AEC OIL & GAS (USA) INC.

EXPLORATION PLAN

McCOVEY
EXPLORATION PROGRAM
ALASKA

JANUARY 2002

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Acronyms

AAC	Alaska Administrative Code
ABS	American Bureau of Shipping
ACS	Alaska Clean Seas
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
AEWC	Alaska Eskimo Whaling Commission
AFE	Authorization for Expenditure
ADNR	Alaska Department of Natural Resources
AOGCC	Alaska Oil and Gas Conservation Commission
APD	Application for Permit to Drill
API	Alaska Petroleum Institute
ARRT	Alaska Regional Response Team
ASH	Alaska Safety Handbook
ATV	All Terrain Vehicle
BAT	Best Available Technology
BLM	Bureau of Land Management
BBLS/DAY	Barrels per Day
BOP	Blow Out Preventer
CFR	Code of Federal Regulations
CISPRI	Cook Inlet Spill Prevention and Response, Inc.
CMT	Crisis Management Team
COGLA	Canada Oil and Gas Land's Administration
CPR	Cardio Pulmonary Resuscitation
DOT	Department of Transportation
EIS	Environmental Impact Statement
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
EPA	Environmental Protection Agency
ERT	Emergency Response Team
ETT	Emergency Trauma Technician
FAA	Federal Aviation Administration
FOSC	Federal On-Scene Coordinator
GAL	Gallon
HAZCOM	Hazard Communications, OSHA
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response, OSHA
HDPE	High Density Poly-Ethylene
HMT	Hazardous Materials Technician
IAP	Incident Action Plan
IC	Incident Commander
ICP	Incident Command Post
ICS	Incident Command System

IMS	Incident Management System
IMT	Incident Management Team
IRT	Incident Response Team
ISB	In-Situ Burn
LEL	Lower Explosive Level
MAD	Mutual Aid Drill
MML	Mean Lower Low Water
MMS	Minerals Management Service, USDOI
MSD	Marine Safety Detachment, USCG
MSDS	Material Safety Data Sheet
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NOP	Next Operational Period
NPRA	National Petroleum Reserve Alaska
NPREP	National Preparedness for Response Exercise Program
NRC	National Response Center
ODPCP	Oil Discharge Prevention and Contingency Plan (Alaska)
OPA90	Oil Pollution Act, 1990
OSC	Operations Section Chief
OSEA	Occupational Safety and Environmental Affairs
OSHA	Occupational Safety and Health Administration
OSIC	On-Scene Incident Coordinator
OSRO	Oil Spill Removal Organization
PCB	Polychlorinated Biphenyl
PPE	Personal Protective Equipment
PPM	Parts Per Million
PVC	Polyvinyl Chloride
QI	Qualified Individual, OPA 90
RAA	Recycle Accumulation Area
RCRA	Resource Conservation and Recovery Act
RP	Responsible Party
RRT	Regional Response Team
RSFO	Regional Supervisor, Field Operations
SAA	Satellite Accumulation Area
SCAT	Shoreline Clean-up Assessment Team
SCR	Silicon Control Rectifier
SERC	State Emergency Response Commission
SMT	Spill Management Team
SOSC	State On-Scene Coordinator
SPCC	Spill Contingency Coordination Plan
SRT	Spill Response Team
SSC	Scientific Support Coordinator (NOAA)
STEL	Short Term Exposure Limit
UOP	Unified Operating Procedures

USC	United States Code
USCG	United States Coast Guard
USDOI	United States Department of Interior
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VSP	Vertical Seismic Profile

1.0 INTRODUCTION

AEC Oil & Gas (USA) Inc. (AEC) is proposing to conduct oil and gas exploration activities in the McCovey Unit, Beaufort Sea during the 2002-2003 winter drilling season (Figure 1). The drilling will be conducted from the Mobile Offshore Drilling Unit (MODU) known as the Steel Drilling Caisson (SDC or SDC/MAT) System. The area of interest covered by this Exploration Plan lies entirely within the Federal Outer Continental Shelf (OCS) Leases (Figure 2). The proposed program includes a single proposed exploration well, referred to as "AEC McCovey No. 1" that is scheduled to be drilled from a surface location in federal OCS Lease Block Y-1577 to a bottom hole location on OCS Lease block Y-1578. AEC is the operator of the proposed exploration well and will be the permittee of record.

Additional exploration/delineation drilling may be considered and is dependent on the outcome of the AEC McCovey No. 1 drilling and testing program. If this initial well shows potential for hydrocarbon development, the original hole may be plugged back and sidetracked to a different bottomhole location (McCovey 1a) on OCS Lease Block Y-1577, within the 2002-2003 drilling season, as well as allow advanced reservoir testing and evaluation. In a dry hole scenario, the AEC McCovey No. 1 well would be plugged and abandoned. If results require additional testing during another drilling season, the well would be plugged in a suspended state using Minerals Management Service (MMS) approved methods. Assuming favorable results from this drilling program, the potential exists for future exploration/delineation drilling in subsequent years within the McCovey Unit.

AEC submits this Exploration Plan (EP) to the MMS in accordance with the requirements of 30 CFR 250.203. AEC is also submitting this EP to the State of Alaska Resource agencies pursuant to the McCovey Unit Agreement and Alaska Coastal Management Program (ACMP) consistency certification. Additionally, it is being submitted to the North Slope Borough Planning Department to evaluate consistency with the North Slope Borough Coastal Management Program. AEC will abide by all terms and conditions of the OCS Lease Sale 124 (See Section 12.0 of this report), permits and authorizations required for oil and gas exploration drilling, as well as applicable local, state, and federal laws and regulations.

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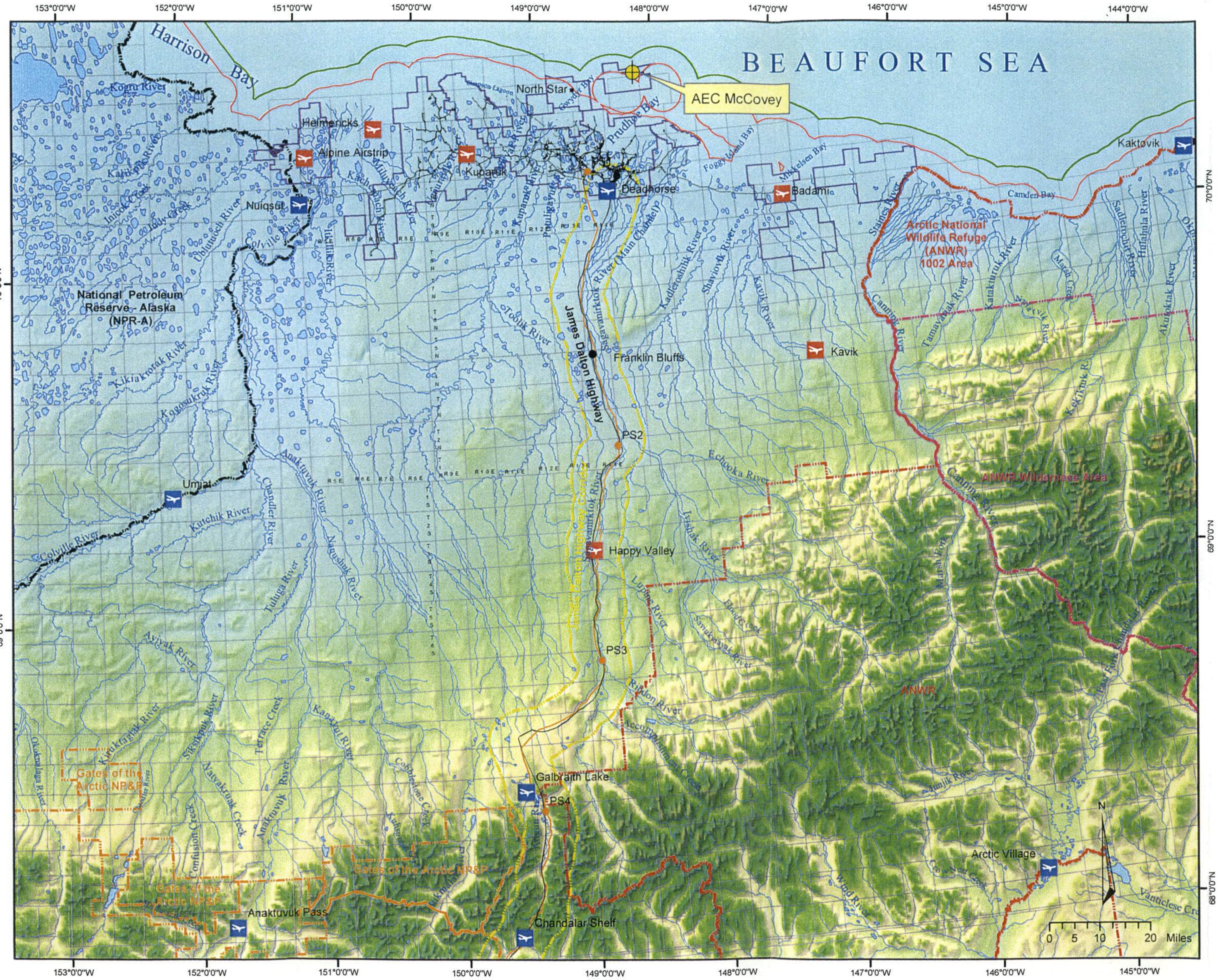


Proposed Prospect Location
Oil & Gas Units
Alaska Seaward Boundary
8(g) Boundary

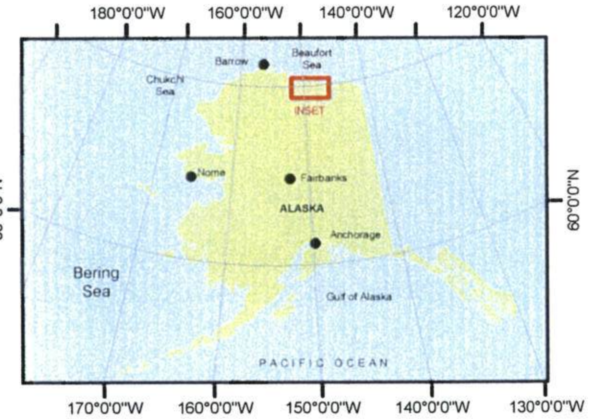
Airports

Public
Private

Administrative Boundaries

National Park & Preserve
National Petroleum Reserve - Alaska
National Wilderness Area
National Wildlife Refuge
State Restricted Area
Trans Alaska Pipeline
Pump Station (PS)

High : 20000 ft
Low : 0 ft
Elevation



Horizontal Datum GCS 1983, coordinate system Alaska Albers Equal Area Conic. Vertical Datum NGVD 29. Digital elevation model 300m grid for Alaska, from Defense Mapping Agency 3-arc second 1x1 degree 1:250,000 scale Digitial Elevation Models. Source data for Digital Shaded-Relief Image of Alaska, USGS Map I-2585. Hydrology derived from USGS 1:2,000,000 Digital Line Graphs (DLG) dataset. Airport data obtained from the Airport Master Record manteined by the U.S. Department of Transportation Federal Aviation Administration. Not all private airports are shown. Administrative Boundary data was provided by the Alaska Department of Natural resources, published in 2000. Wild & Scenic River administraive areas are not included in this map.

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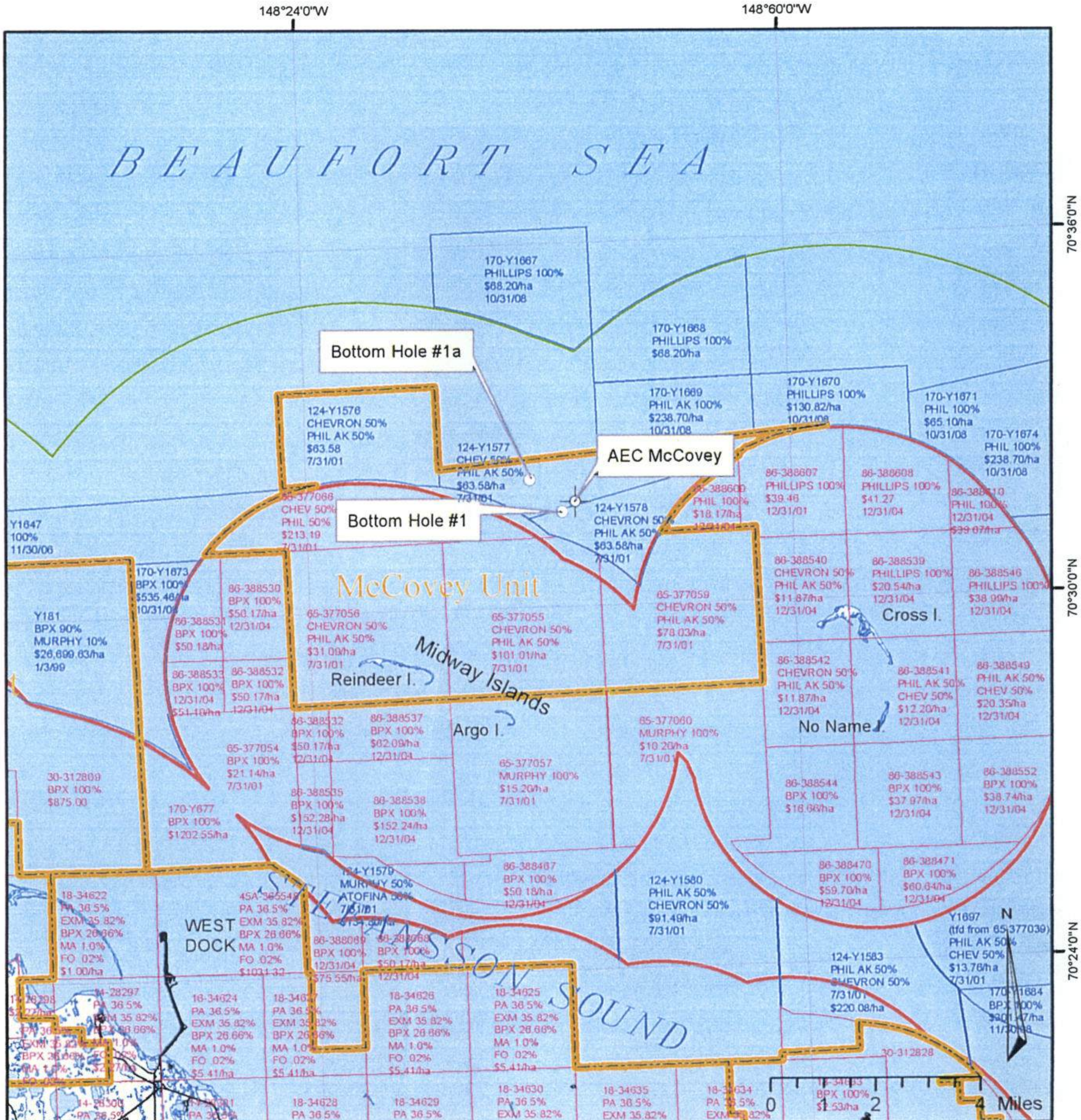
AEC McCovey Exploration Prospect
Exploration Plan

McCOVEY PROSPECT LOCATION MAP

SCALE:	FIGURE:
1 inch equals 20 miles	1

Lynx: aec021.mxd, December 27 2001, Rev 1



Horizontal Datum NAD27, Coordinate System Alaska State Plane, Zone 4. Lease Data Provided by Mapmakers Alaska, Dated August 8, 2001.

Surface Casing	MMS Leases
Bottom Hole	8(g) Boundary
Oil & Gas Units	Alaska Seaward Boundary
Alaska State Leases	

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AEC McCovey Exploration Prospect
Exploration Plan

PROPOSED AEC McCOVEY MAP

SCALE:	FIGURE:
1 inch equals 3 miles	2

Lynx: aec020.mdx, December 27, 2001, Rev 4

2.0 DESCRIPTION OF PROPOSED ACTIVITIES

An overview and general description of the AEC McCovey No. 1 project is presented in below. The following sub-sections expand on the type and sequence of exploratory activities and present a schedule for project execution.

2.1 Project Location

The AEC McCovey No. 1 drilling location lies in the Beaufort Sea approximately 12.5 miles northeast of West Dock at Prudhoe Bay, 60 miles northeast of Nuiqsut, 5.3 miles northwest of Cross Island, and 110 miles northwest of Kaktovik (Figure 1).

Table 2-1 Specific Well Location and Depth Information: AEC McCovey No. 1 and Potential Sidetrack 1(a)

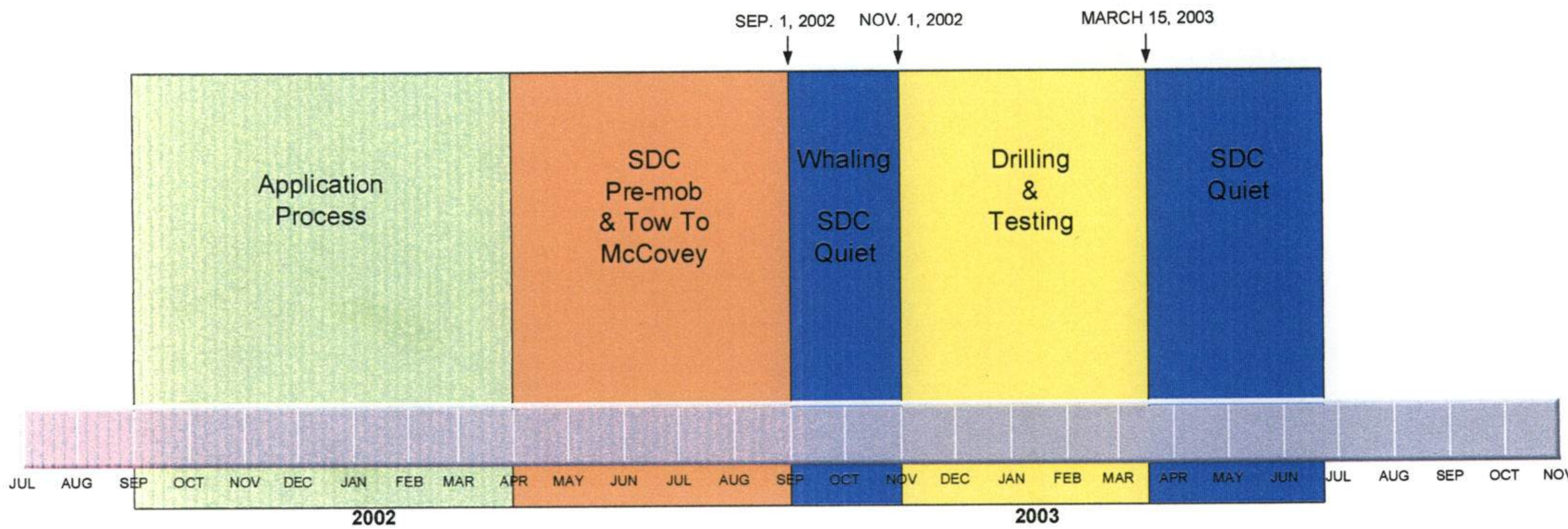
	Lease Block	Geodetic Position	UTM 6 (m) Clark 1866 (NAD 27)	UTM 6 (m) GRS 1980 (NAD 83)	ASP 4 (ft) Clark 1866 (NAD 27)	ASP 4 (ft) GRS 1980 (NAD 83)	Water Depth	Well Depth @ TD
Surface Location	OCS Block Y-1577	Lat: 70°31'44"N Long: 148°10'41"W	X = 456174 Y= 7825107	X = 456176 Y= 7825280	X = 722424 Y = 6046398	X = 1862831 Y = 6046256	36 Ft MLLW	13,000 ft TVDSS
Bottomhole Location @ 13,000 FT TVDSS	OCS Block Y-1578	Lat: 70° 31'34"N Long: 148° 1'19"W	X =455775 Y =7824805	X =455777 Y =7824978	X = 721166 Y = 6045343	X =1861573 Y =6045201	36 Ft MLLW	14,400 ft MD
McCovey 1A Bottomhole	OCS Block Y-1577	Lat: 70° 32'6.58"N Long: 148°12'51.9"W	X =454835 Y =7825833	X =454837 Y =7826006	X =717917 Y =6048560	X =1861573 Y =6045201		

2.2 Proposed Project Schedule

The proposed project schedule is presented in Figure 3, and a brief description of the major activities is summarized below.

Shallow Hazard Geophysical Surveys

Site-specific shallow hazard surveys were performed at the AEC McCovey No. 1 site using remote operated vehicle (ROV) and geotechnical drilling data collected in April 2000. Subsurface imaging data was acquired in July/August 2000 Figure 4. The proposed location is suitable for placement of the SDC. The ROV Observation Report is provided as Appendix A.



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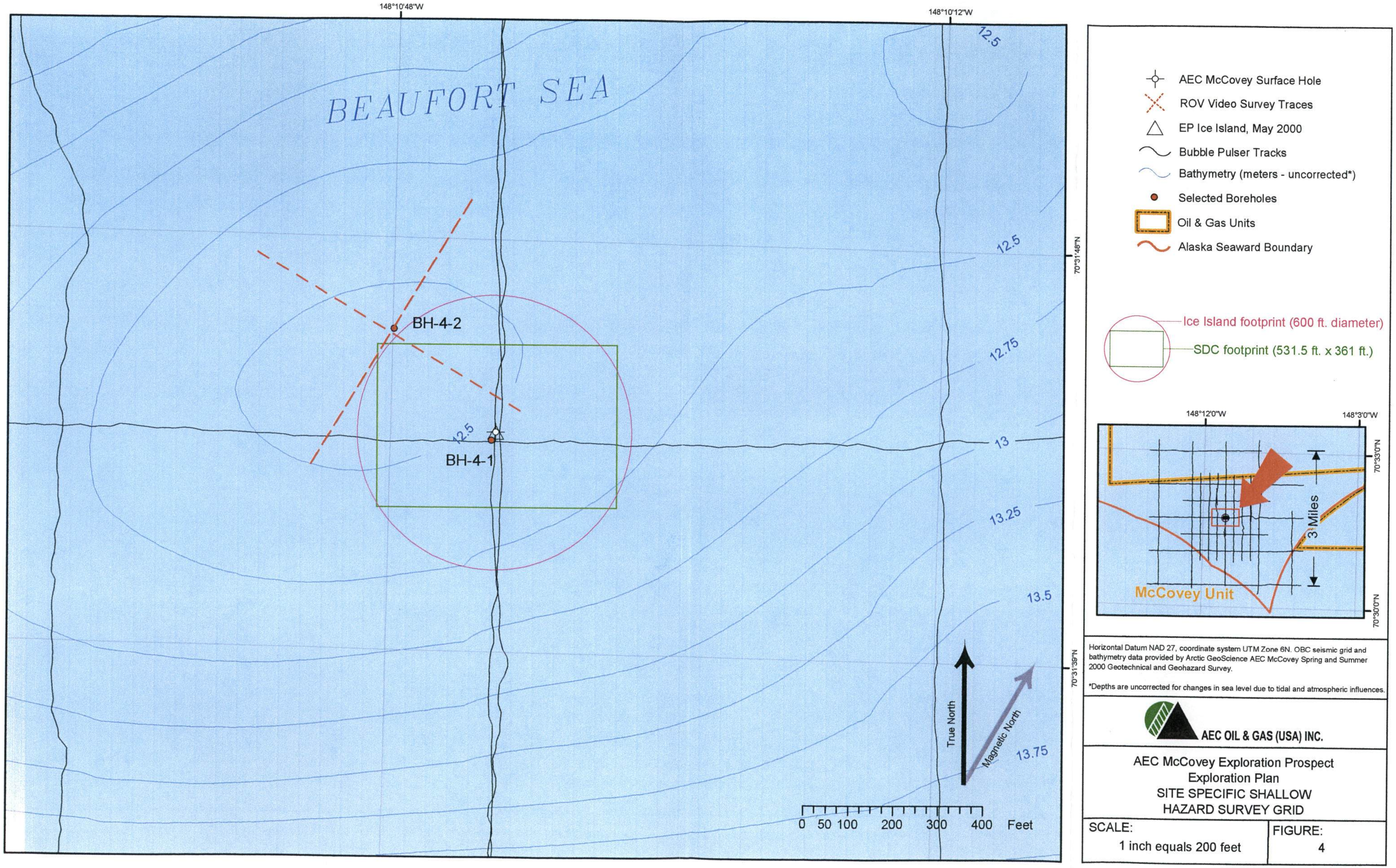
AEC McCovey Exploration Prospect
Exploration Plan

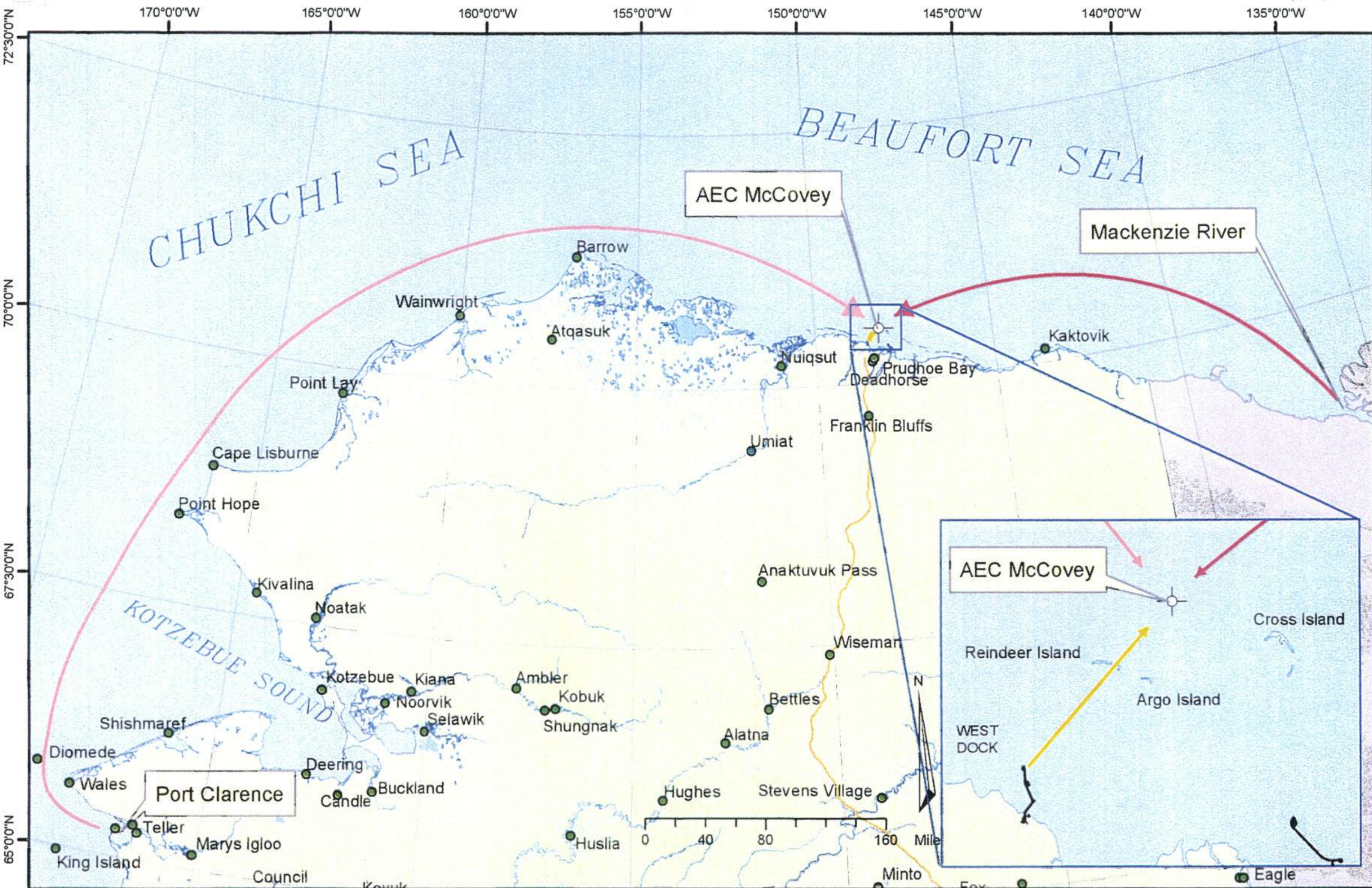
PROJECT SCHEDULE

SCALE: N/A	FIGURE: 3

Lynx:aec029.mxd, January 17, 2001, Rev4



aec054.mxd, January 15, 2002, Rev2



Horizontal Datum NAD 27, coordinate system Alaska Equal Area Conic

- Path of SDC
- Path of Fuel
- Path of Supply Barges from West Dock
- AEC McCovey Wellsite
- Trans Alaska Pipeline

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AEC McCovey Exploration Prospect
Exploration Plan

TRANSPORTATION AND RESUPPLY ROUTES

SCALE:	FIGURE:
1 inch equals 100 miles	5

Permitting and Regulatory Affairs (September 1, 2001 – March 31, 2002)

Initial consultation in preparation for permit applications began in late September 2001 and will continue through the application submittal and the expected issuance of the necessary Federal permits by March 31, 2002. This permitting process includes Federal applications and authorizations as well as a consistency determination for applicable components with the ACMP.

Application Permit to Drill (April 2002)

AEC will submit an application permit to drill (APD) in April 2002. The APD will include specific information on drill operations and well management. General drilling information provided in this EP will be supplemented in the APD.

Pre-Mobilization Activities On Board Drilling Vessel (May - July 2002)

The SDC was last used on the Cabot project in the Beaufort Sea, Alaska in 1991. Prior to returning the SDC to active service, numerous inspections, maintenance, and renewal of certifications are required. Personnel necessary to accomplish these tasks are scheduled to go aboard the SDC in May 2002. Pre-mobilization work will require approximately two months. Retrofitting and modernization of equipment to meet current best management practices (BMPs) will be conducted during this time.

The SDC is cold stacked in State of Alaska waters at Port Clarence offshore from Teller, Alaska (Seward Peninsula). Upon completion of the pre-mobilization work, the SDC will be towed to the McCovey site as shown on Figure 5.

SDC Mobilization and Re-Supply (July-August 2002)

The mobilization of the SDC to the proposed surface location will occur in late July and early August 2002. The mobilization period will include deballasting and towing the SDC from the stack location to the McCovey Prospect area and ballasting the rig down on the AEC McCovey No. 1 location. The SDC can be towed by ice management class tug boats in broken or thin ice conditions past Pt. Barrow to the proposed drilling location in Beaufort Sea. In order to avoid the fall Bowhead whale migration, every effort will be made to move the SDC to the McCovey No. 1 location in early August 2002 to allow for re-fuel and re-supply prior to August 20, 2002.

