

# **Appendix A**

## Numbered List of Standing Research Areas (SRA)



## Numbering System for SRA Survey

### PREVENTION (1000 Series)

Revised #	SRA Name	Subtopic Name
1000	Human Error Factors	
1100	Offshore Facilities and Systems	
1201	Onshore Facilities and Systems	Tank/Piping Inspection, Operations, Design and Data
1202	Onshore Facilities and Systems	Emerging Issues
1300	Waterways Management	
1400	Vessel Design	
1501	Drilling	Deepwater Drilling/Technology
1502	Drilling	Reservoir Characterization
1600	Rail and Truck Transportation	
1701	Pipeline Systems	Materials
1702	Pipeline Systems	Integrity

### PREPAREDNESS (2000 Series)

Revised #	SRA Name	Subtopic Name
2001	Pre-spill Baseline Studies	Habitats and Species Baselines
2002	Pre-spill Baseline Studies	Oceanographic/Geologic Baselines
2003	Pre-spill Baseline Studies	Environmental Baseline Planning
2100	Information Management and Decision Systems	

### RESPONSE (3000 Series)

Revised #	SRA Name	Subtopic Name
3000	Structural Damage Assessment and Salvage	
3100	At-Source Control and Containment	
3201	Chemical and Physical Modeling and Behavior	Arctic Behavior and Modeling
3202	Chemical and Physical Modeling and Behavior	Oil Behavior Models
3203	Chemical and Physical Modeling and Behavior	Transport Models
3204	Chemical and Physical Modeling and Behavior	Oceanographic Models
3205	Emerging Crude (including oil sands products (OSP) and Bakken etc.)	
3301	Oil Spill Detection and Surveillance	Remote Detection
3302	Oil Spill Detection and Surveillance	Monitoring
3303	Oil Spill Detection and Surveillance	Submerged Oil Detection
3401	In and On-water Containment and Recovery	Control and Recovery Technology
3402	In and On-water Containment and Recovery	Recovery Operations and Testing
3500	Shore Containment and Recovery	
3601	Dispersants	Cold Water and Ice Conditions
3602	Dispersants	Behavior
3603	Dispersants	Impacts
3604	Dispersants	Efficacy and Effectiveness
3605	Dispersants	Fate
3606	Dispersants	Subsurface
3701	<i>In situ</i> Burning	Effectiveness and Impacts
3702	<i>In situ</i> Burning	Planning and Technology
3800	Alternative Chemical Countermeasures	
3900	Oily and Oil Waste Disposal	

### IMPACT ASSESSMENT AND RESTORATION (4000 Series)

Revised #	SRA Name	Subtopic Name
4000	Bioremediation and Biodegradation	
4101	Environmental Impacts and Ecosystem Recovery	Species Impacts
4102	Environmental Impacts and Ecosystem Recovery	Toxicological and Sublethal Impacts
4103	Environmental Impacts and Ecosystem Recovery	Sunken and Submerged Oil Impacts
4104	Environmental Impacts and Ecosystem Recovery	Ecosystem and Habitat Impacts
4105	Environmental Impacts and Ecosystem Recovery	Recovery
4106	Environmental Impacts and Ecosystem Recovery	Risk Assessment and Impact Metrics
4200	Environmental Restoration Methods and Technologies	
4301	Human Safety and Health	Safety
4302	Human Safety and Health	Human Exposure
4401	Sociological and Economic Impacts	Community and Economic Impacts
4402	Sociological and Economic Impacts	Human Impacts

#### Number system

1000	Major Category -SRA Framework
100	SRA number
001	Subcategory for SME breakdown



# **Appendix B**

## ICCOPR Standing Research Areas

### 2014 Database



ICCOPR Standing Research Areas  
2014 Database

ICCOPR Standing Research Areas	Subcategory	R&D Need	Source	Physical Location	Sources
<b>PREVENTION - 1000 SERIES</b>					
1000-Human Error Factors	No Subcategory	<b>CREW FITNESS</b> - Create improvements to fitness for fatigue and sleep loss by developing and testing alternative work schedules.	ICCOPR R&T Plan (1997)	All	1
1000-Human Error Factors	No Subcategory	<b>CREW FITNESS</b> - Develop instrumentation for real-time testing of fitness for duty.	ICCOPR R&T Plan (1997)	All	1
1000-Human Error Factors	No Subcategory	<b>CREW FITNESS</b> - Develop standards to minimize human error on vessels, for fatigue, watch standing, stress, organizational relationships, teamwork and training.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
1000-Human Error Factors	No Subcategory	<b>HUMAN BEHAVIOR</b> - Study hazards and risks from the human perspective.	1) Ultra-Deepwater Advisory Committee 2013 Draft Plan: Findings and Recommendations (November 2012) 2) Ultra-Deepwater Advisory Committee 2012 Plan: Comments, Findings and Recommendations (March 2012)	Marine	2
1000-Human Error Factors	No Subcategory	<b>HUMAN BEHAVIOR</b> - Study human behavior as related to the high risk conditions of ultra-deepwater drilling and production operations with emphasis on the "human-machine" interface. Models can be found in training or simulator programs utilized by nuclear and aviation industries.	1) DOE 2013 Annual Plan Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program, Report To Congress (June 2013) 2) Ultra-Deepwater Advisory Committee 2013 Draft Plan: Findings and Recommendations (November 2012) 3) Ultra-Deepwater Advisory Committee 2012 Plan: Comments, Findings and Recommendations (March 2012)	Marine	3
1000-Human Error Factors	No Subcategory	<b>PILOT LICENSING AND CERTIFICATION</b> - Develop surveys to ensure uniform level of expertise commensurate with modern transportation systems.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
1000-Human Error Factors	No Subcategory	<b>"SPILLS OF NATIONAL SIGNIFICANCE" (SONS) SIMULATOR</b> - Develop, test, and evaluate a SONS system.	ICCOPR R&T Plan (1997)	Marine/Estuarine	1
1000-Human Error Factors	No Subcategory	<b>TRAINING</b> - Develop programs for vessel crews to improve their understanding of automated vessel functions.	ICCOPR R&T Plan (1997)	Marine/Estuarine/Freshwater	1
1000-Human Error Factors	No Subcategory	<b>TRAINING</b> - Develop protocols, systems and teamwork for vessel crews.	ICCOPR R&T Plan (1997)	All	1
1000-Human Error Factors	No Subcategory	<b>TRAINING</b> - Improve spill response utilizing innovative methods, including readiness evaluations.	ICCOPR R&T Plan (1992)	All	1
1100-Offshore Facilities and Systems	No Subcategory	<b>BLOWOUT PREVENTERS</b> - Study design modifications to blowout preventer stacks that would allow for more expeditious hook-ups of injection and evacuation networks and hoses.	National Commission on BP DWH - Final Report (2011)	Marine/Estuarine	1
1100-Offshore Facilities and Systems	No Subcategory	<b>OFFSHORE FACILITY DESIGN</b> - Study the effects of ice forces and year round metocean conditions with respect to facility design.	BSEE Alaska Regional Director (2013)	Marine/Arctic	1
1100-Offshore Facilities and Systems	No Subcategory	<b>OFFSHORE MATERIALS</b> - Develop an in situ electrochemical corrosion probe for monitoring risers and other metallic components in deep marine environments in order to improve the integrity, safety, and performance of these systems.	EPAct 2005 Section 999A(b)(4) DOE National Energy Technology Laboratory Complementary Research Program	Marine	1
1100-Offshore Facilities and Systems	No Subcategory	<b>OFFSHORE MATERIALS</b> - Expand information base related to the longevity and integrity of metallic materials used under extreme conditions in relation to these new surface treatments and alloys.	EPAct 2005 Section 999A(b)(4) DOE National Energy Technology Laboratory Complementary Research Program	Marine/Estuarine	1
1100-Offshore Facilities and Systems	No Subcategory	<b>OFFSHORE PIPELINE DESIGN</b> - Study ice scour and gouging, and permafrost effects with respect to pipeline and wellhead placement and design.	BSEE Alaska Regional Director (2013)	Marine/Arctic	1
1100-Offshore Facilities and Systems	No Subcategory	<b>OFFSHORE PIPELINE OPERATIONS</b> - Develop improvements to infrastructure, leak detection, rapid shutdown procedures and computer based systems.	ICCOPR R&T Plan (1992)	All	1
1201-Onshore Facility and Systems	Tank/Piping Inspection, Operations, Design and Data	<b>PIPELINE LEAK DETECTION TECHNOLOGY</b> - Research needed on the use of leak detection systems at storage facilities located near navigable waters.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1

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1201-Onshore Facility and Systems	Tank/Piping Inspection, Operations, Design, and Data	<b>TANK INSPECTION</b> - Evaluate and improve of risk-based inspections, similar service protocols and in-service non-destructive tank testing technologies.	US EPA OSWER OEM Personal Communication (2014)	Terrestrial	1
1201-Onshore Facility and Systems	Tank/Piping Inspection, Operations, Design, and Data	<b>TANK/PIPELINE OPERATIONS</b> - Evaluate the efficacy of oleophilic materials used as an oil spill control technology.	US EPA OSWER OEM Personal Communication (2014)	All	1
1201-Onshore Facility and Systems	Tank/Piping Inspection, Operations, Design, and Data	<b>TANK/PIPELINE OPERATIONS</b> - Develop improved methods and protocols used to determine the imperviousness of secondary containment structures.	US EPA OSWER OEM Personal Communication (2014)	Terrestrial	1
1201-Onshore Facility and Systems	Tank/Piping Inspection, Operations, Design, and Data	<b>TANK/PIPELINE OPERATIONS</b> - Conduct a comparative analysis of overflow prevention equipment/procedures to identify technology gaps/limitations.	US EPA OSWER OEM Personal Communication (2014)	Terrestrial	1
1201-Onshore Facility and Systems	Tank/Piping Inspection, Operations, Design, and Data	<b>TANK/PIPELINE OPERATIONS</b> - Evaluate the cost effective security and safety measures for unmanned upstream production facilities.	US EPA OSWER OEM Personal Communication (2014)	Terrestrial	1
1201-Onshore Facility and Systems	Tank/Piping Inspection, Operations, Design, and Data	<b>DATABASE DEVELOPMENT</b> - Develop a consolidated database and GIS platform of aboveground oil storage tanks based on federal, tribal, state and local data sources and analyze the data gaps.	US EPA OSWER OEM Personal Communication (2014)	Terrestrial	1
1201-Onshore Facility and Systems	Tank/Piping Inspection, Operations, Design, and Data	<b>DATABASE DEVELOPMENT</b> - Develop a consolidated database and corresponding GIS platform of oil discharges from onshore facilities.	US EPA OSWER OEM Personal Communication (2014)	Terrestrial	1
1201-Onshore Facility and Systems	Tank/Piping Inspection, Operations, Design, and Data	<b>TANK/PIPELINE OPERATIONS</b> - Analyze upstream and/or downstream causes of discharges, including an analysis of the tanks, appurtenances and associated piping.	US EPA OSWER OEM Personal Communication (2014)	Terrestrial	1
1202-Onshore Facility and Systems	Emerging Issues	<b>EMERGING ISSUES FOR TANKS AND PIPING OPERATIONS</b> - Identify the impacts of an aging oil storage infrastructure (tanks, appurtenances and piping systems) and develop methodologies/protocols to predict/minimize failures.	US EPA OSWER OEM Personal Communication (2014)	Terrestrial	1
1202-Onshore Facility and Systems	Emerging Issues	<b>EMERGING ISSUES FOR TANKS AND PIPING OPERATIONS</b> - Evaluate the impacts of emerging crude oils and alternative fuels on tanks, appurtenances and piping.	US EPA OSWER OEM Personal Communication (2014)	All	1
1202-Onshore Facility and Systems	Emerging Issues	<b>EMERGING ISSUES FOR TANKS AND PIPING OPERATIONS</b> - Assess the impacts of Arctic and cold weather environments on the operation and maintenance of tanks, appurtenances, and associated piping.	US EPA OSWER OEM Personal Communication (2014)	All	1
1300-Waterways Management	No Subcategory	<b>PORT FACILITES DESIGN</b> - New designs needed to improve facilities and vessel traffic infrastructure (e.g., storage tanks, pipes, pumps, channels).	ICOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
1300-Waterways Management	No Subcategory	<b>SHIPBOARD EXPERT PILOTING SYSTEMS (SEPS)</b> - Improved piloting systems, electronic chart display and information systems (ECDIS) integration development needed to improve navigation.	ICOPR R&T Plan (1997)	te	1
1300-Waterways Management	No Subcategory	<b>TANK VESSEL ALTERNATIVES ASSESSMENT</b> - Research needed on the level of risk for various sizes of vessels, numbers of vessels in operation, types of ports, terminals, probability of accidents and the rate of production to improve vessel assessment.	ICOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
1300-Waterways Management	No Subcategory	<b>TRAINING SIMULATOR</b> - Simulator development needed for port operations.	ICOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
1300-Waterways Management	No Subcategory	<b>VESSEL TRAFFIC SYSTEMS</b> - Systems needed for control in ports, including surveillance of vessel traffic.	ICOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
1400-Vessel Design	No Subcategory	<b>LIQUID CARGO SAFETY SYSTEMS</b> - Develop and test passive onboard countermeasures to minimize the discharge of oil from damaged vessels prior to arrival of outside response equipment.	ICOPR R&T Plan (1997)	Marine/Estuarine/Freshwater	1

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1400-Vessel Design	No Subcategory	<b>LIQUID CARGO SAFETY SYSTEMS</b> - Develop improved liquid cargo systems to minimize spilled oil from damaged tanks.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
1400-Vessel Design	No Subcategory	<b>LIQUID CARGO SAFETY SYSTEMS</b> - Develop technologies to measure prevention of discharges from tanks on vessels, discharges from tank vents, discharges during lightering and bunkering operations, discharges on the deck of a vessel, discharges through the use of vacuums in tanks.	Title 33 Chapter 40 Subchapter IV 2761 (OPA 1990)	Marine/Estuarine/Freshwater	1
1400-Vessel Design	No Subcategory	<b>LIQUID CARGO SAFETY SYSTEMS</b> - Study capabilities of product off-loading and onboard countermeasures.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
1400-Vessel Design	No Subcategory	<b>TANKER DESIGN</b> - Develop advanced models for evaluating tanker designs.	ICCOPR R&T Plan (1997)	Marine/Estuarine/Freshwater	1
1400-Vessel Design	No Subcategory	<b>TANKER DESIGN</b> - Develop improved vessel designs and various alternative vessel designs.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
1400-Vessel Design	No Subcategory	<b>TANKER DESIGN</b> - Develop, test and evaluate alternatives to double hulls.	ICCOPR R&T Plan (1997)	Marine/Estuarine/Freshwater	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER FLUIDS DATABASE</b> - Expand the experimental database on critical fluid properties for hydrocarbons at high pressure and temperature, extending the current work to multi-phase and multi-component fluids (hydrocarbons, etc), which is key to predicting their behavior in situ conditions in the deep subsurface.	EPAct 2005 Section 999A(b)(4) DOE National Energy Technology Laboratory Complementary Research Program	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Characterize experimentally the properties and behavior of foam cement samples at in situ conditions to improve the safe use and emplacement of these barriers in deep offshore settings.	EPAct 2005 Section 999A(b)(4) DOE National Energy Technology Laboratory Complementary Research Program	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Conduct research on complex fluid phase behaviors that occur under conditions of extreme pressure and temperature, and develop advanced models of hydrocarbon behavior.	DOE 2012 Annual Plan Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program, Report To Congress (August 2012)	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Conduct research on methods of Managed Pressure Drilling (MPD) and, in particular, Dual Gradient Drilling. Conduct a gap analysis to identify future critical needs.	Ultra-Deepwater Advisory Committee 2012 Plan: Comments, Findings and Recommendations (March 2012)	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Conduct research on the viability of activation of BOPs and other submerged well-control equipment in the deepwater, including the feasibility and viability of integrating the use of acoustics and ROV technology.	OESC Letter Recommendations to BSEE Department of Interior (August 2012)	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Conduct research related to the containment of hydrocarbons throughout the entire lifecycle of an oil or gas field to include mitigating leakage in and around the borehole from reservoir fluids and gas as well as any injected liquids and materials; long term borehole stability; plugging and abandoning technology for long term containment of hydrocarbons; and long term monitoring systems (i.e. down hole and well head pressure sensors, time lapse seismic surveying, sea bed monitoring, etc.).	Ultra-Deepwater Advisory Committee 2013 Draft Plan: Findings and Recommendations (November 2012)	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Develop an ROV to rapidly determine hydrocarbon composition and volume of leaks at high pressures and low temperatures (UDW seafloor conditions) in order to improve deepwater drilling safety and spill response efficacy.	EPAct 2005 Section 999A(b)(4) DOE National Energy Technology Laboratory Complementary Research Program	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Develop design criteria to address and mitigate the impact of storms on deepwater operations identifying suitable vessel designs for drilling and production, including FPSOs.	Ultra-Deepwater Advisory Committee 2013 Draft Plan: Findings and Recommendations (November 2012)	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Develop enhanced shearing technologies to completely cut drill pipe, tool joints, and casing strings, and to assure that the blind shear rams installed in the blowout preventer (BOP) stack are capable of shearing the pipe and/or sealing the wellbore under maximum anticipated pressures.	OESC Letter Recommendations to BSEE Department of Interior (August 2012)	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Develop geophysical imaging techniques (e.g., seismic reflection surveys, and possibly passive microseismic monitoring) for remotely monitoring oil and gas leakage rates and upward migration below the sea floor and external to the wellbore.	OESC Letter Recommendations to BSEE Department of Interior (January 2013)	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Develop improved casing and cementing design for ultra-deepwater wells.	DOE - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program (2011)	Marine/Estuarine	1

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1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Develop improved quantitative models for reservoir response and cross flow during blowouts to better understand subsurface behavior in a cross-flow situation.	OESC Letter Recommendations to BSEE Department of Interior (January 2013)	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Develop improved subsea ultra-deepwater measurement and monitoring instrumentation, including technologies for "seeing" through the casing via downhole tools to gauge the cement top and in-situ cement characteristics (thickness, channeling, density (gas or liquid pockets), etc.) to better determine potential failure pathways.	DOE - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program (2012)	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Evaluate the feasibility of using existing geophysical measurements for rapid identification of fluid influx into the borehole near the bit to reduce loss of control risks associated with drilling into over-pressured intervals	EPAct 2005 Section 999A(b)(4) DOE National Energy Technology Laboratory Complementary Research Program	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Research sensors; instrumentation; command electronics; and advanced data interpretation technologies and alert systems to improve decision-making capabilities. Include data analysis and expert systems.	1) DOE 2013 Annual Plan Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program, Report To Congress (June 2013) 2) Ultra-Deepwater Advisory Committee 2013 Draft Plan: Findings and Recommendations (November 2012) ;DOE - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program (2012) 3) OESC Letter Recommendations to BSEE Department of Interior (January 2013)	Marine	3
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Study expert (case based) systems, and then identify benefits and limitations as well as other applications (such as cementing, completions, wellbore design, etc.) that would reduce the risk when operating in deepwater.	1) Ultra-Deepwater Advisory Committee 2013 Draft Plan: Findings and Recommendations (November 2012) 2) Ultra-Deepwater Advisory Committee 2012 Plan: Comments, Findings and Recommendations (March 2012)	Marine	2
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Study the interaction and potential for failure between the in situ formation (and fluids), cement, and casing, including the physical, chemical, and temporal integrity of formation, cement and casing systems.	EPAct 2005 Section 999A(b)(4) DOE National Energy Technology Laboratory Complementary Research Program	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>DEEPWATER TECHNOLOGY</b> - Evaluate subsea blowout preventer/control pod batteries including assessments of battery design, life expectancy, performance and reliability with respect to different manufacturers.	DOE personal communication	Marine	1
1501-Drilling	Deepwater Drilling/Technology	<b>GOM DRILLING</b> - Conduct a gap analysis to characterize the salient differences between operations in the GOM environment and those to be encountered in drilling and completion in unique and sensitive marine habitats, such as arctic waters and tropical coral reef areas to assess the risks that demand more research.	Ultra-Deepwater Advisory Committee 2012 Plan: Comments, Findings and Recommendations (March 2012)	Marine	
1501-Drilling	Deepwater Drilling/Technology	<b>WELL FLOW</b> - Develop improved flow assurance, expediting the completion of well control efforts, and reduce the risk of environmental impacts from hydrate plugging related ruptures during producing operations.	DOE - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program (2011)	Marine/Estuarine	1
1502-Drilling	Reservoir Characterization	<b>DEEPWATER CHARACTERIZATION</b> - Conduct research on the conditions (e.g., in-situ stress, sediment rheology, fluid pressure, flow rate and blowout duration) where hydrocarbon pathways to the sea floor established through hydraulic fractures and reactivated natural faults can heal	OESC Letter Recommendations to BSEE Department of Interior (January 2013)	Marine	1
1502-Drilling	Reservoir Characterization	<b>DEEPWATER CHARACTERIZATION</b> - Conduct research on the physical processes controlling upward propagation and arrest of two-phase (oil/gas) hydraulic fractures in poorly consolidated marine sediments, leading to improved numerical models for leakage volumes required for a sea-floor broach under different geological settings.	OESC Letter Recommendations to BSEE Department of Interior (January 2013)	Marine	1
1502-Drilling	Reservoir Characterization	<b>DEEPWATER CHARACTERIZATION</b> - Conduct reservoir characterization research, including bounding strata to ensure hydrocarbon containment within the geologic and engineered system.	DOE 2013 Annual Plan Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program, Report To Congress (June 2013)	Marine	1
1502-Drilling	Reservoir Characterization	<b>DEEPWATER CHARACTERIZATION</b> - Expand the research on reservoir characterization to include overburden characterization with emphasis on technology and methods for geological and geomechanical characterization of the subsurface from sea bed to the reservoir.	Ultra-Deepwater Advisory Committee 2013 Draft Plan: Findings and Recommendations (November 2012)	Marine	1

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1502-Drilling	Reservoir Characterization	<b>OFFSHORE DRILLING DATABASE</b> - Develop consistent global dataset for offshore drilling incidents to help prevent future incidents.	National Commission on BP DWH - Final Report (2011)	Marine/Estuarine	1
1502-Drilling	Reservoir Characterization	<b>OIL SANDS PRODUCTS EXTRACTION</b> - Conduct research on improving setting times of fines in process water to enhance water reuse and reduce settling pond restoration time.	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Terrestrial	1
1502-Drilling	Reservoir Characterization	<b>OIL SANDS PRODUCTS EXTRACTION</b> - Conduct research to develop <i>insitu</i> OSP extraction processes that use less water.	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Terrestrial	1
1502-Drilling	Reservoir Characterization	<b>OIL SANDS PRODUCTS EXTRACTION</b> - Conduct research to improve the efficiency and reduce energy use from <i>insitu</i> extraction processes.	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Terrestrial	1
1502-Drilling	Reservoir Characterization	<b>RESERVOIR CHARACTERIZATION</b> - Develop better reservoir characterization which results in lower dependence on new field developments and new wells, thus reducing the physical and environmental footprint.	DOE - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program (2012)	Marine	1
1502-Drilling	Reservoir Characterization	<b>RESERVOIR CHARACTEIZATION</b> - Characterize reservoir conditions associated with offshore Arctic oil and gas provinces to identify potential issues in areas of offshore cathates, sea ice and other effects.	DOE personal communication	Marine	
1502-Drilling	Reservoir Characterization	<b>SITE IMPACTS</b> - Study methods for reducing the site impact of drilling individual wells and increasing the reach associated with multiple wells drilled from a single pad.	DOE - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program (2012)	Terrestrial/Freshwater	1
1600-Rail and Truck Transportation	No Subcategory	<b>HEADSPACE GAS RISKS</b> - Evaluate methods to reduce the volatility of headspace gas in rail cars.	PHMSA - Personal Communication (2014)	Terrestrial/Freshwater	1
1600-Rail and Truck Transportation	No Subcategory	<b>HEADSPACE GAS CHARACTERISTICS</b> - Determine the volume and characteristics of headspace gas during transport and the factors affecting these characteristics.	PHMSA - Personal Communication (2014)	Terrestrial/Freshwater	1
1600-Rail and Truck Transportation	No Subcategory	<b>TANK CAR INTEGRITY</b> - Evaluate the potential for different oil sands-derived crude oils (i.e., dilbit, synbit, and Bakken crudes) to cause corrosion or other failure mechanisms for rail tanker car operating parameters (e.g., temperature) and physical standards (e.g., wall thickness).	PHMSA - Personal Communication (2014)	Terrestrial/Freshwater	1
1600-Rail and Truck Transportation	No Subcategory	<b>TANK CAR SAFETY</b> - Evaluate alternative designs and modifications to minimize risk of oil spills during accidents.	PHMSA - Personal Communication (2014)	Terrestrial/Freshwater	1
1600-Rail and Truck Transportation	No Subcategory	<b>ACCIDENT ANALYSES</b> - Evaluate accident and incident trends to identify ways to minimize the incident rate of leaks, spills, and damage to the environment due to oil spills.	FRA Objectives ( <a href="http://www.fra.dot.gov/Page/P0151">http://www.fra.dot.gov/Page/P0151</a> )	Terrestrial/Freshwater	1
1600-Rail and Truck Transportation	No Subcategory	<b>TANK CAR INTEGRITY TESTING</b> - Investigate non-destructive detection technologies to improve methods to inspect tank cars for damage.	FRA Objectives ( <a href="http://www.fra.dot.gov/Page/P0151">http://www.fra.dot.gov/Page/P0151</a> )	Terrestrial/Freshwater	1
1600-Rail and Truck Transportation	No Subcategory	<b>OIL CLASSIFICATION</b> - Determine the chemical and other characteristics of crude oils for proper classification before shipping by rail or truck, including gas content, corrosivity, toxicity, flammability, Reid Vapor Pressure, hydrogen sulfide content and composition/concentration of entrained gases.	PHMSA, Safety Alert-January 2, 2014. Preliminary Guidance from OPERATION CLASSIFICATION.	All	1
1600-Rail and Truck Transportation	No Subcategory	<b>CREW SIZE</b> - Evaluate and determine minimum operating requirements for safe operation of unit trains transporting crude oil.	78 Federal Register 48224, FRA, PHMSA, Lac Megantic Railroad Accident Discussion and DOT Safety Recommendations.	Terrestrial/Freshwater	1
1701 Pipeline Systems	Materials	<b>PIPELINE MATERIALS</b> - Research needed on strain based design and assessment of segments of pipelines with and without fittings.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1701 Pipeline Systems	Materials	<b>PIPELINE MATERIALS</b> - Research needed on the effects of hydrocarbon permeation on plastic pipe strength and fusion performance.	Government and Industry Pipeline Forum (2012)	Terrestrial	1

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1701 Pipeline Systems	Materials	<b>PIPELINE MATERIALS</b> - Research needed on the fatigue of steels and welds in a hydrogen environment.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1701 Pipeline Systems	Materials	<b>PIPELINE MATERIALS</b> - Research needed on the interaction of high longitudinal strain and anomalies from corrosion and mechanical damage.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1701 Pipeline Systems	Materials	<b>PIPELINE MATERIALS</b> - Research required on high toughness steels to characterize line pipe toughness for fracture arrest assessment.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1701 Pipeline Systems	Materials	<b>PIPELINE THREAT/ANOMALY MITIGATION PROCESS</b> - Research needed to improve the decision making process.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1701 Pipeline Systems	Materials	<b>WELL CONSTRUCTION MATERIAL TESTING</b> - Research needed to improve cement evaluation and pressure testing wireline tools to assure casing and cementing integrity.	DOE - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program (2012)	Terrestrial	1
1701 Pipeline Systems	Materials	<b>PIPELINE LEAK DETECTION TECHNOLOGY</b> - Advanced technology needed for sensing pipeline breaks.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1701 Pipeline Systems	Materials	<b>PIPELINE LEAK DETECTION TECHNOLOGY</b> - Develop improvements to mobile based LDS (leak detection systems) that are tested for accuracy on moving platforms (e.g., aerial, mobile vehicles).	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1701 Pipeline Systems	Materials	<b>PIPELINE LEAK DETECTION TECHNOLOGY</b> - Leak detection technology and health monitoring sensors needed that are miniaturized, automatic, robust and withstand harsh environments.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1701 Pipeline Systems	Materials	<b>PIPELINE LEAK DETECTION TECHNOLOGY</b> - Technology improvements needed to reduce leak detection false alarms.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1702 Pipeline Systems	Integrity	<b>PIPELINE INDUSTRY DATABASE</b> - Consolidated database needed for pipelines installed in the ground.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1702 Pipeline Systems	Integrity	<b>PIPELINE TECHNOLOGY</b> - Technology needed to effectively locate plastic pipe.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1702 Pipeline Systems	Integrity	<b>PIPELINE TECHNOLOGY</b> - Develop trenchless renewal/rehabilitation methods for piping systems.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1702 Pipeline Systems	Integrity	<b>PIPELINE TECHNOLOGY</b> - Investigate aerial surveillance technology (manned and unmanned) for pipelines with ROW encroachment.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1702 Pipeline Systems	Integrity	<b>PIPELINE TECHNOLOGY</b> - Technology needed for documenting the type of pipe materials installed in the ground.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
1702 Pipeline Systems	Integrity	<b>PIPELINE TECHNOLOGY</b> - Technology needed that detects the presence and location of multiple utilities (underground, through various soil conditions) in a given area.	Government and Industry Pipeline Forum (2012)	Terrestrial	1
<b>PREPAREDNESS - 2000 SERIES</b>					
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>ARCTIC BASELINE STUDIES</b> - Collect baseline data specifically for ESA's in underrepresented environments including the Arctic (Chukchi Sea, Bristol Bay), particularly in areas that are likely to be developed for oil and gas extraction in the near to mid-term.	1) NSTC JSOST - DWH Oil Spill PI Conference Report (2011) 2) National Commission on BP DWH - Final Report (2011) 3) ICCOPR R&T Plan (1992) 4) ICCOPR Public Meeting - East (2010)	Marine/Estuarine	4
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>ARCTIC BASELINE STUDIES</b> - Collect species and habitat inter-annual variability data in the Arctic nearshore zone and create high-resolution maps.	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>ARCTIC BASELINE STUDIES</b> - Conduct fundamental scientific research on regional living marine resources, ecology, spatial habitat of flora and fauna.	US Arctic Research Commission White Paper (2010)	Marine/Estuarine	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>ARCTIC BASELINE STUDIES</b> - Develop integrated information about the composition, structure and functioning of the arctic ring ecosystem.	ICCOPR Public Meeting - West (2010)	Marine/Estuarine	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>ARCTIC BASELINE STUDIES</b> - Develop maps of sub-tidal habitats in Arctic.	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>ARCTIC BASELINE STUDIES</b> - Study ecological structure and population of Arctic key indicator species (include subsistence & ecosystem importance).	US Arctic Research Commission White Paper (2010)	Marine/Estuarine	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>ARCTIC BASELINE STUDIES</b> - Study living marine resources and their vulnerability to oil spills, including consideration of the nature and potential severity of worst case scenarios [in the Arctic].	ICCOPR Public Meeting - East (2010)	Marine/Estuarine	1

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2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>AVIAN BASELINE STUDIES</b> - Develop a better understanding of bird beaching rates including seasonal variabilities.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	Marine/Estuarine	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>AVIAN BASELINE STUDIES</b> - Study the feasibility of using genetic labeling (DNA) to identify local populations of colonial seabirds at risk from oil spills.	ICOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>BASELINE HABITAT STUDIES</b> - Collect baseline data on species abundance in key habitats (e.g., mangroves, corals).	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>BASELINE HABITAT STUDIES</b> - Collect data to fill data gaps on living marine resources and their habitats including (phytoplankton, invertebrates, fish stocks, waterfowl, and marine mammals).	Marine Mammal Commission Letter to ICOPR (2010)	Marine/Estuarine	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>BASELINE HABITAT STUDIES</b> - Study bacterial communities inhabiting natural seeps, and the role of deep natural seeps in the ecological communities.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>BASELINE HABITAT STUDIES</b> - Study location, intensity, frequency of convergence zones both as sentinels for otherwise undetectable oil and as high risk sites for biota.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>ECOTOXICITY BASELINES</b> - Develop ecotoxicity benchmarks for benthic organisms.	EPA Draft Oil Spill Research Strategy (2011)	Marine/Estuarine/Freshwater	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>GOM BASELINE HABITAT STUDIES</b> - Develop benthic mapping of sensitive/important habitats in the GOM.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>GOM FISHERIES BASELINE STUDIES</b> - Develop improved understanding of GOM fisheries especially migratory species and habitat use characteristics.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>INTERTIDAL BASELINE STUDIES</b> - Study and synthesize existing information for rocky and cobble habitats regarding productivity, species diversity, and community structure. Study the effects of oil on these parameters, including recovery time with consideration for regional variation	CRRC - R&D Priorities: Oil Spill Workshop (2009)	Marine/Estuarine	1
2001-Pre-spill Baseline Studies	Habitats and species baselines	<b>INTERTIDAL BASELINE STUDIES</b> - Study and synthesize existing information for sand beaches regarding productivity, species diversity, and community structure, and the effects of oil on these parameters, including recovery time with consideration for regional variation.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	Marine/Estuarine	1
2002-Pre-spill Baseline Studies	Oceanographic/geological Baselines	<b>ARCTIC BASELINE STUDIES</b> - Develop a redundant meteorological sensor system to enhance Arctic coast-wide spill response goals and a series of large-scale studies of oceanographic exchanges, shelf-basin exchanges via wind and eddies, coastal boundary, under-ice river plumes, and sea-ice boundary to better inform pre- and post-spill modeling and response	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
2002-Pre-spill Baseline Studies	Oceanographic/geological Baselines	<b>ARCTIC BASELINE STUDIES</b> - Investigate ice hazards associated with operations in Arctic environment.	ICOPR R&T Plan (1997)	Marine/Estuarine	1
2002-Pre-spill Baseline Studies	Oceanographic/geological Baselines	<b>BASELINE GEOLOGICAL STUDIES</b> - Collect info on bathymetry and shoreline conditions and natural and human hazards.	Marine Mammal Commission Letter to ICOPR (2010)	Marine/Estuarine	1
2002-Pre-spill Baseline Studies	Oceanographic/geological Baselines	<b>GOM GEOLOGIC BASELINE STUDIES</b> - Develop a better understanding of how coasts naturally work (relationship between floods breaching natural levees and the health of marshland and barrier islands fed by the sediment).	National Commission on BP DWH - Final Report (2011)	Marine/Estuarine	1
2002-Pre-spill Baseline Studies	Oceanographic/geological Baselines	<b>GULF OF MEXICO SUSPENDED SEDIMENTS</b> - Conduct research on the baseline sediment loads in the GOM.	Center for Spills in the Environment Oil Spill Dispersant Research Workshop Report (March 2013)	Marine	1
2002-Pre-spill Baseline Studies	Oceanographic/geological Baselines	<b>OCEANOGRAPHIC BASELINE STUDIES</b> - Develop tidal and current flow baselines and scientifically based strategies focused on determining shallow water inlet flow characteristics.	Oil Spill Preparedness and Response JITF (2011)	Shoreline	1
2002-Pre-spill Baseline Studies	Oceanographic/geological Baselines	<b>OCEANOGRAPHIC BASELINE STUDIES</b> - Study climactic/oceanic conditions, ice conditions, and their variations.	Marine Mammal Commission Letter to ICOPR (2010)	Marine/Estuarine	1
2002-Pre-spill Baseline Studies	Oceanographic/geological Baselines	<b>OCEANOGRAPHIC/ATMOSPHERIC BASELINE STUDIES</b> - Develop a better understanding of cloud and ice coverage in various environments, GOM and Arctic	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
2002-Pre-spill Baseline Studies	Oceanographic/geological Baselines	<b>OCEANOGRAPHIC/ATMOSPHERIC BASELINE STUDIES</b> - Study atmospheric baselines to examine the exchange with the water surface. There is natural variability, e.g., how much methane is released from marsh systems. There is a need for the active monitoring of volatiles (e.g., H2S)	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	All	1
2003-Pre-spill Baseline Studies	Environmental Baseline Planning	<b>BASELINE PLANNING</b> - Conduct comprehensive, ecosystem-based scientific reviews of OCS areas that are currently or will likely be open for oil and gas leasing. Focus on (1) decision-making related to future leasing, exploration, and development; (2) measuring and monitoring impacts on ecological resources; and (3) providing necessary data for natural resource damage assessment should an oil spill occur.	National Commission on BP DWH - Final Report (2011)	All	1
2003-Pre-spill Baseline Studies	Environmental Baseline Planning	<b>BASELINE PLANNING</b> - Conduct research to improve the understanding of the potential for environmental impacts in frontier ultra-deepwater areas where a well-established infrastructure for spill containment does not exist (e.g., Alaskan Arctic offshore and Eastern GOM)	DOE - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program (2011)	Marine/Estuarine	1

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2003-Pre-spill Baseline Studies	Environmental Baseline Planning	<b>BASELINE PLANNING</b> - Develop statistics for strategically planning for different risks, their location and therefore who has what stake; develop stats for risk profiles and pre-position equipment.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine	1
2003-Pre-spill Baseline Studies	Environmental Baseline Planning	<b>ENVIRONMENTAL BASELINE STUDIES</b> - Collect data on prevailing environmental conditions on a broad geographic scale, not just at individual lease sites.	National Commission on BP DWH - Final Report (2011)	All	1
2003-Pre-spill Baseline Studies	Environmental Baseline Planning	<b>ENVIRONMENTAL BASELINE STUDIES</b> - Collect ecological baseline information and construct a long term dataset of condition of relevant ecosystems prior to spill incidents.	1) National Commission on BP DWH - Final Report (2011) 2) CRRC - Dispersant Workshop (2013)	All	2
2003-Pre-spill Baseline Studies	Environmental Baseline Planning	<b>ENVIRONMENTAL BASELINE STUDIES</b> - Collect environmental baseline data in ecologically sensitive areas at particular risk to oil discharges where such data are insufficient	Title 33 Chapter 40 Subchapter IV 2761 (OPA 1990)	All	1
2003-Pre-spill Baseline Studies	Environmental Baseline Planning	<b>ENVIRONMENTAL BASELINE STUDIES</b> - Develop baseline data by conducting long-term monitoring and an integrated natural system research approach at a variety of spatial scales. Develop a broad suite of indicators that can be used to evaluate an ecosystem's response and recovery.	SAB Review of EPA Research Strategy (2011)	All	1
2003-Pre-spill Baseline Studies	Environmental Baseline Planning	<b>ENVIRONMENTAL BASELINE STUDIES</b> - Study linkages between systems, including life history information and trophic linkages. Take a holistic perspective	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
2003-Pre-spill Baseline Studies	Environmental Baseline Planning	<b>ENVIRONMENTAL BASELINE STUDIES</b> - Study the signal-to-background-noise ratio in various environments so that the impacts from oil or other stressor(s) can be delineated from natural variation. This requires adequate sampling.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	All	1
2003-Pre-spill Baseline Studies	Environmental Baseline Planning	<b>GOM BASELINE HABITAT STUDIES</b> - Conduct baseline studies for critical habitats in Texas and Louisiana.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
2003-Pre-spill Baseline Studies	Environmental Baseline Planning	<b>GREAT LAKES BASELINE STUDIES</b> - Study the potential impacts from oil discharged into the Great Lakes near shore habitats, including potential bioaccumulation of petroleum products and byproducts, early life history stages of Great Lakes fish, wetland vegetation, aquatic biota risk assessment.	ICCOPR R&T Plan (1992)	Freshwater	1
2100-Information Management and Decision Systems	No Subcategory	<b>DATA COLLECTION AND ANALYSIS</b> - Collect and synthesize existing data in a format useful for making decisions during spill events.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	All	1
2100-Information Management and Decision Systems	No Subcategory	<b>DATA COLLECTION AND ANALYSIS</b> - Collect spill data, re-examine statistical approaches used in the application of non-Arctic analogs (see Eschenbach and others, 2010), and develop and incorporate climate influenced forecasts on factors such as storms, vessel traffic, or other fault-tree model adjustments that would provide improved understanding of and confidence in spill risk estimates over the proposed project life.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
2100-Information Management and Decision Systems	No Subcategory	<b>DATA COLLECTION AND ANALYSIS</b> - Develop standards and processes for the expedited collection, processing, correlation, analysis, and distribution of satellite imagery and oil thickness sensors to provide for real-time data.	DWH ISPR (2011)	All	1
2100-Information Management and Decision Systems	No Subcategory	<b>DATA COLLECTION METHODS</b> - Develop methods for automatically transferring collected data into a usable format.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
2100-Information Management and Decision Systems	No Subcategory	<b>DATA COLLECTION METHODS</b> - Develop new information tools to have easier access to individual response teams (e.g., SCAT team, skimming crews, disposal crews) in Arctic spill response.	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine	1
2100-Information Management and Decision Systems	No Subcategory	<b>DECISION SUPPORT SYSTEMS</b> - Develop a coordinated platform to allow for the rapid evaluation and assessment of risks and potential impacts associated with offshore deepwater operations for the GOM to produce science-based predictions, and evaluate potential future adaptation for application to other areas of the Outer Continental Shelf.	EPAct 2005 Section 999A(b)(4) DOE National Energy Technology Laboratory Complementary Research Program	Marine	1
2100-Information Management and Decision Systems	No Subcategory	<b>DECISION SUPPORT SYSTEMS</b> - Develop data repositories to be more user friendly/intuitive.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
2100-Information Management and Decision Systems	No Subcategory	<b>DECISION SUPPORT SYSTEMS</b> - Develop decision support and data systems, such as the Arctic Emergency Response Management Application, the Alaska Ocean Observing System, and the State-Federal Alaska Data Integration Working Group. Field testing of assets and data systems as was done in the 2009 "Sound Predictions" experiment in Prince William Sound, Alaska, that could significantly improve preparedness by highlighting significant data and operational needs	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
2100-Information Management and Decision Systems	No Subcategory	<b>DECISION SUPPORT SYSTEMS</b> - Develop improved information systems for decision-making, including the use of data from coastal mapping, baseline data, and other data related to the environmental effects of oil discharges, and cleanup technologies.	Title 33 Chapter 40 Subchapter IV 2761 (OPA 1990)	Marine/Estuarine	1

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2100-Information Management and Decision Systems	No Subcategory	<b>DECISION SUPPORT SYSTEMS</b> - Develop Structured Decision Making and supporting tools to spill response to provide a more transparent and quantitative discipline to technical or value based deliberations.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
2100-Information Management and Decision Systems	No Subcategory	<b>GOM DATA</b> - Develop a unified structure of all data sets and approaches within GOMRI so all data are consistent and have documentation that is available to other researchers.	Center for Spills in the Environment Oil Spill Dispersant Research Workshop Report (March 2013)	Marine	1
2100-Information Management and Decision Systems	No Subcategory	<b>ICE DYNAMICS</b> - Develop short-term ice dynamics forecasts to inform windows for mechanical recovery operations and to improve recovery technologies in the "ice gap" (about 30 to 70 percent ice coverage).	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
2100-Information Management and Decision Systems	No Subcategory	<b>SPATIAL PLANNING</b> - Study potential for using marine spatial planning for ocean uses including offshore drilling, shipping, national defense, sustainable fisheries, and conservation.	National Commission on BP DWH - Final Report (2011)	Marine/Estuarine	1
2100-Information Management and Decision Systems	No Subcategory	<b>SPILL PLANNING</b> - Develop spill planning and response based on Response Gap analysis of countermeasures, a rigorous analysis of the likelihood of the availability of a multi-countermeasure suite in different Arctic locations and seasons, and the forecasting of climate change influences on the Response Gap.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
<b>RESPONSE - 3000 SERIES</b>					
3000-Structural Damage Assessment and Salvage	No Subcategory	<b>REMOTE DAMAGE ASSESSMENT</b> - Develop improved remotely operated vehicles (ROV) for underwater assessment of hull damage.	ICOPR R&T Plan (1997)	Marine/Estuarine/Freshwater	1
3000-Structural Damage Assessment and Salvage	No Subcategory	<b>REMOTE DAMAGE ASSESSMENT</b> - Study methods for remotely determining whether a cargo tank contains sea water and the height of the oil/water interface from the bottom of the tank.	ICOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
3000-Structural Damage Assessment and Salvage	No Subcategory	<b>WRECK POLLUTION</b> - Collect baseline data on the potentially polluting wrecks in marine waters.	Potentially Polluting Wrecks in Marine Waters: An Issue Paper for the International Oil Spill Conference (2005)	Marine/Estuarine	1
3000-Structural Damage Assessment and Salvage	No Subcategory	<b>WRECK POLLUTION</b> - Conduct a wreck identification, evaluation and risk assessment.	Wreck Oil Removal Program Overview (2009)	Marine/Estuarine	1
3100-At-Source Control and Containment	No Subcategory	<b>SHIP CONTAINMENT TECHNOLOGY</b> - Test plugging and patching vessel leak technologies.	ICOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
3100-At-Source Control and Containment	No Subcategory	<b>WELL CONTAINMENT TECHNOLOGY</b> - Develop and integrate subsea containment equipment including relevant procedures and training of skilled personnel.	DWH ISPR (2011)	Marine/Estuarine	1
3100-At-Source Control and Containment	No Subcategory	<b>WELL CONTAINMENT TECHNOLOGY</b> - Develop capping and containment options to contain blowouts from platform wells.	National Commission on BP DWH - Final Report (2011)	Marine/Estuarine	1
3100-At-Source Control and Containment	No Subcategory	<b>WELL CONTAINMENT TECHNOLOGY</b> - Develop containment technology that is compatible with deepwater wells.	National Commission on BP DWH - Final Report (2011)	Marine/Estuarine	1
3100-At-Source Control and Containment	No Subcategory	<b>WELL CONTAINMENT TECHNOLOGY</b> - Develop improved technology and response protocols to adequately address source control and containment objectives arising from an uncontrolled well blowout.	DWH ISPR (2011)	Marine/Estuarine	1
3100-At-Source Control and Containment	No Subcategory	<b>WELL CONTAINMENT TECHNOLOGY</b> - Develop subsea containment equipment, vessels, personnel, & capabilities for collecting flow from pipelines, risers, blowout preventers, flanges, & other subsea equipment at any water depth at which exploration and development activities are taking place.	DWH ISPR (2011)	Marine/Estuarine	1
3100-At-Source Control and Containment	No Subcategory	<b>WELL CONTAINMENT TECHNOLOGY</b> - Study the range of failure states under which blowout preventers (BOPs) must perform.	DOE - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program (2011)	Marine/Estuarine	1
3201-Chemical and Physical Behavior Modeling	Arctic Behavior/Modeling	<b>ARCTIC OCEANOGRAPHIC DATA</b> - Investigate surface circulation using HF radar and satellite track drifters in the Arctic.	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine	1

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3201-Chemical and Physical Behavior Modeling	Arctic Behavior/Modeling	<b>ARCTIC OCEANOGRAPHIC MODELS</b> - Develop and validate hydrologic model for Prince William Sound.	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine	1
3201-Chemical and Physical Behavior Modeling	Arctic Behavior/Modeling	<b>ARCTIC OCEANOGRAPHIC MODELS</b> - Develop improved modeling tools and trajectory models in order to predict spreading of oil in different ice conditions.	ICOPR Public Meeting - West (2010)	Marine/Estuarine/Freshwater	1
3201-Chemical and Physical Behavior Modeling	Arctic Behavior/Modeling	<b>ARCTIC OCEANOGRAPHIC MODELS</b> - Develop spill trajectory and weather models based on Arctic conditions.	National Commission on BP DWH - Final Report (2011)	Marine/Estuarine	1
3201-Chemical and Physical Behavior Modeling	Arctic Behavior/Modeling	<b>ARCTIC OIL BEHAVIOR</b> - Identify fate of specific oils in ice conditions if left in the environment until open water season.	Marine Mammal Commission Letter to ICOPR (2010)	Marine/Estuarine/Freshwater	1
3201-Chemical and Physical Behavior Modeling	Arctic Behavior/Modeling	<b>ARCTIC OIL BEHAVIOR</b> - Study oil-in-ice weathering, particularly as it relates to the effectiveness of spill response countermeasures and the potential for ecosystem exposure. Oil-water partitioning is recognized as needing further study, especially the potential toxicity of the partitioned phases.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3201-Chemical and Physical Behavior Modeling	Arctic Behavior/Modeling	<b>ARCTIC OIL BEHAVIOR</b> - Study the fate and behavior of oil in broken ice.	1) PWS OSRI - Research Plan 2011-2015 (2010) 2) ICOPR Public Meeting - East (2010)	Marine/Estuarine/Freshwater	2
3201-Chemical and Physical Behavior Modeling	Arctic Behavior/Modeling	<b>ARCTIC OIL WEATHERING</b> - Study Arctic-based indigenous microbial populations in the water column and benthic sediment, and define rates of microbial processes. This will ultimately allow for the full characterization of the role such communities have in the oil weathering process.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>BIODEGRADATION MODELS</b> - Develop biodegradation models for incorporation into ADIOS3.	Center for Spills in the Environment Oil Spill Dispersant Research Workshop Report (March 2013)	Marine	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>DEEPWATER OIL BEHAVIOR</b> - Develop improved capability to develop accurate flow rate estimates from uncontrolled well blowouts.	National Commission on BP DWH - Final Report (2011)	Marine/Estuarine	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>DEEPWATER OIL BEHAVIOR</b> - Study the complex fluid phase behaviors that occur under conditions of extreme pressure and temperature, and develop advanced models of hydrocarbon behavior under these conditions.	DOE - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program (2011)	Marine/Estuarine	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>INTERTIDAL OIL WEATHERING</b> - Study how oil degrades in intertidal and shallow subtidal habitats (e.g., cobble, pebbles, sands, mud, mussel beds, mangroves, marshes).	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>MARINE SNOW</b> - Study the formation of marine snow and its role in oil spills using different oils and utilizing field experiments.	Center for Spills in the Environment Oil Spill Dispersant Research Workshop Report (March 2013)	Marine	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>OCEANOGRAPHIC MODELS</b> - Study the upper sea-surface turbulence with particular emphasis on quantifying horizontal and vertical diffusivities and the rate of energy dissipation.	NRC Oil Spill Dispersants: Efficacy and Effects (2005)	Marine/Estuarine	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>OIL BEHAVIOR</b> - Develop conceptual model of the "life history of an oil droplet".	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>OIL BEHAVIOR</b> - Develop improved methods to determine rates of microbial degradation in different environments, both in preparation for a response and during response (e.g., temperature-dependent rates, bioassays, and prioritized methods).	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>OIL BEHAVIOR</b> - Study bottom substrate dynamics that might affect submerged oil behavior and fate.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>OIL BEHAVIOR</b> - Study droplet size of deepwater blowouts, thickness of surfacing oil and behavior of dissolvable components.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>OIL BEHAVIOR</b> - Study the fate and transport of heavy oil releases from land.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>OIL WEATHERING</b> - Study how oil grounding processes both physical and biological, affect oil degradation, persistence, and toxicity.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1