Once the rig is secure on the McCovey site, approximately five (5) tug and barge voyages will be made to the rig from West Dock in Prudhoe Bay to fully provision the rig with the consumables, materials, and equipment required to drill the initial well and a possible sidetrack during the 2002-2003 drilling season. Proposed vessel resupply routes are presented on Figure 5. Fuel will be supplied to the rig with barges traveling from the Hay River Refinery via the McKenzie River in the Canadian Beaufort. Tug(s) will remain in attendance of all barges during loadout of the SDC including during fueling operations. It is anticipated that the pre-spud MMS rig inspection would occur shortly after the rig is on station at the McCovey Prospect area. Transportation of crews and camp supplies between the SDC and Prudhoe Bay will be accomplished by helicopter. During this period, the 30" structural casing will be driven into the seafloor using a drive hammer. This will allow the drive hammer to be backhauled on one of the supply barges and the diverter installed on the casing in preparation for spudding the well immediately after the bowhead whale migration. It is anticipated that an approved Permit to Drill will have been received from the MMS before driving the structural casing.

Cold Stack "Go Quiet" Mode During Whale Migration (Late August to Late October 2002)

All efforts will be made to complete mobilization activities by August 15, 2002, however, if this is not possible, activities conducted between August 15, 2002 and September 1, 2002 would occur pursuant to a Conflict Avoidance Agreement (CAA) with the Alaska Eskimo Whaling Commission. If mobilization activities are required in the first week of September, they would be uniquely authorized by the AEWC pursuant to a CAA. At the conclusion of authorized mobilization activities, the SDC will be placed in a cold stack "go quiet" mode during the period when active whaling occurs. Native subsistence whaling activities, which traditionally occur early September through early October, are not expected to be impacted by the presence of the rig at the McCovey Prospect area under a cold stack "go quiet" mode, since no noise will generate from the SDC. The SDC warm-up operations will begin in late October 2002 in preparation of drilling.

Drilling the AEC McCovey No. 1 Well (November 1, 2002 - March 15, 2003)

The AEC McCovey No. 1 will be drilled in accordance with the MMS program defined in an Application for Permit to Drill (APD). The well will not penetrate below intermediate casing point prior to the development of full ice coverage as determined by the MMS. This may occur as early as mid-November 2002. After the ice is formed, crew changes and supplies will be handled via helicopter(s) based in Deadhorse, Alaska.

The expected timeframe for the McCovey No. 1 drilling operation is based on drilling data from the Gulf Oil Cross Island #1 Well, the AMOCO No Name Island Well, and the Sohio Reindeer Island Well. Two weeks of reservoir/formation testing are planned. If results are favorable, the first sidetrack (McCovey No.1a) would be drilled to a new bottom hole location, followed by two weeks of well testing. The well(s) will be plugged and abandoned (P&A'd) as approved or suspended by the MMS prior to March 15, 2002.

Post-Drilling Evaluation Activities (Approximate Time Frame: March 15, 2003-July 2003)

The SDC will be placed in cold stack "go quiet" mode after operations are completed. The results of the drilling and testing program will be evaluated to determine the next activity at McCovey with the SDC.

Demobilization of SDC

The timing of the demobilization will be based on information gathered during the drilling and testing of the McCovey Prospect area. If testing results are favorable, the SDC may remain on location in a cold stack "go quiet" mode for an additional drilling program in the following season(s). These drilling programs will be prospectively proposed in new exploration plans. Alternatively, the SDC may be moved to: a different surface location to conduct additional testing of the McCovey Prospect area, a storage location in Steffansson Sound, or to a new location under a different contract. When demobilization does occur, a final site clearance will be performed in accordance with MMS regulations. This abandonment activity will leave the McCovey Prospect Area in essentially an undisturbed condition. For these reasons, navigational hazards and impact upon marine mammal habitat would be negligible with no need for site restoration.

3.0 DESCRIPTION OF THE SDC DRILLING UNIT & SAFETY FEATURES

A general description of the SDC/MAT drilling unit, safety features, and operations procedures is provided below. Detailed discussions and procedures will be provided in the APD scheduled to be submitted to the MMS in April 2002.

3.1 SDC Mobile Drilling Unit Description

The SDC is an ice-strengthened, bottom-founded, MODU designed to operate year round in harsh arctic environments. The MODU is a converted VLCC (Very Large Crude Carrier) complete with topside drilling facilities sitting on top of an all steel MAT, which provides support and resistance to sliding forces. The SDC is fully certified by the U.S. and Canadian Coast Guards and can operate in water depths of between 9.1 meters and 22.9 meters (30-75 ft.). Its large footprint and unique skirt system makes the SDC/MAT suitable for any soil conditions encountered.

Combined, the SDC and MAT form a MODU, which can be towed to, and ballasted down at, the drill site. When required, the MODU can be deballasted, refloated and towed to another drill site. The deballasting and refloating operation can be accomplished within approximately 72 hours under normal conditions. The SDC has living quarters to accommodate 104 personnel.

The stability of the system under ice loading is provided by water ballasting the MAT, and if required the original cargo tanks.

3.1.1 Modular Components

The modular components for the SDC/MAT system are discussed below. The SDC and MAT are permanently mated and cannot be separated.

<u>SDC</u>

The drill rig is capable of drilling through each one of the four available drilling slots to a maximum depth of 7,900 meters (26,000 ft.). There is sufficient storage capacity for 270 days of operation and drilling of two 5,000 meters (16,000 ft.) of wells without re-supply.

<u>MAT</u>

The MAT was newly constructed in 1985/86 and serves as the support for the SDC. It is an all steel, sloping sided, submersible barge.

The MAT is equipped with all necessary pumping and piping systems to perform ballasting and deballasting operations. Ballasting operations are carried out by gravity filling of the tanks. The MAT has a tower located forward for access to the pump room and tanks. The power source for the MAT systems is located on the SDC. Flexible systems connections between the MAT tower and the SDC are installed.

The MAT is equipped with a skirt system that is optimized for the soil and bottom conditions generally found in the Alaskan Beaufort Sea. The skirt system is designed to penetrate surficial soils and utilize the horizontal shear strength of stronger soils at depth.

The top deck of the MAT is covered with a layer of urethane foam which serves as the interface material between the SDC base and MAT deck. This interface transmits the loads between the two units. Typical sections and drawings of the SDC provided as Appendix B.

3.1.2 Vessel Specifications

The vessel specifications including auxillary equipment, storage capacities, and power systems are discussed below.

The principal specifications of the SDC and MAT are listed below.

General Specifications:

SDC

Name Registered at	Liberia
Official Number	804224
Gross Tonnage	82859.28 Tonnes
Net Registered Tonnage	65964.50 Tonnes
Light Weight Displacement	44640.00 Tonnes
Length 213.9 m	(701.8 ft.)
Length at Waterline	162.0 m (531.5 ft.)
Breadth, Moulded	53.0 m (173.9 ft.)
Depth, Moulded	25.3 m (83.0 ft.)

MAT

Name Registered at	Liberia
Official Number	15822-86
Gross Tonnage	60,144 Tonnes

Net Registered Tonnage	18,043 Tonnes	
Light Weight Displacement	34,651 Tonnes	
Length 168.0 m	(551.2 ft.)	
Length at Waterline (excluding forward tower)	162.0 m	(531.5 ft.)
Breadth on Upper Deck	60.0 m (196.9 ft.)	
Breadth Bottom	110.0 m	(360.9 ft.)
Depth (Includes Skirt and Foam)	15.9 m (52.2 ft.)	
Depth of Skirt	2.0 m	(6.6 ft.)
Depth of Foam (average) (Contoured)	0.4 m	(1.3 ft.)
Height of Forward Tower above Skirt Bottom	31.1 m	(102.0 ft.)

<u>SDC/MAT</u>

Length Overall at Deck	202.4 m	(664.0 ft.)
Breadth Overall at Bottom	110.0 m	(360.9 ft.)
Depth Overall 41.1 m	(134.8 ft.)	
Maximum Towing Draft	21.0 m	(68.9 ft.)
Light Ship Draft (10% consumables)	7.0 m	(23.0 ft.)

Auxiliary Equipment

Cranes & Forklift: Two FMC Link Belt 1,500, max. capacity 62 tons, 120 ft. boom
One FMC Link Belt 238A, max. capacity 36 tons, 120 ft. boom
One FMC Link Belt HSP-8022, 22 tons, mobile crane
One Caterpillar Model 930 Forklift
Two 25 ton Beebe B.O.P. cranes

Storage Capacities

BULK BARITE (14 silos) .... 141,000 ft^3
BULK CEMENT
Permafrost (4 silos) .... 40,000 ft^3
Class "G" (2 silos) .... 20,100 ft^3
SACK STORAGE AREA .... 8,660 ft^2
LIQUID MUD .... 21,000 bbls
FUEL OIL .... 35,740 bbls

HELI FUEL..6,000 US Gal.
POTABLE WATER...29,000 US Gal.
DRILL WATER ....10,790 bbls
CASING ....2,750 tons
DRILL PIPE...275 tons

Power Systems

Main Engines: Six (6) Caterpillar D-399 JWAC, 1,000 HP

AC Generators: Six (6) Kato 6P5-3150, 1,050 kW -1,500 kVA 600 VAC

DC Conversion: Four (4) Ross H11 SCRs - 2,000 AMP @ 750 VDC

Emergency Power: One (1) Caterpillar D-399 JWAC, 1,000 HP, 600 VAC

3.1.3 Major Drilling Equipment

The major drilling equipment consists of mast, substructure, drawworks, rotary table, mud pumps, and solids control. Specifications on this equipment is discussed below.

DRILL DEPTH: 26,000 ft.

MAST: Dreco cantilever, 147 ft. clear working height, 34 ft. leg spread, 1,300,000 lb. gross nominal capacity:

Maximum 12 lines – 4,450 kN (1,000,000 lb.)

Hook Loads 10 lines – 1,880 kN (952,000 lb.)
8 lines – 1,757 kN (889,000 lb.)

SUBSTRUCTURE: Dreco posted box substructure with 11.6 m (38 ft.) high rig floor.

DRAWWORKS: National Supply Model 1625-DE 2,240 kW (3,000 HP) with Elmagco Model 7838 brake driven by 2-GE 752-R DC motors.

ROTARY TABLE: National Supply Model C-495 1,257 mm (49 ½ in.) diameter with independent gear drive driven by 1-GE-752-R DC motor.

MUD PUMPS: Two National Supply 12-P-160 triplex pumps rated at 1,200 kW (1,600 HP) each driven by 2-GE 752-R DC motors.

3.2 Safety Considerations

General weather and ice loading information is discussed below. Site specific ice and wave load analysis conducted for the platform verification are provided in Appendix C.

3.2.1 Ice Loading

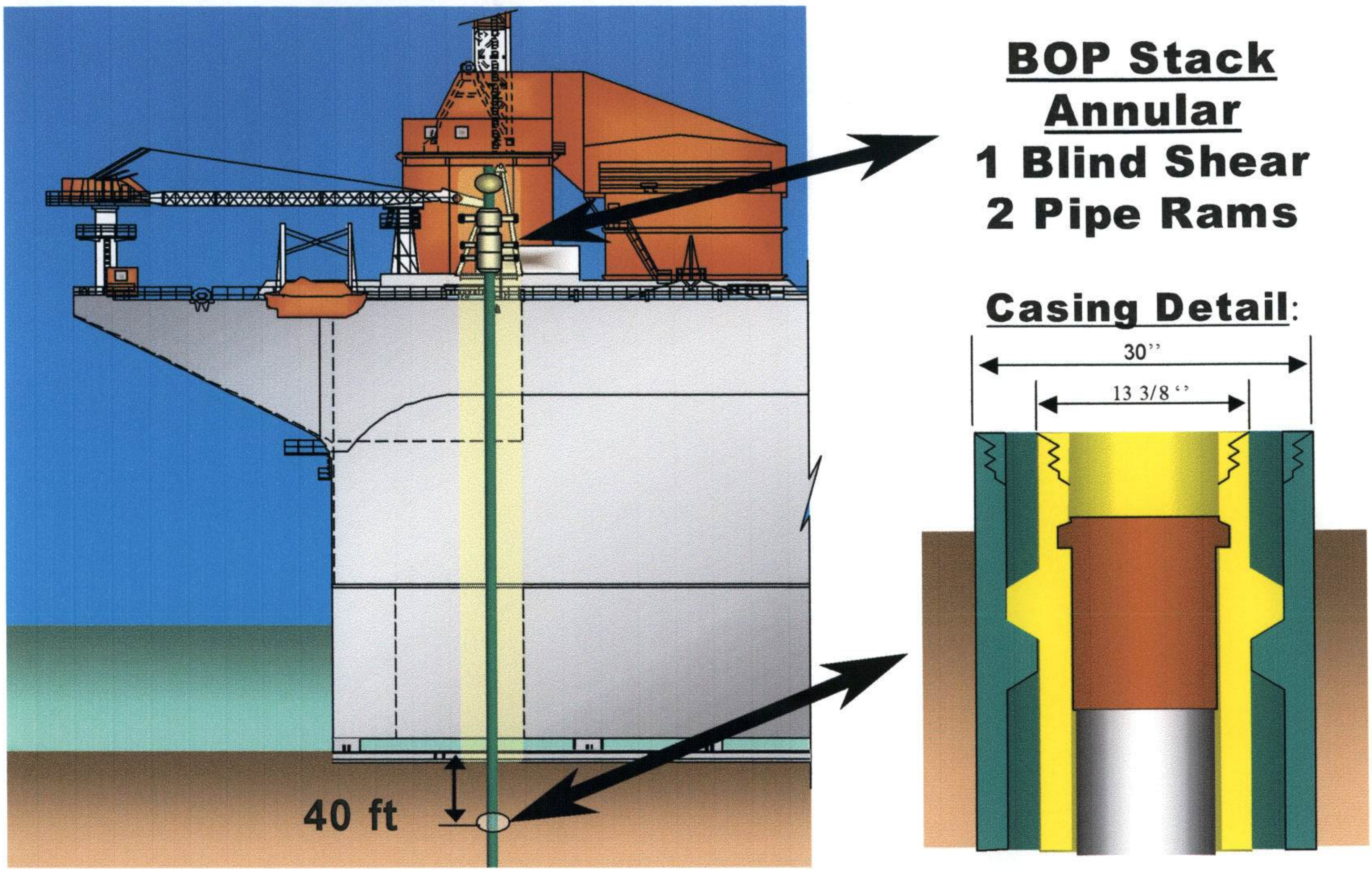
The SDC/MAT structure is capable of resisting large lateral loads such as those that could be incurred by ice movement in the Beaufort Sea. The amount of ballast water in the SDC required to resist such loads must be determined for each specific site. Ice loads, water depth and soil conditions will be reviewed and approved by the MMS in order to determine the net contact force between SDC and MAT and to determine the net bottom force. Design criteria for the SDC/MAT were evaluated for the McCovey deployment. These criteria included both ice loading (Croasdale, November 28, 2001) and wind wave analysis (CJK Engineering, November 2001). These design criteria were combined in an evaluation of the geotechnical properties to resist the anticipated loads (AGSI, November 27, 2001). These platform verification analyses are provided on Appendix C.

3.3 Blowout Prevention Equipment

Blowout prevention equipment is in place on the SDC. Some of the existing equipment will be upgraded prior to mobilization to the McCovey site. The existing BOP is shown on Figure 6 and associated equipment is provided below. Detailed inventories and system upgrades will be provided in the APD scheduled for submittal to the MMS in April 2002.

<u>Low Pressure System</u>:	One Hydril 527 mm (20 ¾ in.) double ram, 20.7 MPa (3,000 psi) One Hydril 540 mm (21 ¼ in.) annular preventer, 13.8 MPa (2,000 psi) Vetco LS riser system 610 mm (24 inc.) O.D. 13.8 MPa (2,000 psi)
<u>High Pressure System</u>:	Three Hydril 346 mm (13 5/8 in.) annular preventer 69.0 MPa (10,000 psi) One Hydril 346 mm (13 5/8 in.) annular preventer 34.5 MPa (5,000 psi) Vetco MRF Riser System 457 mm (18 in.) O.D. 69.0 MPa (10,000 psi)
Diverter	Regan KFDJ-500 System
Accumulator	Hydril Valvcon 908 litre (240 gal.) capacity
Choke Manifold	69.0 MPa (10,000 psi) with Wagner auto choke

Bulk Transfer	Two low pressure air blowers Three Airconvey Vack II Model 36
Pipe Handling	One Mereco model 33 lay down machine Handles all sizes up to 1,067 mm (42 in.) casing
Cranes & Forklift	Two FMC Link Belt 1500, max. capacity 57 tonnes (62 tons), 36.6 m (120 ft.) boom. One FMC Link Belt 238A, max. capacity 32 tonnes (35 tons), 36.6 m (120 ft.) boom. One FMC Link Belt HSP-8022, 20 tonnes (22 tons) mobile crane. One Caterpillar Model 930 Forklift Two 22.8 tonne (25 ton) Beebe B.O.P. Cranes.



AEC OIL & GAS (USA) INC.

AEC McCovey Exploration Prospect
Exploration Plan

30 INCH CASING DETAIL

SCALE: N/A	FIGURE: 6

Lynx:aec030.mxd, January 18, 2001, Rev3

3.4 Firefighting and Safety Equipment

Fire Water System

The fire water system is a saltwater system that provides high volumes of water to all vessel locations for fire suppression. In this case the Viking sprinkler system consists of two independent systems, one for each floor. The system components are:

- Two (2) dry pipe valves;
- One (1) water gong;
- One (1) air compressor;
- Two (2) shut-off valves;
- Eighteen (18) auxiliary drain valves;
- Two (2) inspection valves;
- Two (2) maintenance valves; and
- Two (2) pressure operated switches
- Two (2) monitoring switches.

Halon 1301 Fire Extinguishing System

The Halon system provides positive fire suppression in compartments where the use of water is either dangerous or would have limited effectiveness and would damage the equipment located within the compartment. Halon itself has low toxicity and is electrically non-conductive. It is suitable for electrical, oil, fuel, and other similar fires. The Halon system provides protection for the following areas:

- Camp utilities, CU1, CU2, CU3;
- Generators, U2 and U3 Electrical Room, U6;
- Mud areas, M7, M8 and M9; and,
- DA trailers Radio room Pump room.

Fixed Dry Powder Fire Extinguishing System

The fixed dry powder extinguisher system provides areas of high fire susceptibility with ready access to volumes of dry powder for fighting fires too large to be quickly handled by portable extinguishers. The fixed dry powder fire system consists of hose reel Ansul extinguishers. Both 30 lb. and 20 lb. types are located in areas of easy access throughout the rig. Two (2) wheeled 350 lb. dry powder extinguishers are located onboard the SDC. One is located in the welding shop and the other is located in the production testing area.

Miscellaneous Fire Fighting Equipment

Portable extinguishers (CO2) are located for use within areas with sensitive electrical equipment.

Fire Detection/Alarm System

The fire alarm system is on an auxiliary power system and consists of a Pyrotronics System 3 main fire alarm panel. The panel was custom built with individual zones for separate areas. Each zone has a separate alarm and trouble indicator. The panel is programmed so that suppression systems, such as sprinklers and Halon 1301 systems, can be monitored. The overall fire detection system is arranged as follows:

In areas where the hazard is electrical, smoke detectors are used for detection.

In all Class B areas, rate compensated detectors are used for alarm.

- In all areas protected by Halon 1301 Systems, a manual discharge switch is located at all exit doors.
- Bells are located throughout the complex; tone generator is in public address system.
- In areas where there is no suppression, breakglass stations are provided at all exit doors.
- A zonal graphic is provided by the control panel.

Gas Detection/Alarm System

The gas alarm system includes the following components:

- MSA Model 516 main panel in Silicon Control Rectifier (SCR) room;
- MSA gas detectors;
- Alarms set at 20 percent and 60 percent LEL (Lower Explosive Level); and,
- Trouble indication at main panel.

All fire and safety equipment will be modified as necessary to meet current U.S. Coast Guard (USCG) regulations.

Survival System

Boats onboard the SDC include:

- Two (2) 50-man totally enclosed WaterCraft lifeboats;
- Two (2) 58-man totally enclosed FISKAR lifeboats;
- One (1) WaterCraft rescue/pickup boat; and,
- Five (5) 25-man deck inflatable life rafts.

Personnel embarkation equipment includes:

- Four (4) scramble nets;

- Ten (10) life rings.

Flotation and rescue equipment includes:

- Sufficient life jackets to meet or exceed USCG requirements;
- Sufficient exposure suits to meet or exceed USCG requirements;
- Sufficient immersion suits to meet or exceed USCG requirements.

All the above appliances meet Canada Oil and Gas Land's Administration (COGLA) and/or USCG requirements. All personnel will receive full training in emergency use of these systems and will be required to participate in weekly abandon ship drills.

3.5 Drilling Program

The specifics of the AEC McCovey No. 1 drilling program will be presented in the APD, which will be filed with, and approved by the MMS. The AEC McCovey No. 1 exploration well will be drilled from a surface location in OCS Lease Block Y-1577 to a bottomhole location on OCS Lease Block Y-1578 within the McCovey Prospect Area. The well's total depth will be approximately 13,000 ft total vertical depth (TVD). Flaxman Sands are the principle target. Specific information on the well design and logging program will be contained in the APD.

As described in Section 2.2, the post-drilling evaluation activities are dependent on what is discovered during the drilling and testing program. These activities range from plugging and abandoning or plugging and suspending the well, to production testing and drilling a sidetrack well. If a decision is made to flow test the well, a testing program will be written at that time based on the known downhole conditions. Pressure or mechanically activated test tools will be employed. Recovered liquids will be stored in tanks aboard the SDC and gas will be flared from a flare stack on the drilling vessel. Produced fluids will be reinjected (bullheaded) back into the formation from which they originated or transported back to an on-shore production facility.

4.0 EMERGENCY PLANNING

MMS Alaska OCS Region requires that this Exploration Plan contain a discussion of emergency planning including the drilling of a relief well, should a blowout occur; the actions taken in response to the loss or disablement of the drilling unit; and the course of action in the event of loss or damage to support craft. All contingency plans for these emergencies are founded on the following priorities and objectives:

- Protection and safety of personnel;
- Protection and safety of the environment;
- Minimization of rig and property damage; and,
- Regulatory Agency and AEC notification.

AEC considers the risk of a blowout occurring during drilling and testing operations at the McCovey site as extremely low due to the following conditions:

- The SDC crew will be trained in Well Control as per 30 CFR 250 Subpart O;
- Key personnel (i.e. toolpushers, operator's representatives, drilling engineers, mud engineers, and drillers) will be Subsea and/or Surface Stack Certified in Well Control as per 30 CFR 250 Subpart O;
- The well design has been prepared based on data from other exploratory wells drilled in or near the McCovey Prospect area (Sohio Reindeer Island Well, AMOCO No Name Island #1well, and Gulf Oil Cross Island #1 well);
- A mud-logging unit will be employed on the McCovey well(s), which will add a second pit level and flow line monitoring system, in addition to the one already provided for rig use. Mud logging unit equipment will include gas monitors to track background, connection, and trip gas. This equipment will aid in the detection of impending kicks and assist in rapid well shut in response;
- The Operator and drilling contractor have established formal internal procedures to ensure all well control situations are addressed immediately and that adequate personnel and equipment services are employed to prevent the total loss of well control (blowout); and,
- AEC has contracted Key Safety Services, Inc. to assist in the intervention and resolution of any well control emergencies. Key Safety Services, Inc. will be notified immediately in the event of any well control situation, which has the potential to escalate.

4.1 Relief Well Discussion

An ice island would be constructed for relief well operations in the unlikely event of a loss of primary and secondary well control. The selection of the surface location from which to drill a relief well would be based on the water depth, safe distance and direction from the blowout and/or fire, and the planned point of intersection with the blowing well in order to optimize the well kill.

Construction of an Ice Island:

An ice island would need to be constructed in support of a relief well. The time required to construct an ice island is both weather and water depth dependent. For purposes of this scenario, a 37 to 45 ft water depth is assumed, as bathymetric surveys have confirmed this depth near the McCovey bottomhole location and still close enough to directionally drill to the McCovey wellbore. The time to construct a spray ice island with 15 feet of freeboard is estimated to be 32 days, depending on temperature and other weather conditions during the construction period. High-volume pumps designed for seawater flooding and spray ice construction of ice islands exist in Deadhorse and would be mobilized via rolligons to immediately commence ice island construction. Additionally, a dozer from the SDC would be used to assist in ice island construction. Rolligons with sprayers would be mobilized to begin spraying the ice with extra water. Additionally, a dozer from the SDC would be used to move ice rubble and snow to the project pad. By continued movement of ice/snow and application of water, the ice pad can be built in 32 days. Concurrent with the ice pad construction an ice road would be constructed to enable heavy equipment to travel to the SDC. The ice road would be completed in 24 days. Once the island was constructed, a conventional modular land rig, equipment and materials could be transported to the island by truck/rolligon. The window available for drilling a relief well would be dependent on when the ice island was constructed. Obviously the relief well would have to be completed, plugged, and abandoned in time to demobilize from the ice island while ATV transport was still possible. The ice island option offers a workable approach for relief well operations over an approximate 2-3 month period that encompasses the winter and early spring seasons.

Relief Well Drilling Considerations:

The equipment and materials needed to drill a relief well are available from drilling stocks on the North Slope or in Fairbanks. These items would be moved to the relief well site by rolligon, truck, ATV, or barge depending on the season. It is expected that extensive helicopter operations would support the drilling effort.

The time required to drill a relief well and kill a blowout is dependant on the depth required, directional considerations, the complexity of the kill itself, and weather. With this many variables, it is impossible to accurately forecast a time duration for relief well drilling; however, for planning purposes, a period of four (4) to seven (7) weeks is estimated. Please refer to Appendix D (Oil Discharge Prevention and Contingency Plan) for more information.

4.2 Loss or Disablement of the Drilling Unit

As part of the McCovey Project planning process, AEC has assessed the potential for loss or disablement of the drilling unit from cases other than a loss of well control. In the case of the SDC, the possibility of rig movement resulting from ice loads was evaluated and is presented as Appendix C. Platform verification supporting documents are provided in Appendix C. In order to evaluate the stability of the SDC on the McCovey location, geotechnical information on the soils was obtained and the shear strengths of the soils determined. Meanwhile, the anticipated ice conditions at McCovey were quantified. The geotechnical and ice forces information were then combined with the SDC/MAT's geometry and weight (including ballast water) to determine the Unit's stability parameters via the methodology set out in API RP-2N. Per 30CFR 250.902, AEC has provided the credentials of a certified verification agent should this analysis be requested by the MMS.

Should any condition develop during the drilling of the McCovey No. 1 well that presents a potential threat to the integrity of the drilling vessel (e.g., fire), the well would be suspended by placing a cement or mechanical plug in the wellbore, leaving the hole filled with a minimum of 200 psi overbalance drilling fluid, and securing operations until the threat is past or overcome.

4.3 Loss or Damage to Support Craft

The SDC will require minimal support during the AEC McCovey No. 1 project, as described earlier. Any unforeseen or emergency transport of equipment or materials that could be required in the later stages of the program will be accomplished by Rolligons/ATVs and/or available in Deadhorse. Fuel will only be transported during the summer, by barge (See Appendix I, IHA Application). Several Deadhorse contractors operate and maintain sufficient backup equipment to accommodate any rolligon/ATV mechanical problems or breakdowns.

The rig will also have helicopter support throughout the duration of the McCovey project. A Bell 212 (or equivalent) helicopter will be dedicated to the job and crewed 24 hours per day. In the event of a mechanical breakdown or loss of this aircraft, a substitute helicopter will be made available from the helicopter operator's fleet. If any search and rescue operations are required, assistance would be provided by other helicopters operating on the North Slope, the North Slope Borough Search and Rescue Unit, and the military as necessary.

5.0 OIL SPILL RESPONSE PLAN

The Oil Spill Response Plan (OSRP) also referred to as Oil Discharge Prevention and Contingency Plan (ODPCP) for the AEC McCovey No. 1 drilling program is included as Appendix D to this Exploration Plan (AEC Oil & Gas (USA) Inc. – Oil Discharge Prevention and Contingency Plan (ODPCP), December 2001). The plan provides information on oil spill prevention detection and control procedures, response organization, risk analysis, and environmental sensitivity. It is designed to assist AEC and contractor personnel in responding rapidly and effectively to oil spills that may result from exploratory drilling operations.

The OSRP/ODPCP provides a detailed description of appropriate actions and techniques for various spill circumstances, response times for mobilization of personnel and equipment from various locations, equipment operating characteristics, and the availability of equipment both on site and off site. This plan emphasizes the prevention of oil pollution by employing the best control mechanisms for blowout prevention and fuel transfer, and by implementing a mandatory program of personnel training. MMS Regulations (30 CFR 254) include specific requirements for oil spill and pollution prevention. The OSRP/ODPCP includes a cross-reference to these for review of the applicability and compliance with these regulations.

All project personnel, including employees and contractors, will be involved in oil spill contingency response and will receive training as described in the OSRP/ODPCP. Training drills will be conducted periodically to familiarize personnel with on-site equipment, proper deployment techniques, and maintenance procedures.

6.0 GEOLOGIC CONDITIONS 30 CFR 250.203(b)

Documents meeting the requirements of 30 CFR 250.203.(b) were previously submitted to the MMS under separate cover. These documents and summaries of their findings are provided below.

Arctic Geoscience, Inc. April 2000 Technical Survey Phillips Alaska, Inc, McCovey Prospect Beaufort Sea Vol. I and Vol. II, Submitted to MMS November 13, 2000.

Arctic Geoscience Inc. Bubble Pulser and Sub-Bottom Profiler Trackline Shotpoint Maps and Data Phillips Alaska Inc. Submitted November 22, 2000.

Arctic Geoscience Inc. Geotechnical and High Resolution Geophysical Investigation, McCovey Prospect. Submitted October 12, 2000.

Data from the three reports reference above at the proposed wellsite found a clean sand seafloor with minute sand wavelet bedforms and no excessive ice gouging. The ROV video survey performed supported the sonar data set collected at the proposed ice island location. No evidence of any seafloor hazards on the seabed was observed at the time of our investigation, no boulders were visible, nor was ice gouging prevalent. The ice gouge tracks observed on the seafloor at the site were low profile and limited in length to non-existent. No man-made hazards were observed.

DataSonics Chirp II Subbottom profiler was run across the high-resolution geophysical survey area and the data records indicate a relatively hard bottom. Interpretations of a hard seafloor are based on resulting shallow penetration of the subbottom profiler to a limited depth of 5 m across the site as a result of the dense sand present at the seafloor. The top of the shoal is relatively featureless with excessive gouge morphology incisions of the seabed present on the flanks of the shoal. No other seafloor or near seafloor features were identified in the review of the analogue subbottom profiler records.