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3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>OIL WEATHERING</b> - Study how the properties of oil impact emulsification.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>OIL WEATHERING</b> - Study the long term fate of chemically and/or naturally dispersed oil including its interactions with fine suspended or bottom sediments, and biological and chemical degradation.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
3202-Chemical and Physical Behavior Modeling	Oil Behavior Models	<b>OIL WEATHERING</b> - Study the long term fate of oil in various conditions in the environment (e.g., tar balls, solution, micells) including photolysis and biodegradation, use results to inform models.	1) CRRC - R&D Priorities: An Oil Spill Workshop (2003) 2) Gulf of Mexico Research Initiative (2010)	Marine/Estuarine/Freshwater	2
3203-Chemical and Physical Behavior Modeling	Transport models	<b>GOM OIL TRANSPORT</b> - Conduct research to improve understanding of vertical movement of hydrocarbon in order to advance ability to predict diffusivity.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>GOM OIL TRANSPORT</b> - Study the fate and transport of contaminants associated with the DWH spill.	Gulf of Mexico Research Initiative (2010)	Marine/Estuarine	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>GOM OIL TRANSPORT</b> - Study the interactions of dispersed and non-dispersed oil components with marine snow particles and resuspended sediments.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>GOM OIL TRANSPORT</b> - Study the long-term fate of sunken oil including hydrocarbons and metals.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine/Freshwater	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>GOM OIL TRANSPORT</b> - Study the remobilization of oil after storm events.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)		1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>IMPROVED DISPERSANT MODELS</b> - Study the integration of fate and toxicity models with population models to predict short- and long-term effects of dispersant application.	CRRC - R&D Needs for Making Decisions Regarding Dispersing Oil (2005)	Marine/Estuarine	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>IMPROVED OIL TRANSPORT MODELS</b> - Develop data/method needs to improve trajectory modeling, 2D, 3D (surface and subsurface), real time comparison/validation, integrate surface and fate modeling. Include checklists of monitoring needs	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>IMPROVED OIL TRANSPORT MODELS</b> - Develop improved evaporation models to include a wider range of temperatures and wind speeds and other conditions.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>IMPROVED OIL TRANSPORT MODELS</b> - Develop improved models predicting dispersability using information on the physiochemical properties of oil.	BSEE BAA Proposed Research on Oil Spill Response Operations (2012)	Marine/Estuarine	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>IMPROVED OIL TRANSPORT MODELS</b> - Develop improved oil weathering and fate information for models (e.g., volatilization, solubilization, emulsification, biodegradation).	CRRC - Coordinating R&D on Oil Spill Research in the Wake of DWH (2011)	Marine/Estuarine/Freshwater	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>IMPROVED OIL TRANSPORT MODELS</b> - Develop improved physical transport models to accommodate different oil types, oil interactions with suspended particulates, 3-D capabilities, differential spatial scales, calibration and validation in the field, and intercomparisons with other existing modeling environments.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>IMPROVED OIL TRANSPORT MODELS</b> - Develop models for: shoreline cleanup, near shore and ocean transport, emulsions in water.	ICCOPR R&T Plan (1992)	Shoreline	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>IMPROVED OIL TRANSPORT MODELS</b> - Develop oil trajectory and fate models used during spill response to predict the behavior of dispersed oil and verify and validate them in an appropriately designed experimental setting or during actual spills	NRC Oil Spill Dispersants: Efficacy and Effects (2005)	Marine/Estuarine	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>IMPROVED OIL TRANSPORT MODELS</b> - Develop standards to validate trajectory models to improve site specific models.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>IMPROVED OIL TRANSPORT MODELS</b> - Develop understanding of the size, composition, and distribution of particles, both oil and sediment, which are key to developing better models for forecasting, observing, understanding, and hindcasting submerged oil behavior	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>IMPROVED OIL TRANSPORT MODELS</b> - Improve oil trajectory models by conducting a directed synthesis and sensitivity analysis on spreading, advection, evaporation, mixing, etc.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine	1

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3203-Chemical and Physical Behavior Modeling	Transport models	<b>IMPROVED OIL TRANSPORT MODELS</b> - Study how dispersed oil transport mechanisms relate to an oil's migration to the benthic environment.	CRRC - Coordinating R&D on Oil Spill Research in the Wake of DWH (2011)	Marine/Estuarine/Freshwater	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>SUBSURFACE OIL TRANSPORT MODELS</b> - Develop a decision template or conceptual model of the conditions under which oil might become submerged that includes oil properties and environmental characteristics.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3203-Chemical and Physical Behavior Modeling	Transport models	<b>SUBSURFACE OIL TRANSPORT MODELS</b> - Study technologies to model subsurface oil trajectory.	SAB Review of EPA Research Strategy (2011)	Marine/Estuarine/Freshwater	1
3204-Chemical and Physical Behavior Modeling	Oceanographic models	<b>NEARSHORE MODELING</b> - Develop high resolution nearshore models.	Center for Spills in the Environment Oil Spill Dispersant Research Workshop Report (March 2013)	Marine/Freshwater	1
3204-Chemical and Physical Behavior Modeling	Oceanographic models	<b>OCEAN CIRCULATION MODELS</b> - Determine the sensitivity of large General Circulation Models to variations in the boundary conditions and forcing.	ICCOPR R&T Plan (1992)	Marine/Estuarine	1
3204-Chemical and Physical Behavior Modeling	Oceanographic models	<b>OCEAN CIRCULATION MODELS</b> - Develop new 4D numerical circulation models that can be used to map oil tracking.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	Marine/Estuarine/Freshwater	1
3204-Chemical and Physical Behavior Modeling	Oceanographic models	<b>OCEAN CIRCULATION MODELS</b> - Develop optimal methods for stitching together small-scale and large-scale hydrodynamic models.	CRRC - Coordinating R&D on Oil Spill Research in the Wake of DWH (2011)	All	1
3204-Chemical and Physical Behavior Modeling	Oceanographic models	<b>OCEAN CIRCULATION MODELS</b> - Link models to observation to incorporate real-time data and ocean state.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine	1
3204-Chemical and Physical Behavior Modeling	Oceanographic models	<b>OCEAN CIRCULATION MODELS</b> - Study and validate ocean circulation models for use in spill transport models.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
3204-Chemical and Physical Behavior Modeling	Oceanographic models	<b>OCEANOGRAPHIC DATA STUDIES</b> - Study forecasting ability with new technology - feasibility study of circulation mapping using drift buoys, LIDAR, Doppler radar.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine	1
3204-Chemical and Physical Behavior Modeling	Oceanographic models	<b>OCEANOGRAPHIC MODELS</b> - Develop improved capacity to model in 3D.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
3204-Chemical and Physical Behavior Modeling	Oceanographic models	<b>OCEANOGRAPHIC MODELS</b> - Develop updated Parameter-elevation Regressions on Independent Slopes Model (PRISM).	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine	1
3205-Chemical and Physical Behavior Modeling	Emerging Crude	<b>OIL SANDS PRODUCTS CHARACTERISTICS</b> - Conduct research on the chemical and physical characteristics of various blends of dilbit and synbit to better understand how to address spills.	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Marine/Estuarine/Freshwater	
3205-Chemical and Physical Behavior Modeling	Emerging Crude	<b>OIL SANDS PRODUCTS DISPERSION</b> - Conduct research on OSP-sediment interactions and dispersion.	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Marine/Estuarine/Freshwater	
3205-Chemical and Physical Behavior Modeling	Emerging Crude	<b>OIL SANDS PRODUCTS DISPERSION</b> - Conduct research on the dispersion of OSP in water (droplet size, coalescence, rise time).	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Marine/Estuarine/Freshwater	

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3205-Chemical and Physical Behavior Modeling	Emerging Crude	<b>OIL SANDS PRODUCTS DISPERSION</b> - Conduct research on the resuspension and remobilization potential of OSP in freshwater and marine environments.	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Marine/Estuarine/Freshwater	
3205-Chemical and Physical Behavior Modeling	Emerging Crude	<b>OIL SANDS PRODUCTS WEATHERING</b> - Conduct research and develop models of the changes in dilbit chemistry due to evaporation.	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Marine/Estuarine/Freshwater	
3205-Chemical and Physical Behavior Modeling	Emerging Crude	<b>OIL SANDS PRODUCTS WEATHERING</b> - Develop models for the photooxidation of OSP.	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Marine/Estuarine/Freshwater	
3205-Chemical and Physical Behavior Modeling	Emerging Crude	<b>OIL SANDS PRODUCTS WEATHERING</b> - Develop models of water uptake and retention by OSP.	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Marine/Estuarine/Freshwater	
3205-Chemical and Physical Behavior Modeling	Emerging Crude	<b>OIL SANDS PRODUCTS WEATHERING</b> - Study the persistence of OSP in the marine and freshwater environments.	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Marine/Estuarine/Freshwater	
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>ALTERNATIVE TECHNOLOGIES</b> - Develop improved methods for detecting thick oil (i.e., large collections of oil) to assist in recovery operations (alternative sensor technologies, improved acoustic survey cost effective laser fluorometers and hyper spectral systems).	1) CRRC - Coordinating R&D on Oil Spill Research in the Wake of DWH (2011) 2) DWH ISPR (2011)	Marine/Estuarine/Freshwater	2
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>ALTERNATIVE TECHNOLOGIES</b> - Develop refined frequency scanning radiometer.	ICCOPR R&T Plan (1997)	Marine/Estuarine/Freshwater	1
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>ALTERNATIVE TECHNOLOGIES</b> - Further develop and test laser fluorosensor.	ICCOPR R&T Plan (1997)	Marine/Estuarine/Freshwater	1
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>ICE/OIL DETECTION</b> - Develop airborne systems for detecting oil in ice.	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine/Freshwater	1
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>ICE/OIL DETECTION</b> - Develop AUV mounted sensors for detection of oil under ice.	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine/Freshwater	1
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>ICE/OIL DETECTION</b> - Develop enhanced technology for oil detection under ice and in broken ice and in low visibility.	ICCOPR Public Meeting - East (2010)	Marine/Estuarine/Freshwater	1
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>ICE/OIL DETECTION</b> - Develop the use of laser fluorosensor, given its potential to detect oil in the presence of ice and snow. However, to facilitate broader use of this sensor and its incorporation into multi-sensory packages that can be deployed from a variety of platforms, a reduction in the size and energy consumption is needed.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>ICE/OIL DETECTION</b> - Study enhanced satellite remote sensing and surface validation capabilities, including development and (or) refinement of satellite-based oil detection algorithms for ice-covered areas.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1

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3301-Oil Spill Detection and Surveillance	Remote Detection	<b>ICE/OIL DETECTION</b> - Test latest evolution of acoustic system over a realistic mix of first year sea ice under field conditions, and at the same time test the capabilities of the latest generation of ground-penetrating radars in areas of bottom-fast ice where the interface is ice to frozen sediment rather than ice to water.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>REMOTE TECHNOLOGIES</b> - Develop and test multi-sensor systems to inform remote-sensing operations for spill response. In particular, expanded testing of unmanned aircraft systems is needed to augment observations from trained observers.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>REMOTE TECHNOLOGIES</b> - Develop enhanced aerial detection sensor capability to locate concentrations of oil necessary for ISB operations.	DWH ISPR (2011)	All	1
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>REMOTE TECHNOLOGIES</b> - Develop improved aerial surveillance for identifying thick oil.	1) CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012) 2) DWH ISPR (2011)	Marine/Estuarine/Freshwater	2
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>REMOTE TECHNOLOGIES</b> - Develop improved satellite tracking of ice movement and divergence (National Ice Center Purview).	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine	1
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>REMOTE TECHNOLOGIES</b> - Develop improvements to our ability to track oil at night consistently on a local and global level 24/7.	ICCOPR Public Meeting - Gulf (2010)	Marine/Estuarine/Freshwater	1
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>REMOTE TECHNOLOGIES</b> - Develop improvements to remote sensing technologies that facilitate the efficiency of various response countermeasures.	BSEE BAA Proposed Research on Oil Spill Response Operations (2012)	Marine/Estuarine	1
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>REMOTE TECHNOLOGIES</b> - Develop methods for oil spill detection and mapping in low visibility and ice conditions.	1) OGP - JIP Solicitation for Expression of Interest (EOI) on Arctic Oil Spills (2012) 2) US Arctic Research Commission White Paper (2010)	Marine/Estuarine/Freshwater	2
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>REMOTE TECHNOLOGIES</b> - Develop programs to monitor and track large dispersed oil plumes.	DWH ISPR (2011)	Marine/Estuarine	1
3301-Oil Spill Detection and Surveillance	Remote Detection	<b>REMOTE TECHNOLOGIES</b> - Develop remote "survey" technologies for rapid and accurate detection of oil and plumes in deep- and mid-water over larger distances.	Oil Spill Preparedness and Response JITF (2011)	Marine/Estuarine	1
3302-Oil Spill Detection and Surveillance	Monitoring	<b>ALTERNATIVE TECHNOLOGIES</b> - Study the quality of data from new detection/monitoring technology/instruments.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
3302-Oil Spill Detection and Surveillance	Monitoring	<b>ALTERNATIVE TECHNOLOGIES</b> - Develop high resolution microwave sensor research for oil spill detection and monitoring.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
3302-Oil Spill Detection and Surveillance	Monitoring	<b>CHEMICAL MONITORING</b> - Develop advanced field monitoring techniques and rapid chemical analysis.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	All	1
3302-Oil Spill Detection and Surveillance	Monitoring	<b>CHEMICAL MONITORING</b> - Develop fine-scale plume sampling and analytical methodologies that accurately characterize the plume, e.g. Polycyclic Aromatic Hydrocarbon (PAH), TPH, water-accommodated fraction, with respect to chemical constituents of concern that are directly relevant for ecological risk assessments.	Oil Spill Preparedness and Response JITF (2011)	Marine/Estuarine/Freshwater	1
3302-Oil Spill Detection and Surveillance	Monitoring	<b>CHEMICAL MONITORING</b> - Develop improved methods for in situ monitoring of biological and chemical data (e.g., dissolved oxygen).	1) NSTC JSOST - DWH Oil Spill PI Conference Report (2011) 2) ICCOPR R&T Plan (1992)	Marine/Estuarine	2
3302-Oil Spill Detection and Surveillance	Monitoring	<b>CHEMICAL MONITORING</b> - Develop technology to rapidly analyze physio-chemical properties of spilled oil.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
3302-Oil Spill Detection and Surveillance	Monitoring	<b>CONTAMINATED SEDIMENT MONITORING</b> - Develop improved techniques for locating and sampling contaminated sediments, including both onshore and offshore.	CRRC - Coordinating R&D on Oil Spill Research in the Wake of DWH (2011)	Marine/Estuarine/Freshwater	1
3302-Oil Spill Detection and Surveillance	Monitoring	<b>CONTROLLED SPILL</b> - Study system performance under real-world conditions during a future offshore controlled spill exercise. Such an exercise would provide information essential to refining these capabilities from an operational standpoint.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1

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3302-Oil Spill Detection and Surveillance	Monitoring	<b>DISPERSANT MONITORING</b> - Develop new technologies for monitoring dispersant effectiveness in the field.	CRRC - R&D Needs for Making Decisions Regarding Dispersing Oil (2005)	Marine/Estuarine	1
3302-Oil Spill Detection and Surveillance	Monitoring	<b>DISPERSANT MONITORING</b> - Develop technologies to improve oil and dispersant detection in the water column and seafloor.	1) Oil Spill Preparedness and Response JITF (2011) 2) DWH ISPR (2011)	Marine/Estuarine	2
3302-Oil Spill Detection and Surveillance	Monitoring	<b>IN-SITU TECHNOLOGY</b> - Study the use of in-situ measuring instruments or synthetic materials for monitoring exposure of specific contaminants over time.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)		1
3302-Oil Spill Detection and Surveillance	Monitoring	<b>MONITORING PLATFORMS</b> - Develop improved longevity of marine measurement platforms (i.e., monitoring vessels).	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
3302-Oil Spill Detection and Surveillance	Monitoring	<b>MONITORING PLATFORMS</b> - Develop shallow water gliders that can transit large vertical density gradients.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
3302-Oil Spill Detection and Surveillance	Monitoring	<b>SENSOR INTEGRATION</b> - Develop sensor integration and data analysis techniques.	ICCOPR R&T Plan (1997)	Marine/Estuarine/Freshwater	1
3302-Oil Spill Detection and Surveillance	Monitoring	<b>SMART PROTOCOL</b> - Develop a refined SMART protocol and operational need/value during subsea and surface response based on recent experiences.	1) CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012) 2) DWH ISPR (2011) 3) EPA Draft Oil Spill Research Strategy (2011)	Marine/Estuarine	3
3303-Oil Spill Detection and Surveillance	Submerged Oil Detection	<b>SUBMERGED OIL DETECTION</b> - Develop capability to determine the presence or absence of submerged oil over a large area (on the seafloor or in the water column) on a coarse scale. (Although focus was on sonar and laser fluorosensor technologies, all potential technologies across the spectral range should be considered.)	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3303-Oil Spill Detection and Surveillance	Submerged Oil Detection	<b>SUBMERGED OIL DETECTION</b> - Develop improved confidence in ability to estimate the areal extent and amount of submerged oil since actual locations and amounts are not visible.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3303-Oil Spill Detection and Surveillance	Submerged Oil Detection	<b>SUBMERGED OIL DETECTION</b> - Develop method to calibrate the degree of oiling on snare sampling systems with the amount of oil on the seafloor or in the water column.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3303-Oil Spill Detection and Surveillance	Submerged Oil Detection	<b>SUBMERGED OIL DETECTION</b> - Develop observation systems that can be deployed on scene at spills of submerged oil to help validate or calibrate models and direct sampling and monitoring.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3303-Oil Spill Detection and Surveillance	Submerged Oil Detection	<b>SUBMERGED OIL DETECTION</b> - Develop surrogates for different types of submerged oil to be used for testing and training.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3303-Oil Spill Detection and Surveillance	Submerged Oil Detection	<b>SUBMERGED OIL DETECTION</b> - Develop the capability to confirm and refine the location and quantity of submerged oil detected on a coarse scale.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3303-Oil Spill Detection and Surveillance	Submerged Oil Detection	<b>SUBMERGED OIL DETECTION</b> - Develop understanding of when and which in-water chemical sensors would be useful for detecting submerged oil.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3303-Oil Spill Detection and Surveillance	Submerged Oil Detection	<b>SUBMERGED OIL DETECTION</b> - Study the potential of acoustic systems and LiDAR, both individually and as packaged suites, to detect submerged oil on the seafloor and in the water column.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3303-Oil Spill Detection and Surveillance	Submerged Oil Detection	<b>SUBSURFACE OIL DETECTION</b> - Develop improved methods for sampling and monitoring the transport of subsurface oil.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
3303-Oil Spill Detection and Surveillance	Submerged Oil Detection	<b>SUBSURFACE OIL DETECTION</b> - Study the use of acoustics for tracking subsurface oil plumes.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>ALCOHOL FUEL RECOVERY</b> - Develop new types of mechanical recovery technologies and CTAs to more effectively respond to alcohol based fuel spills.	SAB Review of EPA Research Strategy (2011)	Marine/Estuarine/Freshwater	1

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3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>ARCTIC CONTROL AND RECOVERY TECHNOLOGIES</b> - Develop control and recovery capabilities for icy river conditions with pack ice and ice flows.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>ARCTIC CONTROL AND RECOVERY TECHNOLOGIES</b> - Develop improved ice processing capabilities of skimmers.	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine/Freshwater	1
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>ARCTIC CONTROL AND RECOVERY TECHNOLOGIES</b> - Develop improved methods of mechanical recovery in arctic conditions (e.g., cold water, ice, broken ice).	1) BSEE BAA Proposed Research on Oil Spill Response Operations (2012) 2) OGP-JIP Solicitation for Expression of Interest on Arctic Oil Spills (2012) 3) ICCOPR R&T Plan (1992) 4) ICCOPR Public Meeting - East (2010) 5) ICCOPR Public Meeting - West (2010) 6) USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011) 7) PWS OSRI Research Plan 2011-2015 (2010) 8) National Commission on BP DWH - Final Report (2011) 9) US Arctic Research Commission White Paper (2010)	Marine/Estuarine/Freshwater	9
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>ARCTIC CONTROL AND RECOVERY TECHNOLOGIES</b> - Develop techniques to artificially thicken ice to increase its oil retention capabilities.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>ARCTIC CONTROL AND RECOVERY TECHNOLOGIES</b> - Further develop mechanical recovery systems to recover oil accumulated under ice.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>ARCTIC CONTROL AND RECOVERY TECHNOLOGIES</b> - Need to develop mechanical recovery equipment and documentation of this capacity in different ice scenarios.	ICCOPR Public Meeting - West (2010)	Marine/Estuarine/Freshwater	1
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>ARCTIC CONTROL AND RECOVERY TECHNOLOGIES</b> - Study Arctic-specific response (environmental baseline, unique conditions/logistics).	US Arctic Research Commission White Paper (2010)	Marine/Estuarine	1
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>CONTROL AND RECOVERY TECHNOLOGIES</b> - Develop improved high seas containment devices including booms and skimmers.	1) ICCOPR R&T Plan (1992) 2) ICCOPR R&T Plan (1997)	Marine/Estuarine/Freshwater	2
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>CONTROL AND RECOVERY TECHNOLOGIES</b> - Develop improved large volume skimming platforms.	Oil Spill Preparedness and Response JITF (2011)	Marine/Estuarine	1
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>CONTROL AND RECOVERY TECHNOLOGIES</b> - Develop improved mechanical recovery to increase capture rate and capacity.	DOE - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program (2011)	Marine/Estuarine/Freshwater	1
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>CONTROL AND RECOVERY TECHNOLOGIES</b> - Develop improved strategies for removal of suspended oil from the water column using trawling systems.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>CONTROL AND RECOVERY TECHNOLOGIES</b> - Develop innovative techniques for containment.	EPA Draft Oil Spill Research Strategy (2011)	Marine/Estuarine/Freshwater	1
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>CONTROL AND RECOVERY TECHNOLOGIES</b> - Develop methods to increase the encounter rate of skimming and in situ burning operations, by increasing amount/thickness of oil on the surface (methods could involve use of chemicals, innovative mechanical systems, new operational procedures).	1) BSEE BAA Proposed Research on Oil Spill Response Operations (2012) 2) ICCOPR R&T Plan (1992) 3) CRRC - R&D Priorities: Oil Spill Workshop (2009)	Marine/Estuarine/Freshwater	3
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>CONTROL AND RECOVERY TECHNOLOGIES</b> - Develop new tools to recover submerged oil, both suspended and on the seafloor.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1