DataSonics Bubble Pulser system was run across the high-resolution geophysical survey area. Review of the bubble pulse analogue records shows an erosional feature that has a similar appearance of a “channel” to the north of the proposed exploration site. This erosional feature is oriented parallel with the shoal. The depth of the base of the feature is approximately 8 m below the mudline, and is approximately 300 m in width and visible in a length of 600 meters. This orientation and shape appears to be associated with gouging and sea bed ice keel interaction as opposed to being a pre-historic terrain feature. The SDC seafloor “footprint” is not situated on this feature; therefore, there will be no potential impact.

The geotechnical and geophysical surveys show that there are no seafloor and subsurface geological and man-made hazards in the McCovey area.

Arctic Geoscience Inc. Bathymetric Data Review McCovey Exploration Well, for AEC. Submitted January 2, 2002.

This report summarizes the bathymetric data for the McCovey exploration well collected off the ice sheet during a winter program and open water summer program Bathymetry survey and a comparison of the results. The bathymetric data from this winter survey indicates a generally flat, even substrate at the site. The bathymetry data also indicates a very low seabed gradient of approximately 0.67%, or 1 in 150 at the site. Water depths within the survey area range from approximately 34 feet in the northwest, 38 feet in the south, and 36 feet in the north. The bathymetric data collected over the site clearance grid supports original bathymetric results and interpretations that the proposed location of the McCovey exploration site is located on a shoal feature. Water depths at the well location range from 33 ft. to 36 ft. (10 to 11 meters) across the proposed wellsite. Data collected during the summer program was collected during a storm surge and was not corrected. Subsurface topographic maps prepared for supporting documents to the Exploration Plan were based on this uncorrected data.

Arctic Geoscience Pre-Historic Archaeological Assessment of the Phillips Alaska Inc.'s McCovey Prospect. Submitted December 2000.

This document describes the details of a pre-historic archeological assessment of the McCovey Prospect. The information submitted is in accordance with 30 CFR 250.194. Results of the assessment determined that the potential effects of the proposed operations on historical and pre-historical resources are not significant. Reanier and Associates conducted an independent evaluation of this assessment for the SDC deployment. The Reanier's analysis agreed with the results of this report. A copy of the Reanier and Associates letter is provided in Appendix G.

Proprietary G&G:McCovey Unit Application Geological and Geophysical Discussion and data. Submitted May 2000.

7.0 HYDROGEN SULFIDE INFORMATION & PRECAUTIONARY MEASURES

The presence of hydrogen sulfide in formations that will be penetrated by AEC McCovey No. 1 is not known. It is anticipated that the MMS will classify the McCovey location as a "zone where the presence of hydrogen sulfide is unknown" 30 CFR 250.208(a)(5)(ii). This means that sufficient information is not available to conclusively confirm that hydrogen sulfide is absent or present. Therefore plans and equipment must be available to ensure the safety of personnel and to mitigate damage to property and the environment in the event hydrogen sulfide is encountered.

A Hydrogen Sulfide Contingency Plan for drilling and testing operations on the McCovey Prospect will be prepared and submitted to the MMS concurrently with the submittal of the Application for Permit to Drill as per 30CFR 250.417(f). This plan will be developed in response to the possible risks of encountering hydrogen sulfide at the McCovey location. The plan will, at a minimum, cover the topics defined in the above referenced regulation.

8.0 NEW AND UNUSUAL TECHNOLOGY

AEC does not plan to use any new or unusual technology on this well. All technology to be used on this project has been proven on past exploration wells, and/or is currently being used successfully in other North Slope and Beaufort Sea drilling operations. The use of the SDC is simply the continued use of a technology that has been proven in the past.

The planned use of the Best Available Technology (BAT) will be discussed in the Application for Permit to Drill.

9.0 ONSHORE OPERATIONS SUPPORT AND FACILITIES

9.1 Project Management and Administration

The AEC McCovey No. 1 drilling operations and any subsequent related activities will be directed from the AEC offices in Calgary, Alberta Canada, a field office in Anchorage, Alaska and/or an on-site SDC Field office. Logistical support for the operations will be provided by helicopter services and, if required, by rolligon. The support functions will utilize existing facilities at Deadhorse, Alaska. No new facilities will be constructed.

9.2 Helicopter Support

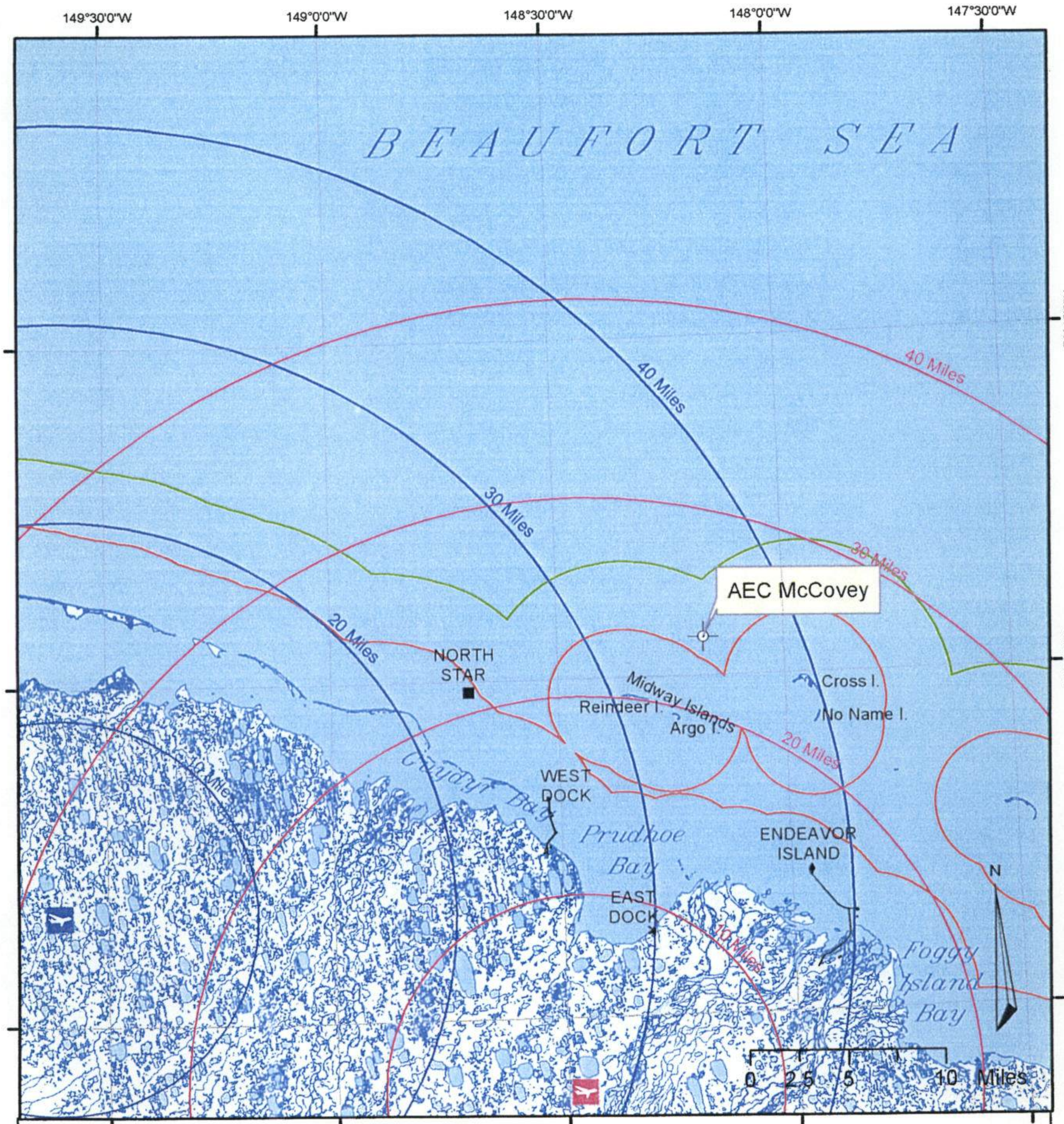
Rig crews, operator personnel, and third party personnel who are not already on the North Slope will be flown to the Deadhorse Airport from Anchorage or Fairbanks by scheduled commercial or chartered aircraft. Personnel will then be transported by helicopter to the drilling unit. Personnel will be housed in a Deadhorse casual camp (e.g. Prudhoe Bay Hotel) in the event of inclement weather.

Helicopter support will consist of a Bell 212 (or equivalent) helicopter certified for IFR operations. This aircraft will be based at the Deadhorse Airport. Helicopter flights are expected to average two (2) per day. Flight routes will follow a more or less direct north/south route (or a route uniquely specified in the Conflict Avoidance Agreement) from the Deadhorse Airport to the AEC McCovey No. 1 location. The estimated distance is 26 statute miles, which will require approximately 15 minutes flying time. Helicopter crews and support personnel will number 6 or 7 persons and will be housed in Deadhorse in existing facilities. A distance map is provided as Figure 7.

The Deadhorse Airport will be the principal base for helicopter operations. If weather prevents landing in Deadhorse, alternate airports at Kuparuk, Alpine, Nuiqsut, or Barrow are available for diverted flights. Sufficient fuel will be carried on all flights under inclement weather conditions to return to the SDC as an additional alternate destination.

9.3 Rolligon/ATV Support

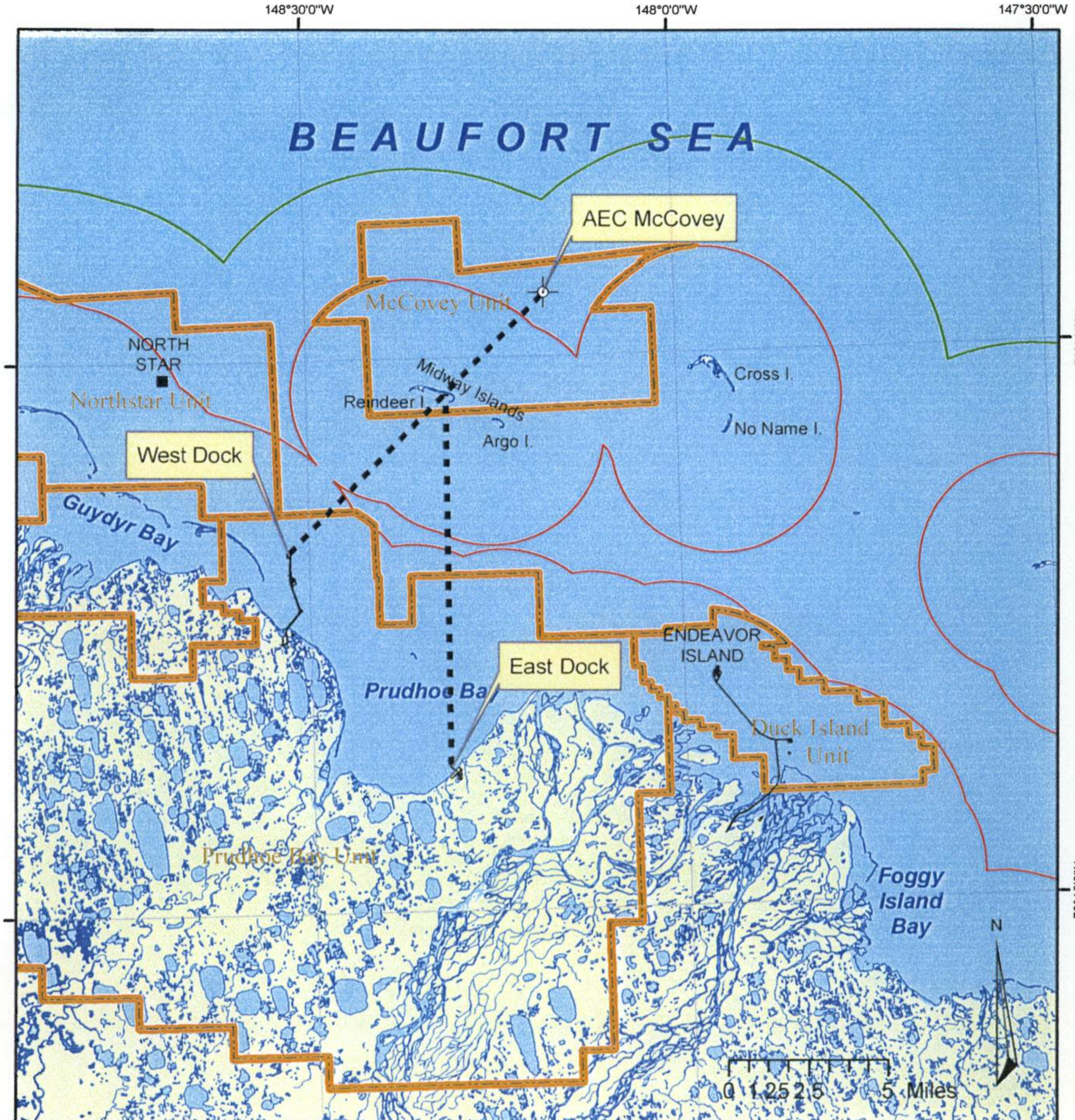
The SDC will have materials and consumables required for both the AEC McCovey No. 1 well and a sidetrack well put aboard during the rig mobilization and re-supply phase of the program in August 2002. Unless well operations extend much longer than anticipated, fuel re-supply should not be required. If specific items of large equipment have to be replaced, or specialized downhole tools that were not anticipated need to be brought to the rig, or if fuel re-supply becomes necessary, these items will be transported by rolligon/ATV on an as needed basis (Figure 8). Overland travel time from Deadhorse to the AEC McCovey #1 well site (no ice road) is expected to be four (4) hours. Rolligons/ATVs are currently based in Deadhorse, as are operators and support personnel. No additional personnel or facilities are required for the McCovey project.



Horizontal Datum NAD 27, coordinate system Alaska State Plane Zone 4. Hydrology derived from 1:63360 USGS DLG Data.

Proposed Exploration Well Location	AEC OIL & GAS (USA) INC.
Deadhorse Public Airport	AEC McCovey Exploration Prospect Exploration Plan
Kuparuk Private Airport	
Air Distances from Deadhorse Airport (10 Miles Increments)	DISTANCE MAP
Air Distances from Kuparuk Airport (10 Miles Increments)	
8(g) Boundary	SCALE: 1 inch equals 8 miles / FIGURE: 7
Alaska Seaward Boundary	

Lynx: aec025.mdx, December 27, 2001, Rev 3



Horizontal Datum NAD 27, coordinate system Alaska State Plane Zone 4. Hydrology derived from 1:63360 USGS DLG Data.

Proposed Exploration Well
Proposed Rolligon/ ATV Ice Trails
8(g) Boundary
Alaska Seaward Boundary
Oil & Gas Units

AEC OIL & GAS (USA) INC.

AEC McCovey Exploration Prospect
Exploration Plan
PROPOSED ROLLIGON/ATV ICE TRAIL ROUTES FROM WEST AND EAST DOCKS

SCALE: 1 inch equals 5 miles	FIGURE: 8

Lynx: aec026.mxd, December 27 2001, Rev 2

9.4 Emergency Support

Necessary medical, fire, spill, and evacuation support infrastructure is located in Prudhoe Bay, Deadhorse, and Endicott. Any medivac from the rig will be conducted via helicopter. The project will employ an EMT III medic/Environmental Technician on site who will have Advanced Life Support capabilities. A spill van will be onboard to provide ready access to equipment in the event of a spill. In the event of a massive spill beyond the rig crew's capability to control, the Emergency Response Network will be activated and personnel and equipment from across the North Slope and all Alaska will be accessed as necessary (See Oil Spill Response Plan/ODPCP, Appendix D).

9.5 Project Staffing

Labor requirements will vary during the AEC McCovey No. 1 project. The estimated number of personnel for unique tasks are provided below. Detailed project staffing and their qualifications will be provided in the APD.

Project Activity	Estimated Number of Personnel
Pre-mobilization rig maintenance and warm-up	45-50
Mobilization	15-20
Warm Shutdown	15-20
Drilling	60-70
Evaluation	70-80
Testing	55-65
Demobilization	10-15

10.0 WASTE MANAGEMENT

The USEPA issued the site specific NPDES Permit No. AKG-28-4205 to Phillips Alaska, Inc. for the McCovey exploration project on May 1, 2000. In accordance with Section V(k) of the permit, PAI has requested the permit be transferred to the current operator, AEC. Upon receiving verification of the transfer of the permit to AEC, a copy of the communication will be provided to the MMS. Copies of NPDES Permit AKG-28-4205 and associated correspondence are provided in Appendix E.

AEC will develop a waste management plan with best management practices (BMP) for this exploratory drilling program to ensure compliance with the NPDES permit as well as applicable federal, state, and local regulations. This waste management plan will be included in the APD. The waste management flow that will be used on the McCovey Project, is provided as Figure 9. The Alaska Waste and Reuse Guide will also be used as a waste management tool for this project.

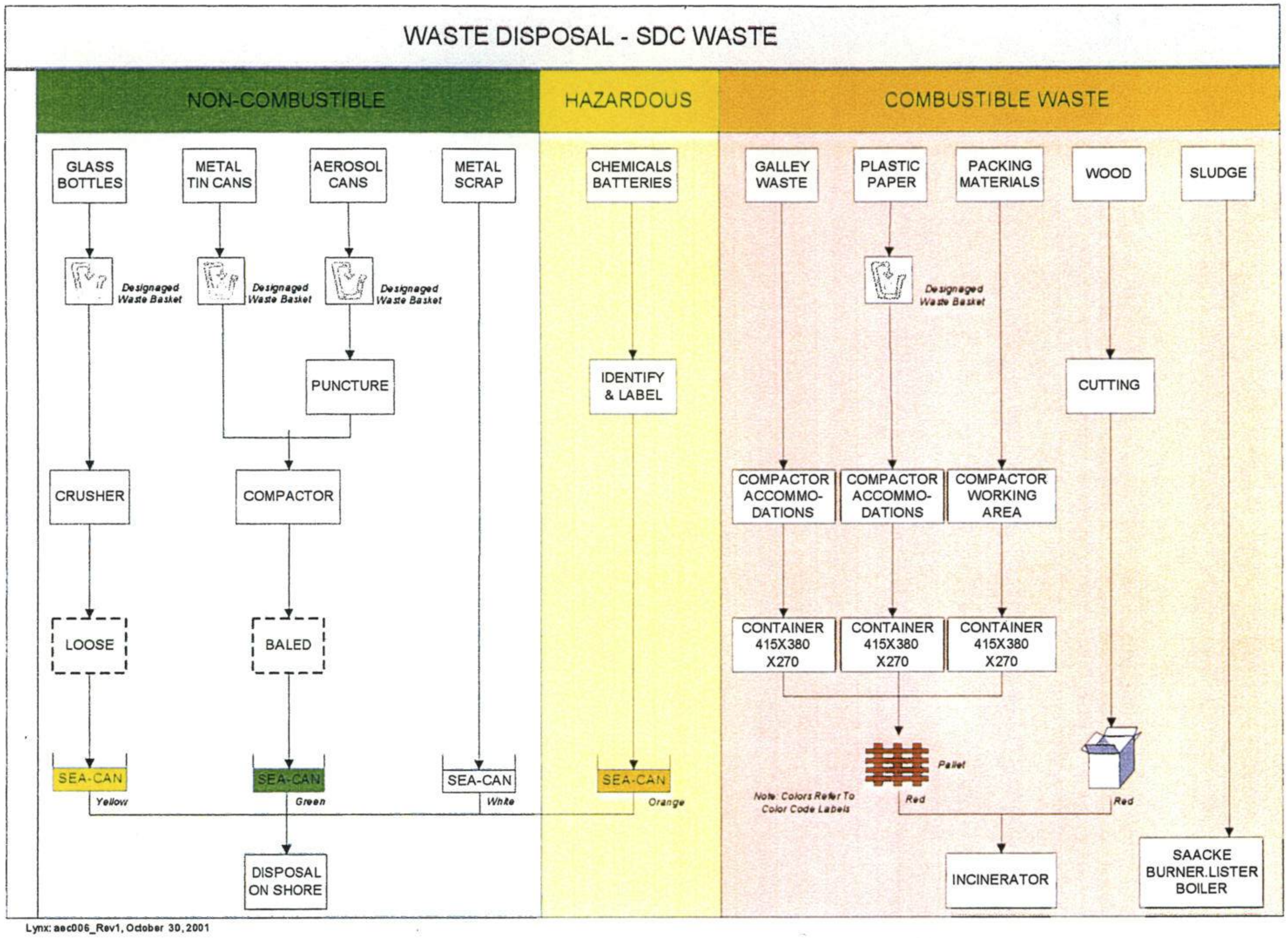
10.1 Estimated Waste Quantities

Based on a single-well scenario, the following quantities of waste are anticipated to be generated from the McCovey Project:

Waste	Quantity
Drilling Mud and Cuttings	5,900 bbls
Deck Drainage	7,000 bbls
Sanitary and Domestic Liquid Waste	7,500 bbls
Desalination Unit Waste	21,000 bbls
Boiler Blowdown	350 bbls
Fire Control System Test Water	350 bbls
Combustible Solid Waste	1,000 cubic feet
Sewage Sludge	500 cubic feet
Non-Combustible Solid Waste	700 cubic feet
Produced Reservoir Fluids	0-20,000 bbls
Used Oil	25 bbls
Excess Cement Slurry and Washdown	150 bbls

10.2 Waste Disposal and Treatment

Drill cuttings and drilling fluids will be discharged to the sea ice surface under the terms of the existing NPDES Arctic General Permit AKG 2842005 coverage. All muds used at the McCovey No. 1 will consist of systems approved under, NPDES Permit AKG-28-4205. The components of the typical mud system and their maximum concentrations are listed on Table 10-1. Both seawater and/or freshwater will be used to maintain this mud system. Rates of discharge will be in accordance with the limitations specified in the NPDES permit. A specific mud plan will be provided in the APD.



AEC OIL & GAS (USA) INC.

AEC McCovey Exploration Prospect
Exploration Plan

WASTE MANAGEMENT FLOW DIAGRAM

SCALE: N/A	FIGURE: 9

Lynx:aec049.mxd, December 27 2001, Rev1

Table 10-1 Maximum Proposed Concentrations of Mud Additives, Generic Mud No. 2 with Additives

Mud additives (generic name)	Maximum Proposed Concentrations (ppb)	"Most Likely" Concentrations (ppb)
Base Mud		
Bentonite/Sepiolite	50	20
Barite	575	125
Lignite	10	4
Potassium Chloride	14	11
Caustic Soda	5	1.5
Soda Ash	2	1
Lime	2	0.25
Cellulose Polymers	5	2
Xanthan Gum	3	1.5
Modified Lignin	4	3
Detergent	0.4	2
Defoamer	0.3	0.1
PHPA (dry)	3	1.5
Acrylic copolymer	1	0.5
Sodium Polyacrylate	3	1
Lost Circulation Contingency		
Vegetable Plus/Polymer	50	50
Mica	45	45
Nut Hulls	As required	As required
Cellulose Fibers	12	12
H_2S Contingency Products		
Zinc Oxide	As required	As required
Chemical Contingency		
Lignosulfonate	15	5
Aluminum Strearate	0.2	0.1
Sulfonated Asphalt	6	5
Tannin	0.5	0.5
Sodium Acid Pyrosphate	0.5	0.2
Starch	4	3
Sodium Bromide	2	2
Bentonite extender	1	0.2
Citric Acid	1	0.5
Vegetable Oil/Alcohol	6	2

As a contingency for mechanical problems, cuttings may be temporarily stored in tanks in the hull of the drilling rig, and later discharged to the sea ice. Discharge of drilling fluids will be minimized by on-site reuse where possible. As an alternative to discharge, drilling fluids could be disposed of down an injection annulus when this becomes available on the well. Annular pumping will be requested in the APD in order to establish this injection option. Produced reservoir fluids will be reinjected downhole and gas will be flared. Used oil will be recycled back to the rig or packaged in drums and hauled to Prudhoe Bay at the end of the project for shipment to an approved recycle facility. No hazardous wastes should be generated as a result of this project. However, if any hazardous wastes were generated, they would be temporarily stored in an onboard satellite accumulation area, then transported off-site for disposal at an approved facility.

Sewage from the quarters module will be processed in the onboard approved marine sanitation device and effluent from the unit will be chlorinated. Treated effluent will be discharged to the sea ice under the general NPDES permit. Sewage sludge, kitchen trash, and non-metallic trash from the rig quarters will be incinerated, and ash from the incinerator will be stored onboard until project completion and then hauled to the North Slope Borough waste disposal facility as soon as conditions allow.

11.0 ENVIRONMENTAL REPORT

The environmental report for the AEC McCovey No. 1 project is included as Appendix F to this Exploration Plan.

12.0 COMPLIANCE WITH LEASE STIPULATIONS

The surface location for drilling activities is on OCS Lease Y-1577, which was leased under Federal OCS Sale 124. If the McCovey No. 1 well is sidetracked or a new well is drilled, the location(s) will be in Y-1578 or Y-1577. This section describes how AEC will comply with the lease stipulations for the lease sale area.

12.1 Federal OCS Lease Sale 124 (OCS-1577, 1578)

Stipulation No. 1: Protection of Archaeological Resources

The Regional Supervisor, Field Operations (RSFO) may require the lessee to prepare a report determining the potential existence of any archaeological resource that may be affected by the operations. If evidence suggests that an archaeological resource may be present the lessee shall either relocate the site so as to not affect the resource or establish to the satisfaction of the RSFO that an archaeological resource does not exist or will not be adversely affected by the operations. If the RSFO determines that an archaeological resource does exist and may be adversely affected the lessee shall take no action until told by the RSFO how to protect the resource.

AEC Action: The closest known archaeological resources to the McCovey project area are the cabins and house depressions located on Cross Island 5.3 miles to the southeast. Although there are known to be numerous shipwrecks along the coast of the Beaufort Sea, no surveys for locations of these shipwrecks have been made. In April 2000, a AGSI shallow hazard survey was conducted to confirm the absence of any archaeological sites at the project location. Reanier & Associates (Reanier) conducted a third-party review of the data and evaluation. Reanier concurred with the no-impact evaluation and copy of the concurrence is provided as Appendix G.

Stipulation No. 2: Protection of Biological Resources

The RSFO may require the lessee to conduct biological surveys needed to determine the extent and composition of biological populations and habitats requiring additional protection. As a result of these surveys, the RSFO may require the lessee to relocate the site of operations; modify the operation and/or establish that operations will not have adverse effects, or that special biological resources do not exist; or operate during periods of time that will not cause significant adverse effects upon the resource. In addition, the lessee is required to report any areas of biological significance discovered during the conduct of any operations on the lease, and make every effort to preserve and protect the biological resources from damage until the RSFO provides direction with respect to resource protection.

AEC Actions: Previous survey work on nearby federal and state acreage and site specific shallow hazard work at the McCovey location in April 2000 have not identified any hard bottom (i.e. "boulder patch" areas). AEC, in April and July/August 2000, as required by 30 CFR 250.33 (b)(1)(ix), shallow hazard survey activities were conducted including detailed bathymetry and remote underwater camera work. These surveys did not identify any presently unknown biological communities in a 500-meter x 500-meter area centered on the drilling location. These surveys did not identify any notable biological communities in a 500-meter x 500-meter area centered on the drilling location. These surveys, and their interpretations have been provided to the RSFO as part of the Shallow Hazard report.

Stipulation No. 3: Orientation Program

The lessee must develop a proposed orientation program for all personnel involved in the exploration program.

AEC Actions: All AEC and contractor personnel will receive North Slope cultural awareness training, and specific training in environmental awareness and safety, including polar bear avoidance. An Environmental and Cultural Orientation program has been developed for this project, and is attached as Appendix H. Orientation Program training will include the MMS approved video program "Exploring the Beaufort Sea". A polar bear interaction plan and request for a letter of authorization will be submitted to the USF&WS as part of the IHA. Appropriate parts of video materials currently in the library that were prepared for the Kuvlum and Stinson projects. In addition, Incidental Harassment Authorization (IHA) for Marine Mammals will be acquired which include orientation and training and polar bear interaction plan will be submitted to the US Fish and Wildlife Service (USFWS) as part of the IHA.

Stipulation No. 4: Transportation of Hydrocarbons

This stipulation states that pipelines are the preferred mode of transporting production.

AEC Actions: This stipulation is not applicable to this exploratory drilling program.

Stipulation No. 5: Industry Site-Specific Bowhead Whale Monitoring Program

A monitoring program is required for drilling and seismic operations conducted during the bowhead whale migration.

AEC Actions: No drilling operations will occur during whale migration season, and no open-water seismic data is scheduled to be collected during this McCovey Project. AEC has applied to the National Marine Fisheries Service (NMFS) for an IHA for taking of marine mammals incidental to exploration drilling activities that will be conducted at the McCovey Prospect Area. A copy of the application is provided as Appendix I. The proposed IHA Application monitoring program will utilize visual observations by trained personnel combined with climatic condition measurement to locate and assess the presence, distribution, and behavior of the six species of marine mammals that are known to use the McCovey Prospect Area. The six species of marine mammals are the bowhead whale, Beluga whale, ringed seal, spotted seal, bearded seal, and polar bear. AEC will also record information on any other marine mammals that may be encountered in the project mobilization and operation area.

During open water, shipboard observations of cetaceans and pinnipeds will be conducted as proposed in the IHA Application. Polar bear monitoring (in accordance with the IHA Application submitted to USFWS) will occur whenever personnel are on board the SDC, through both the open water and full ice coverage seasons.

Stipulation No. 6: Subsistence Whaling and Other Subsistence Activities

Exploration, development, and production operations must be conducted in a manner that prevents unreasonable conflicts between the oil industry and subsistence activities (including, but not limited to Bowhead whale subsistence hunting). The lessee must contact the potentially affected communities and a discussion of resolutions reached during a consultation process and any unresolved conflicts with communities, individuals, and other entities shall be included in the exploration plan and a copy of this plan will be delivered to the potentially affected communities.

AEC Actions: A community outreach program was initiated on October 9, 2001, and will continue throughout planning and through the execution of the project. Summaries of completed and pending meetings were included in the IHA Application provided in Appendix I.

Stipulation No. 7: Oil Spill Response Preparedness

Lessee must submit Oil Spill Contingency Plans for review and approval that address all aspects of oil spill response readiness prior to approval of exploration or development and production plans.

AEC Actions: The Oil Spill Response Plan (OSRP/ODPCP) is provided in Appendix D. The plan provides information on oil spill prevention and control procedures, response organization, risk analysis, and environmental sensitivity. It is designed to assist AEC and contractor personnel in responding rapidly and effectively to oil spills that may result from exploratory drilling operations.

Stipulation No. 8: Agreement Between the United States of America and the State of Alaska

This stipulation is advisory as to the Outer Continental Shelf Lands Act and the ownership of disputed tracts.

AEC Actions: No compliance activity is required. It is AEC's understanding that this matter was resolved in 1997.

Stipulation No. 9: Agreement Regarding Unitization

This stipulation is also advisory in nature and identifies those blocks subject to the "Agreement Regarding Unitization for the Outer Continental Shelf Oil and Gas Lease Sale 124 and State Oil and Gas Lease Sale 65 between the United States of America and the State of Alaska".

AEC Actions: No compliance action is required.

13.0 CERTIFICATION OF ALASKA COASTAL MANAGEMENT CONSISTENCY PROGRAM

AEC will submit a Coastal Project Questionnaire (CPQ) and Certification Statement to the office of the Governor, Division of Governmental Coordination. A copy of the CPQ is provided as Appendix J.

14.0 EPA PART 55 AIR PERMIT

The enclosed application and "Notice of Intent (to submit an application for pre-construction permit) McCovey Exploration Prospect – Beaufort Sea" is pending and will be provided upon submittal to the U. S. Environmental Protection Agency (EPA) as Appendix K.

15.0 SECTION 10 PERMIT

AEC will submit a request for coverage of Nationwide Permit-8 (NWP-8). NWP-8 has been deemed consistent with the Alaska Coastal Management Program (ACMP) per 6 AAC 50.050 (c) and (e). A copy of the request for coverage under NWP-8 is provided as Appendix L.

16.0 COMMUNITY OUTREACH PROGRAM

AEC has actively engaged locally affected communities through several meetings with the public and local officials. Details of the outreach program comments received, and proposed additional interaction is provided in the IHA Application and supporting documents in Appendix I.

APPENDIX A

REMOTE UNDERWATER VEHICLE OBSERVATION SUMMARY

ARCTIC GEOSCIENCE, INC.
1000 O'MALLEY DRIVE, SUITE 205 • ANCHORAGE, ALASKA 99515-3069

ROV Observation Summary
McCovey Prospect
OCS, Beaufort Sea, Alaska

Prepared for:

AEC OIL & GAS (USA) INC.

By:

Arctic GeoScience, Inc.
1000 O'Malley Drive, Suite 205
Anchorage, AK 99516

September 2000

00-0505 wo 12

Phone (907) 522-4300 FAX (907) 522-4301

ARCTIC GEOSCIENCE, INC.
1000 O'MALLEY DRIVE, SUITE 205 • ANCHORAGE, ALASKA 99515-3069

Sept. 19, 2000
00-0505wo12

PHILLIPS Alaska Inc.
P.O. Box 100360
Anchorage, Alaska 99510-0360

Attention: Mr. Gregory Keith

ROV OBSERVATION SUMMARY
PHILLIPS ALASKA INC. McCOVEY PROSPECT
OCS, BEAUFORT SEA, ALASKA

Mr. Keith:

Transmitted herewith is five (5) copies of a summary of the ROV video sea floor survey performed on 4/19/00 as part of the PHILLIPS Alaska Inc.'s McCovey Prospect Site Clearance Program, Site No. 4.

The included summary details operations related to the ROV survey, provides observation notes with coordinates, a plot of the survey traces, and a copy of the biological survey.

Arctic GeoScience Inc. appreciates this opportunity to assist PHILLIPS Alaska Inc. with your site clearance program for the McCovey Prospect exploration site. We trust that our services to date have been of value. Arctic GeoScience Inc. will continue to remain available to assist you and further support your program needs. If you should have any questions or require any additional information please do not hesitate to contact the undersigned.

Sincerely,
Arctic GeoScience Inc.

Michael G. Schlegel
Technical Consultant
President/CEO

Phone (907) 522-4300 FAX (907) 522-4301

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ROV Observation Summary

PHILLIPS Alaska, Inc. McCovey Prospect

OCS, Beaufort Sea, Alaska

1.0 INTRODUCTION

A sea floor video survey of the McCovey Prospect Site #4 was performed on April 19, 2000 using a remotely operated vehicle (ROV) equipped with a high-resolution wide-angle video camera. The purpose of the survey was to characterize the species composition, abundance, and distribution of the benthic community, visually characterize the material composition of the sea floor surface, verify the presence of stone or boulder fields which might inhibit the placing of an exploration structure, determine the presence of ice gouging at the site, and finally, identify the presence, if any, of oceanic flora.

The findings of the video survey were used to provide a preliminary determination of the viability of the site for placing an offshore structure and to provide contributing information for meeting the requirements of a biological survey as required by 30 CFR 250.203(b)(12), 250.204(b)(8)(v)(B), and Notice to Lessees (NTL) 98-08. This report summarizes the findings of the video survey. A copy of the biological report previously submitted to PHILLIPS, Alaska in Arctic GeoScience Inc.'s, <u>Geotechnical and High Resolution Geophysical Investigation Site Data Report</u> has been included in Appendix A for convenience.

2.0 EQUIPMENT

A remotely operated underwater vehicle (ROV), the MiniROVER MKII manufactured by Benthos, Inc., was used to perform the survey. The MKII is a streamlined underwater vehicle with a low light, high resolution color video camera and two variable intensity long-life quartz halogen lamps. The camera has a wide field of view, 95 degrees, and may be panned and tilted 45 degrees above and below the horizontal. Internal to the ROV, a fluxgate compass and depth sensor have been installed for navigation and documentation; data from these instruments is superimposed on the video display of the camera.

The ROV is directly connected to a surface control consol via a 500-foot tether cable. Telemetry, video, and power are all transmitted via this cable. As power is supplied external to the ROV, loiter time underwater is virtually indefinite. Video images from the camera, along with navigational, operational, and current time and date are displayed on a standard video screen or television and can be recorded with a video camera recorder (VCR). A picture of the ROV immediately prior to deployment at the site is included as Figure 1. Not shown in the picture is the surface control console which was located in a heated shack.

3.0 DEPLOYMENT AND FINDINGS

The ROV was used to survey the seafloor of proposed McCovey Prospect sites 3 and 4. Initially Site 3 was selected for locating the exploration structure. However, after the survey, the water depth of this site, at 46 feet, was determined by PHILLIPS, Alaska to be too deep to support the intended exploration phase and the survey was subsequently moved to Site 4. This report, therefore, details the observations made at Site 4.

A time and event summary of all ROV operations between April 16 and April 19 are included in Appendix B.

3.1 McCovey Site 4 Survey

On April 18, 2000 the ROV was deployed to Site 4. Deployment was made through an existing ice boring staked and labeled "4-2". Although other ice borings were present this particular boring was the only one which had sufficient diameter to allow deployment of the ROV. The UTM zone 6 coordinates of bore hole "4-2" are:

7825170 N
456104 E.

Water depth at Site 4, directly beneath the deployment hole, was measured by sounding to be 35 feet. The ROV's depth sensor recorded a water depth of approximately 34.5 feet when the ROV was sitting on the sea floor, confirming the relative accuracy of the onboard sensor. The ROV was placed in the deployment hole at 11:54 p.m. and the survey commenced on a southerly magnetic course at 00:02 a.m. on April 19.

As the fluxgate compass of the ROV displays is magnetic, the survey was oriented on the magnetic cardinal headings of North, South, East, and West. The magnetic declination of the site is approximately 31 degrees East. A written log of the survey was kept and indexed to the time stamp on the video signal. In addition, the survey was recorded on magnetic video tape for future analysis and review.

Copies of the video tape and the survey log were delivered to PHILLIPS, Alaska upon completion of the survey and additional video tape copies were delivered on July 11, 2000.

The survey log has been included as Table 1. With the addition of observation coordinates, this log differs slightly from the survey log delivered previously to PHILLIPS, Alaska. In addition, the survey has been graphically depicted, in relation to the proposed exploration site, in Figure 2. Observation events are plotted and colored coded to facilitate locating and identifying the features recorded. They have also been numbered and indexed to the survey log in Table 1.

3.2 Survey Summary

The survey revealed a seabed composed of low relief and dominated by sediment bed flow ripples with randomly located linear furrows formed by ice gouging. These gouges provide the only true vertical relief to an otherwise featureless bottom. The bottom surface appears to be composed of fine-grained sand, organic detritus, and, in localized areas, possibly some silt. At the time of the survey there appears to have been little or no water current over the seafloor as evidenced by debris disturbed by the ROV hanging motionless in the water column.

There was no evidence of single or multiple boulders, stones, cobbles or other objects, nor flora within the survey radius. Although present, the epibenthic and infaunal community is of exceptionally limited density and diversity. See Appendix A for a biological discussion of the site.

Typical examples of the featureless nature of the seabed are shown in Figures 3 and 4 and ice-gouging examples are included as Figures 5 and 6.

4.0 CLOSURE

The information presented and described herein is based on Arctic GeoScience Inc.'s ROV survey performed at PHILLIPS' McCovey Prospect from April 16 to April 19, 2000. This information is presented to support PHILLIPS Alaska, Inc.'s planning for the execution of an offshore exploration well during the winter of 2000-2001 in the Alaska OCS Region of the Beaufort Sea.

Arctic GeoScience, Inc. performed this work in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. This ROV observation summary has been prepared specifically for PHILLIPS Alaska, Inc.

Arctic GeoScience, Inc. appreciates this opportunity to assist PHILLIPS Alaska, Inc. with the site clearance activities at the McCovey Prospect and continues to remain available.

Sincerely,
Arctic GeoScience, Inc.

For Steven C. Henslee, P.E.
Senior Engineer

Reviewed by:

Charles J. Livers, P.E.
Engineering Group Manager

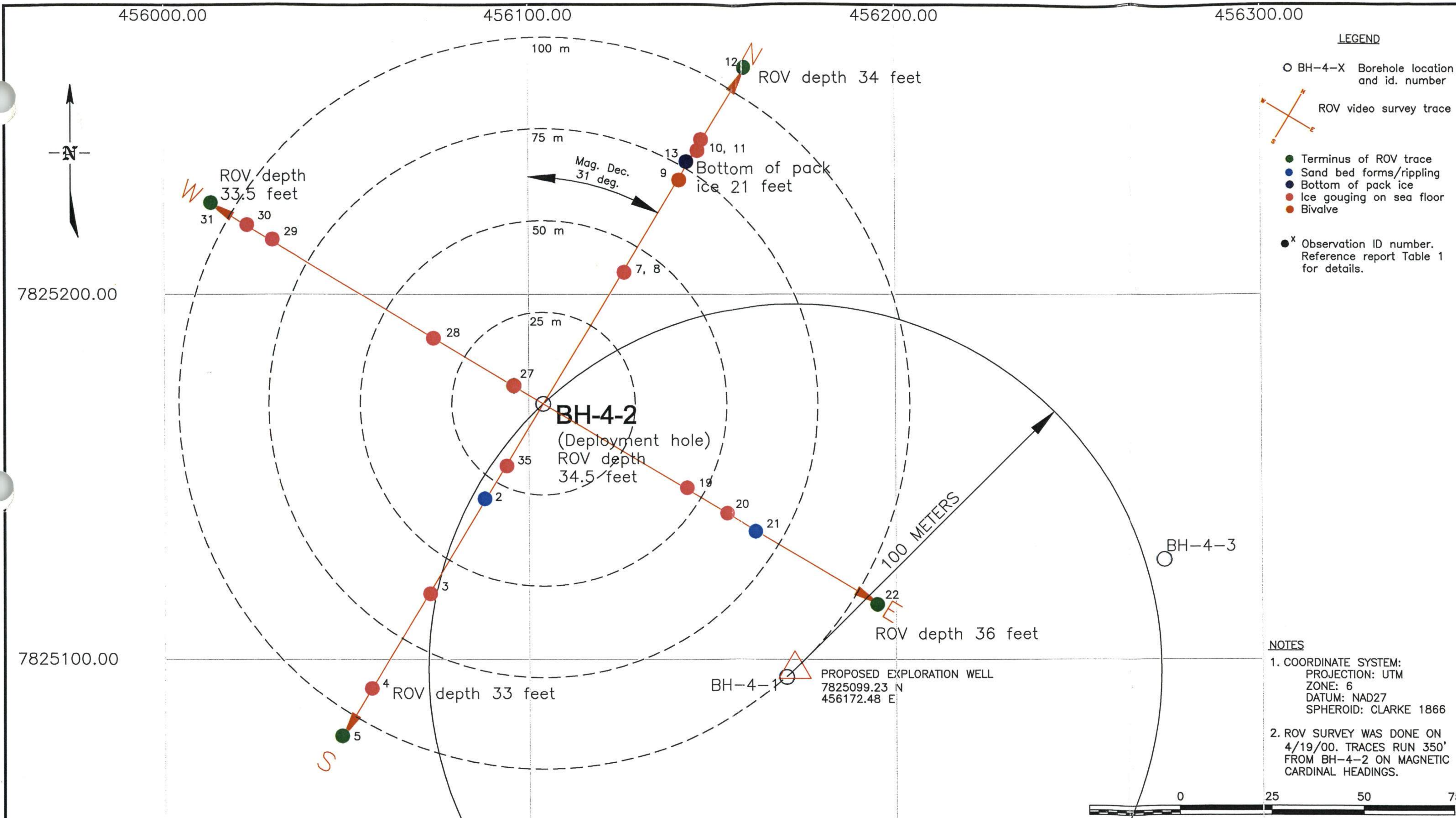
Michael G. Schelgel
Technical Consultant
President/CEO

Figures

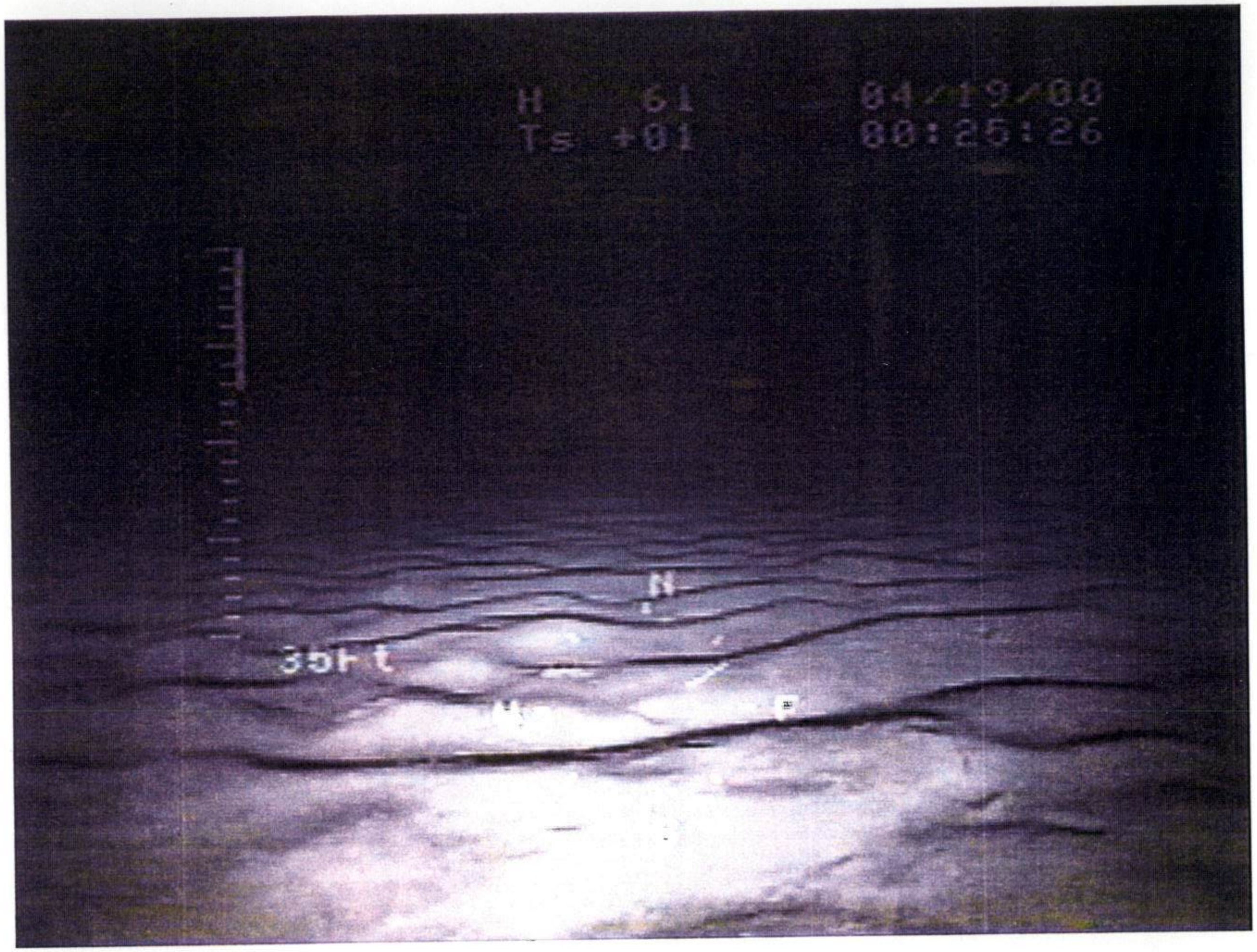
DEPLOYMENT OF ROV

McCOVEY PROSPECT SITE

ARCTIC GEOSCIENCE, INC.	ROV Observation Summary McCovey Prospect Beaufort Sea, Alaska April 16-19, 2000	By: SCH	Date: SEP 2000	Project No: 00-0505.12
		Checked: CJL	Date: SEP 2000	Figure No. 1
	AEC OIL & GAS (USA) INC.	Scale: N/A		



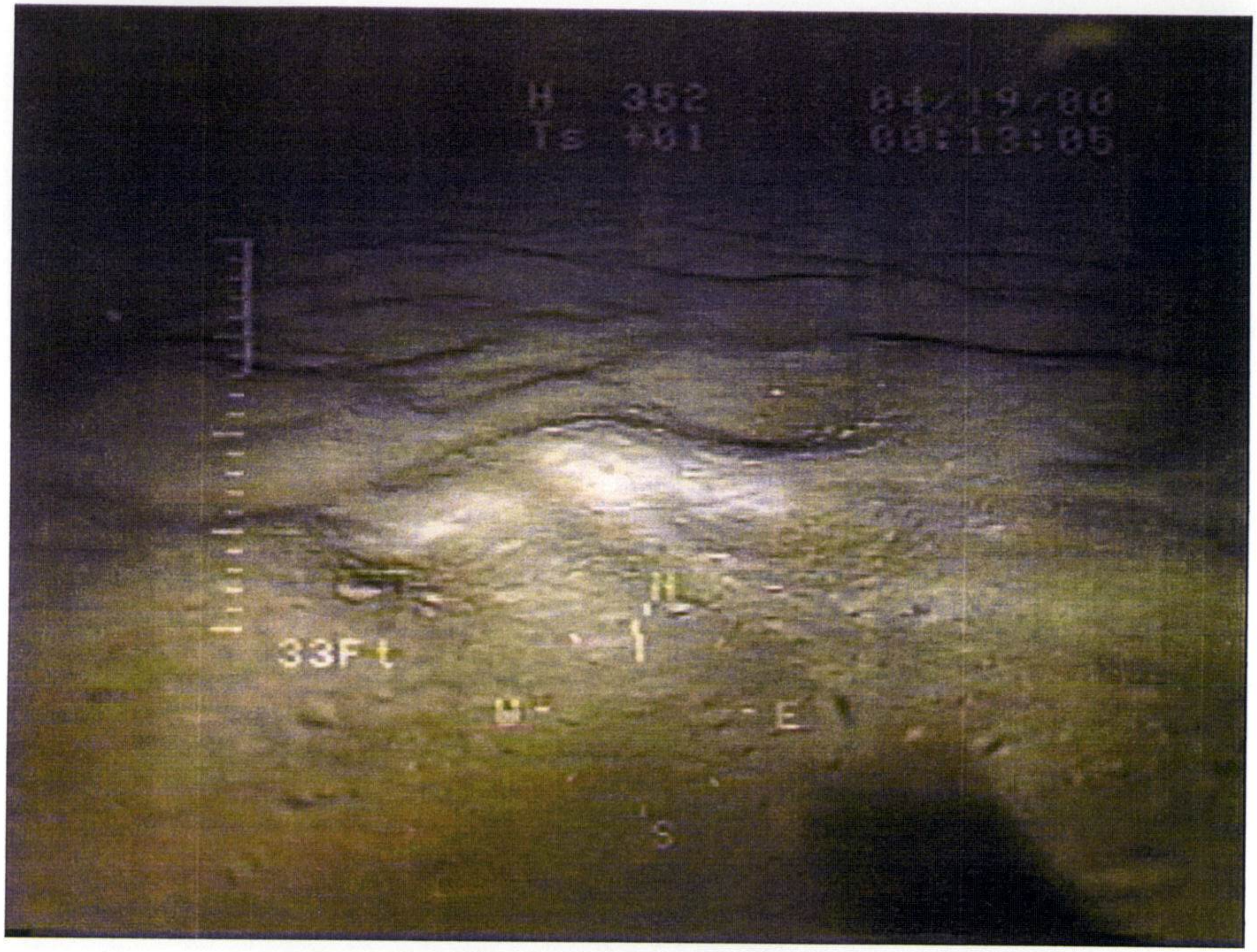
ARCTIC GEOSCIENCE, INC.	Title: OBSERVATION PLOT ROV VIDEO SEA FLOOR SURVEY	Designed By: SCH	Date: SEP. 2000	Job No.: 00-0505 wo12
	Project: McCovey Prospect Site Clearance Program, Site No. 4 Beaufort Sea, Alaska	Drawn By: SCH	File Name: Fig_2.dwg	Figure No.: 2
	Client: AEC OIL & GAS (USA) INC.	Checked By: CJL	Scale: 1:100	



SEABED FLOOR, TYPICAL OF SITE

TERMINUS OF EAST SURVEY

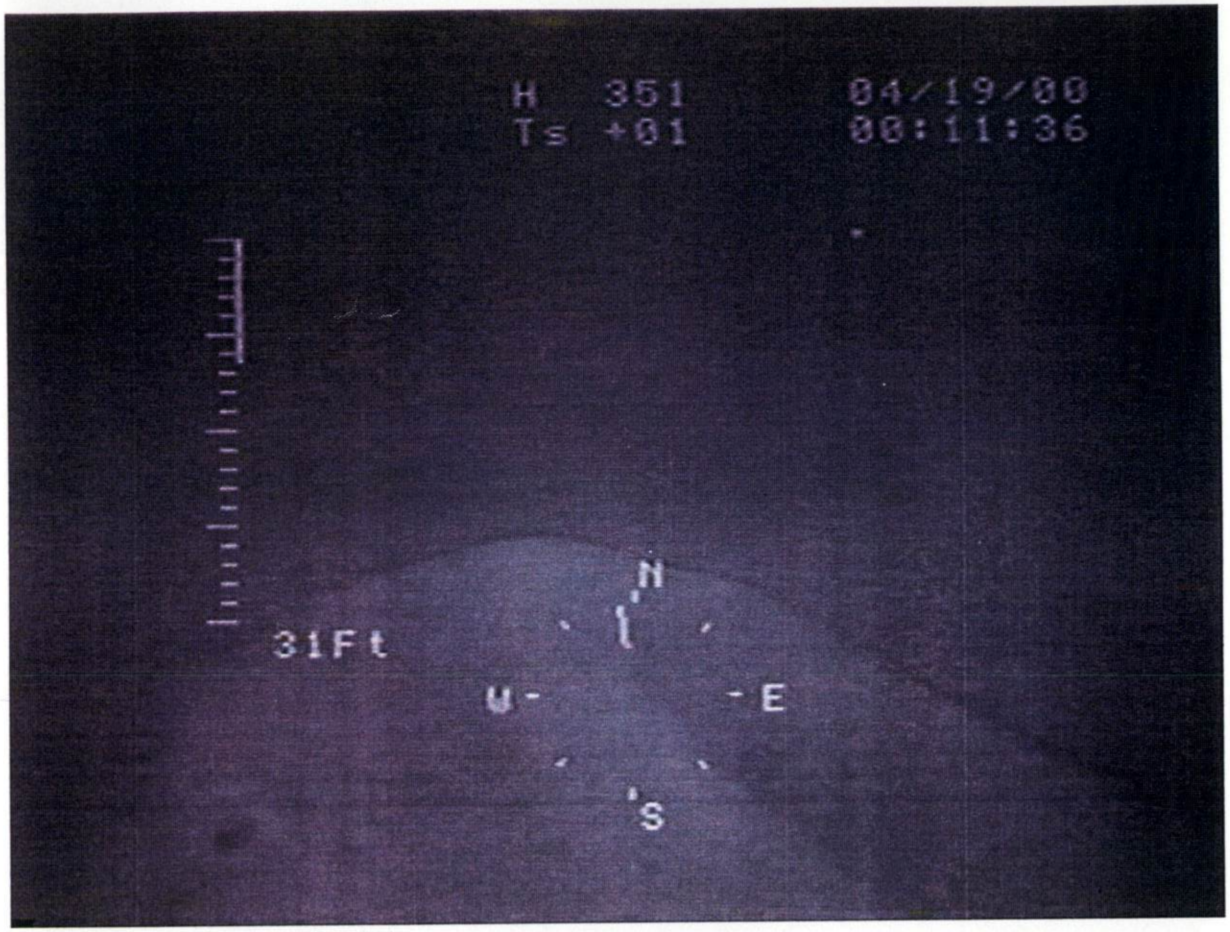
ARCTIC GEOSCIENCE, INC.	**ROV Observation Summary** McCovey Prospect Beaufort Sea, Alaska April 16-19, 2000	By: SCH	Date: SEP 2000	Project No: 00-0505.12
		Checked: CJL	Date: SEP 2000	Figure No. 3
	AEC OIL & GAS (USA) INC.	Scale: N/A		



SEABED FLOOR, TYPICAL OF SITE

TERMINUS OF NORTH SURVEY

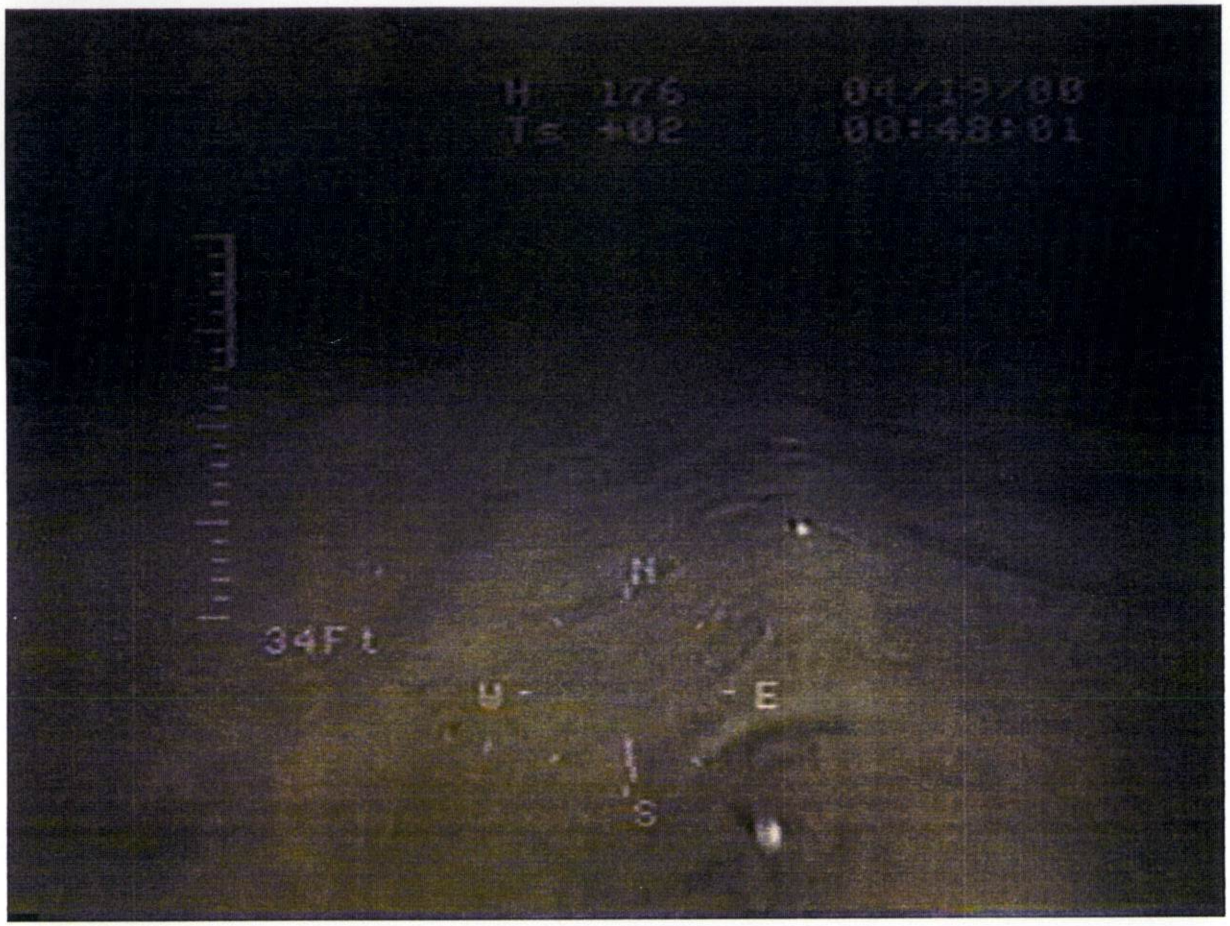
ARCTIC GEOSCIENCE, INC.	**ROV Observation Summary** McCovey Prospect Beaufort Sea, Alaska April 16-19, 2000	By: SCH	Date: SEP 2000	Project No: 00-0505.12
		Checked: CJL	Date: SEP 2000	Figure No. 4
	AEC OIL & GAS (USA) INC.	Scale: N/A		



ICE GOUGE TERMINUS.