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3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>CONTROL AND RECOVERY TECHNOLOGIES</b> - Develop, test and evaluate containment booms and recovery systems.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>SUBSEA OIL RECOVERY</b> - Conduct research to evaluate new or innovative mechanical technologies that contain or remove subsea oil releases.	BSEE BAA Proposed Research on Oil Spill Response Operations (2012)	Marine/Estuarine	1
3401-In and On-water Containment and Recovery	Control/Recovery Technology	<b>SUBSEA OIL RECOVERY</b> - Refine techniques for removal of subsurface oil.	ICCOPR R&T Plan (1997)	Marine/Estuarine/Freshwater	1
3402-In and On-water Containment and Recovery	Recovery Operations and Testing	<b>ARCTIC CONTROL AND RECOVERY TECHNOLOGIES</b> - Study the presence or lack of standardized testing approaches (especially wave tanks), the cross-comparability of results, and collaborative development of protocols that would establish the practical recovery limits that are achievable during response operations, and refine our understanding of the appropriate setting and scale at which these devices could be effectively deployed.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3402-In and On-water Containment and Recovery	Recovery Operations and Testing	<b>ARCTIC CONTROL AND RECOVERY TECHNOLOGIES</b> - Test response equipment in Arctic.	ICCOPR Public Meeting - East (2010)	Marine/Estuarine	1
3402-In and On-water Containment and Recovery	Recovery Operations and Testing	<b>CONTROL AND RECOVERY TECHNOLOGIES</b> - Study response options and determine which were most successful during DWH.	EPA Draft Oil Spill Research Strategy (2011)	Marine/Estuarine	1
3402-In and On-water Containment and Recovery	Recovery Operations and Testing	<b>CONTROL TECHNOLOGY FIELD TESTING</b> - Conduct field test of cleanup techniques and create protocols for various habitats and conditions.	ICCOPR R&T Plan (1992)	All	1
3402-In and On-water Containment and Recovery	Recovery Operations and Testing	<b>CONTROL TECHNOLOGY FIELD TESTING</b> - Control technology field testing.	Title 33 Chapter 40 Subchapter IV 2761 (OPA 1990)	Marine/Estuarine	1
3402-In and On-water Containment and Recovery	Recovery Operations and Testing	<b>OIL SIMULANTS</b> - Conduct simulant toxicity testing for wildlife, fish and ESA species.	Oil Spill Simulants Materials: Workshop Proceedings (March 2013)	Marine/Estuarine	1
3402-In and On-water Containment and Recovery	Recovery Operations and Testing	<b>OIL SIMULANTS</b> - Develop a decision-making framework regarding potential risks for all types of simulants.	Oil Spill Simulants Materials: Workshop Proceedings (March 2013)	Marine/Estuarine	1
3402-In and On-water Containment and Recovery	Recovery Operations and Testing	<b>OIL SIMULANTS</b> - Identify case histories of the use of simulants in field exercises to identify potential environmental impacts.	Oil Spill Simulants Materials: Workshop Proceedings (March 2013)	Marine/Estuarine	1
3402-In and On-water Containment and Recovery	Recovery Operations and Testing	<b>SORBENT USAGE</b> - Study the use of sorbents for smaller spills under various conditions and oil types.	ICCOPR R&T Plan (1992)	All	1
3402-In and On-water Containment and Recovery	Recovery Operations and Testing	<b>SPILL RESPONSE CAPACITY</b> - Develop improved capability to do 24/7 spill response.	Pacific States/BC OSTF Letter to ICCOPR (2010)	All	1
3500- Shore Containment and Recovery	No Subcategory	<b>NATURAL ATTENUATION</b> - Study natural attenuation as an option for spill response using spills of opportunity and field trials.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	All	1
3500- Shore Containment and Recovery	No Subcategory	<b>SHORELINE CLEANUP METHODOLOGIES</b> - Develop technologies to improve "sandy" beach mechanized, mechanical cleanup.	Oil Spill Preparedness and Response JITF (2011)	Shoreline	1
3500- Shore Containment and Recovery	No Subcategory	<b>SHORELINE CLEANUP METHODOLOGIES</b> - Conduct research to assess the ability of chemicals to prevent oil impact on shorelines.	ICCOPR R&T Plan (1992)	Marine/Estuarine	1
3500- Shore Containment and Recovery	No Subcategory	<b>SHORELINE CLEANUP METHODOLOGIES</b> - Study the effectiveness of surface washing and develop standards.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	Shoreline	1
3500- Shore Containment and Recovery	No Subcategory	<b>SHORELINE CLEANUP METHODOLOGIES</b> - Study the use of dispersants vs. shoreline cleaners vs. mechanical recovery in near-shore and shoreline zones.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)		1
3500- Shore Containment and Recovery	No Subcategory	<b>SHORELINE IMPACTS</b> - Study impacts of foot traffic on shoreline cleanup.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1

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3601-Dispersants	Cold weather and Ice Conditions	<b>ARCTIC APPLICATION</b> - Study the understanding of the "window of opportunity" for potential deployment of all dispersants in the Arctic.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3601-Dispersants	Cold Weather and Ice Conditions	<b>ARCTIC EFFECTIVENESS</b> - Study best dispersant for different environmental conditions including ice.	Marine Mammal Commission Letter to ICCOPR (2010)	Marine/Estuarine	1
3601-Dispersants	Cold Weather and Ice Conditions	<b>ARCTIC EFFECTIVENESS</b> - Study dispersant fate and effectiveness in open water versus ice conditions.	Marine Mammal Commission Letter to ICCOPR (2010)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>BIODEGRADATION</b> - Develop a detailed investigation on the kinetics of dispersed oil biodegradation at low oil-water ratios to simulate conditions that represent those that follow significant dilution of the dispersed oil plume.	NRC Oil Spill Dispersants: Efficacy and Effects (2005)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>BIODEGRADATION</b> - Develop biotransformation products of high-molecular-weight PAH using indigenous microbial communities from seawater	NRC Oil Spill Dispersants: Efficacy and Effects (2005)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>BIODEGRADATION</b> - Develop droplet-scale models of biodegradation kinetics and estimate the appropriate kinetic parameters.	NRC Oil Spill Dispersants: Efficacy and Effects (2005)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>BIODEGRADATION</b> - Study and quantify biodegradation kinetics of dispersed oil.	CRRC - R&D Needs for Making Decisions Regarding Dispersing Oil (2005)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>BIODEGRADATION</b> - Study the toxic and sub-lethal effects and ramifications for microbial communities (and the natural biodegradation of oil).	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>CONSTITUENTS</b> - Conduct a literature review of dispersant constituents for dispersants listed on the NCP product schedule to determine relevant information such as chemical makeup, environmental fate, kinetics, toxicity, bioconcentration factor, and bioaccumulation factor (BCF/BAF) in order to identify constituents of concerns or chemical markers.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>CONSTITUENTS</b> - Develop appropriate chemical (analytical) methods for detecting and quantifying dispersant constituents in environmental samples to assess biodegradation and bioaccumulation.	CRRC - Coordinating R&D on Oil Spill Research in the Wake of DWH (2011)	Marine/Estuarine/Freshwater	1
3602-Dispersants	Behavior	<b>CONSTITUENTS</b> - Study chemistry data for individual dispersant components in the oil droplets during the DWH spill.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>DISPERSED OIL ANALYSIS</b> - Develop methods for collection and analysis of samples of dissolved phase and particulate/oil-droplet phase PAH in environmental samples	CRRC - R&D Needs for Making Decisions Regarding Dispersing Oil (2005)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>DISPERSED OIL BEHAVIOR</b> - Conduct field trials with dispersants that include tracking and monitoring concentrations.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>DISPERSED OIL BEHAVIOR</b> - Study the behavior of chemically treated oil in terms of vertical movements in interstitial spaces.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
3602-Dispersants	Behavior	<b>DISPERSED OIL BEHAVIOR</b> - Study the degree, rate, and consequence of surfactant leaching from chemically dispersed oil droplets.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>DISPERSED OIL BEHAVIOR</b> - Study the degree, rate, and consequences of surfactant leaching from surface slicks and chemically dispersed oil droplets.	CRRC - R&D Needs for Making Decisions Regarding Dispersing Oil (2005)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>DISPERSED OIL BEHAVIOR</b> - Study the fate and transport of dispersed oil and dispersants in the surface, subsurface and deep water.	EPA Draft Oil Spill Research Strategy (2011)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>DISPERSED OIL BEHAVIOR</b> - Study the impact of chemical dispersants on the dissolution/degradation of water soluble hydrocarbons including VOCs from subsea releases	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>DISPERSED OIL BEHAVIOR</b> - Study the interactions of chemically dispersed oil droplets with suspended particulate matter (SPM) and how these processes affect the rate of oil biodegradation and ultimate fate of dispersed oil.	CRRC - R&D Needs for Making Decisions Regarding Dispersing Oil (2005)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>DISPERSED OIL BEHAVIOR</b> - Study the role of dispersants on the dissolution process (short and long term).	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>DISPERSED OIL BEHAVIOR</b> - Study the variables affecting coalescence and resurfacing of dispersed oil droplets to develop models for tracking movement at surface, subsurface and deepwater.	EPA Draft Oil Spill Research Strategy (2011)	Marine/Estuarine	1
3602-Dispersants	Behavior	<b>DISPERSED OIL BEHAVIOR</b> - Study the quantification of degradation rates of chemically dispersed, physically dispersed, and undispersed oil.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>DISPERSANT INTERACTIONS</b> - Conduct research on benthic species interactions with oil, oil/dispersants and dispersant contaminated sediments.	Center for Spills in the Environment Oil Spill Dispersant Research Workshop Report (March 2013)	Marine/Freshwater	1

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3603-Dispersants	Impacts	<b>DISPERSANT INTERACTIONS</b> - Conduct research on dispersants, oil only, and dispersed oil interactions with algae, sediments and particles.	Center for Spills in the Environment Oil Spill Dispersant Research Workshop Report (March 2013)	Marine	1
3603-Dispersants	Impacts	<b>DISPERSANT WEATHERING</b> - Study the impact of flocculation on oil and dispersants.	Center for Spills in the Environment Oil Spill Dispersant Research Workshop Report (March 2013)	Marine/Freshwater	1
3603-Dispersants	Impacts	<b>DISPERSED OIL FATE</b> - Collect available data on dispersant bioaccumulation and assess whether more info is needed.	EPA Draft Oil Spill Research Strategy (2011)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>DISPERSED OIL FATE</b> - Gain better understanding of long term impact of dispersants on fisheries etc.	ICCOPR Public Meeting - Gulf (2010)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>DISPERSED OIL FATE</b> - Study and evaluate dispersant and dispersed oil chronic and sub-lethal effects on key species for varying, real world exposure scenarios and durations	CRRC - Coordinating R&D on Oil Spill Research in the Wake of DWH (2011)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>DISPERSED OIL FATE</b> - Study and improve understanding of long-term ecological effects of dispersed oil.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>DISPERSED OIL FATE</b> - Study whether dispersants or changes in oil chemistry are effective in reducing marine species' exposure to oil and its constituents.	EPA Draft Oil Spill Research Strategy (2011)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>DISPERSED OIL FATE</b> - Study worldwide, synthesis, and analysis of biological effects from dispersed oil under controlled and uncontrolled oil spills	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>DISPERSED OIL TOXICITY</b> - Develop and implement focused toxicity studies to: (1) provide data that can be used to parameterize models to predict photo-enhanced toxicity; (2) estimate the relative contribution of dissolved and particulate oil phases to toxicity with representative species, including sensitive species and life stages; and (3) expand toxicity tests to include an evaluation of delayed effects.	NRC Oil Spill Dispersants: Efficacy and Effects (2005)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>DISPERSED OIL TOXICITY</b> - Develop focused toxicity studies to determine the mechanisms of both acute and sub lethal toxicity to key organisms from exposure to dispersed oil	NRC Oil Spill Dispersants: Efficacy and Effects (2005)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>DISPERSED OIL TOXICITY</b> - Develop standard methods for toxicity testing of dispersed oil appropriate for coastal regimes.	CRRC - R&D Needs for Making Decisions Regarding Dispersing Oil (2005)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>DISPERSED OIL TOXICITY</b> - Study chronic testing, testing of indigenous species, and testing of specific oil types in combination with specific dispersant types with specific water bodies and set appropriate temporal, spatial, and volumetric standards.	DWH ISPR (2011)	Marine/Estuarine/Freshwater	1
3603-Dispersants	Impacts	<b>DISPERSED OIL TOXICITY</b> - Study the ecotoxicological effects of oil dispersant products and dispersed oil on surface and deep sea species.	1)EPA Draft Oil Spill Research Strategy (2011) 2)Center for Spills in the Environment Oil Spill Dispersant Research Workshop Report (March 2013)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>DISPERSED OIL TOXICITY</b> - Study whether dispersants increase bioavailability of toxic oil compounds.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>RISK-BASED DECISION MAKING</b> - Collect existing dispersed oil toxicity data and studies to support risk-based decision making for use of dispersants at spills.	CRRC - R&D Needs for Making Decisions Regarding Dispersing Oil (2005)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>RISK-BASED DECISION MAKING</b> - Conduct research to improve understanding of the efficiency of dispersion into the water column and plume transport dynamics to inform exposure and risk assumptions.	CRRC - Coordinating R&D on Oil Spill Research in the Wake of DWH (2011)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>RISK-BASED DECISION MAKING</b> - Develop an ecosystem consequence analysis (ECA) for dispersant usage that considers key populations at risk, recovery rates, and food web consequences, using population sensitivity tables that inform many decisions (e.g., ecological to economic), identify data gaps and identify key species that drive tradeoff decisions.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>RISK-BASED DECISION MAKING</b> - Develop localized integrative models and decision support tools for dispersant planning and response.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>TOXICITY</b> - Conduct toxicological studies of sub-chronic and chronic exposures to the variable complex dispersant mixtures.	SAB Review of EPA Research Strategy (2011)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>TOXICITY</b> - Develop protocols for testing efficacy and toxicity of commercially available dispersants and other chemical agents which may become commercially available	ICCOPR R&T Plan (1992)	Marine/Estuarine	1
3603-Dispersants	Impacts	<b>WILDLIFE EFFECTS</b> - Study long-term effects of short-term exposures to dispersed oil on wildlife.	SAB Review of EPA Research Strategy (2011)	All	1
3604-Dispersants	Efficacy and Effectiveness	<b>ALCOHOL-HYDROCARBON SPILLS</b> - Study the use of dispersants on blended alcohol-hydrocarbon fuel spills.	SAB Review of EPA Research Strategy (2011)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>ALTERNATIVE FORMULATIONS</b> - Develop alternative dispersant products that have a "lighter" environmental footprint than petroleum based products	EPA Draft Oil Spill Research Strategy (2011)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>ALTERNATIVE FORMULATIONS</b> - Develop innovative "next generation" dispersants.	Oil Spill Preparedness and Response JITF (2011)	Marine/Estuarine	1

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3604-Dispersants	Efficacy and Effectiveness	<b>ALTERNATIVE FORMULATIONS</b> - Develop new highly effective dispersants for use in different extremes.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>ALTERNATIVE FORMULATIONS</b> - Study and evaluate the efficacy of dispersant alternatives solvent-free formulations.	CRRC - Coordinating R&D on Oil Spill Research in the Wake of DWH (2011)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>ALTERNATIVE FORMULATIONS</b> - Study availability and effectiveness of alternative dispersants.	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>WEATHERED OIL EMULSIONS</b> - Develop a detailed investigation of wave-tank studies that specifically address the chemical treatment of weathered oil emulsions	NRC Oil Spill Dispersants: Efficacy and Effects (2005)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>EFFECTIVENESS</b> - Conduct a comparison study on various oil types and their dispersability.	CRRC - R&D Needs for Making Decisions Regarding Dispersing Oil (2005)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>EFFECTIVENESS</b> - Conduct a study comparing methods for measuring droplet size distribution and energy dissipation rate in different dispersant effectiveness test systems	CRRC - R&D Needs for Making Decisions Regarding Dispersing Oil (2005)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>EFFECTIVENESS</b> - Develop and implement focused series studies to better predict the effectiveness of dispersants for different oil types and environmental conditions based on climatology data supplemented with real-time in situ observations.	NRC Oil Spill Dispersants: Efficacy and Effects (2005)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>EFFECTIVENESS</b> - Develop experimental systems for bench-scale effectiveness to: 1) determine the energy dissipation rates that prevail over a wide range of operating conditions; 2) measure chemical effectiveness over a range of energy dissipation rates to characterize the relationship between these variables; and 3) include measurement of the droplet-size distribution of the dispersed oil.	NRC Oil Spill Dispersants: Efficacy and Effects (2005)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>EFFECTIVENESS</b> - Develop improved instrumentation for measuring dispersant effectiveness on the surface and subsurface.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>EFFECTIVENESS</b> - Develop improved models to predict dispersant effectiveness and oil fate.	CRRC - R&D Needs for Making Decisions Regarding Dispersing Oil (2005)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>EFFECTIVENESS</b> - Develop optimal operational effectiveness of dispersant applications.	CRRC - R&D Needs for Making Decisions Regarding Dispersing Oil (2005)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>EFFECTIVENESS</b> - Study best dispersant for crude oil.	Marine Mammal Commission Letter to ICOPR (2010)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>EFFECTIVENESS</b> - Study dispersant use in calm sea surface conditions.	Oil Spill Preparedness and Response JITF (2011)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>EFFECTIVENESS</b> - Study the effect of dispersants on droplet size/bubble size distribution and the trapping height of plumes.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>EFFECTIVENESS</b> - Study the effectiveness and net environmental benefits of subsea dispersant application.	DWH ISPR (2011)	Marine/Estuarine	1
3604-Dispersants	Efficacy and Effectiveness	<b>EFFECTIVENESS</b> - Study the physical and chemical properties of oils that determine the overall effectiveness of dispersant application.	CRRC - R&D Needs for Making Decisions Regarding Dispersing Oil (2005)	Marine/Estuarine	1
3605-Dispersants	Fate	<b>DISPERSED OIL FATE</b> - Conduct transport and fate studies with the CTAs in conjunction with the particular oils with which they would most likely be used (address important conditions: high pressure to model under ice and deep sea).	SAB Review of EPA Research Strategy (2011)	Marine/Estuarine	1
3605-Dispersants	Fate	<b>DISPERSED OIL FATE</b> - Develop and implement steps to ensure that future wave-tank or spill-of-opportunity studies implement a field program to measure both dissolved-phase PAH and particulate/oil-droplet phase PAH concentrations for comparison to PAH thresholds measured in toxicity tests and predicted by computer models for oil spill fate and behavior	NRC Oil Spill Dispersants: Efficacy and Effects (2005)	Marine/Estuarine	1
3605-Dispersants	Fate	<b>DISPERSED OIL FATE</b> - Develop studies to quantify the weathering rates and final fate of chemically dispersed oil droplets compared with undispersed oil.	NRC Oil Spill Dispersants: Efficacy and Effects (2005)	Marine/Estuarine	1
3605-Dispersants	Fate	<b>DISPERSED OIL FATE</b> - Study anticipated fate of spilled oil dispersants and dispersed oil from different operations in geographical locations.	ICOPR Public Meeting - East (2010)	Marine/Estuarine	1
3605-Dispersants	Fate	<b>DISPERSED OIL FATE</b> - Study the differences in the effects of photolysis on chemically and physically dispersed oil droplets.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3605-Dispersants	Fate	<b>DISPERSED OIL FATE</b> - Study the interactions of chemically dispersed oil droplets with suspended particulate matter and the effect of these processes on the rate of oil biodegradation and fate.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3605-Dispersants	Fate	<b>FATE AND EFFECTS</b> - Study the long-term fate and effects of dispersant applications.	Pacific States/BC OSTF Letter to ICOPR (2010)	Marine/Estuarine	1
3606-Dispersants	Subsurface	<b>SUBSURFACE APPLICATION</b> - Study how subsurface application of dispersants affects characteristics of that oil at the surface.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3606-Dispersants	Subsurface	<b>SUBSURFACE BEHAVIOR</b> - Study the effect of dispersant on deposition, partitioning, toxicity and degradation (deep sea and in presence of high flow rates).	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1

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3606-Dispersants	Subsurface	<b>SUBSURFACE DISPERSANTS</b> - Conduct research involving the application of dispersants at high pressure and low temperatures with the potential for significant turbidity.	Center for Spills in the Environment Oil Spill Dispersant Research Workshop Report (March 2013)	Marine	1
3606-Dispersants	Subsurface	<b>SUBSURFACE EFFECTIVENESS</b> - Develop conditions of operability for dispersant use in the subsea, including characteristics of most effective dispersant, physical parameters of when to apply, considering flow rate.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3606-Dispersants	Subsurface	<b>SUBSURFACE EFFECTIVENESS</b> - Develop confirmation of volatile organic compound reduction at the surface from subsurface dispersant use.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3606-Dispersants	Subsurface	<b>SUBSURFACE EFFECTIVENESS</b> - Study and correlate quantitative info on subsurface dispersant effectiveness and dispersant application time series.		Marine/Estuarine	1
3606-Dispersants	Subsurface	<b>SUBSURFACE EFFECTIVENESS</b> - Study dispersant use in the subsea.	Oil Spill Preparedness and Response JITF (2011)	Marine/Estuarine	1
3606-Dispersants	Subsurface	<b>SUBSURFACE EFFECTIVENESS</b> - Study the correlation of the subsurface injection with emulsification at the surface.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3606-Dispersants	Subsurface	<b>SUBSURFACE EFFICACY</b> - Develop improved capacity to measure the efficacy of dispersants injected at subsurface.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
3606-Dispersants	Subsurface	<b>SUBSURFACE EFFICACY</b> - Study the subsea application of dispersants, including methods, application ratios, injection nozzle design, location of nozzle.	BSEE BAA Proposed Research on Oil Spill Response Operations (2012)	Marine/Estuarine	1
3606-Dispersants	Subsurface	<b>SUBSURFACE FORMULATIONS</b> - Study the need for separate subsea specific dispersant.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
3606-Dispersants	Subsurface	<b>SUBSURFACE TANK TESTING</b> - Study the feasibility of conducting subsea dispersant research at Ohmsett.	BSEE BAA Proposed Research on Oil Spill Response Operations (2012)	Marine/Estuarine	1
3701-In Situ Burning	Effectiveness and Impacts	<b>AERIAL PLUME IMPACTS</b> - Develop methods to mitigate airborne pollutants during burning.	ICCOPR R&T Plan (1992)	All	1
3701-In Situ Burning	Effectiveness and Impacts	<b>AERIAL PLUME IMPACTS</b> - Develop simplified air plume models.	ICCOPR R&T Plan (1997)	All	1
3701-In Situ Burning	Effectiveness and Impacts	<b>AERIAL PLUME IMPACTS</b> - Develop soot reduction techniques.	ICCOPR R&T Plan (1997)	All	1
3701-In Situ Burning	Effectiveness and Impacts	<b>AERIAL PLUME IMPACTS</b> - Study the impact of volatile plumes from in-situ burning on natural resources (e.g., birds).	CRRC - R&D Priorities: Oil Spill Workshop (2009)	All	1
3701-In Situ Burning	Effectiveness and Impacts	<b>ARCTIC ISB</b> - Conduct additional research to improve ISB effectiveness in the Arctic and better define the applicability of ISB under various conditions.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3701-In Situ Burning	Effectiveness and Impacts	<b>ARCTIC ISB</b> - Develop improved pre- and post-spill plume modeling to inform whether or not an ISB should be conducted and would facilitate decisions on measures to protect local populations, including potential effect of "fall-out" from a smoke plume that goes over land based subsistence resources.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3701-In Situ Burning	Effectiveness and Impacts	<b>ARCTIC ISB</b> - Develop improved understanding of in situ burn operations in ice.	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine/Freshwater	1
3701-In Situ Burning	Effectiveness and Impacts	<b>ARCTIC ISB</b> - Conduct additional research to better define the applicability of ISB under various conditions in the Arctic.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3701-In Situ Burning	Effectiveness and Impacts	<b>ISB BIOAVAILABILITY</b> - Study ISB residues, especially toxicity, physical properties, and bioavailability of contaminants contained within the residue matrix; especially with potential benthic community effects.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3701-In Situ Burning	Effectiveness and Impacts	<b>ISB EFFECTIVENESS</b> - Develop better means of quantifying ISB effectiveness. Unburned oil or other residue from burning operations should be recovered and accounted for when evaluating the effectiveness of in situ burning.	DWH ISPR (2011)	All	1
3702-In Situ Burning	Planning and Technology	<b>ISB CONTAINMENT TECHNOLOGY</b> - Conduct research and development programs on ISB to develop more robust booming systems with greater oil encounter rates and expand the weather/sea state of opportunity in which ISB can effectively be used.	DWH ISPR (2011)	Marine/Estuarine/Freshwater	1
3702-In Situ Burning	Planning and Technology	<b>ISB CONTAINMENT TECHNOLOGY</b> - Develop enhanced designs for containment and burning oil.	BSEE BAA Proposed Research on Oil Spill Response Operations (2012)	Marine/Estuarine/Freshwater	1
3702-In Situ Burning	Planning and Technology	<b>ISB CONTAINMENT TECHNOLOGY</b> - Develop improved fire boom design and materials, develop test protocols and test.	NSTC JSOST - DWH Oil Spill PI Conference Report (2010)	Marine/Estuarine/Freshwater	1