NORTH SURVEY

ARCTIC GEOSCIENCE, INC.	**ROV Observation Summary** McCovey Prospect Beaufort Sea, Alaska April 16-19, 2000	By: SCH	Date: SEP 2000	Project No: 00-0505.12
		Checked: CJL	Date: SEP 2000	Figure No. 5
	AEC OIL & GAS (USA) INC.	Scale: N/A		



ICE GOUGE TRACK

DIRECTLY BELOW DEPLOYMENT HOLE

ARCTIC GEOSCIENCE, INC.	**ROV Observation Summary** McCovey Prospect Beaufort Sea, Alaska April 16-19, 2000	By: SCH	Date: SEP 2000	Project No: 00-0505.12
		Checked: CJL	Date: SEP 2000	Figure No. 6
	AEC OIL & GAS (USA) INC.	Scale: N/A		

Table 1

ROV Survey Log

Table 1
ROV Survey Log

ID No.	Time	Northing (meters)	Easting (meters)	Observations
1	**4/18/00** 23:54:00	7825170	456104	Start survey, commence recording.
	23:56:00			ROV too buoyant, remove ROV from hole to add weight.
	4/19/00 00:00:00			ROV back in hole, commence survey.
	00:01:00			Recorder back online.
	00:02:00			Ice gouging directly beneath access hole, gouging orientation North and South. Commence bottom survey to the south.
2	00:03:00	7825144	456088	Heading south, sand bed forms.
3	00:04:00	7825118	456073	More ice gouging. General orientation East and West.
4	00:05:00	7825092	456057	Three ice gouges, NE/SW orientation. Water depth at 33 feet per ROV depth gauge.
5	00:05:30	7825079	456049	End of southerly survey, begin return to deployment hole. Rotate to find tether for return route.
6	00:07:00	7825170	456104	ROV at bottom of hole, descend to seabed for commencement of bottom survey to the North.
	00:08:00			At seabed floor below hole, commence travel to the North.
7	00:09:48	7825207	456126	Follow North / South ice gouging.
8	00:09:50	7825207	456126	Ice gouging turning to the East. Additional ice gouging appearing ahead, orientation East / West.
9	00:11:00	7825231	456140	Bivalve.
10	00:11:25	7825239	456146	More sea floor ice gouging.
11	00:11:34	7825242	456147	Terminus of gouge. **Reference figure 5**
12	00:12:31	7825262	456159	At end of tether for North survey. Deployed tether length is 350 feet. Set ROV on bottom for inspection and measurement of depth. Water depth 34 feet.
	00:13:30			Seabed surface appears to be composed of fine-grained sand. **Reference figure 4**
	00:14:00			Lift off bottom and commence return trip to deployment hole. Again, return via tether.
	00:14:30			Found tether and commence return trip.
13	00:15:47	7825236	456143	Bottom of ice at 21 feet.
14	00:15:57	7825232	456141	Bottom of ice at 18 feet.
15	00:16:45	7825216	456131	Lost cable in the ice.

Table 1
ROV Survey Log

ID No.	Time	Northing (meters)	Easting (meters)	Observations
16	00:18:05	NA	NA	Descend to the sea bottom and commence swinging around looking for the tether.
	00:18:11			Found the tether and resume trip back.
17	00:20:41	NA	NA	Bottom of ice at approx. 18 feet. Still looking for deployment hole.
18	00:21:30	7825170	456104	At deployment hole, commence descent to seabed and set up for survey to the East. (Ended up manually pulling the ROV to the deployment hole via the tether.)
19	00:23:10	7825147	456143	Ice gouging. Orientation estimated at NW/SE.
20	00:23:38	7825140	456154	Ice gouging.
21	00:24:00	7825135	456162	Bottom features: Sand bed flow ripples.
22	00:25:26	7825115	456195	End of survey to the East. Depth approximately 36 feet. ROV on seabed floor; brown med to fine sand. Sand rippling. **Reference figure 3**
	00:26:48			Find tether and commence return trip to deployment hole.
23	00:29:00	7825146	456144	Lost tether in the ice.
	00:32:00			Looking for tether.
	00:34:00			Found the tether and continue return to deployment hole.
24	00:34:50	7825158	456125	Tether hung up in the ice. Unable to pull the tether from the deployment hole.
	00:36:01			Descend to the bottom and head the ROV to the West. Hoping to pull the tether down and away from ice.
25	00:36:51	7825170	456106	Appear to be free. Set on seabed and setup to pull ROV to the deployment hole via the tether.
26	00:38:00	7825170	456104	Back at the hole. Commence descent to the bottom to set up for survey to the West.
	00:38:30			Commence survey.
27	00:38:45	7825175	456096	Ice gouging. Continue westerly heading.
28	00:39:15	7825185	456080	Little to no current during the time of the survey. Bottom debris from earlier surveys can be seen suspended in the water.
29	00:40:47	7825215	456030	A number of ice gouges appearing.
30	00:41:00	7825219	456023	Exceptionally large ice gouge.
31	00:41:20	7825225	456013	Reach end of tether to the West.
	00:41:30			Set ROV on seabed. Water depth approximately 33 to 34 feet.
	00:42:08			Red worm in the distance approaching ROV.
	00:42:50			Worm burrows into the sand.

Table 1
ROV Survey Log

ID No.	Time	Northing (meters)	Easting (meters)	Observations
32	00:43:00	7825225	456013	Commence return to deployment hole. Using tether to manually pull the ROV.
	00:44:28			Swung around to find tether. Surface crew begins pulling tether.
33	00:46:10	7825170	456104	Back at the deployment hole. Descend to seabed and set on floor.
34	00:46:38	7825170	456104	Water depth 34 to 35 feet. Corresponds to earlier soundings taken through the ice hole from the surface. Large ice gouge directly beneath access hole.
	00:47:48			Pickup and follow the ice gouge to the South. **Reference figure 6**
35	00:48:20	7825153	456094	Ice gouge ends.
36	00:48:30	7825148	456090	End of survey to the South following ice gouge. Pull ROV back to deployment hole
37	00:50:17	7825170	456104	At the test hole. Site survey complete. Power down ROV.

Notes:

1. ID numbers indexed to Figure 2.
2. All times are in Alaska Standard Time
3. Coordinates are in meters.
4. Coordinates shown for the various time increments are computed from the total distance traveled, assumed magnetic variation for the area, compass headings recorded by the ROV compass, ROV operator assumptions, and reasonable estimates. Consequently, these coordinates should be treated as approximate positions only.

ROV Observation Summary

McCovey Prospect

OCS, Beaufort Sea, Alaska

Appendix A

Biological Survey – Winter Conditions

McCovey Prospect Site Clearance Program: Site 4
Beaufort Sea, Alaska

Biological Survey – Winter Conditions

Prepared by:

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1000 O'MALLEY DRIVE, SUITE 205
ANCHORAGE, ALASKA 99515-3069
(907) 522-4300

JUNE 8, 2000

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SECTION

1.0 ABSTRACT

The PHILLIPS Alaska, Inc. McCovey Prospect Site #4-2 is located in the Beaufort Sea, about 32 kilometers (km) north and 5 km east of the Prudhoe Bay Airport, Alaska. The survey was conducted beneath sea ice on April 19, 2000 using a remotely operated vehicle (ROV) equipped with a video camera. The purpose of the survey was to characterize the species composition, abundance, and distribution of the benthic community. The physical environment at the project site was dominated by fine and medium-grained sediments with distinctive sediment bed flow ripples and linear furrows caused by ice gouging. Epibenthic biota and infauna was limited to one or more species of an unidentified bivalve and a polychaete worm. The macrofauna of the nektonic community was comprised largely of amphipod crustaceans. Other nektonic and planktonic organisms were likely present but outside the range of video resolution. Traces or imprints resulting from the actions of epibenthic and burrowing organisms on surface sediments are evident throughout the survey area.

2.0 INTRODUCTION

This biological survey was conducted in response to 30 CFR 250.203(b)(12) (Exploration Plan), 250.204(b)(8)(v)(B) (Development and Production Plan) and Notice to Lessees (NTL) 98-08 ("Notice to Lessees and Operators of Federal Oil and Gas Leases in the Pacific Outer Continental Shelf Region – Biological Survey Criteria"). These regulations and the associated NTL define biological survey criteria and require the lessee to submit the results of the biological survey to the applicable Minerals Management Service (MMS) office for review. NTL 98-08 applies to lessees within areas that may contain significant biological communities.

NTL 98-08 applies only to the Pacific Outer Continental Shelf (OCS) region and is not directly applicable to leases within the Alaska OCS region. However, the Alaska MMS office is presently requiring lessees and operators to conduct biological surveys following the purpose and intent of NTL 98-08.

The overall purpose of a biological survey is to describe the habitats and species that may be affected by proposed exploration or development operations. NTL 98-08 defines the criteria and focus of the biological survey. These guidelines include documenting species composition, abundance, density and generally defining and describing in a regional context, the biological components existing in the survey area. The emphasis and focus of the biological survey in the Alaska OCS region is on the benthic community.

NTL 98-08 states that the survey should include observations of fisheries, seabirds, and marine mammal activities within the study area. These surveys, including additional benthic surveys, will be undertaken during the summer of 2000.

3.0 SURVEY METHODOLOGY AND PROCEDURES

The Remote Operated Vehicle (ROV) used to videotape the bottom was a Benthos MiniROVER MK II, equipped with a high-resolution, low-light sensitive, color video camera and with two 150-watt Quartz Halogen lamps. The camera had an automatic iris, 3.5 mm / f 1.8 lens with a field of view of 95° horizontally and 75° vertically. The ROV was navigated with a joystick control and viewed through a TV monitor.

ROV transects were conducted on April 19, 2000. Each transect had a length of about 350 feet (107 meters from the approximate site of borehole 4-2 and was conducted on roughly cardinal headings from a cored ROV deployment hole. Videotapes were analyzed using a JVC Model HR-VP473U VHS player and a 17-inch LXI monitor. The video comprised a transect record of approximately 50 minutes.

4.0 RESULTS

4.1 Physical Environment

The PHILLIPS McCovey Prospect Site #4-2 is located in the Beaufort Sea, about 32 km north and 5 km east of the Prudhoe Bay Airport (Figure 1). The survey was conducted beneath sea ice on April 19, 2000. Transect locations are depicted in Figure 2.

Water depths at the project site ranged from approximately 32 (9.8 m) to 36 feet (11.0 m) based on ROV bathymetric instrumentation (Figure 3). The bottom of the sea ice varied from roughly 18 to 21 feet (5.5 to 6.4 m) below the surface.

The seabed at the survey site is composed of a low relief seabed dominated by sediment bed flow ripples interspersed with linear gouges or furrows caused by ice gouging. The ice gouges provide the only significant vertical relief on an otherwise flat to slightly rippled seabed. Bottom sediments appear to be dominated by fine to medium grain sedimentary materials, organic detritus, and silt. The apparent immobility of silt and detritus suspended by ROV disturbance suggests the absence of significant water currents during the survey period. Biogenic mounds resulting from the actions of infaunal organisms were not observed.

The micro-landscape demonstrated traces or tracks resulting from the activities of benthic organisms on surface sediments. The sediment traces ranged from surface craters or dimples a few centimeters in diameter, to irregular overlapping tracks. In some instances, video images suggested the presence of burrows. However, because of video resolution it was not possible to accurately distinguish between a small, cone-shaped surface depression and a burrow. In one instance, a polychaete worm either sought refuge within a previously excavated burrow or rapidly burrowed into undisturbed substrate (tape interval 00:42:50).

4.2 Biological Environment

ROV video surveys indicated that the shallow unconsolidated seabed sediments provide habitat for a limited number of epibenthic and infaunal organisms during periods of sea ice coverage. A quantitative or qualitative estimate of population density or abundance of represented benthic fauna was not possible.

Benthic macrofauna associated with the project site included a single bivalve mollusk (tape interval 00:11:00) and three observations of an unidentified polychaete worm (Phylum Annelida; Class Polychaeta). Video resolution was insufficient to positively confirm the presence of the mollusk. Bivalve siphons were not observed on any transect.

Video camera resolution was insufficient to permit taxonomic identification of the polychaete to the family, genus, or species level. The polychaete resembled taxa associated with the family Glyceridae, but this observation could not be confirmed. (polychaete taxonomic identification generally requires microscopic examination of parapodia or setae in order to determine genus and species). The polychaete observed at tape interval 00:42:08 can be observed burrowing into the substrate at tape interval

00:42:50. This specimen appeared to demonstrate a phototropic (light) or acoustical attraction to ROV lighting or sound. A polychaete was also observed adjacent to an ice gouge at tape interval 00:47:27.

Unidentified objects or structures of possible biological origin were also observed at tape intervals 00:40:53, 00:41:53, and possibly at 00:41:10. Whether these objects or structures were of biological origin could not be confirmed.

The water column supported an assemblage of unidentified nektonic and planktonic organisms. Nektonic amphipods (Class Crustacea; Family Gammaridae) were occasionally observed in the water column. ROV lighting backscatter was inimical to a more comprehensive characterization of the nektonic fauna.

No evidence of an epontic community (organisms living on the underside of sea ice) was discernible on the survey videotape.

5.0 DISCUSSION

The abundance, spatial, and seasonal distribution of benthic organisms in the Beaufort Sea are strongly influenced by environmental conditions. The results of winter benthic surveys suggests that the nearly featureless silt and sediment-dominated seabed, periodic disturbance caused by ice gouging, and sea ice coverage results in an epibenthic and infaunal community of exceedingly low diversity and density. Ice gouging results in habitat disturbance, crushing of benthic and infaunal biota, and sediment mixing (Braun, 1985). The macrofauna at the project site is represented by a small number of benthic mollusks, infaunal annelids, and nektonic crustacea.

The benthic communities in the Alaskan Beaufort Sea contain macrophytic algae (large kelps), benthic microalgae and bacteria, and benthic invertebrates. Although most of the substrates in the Beaufort Sea consist of silty sediments that are unsuitable for settlement and growth of macrophytes, hard substrates in the form of cobbles and boulders are known to exist (Dunton, 1984). Macroalgae are unlikely to occur in the vicinity of the project site because of the absence of hard substrates and frequent ice gouging.

Biomass and diversity in the inshore zone of the Beaufort Sea generally increase with depth, except in the shear zone at approximately 10 to 25 m in depth. Intensive ice gouging occurs in this zone between the landfast ice and the moving polar pack ice, which generally disturbs the sediments that infaunal organisms inhabit. Polychaetes, bivalves, and gammarid amphipods normally predominate in this zone (Carey, 1978). The diversity and biomass of infauna generally increases beyond this minimum-abundance zone with distance offshore. On the basis of the limited biota and prevailing water depths, the ARCO McCovey Prospect survey area appears to lie within the shear zone where winter biomass and diversity is low.

Epibenthic organisms are comprised primarily of crustacea and polychaetes that occupy the benthic boundary layer in offshore and littoral regions of the Beaufort Sea. Many epibenthic crustacea and polychaetes constitute important prey organisms for fish and form a critical component of the arctic food chain for higher trophic level species such as marine mammals and seabirds (Hachmeister and Vinelli, 1983). On the basis of the survey described herein, the ARCO McCovey Prospect site would not constitute an important winter feeding area for fishes or other higher trophic level organisms. Summer surveys planned for August 2000 utilizing trawls and grab sample collection apparatus will provide the opportunity to quantitatively characterize the diversity, density, and biomass of benthic and epibenthic organisms occurring at the project site during a period of known high primary and secondary production. Based upon the results of other investigations, distinct seasonal differences in species diversity, density, and abundance are to be expected. Summer biodiversity and species diversity is expected to exceed that associated with winter conditions (Broad, et al., 1978; Frost, et al., 1983; Stoker, 1981).

There are three basic categories of Beaufort Sea fishes: (1) freshwater species that make relatively short seaward excursions from coastal rivers, (2) anadromous species that spawn in freshwater and migrate seaward as juveniles and adults, and (3) marine species that complete their entire lifecycle in the marine environment. Freshwater species are found almost exclusively in association with fresh or brackish waters extending offshore from major river deltas and are unlikely to occur in the vicinity of the PHILLIPS McCovey project site.

Anadromous species found in the nearshore waters of the Beaufort Sea include arctic, least, and Bering cisco; broad and humpback whitefish; arctic char; pink and chum salmon; and rainbow smelt. The Mackenzie and the Colville rivers contain the most anadromous species (Craig, 1984). During the winter, major shifts in fish distributions take place. At that time, most anadromous species concentrate in the deep, unfrozen pockets of freshwater in North Slope rivers and lakes and are unlikely to occur in offshore waters in the vicinity of the project site.

Forty-three marine fish species have been reported from the Alaskan Beaufort Sea, with some found primarily in the brackish, nearshore waters; others in the marine, offshore waters; and some in both environments (Craig, 1984). The most widespread and abundant species are arctic cod, saffron cod, twohorn and fourhorn sculpins, Canadian eelpout, and the arctic flounder. Feeding habits of marine species are similar to those of anadromous species in nearshore waters, almost all of which rely heavily on epibenthic and planktonic invertebrates. The arctic cod has been described as a “key species in the Arctic Ocean” due to its widespread distribution, abundance, and importance in the diets of other fishes, birds, and marine mammals. Most marine species spawn during the winter period, some of them in the nearshore areas under the landfast ice cover. Others have suggested that the arctic cod spawn under the ice between November and February, and spawning areas appear to occur both in shallow coastal areas as well as in offshore waters (USDOI/MMS, 1990). The study area represents a possible spawning and foraging area for the arctic cod and other marine fish species. The absence of detectable fishes during the survey may reflect the limitations of the ROV video survey apparatus and/or the seasonal absence of fishes from offshore waters due to winter ice coverage.

6.0 CONCLUSIONS

The project site does not appear to constitute an important habitat for either infaunal or epibenthic invertebrates or fishes during the winter season.

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ROV Observation Summary

McCovey Prospect

OCS, Beaufort Sea, Alaska

Appendix B

Time and Events Summary

McCovey Prospect Site Clearance Program: Site 4

Beaufort Sea, Alaska

for PHILLIPS Alaska, Inc.

Time and Events Summary – ROV Survey

April 16, '00 – Arrived in Prudhoe Bay. AGSI personnel consisted of

Mike Schlegel
Tim Tester
Kevin Casey
Steve Henslee

Spend most of the morning making arrangements, shuttling equipment from AK Airlines Freight to CatCo's yard and loading the Rolligon. Left for field camp late in the afternoon / evening.

Upon arriving ate and then commenced to the the initial CID site for a preliminary ROV survey. This was an unofficial suvey done since Western GeoPhysical had a tight schedule the following day and wanted us to inspect the site immediately. If rocky ground or plant life were present, they would have to stop operations and reevaluate the project. Survey was recorded on video.

Performed the ROV survey between 2229 and 2330 hours. Did not cover full survey area, but enough to satisfy Western Geo. Deployment hole staked AGS AGM 2.

April 17, '00 Return to the site and deploy through the same hole. Performed ROV survey from 1210 to 1325 hours. Ran survey on all four cardinal headings and minor cardinal headings to a distance of approximately 350 feet on each heading. Returned to the base camp and prepared to leave for Anchorage. Survey was recorded on video.

Found out at 2045 hours that the site we surveyed was too deep and ARCO was selecting a second site to survey. I will be staying over the following day vs. returning to Anchorage.

April 18, '00 – Arrive on site for second survey approximately 2130 hours. Deploy through hole staked 4/2. Ran the survey on the 4 cardinal headings for an approximate distance of 350 feet each.

April 19, '00 – Continue the survey past the midnight hour. Ended survey at 00:50 hours. Left site soon after. Departed later in the day for Anchorage. Survey was recorded on video.

More detailed information can be found in Kevin Casey's field book for the dates of April 16 to April 18.

ROV specifications:

Benthos MiniROVER MK II

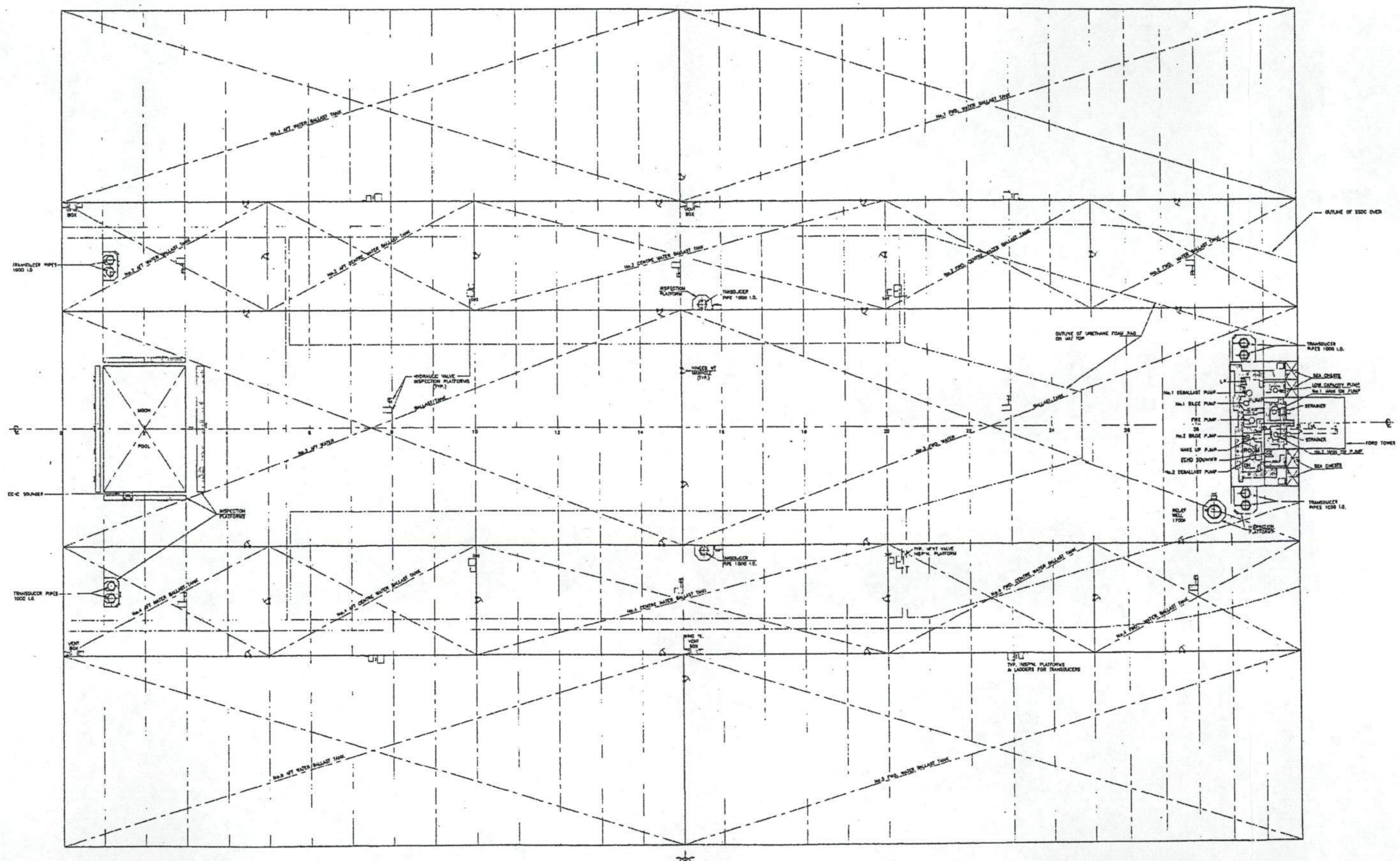
See Attached.

By S. Henslee

END OF EVENT SUMMARY

APPENDIX B

TYPICAL SECTIONS & DRAWINGS OF SDC



PLAN VIEW BELOW MAT TOP

NOTES:

1. No.2 CTR. No.2 FWD. CTR. No.2 AFT. CTR WATER BALLAST TANKS ARE NOW ONE BALLAST TANK.
2. No.4 CTR. No.4 FWD. CTR. No.4 AFT. CTR WATER BALLAST TANKS ARE NOW ONE BALLAST TANK.

DWG. NO.	REFERENCE DRAWINGS	REV.	REVISION DESCRIPTION	BY	DATE
		1	REDRAWN BY MARFI INC.	HN.	92-09-16

ENGINEERING RECORD		
DRAWN BY	PL	DATE
CHKD BY		
ENGINEER	WHJ	86 11 20

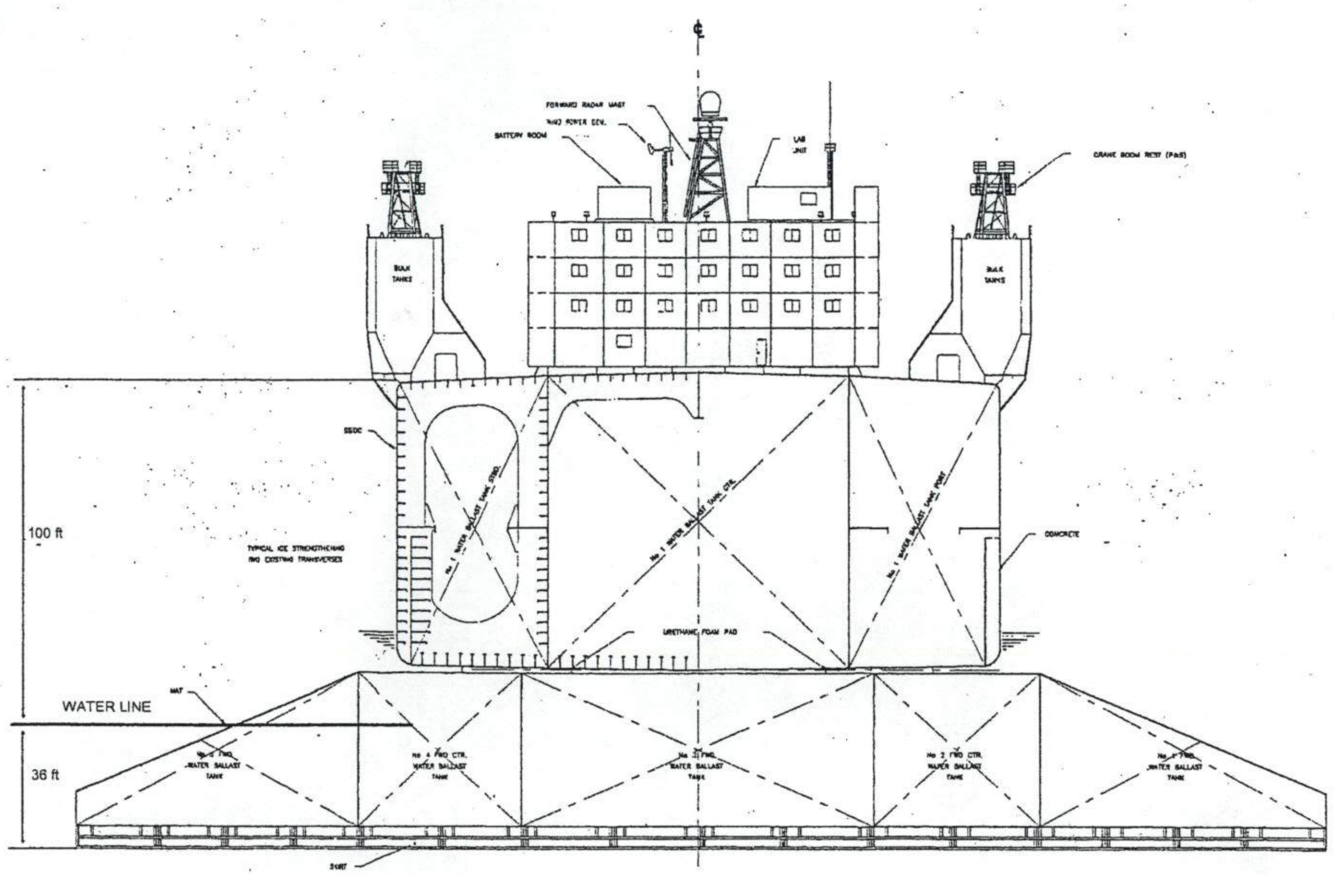
CANADIAN MARINE DRILLING LTD.
CALGARY ALBERTA CANADA

PROJECT SSDC - MAT
PREPARED BY ENGINEERING & DESIGN

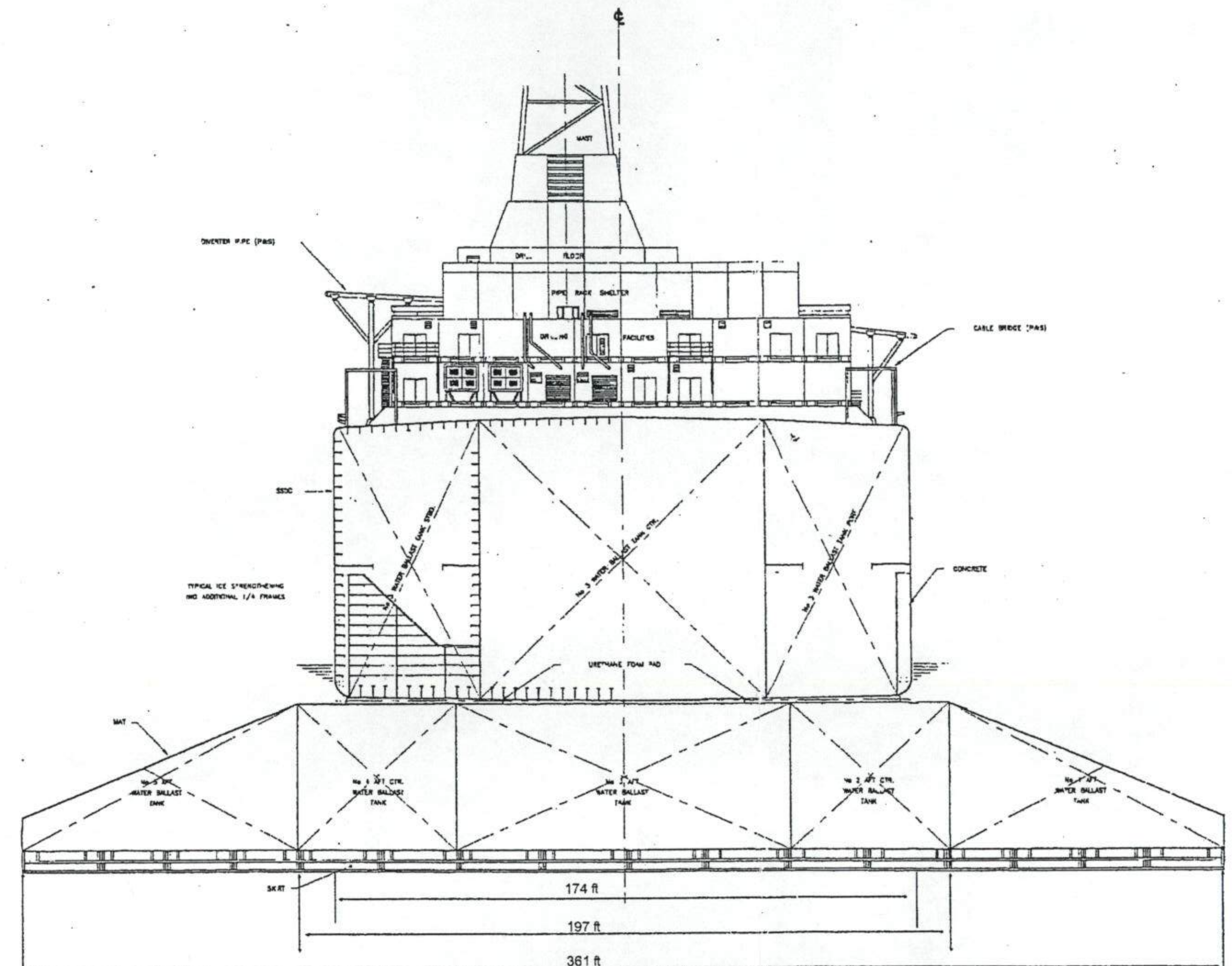
TITLE
GENERAL ARRANGEMENT SSDC - MAT
PLAN VIEW BELOW MAT TOP

SCALE 1 : 200

REV 1



TYPICAL SECTION IWO TWO BULK TANKS & ACCOMMODATION MODULES (LOOKING AFT)