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3702-In Situ Burning	Planning and Technology	<b>ISB CONTAINMENT TECHNOLOGY</b> - Develop more efficient fire boom for high sea states and faster advancing speeds.	Oil Spill Preparedness and Response JITF (2011)	Marine/Estuarine/Freshwater	1
3702-In Situ Burning	Planning and Technology	<b>ISB CONTAINMENT TECHNOLOGY</b> - Study the performance of various fire boom designs and improve technologies for water-cooled and reusable boom types	DWH ISPR (2011)	Marine/Estuarine/Freshwater	1
3702-In Situ Burning	Planning and Technology	<b>ISB PLANNING</b> - Develop improved procedures for in-situ burning under various conditions, develop protocols, improve field verification of airborne constituent behaviors	ICCOPR R&T Plan (1992)	All	1
3702-In Situ Burning	Planning and Technology	<b>ISB PLANNING</b> - Study appropriate level of ISB equipment for responding to worst case spills and to determine the means of enhancing equipment stockpiles of ISB equipment	DWH ISPR (2011)	All	1
3702-In Situ Burning	Planning and Technology	<b>ISB TECHNOLOGY</b> - Develop methods to improve and sustain combustion of emulsions.	ICCOPR R&T Plan (1992)	All	1
3702-In Situ Burning	Planning and Technology	<b>ISB TECHNOLOGY</b> - Develop new technology for recovering sunken burn residue.	BSEE BAA Proposed Research on Oil Spill Response Operations (2012)	Marine/Estuarine/Freshwater	1
3702-In Situ Burning	Planning and Technology	<b>ISB TECHNOLOGY</b> - Study aerial ignition techniques for in situ burns far offshore.	ICCOPR Public Meeting - East (2010)	Marine/Estuarine	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>ALTERNATIVE FUELS</b> - Study usability of current response technologies on alternative fuels.	EPA Draft Oil Spill Research Strategy (2011)	All	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>ARCTIC CHEMICAL HERDERS</b> - Develop toxicological data for Arctic species of interest that would better define the relative value and impact of chemical herders within the countermeasure suite of available tools.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>ARCTIC CHEMICAL HERDERS</b> - Study the value and impact of chemical herders to improve oil-spill response scenarios and the timing for deployment of various countermeasures, particularly given the potential for a second-stage recovery effort during ice melt to target oil that had previously been entrained in sea ice.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>ARCTIC CHEMICAL HERDERS</b> - Study use of oil herders to enhance response capability for in situ burning and other uses.	ICCOPR Public Meeting - East (2010)	Marine/Estuarine/Freshwater	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>BIOFUEL RECOVERY</b> - Study the recovery of biofuels using chemical methods.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	All	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>BIOFUEL RECOVERY</b> - Study the recovery of biofuels using mechanical methods.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	All	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>CHEMICAL HERDERS</b> - Study and characterize chemical herders and potential areas of use.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	Marine/Estuarine/Freshwater	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>EMULSION AGENTS</b> - Field test emulsion treating agents.	ICCOPR R&T Plan (1997)	Marine/Estuarine/Freshwater	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>ISB AND CHEMICAL HERDERS</b> - Study the potential for enhancing burn operations with the use of herding agents and demulsifiers.	DWH ISPR (2011)	Marine/Estuarine/Freshwater	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>NEW TECHNOLOGIES</b> - Determine if trenching is a feasible response option.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>NEW TECHNOLOGIES</b> - Develop innovative techniques for remediation/cleanup.	EPA Draft Oil Spill Research Strategy (2011)	All	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>NEW TECHNOLOGIES</b> - Study and develop techniques for recovery of submerged oils and emulsions.	ICCOPR R&T Plan (1997)	Marine/Estuarine/Freshwater	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>NEW TECHNOLOGIES</b> - Study emerging technologies for use in 24 hour operations.	CRRC - Coordinating R&D on Oil Spill Research in the Wake of DWH (2011)	All	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>OIL SOLIDIFIER</b> - Study solidifiers and their effectiveness in various conditions and a full range of oils.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	All	1

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3800-Alternative Chemical Countermeasures	No Subcategory	<b>OIL/MINERAL AGGREGATES</b> - Conduct research to improve understanding of oil mineral aggregate (OMA) use including in cold climates.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	Marine/Estuarine	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>SUBMERGED OIL</b> - Develop enhanced recovery of submerged oil by changing its properties.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3800-Alternative Chemical Countermeasures	No Subcategory	<b>SUBMERGED OIL</b> - Study potential use of chemical countermeasures to improve response to submerged oil spills.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
3900-Oily and Oil Waste Disposal	No Subcategory	<b>OIL AND WATER SEPARATION</b> - Develop innovative techniques for oil/water separation decanting systems for various oil types.	1) ICCOPR R&T Plan (1992) 2) CRRC - Submerged Oil Workshop Report (2006)	All	2
3900-Oily and Oil Waste Disposal	No Subcategory	<b>SORBENTS</b> - Develop methods to recycle sorbents and reduce the waste created by using sorbents as a recovery option.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	All	1
3900-Oily and Oil Waste Disposal	No Subcategory	<b>WATER TREATMENT</b> - Develop improved best practices for oil and gas field water treatment and water management.	DOE - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program (2012)	Terrestrial/Freshwater	1
<b>IMPACT ASSESSMENT AND RESTORATION - 4000 SERIES</b>					
4000-Bioremediation and Biodegradation	No Subcategory	<b>BIOAVAILABILITY</b> - Study the factors controlling bioavailability of petroleum hydrocarbons in estuarine and freshwater sediments.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
4000-Bioremediation and Biodegradation	No Subcategory	<b>BIOREMEDIATION EFFECTIVENESS</b> - Develop an improved understanding of bioremediation processes with a wider range of conditions/environments (e.g., cold water), and multiple types of oil, nutrient enrichment, and toxicity and eutrophication	1) CRRC - R&D Priorities: Oil Spill Workshop (2009) 2) ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	2
4000-Bioremediation and Biodegradation	No Subcategory	<b>BIOREMEDIATION EFFECTIVENESS</b> - Study the recovery of biofuels using biological methods.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	All	1
4000-Bioremediation and Biodegradation	No Subcategory	<b>BIOREMEDIATION EFFECTIVENESS</b> - Study the relative effectiveness and environmental impacts of bioremediation technologies.	Title 33 Chapter 40 Subchapter IV 2761 (OPA 1990)	Marine/Estuarine/Freshwater	1
4000-Bioremediation and Biodegradation	No Subcategory	<b>SHORELINE CLEANUP</b> - Conduct research to improve understanding of nutrient enrichment as a shoreline cleanup method.	Oil Spill Preparedness and Response JITF (2011)	Marine/Estuarine	1
4000-Bioremediation and Biodegradation	No Subcategory	<b>SHORELINE CLEANUP</b> - Study microbial usage in bioremediation as a shoreline cleanup method.	Oil Spill Preparedness and Response JITF (2011)	Shoreline	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>ARCTIC IMPACTS</b> - Conduct research of the present Environment Resource Area OSRA that would examine the state of knowledge of specific NRDA metrics could help identify specific population, physiological, habitat, and exposure data for future NRDA activities.	USGS An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas (2011)	Marine/Estuarine	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>ARCTIC IMPACTS</b> - Develop a Response Gap Analysis framework to assess the impacts of response actions in the Arctic.	US Arctic Research Commission White Paper (2010)	All	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>ARCTIC IMPACTS</b> - Develop an increased understanding of environmental effects of in situ burning, chemical dispersants and herding agents on Arctic ecology.	1) US Arctic Research Commission White Paper (2010) 2) DWH ISPR (2011)	Marine/Estuarine	2
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>ARCTIC IMPACTS</b> - Develop response guide and restoration guide for oil in ice.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>ARCTIC SHORELINE IMPACTS</b> - Study the hydrocarbon impacts and recovery to intertidal species in Arctic environments.	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>ARCTIC WILDLIFE IMPACTS</b> - Study effects of oil on wildlife and effective response intervention in Arctic environment.	1) US Arctic Research Commission White Paper (2010) 2) OGP-JIP Solicitation for Expression of Interest on Arctic Oil Spills (2012)	All	2
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>AVIAN IMPACTS</b> - Study the long-term effects of oil on birds, including toxicology and food web accumulation.	1) ICCOPR R&T Plan (1992) 2) CRRC - R&D Priorities: Oil Spill Workshop (2009)	All	2

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4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>FISHERIES IMPACTS</b> - Study metabolism/depuration/relay of oil contaminants in fish.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>FISHERIES IMPACTS</b> - Study the pathological effects of water soluble fractions of oil on fishes.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>MAMMALIAN IMPACTS</b> - Determine the biological effects in mammalian systems of dispersant oil mixtures and compare to those predicted of measured by exposure to individual components alone.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine/Freshwater	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>MAMMALIAN IMPACTS</b> - Study the long-term effects of oil on mammals.	ICCOPR R&T Plan (1992)	All	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>MARINE MAMMAL IMPACTS</b> - Conduct research on how oil and/or response activities may have led to ecosystem changes that are harmful to marine mammals (e.g., harmful algal blooms, hypoxia or anoxia).	Marine Mammal Commission: Assessing the Long-Term Effects of the BP Deepwater Horizon Oil Spill on Marine Mammals in the Gulf of Mexico: A Statement of Research Needs (2011)	Marine	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>MARINE MAMMAL IMPACTS</b> - Conduct research on the extent to which exposure to oil and/or response activities leads to a reduction in status of marine mammal populations involving individual fitness, population vitality rates (survival and reproduction), and population abundance and trends.	Marine Mammal Commission: Assessing the Long-Term Effects of the BP Deepwater Horizon Oil Spill on Marine Mammals in the Gulf of Mexico: A Statement of Research Needs (2011)	Marine	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>MARINE MAMMAL IMPACTS</b> - Study oil and/or response-related changes in the ecosystem resulting in a reduction in prey availability for marine mammals, including looking for changes in diet and prey surveys over space and time.	Marine Mammal Commission: Assessing the Long-Term Effects of the BP Deepwater Horizon Oil Spill on Marine Mammals in the Gulf of Mexico: A Statement of Research Needs (2011)	Marine	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>MARINE MAMMAL IMPACTS</b> - Study the effect of exposure to oil or dispersant-related contaminants on physiological functions (immune, reproductive, and other vital systems), including assessing the health status and contaminant loads of stranded or live-captured animals.	Marine Mammal Commission: Assessing the Long-Term Effects of the BP Deepwater Horizon Oil Spill on Marine Mammals in the Gulf of Mexico: A Statement of Research Needs (2011)	Marine	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>MICROBES</b> - Study the effects of oil discharges on microbial communities.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>MICROBES</b> - Study the value of microbial services.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>PLANKTONIC IMPACTS</b> - Study the impact on neuston organisms from spilled oil.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>PLANKTONIC IMPACTS</b> - Study the impact on plankton communities including young squid from spilled oil.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>REPTILE AND AMPHIBIAN IMPACTS</b> - Study the effects of oil on amphibians and reptiles.	ICCOPR R&T Plan (1992)	Freshwater/Terrestrial	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>REPTILE IMPACTS</b> - Develop research on acute and chronic effects of oil exposure to turtles and other reptiles.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>WILDLIFE IMPACTS</b> - Conduct research for oiled wildlife response and practices, including laboratory-based R&D for spill response tactics.	ICCOPR Public Meeting - West (2010)	All	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>WILDLIFE IMPACTS</b> - Study the effects of oil on physiological and immunological processes in wildlife.	ICCOPR R&T Plan (1992)	All	1
4101-Environmental Impacts and Ecosystem Recovery	Species Impacts	<b>WILDLIFE IMPACTS</b> - Study the transport and fate of marine wildlife carcasses to assist in NRDA.	PWS OSRI - Research Plan 2011-2015 (2010)	Marine/Estuarine	1

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4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>CHEMICAL ANALYSIS</b> - Develop more sensitive analytical tests to assess damage.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>CHEMICAL ANALYSIS</b> - Study the TPH hump in chemical analysis.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>EXPOSURE METHODOLOGIES</b> - Develop DNA fingerprinting of fish and mammals to assess long-term effects.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>EXPOSURE METHODOLOGIES</b> - Develop relevant biological markers of exposure and guidelines for responsible use of biomarkers.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>EXPOSURE METHODOLOGIES</b> - Study genomic signatures to different oil types and weathering states as a way of monitoring for exposure to aquatic life.	EPA Draft Oil Spill Research Strategy (2011)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>OIL SANDS PRODUCTS IMPACTS</b> - Conduct research on the dissolution in water and the bioavailability of OSP.	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>OIL SANDS PRODUCTS IMPACTS</b> - Study the toxicity of OSP in freshwater and marine environments.	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>SUBLETHAL IMPACTS</b> - Study relevant endpoints (e.g., growth, behavior, inhibit reproduction, physiological aberrations) and appropriate organisms to use as indicators for different habitats.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>SUBLETHAL IMPACTS</b> - Study the sub-lethal effects for various habitats and organisms from 1ppb oil.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>SUBLETHAL METHODOLOGIES</b> - Develop assay for measuring effects on reproduction, fecundity, lifespan, biomarkers more sensitive than Microtox.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>SUBLETHAL METHODOLOGIES</b> - Study, develop and validate robust markers of petroleum impacts.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>TOXICOLOGICAL IMPACTS</b> - Conduct research to identify toxicologically-relevant analytes by habitat and organism.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>TOXICOLOGICAL IMPACTS</b> - Develop correlation of spilled oil (regardless of the degree of weathering) to residues in biological matrices to assist in establishing a direct link to exposure levels.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>TOXICOLOGICAL IMPACTS</b> - Develop rapid screening methods to assess the toxicological potency of complex oil mixtures.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>TOXICOLOGICAL IMPACTS</b> - Study the effects of oil on vertebrate species using tissue culture assay.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>TOXICOLOGICAL IMPACTS</b> - Study the fate and toxicity of chemically treated oils.	ICCOPR R&T Plan (1992)	Marine/Estuarine	1
4102-Environmental Impacts and Ecosystem Recovery	Toxicological/ Sublethal Impacts	<b>TOXICOLOGICAL IMPACTS</b> - Study the genotoxicity of petroleum hydrocarbons in sediments following an oil spill.	ICCOPR R&T Plan (1992)	All	1

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4102-Environmental Impacts and Ecosystem Recovery	Toxicological/Sublethal Impacts	<b>TOXICOLOGICAL IMPACTS</b> - Study the toxicity of oil constituents of non-aqueous phase oil to benthic organisms.	EPA Draft Oil Spill Research Strategy (2011)	Marine/Estuarine/Freshwater	1
4103-Environmental Impacts and Ecosystem Recovery	Submerged oil/Dispersed Oil Impacts	<b>DEEPWATER ENVIRONMENTAL IMPACTS</b> - Study and quantify the risks of environmental impacts from deepwater oil and gas exploration, drilling, and production activity, to include modeling and evaluation of industry systems, based on newly developed technologies	DOE - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program (2012)	Marine/Estuarine	1
4103-Environmental Impacts and Ecosystem Recovery	Submerged oil/Dispersed Oil Impacts	<b>DISPERSED OIL IMPACTS</b> - Conduct research to evaluate the long-term/chronic impacts of chemically/naturally dispersed oil on invertebrates, anadromous fish, corals, etc. - focus on long exposures to low concentrations, environmentally relevant exposure scenarios.	1) CRRC - R&D Priorities: An Oil Spill Workshop (2003) 2) Pacific States/BC OSTF Letter to ICCOPR (2010)	Marine/Estuarine/Freshwater	2
4103-Environmental Impacts and Ecosystem Recovery	Submerged oil/Dispersed Oil Impacts	<b>DISPERSED OIL IMPACTS</b> - Study the adhesiveness of physically and chemically dispersed oil to fur, feathers and other biological substrates - how adhesion changes over time.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4103-Environmental Impacts and Ecosystem Recovery	Submerged oil/Dispersed Oil Impacts	<b>DISPERSED OIL IMPACTS</b> - Study the impact of dispersed oil on organisms, how it is taken up, end products, effects on benthic primary production.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4103-Environmental Impacts and Ecosystem Recovery	Submerged oil/Dispersed Oil Impacts	<b>SUBMERGED OIL IMPACTS</b> - Develop approaches for long-term monitoring of the impacts of submerged oil spills after termination of cleanup efforts.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
4103-Environmental Impacts and Ecosystem Recovery	Submerged oil/Dispersed Oil Impacts	<b>SUBMERGED OIL IMPACTS</b> - Develop effective rapid-assessment protocols to determine impacts of submerged oil spills.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
4103-Environmental Impacts and Ecosystem Recovery	Submerged oil/Dispersed Oil Impacts	<b>SUBMERGED OIL IMPACTS</b> - Develop understanding of oil interaction, impacts, and cleanup options for different seafloor habitats, similar to the sensitivity ranking of intertidal habitats.	1) CRRC - Submerged Oil Workshop Report (2006) 2) ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	2
4103-Environmental Impacts and Ecosystem Recovery	Submerged oil/Dispersed Oil Impacts	<b>SUBMERGED OIL IMPACTS</b> - Develop understanding of the chronic toxicity and pathways of exposure leading to toxicity of submerged oil to benthic resources.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
4103-Environmental Impacts and Ecosystem Recovery	Submerged oil/Dispersed Oil Impacts	<b>SUBMERGED OIL IMPACTS</b> - Develop understanding of the potential threats of chronic releases from oiled sediments and oily residues.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
4103-Environmental Impacts and Ecosystem Recovery	Submerged oil/Dispersed Oil Impacts	<b>SUBMERGED OIL IMPACTS</b> - Study data from past submerged oil spills to understand potential effects and identify data gaps.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
4103-Environmental Impacts and Ecosystem Recovery	Submerged oil/Dispersed Oil Impacts	<b>SUBMERGED OIL IMPACTS</b> - Study the non-PAH in submerged oils that have toxicity implications.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
4103-Environmental Impacts and Ecosystem Recovery	Submerged oil/Dispersed Oil Impacts	<b>SUBMERGED OIL IMPACTS</b> - Study the specific polynuclear aromatic hydrocarbons (PAH) in submerged oils that have toxicity implications.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat Impacts	<b>ECOSYSTEM IMPACTS</b> - Collect data and evaluate long-term environmental effects of oil discharges larger than 250,000 gallons or if the discharged occurred after Jan 1, 1989.	Title 33 Chapter 40 Subchapter IV 2761 (OPA 1990)	All	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat Impacts	<b>ECOSYSTEM IMPACTS</b> - Collect data on ecological impacts that occurred in sensitive coastal ecosystems due to the DWH spill.	EPA Draft Oil Spill Research Strategy (2011)	Marine/Estuarine	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat Impacts	<b>ECOSYSTEM IMPACTS</b> - Conduct laboratory research and mesoscale studies of impact and recovery from different oil types.	ICCOPR R&T Plan (1997)	All	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat Impacts	<b>ECOSYSTEM IMPACTS</b> - Develop detailed exposure conditions (spatially and temporally) and connections between exposure and ecological effects.	SAB Review of EPA Research Strategy (2011)	Marine/Estuarine/Freshwater	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat Impacts	<b>ECOSYSTEM IMPACTS</b> - Develop methods to assess oil spill injury to wetland communities, submerged vegetation, benthic invertebrates, and waterfowl.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat Impacts	<b>ECOSYSTEM IMPACTS</b> - Develop understanding of the difference between oil effects and natural stressors by assessing community structure and function for different habitats.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1

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4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat Impacts	<b>ECOSYSTEM IMPACTS</b> - Develop understanding of trophic and habitat linkages among organisms to incorporate into models looking at cascading indirect effects.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat impacts	<b>LONG-TERM ECOSYSTEM IMPACTS</b> - Collect data with sustained sampling to assess long-term impacts.	NSTC JSOST - DWH Oil Spill PI Conference Report (2010)	All	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat impacts	<b>LONG-TERM ECOSYSTEM IMPACTS</b> - Conduct long-term comprehensive study of selected oil spills to determine the environmental effects independent of the mandated NRDA studies.	ICCOPR R&T Plan (1992)	All	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat Impacts	<b>LONG-TERM ECOSYSTEM IMPACTS</b> - Study long-term chronic exposure direct and indirect impacts on the food chain - fish eggs, bottom feeders, birds, mammals.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat Impacts	<b>SHORELINE IMPACTS</b> - Study sampling methodologies for determining oil spill effects on intertidal communities.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat impacts	<b>SHORELINE IMPACTS</b> - Study the persistence of oil in mudflats including research on physical, geochemical and biological processes of recovery.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	Terrestrial/Estuarine/Marine	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat Impacts	<b>WETLAND IMPACTS</b> - Study effects of crude oil on freshwater marsh plant growth and survival.	ICCOPR R&T Plan (1992)	Freshwater	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat Impacts	<b>WETLAND IMPACTS</b> - Study natural recovery in mangrove habitats (how long does oil persist in mangrove habitats and what are its long-term impacts?).	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine	1
4104-Environmental Impacts and Ecosystem Recovery	Ecosystem/Habitat Impacts	<b>WETLAND IMPACTS</b> - Study the impacts of spilled oil on coastal wetlands.	ICCOPR R&T Plan (1992)	Marine/Estuarine	1
4105-Environmental Impacts and Ecosystem Recovery	Recovery	<b>ECOSYSTEM RECOVERY</b> - Develop conceptual models of service loss and recovery from key habitats, and the information necessary to parameterize recovery models.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4105-Environmental Impacts and Ecosystem Recovery	Recovery	<b>ECOSYSTEM RECOVERY</b> - Study data collection efforts for spill impact assessment and evaluation of ecological recovery rates for offshore, near-shore, coastal and estuarine areas impacted by spills.	Oil Spill Preparedness and Response JITF (2011)	Marine/Estuarine	1
4105-Environmental Impacts and Ecosystem Recovery	Recovery	<b>ECOSYSTEM RECOVERY</b> - Study recovery rates of injured habitats from previous spills.	CRRC - R&D Priorities: Oil Spill Workshop (2009)	All	1
4105-Environmental Impacts and Ecosystem Recovery	Recovery	<b>ECOSYSTEM RECOVERY</b> - Study the environmental effects of contaminants on ecosystems in the Gulf region and the science of ecosystem recovery.	Gulf of Mexico Research Initiative (2010)	Marine/Estuarine	1
4105-Environmental Impacts and Ecosystem Recovery	Recovery	<b>ECOSYSTEM RECOVERY</b> - Study the rates of ecosystem recovery after submerged oil spills.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
4105-Environmental Impacts and Ecosystem Recovery	Recovery	<b>RESPONSE TECHNOLOGY METRICS</b> - Study effectiveness of response technologies on inland spills (e.g., burning, chemical treatment).	EPA Draft Oil Spill Research Strategy (2011)	Terrestrial	1
4105-Environmental Impacts and Ecosystem Recovery	Recovery	<b>RESPONSE TECHNOLOGY IMPACTS</b> - Conduct a study comparing environmental footprints of various response technologies.	EPA Draft Oil Spill Research Strategy (2011)	All	1
4105-Environmental Impacts and Ecosystem Recovery	Recovery	<b>RESPONSE TECHNOLOGY IMPACTS</b> - Study the effects from various cleanup techniques.	ICCOPR R&T Plan (1992)	All	1
4105-Environmental Impacts and Ecosystem Recovery	Recovery	<b>RESPONSE TECHNOLOGY METRICS</b> - Develop regional performance metrics (evaluation of response effectiveness) that are scientifically valid.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)		1
4105-Environmental Impacts and Ecosystem Recovery	Recovery	<b>WASHING AGENTS</b> - Study the impacts of washing agents on various habitats and ecosystems.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1

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4106-Environmental Impacts and Ecosystem Recovery	Risk Assessment/ Impact Metrics	<b>IMPACT METRICS</b> - Collect, synthesize and evaluate current data on impacts from a range of exposure scenarios to biota at different life stages. Determine feasibility of using compiled data in determining potential ecological impacts from oil spills	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4106-Environmental Impacts and Ecosystem Recovery	Risk Assessment/ Impact Metrics	<b>IMPACT METRICS</b> - Conduct research to determine best metrics for assessing impact/damage.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4106-Environmental Impacts and Ecosystem Recovery	Risk Assessment/ Impact Metrics	<b>IMPACT METRICS</b> - Develop methods for assessment of the ecological value and services of benthic habitats and resources.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1
4106-Environmental Impacts and Ecosystem Recovery	Risk Assessment/ Impact Metrics	<b>IMPACT METRICS</b> - Develop models to estimate injury to natural resources.	ICCOPR R&T Plan (1992)	All	1
4106-Environmental Impacts and Ecosystem Recovery	Risk Assessment/ Impact Metrics	<b>IMPACT METRICS</b> - Develop standardized biological metrics.	ICCOPR R&T Plan (1992)	All	1
4106-Environmental Impacts and Ecosystem Recovery	Risk Assessment/ Impact Metrics	<b>IMPACT METRICS</b> - Study the application of life-history strategies to characterize source-sink for various habitats.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4106-Environmental Impacts and Ecosystem Recovery	Risk Assessment/ Impact Metrics	<b>RISK ASSESSMENT</b> - Conduct a NEBA on DWH that includes the total life-cycle of different CTAs and other response technologies to better understand trade-offs and inform decision making.	SAB Review of EPA Research Strategy (2011)	Marine/Estuarine	1
4106-Environmental Impacts and Ecosystem Recovery	Risk Assessment/ Impact Metrics	<b>RISK ASSESSMENT</b> - Conduct single species toxicity research on endpoints to assess population effects and help risk-based decision-making during an event as part of restoration efforts.	SAB Review of EPA Research Strategy (2011)	Marine/Estuarine/Freshwater	1
4106-Environmental Impacts and Ecosystem Recovery	Risk Assessment/ Impact Metrics	<b>RISK ASSESSMENT</b> - Develop a risk assessment based on key exposure-response relationships from lab tests where conditions reflect ambient exposures.	SAB Review of EPA Research Strategy (2011)	Marine/Estuarine/Freshwater	1
4106-Environmental Impacts and Ecosystem Recovery	Risk Assessment/ Impact Metrics	<b>RISK ASSESSMENT</b> - Study risk assessment in coastal environments and include data from a variety of sources to model environmental response.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>ACTIVE VS. NATURAL ATTENUATION RESTORATION</b> - Conduct a net-benefit analysis of restoration vs. natural attenuation using case histories.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	All	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>ACTIVE VS. NATURAL ATTENUATION RESTORATION</b> - Study the relationship between natural recovery and restoration.	ICCOPR R&T Plan (1992)	All	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>AVIAN RESTORATION</b> - Study methods of luring colonial nesting birds from oil spill impacted wetlands.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>BEACH RESTORATION</b> - Study the role of beach renourishment as a strategy for restoration.	ICCOPR R&T Plan (1992)	Marine/Estuarine	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>BENTHIC RESTORATION</b> - Develop methods to recolonize benthic algal and invertebrate communities on oil impacted intertidal and subtidal bottoms.	ICCOPR R&T Plan (1992)	Marine/Estuarine	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>BIVALVE IMPACT</b> - Study the viability of intrusive restoration approaches to bivalve communities for ecological and economic concern.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>MEASURING RESTORATION SUCCESS</b> - Conduct a retrospective case study of restoration sites.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	All	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>MEASURING RESTORATION SUCCESS</b> - Develop methods for assessing success/progress, potential negative impacts, and total cost of restoration activities.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	All	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>MEASURING RESTORATION SUCCESS</b> - Develop restoration indicators and measures of effectiveness.	ICCOPR R&T Plan (1997)		1

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4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>MEASURING RESTORATION SUCCESS</b> - Study and identify sentinel organisms to measure the success of oil spill restoration.	ICCOPR R&T Plan (1992)	All	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>MEASURING RESTORATION SUCCESS</b> - Study long-term restoration issues and develop and apply performance measures and indicators of long-term restoration.	National Commission on BP DWH - Final Report (2011)	All	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>MEASURING RESTORATION SUCCESS</b> - Study whether ecosystem service losses can be regained through remediation.	EPA Draft Oil Spill Research Strategy (2011)	All	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>OIL SANDS PRODUCTS RESTORATION</b> - Conduct research to improve reclamation of mining areas and settling ponds from OSP operations.	Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force (April 2013)	Terrestrial	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>RESTORATION METHODOLOGIES</b> - Develop innovative techniques for restoration.	1) EPA Draft Oil Spill Research Strategy (2011) 2) CRRC - R&D Priorities: An Oil Spill Workshop (2003) 3) ICCOPR R&T Plan (1992)	All	3
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>RESTORATION METHODOLOGIES</b> - Study the pairing of restoration methods and its impact negative or positive on different types of habitats.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	All	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>SEAGRASS RESTORATION</b> - Study methods of restoring seagrass communities following losses related to oil spills.	ICCOPR R&T Plan (1992)	Marine/Estuarine	1
4200-Environmental Restoration Methods and Technologies	No Subcategory	<b>WILDLIFE RESTORATION</b> - Study the impacts of rehabilitating and releasing oil injured wildlife on population restoration.	ICCOPR R&T Plan (1992)	All	1
4301-Human Safety and Health	Safety	<b>COMMUNICATION</b> - Study communication methods to educate stakeholder groups (general public) with regard to dispersants and oil spills, environmental trade-offs, human health and seafood safety issues.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	All	1
4301-Human Safety and Health	Safety	<b>HUMAN EXPOSURE TO OIL</b> - Study whether current monitoring methods for oil exposure to humans are effective.	EPA Draft Oil Spill Research Strategy (2011)	All	1
4301-Human Safety and Health	Safety	<b>PROTECTIVE TECHNOLOGIES</b> - Develop technologies and methods to protect public health and safety from oil discharges, including the population directly exposed to an oil discharge	Title 33 Chapter 40 Subchapter IV 2761 (OPA 1990)	All	1
4301-Human Safety and Health	Safety	<b>SEAFOOD SAFETY</b> - Conduct research on the short-term and long-term safety of seafood in the GOM following the DWH spill and communicate it to the public	NAS- Research Priorities for assessing Health Effects from gulf of Mexico Oil Spill (2010)	Marine/Estuarine	1
4301-Human Safety and Health	Safety	<b>SEAFOOD SAFETY</b> - Correlate organoleptic testing with analytical procedures for oil contaminants in fish.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
4301-Human Safety and Health	Safety	<b>SEAFOOD SAFETY</b> - Determine attitudes and behaviors relative to consumption of seafood in restaurants and household purchases in different regions	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
4301-Human Safety and Health	Safety	<b>SEAFOOD SAFETY</b> - Develop improved analytical capabilities for assessing seafood safety.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
4301-Human Safety and Health	Safety	<b>SEAFOOD SAFETY</b> - Study the safety of fisheries from oil discharges.	ICCOPR R&T Plan (1992)	Marine/Estuarine/Freshwater	1
4301-Human Safety and Health	Safety	<b>WORKER SAFETY</b> - Develop technologies, methods, and standards for protecting removal personnel, including training, adequate supervision, information databases, protective equipment, maximum exposure limits, and decontamination procedures.	1) Title 33 Chapter 40 Subchapter IV 2761 (OPA 1990) 2) ICCOPR R&T Plan (1997)	All	2
4301-Human Safety and Health	Safety	<b>WORKER SAFETY</b> - Study surface VOC levels in dispersant application scenarios, subsea and surface, to assess worker safety.	BSEE BAA Proposed Research on Oil Spill Response Operations (2012)	All	1
4301-Human Safety and Health	Safety	<b>WORKER SAFETY</b> - Study the health and safety issues associated with spill response, and develop protocols for personnel protection (e.g., training, fitness, stress management).	ICCOPR R&T Plan (1992)	All	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN BEHAVIORAL EFFECTS OF DWH</b> - Conduct research on the psychological and behavioral effects of DWH.	NAS- Research Priorities for assessing Health Effects from gulf of Mexico Oil Spill (2010)	All	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN DISPERSANT EXPOSURE</b> - Develop an upper bound of exposure of the variable exposure scenarios associated with the dispersant use.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	All	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN DISPERSANT EXPOSURE</b> - Develop models to estimate exposure to dispersant and/or dispersed oil to human populations.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	All	1

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4302-Human Safety and Health	Human Exposure	<b>HUMAN DISPERSANT EXPOSURE</b> - Study the health effects in known potentially exposed human populations .	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	All	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE DURING DWH</b> - Collect long-term monitoring data of health (human) of coastal communities impacted by DWH.	National Commission on BP DWH - Final Report (2011)	Marine/Estuarine	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE DURING DWH</b> - Conduct clinical evaluations, diagnostics and documentation for individuals affected from the DWH spill	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE DURING DWH</b> - Study the human health impacts from harmful algal blooms and toxins associated with the DWH spill.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE TO ISB</b> - Conduct research on the cardiovascular effects associated with exposure to smoke plumes from in situ burns	EPA Draft Oil Spill Research Strategy (2011)	All	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE TO ISB</b> - Conduct research on the effects associated with exposure to oil, dispersants, and by-products from in situ burns during the DWH spill	NAS- Research Priorities for assessing Health Effects from gulf of Mexico Oil Spill (2010)	Marine/Estuarine	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE RESEARCH PLANNING</b> - Conduct research on the framework needed to deploy a rapid research response for future oil spills.	NAS- Research Priorities for assessing Health Effects from gulf of Mexico Oil Spill (2010)	All	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE TO OIL</b> - Conduct long-term monitoring of the general health and changing conditions in hydrocarbon extraction, processing, and transportation	SAB Review of EPA Research Strategy (2011)	All	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE TO OIL</b> - Conduct Research on neurological effects from exposure to a mixture of hydrocarbon vapors compared to the sum of the effects of exposure to individual vapors.	EPA Draft Oil Spill Research Strategy (2011)	All	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE TO OIL</b> - Conduct research on the dose-response function for acute exposures to hydrocarbon vapors.	EPA Draft Oil Spill Research Strategy (2011)	All	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE TO OIL</b> - Conduct research on the effects of dermal contact with oil.	EPA Draft Oil Spill Research Strategy (2011)	All	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE TO OIL</b> - Develop a database on health effects relating to oil.	ICOPR R&T Plan (1992)	All	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE TO OIL</b> - Study the interactions between added stressors (e.g., health, anxiety) and health effects caused by direct exposure to oil spill related components	EPA Draft Oil Spill Research Strategy (2011)	All	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE TO OIL</b> - Study the short and long terms impacts to humans from exposure to contaminants from an oil spills, dermal, orally (through seafood), and respiratory	SAB Review of EPA Research Strategy (2011)	All	1
4302-Human Safety and Health	Human Exposure	<b>HUMAN EXPOSURE TO OIL AND DISPERSANTS</b> - Study the toxicological effects and the causal or correlative relationships between chemical (i.e., oil and dispersants) exposure and human health.	1) EPA Draft Oil Spill Research Strategy (2011) 2) National Commission on BP DWH - Final Report (2011)	All	2
4302-Human Safety and Health	Human Exposure	<b>WORKER HEALTH AFTER DWH</b> - Collect long-term monitoring data on Deepwater Horizon responders' health.	National Commission on BP DWH - Final Report (2011)	All	1
4302-Human Safety and Health	Human Exposure	<b>WORKER HEALTH AFTER DWH</b> - Determine the neurological effects in cleanup workers or nearby residents exposed to the DWH contaminants.	EPA Draft Oil Spill Research Strategy (2011)	All	1
4401-Sociological and Economic Impacts	Community/Economic Impacts	<b>COMMUNITY IMPACTS OF RESTORATION</b> - Study the extent to which restoration practices promote community development and meet other ethical criteria	CRRC - R&D Needs for Addressing the Human Dimensions of Oil Spills (2006)	All	1
4401-Sociological and Economic Impacts	Community/Economic Impacts	<b>COMMUNITY IMPACTS OF SPILLS</b> - Develop an improved understanding of community tolerance of ecological disturbances.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	All	1
4401-Sociological and Economic Impacts	Community/Economic Impacts	<b>COMMUNITY IMPACTS OF SPILLS</b> - Study community vulnerability and resilience to past spills including social impacts.	CRRC - R&D Needs for Addressing the Human Dimensions of Oil Spills (2006)	All	1
4401-Sociological and Economic Impacts	Community/Economic Impacts	<b>COMMUNITY IMPACTS OF SPILLS</b> - Study past support services and aid in communities impacted by past spills.	CRRC - R&D Needs for Addressing the Human Dimensions of Oil Spills (2006)	All	1
4401-Sociological and Economic Impacts	Community/Economic Impacts	<b>COMMUNITY PREPAREDNESS</b> - Conduct a needs assessment research (survey) of external stakeholders for spill response literacy, dispersant information needs and expectations and recommendations for future preparedness and response.	CRRC - The Future of Dispersant Use in Oil Spill Response Initiative (2012)	Marine/Estuarine	1
4401-Sociological and Economic Impacts	Community/Economic Impacts	<b>COMMUNITY PREPAREDNESS</b> - Develop more effective models for community/stakeholder involvement in oil spill planning, response and restoration	CRRC - R&D Needs for Addressing the Human Dimensions of Oil Spills (2006)	All	1
4401-Sociological and Economic Impacts	Community/Economic Impacts	<b>COMMUNITY PREPAREDNESS</b> - Study organizational culture and its influence on preparedness, response and restoration.	CRRC - R&D Needs for Addressing the Human Dimensions of Oil Spills (2006)	All	1
4401-Sociological and Economic Impacts	Community/Economic Impacts	<b>ECONOMIC ANALYSIS OF ALTERNATIVES</b> - Study the cost/benefit of alternative measures that prevent subsequent events vs. direct application of resources to the injuries themselves (e.g. meteorological station to provide wind data to guide ship traffic in restricted environment; channel markers to prevent groundings).	CRRC - R&D Priorities: An Oil Spill Workshop (2003)		1
4401-Sociological and Economic Impacts	Community/Economic Impacts	<b>ECONOMIC IMPACTS</b> - Conduct an assessment of the economic, recreational, and commercial effects of submerged oil spills.	CRRC - Submerged Oil Workshop Report (2006)	Marine/Estuarine/Freshwater	1

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4401-Sociological and Economic Impacts	Community/ Economic Impacts	<b>ECONOMIC IMPACTS</b> - Study far-reaching effects of large oil spills on other businesses dependent on the region's resources.	National Commission on BP DWH - Final Report (2011)	All	1
4401-Sociological and Economic Impacts	Community/ Economic Impacts	<b>NRDA HUMAN USE VALUES</b> - Develop estimates of human use values and the loss due to oil spills. Consider environmental psychology/perception	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	All	1
4401-Sociological and Economic Impacts	Community/ Economic Impacts	<b>RISK COMMUNICATION</b> - Conduct case study comparing risk communication strategies and goals used during past oil spills. Assess risk communication messages vs. perceptions from previous spills including DWH.	1)CRRC - R&D Needs for Addressing the Human Dimensions of Oil Spills (2006) 2)NAS Research Priorities for Assessing Health Effects from the Gulf of Mexico Spill	All	2
4401-Sociological and Economic Impacts	Community/ Economic Impacts	<b>RISK COMMUNICATION</b> - Develop improved methods for communicating risks and tradeoffs to various audiences, including tradeoffs of dispersant use vs. alternative technologies.	1) CRRC - R&D Priorities: An Oil Spill Workshop (2003) 2) CRRC - R&D Needs for Addressing the Human Dimensions of Oil Spills (2006)	All	2
4401-Sociological and Economic Impacts	Community/ Economic Impacts	<b>RISK COMMUNICATION</b> - Study potential strategies to communicate risk of oil spills, especially inland spill affecting drinking water	SAB Review of EPA Research Strategy (2011)	Freshwater/Terrestrial	1
4402-Sociological and Economic Impacts	Human Impacts	<b>HUMAN IMPACTS</b> - Determine the likely degree of impact on human well-being from ecosystem service losses.	1) EPA Draft Oil Spill Research Strategy (2011) 2) CRRC - R&D Priorities: An Oil Spill Workshop (2003)	All	2
4402-Sociological and Economic Impacts	Human Impacts	<b>HUMAN IMPACTS</b> - Study cumulative social impacts of chronic and long lasting spills.	SAB Review of EPA Research Strategy (2011)	All	1
4402-Sociological and Economic Impacts	Human Impacts	<b>HUMAN IMPACTS</b> - Study regional differences in perceptions and responses to spills.	CRRC - R&D Needs for Addressing the Human Dimensions of Oil Spills (2006)	All	1
4402-Sociological and Economic Impacts	Human Impacts	<b>HUMAN IMPACTS</b> - Study the resilience of social-ecological systems to environmental disasters.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
4402-Sociological and Economic Impacts	Human Impacts	<b>NRDA HUMAN USE VALUES</b> - Determine social and cultural values associated with natural resource injuries due to spills.	CRRC - R&D Needs for Addressing the Human Dimensions of Oil Spills (2006)	All	1
4402-Sociological and Economic Impacts	Human Impacts	<b>NRDA HUMAN USE VALUES</b> - Develop ability to assess non-market value of resources and the loss of value from oil spills.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4402-Sociological and Economic Impacts	Human Impacts	<b>RESOURCE TRADEOFFS</b> - Conduct resource tradeoff research on (e.g., different types of restoration, regional differences, social value).	CRRC - R&D Needs for Addressing the Human Dimensions of Oil Spills (2006)	All	1
4402-Sociological and Economic Impacts	Human Impacts	<b>SUBSISTENCE IMPACTS</b> - Conduct research to fill data gap in subsistence fishing in urban areas.	CRRC - R&D Needs for Addressing the Human Dimensions of Oil Spills (2006)	All	1
4402-Sociological and Economic Impacts	Human Impacts	<b>SUBSISTENCE IMPACTS</b> - Develop meta analysis of subsistence research literature.	CRRC - R&D Needs for Addressing the Human Dimensions of Oil Spills (2006)	All	1
4402-Sociological and Economic Impacts	Human Impacts	<b>SUBSISTENCE IMPACTS</b> - Develop methods to assess subsistence use losses during oil spills.	CRRC - R&D Priorities: An Oil Spill Workshop (2003)	Marine/Estuarine/Freshwater	1
4402-Sociological and Economic Impacts	Human Impacts	<b>SUBSISTENCE IMPACTS</b> - Study how subsistence harvesting could be impacted by a spill.	Marine Mammal Commission Letter to ICCOPR (2010)	All	1
4402-Sociological and Economic Impacts	Human Impacts	<b>SUBSISTENCE IMPACTS</b> - Study the impact from DWH spill on subsistence use.	NSTC JSOST - DWH Oil Spill PI Conference Report (2011)	Marine/Estuarine	1
4402-Sociological and Economic Impacts	Human Impacts	<b>SUBSISTENCE IMPACTS</b> - Study the restoration of subsistence resources and services after spills.	CRRC - R&D Needs for Addressing the Human Dimensions of Oil Spills (2006)	All	1



# **Appendix C**

## ICCOPR Standing Research Areas

### 2014 Sources



## Sources for Research & Technology Needs Database

1. [Title 33 Chapter 40 Subchapter IV 2761 \(Aug 1990\)](#)
2. [Interagency Coordinating Committee on Oil Pollution Research Research and Technology Plan \(1992\)](#)
3. [Interagency Coordinating Committee on Oil Pollution Research Research and Technology Plan \(1997\)](#)
4. [Coastal Response Research Center - Research and Development Priorities: An Oil Spill Workshop \(Nov 2003\)](#)
5. [Coastal Response Research Center - Research & Development Needs For Making Decisions Regarding Dispersing Oil \(Sept 2005\)](#)
6. [National Research Council. Oil Spill Dispersants: Efficacy and Effects. Washington, DC: The National Academies Press \(2005\)](#)
7. [Potentially Polluting Wrecks in Marine Waters: An Issue Paper Prepared for the 2005 International Oil Spill Conference \(2005\)](#)
8. [EPAct 2005 Section 999A\(b\)\(4\) DOE National Energy Technology Laboratory Complementary Research Program](#)
9. [Coastal Response Research Center - R&D Needs for Addressing the Human Dimensions of Oil Spills \(June 2006\)](#)
10. [Coastal Response Research Center - Submerged Oil Workshop Report \(December 2006\)](#)
11. [DOE 2007 Annual Plan Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program, Report \(January 2008\)](#)
12. [DOE 2009 Annual Plan Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program, Report \(December 2008\)](#)
13. [Coastal Response Research Center - R&D Priorities: Oil Spill Workshop \(March 2009\)](#)
14. [House of Representatives, Committee on Science & Technology "A New Direction for Federal Oil Spill Research & Development" \(June 4, 2009\)](#)
15. [DOE 2010 Annual Plan Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program, Report \(December 2009\)](#)
16. [Wreck Oil Removal Program Overview \(2009\)](#)
17. [Prince William Sound Oil Spill Recovery Institute Research Plan 2011-2015 \(Feb 2010\)](#)
18. [Gulf of Mexico Research Initiative: Research Themes \(May 2010\)](#)
19. [Interagency Coordinating Committee on Oil Pollution Research Public Meetings - West \(May 2010\)](#)
20. [Pacific States/British Columbia Oil Spill Task Force Letter to Interagency Coordinating Committee on Oil Pollution Research \(May 2010\)](#)
21. [House of Representatives, Committee on Science & Technology "Deluge of Oil Highlights Research & Technology Needs for Effective Cleanup of Oil Spills" \(June 9, 2010\)](#)
22. [U.S. Arctic Research Commission - White Paper \(July 2010\)](#)
23. [Interagency Coordinating Committee on Oil Pollution Research Public Meetings - East \(Sept 2010\)](#)
24. [Marine Mammal Commission Letter to Interagency Coordinating Committee on Oil Pollution Research \(Sept 2010\)](#)

25. [National Science and Technology Council Joint Subcommittee on Ocean Science and Technology - DWH Oil Spill PI Conference Report \(Oct 2010\)](#)
26. [Interagency Coordinating Committee on Oil Pollution Research Public Meetings - Gulf \(Nov 2010\)](#)
27. [National Academy of Sciences Institutes of Medicine Research priorities for Assessing Health Effects from the Gulf of Mexico Oil Spill \(2010\)](#)
28. [Deepwater Horizon Incident Specific Preparedness Review \(Jan 2011\)](#)
29. [Environmental Protection Agency Draft Oil Spill Research Strategy \(Jan 2011\)](#)
30. [National Commission on BP Deepwater Horizon - Final Report \(Jan 2011\)](#)
31. [Ultra-Deepwater Advisory Committee 2011 Plan: Comments, Findings and Recommendations \(April 2011\)](#)
32. [Coastal Response Research Center - Coordinating R&D on Oil Spill Response In the Wake of Deepwater Horizon \(July 2011\)](#)
33. [Assessing the Long-term Effects of the BP Deepwater Horizon Oil Spill on Marine Mammals in the Gulf of Mexico: A Statement of Research Needs \(Aug 2011\)](#)
34. [DOE 2011 Annual Plan Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program, Report To Congress \(August 2011\)](#)
35. [U.S. Department of Energy - 2011 Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program \(Aug 2011\)](#)

36. [Science Advisory Board Review of Environmental Protection Agency's Draft Oil Spill Research Strategy \(Sept 2011\)](#)
37. [National Science and Technology Council's Joint Subcommittee on Ocean Science and Technology - Deepwater Horizon Oil Spill Principal Investigator Conference Final Report \(Oct 2011\)](#)
38. [Oil Spill Preparedness and Response Joint Industry Task Force \(Nov 2011\)](#)
39. [U.S. Geological Survey. An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas \(2011\)](#)
40. [International Association of Oil and Gas Producers - Joint Industry Programme Solicitation for Expression of Interest \(EOI\) on Arctic Oil Spills \(Feb 2012\)](#)
41. [Coastal Response Research Center - The Future of Dispersant Use in Oil Spill Response Initiative \(Mar 2012\)](#)
42. [Ultra-Deepwater Advisory Committee 2012 Plan: Comments, Findings and Recommendations \(March 2012\)](#)
43. [OESC Letter Recommendations to BSEE Department of Interior \(April 2012\)](#)
44. [U.S. Government Accountability Office Oil Dispersants Report \(May 2012\)](#)
45. [Government and Industry Pipeline Forum \(Jul 2012\)](#)
46. [DOE 2012 Annual Plan Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program, Report To Congress \(August 2012\)](#)
47. [OESC Letter Recommendations to BSEE Department of Interior \(August 2012\)](#)
48. [U.S. Department of Energy - Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources R&D Program \(Aug 2012\)](#)
49. [Ultra-Deepwater Advisory Committee 2013 Draft Plan: Findings and Recommendations \(November 2012\)](#)
50. [Center for Spills in the Environment Alberta Oil Sands Workshop for Maine DEP and U.S. EPA Region 1 \(December 2012\)](#)
51. [Bureau of Safety and Environmental Enforcement - BAA Proposed Research on Oil Spill Response Operations \(2012\)](#)
52. [OESC Letter Recommendations to BSEE Department of Interior \(January 2013\)](#)
53. [Center for Spills in the Environment Oil Spill Dispersant Research Workshop Report \(March 2013\)](#)
54. [Oil Spill Simulants Materials: Workshop Proceedings \(March 2013\)](#)
55. [University of Washington Transporting Alberta Oil Sands Products: Defining the Issues and Assessing the Risks \(March 2013\)](#)
56. [Center for Spills in the Environment Alberta Oil Sands Workshop for Washington State Department of Ecology, the Regional Response Team 10 and the Pacific States/British Columbia Oil Spill Task Force \(April 2013\)](#)
57. [DOE 2013 Annual Plan Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program, Report To Congress \(June 2013\)](#)
58. [NRC An Ecosystem Approach to Assessing the Impact of the Deepwater Horizon Spill in the Gulf of Mexico \(2013\)](#)
59. [TRB Effect of Diluted Bitumen on Crude Oil Transmission Pipelines Special Report 311 \(2013\)](#)
60. [http://www.crrc.unh.edu/workshops/oil\\_sands\\_washington/index.html](http://www.crrc.unh.edu/workshops/oil_sands_washington/index.html)
61. BSEE Alaska Regional Director- Personal Communication (2013)