TYPICAL SECTION IWO DRILLING FACILITIES (LOOKING AFT)

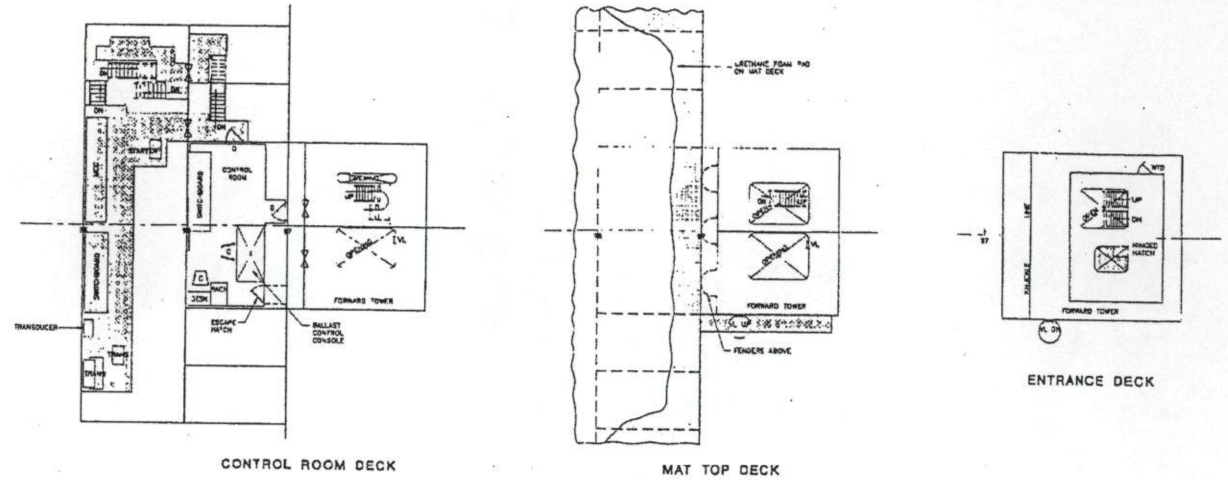
DWG. NO.	REFERENCE DRAWINGS	REV.	REVISION DESCRIPTION	BY	DATE
		2	WIND POWER GENERATOR ADDED TO ACCOMMODATION MODULE	KG	94-01-13
		1	REDRAWN BY MAREI INC.	DE	92-09-16

ENGINEERING RECORD		
DRAWN BY	PL	DATE
CHKD BY		
ENGINEER	WHJ	86 11 20

CANADIAN MARINE DRILLING LTD.
CALGARY ALBERTA CANADA

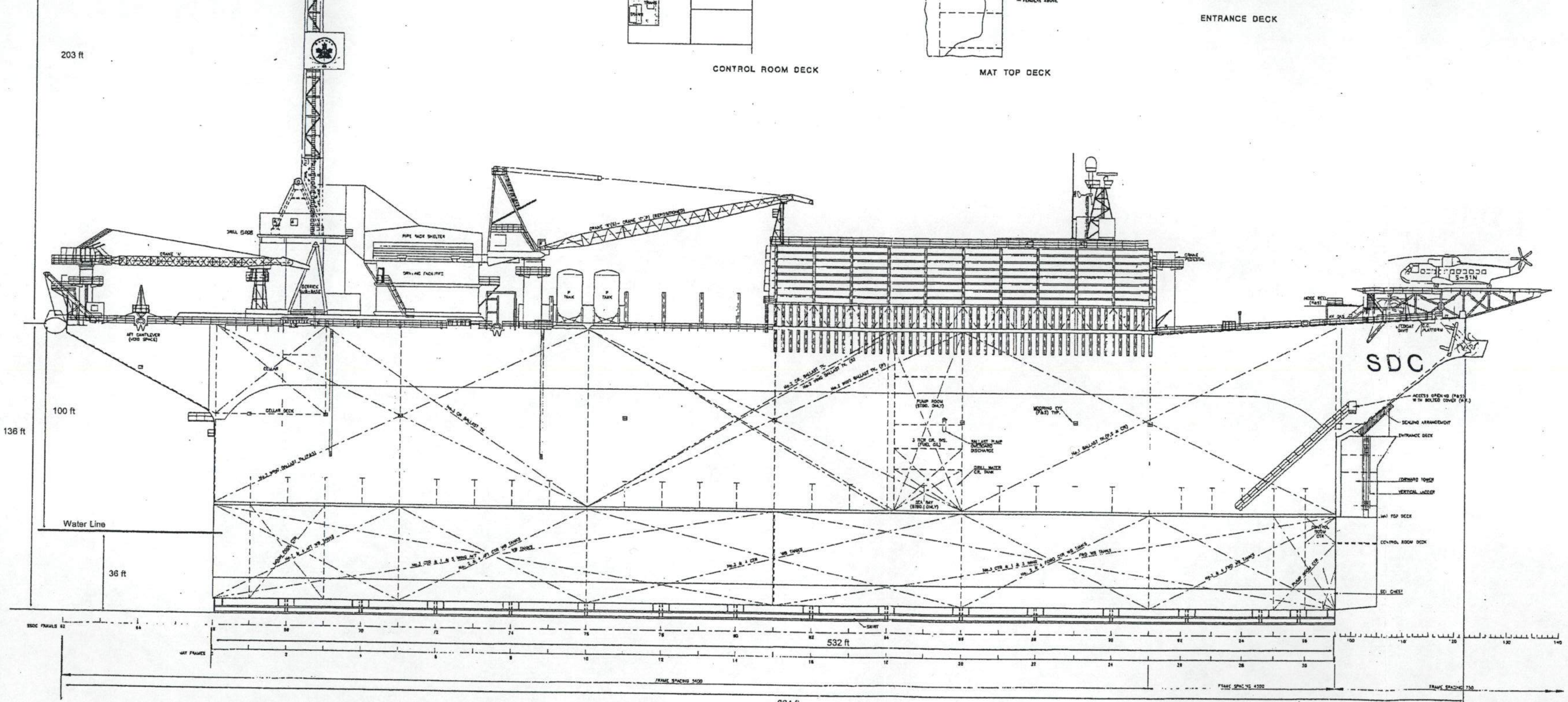
PROJECT SDC - MAT
PREPARED BY ENGINEERING & DESIGN
TITLE
GENERAL ARRANGEMENT SDC - MAT
SECTIONS

SCALE
1 : 200



PRINCIPAL DIMENSIONS: SSDC AND MAT:

LENGTH AT DECK	– 202.350 m (663.875ft)
LENGTH AT WATER LINE	– 168.000 m (551.179ft)
LENGTH AT BOTTOM OF SSDC (EXCL TOWER)	162.000 m (531.494ft)
BREADTH MLD SSDC	– 53.000 m (173.883ft)
BREADTH EXTREME AT SIDE MAT	– 110.000 m (360.891ft)
BREADTH EXTREME AT DECK MAT	– 60.000 m (196.849ft)
DEPTH MLD (BOTTOM OF SKIRT TO DECK)	– 41.135 m (134.952ft)
MAXIMUM FULL LOAD TOWING DRAFT (BOTTOM OF SKIRT TO W...)	– 21.000 m (68.897ft)
DEPTH MLD SSDC	– 25.300 m (83.004ft)
DEPTH EXTREME AT SIDE MAT (INCL. SKIRT)	– 5.000 m (16.404ft)
DEPTH EXTREME AT CTR MAT (INCL. SKIRT)	– 15.500 m (50.852ft)
DEPTH OF SKIRT	– 2.000 m (6.561ft)
THICKNESS OF FOAM	– 300 mm (11.81in)
KEEL THICKNESS (S.S.D.C.)	– 33.5 mm (1.318in)

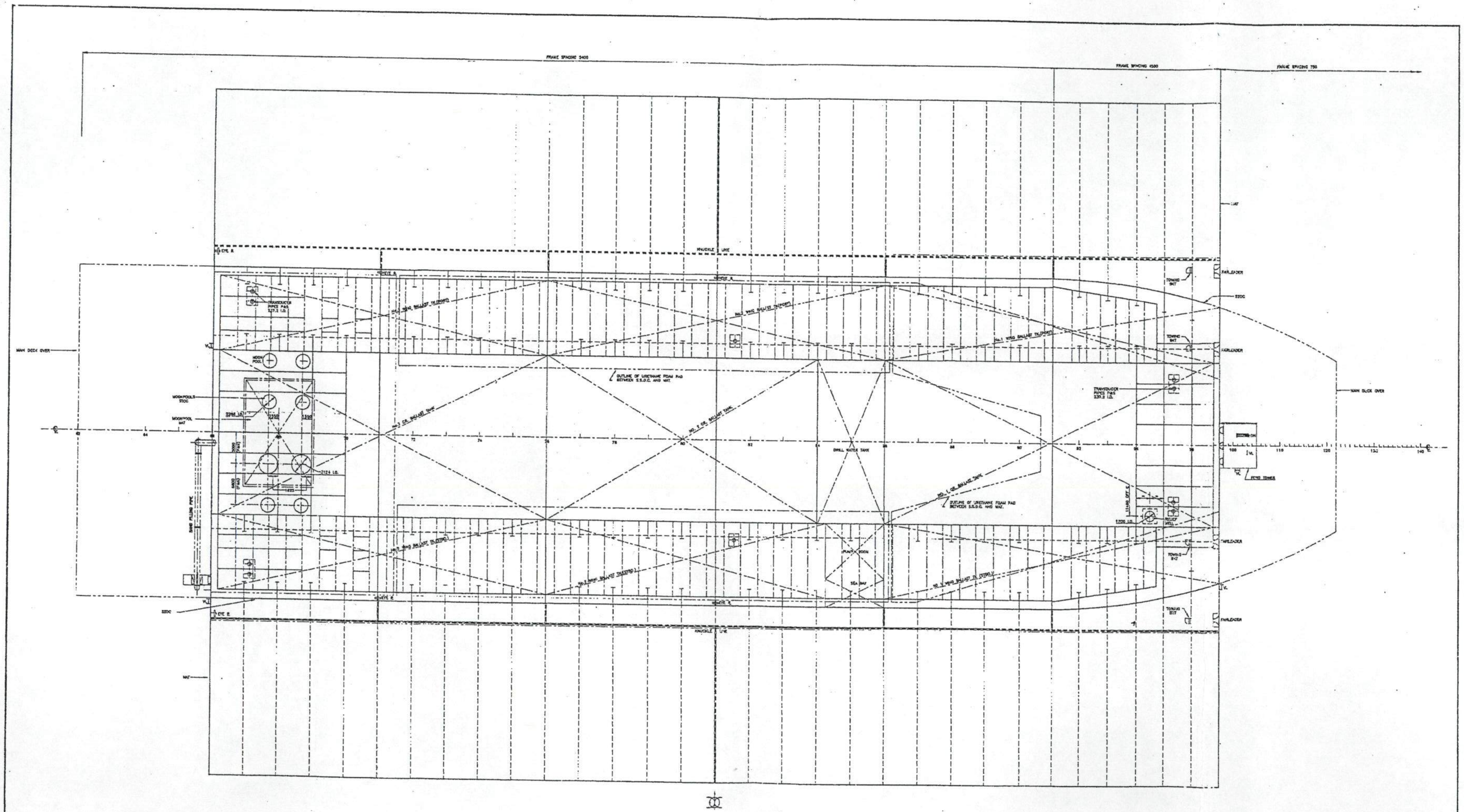


DWG. NO.	REFERENCE DRAWINGS	REV.	REVISION DESCRIPTION	BY	DATE
		4	NEW POWER GENERATOR ADDED TO ACCOMMODATION MODULE		94-01-13
		3	REDRAWN BY MARCI INC.	HM	92-09-16
		2	ACCOM. LADDER RELOCATED		91-11-18
		1	ADDED DIVERTER		90-08-08

ENGINEERING RECORD		
DRAWN BY	PL	DATE
CHKD BY		
ENGINEER	WHJ	86 1 20

CANADIAN MARINE DRILLING LTD.
CALGARY ALBERTA CANADA

PROJECT: SDC - MAT
PREPARED BY: ENGINEERING & DESIGN
TITLE: GENERAL ARRANGEMENT SDC - MAT PROFILE
SCALE: 1 : 200



PLAN VIEW BELOW 12-7 STRINGER

DWG. NO.	REFERENCE DRAWINGS	REV.	REVISION DESCRIPTION	BY	DATE

ENGINEERING RECORD		
DRAWN BY	PL	DATE
CHKD BY		
ENGINEER	WHJ	86 11 20

CANADIAN MARINE DRILLING LTD.
CALGARY ALBERTA CANADA

PROJECT SSDC - MAT
PREPARED BY ENGINEERING & DESIGN

TITLE
GENERAL ARRANGEMENT SSDC - MAT
PLAN BELOW 12-7 STRINGER

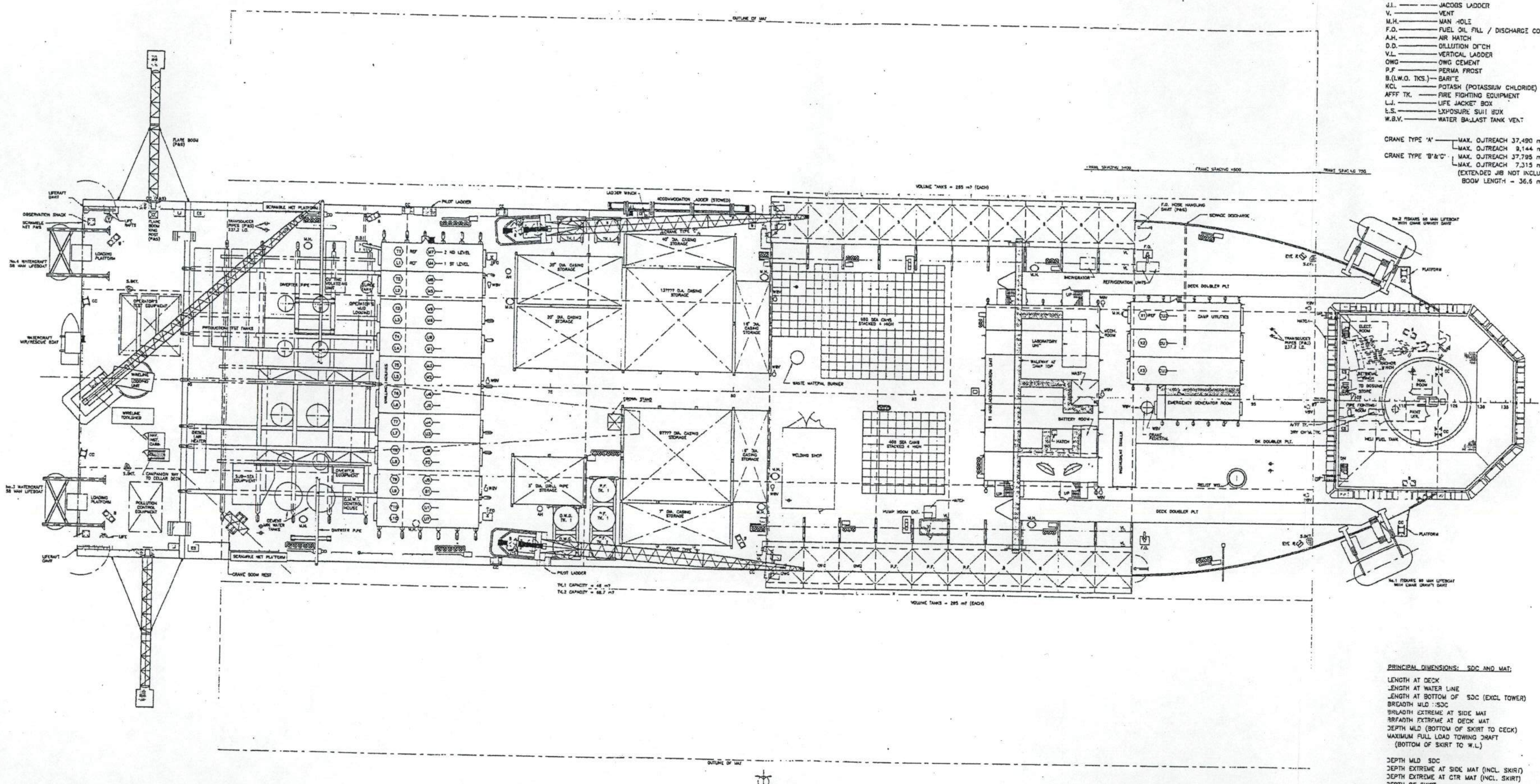
SCALE 1 : 200
REV 0

ABBREVATIONS:

- B. — BOLLARD
- C.C. — CLOSED CHOCK
- S.BKT. — SMITT BRACKET
- M. — MOORING
- J.L. — JACOBS LADDER
- V. — VENT
- M.H. — MAN HOLE
- F.O. — FUEL OIL FILL / DISCHARGE CONN.
- A.H. — AIR HATCH
- D.D. — DILLUTION DITCH
- V.L. — VERTICAL LADDER
- OWG — OWG CEMENT
- P.F — PERMA FROST
- B.(LW.O. TKS.) — BARITE
- KCL — POTASH (POTASSIUM CHLORIDE)
- AFFF TK. — FIRE FIGHTING EQUIPMENT
- L.J. — LIFE JACKET BOX
- E.S. — EXPOSURE SUIT BOX
- W.B.V. — WATER BALLAST TANK VENT

CRANE TYPE 'A' — MAX. OUTREACH 37.490 m, MAX. API HOOK LOAD 10,900#
MAX. OUTREACH 9.144 m, MAX. API HOOK LOAD 89,400#

CRANE TYPE 'B'&'C' — MAX. OUTREACH 37.795 m, MAX. API HOOK LOAD 22,700#
MAX. OUTREACH 7.315 m, MAX. API HOOK LOAD 125,000#
(EXTENDED JIB NOT INCLUDED IN ALL ABOVE FIGURES, BOOM LENGTH - 36.6 m)



PLAN AT MAIN DECK

PRINCIPAL DIMENSIONS: SDC AND MAT:

LENGTH AT DECK	- 202.350 m (663.875ft)
LENGTH AT WATER LINE	- 168.000 m (551.179ft)
LENGTH AT BOTTOM OF SDC (EXCL TOWER)	- 162.000 m (531.494ft)
BREADTH MLD : SDC	- 53.000 m (173.883ft)
BREADTH EXTREME AT SIDE MAT	- 110.000 m (360.891ft)
BREADTH EXTREME AT DECK MAT	- 60.000 m (196.849ft)
DEPTH MLD (BOTTOM OF SKIRT TO DECK)	- 41.135 m (134.952ft)
MAXIMUM FULL LOAD TOWING DRAFT (BOTTOM OF SKIRT TO W.L.)	- 21.000 m (68.897ft)
DEPTH MLD SDC	- 25.300 m (83.004ft)
DEPTH EXTREME AT SIDE MAT (INCL. SKIRT)	- 5.000 m (16.404ft)
DEPTH EXTREME AT CTR MAT (INCL. SKIRT)	- 15.500 m (50.852ft)
DEPTH OF SKIRT	- 2.000 m (6.561ft)
THICKNESS OF FOAM	- 300 mm (1'.8"1in)
KEEL THICKNESS (S.D.C.)	- 33.5 mm (1.318in)

NOTE:

TEST EQUIPMENT, MUD LOGGING, GEOLOGIST'S SHACK, CUTTING VOLATIZING UNIT, WIRELINE LOGGING UNIT, WIRELINE TOOL SHED & PRODUCTION TEXT TANKS ARE OPERATOR SUPPLIED ITEMS.

DWG. NO.	REFERENCE DRAWINGS	REV.	REVISION DESCRIPTION	BY	DATE
		4	REDRAWN BY MAREI INC.		92-09-16
		3	REMOVED STBD. ACCOM. LADDER		91-11-19
		2	REVISED/UPDATED		90-08-
		1	REVISED/UPDATED FOREDECK EQUIPMENT ARRANGEMENT		88-06-24

ENGINEERING RECORD		
DRAWN BY	PL	DATE
CHKD BY		
ENGINEER	WHJ	86 11 20

CANADIAN MARINE DRILLING LTD.
CALGARY ALBERTA CANADA

PROJECT: SDC - MAT
PREPARED BY: ENGINEERING & DESIGN
TITLE: GENERAL ARRANGEMENT SDC - MAT
PLAN AT TOP DECK SDC
SCALE: 1 : 200

APPENDIX C

PLATFORM VERIFICATION

SDC Setdown & Deformation Analysis
Ice Design Criteria
Wave Loads on the Steel Drilling Caisson (SDC)

SDC Setdown and Deformation Analysis
McCovey Prospect
OCS Region of the Beaufort Sea, Alaska

Prepared For:

Alberta Energy Company

AEC Oil & Gas (USA), Inc.

Prepared By:

Arctic GeoScience, Inc.

1000 O'Malley Drive, Suite 205

Anchorage, Alaska 99515

November 27, 2001

AGSI Project No.: 01-0603wo2

ARCTIC GEOSCIENCE, INC.
1000 O'MALLEY DRIVE, SUITE 205 • ANCHORAGE, ALASKA 99515-3069

November 27, 2001
01-0603wo2

Alberta Energy Company
AEC Oil & Gas (USA), Inc.

Attention: Mr. Soren Christiansen, P. Eng.

SDC Setdown and Deformation Analysis
McCovey Prospect
OCS Region of the Beaufort Sea, Alaska

Dear Mr. Christiansen:

This letter transmits the results of the SDC Setdown and Deformation Analysis performed by Arctic GeoScience, Inc. (AGSI) for the McCovey Prospect, Beaufort Sea, Alaska. This analysis was authorized by Mr. Soren Christiansen, PE, of Alberta Energy Company (AEC).

The scope of the setdown portion of the analysis included predicting the depth of SDC skirt penetration into the seafloor, the resulting sliding resistance that could be expected from the soils at the site, and the effects of consolidation with time. These predictions are based on traditional practice in soil mechanics.

The scope of the deformation portion of the analysis included modeling the SDC and near surface soils after setdown, applying a lateral ice load, and analyzing model predicted deformation and stresses. The computer model was created using the three-dimensional finite difference program, FLAC3D v.2.0.

Two reports, prepared by AGSI as part of previous geotechnical and geophysical work for PHILLIPS Alaska, Inc. (PAI), were used extensively in preparing this analysis and are referenced throughout. They include:

Phone (907) 522-4300 FAX (907) 522-4301

1. "*Geotechnical and High Resolution Geophysical Investigation, Site Data Report, McCovey Prospect, Beaufort Sea, Alaska*," dated June 9, 2000.

2. "*Exploration Concepts, Analysis of Global Marine's CIDS and Alternative Structures, PHILLIPS Alaska Inc, McCovey Prospect, OCS, Beaufort Sea, Alaska*," July 9, 2000.

1.0 DESIGN PARAMETERS

1.1 SDC Structure Description and Configuration

The SDC system includes the SSDC structure and the MAT vessel that has been mated under the SSDC. In this report, SDC refers to the combination of the SSDC and the MAT. The MAT consists of a steel hull structure and steel skirts affixed along its base.

The SDC's structural parameters and dimensions of significance to the geotechnical evaluation are summarized below and illustrated in Figure 1. This information was obtained from the "*SSDC/MAT Operations Manual Summary*," Canadian Marine Drilling Ltd., Revised June 19, 1990.

SDC MAT Base Dimensions:

Length	=	531.5 ft [162 m]
Width	=	361 ft [110 m]
Overall base area	=	191,813 ft^2 [17,820 m^2]
Height to inclined surface (incl. skirt)	=	16.4 ft [5 m]
Overall height (including skirt)	=	50.9 ft [15.5 m]

Skirt Configuration:

Number of longitudinal skirts	=	17
Number of transverse skirts	=	17
Average longitudinal spacing	=	22.6 ft [6.9 m]
Average transverse spacing	=	33.2 ft [10.1 m]
Distance from MAT base to skirt tip	=	6.6 ft [2 m]
Height of skirt blade	=	3.3 ft [1 m]
Thickness of skirt blade	=	1.0 ft [0.3 m]
Area of skirt blade tips	=	14,932 ft^2 [1,387 m^2]

Net Ballasted Weight of SDC:

Weight of SDC on seafloor = 176,000 kips [80,000 tonnes]

(This weight was provided to AGSI by Mr. Kevin Hewitt, P. Eng., of K.J. Hewitt & Associates Ltd., representing AEC. It was described as the weight felt by the seafloor at the McCovey site, when the skirts were fully embedded, and only the MAT was ballasted. This technical correspondence has been included for reference as Appendix A.)

1.2 Ice Load

AGSI was provided an unfactored ice load of 61,100 kips [272 MN] applied to the long side of the SDC structure. This value is presented in the "Ice Design Criteria" report prepared by K.R. Croasdale and Associates Ltd., dated October 28, 2001. This information was provided to AGSI by AEC in the correspondence entitled *"Design Parameters for SDC Stability and Deformation Analysis at McCovey Prospect,"* which has been included for reference as Appendix A. A copy of the K.R. Croasdale report has not been provided to AGSI at this time.

1.3 Bathymetric Conditions

Bathymetric data collected at the McCovey site was presented in AGSI's report titled, "*Geotechnical And High Resolution Geophysical Investigation, Site Data Report, McCovey Prospect, Beaufort Sea, Alaska*," dated June 9, 2000. As previously reported, the McCovey site is relatively flat with surface ripples in the sand. The slope of the sea floor at the McCovey site indicates a very low seabed gradient of approximately 0.67%, or 1 in 150. The average water depth at the site is 36 feet [11 m].

1.4 Design Soil Profile

AGSI's recommended design soil parameters for the McCovey exploration site (UTM coordinates N 7,825,095.11, E 456,170.36) are fully documented in AGSI's report titled, "*Exploration Concepts, Analysis of Global Marine's CIDS and Alternative Structures, PHILLIPS Alaska Inc., McCovey Prospect, OCS, Beaufort Sea, Alaska*," dated July 9, 2000. These recommendations are founded on AGSI's site specific investigations, results of laboratory and in-situ soil testing, and past project experience with bottom-founded structures in the Alaskan Beaufort Sea.

The seabed soil conditions at the "McCovey Prospect" site consist of three general soil horizons. The top layer (Horizon 1) is mainly a fine to medium grained sand, with a dense to very dense consistency, to a depth of 16 feet [4.9 m]. The top sand layer overlies a fine-grained cohesive soil layer (Horizon 2), comprised of silt and clay, with a very stiff to hard consistency, which extends to a depth of 55 feet [16.8 m]. Below the clay layer, there is a fine to medium grained sand and gravel layer (Horizon 3) that extends to a depth of at least 83.5 feet [25.5 m].

Arctic bottom-founded structure performance analysis, directed at lateral stability to withstand environmental forces such as ice, wind, and waves, requires a critical look at the soil profile in the upper 10 feet [3.3 m] of the site (Horizon 1a). The use of in-situ testing methods, such as cone penetrometer testing (CPT), continuous soil sampling in the soil borings, and soil laboratory testing, were performed to establish a detailed soil profile to support these specific analyses.

The design soil profile for the McCovey Site is outlined below, and presented graphically in Figures 2, 3, and 4.

Horizon 1a (Near Seafloor Soils): the top 10 feet [3.3 m] of the surface sand layer.

Top of Layer (ft)	Bottom of Layer (ft)	γ_d (pcf)	w.c. (%)	ϕ (°)	c (psi)	E_s (psi)
0.0	0.5	101.3	21.6	28.2	0	2,590
0.5	1.0	101.3	21.6	30.3	0	2,640
1.0	1.5	102.1	21.6	28.6	0	2,700
1.5	2.0	102.1	21.6	30.5	0	2,750
2.0	2.5	102.1	21.6	32.8	0	2,800
2.5	3.0	102.1	22.0	32.8	0	2,850
3.0	4.0	102.8	22.0	36.5	0	2,920
4.0	5.0	102.8	21.0	38.2	0	3,020
5.0	10.0	102.3	21.0	38.9	0	

Horizon 1: Seafloor surface to 16 feet [4.9 m] below surface. The following values are average values for the seabed **sand** layer, when in a **drained** condition.

Internal Angle of Friction:	ϕ	=	37°
Cohesion	c	=	0 psi
Modulus of Elasticity of Soil:	E_s	=	4,100 psi
Shear Modulus of Soil:	G	=	1,600 psi
Bulk Modulus of Soil:	E_b	=	3,400 psi

Horizon 2: 16 to 55 feet [4.9 to 16.8 m] below the seafloor surface. The following values are average values for the middle **clay** layer, when in an **undrained** condition.

Undrained Shear Strength:	C_u	=	6.3 psi
Modulus of Elasticity of Soil:	E_s	=	104 psi
Shear Modulus of Soil:	G	=	37 psi
Bulk Modulus of Soil:	E_b	=	173 psi

Horizon 2: 16 to 55 feet [4.9 to 16.8 m] below the seafloor surface. The following values are average values for the middle **clay** layer, when in a **drained** condition.

Internal Angle of Friction:	ϕ'	=	31°
Cohesion	c	=	0 psi
Modulus of Elasticity of Soil:	E_s	=	1,400 psi
Shear Modulus of Soil:	G	=	490 psi
Bulk Modulus of Soil:	E_b	=	2,300 psi

Horizon 3: Below 55 feet [16.8 m] below the seafloor surface. The following values are average values for the underlying coarse granular **sand and gravel** soil unit.

Internal Angle of Friction:	ϕ	=	37°
Cohesion	c	=	0 psi
Modulus of Elasticity of Soil:	E_s	=	4,100 psi
Shear Modulus of Soil:	G	=	1,600 psi
Bulk Modulus of Soil:	E_b	=	3,400 psi

1.5 Load Factors and Resistance Factors

The design ice load given in Section 1.2 is an unfactored load. Therefore, appropriate load and resistance factors or a safety factor must be applied to the structural system. Definition of these factors is outside the scope of our involvement; however, the following table has been prepared to assist AEC. AGSI recommends that AEC coordinate its operations plans with the ice force consultant recommendations to identify the appropriate factors.

Table 1
Load and Resistance Factor Combinations
SDC Setdown and Deformation Analysis
McCovey Prospect

Method	Case	Resistance Factor	Load Factor	Effective Multiplier
LRFD[1]	Operating Ice[3]	0.80[4]	1.25[3]	1.56[5]
LRFD[1]	Design Ice Frequent[3]	0.80[4]	1.35[3]	1.688[5]
LRFD[1]	Design Ice Infrequent[3]	0.80[4]	1.0[3]	1.25[5]
WSD[2]	Sliding	N/A	N/A	1.5[6]

Notes

1) Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms – Load and Resistance Factor Design, API RP2A-LRFD.
2) Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms – Working Stress Design, API RP2A-WSD
3) Recommended Practice for Planning, Designing, and Constructing Structures and Pipelines for Arctic Conditions, APR RP 2N, Table 6 – Load Combinations and Factors
4) APR RP2A-LRFD, paragraph G.13.1
5) Calculated value obtained by dividing Load Factor by Resistance Factor
6) API RP2A-WSD, paragraph 6.13.4

2.0 SETDOWN ANALYSIS

2.1 General Foundation Considerations and Limitations

To successfully perform on the Beaufort Shelf, the soil beneath the drilling unit must have sufficient strength to support the weight of the unit and to resist the lateral ice forces. A critical item for sliding resistance is the interface between the structure and the near surface soils of the seafloor. The SDC employs a MAT with a skirt grid to firmly engage the soil. The concept is to penetrate the surficial deposits and utilize the shear strength of the more competent soils at depth.

The following analysis is based on anticipated conditions and generally accepted geotechnical theory. However, it is imperative that the actual setdown conditions (i.e. ballasted weight, penetration depth, setdown location, water depth, etc.) be analyzed to accurately predict the actual performance of the SDC during a design ice event.

2.2 Skirt Penetration Resistance

Because the leading edges (tips) of the SDC skirts are 1 foot [0.3 m] wide, the soil's ability to resist skirt penetration may best be determined using a classic foundation analysis for a continuous footing. Meyerhof's solution of the general bearing capacity equation has been utilized for the penetration of the skirt because it has correction factors for the depth and width of the footing. The general equation is:

$$q_u = c\, N_c\, \zeta_c + 0.5\, B'\, \gamma'_H\, N\gamma\, \zeta_\gamma + \sigma'_D\, N_q\, \zeta_q \qquad \textit{(Eq. 4-1, p. 26, Ref. 15)}$$

The ultimate load that can be applied to the soil, without causing failure, is:

$$Q_u = q_u \cdot A \qquad \textit{(Eq. 4-5, p. 28, Ref. 15)}$$

For the skirt to penetrate into the seafloor, failure of the soil is required. As long as the net buoyant weight of the ballasted SDC is greater than Q_u, penetration will occur. As the skirts penetrate into more dense sands, general shear failure will occur. See Figure 6a. This method predicts that the SDC skirts will penetrate approximately 3 feet [0.9 m] into the seafloor sands. A plot of the penetration resistance, as a function of depth, is shown in Figure 5.

2.3 Sliding Resistance

2.3.1 General

The sliding resistance of a bottom-founded structure is developed from the frictional forces at the structure/soil interface and the shear strength of the soil between the skirts. The two principal mechanisms generally associated with skirt behavior are 1) the formation of a passive wedge in front of the skirt blades (passive failure) and 2) the development of a horizontal failure surface at the skirt tip elevation (tip-to-tip failure). These failure modes are shown in Figures 6b and 6c, respectively.

The total sliding resistance is a result of both the shear strength of the soil and the friction between the structure and the soil. Because the failure modes depend on a number of factors, including skirt spacing, penetration depth, soil strength, and surcharge, both failure modes have been analyzed. Also, because friction is a major contributor to the overall sliding resistance, the frictional components have been analyzed in detail. These analyses are further described below.

2.3.2 Friction Resistance

The frictional component contributing to the sliding resistance can be calculated with the following simple formula:

$$R_F = W_B \cdot \mu$$

where:

W_B = Net buoyant weight of the SDC (as felt by the seafloor)

μ = coefficient of friction

= $\tan \delta$

δ = friction angle between the steel skirts and the sand soil

AGSI's performance model of the SDC at the McCovey site clearly shows that friction between the skirt tips and the dense sandy soil is the predominant mechanism resisting the lateral ice force. Selection of an appropriate coefficient of friction is therefore of great importance when assessing the lateral stability of the SDC at the McCovey site. To that end, AGSI has spent considerable time researching this issue further.

Two methods that can be used to determine a friction angle, δ, include 1) historical literature review in conjunction with site-specific geotechnical data, and 2) laboratory testing, specifically friction / direct shear testing. PAI did not consider this specific testing critical during their McCovey Prospect Ice Island design planning. Since laboratory testing, specific to determining the friction values between the soil and steel, was not performed on the soil samples, AGSI has focused our analysis on the published literature. Also taken into consideration were the available geotechnical data, the intrusive manner in which the skirts will be installed, and the loose sandy soils present in the upper 3 feet [1 m].

The AGSI literature search included 12 sources that had discussions on friction angle. Mr. Kevin Hewitt (AEC) also provided six additional sources to support this effort. These literature sources, along with reported friction angles, are presented in Appendix B.

Based on the literature research presented in Appendix B, the soil conditions identified at the McCovey site during our geotechnical site investigation, and a low probability of liquefaction of the near surface sands during ice loading, AGSI recommends that a friction angle value, δ, of 0.74ϕ be used for evaluating the performance of the SDC at the McCovey Prospect site. This is equivalent to 0.5 standard deviation above the mean value found in the literature. This relatively high interpretation of the appropriate friction angle is justified because the sands are consistent and very dense below 3 feet [1 m] at the proposed McCovey setdown location. AGSI's performance analyses are based on a steel/sand friction angle, δ, of 0.74ϕ, and an internal friction angle, ϕ, as determined from the design soil profile.

As the SDC begins to penetrate into the seafloor, all of the weight is transferred to the soil through the leading edges (tips) of the skirts. The total frictional resistance (R_F), then, is simply the buoyant weight (W_B) of the SDC multiplied by the coefficient of friction (μ) at the depth of the skirt tips. As the SDC penetrates deeper, the buoyant weight decreases. At the same time, the angle of internal friction, ϕ, generally increases. The plot of tip friction resistance vs. depth of penetration, shown in Figure 7, demonstrates how the frictional resistance varies with changes in ϕ and depth of penetration (buoyant weight). The significant drop in tip friction resistance below a depth of 6.6 feet [2 m] is a result of the load being transferred from the skirt tips to the base of the MAT.

If the skirts are fully embedded and contact is made between the base of the MAT and the seafloor, the weight of the SDC begins to be transferred to the soil through the base. The portion of the buoyant weight transferred to the soil through the MAT base is multiplied by the coefficient of friction, $\mu = \tan \delta$, at the depth of the MAT base, which is

6.6 feet [2 m] above the skirt tips. The plot of MAT base friction resistance vs. depth of penetration, shown in Figure 7, shows that after contact is made a significant portion of the total buoyant weight is transferred to the soil through the MAT base.

2.3.3 Passive Earth Pressure Resistance

The ability of the soil to resist lateral loads, such as ice forces, is derived from the Passive Earth Pressure. If this force is exceeded, failure will occur as shown in Figure 6b. The plane of failure extends on a path from the tip of the skirt to the surface of the soil and will result in the "wedge" of soil sliding upward along this path. It should be noted that a slight movement up this plane must occur in order to develop the full resisting friction (force) in the soil.

From classic soil mechanics, it is shown that there are three components of passive earth pressure acting on the front of the skirt blades. The first component is dependent on unit weight, the second on cohesion, and the third on surcharge. The total resultant pressure or force is the sum of the individual components.

$P_{P[T]} = P_{P[I]} + P_{P[II]} + P_{P[III]}$ *(Eq. 28.17, p. 249, Ref. 14)*

where:

$P_{P[T]}$ = total resultant pressure or force acting on a unit length of skirt blade

$P_{P[I]}$ = passive earth pressure due to unit weight of soil

= $0.5\,[\gamma\,(D - H)\,K_p + \gamma\,D\,K_p]\,H$, when $D > H$

= $0.5\,\gamma\,D^2\,K_p$, when $D < H$ *(Eq. 28.15, p. 248, Ref. 14)*

$P_{P[II]}$ = passive earth pressure due to cohesion of soil

= $2\,c\,H\,(K_p)^{1/2}$, when $D > H$

= $2\,c\,D\,(K_p)^{1/2}$, when $D < H$ *(Eq. 28.16, p. 249, Ref. 14)*

$P_{P[III]}$ = passive earth pressure due to surcharge

= $q\,H\,K_p$, when $D > H$

= $q\,D\,K_p$, when $D < H$ *(Eq. 28.16, p. 249, Ref. 14)*

D = depth of penetration

H = height of skirt blade, 3.3 feet [1 m] for the SDC

For the SDC, two cases must be examined: 1) skirt blades penetrate below the seafloor surface, i.e. $D > H$, and 2) skirt blades partially penetrate the seafloor, i.e. $D < H$. If the skirt blades penetrate below the surface of the seafloor, then only that portion of the passive earth pressure acting on the skirt blade resists sliding.

If the base of the SDC MAT has not made contact with the seafloor, there will be no surcharge ($q = 0$). If contact is made, the surcharge pressure, q, will be that portion of the SDC weight transferred to the seafloor through the base of the MAT.

The resultant passive force resisting sliding, R_P, is the total passive pressure, $P_{P[T]}$, multiplied by the total length of skirts involved. The sliding resistance due to passive earth pressure is plotted in Figure 8. Note the significant increase in resistance after the MAT base contacts the seafloor. This is due to the large surcharge applied to the seafloor by the base of the MAT.

2.3.4 Tip-to-Tip Resistance

Another possible mode of failure is shown in Figure 6c. In this case, the soil within the skirts acts as a solid block and is an integral part of the SDC. This failure mode would occur if the soil within the skirt area stays intact and the shear strength of the soil beneath the level of the skirt is exceeded. The failure plane in this instance is horizontal at the depth of the skirt penetration.

The ability of the soil to resist this type of failure depends on the shear resistance of the soil along the plane of failure. This is called tip-to-tip resistance. If the soil structure fails along the horizontal plane at the bottom of the skirts, then the shear strength of the soil has been exceeded. The following expression can be used to calculate the tip-to-tip resisting force:

$$R_{Tip\text{-}to\text{-}Tip} = s \cdot A$$

where:

$$s = \text{shear strength of the soil}$$

$$= c + (\sigma'_{vo} + q) \tan \phi$$

The tip-to-tip resistance is plotted in Figure 8. Note the significant increase in resistance after the MAT base contacts the seafloor. This is due to the large surcharge, q, applied to the seafloor by the base of the MAT.

2.3.5 Total Sliding Resistance

The overall sliding resistance is the summation of the frictional resistances and the soil resistance due to shear strength. However, depending on which failure mode occurs, the frictional contribution from the MAT base may or may not be included.

For the case of Passive Earth Pressure soil failure (Figure 6b), the base of the SDC MAT moves relative to the soil beneath it, resulting in friction between these two surfaces. Therefore, the total frictional resistance is the summation of the friction between the skirt tips and soil and the friction between the MAT base and soil. The overall sliding resistance, for the passive failure case, is:

$$R_{\text{Total (Passive Failure Case)}} = R_{\text{Passive}} + R_{\text{Friction (Tip)}} + R_{\text{Friction (Base)}}$$

The total sliding resistance of the soil, for the passive soil failure case, is plotted in Figure 9. Figure 9 is based on AGSI's recommended friction angle, δ, of 0.74ϕ. As discussed in Section 2.3.2, the literature presents a wide range of friction angle, δ, values. Figure B-3, in Appendix B, presents the total sliding resistances for the ranges found in the literature.

For the case of Tip-to-Tip soil failure (Figure 6c), the base of the SDC MAT does not move relative to the soil beneath it because the MAT, skirts, and soil between the skirts act as a block. Therefore, there are no frictional forces between the base of the MAT and the soil. The "friction" in this case occurs between the soil just above and just below the plane of failure, which is at the level of the skirt tips. This "frictional force" is included in the tip-to-tip soil resistance calculations, so is not part of the total frictional resistance. The overall sliding resistance, for the tip-to-tip failure case, is:

$$R_{\text{Total (Tip-to-Tip Failure Case)}} = R_{\text{Tip-to-Tip}} + R_{\text{Friction (Tip)}}$$

The total sliding resistance of the soil, for the tip-to-tip soil failure case, is plotted in Figure 9.

2.4 Consolidation

The settlement of a soil mass under an applied vertical load is composed of three distinct settlement components. They are immediate, consolidation, and secondary compression or creep. In equation form, the total expected settlement can be written as:

$$\Delta H_T = \Delta H_I + \Delta H_C + \Delta H_S$$ *(Eq. 11-12, p. 373, Ref. 4)*

Immediate settlement results from the elastic deformation of the soil/water structure in response to the applied load and occurs almost immediately. Consolidation is the resulting change in volume of the soil structure as pore water is forced out of the interstitial voids between the soil grains. Creep is the continuing rearrangement of the soil skeleton in response to the loading.

Generally, the three settlement components occur in sequence with the immediate settlement occurring first, followed by consolidation, and then creep. The last two phases of the settlement process normally span a number of years, and, depending upon the soil type, can continue for decades or centuries. Total settlement, at any given period of time, is the sum of these three components.

Creep was not considered, as the magnitude of its contribution is expected to be virtually non-existent. This is especially true when considering the exceptionally long time spans involved before it becomes a factor.

The estimated total consolidation was computed using the generally accepted equation for determining settlement in a compressible medium as a result of a change in void ratio:

$$\Delta H = H \cdot (C_c / (1 + e)) \cdot \log (1 + \Delta p/p_o)$$ *(Eq. 5-11, pg. 141, Ref. 8)*

First year settlement, after the structure base has contacted the seafloor and developed equilibrium under gravity, is expected to be approximately 0.7 inch [18 mm]. Second year settlement is estimated to be 0.2 inch [5 mm], for a total two-year settlement of 0.9 inch [23 mm]. This small amount of consolidation settlement is attributed to the extremely high pre-consolidation stress of the clay layer in Horizon 2. These values do not account for the immediate settlement that will occur during setdown. Settlement increments in subsequent years will decrease. Because the SDC will be used at the McCovey site as an exploratory structure, with a short-term application, long-term settlement was not considered. However, if the structure stays on location longer, and settlement issues are a concern, then a long-term settlement analysis should be performed at that time.

Settlement calculations were based on a 2V:1H vertical stress distribution model and a soil profile identified by BH 4-1. See AGSI's report titled "*Exploration Concepts, Analysis of Global Marine's CIDS and Alternative Structures, PHILLIPS Alaska Inc., McCovey Prospect, OCS, Beaufort Sea, Alaska*," dated July 9, 2000, for a complete description of the consolidation parameters used.

2.5 Liquefaction Potential

Because of the generally flat local topography around the proposed McCovey well site (See AGSI's report titled, "*Geotechnical and High Resolution Geophysical Investigation, Site Data Report, McCovey Prospect, Beaufort Sea, Alaska*," dated June 9, 2000.), the grain size distribution of the very dense sands present at 3 feet [1 m], the resulting shallow depth of penetration of the MAT skirt, as well as the short term exposure of an exploratory structure, the occurrence of large scale slope stability and mass movement associated with wave, ice, or seismically induced liquefaction is considered low at this site. However, the grain size distribution and loose state of the surface sands on the seafloor indicate that the surface sands are susceptible to liquefaction. Localized liquefaction under the SDC MAT/skirt foundation system may result in a temporary loss of support and differential settlements. The potential for liquefaction has not been addressed in the performance analyses performed, at this time, because this is specifically an exploration project.

For long-term permanent bottom-founded structure deployment on the shoal, liquefaction potential should be considered in the design. The grain sizes of the fine sands present and the loose state of the surface sands on the seafloor indicate a potential for liquefaction to occur. However, with depth the sands become much denser and the potential for liquefaction decreases.

3.0 DEFORMATION ANALYSIS DUE TO ICE LOADS

3.1 General

AGSI developed a model of the SDC MAT skirt system and near surface seabed soils. The model is designed to simulate the SDC performance during an ice event in which the MAT hull is subjected to a broadside lateral force. The magnitude of the broadside lateral ice force was established by K.R. Croasdale and Associates Ltd. Soil unit deformation and the general stability of the SDC were analyzed. The computer model was developed using the three-dimensional finite difference program, FLAC3D v.2.0.

Based on the results of skirt penetration resistance calculations, a final penetration depth of 3.3 feet [1 m] was assumed for model simulations. (See Figure 5.)

An ice event capable of generating the lateral force applied against the MAT hull in this model would likely develop over the course of many hours to several days and could sustain the design lateral force for only a short period of time after atmospheric or sea conditions changed or the storm system dissipated. Based on the short duration of anticipated ice events relative to the longer time scales more typical of soil and foundation studies, the model simulation was performed using parameters corresponding to 'undrained' conditions. If dissipation of excess porewater pressure occurs, the soil will likely densify and increase in stiffness according to the findings of soil laboratory testing. This would lead to lower lateral deformation under ice loading if the excess porewater pressure dissipated significantly under the weight of the structure prior to ice loading. The 'undrained' conditions used in the deformation analysis should therefore be conservative in calculating the immediate responses of the SDC to ice loading.

A maximum ice load of 61,100 kips [272 MN] was applied to the broadside of the MAT hull in the model scenario. The load was applied laterally to the MAT hull as a horizontal normal stress and allowed to transmit through the hull section to the skirts. The MAT hull section, skirt system, and near-surface soils are represented by a three dimensional network of nodes called a finite difference grid.

3.2 Model Design Considerations

Two aspects of the model geometry are important to consider. First, the SDC MAT foundation system exhibits a repeating pattern of intersecting transverse and longitudinal skirts along its base. The repetition in the skirt system design allows an accurate model to be developed that consists only of a single intersection with skirts extending the equivalent of one half-bay in each direction. The skirt symmetry provides an opportunity for a highly detailed dimensionally accurate model representation of the actual SDC MAT skirt and near-surface soils.

The second aspect of model geometry is the model hull size and configuration. For the purposes of modeling the SDC skirt interactions with near-surface soils, the SDC skirts and hull are assumed to be monolithic (lacking internal structure such as concrete and steel members) and very rigid relative to the surrounding soils. The stiffness of the hull and skirt structures were set approximately 100 times that of the surrounding soils. The modeled hull and skirts, therefore, exhibit small deflections and remain in stress states that do not approach yield through the course of model ice events.

One additional consideration arises when the model simulation consists of a single skirt intersection. The limited physical extent of a single skirt intersection is susceptible to an overturning moment created during the simulation when lateral forces are applied above the mudline (or more specifically, any perpendicular distance from the axis of rotation). AGSI assumes the overall size and aspect of the actual SSDC/MAT system prevents the vehicle from rotating into the seafloor when subjected to ice sheet forces applied approximately 33 feet [10 m] high on the sides. Based on this assumption, the lateral force is applied to the model SDC skirt section in order to induce minimal overturning moment as described below in Section 3.3.

The final model incorporated skirts that were 6.6 feet [2.0 m] tall, 1.0 foot [0.3 m] wide, 19.7 feet [6.0 m] long in the direction of applied force, and 33 feet [10.0 m] long in the direction transverse to the applied force, with the intersection at the center of the model (Figure 10). The soil grid was extended at both ends beyond the skirt system in the direction of the applied forces by 9.8 feet [3.0 m] to minimize the influence of model boundary conditions on the SDC behavior. Negligible deformation was assumed beyond the grid boundaries. The soil layers beneath the SDC were modeled to a depth of approximately 16 feet [5 m] below the mudline.

Physical parameters related to the mechanical performance of the near-surface soils were assigned to the complete grid based on AGSI's recommended design soil parameters described in detail in AGSI's report titled, "*Exploration Concepts, Analysis of Global Marine's CIDS and Alternative Structures, PHILLIPS Alaska Inc., McCovey Prospect, OCS, Beaufort Sea, Alaska*," dated July 9, 2000. Material properties of concern to the model include: cohesive strength, c, angle of internal friction, ϕ, mass density, ρ, bulk modulus, E_b, shear modulus, G, and tensile strength. To determine the sensitivity of the model to changes in soil stiffness, the bulk modulus and shear modulus were varied for independent model tests and overall deformation results compared. For comparison, the lowest and the highest values for E_s reported in AGSI's July 9, 2000 report were utilized to establish the lower and upper strength profiles, respectively. A water table was also added at the mudline to allow the determination of effective stress in the model soils.

3.3 Simulation Considerations

The computer model of the SDC and underlying seabed soils was developed using FLAC3D Version 2.0, a three-dimensional explicit finite-difference program developed by Itasca Consulting Group, Inc. FLAC3D is capable of simulating the behavior of three-dimensional structures built of materials such as soil, rock, or any other material that undergoes plastic flow when its yield limits are reached.

FLAC3D permits the selection of broad categories of material behavior when developing models to accurately represent a wide range of materials. The most appropriate material behavior category for soils subjected to the normal and shear stress conditions encountered near strip footings and retaining walls is the Mohr-Coulomb material behavior model. The Mohr-Coulomb model is appropriate for materials that exhibit an elastic response to loads up to the yield stress and that yield when subjected to shear loading. Based on the similarities of the SDC skirts to structures such as strip footings and retaining walls, the Mohr-Coulomb behavior model is used in the computer model. An important exception in the computer model is the behavior of the MAT hull and skirts themselves. These structural elements were assumed to be very stiff relative to the surrounding soil and monolithic in construction. The portions of the model grid representing MAT hull and skirt material were assumed to be perfectly elastic. Only completely elastic response to imposed forces is permitted. It is understood that all regions of the MAT hull and skirt are expected to remain well outside of yield conditions for the service life of the SDC, per Mr. Kevin Hewitt (AEC).

Before subjecting the model grid to the lateral ice force, the force of gravity was imposed on the soil and SDC. A simulation was run without the ice forces to allow the SDC-soil system to develop equilibrium under gravity. Once equilibrium was established, all grid points representing the SDC and underlying soil were initialized to zero displacement. No other initial conditions were specified.

After gravitational equilibrium of the model was reached, the lateral ice force was applied to the MAT hull incrementally up to the maximum design load value of 61,100 kips [272 MN]. To minimize the effects of an overturning moment on simulation results, lateral ice forces are applied to the lower half of the SDC skirts (the embedded portion). The induced moment is nearly eliminated and the frictional resistance from the skirt tips is mobilized more effectively. Figure 10 provides a summary of the resulting soil deformations. The simulation was allowed to run until the soil reaction to the ice force completely developed and the entire SDC-soil system returned to a state of equilibrium.

3.4 Vertical and Lateral Deformation

The results of the deformation analysis are shown graphically in Figure 11. Based on a design ice load equal to 61,100 kips [272 MN], and partial skirt penetration equal to 3.3 feet [1.0 m], the embedded SDC skirts and adjacent soil units experience a total lateral deformation of approximately 0.3 inch [7 mm] in soil regions located very near the surface (top 4 inches [10 cm]) and adjacent to the leading face of the skirts. Decreased deformation with increasing distance from the skirts and increasing depth is predicted and negligible deformation is expected below four times the embedment depth. This result is consistent with analytical results that indicate reaction to an applied lateral force is mobilized predominantly by friction between the skirt tip surfaces and the underlying soil, and sufficient capacity for resisting lateral loads exists to react to an unfactored ice load of 61,100 kips [272 MN]. A smaller contribution from passive earth pressure against the skirt faces also contributes to the overall sliding resistance of the SDC to lateral ice forces. The displacement contours in Figure 11 demonstrate graduated passive yielding of the soil in front of the skirts; contributing to the overall sliding resistance capacity of the SDC.

3.5 Monitoring Considerations

Deformation results computed by the FLAC3D model simulation are reported relative to an absolute frame of reference. To support a monitoring and alerts program, lateral soil deformations parallel to the direction of the applied ice force are presented in Figure 12. These lateral deflections are tabulated at points of skirt intersection.

4.0 CLOSURE

The information presented and described herein has been derived from the dataset collected and presented by Arctic GeoScience Inc., as a result of the geotechnical site investigation performed at PAI's McCovey Prospect, located in the Alaska OCS Region of the Beaufort Sea, from April 16 to May 1, 2000. This report is presented to support AEC's engineering and operations planning of an offshore exploration well at the same site.

Arctic GeoScience Inc. performed this work in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No warranty expressed or implied is made. This report is intended for use only in accordance with the purpose and scope of study described. This technical report has been prepared specifically for Alberta Energy Company.

Arctic GeoScience Inc. appreciates this opportunity to assist Alberta Energy Company with their exploration activities at the McCovey Prospect and continues to remain available.

Sincerely,

Arctic GeoScience Inc.

Steve Coleman, PE
Senior Civil Engineer

Brian Schumaker, EIT
Civil Engineer

Review by: Michael G. Schlegel
Geotechnical Consultant
President/CEO

List of Figures:

List of Appendices:

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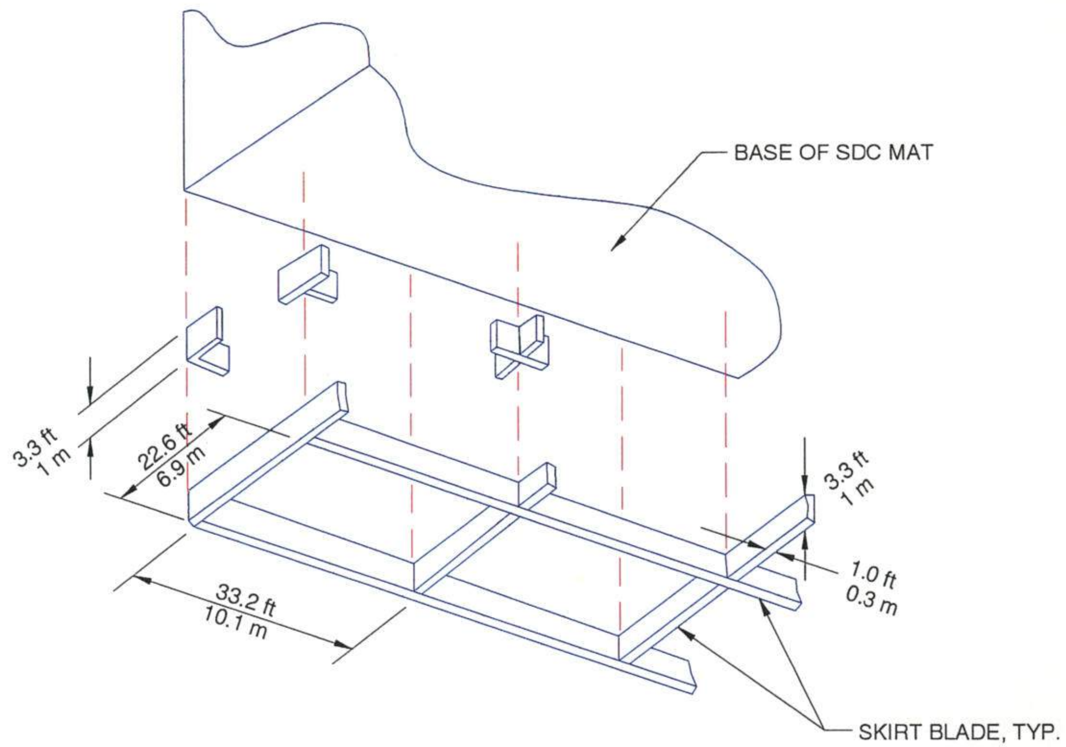
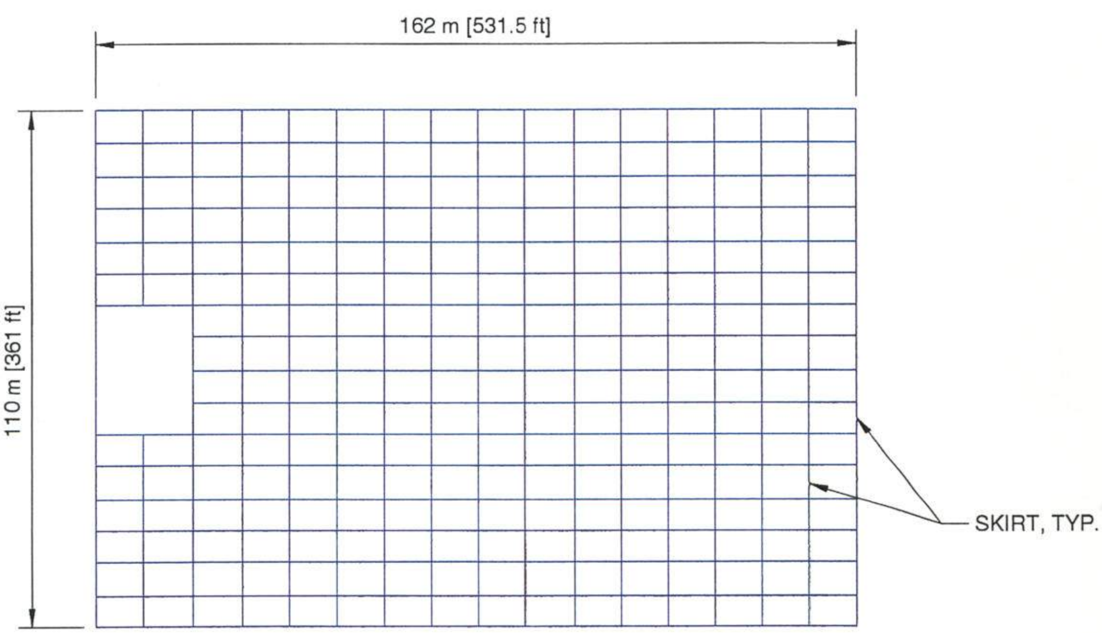
Figures



a) SCHEMATIC OF SKIRT AND BLADES



b) PLAN VIEW OF SDC MAT BASE

ARCTIC GEOSCIENCE, INC.	Title: SDC Skirt Configuration and SDC Mat Base	Design By: SEC	Date: 11-27-01	Job No.: 01-0603wo2
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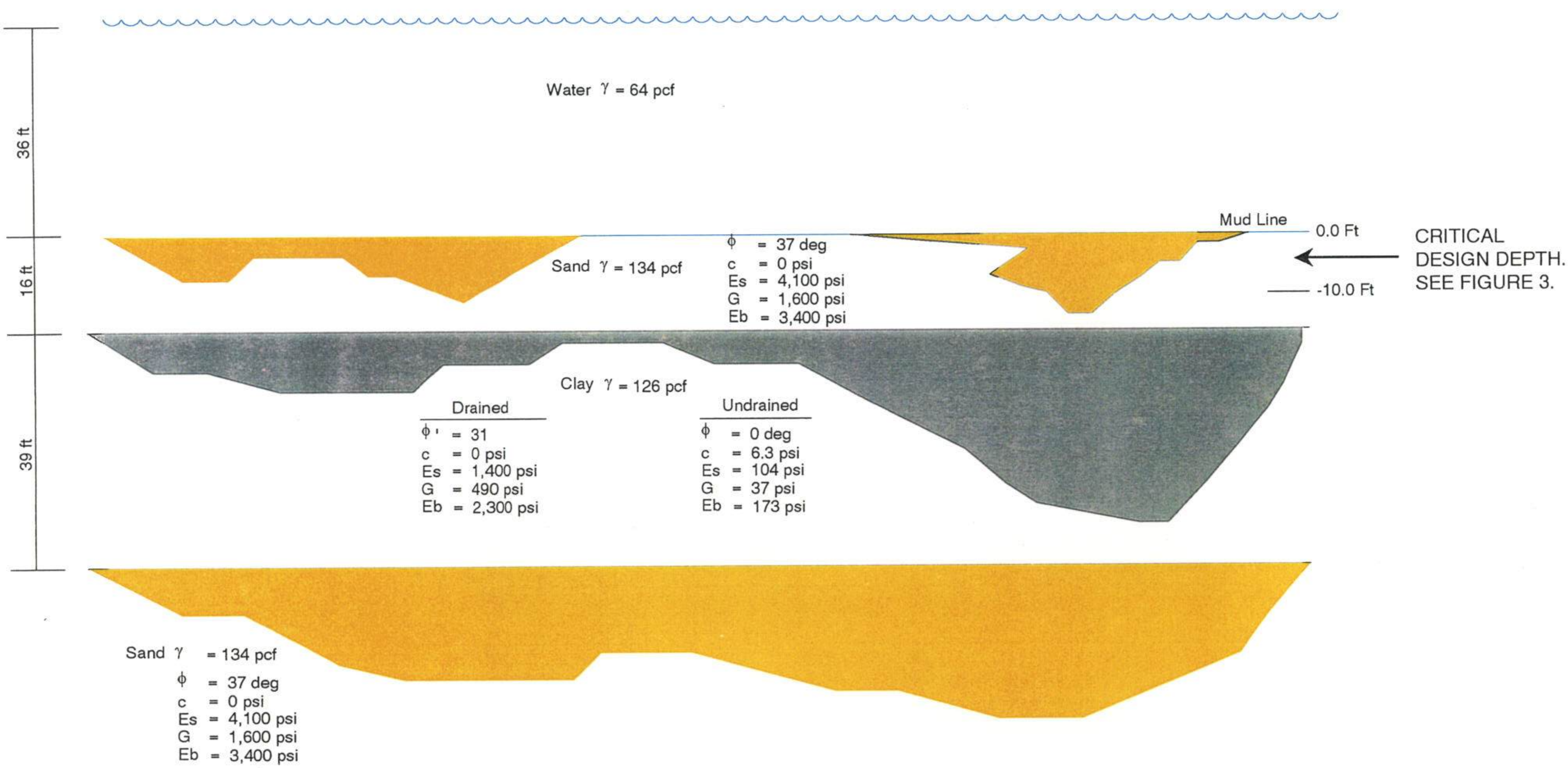