**Websites Used:**

[BP Gulf of Mexico Restoration](#)

[Bureau of Safety and Environmental Enforcement Technology Assessment and Research](#)  
[Dauphin Island Sea Lab](#)  
[Deepwater Horizon Oil Spill Research and Monitoring Database \(GOM Sea Grant\)](#)  
[Gulf of Mexico Alliance](#)  
[HARTE Institute](#)  
[Louisiana Universities Marine Consortium](#)  
[National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling](#)  
[National Institute of Environmental Health, Gulf Oil Spill Response Efforts](#)  
[National Institute of Undersea Science and Technology, University of Mississippi](#)  
[National Institutes of Health, Research Portfolio Online Reporting Tools](#)  
[Northern Gulf Institute](#)  
[US Department of Agriculture Current Research Information System](#)  
[US Department of Energy, Office of Scientific and Technical Information](#)  
[US Environmental Protection Agency Research](#)  
[US Environmental Protection Agency, Gulf of Mexico Program](#)

**Other Available Resources:**

[Thibodeaux et al \(2011\), Marine Oil Fate: Knowledge Gaps, Basic Research, and Development Needs; A Perspective Based on the Deepwater Horizon Spill, Environmental Engineering Science, Vol. 28, No. 2, pp. 87-93.](#)  
[Response to the Montara Wellhead Platform Incident Report of the Incident Analysis Team March 2010](#)  
[Analysis of U.S. Oil Spillage, API Publication 356 \(August 2009\)](#)  
[2008 IOSC paper 'Systematic Analysis of Oil Spill Response' by Mark VanHaverbeke, USCG & Bernard Cottonm Jr \(SAIC\)](#)  
[Hazardous Materials Employee Resource Book, US Dept of Transportation \(2007\)](#)  
[U. S. Coast Guard Oil Spill Response Research & Development Program A Decade of Achievement \(2003\)](#)  
[Marine Board Review-Final Report-1994](#)  
[Marine Board Review-First Report-1993](#)  
[1992 International Oil Spill R&D Forum Proceedings](#)

# **Appendix D**

## Survey Technical Report



## **SME SURVEY TECHNICAL REPORT**

### **1.0 Survey Instrument Development**

The University of New Hampshire Survey Center (UNHSC), in collaboration with the University of New Hampshire Coastal Response Research Center (CRRC) and the Interagency Coordinating Committee on Oil Pollution Research (ICOPR) developed a set of criteria that could be used to establish the relative importance of individual research needs in five domains: cost, timeliness, importance, complexity of research question, and current progress. In addition to the five domains, Subject Matter Experts (SMEs) were asked to: (1) select the top five research needs within the Standing Research Areas (SRAs) or subgroups of the SRAs and then rank order the five top needs, (2) provide examples of research needs that may have been missed, and (3) list up to three impediments to fulfilling the top five research needs (excluding cost and time to completion).

Any SME who completed a survey within a subgroup of an SRA was notified they would be contacted again to evaluate the top three needs from each of the subgroups within their SRA. This survey consisted of a list of the top three research needs from each subgroup within the SRA. SMEs were asked to rank order all or up to 10 research needs (depending on total number of needs in the SRA).

The survey instrument was programmed using Qualtrics surveys (city, state) and was extensively tested by the UNHSC staff, as well as by select members from the ICOPR workgroup and CRRC, for accuracy and ease of use.

The University of New Hampshire Institutional Review Board approved the survey and methodology for this study. Respondents were provided assurances of confidentiality and that identifiable information would not be included in any report. The full consent language can be found in Attachment 1 which also includes a final version of the survey.

### **2.0 SME Sample Selection**

The ICOPR Workgroup, CRRC and ICOPR members selected the SMEs for the ICOPR Survey. For each of the SRAs and SRA subgroups, the Workgroup and CRRC identified federal employee SMEs that were knowledgeable about the research areas. In addition, the Workgroup contacted other members of

## Appendix D

ICCOPR and members of their individual agencies to expand the pool of SMEs. In some areas, there was a need to include state agency, academic and industry experts in order to find the right expertise to address the R&D Needs questions. The Workgroup determined, however, that in no SRA category or subgroup should non-federal employees exceed the number of federal SMEs. A total of 38 non-federal employees were used (only 10.4 % of the SME surveyed).

A sample of 289 SMEs was identified to participate in surveys for the SRAs. Any SRA that had more than 15 identified research needs was divided into smaller subareas to reduce respondent burden (“survey fatigue”). This division also added more specificity to the research needs which in turn added more specificity to the SMEs who were selected. A total of 46 ICCOPR SRAs or subgroups were used for evaluative purposes. A list of all 46 SRAs and associated subgroups and the number of selected SMEs for each can be found in Appendix A. If an SME was selected to participate and either requested not to participate or did not consider themselves him/herself knowledgeable in the field, they were replaced by another identified expert (N=6).

### **4.0 Survey Initiation**

The survey was sent electronically to the SMEs on October 31, 2013 with three reminders about participation sent on November 6, November 13, and November 27, 2013. The survey was closed on December 13, 2013. Copies of the invitation and reminders can be found in Attachment 2.

### **5.0 Response Rates**

Surveys were completed by 244 SMEs from a sample of 287 selected SMEs (Table 1). This resulted in an overall response rate of 85%, which is a high response rate for surveys of this type.

**Table 1: Response Rates by SRA series**

SRA Series	Sample Size	Completed	Response Rate
<b>1000 Series</b>	38	30	79%
<b>2000 Series</b>	29	22	76%
<b>3000 Series</b>	135	124	92%
<b>4000 Series</b>	85	68	80%
<b>Total</b>	<b>287</b>	<b>244</b>	<b>85%</b>

## 6.0 Ranking Instructions

A research need was identified as “in the top three” if it received the three highest votes for the top five by the SMEs surveyed. For example, if four people ranked research need #1 in the top five, three people ranked research need #4 in the top five, and two people ranked research need #7 in the top five, and the remaining research needs received one or zero votes for the top five then research needs #1, 4, and 7 were the “top three”.

In the case of a tie, the research need ranked first by at least one SME was selected as having the higher score. If additional tie breaking was required, the research need selected as second by at least one SME was used. For example, if six people ranked research need #4 in the top five and four people each ranked research needs #1, #6, and #7 in the top five, with the remainder of research needs receiving three , or less then there are four needs (#4, 1, 6 and 7) identified for the “top three” list. Of the three research needs receiving four votes, the two with the highest ranks were included in the “top three”.

## 7.0 Calculating a Score

The survey was designed to allow UNHSC to calculate a composite score based on four of the five domains listed above with the exception of current progress. Each domain is scored from 0 to 100. A zero and 100 would place the research need lower and higher, respectively, in significance. In cases where the question was asked in a reverse order<sup>1</sup>, the scores were reversed for all analysis, so that higher scores represented more significant research needs. To reverse code, the following formula was

<sup>1</sup> For example, Question 4 asks how soon the specific research need would improve spill prevention, preparedness, response or impact assessment/restoration, with a zero representing short time frame and 100 representing a long time frame. In this instance, zero and 100 would indicate a higher and lower importance, respectively, for the research need.

## Appendix D

used:  $(\text{respondent's score}) - 100 = |\text{answer}|$ , where the absolute value of the respondent's score minus 100 was calculated. For example, if a respondent scored a research need as 60, the reverse coded score would be  $60 - 100 = |-40| = 40$ .

The fifth domain of current progress was not included in the composite score, but could be included, if additional information was requested by the Workgroup during its deliberations. Additionally, the cost domain was subsequently dropped from the composite score because there was significant missing data for this question. Many SMEs did not choose to estimate the cost of conducting research on a specific need. Ultimately, the composite score consisted of three domains: timeliness, importance and complexity of the research question, with a separate single score based on current progress. The possible range for the composite score was zero to 300 (100 being the maximum score for each of the three domains) and the possible range for the single measure of current progress was zero to 100.

Each respondent's composite score was calculated by adding the three domain scores for a total score within the range of zero to 300. Finally, all respondents' scores for the specified research need were averaged together to get an average arithmetic composite score (with its associated standard deviation) with a range of zero to 300.

### **8.0 Weighting of Data**

The composite score was based on all domains being considered as equally influential on the importance of a research need. Additionally, the Workgroup asked the UNHSC to develop an alternate system to give higher weights to domains that are more influential on the importance of research needs. Domains 1 (importance), 2 (complexity of research) and 3 (timeliness) were weighted to comprise 55%, 30% and 15% of the score, respectively. The weights were selected by the Workgroup. Each domain score was multiplied by the associated proportional weight and then all three were added together. This sum was multiplied by 3 to make the weighted score range consistent with the unweighted score range of zero to 300. Finally, all respondents' weighted scores for the specified research need were averaged together to get an average weighted composite score (and its associated standard deviation) for the research need with a range of zero to 300.

## 9.0 Selecting Decision Making Measures

The Workgroup met to discuss the final evaluation methodology, and then to evaluate the results of the survey data. Prior to prioritizing the R&D needs, they decided to exclusively use the weighted mean scores of each SRA and SRA subcategory to determine the most important R&T Needs as determined by the survey. The Workgroup unanimously agreed that weighting the results was the best policy. Since Question 5 (current progress) was not included in the scoring, the ICCOPR Workgroup used the results of Question 5 as a way to distinguish between similarly ranked needs. A need that was rated to be a final step might be used to separate it from a similarly ranked need that would take longer to complete. The results of the impediments question (#7) were reviewed to determine if there were any significant issues associated with the selected research priorities that had been missed from the literature search. ICCOPR Workgroup members determined whether these additional R&T Needs were important to the process and if they deserved further consideration. In some cases, these needs were identified by the Workgroup as priorities; in other cases they were combined with other similar R&T Needs in the final prioritization process.

In most cases, they were included as needs on other SRA or SRA subgroup surveys that the SMEs did not see. The final results of the survey were analyzed and summarized for the full ICCOPR Committee for their final review. Comments by the full ICCOPR Committee were evaluated and incorporated into the prioritization process. The results for each SRA Category and Subcategory are presented in Section 7.0

## University of New Hampshire

Research Integrity Services, Service Building  
51 College Road, Durham, NH 03824-3585  
Fax: 603-862-3564

30-Aug-2013

Keirns, Tracy Fowler  
UNH Survey Center, Huddleston Hall  
73 Main Street  
Durham, NH 03824

**IRB #:** 5817

**Study:** ICCOPR Research & Technology Plan

**Approval Date:** 30-Aug-2013

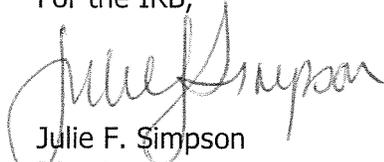
The Institutional Review Board for the Protection of Human Subjects in Research (IRB) has reviewed and approved the protocol for your study as Exempt as described in Title 45, Code of Federal Regulations (CFR), Part 46, Subsection 101(b). Approval is granted to conduct your study as described in your protocol.

Researchers who conduct studies involving human subjects have responsibilities as outlined in the attached document, *Responsibilities of Directors of Research Studies Involving Human Subjects*. (This document is also available at <http://unh.edu/research/irb-application-resources>.) Please read this document carefully before commencing your work involving human subjects.

Upon completion of your study, please complete the enclosed Exempt Study Final Report form and return it to this office along with a report of your findings.

If you have questions or concerns about your study or this approval, please feel free to contact me at 603-862-2003 or [Julie.simpson@unh.edu](mailto:Julie.simpson@unh.edu). Please refer to the IRB # above in all correspondence related to this study. The IRB wishes you success with your research.

For the IRB,



Julie F. Simpson  
Director

cc: File

# University of New Hampshire

Research Integrity Services, Service Building  
51 College Road, Durham, NH 03824-3585  
Fax: 603-862-3564

30-Aug-2013

Keirns, Tracy Fowler  
UNH Survey Center, Huddleston Hall  
73 Main Street  
Durham, NH 03824

**IRB #:** 5817

**Study:** ICCOPR Research & Technology Plan

**Anticipated Study End Date:** October 2013

## Exempt Study Final Report

Upon completion of your Exempt study, please provide the information requested below and submit to the Institutional Review Board (IRB) **along with a report of findings for this study**, for audit purposes. Copies of abstracts, articles, and/or publications specific to the project are acceptable. Send to the IRB at the address shown at the top of this form.

1. Please give date of termination date of study. \_\_\_\_\_
2. How many months did you actually perform the proposed investigation or activity? \_\_\_\_\_
3. How many subjects were studied or involved? \_\_\_\_\_
4. Did you conduct the research in accordance with the procedures reviewed and approved by the IRB? \_\_\_\_\_
5. Did any problems emerge or were any serious unexpected adverse subject experiences observed? If YES, please describe on a separate sheet. Yes \_\_\_ No \_\_\_

Principal Investigator or  
Advisor Signature: \_\_\_\_\_ Date: \_\_\_\_\_

cc: File



**INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS IN RESEARCH**

**RESPONSIBILITIES OF DIRECTORS OF RESEARCH STUDIES INVOLVING HUMAN SUBJECTS**

University of New Hampshire (UNH) tenure-track faculty, lecturers, senior lecturers, visiting faculty with rank, research faculty with rank, clinical faculty with rank, and permanent staff may serve as directors of research studies (researcher) involving human subjects. Adjunct faculty, courtesy faculty (affiliate, affiliate research, and affiliate clinical), and graduate and undergraduate students must be sponsored by an individual who qualifies to serve as a project director.

- A. Researchers are responsible for complying with
  - I. UNH's Policy on the Use of Human Subjects in Research (<http://www.usnh.edu/olpm/UNH/VIII.Res/F.htm>),
  - II. UNH's Federalwide Assurance (FWA) ([http://unh.edu/research/sites/unh.edu.research/files/docs/RIS/FWA\\_1009.pdf](http://unh.edu/research/sites/unh.edu.research/files/docs/RIS/FWA_1009.pdf)), and
  - III. Title 45, Code of Federal Regulations, Part 46: Protection of Human Subjects (45 CFR 46) (<http://www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.html>).
- B. Researchers are responsible for gaining familiarity with, and adhering to, the ethical principles stated in *The Belmont Report* (<http://www.hhs.gov/ohrp/policy/belmont.html>).
- C. Researchers must submit all proposed research activities involving human subjects to the UNH Institutional Review Board (IRB) for review before commencing. Researchers must not involve human subjects in research activities until the researcher has received written, unconditional approval from the IRB for the study.
- D. Researchers are responsible for protecting the rights and welfare of human subjects in their research studies.
- E. Researchers are responsible for keeping co-researchers and all research staff informed about the nature and goals of the study, and the need to adhere to ethical and responsible practices.
- F. Researchers are responsible for adhering to the IRB-approved protocol and consent process, including providing a copy of the IRB-approved and signed informed consent document to each subject at the time of consent, unless the IRB has specifically waived this requirement. The researcher must retain all signed consent documents for at least 3 years after the end of the study.
- G. Researchers must request IRB approval for proposed changes in previously approved human subject research activities before initiating them, except where necessary to eliminate apparent immediate hazards to the subjects.
- H. Researchers are responsible for reporting progress of approved research to the IRB as often as, and in the manner, prescribed by the approving IRB on the basis of risks to subjects. For studies approved at the Expedited and Full Board review levels, this must be no less than once a year (365 days) from the last review date.
- I. Researchers must report to the IRB any injuries or unanticipated problems involving risks to subjects and others within one working day of occurrence.
- J. Researchers will not seek to obtain research credit for, or use data from, patient interventions that constitute the provision of emergency medical care without prior IRB approval. A physician may provide emergency medical care to a patient without prior IRB review and approval, to the extent permitted by law. However, such activities will not be considered research nor may the data be used in support of research.
- K. Researchers who collaborate with colleagues at other institutions/sites have additional responsibilities. Researchers will advise the IRB, Research Integrity Services, and appropriate officials of other institutions of the intent to engage human subjects in research studies for which the UNH FWA or any related Inter-Institutional Amendment or Non-institutional Investigator Agreement applies. Institutions in the collaboration must possess an OHRP-approved Assurance prior to the involvement of human subjects in a research study.

## CRRC Follow-up

Once again we would like to thank you for your participation in this important survey to determine the future research needs in oil spill research. As you know from the first survey there were a large number of research needs in your area of expertise; thus they were broken down into several subcategories with each subcategory being prioritized.

We would now like to ask you to participate in this final survey which asks you only to rank the priorities from all the subcategories (some of which you did not review previously) as this will help advise the ICCOPR in establishing a final prioritization for the whole research area. This survey will take less than 5 minutes of your time. If you have questions regarding the survey please contact Ms. Tracy Keirns of the UNH Survey Center (603-862-1060) or Nancy Kinner UNH Coastal Response Research Center (603-862-1422)

Answer If ICCOPR Is Equal to 1201 Or ICCOPR Is Equal to 1202

Each of the following Research Needs was ranked in the top 3 by the Subject Matter Experts assigned to each specific sub-area.

The top 3 from each sub-area are listed here. Please rank these 6 research needs in order with a "1" being the most important and a "6" being the least important.

- \_\_\_\_\_ PIPELINE INDUSTRY DATABASE - Consolidated database needed for pipelines installed in the ground. (1)
- \_\_\_\_\_ PIPELINE MATERIALS - Research needed on strain based design and assessment of segments of pipelines with and without fittings. (2)
- \_\_\_\_\_ PIPELINE MATERIALS - Research required on high toughness steels to characterize line pipe toughness for fracture arrest assessment. (3)
- \_\_\_\_\_ PIPELINE LEAK DETECTION TECHNOLOGY - Advanced technology needed for sensing pipeline breaks. (4)
- \_\_\_\_\_ PIPELINE LEAK DETECTION TECHNOLOGY - Develop improvements to mobile based LDS (leak detection systems) that are tested for accuracy on moving platforms (e.g., aerial, mobile vehicles). (5)
- \_\_\_\_\_ PIPELINE LEAK DETECTION TECHNOLOGY - Technology improvements needed to reduce leak detection false alarms. (6)

**Answer If ICCOPR Is Equal to 1501 Or ICCOPR Is Equal to 1502**

Each of the following Research Needs was ranked in the top 3 by the Subject Matter Experts assigned to each specific sub-area.

The top 3 from each sub-area are listed here. Please rank these 6 research needs in order with a "1" being the most important and a "6" being the least important.

\_\_\_\_\_ DEEPWATER TECHNOLOGY - Develop improved casing and cementing design for ultra-deepwater wells. (1)

\_\_\_\_\_ DEEPWATER TECHNOLOGY - Develop improved subsea ultra-deepwater measurement and monitoring instrumentation, including technologies for "seeing" through the casing via downhole tools to gauge the cement top and in-situ cement characteristics (thickness, channeling, density (gas or liquid pockets), etc.) to better determine potential failure pathways. (2)

\_\_\_\_\_ DEEPWATER TECHNOLOGY - Characterize experimentally the properties and behavior of foam cement samples at in situ conditions to improve the safe use and emplacement of these barriers in deep offshore settings. (3)

\_\_\_\_\_ OFFSHORE DRILLING DATABASE - Develop consistent global dataset for offshore drilling incidents to help prevent future incidents. (4)

\_\_\_\_\_ DEEPWATER CHARACTERIZATION - Conduct research on the conditions (e.g., in-situ stress, sediment rheology, fluid pressure, flow rate and blowout duration) where hydrocarbon pathways to the sea floor established through hydraulic fractures and reactivated natural faults can heal. (5)

\_\_\_\_\_ DEEPWATER CHARACTERIZATION - Expand the research on reservoir characterization to include overburden characterization with emphasis on technology and methods for geological and geomechanical characterization of the subsurface from sea bed to the reservoir. (6)

Answer If ICCOPR Is Equal to 2001 Or ICCOPR Is Equal to 2002 Or ICCOPR Is Equal to 2003

Each of the following Research Needs was ranked in the top 3 by the Subject Matter Experts assigned to each specific sub-area.

The top 3 from each sub-area are listed here. Please rank these 9 research needs in order with a "1" being the most important and a "9" being the least important.

- \_\_\_\_\_ ARCTIC BASELINE STUDIES - Collect baseline data specifically for ESA's in underrepresented environments including the Arctic (Chukchi Sea, Bristol Bay), particularly in areas that are likely to be developed for oil and gas extraction in the near to mid-term. (1)
- \_\_\_\_\_ INTERTIDAL BASELINE STUDIES - Study and synthesize existing information for sand beaches regarding productivity, species diversity, and community structure, and the effects of oil on these parameters, including recovery time with consideration for regional variation. (2)
- \_\_\_\_\_ GOM BASELINE HABITAT STUDIES - Develop benthic mapping of sensitive/important habitats in the GOM. (3)
- \_\_\_\_\_ ARCTIC BASELINE STUDIES - Develop a redundant meteorological sensor system to enhance Arctic coast-wide spill response goals and a series of large-scale studies of oceanographic exchanges, shelf-basin exchanges via wind and eddies, coastal boundary, under-ice river plumes, and sea-ice boundary to better inform pre- and post-spill modeling and response. (4)
- \_\_\_\_\_ BASELINE GEOLOGICAL STUDIES - Collect info on bathymetry and shoreline conditions and natural and human hazards. (5)
- \_\_\_\_\_ GULF OF MEXICO SUSPENDED SEDIMENTS - Conduct research on the baseline sediment loads in the GOM. (6)
- \_\_\_\_\_ ENVIRONMENTAL BASELINE STUDIES - Collect environmental baseline data in ecologically sensitive areas at particular risk to oil discharges where such data are insufficient. (7)
- \_\_\_\_\_ BASELINE PLANNING - Conduct research to improve the understanding of the potential for environmental impacts in frontier ultra-deepwater areas where a well-established infrastructure for spill containment does not exist (e.g., Alaskan Arctic offshore and Eastern GOM). (8)
- \_\_\_\_\_ BASELINE PLANNING - Develop statistics for strategically planning for different risks, their location and therefore who has what stake; develop stats for risk profiles and pre-position equipment. (9)

Answer If ICCOPR Is Equal to 3201 Or ICCOPR Is Equal to 3202 Or ICCOPR Is Equal to 3203 Or ICCOPR Is Equal to 3204

Each of the following Research Needs was ranked in the top 3 by the Subject Matter Experts assigned to each specific sub-area.

The top 3 from each sub-area are listed here. Please rank the top 10 research needs in order with a "1" being the most important and a "10" being the least important.

- \_\_\_\_\_ ARCTIC OCEANOGRAPHIC MODELS - Develop spill trajectory and weather models based on Arctic conditions. (1)
- \_\_\_\_\_ ARCTIC OCEANOGRAPHIC DATA - Investigate surface circulation using HF radar and satellite track drifters in the Arctic. (2)
- \_\_\_\_\_ ARCTIC OIL BEHAVIOR - Study oil-in-ice weathering, particularly as it relates to the effectiveness of spill response countermeasures and the potential for ecosystem exposure. Oil-water partitioning is recognized as needing further study, especially the potential toxicity of the partitioned phases. (3)
- \_\_\_\_\_ OIL SANDS PRODUCTS CHARACTERISTICS - Conduct research on the chemical and physical characteristics of various blends of dilbit and synbit to better understand how to address spills. (4)
- \_\_\_\_\_ OIL SANDS PRODUCTS DISPERSION - Conduct research on the dispersion of OSP in water (droplet size, coalescence, rise time). (5)
- \_\_\_\_\_ OIL SANDS PRODUCTS WEATHERING - Study the persistence of OSP in the marine and freshwater environments. (6)
- \_\_\_\_\_ IMPROVED OIL TRANSPORT MODELS - Develop understanding of the size, composition, and distribution of particles, both oil and sediment, which are key to developing better models for forecasting, observing, understanding, and hindcasting submerged oil behavior. (7)
- \_\_\_\_\_ SUBSURFACE OIL TRANSPORT MODELS - Develop a decision template or conceptual model of the conditions under which oil might become submerged that includes oil properties and environmental characteristics. (8)
- \_\_\_\_\_ GOM OIL TRANSPORT - Conduct research to improve understanding of vertical movement of hydrocarbon in order to advance ability to predict diffusivity. (9)
- \_\_\_\_\_ IMPROVED OIL TRANSPORT MODELS - Develop improved models predicting dispersability using information on the physiochemical properties of oil. (10)
- \_\_\_\_\_ IMPROVED OIL TRANSPORT MODELS - Develop oil trajectory and fate models used during spill response to predict the behavior of dispersed oil and verify and validate them in an appropriately designed experimental setting or during actual spills. (11)
- \_\_\_\_\_ NEARSHORE MODELING - Develop high resolution nearshore models. (12)
- \_\_\_\_\_ OCEAN CIRCULATION MODELS - Determine the sensitivity of large General Circulation Models to variations in the boundary conditions and forcing. (13)
- \_\_\_\_\_ OCEAN CIRCULATION MODELS - Link models to observation to incorporate real-time data and ocean state. (14)

Answer If ICCOPR Is Equal to 3301 Or ICCOPR Is Equal to 3302 Or ICCOPR Is Equal to 3303

Each of the following Research Needs was ranked in the top 3 by the Subject Matter Experts assigned to each specific sub-area.

The top 3 from each sub-area are listed here. Please rank these 9 research needs in order with a "1" being the most important and a "9" being the least important.

- \_\_\_\_\_ ICE/OIL DETECTION - Develop AUV mounted sensors for detection of oil under ice. (1)
- \_\_\_\_\_ ALTERNATIVE TECHNOLOGIES - Develop improved methods for detecting thick oil (i.e., large collections of oil) to assist in recovery operations (alternative sensor technologies, improved acoustic survey cost effective laser fluorometers and hyper spectral systems). (2)
- \_\_\_\_\_ ICE/OIL DETECTION - Develop enhanced technology for oil detection under ice and in broken ice and in low visibility. (3)
- \_\_\_\_\_ DISPERSANT MONITORING - Develop technologies to improve oil and dispersant detection in the water column and seafloor. (4)
- \_\_\_\_\_ CHEMICAL MONITORING - Develop advanced field monitoring techniques and rapid chemical analysis. (5)
- \_\_\_\_\_ SMART PROTOCOL - Develop a refined SMART protocol and operational need/value during subsea and surface response based on recent experiences. (6)
- \_\_\_\_\_ SUBMERGED OIL DETECTION - Develop observation systems that can be deployed on scene at spills of submerged oil to help validate or calibrate models and direct sampling and monitoring. (7)
- \_\_\_\_\_ SUBMERGED OIL DETECTION - Develop the capability to confirm and refine the location and quantity of submerged oil detected on a coarse scale. (8)
- \_\_\_\_\_ SUBSURFACE OIL DETECTION - Develop improved methods for sampling and monitoring the transport of subsurface oil. (9)

**Answer If ICCOPR Is Equal to 3401 Or ICCOPR Is Equal to 3402**

Each of the following Research Needs was ranked in the top 3 by the Subject Matter Experts assigned to each specific sub-area.

The top 3 from each sub-area are listed here. Please rank these 8 research needs in order with a "1" being the most important and a "8" being the least important.

- \_\_\_\_\_ CONTROL AND RECOVERY TECHNOLOGIES - Develop improved mechanical recovery to increase capture rate and capacity. (1)
- \_\_\_\_\_ ARCTIC CONTROL AND RECOVERY TECHNOLOGIES - Develop improved methods of mechanical recovery in arctic conditions (e.g., cold water, ice, broken ice). (2)
- \_\_\_\_\_ ARCTIC CONTROL AND RECOVERY TECHNOLOGIES - Further develop mechanical recovery systems to recover oil accumulated under ice. (3)
- \_\_\_\_\_ ARCTIC CONTROL AND RECOVERY TECHNOLOGIES - Need to develop mechanical recovery equipment and documentation of this capacity in different ice scenarios. (4)
- \_\_\_\_\_ CONTROL AND RECOVERY TECHNOLOGIES - Develop methods to increase the encounter rate of skimming and in situ burning operations, by increasing amount/thickness of oil on the surface (methods could involve use of chemicals, innovative mechanical systems, new operational procedures). (5)
- \_\_\_\_\_ ARCTIC CONTROL AND RECOVERY TECHNOLOGIES - Study the presence or lack of standardized testing approaches (especially wave tanks), the cross-comparability of results, and collaborative development of protocols that would establish the practical recovery limits that are achievable during response operations, and refine our understanding of the appropriate setting and scale at which these devices could be effectively deployed. (6)
- \_\_\_\_\_ ARCTIC CONTROL AND RECOVERY TECHNOLOGIES - Test response equipment in Arctic. (7)
- \_\_\_\_\_ CONTROL AND RECOVERY TECHNOLOGIES - Study response options and determine which were most successful during DWH. (8)

Answer If ICCOPR Is Equal to 3601 Or ICCOPR Is Equal to 3602 Or ICCOPR Is Equal to 3603 Or ICCOPR Is Equal to 3604 Or ICCOPR Is Equal to 3605 Or ICCOPR Is Equal to 3606

Each of the following Research Needs was ranked in the top 3 by the Subject Matter Experts assigned to each specific sub-area.

The top 3 from each sub-area are listed here. Please rank the top 10 research needs in order with a "1" being the most important and a "10" being the least important.

- \_\_\_\_\_ DISPERSED OIL BEHAVIOR - Study the fate and transport of dispersed oil and dispersants in the surface, subsurface and deep water. (1)
- \_\_\_\_\_ BIODEGRADATION - Study the toxic and sub-lethal effects and ramifications for microbial communities (and the natural biodegradation of oil). (2)
- \_\_\_\_\_ BIODEGRADATION - Develop a detailed investigation on the kinetics of dispersed oil biodegradation at low oil-water ratios to simulate conditions that represent those that follow significant dilution of the dispersed oil plume. (3)
- \_\_\_\_\_ DISPERSED OIL BEHAVIOR - Conduct field trials with dispersants that include tracking and monitoring concentrations. (4)
- \_\_\_\_\_ DISPERSED OIL BEHAVIOR - Study the variables affecting coalescence and resurfacing of dispersed oil droplets to develop models for tracking movement at surface, subsurface and deepwater. (5)
- \_\_\_\_\_ DISPERSED OIL BEHAVIOR - Study the quantification of degradation rates of chemically dispersed, physically dispersed, and undispersed oil. (6)
- \_\_\_\_\_ DISPERSED OIL FATE - Study and evaluate dispersant and dispersed oil chronic and sub-lethal effects on key species for varying, real world exposure scenarios and durations. (7)
- \_\_\_\_\_ DISPERSANT INTERACTIONS - Conduct research on benthic species interactions with oil, oil/dispersants and dispersant contaminated sediments. (8)
- \_\_\_\_\_ DISPERSED OIL TOXICITY - Develop standard methods for toxicity testing of dispersed oil appropriate for coastal regimes. (9)
- \_\_\_\_\_ TOXICITY - Develop protocols for testing efficacy and toxicity of commercially available dispersants and other chemical agents which may become commercially available. (10)
- \_\_\_\_\_ WILDLIFE EFFECTS - Study long-term effects of short-term exposures to dispersed oil on wildlife. (11)
- \_\_\_\_\_ EFFICACY - Study the efficacy of dispersant alternative delivery methods (subsurface application). (12)
- \_\_\_\_\_ EFFICACY AND EFFECTIVENESS - Conduct field testing and evaluation of dispersants (efficacy and effectiveness). (13)
- \_\_\_\_\_ MECHANICAL RESPONSE - Study the effects of dispersant application on subsequent mechanical recovery of undispersed oil. (14)
- \_\_\_\_\_ DISPERSED OIL FATE - Study anticipated fate of spilled oil dispersants and dispersed oil from different operations in geographical locations. (15)

- \_\_\_\_\_ DISPERSED OIL FATE - Study the interactions of chemically dispersed oil droplets with suspended particulate matter and the effect of these processes on the rate of oil biodegradation and fate. (16)
- \_\_\_\_\_ FATE AND EFFECTS - Study the long-term fate and effects of dispersant applications. (17)
- \_\_\_\_\_ SUBSURFACE APPLICATION - Study how subsurface application of dispersants affects characteristics of that oil at the surface. (18)
- \_\_\_\_\_ SUBSURFACE BEHAVIOR - Study the effect of dispersant on deposition, partitioning, toxicity and degradation (deep sea and in presence of high flow rates). (19)
- \_\_\_\_\_ SUBSURFACE EFFECTIVENESS - Develop conditions of operability for dispersant use in the subsea, including characteristics of most effective dispersant, physical parameters of when to apply, considering flow rate. (20)

**Answer If ICCOPR Is Equal to 3701 Or ICCOPR Is Equal to 3702**

Each of the following Research Needs was ranked in the top 3 by the Subject Matter Experts assigned to each specific sub-area.

The top 3 from each sub-area are listed here. Please rank these 6 research needs in order with a "1" being the most important and a "6" being the least important.

- \_\_\_\_\_ AERIAL PLUME IMPACTS - Study the impact of volatile plumes from in-situ burning on natural resources (e.g., birds). (1)
- \_\_\_\_\_ ISB BIOAVAILABILITY - Study ISB residues, especially toxicity, physical properties, and bioavailability of contaminants contained within the residue matrix; especially with potential benthic community effects. (2)
- \_\_\_\_\_ ISB EFFECTIVENESS - Develop better means of quantifying ISB effectiveness. Unburned oil or other residue from burning operations should be recovered and accounted for when evaluating the effectiveness of in situ burning. (3)
- \_\_\_\_\_ ISB CONTAINMENT TECHNOLOGY - Develop enhanced designs for containment and burning oil. (4)
- \_\_\_\_\_ ISB PLANNING - Develop improved procedures for in-situ burning under various conditions, develop protocols, improve field verification of airborne constituent behaviors. (5)
- \_\_\_\_\_ ISB CONTAINMENT TECHNOLOGY - Conduct research and development programs on ISB to develop more robust booming systems with greater oil encounter rates and expand the weather/sea state of opportunity in which ISB can effectively be used. (6)

Answer If ICCOPR Is Equal to 4101 Or ICCOPR Is Equal to 4102 Or ICCOPR Is Equal to 4103 Or ICCOPR Is Equal to 4104 Or ICCOPR Is Equal to 4105 Or ICCOPR Is Equal to 4106

Each of the following Research Needs was ranked in the top 3 by the Subject Matter Experts assigned to each specific sub-area.

The top 3 from each sub-area are listed here. Please rank the top 10 research needs in order with a "1" being the most important and a "10" being the least important.

- \_\_\_\_\_ ARCTIC IMPACTS - Develop a Response Gap Analysis framework to assess the impacts of response actions in the Arctic. (1)
- \_\_\_\_\_ ARCTIC IMPACTS - Develop response guide and restoration guide for oil in ice. (2)
- \_\_\_\_\_ ARCTIC WILDLIFE IMPACTS - Study effects of oil on wildlife and effective response intervention in Arctic environment. (3)
- \_\_\_\_\_ EXPOSURE METHODOLOGIES - Develop relevant biological markers of exposure and guidelines for responsible use of biomarkers. (4)
- \_\_\_\_\_ SUBLETHAL IMPACTS - Study relevant endpoints (e.g., growth, behavior, inhibit reproduction, physiological aberrations) and appropriate organisms to use as indicators for different habitats. (5)
- \_\_\_\_\_ TOXICOLOGICAL IMPACTS - Conduct research to identify toxicologically-relevant analytes by habitat and organism. (6)
- \_\_\_\_\_ DISPERSED OIL IMPACTS - Conduct research to evaluate the long-term/chronic impacts of chemically/naturally dispersed oil on invertebrates, anadromous fish, corals, etc. - focus on long exposures to low concentrations, environmentally relevant exposure scenarios. (7)
- \_\_\_\_\_ DISPERSED OIL IMPACTS - Study the impact of dispersed oil on organisms, how it is taken up, end products, effects on benthic primary production. (8)
- \_\_\_\_\_ SUBMERGED OIL IMPACTS - Develop understanding of the chronic toxicity and pathways of exposure leading to toxicity of submerged oil to benthic resources. (9)
- \_\_\_\_\_ ECOSYSTEM IMPACTS - Collect data and evaluate long-term environmental effects of oil discharges larger than 250,000 gallons or if the discharged occurred after Jan 1, 1989. (10)
- \_\_\_\_\_ ECOSYSTEM IMPACTS - Develop methods to assess oil spill injury to wetland communities, submerged vegetation, benthic invertebrates, and waterfowl. (11)
- \_\_\_\_\_ LONG-TERM ECOSYSTEM IMPACTS - Study long-term chronic exposure direct and indirect impacts on the food chain - fish eggs, bottom feeders, birds, mammals. (12)
- \_\_\_\_\_ ECOSYSTEM RECOVERY - Develop conceptual models of service loss and recovery from key habitats, and the information necessary to parameterize recovery models. (13)
- \_\_\_\_\_ ECOSYSTEM RECOVERY - Study data collection efforts for spill impact assessment and evaluation of ecological recovery rates for offshore, near-shore, coastal and estuarine areas impacted by spills. (14)
- \_\_\_\_\_ ECOSYSTEM RECOVERY - Study recovery rates of injured habitats from previous spills. (15)

- \_\_\_\_\_ RISK ASSESSMENT - Develop a risk assessment based on key exposure-response relationships from lab tests where conditions reflect ambient exposures. (16)
- \_\_\_\_\_ IMPACT METRICS - Collect, synthesize and evaluate current data on impacts from a range of exposure scenarios to biota at different life stages. Determine feasibility of using compiled data in determining potential ecological impacts from oil spills. (17)
- \_\_\_\_\_ IMPACT METRICS - Conduct research to determine best metrics for assessing impact/damage. (18)

**Answer If ICCOPR Is Equal to 4301 Or ICCOPR Is Equal to 4302**

Each of the following Research Needs was ranked in the top 3 by the Subject Matter Experts assigned to each specific sub-area.

The top 3 from each sub-area are listed here. Please rank these 8 research needs in order with a "1" being the most important and a "8" being the least important.

- \_\_\_\_\_ SEAFOOD SAFETY - Conduct research on the short-term and long-term safety of seafood in the GOM following the DWH spill and communicate it to the public. (1)
- \_\_\_\_\_ WORKER SAFETY - Study the health and safety issues associated with spill response, and develop protocols for personnel protection (e.g., training, fitness, stress management.) (2)
- \_\_\_\_\_ PROTECTIVE TECHNOLOGIES - Develop technologies and methods to protect public health and safety from oil discharges, including the population directly exposed to an oil discharge. (3)
- \_\_\_\_\_ HUMAN EXPOSURE RESEARCH PLANNING - Conduct research on the framework needed to deploy a rapid research response for future oil spills. (4)
- \_\_\_\_\_ HUMAN EXPOSURE DURING DWH - Collect long-term monitoring data of health (human) of coastal communities impacted by DWH. (5)
- \_\_\_\_\_ HUMAN DISPERSANT EXPOSURE - Develop models to estimate exposure to dispersant and/or dispersed oil to human populations. (6)
- \_\_\_\_\_ HUMAN EXPOSURE DURING DWH - Conduct clinical evaluations, diagnostics and documentation for individuals affected from the DWH spill. (7)
- \_\_\_\_\_ WORKER HEALTH AFTER DWH - Collect long-term monitoring data on Deepwater Horizon responders' health. (8)

**Answer If ICCOPR Is Equal to 4401 Or ICCOPR Is Equal to 4402**

Each of the following Research Needs was ranked in the top 3 by the Subject Matter Experts assigned to each specific sub-area.

The top 3 from each sub-area are listed here. Please rank these 6 research needs in order with a "1" being the most important and a "6" being the least important.

- \_\_\_\_\_ COMMUNITY PREPAREDNESS - Develop more effective models for community/stakeholder involvement in oil spill planning, response and restoration. (1)
- \_\_\_\_\_ RISK COMMUNICATION - Develop improved methods for communicating risks and tradeoffs to various audiences, including tradeoffs of dispersant use vs. alternative technologies. (2)
- \_\_\_\_\_ COMMUNITY IMPACTS OF SPILLS - Study past support services and aid in communities impacted by past spills. (3)
- \_\_\_\_\_ HUMAN IMPACTS - Study cumulative social impacts of chronic and long lasting spills. (4)
- \_\_\_\_\_ HUMAN IMPACTS - Study the resilience of social-ecological systems to environmental disasters. (5)
- \_\_\_\_\_ HUMAN IMPACTS - Determine the likely degree of impact on human well-being from ecosystem services losses. (6)



# **Appendix E**

## Sample of Research Priority Survey



Interagency Coordinating Committee on Oil Pollution Research (ICCOPR) Research &  
Technology Plan Research Needs Survey

Your input is critical to the success of this project. We know that you are extremely busy, but please take the 10 to 45 minutes required to complete the online survey. We are surveying up to 200 subject matter experts (SMEs) in numerous fields across many federal agencies because we want to capture the unique perspectives of many experts and have them represented in the results.

Note that by completing the survey, you are consenting to participate in this research. Participation in this research is expected to present minimal risk to you. While you may not receive any direct benefits from participating in this study, the anticipated benefits of the knowledge gained via the study include determining future priorities of oil spill research.

Although we hope that you will answer every question, you are certainly free to skip any questions. Your participation is voluntary, and you may withdraw your consent and discontinue participation at any time. The UNH Survey Center and Coastal Response Research Center (CRRC) seek to maintain the confidentiality of all data and records associated with your participation in this research. However, any communication via the Internet poses minimal risk of a breach of confidentiality. Data will be shared with study sponsors, however, your responses will be combined with others in such a way that individual responses cannot be identified when data is reported or published.

Thank you in advance for completing this survey. If you have any questions pertaining to:

- content and/or definition of the research needs, contact Nancy Kinner, CRRC 603-862-1422 or [nancy.kinner@unh.edu](mailto:nancy.kinner@unh.edu)
- the mechanism or “how-to” of completing this survey, contact Tracy Keirns, UNH Survey Center, [tracy.keirns@unh.edu](mailto:tracy.keirns@unh.edu)
- information on ICCOPR (Interagency Coordinating Committee on Oil Pollution Research), contact CDR Eric Miller, U.S. Coast Guard at [eric.j.miller2@uscg.mil](mailto:eric.j.miller2@uscg.mil)
- research integrity and your rights as a research subject, contact Dr. Julie Simpson, UNH Research Integrity services, 603.862.2003 or [julie.simpson@unh.edu](mailto:julie.simpson@unh.edu)

By clicking “Next” you are agreeing to take part in this survey.

You have been selected as a Subject Matter Expert in the area of [SRA or SRA subcategory]

The following questions will focus on evaluation of all identified research needs in your subject matter area.

You will be asked a set of 5 questions for each research need in your subject matter area. These questions will ask you to rate a statement on a scale of 0 to 100. In order to do this, select the slider bar and move the bar to the number between 0 and 100 that comes closest to your opinion. The last set of questions will ask you rank all of the research needs in your subject research area.

If at any time you need to leave the survey, simply close your browser and all of your answers will be saved. To continue the survey just click the original link you were provided and continue the survey. Do not use the browsers back button, but if you would like to navigate through the survey you may use the “Back” and “Next” buttons at the bottom of each page.

While you are not required to answer every question, accurate recommendations can only be made with complete data.

#### IF ANSWERING A SUB AREA

As a Subject Matter Expert (SME) you are being asked to answer questions regarding an important oil spill related Subject Research Area (SRA). Because there were a large number of identified research and technology needs in your SRA we have divided the SRA into subcategories to reduce the number of questions you need to address.

If you would like to see all of the identified R&D needs in the SRA, click [here](#) for a comprehensive list. This may help you at the end of the survey when evaluating whether all the important R&D needs are included in the overall survey.

When all SMEs have completed this survey we intend to send you the list of prioritized R&D needs in all the subcategories within the SRA so you will have an opportunity to provide us with your overall ranking of the top R&D needs in the entire SRA. This will be a simple ranking of the top 1% of the R&D needs and will not require you to evaluate each research need.

Q1

Research Need: \_\_\_\_\_

1. How important is this R&D need to improving any or all of the following: spill prevention, preparedness, response or impact assessment/restoration?

Low Importance  
0

Medium Importance  
50

High Importance  
100

Q2

Research Need: \_\_\_\_\_

2. Some research is designed to answer a *small detail* which refines our understanding of a research problem while other research *answers key questions* that become the building blocks for further advancements. Please estimate where this R&D need fits in this spectrum of oil pollution research (explained above).

Small Detail/Nuance

0

50

Building Block/Key Question

100

Q3

Research Need: \_\_\_\_\_

3. In your opinion, what is the **total** estimated cost of the research to answer this R&D need? (Please provide your best single number estimate - If you still don't know, please enter "0") Please use only numbers with no commas or decimals (ex. 1000000)

\$ \_\_\_\_\_

Q4

Research Need: \_\_\_\_\_

4. How soon would the results of this specific R&D need improve any or all of the following: spill prevention, preparedness, response or impact assessment/restoration?

Short (<2 Years)

0

2 - 5 Years

50

Long (> 5 Years)

100

Q5

Research Need: \_\_\_\_\_

5. Solving larger research problems can require multiple steps. Some research projects take the initial steps while others will be the final step. Please estimate where this R&D need fits in the lifespan of solving a research problem.

Initial Step

0

50

Final Step

100

IF number of research needs is 5 or less only Q6a is asked excluding bracketed text.

Q6

Of the research needs that you reviewed today, which rise to the top (maximum of 5)?

- [Need 1]
- [Need 2]
- [Need 3]
- [Need 4]
- [Need 5]
- [Need 6]
- [Need 7]
- [Need 8]
- [Need 9]
- [Need 10]

Q6a

Of these [top 5] research needs [that you just selected], please prioritize them. (i.e. "1" as your 1st choice, "2" as your 2nd choice, etc)

- [Need 1]
- [Need 2]
- [Need 3]
- [Need 4]
- [Need 5]
- [Need 6]
- [Need 7]
- [Need 8]
- [Need 9]
- [Need 10]

Q7

Are there any research needs related to this subject area that you feel need to be addressed, but were not on this list?

Q8

List (up to 3) impediments (other than cost or time to completion) to the top 5 research needs you indicated. We appreciate succinct bullet responses, complete sentences are not expected.

[*Research Need 1*]

Impediment 1 (1)

Impediment 2 (2)

Impediment 3 (3)

[*Research Need 2*]

Impediment 1 (1)

Impediment 2 (2)

Impediment 3 (3)

[*Research Need 3*]

Impediment 1 (1)

Impediment 2 (2)

Impediment 3 (3)

[*Research Need 4*]

Impediment 1 (1)

Impediment 2 (2)

Impediment 3 (3)

[*Research Need 5*]

Impediment 1 (1)

Impediment 2 (2)

Impediment 3 (3)

Thank you taking for the time to complete this survey. Click "Submit" below to exit.

IF ANSWERING SUBAREA:

Thank you taking for the time to complete this survey. You completed a survey for one subcategory of a larger subject research area.

When all SMEs have completed this survey we intend to send you the list of prioritized R&D needs in all the subcategories within the SRA so you will have an opportunity to provide us with your overall ranking of the top R&D needs in the entire SRA. This will be a simple ranking of the top 1% of the R&D needs and will not require you to evaluate each research need. Click "Submit" below to exit.



# **Appendix F**

## Sample of Survey Data



### Sample of Survey Data Results

R&D Needs	Weighted		# Ranking		Count = 4
	Score Mean	Weighted SD	Rank Order	RN in Top 5	
R&D Need 10	260.44	29.15	1	4	
R&D Need 4	215.74	28.61	4	1	
R&D Need 7	212.70	22.30	2	3	
R&D Need 6	211.99	37.62	6	1	
R&D Need 5	195.41	69.17	4	1	
R&D Need 3	190.76	64.54	8	1	
R&D Need 1	184.28	89.51	-	0	
R&D Need 8	181.91	87.41	7	1	
R&D Need 2	167.74	91.72	-	0	
R&D Need 9	164.96	97.98	3	2	

Sorted by Weighted Mean Score