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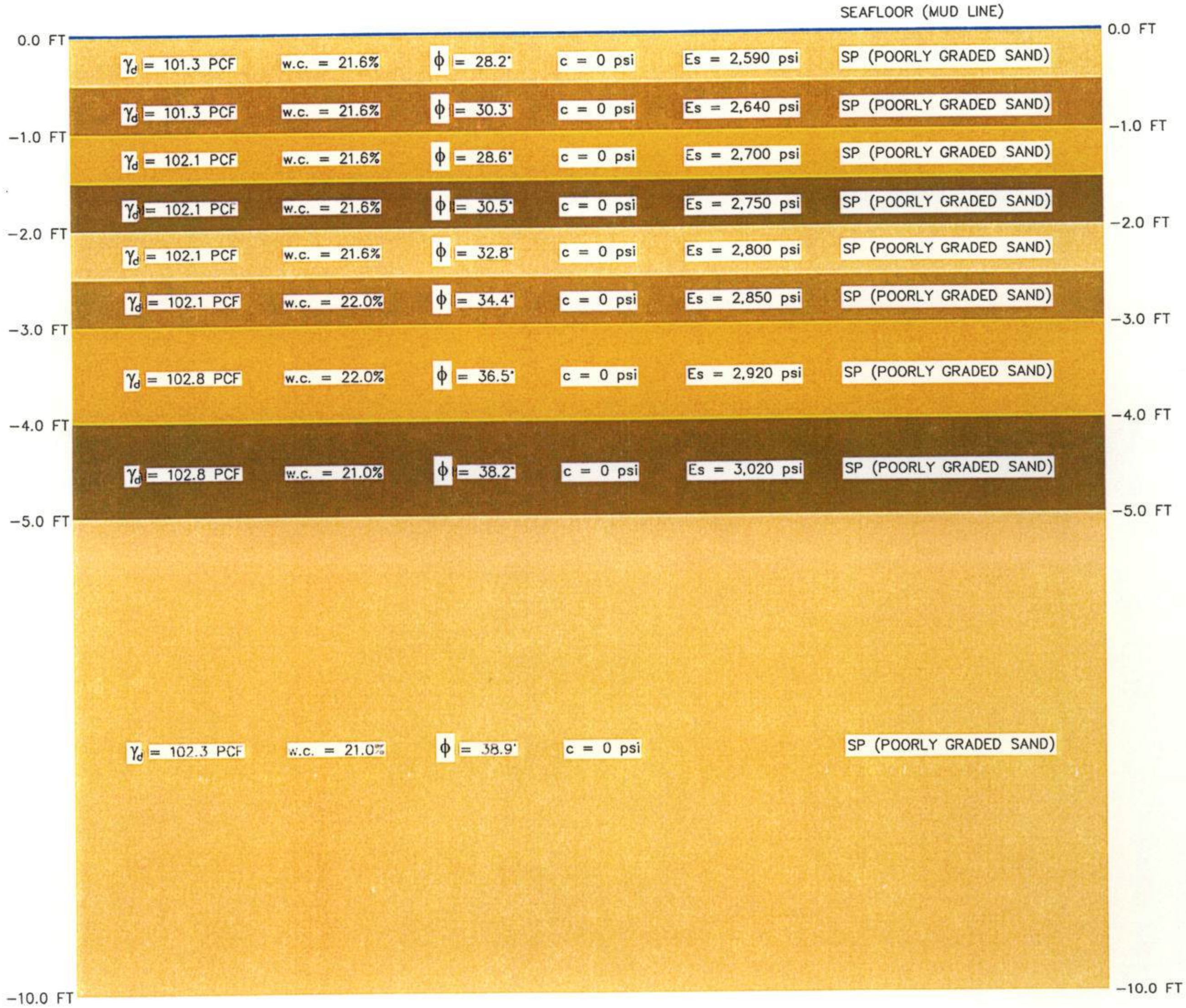

ARCTIC GEOSCIENCE, INC.	Title: Critical Design Soil Profile (Top 10 Feet of Seafloor)	Design By: SEC	Date: 11-27-01	Job No.: 01-0603wo2
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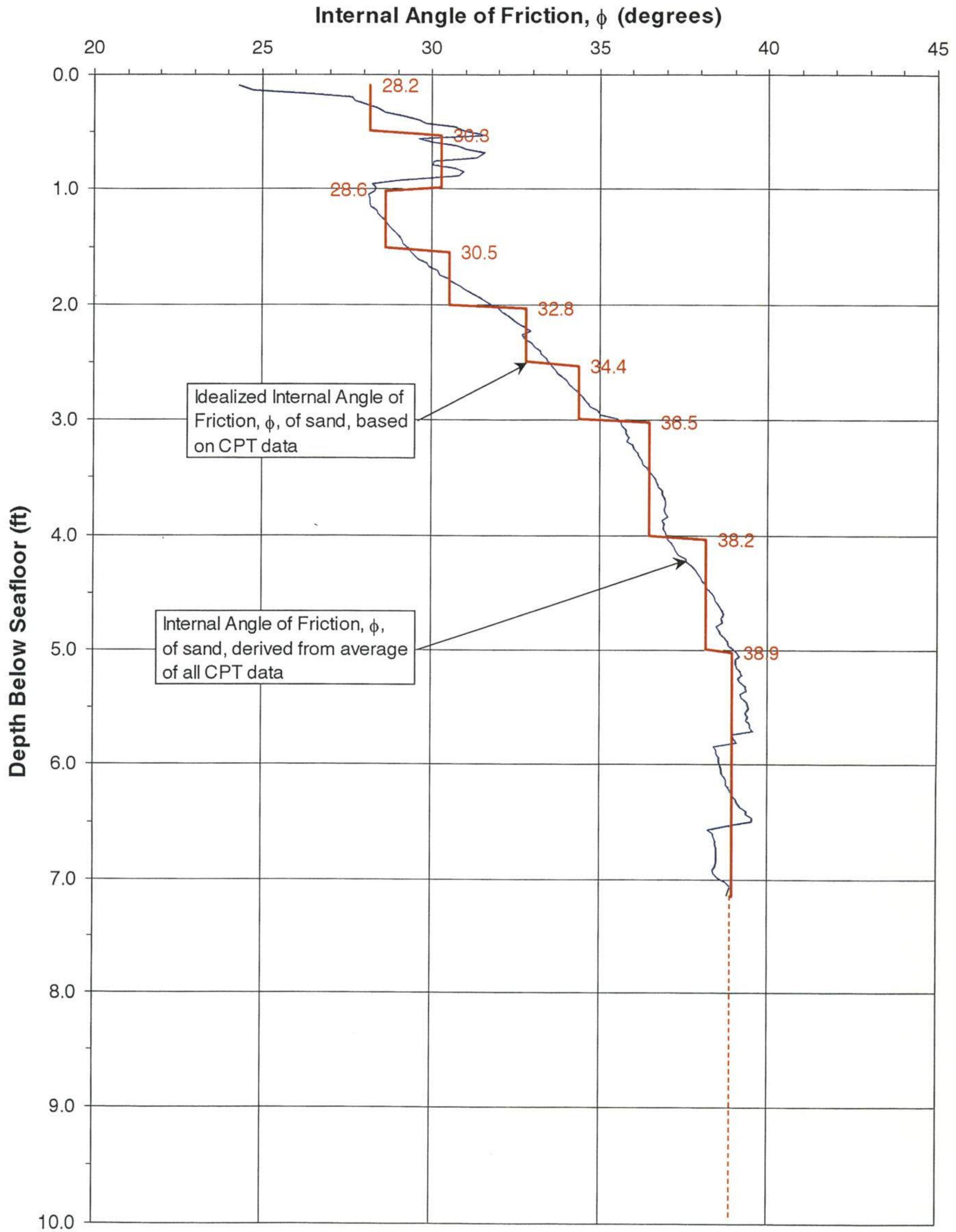

ARCTIC GEOSCIENCE, INC.	Title: Internal Friction Angle (from CPT Data) vs. Depth Below Seafloor	Design By: SEC	Date: 11-27-01	Job No.: 01-0603wo2
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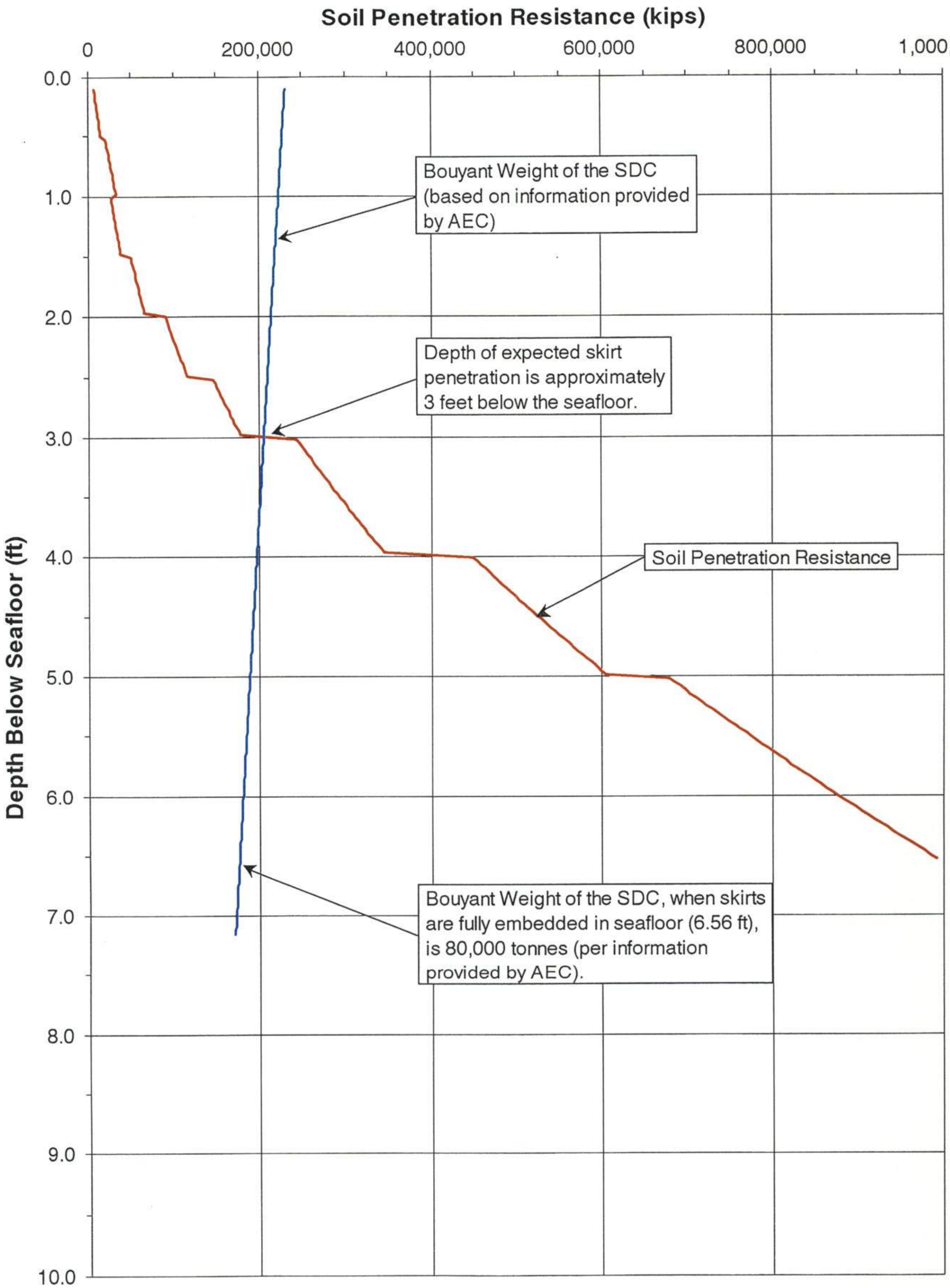

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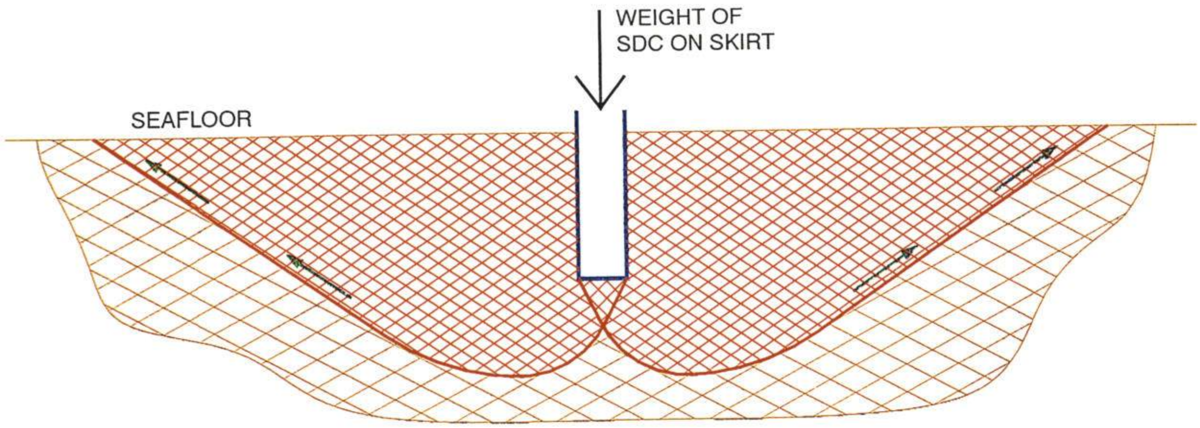
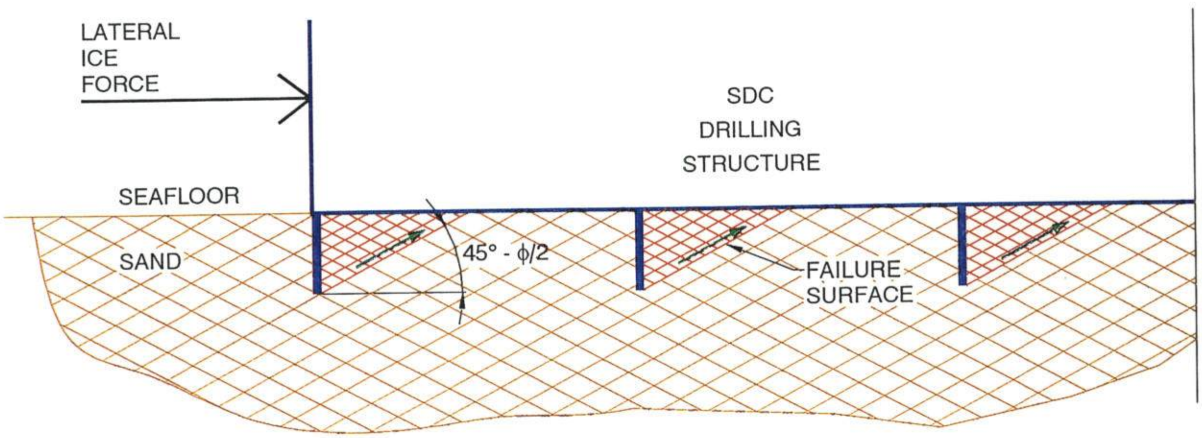
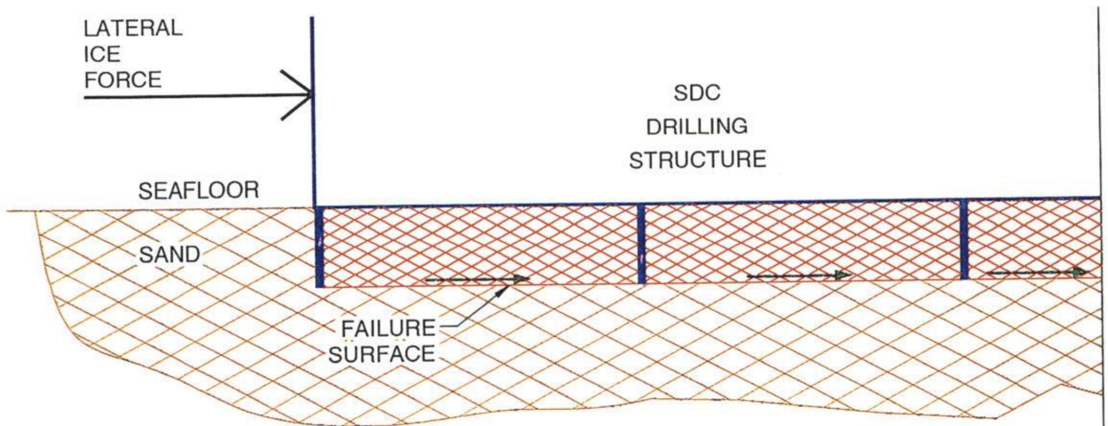


(a) GENERAL SHEAR FAILURE



(b) PASSIVE WEDGE FAILURE MODE



(c) TIP - TO - TIP FAILURE MODE

ARCTIC GEOSCIENCE, INC.	Title: Soil Failure Modes Due to Weight of SDC and Lateral Ice Loads	Design By: SEC	Date: 11-27-01	Job No.: 01-0603wo2
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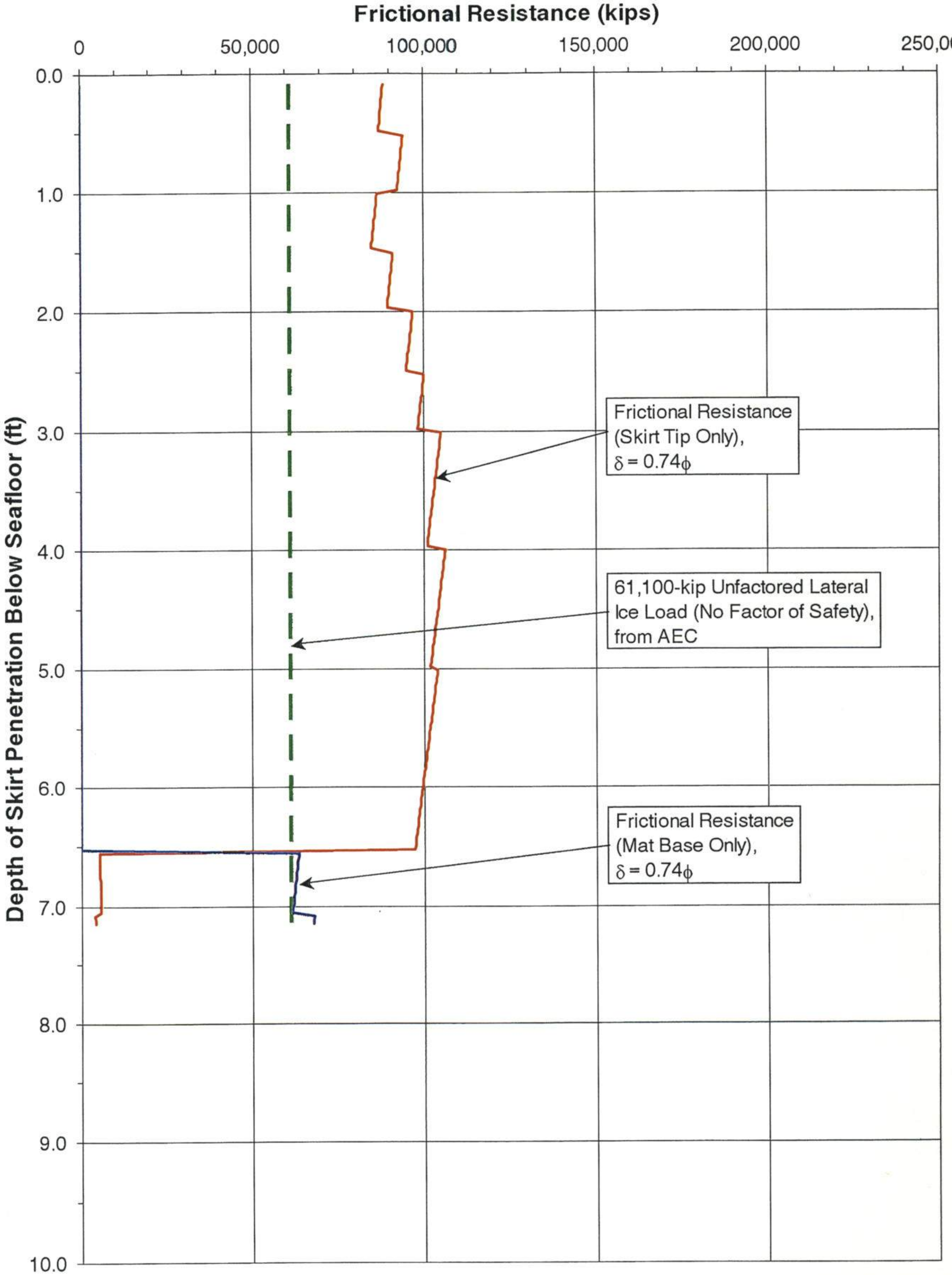

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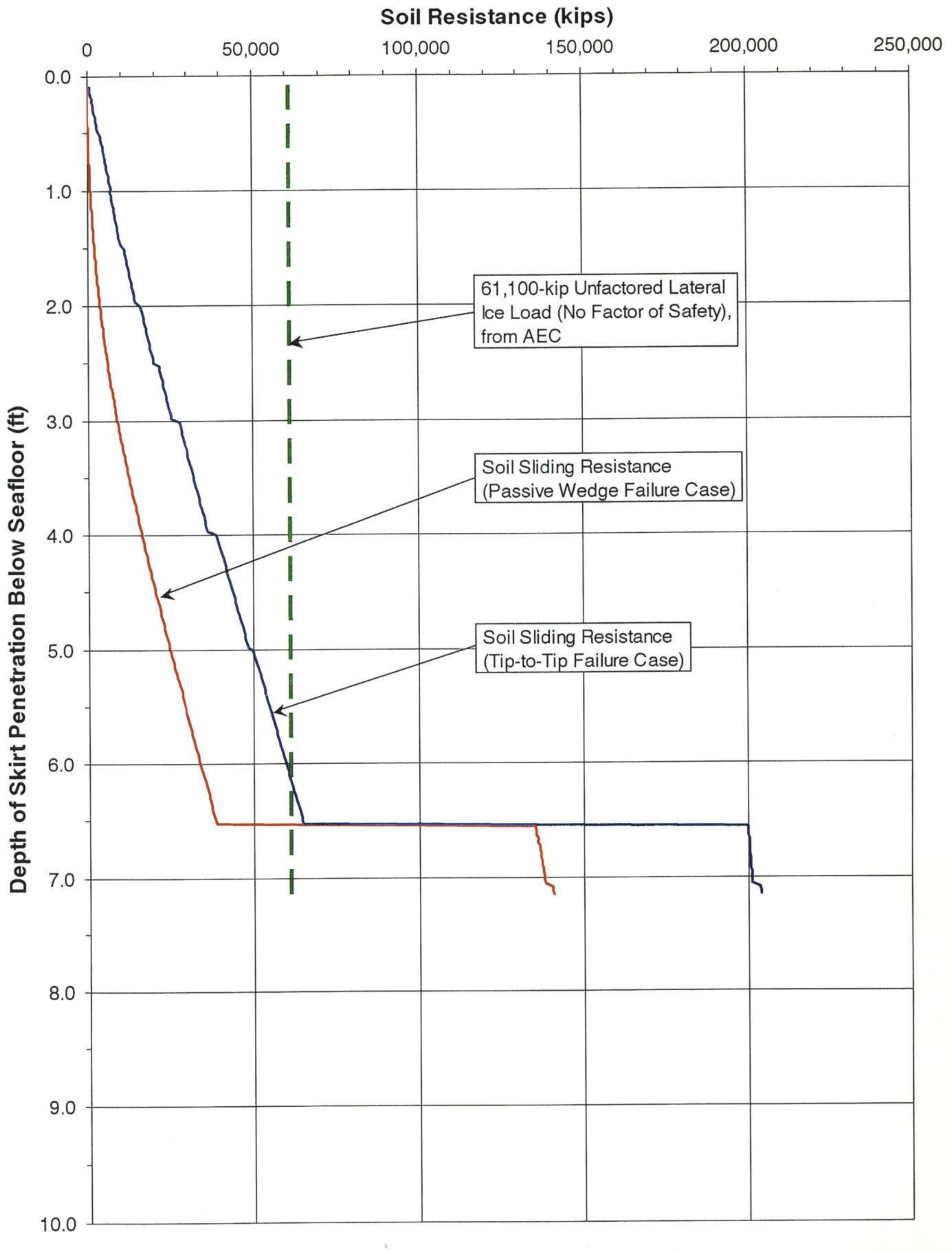

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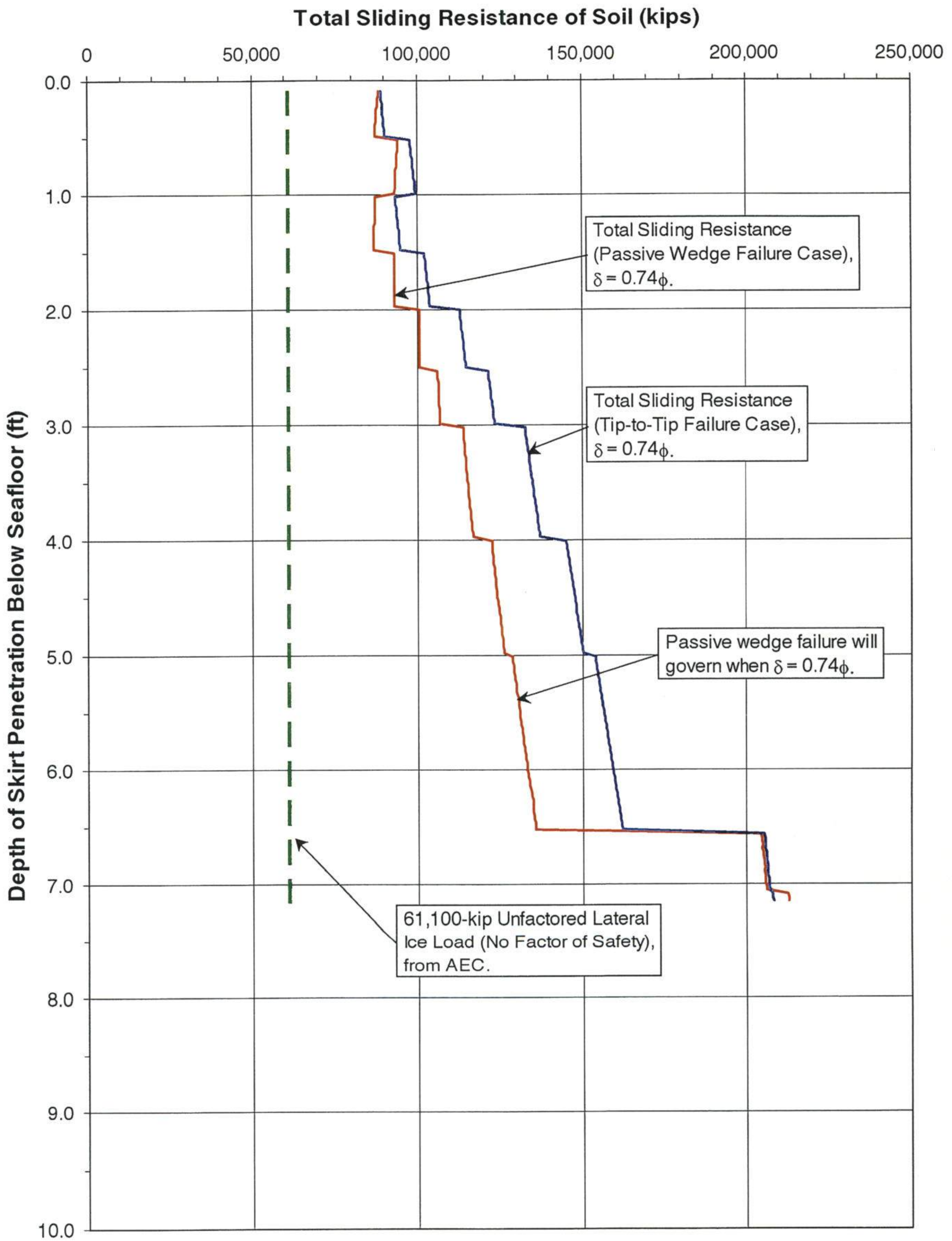

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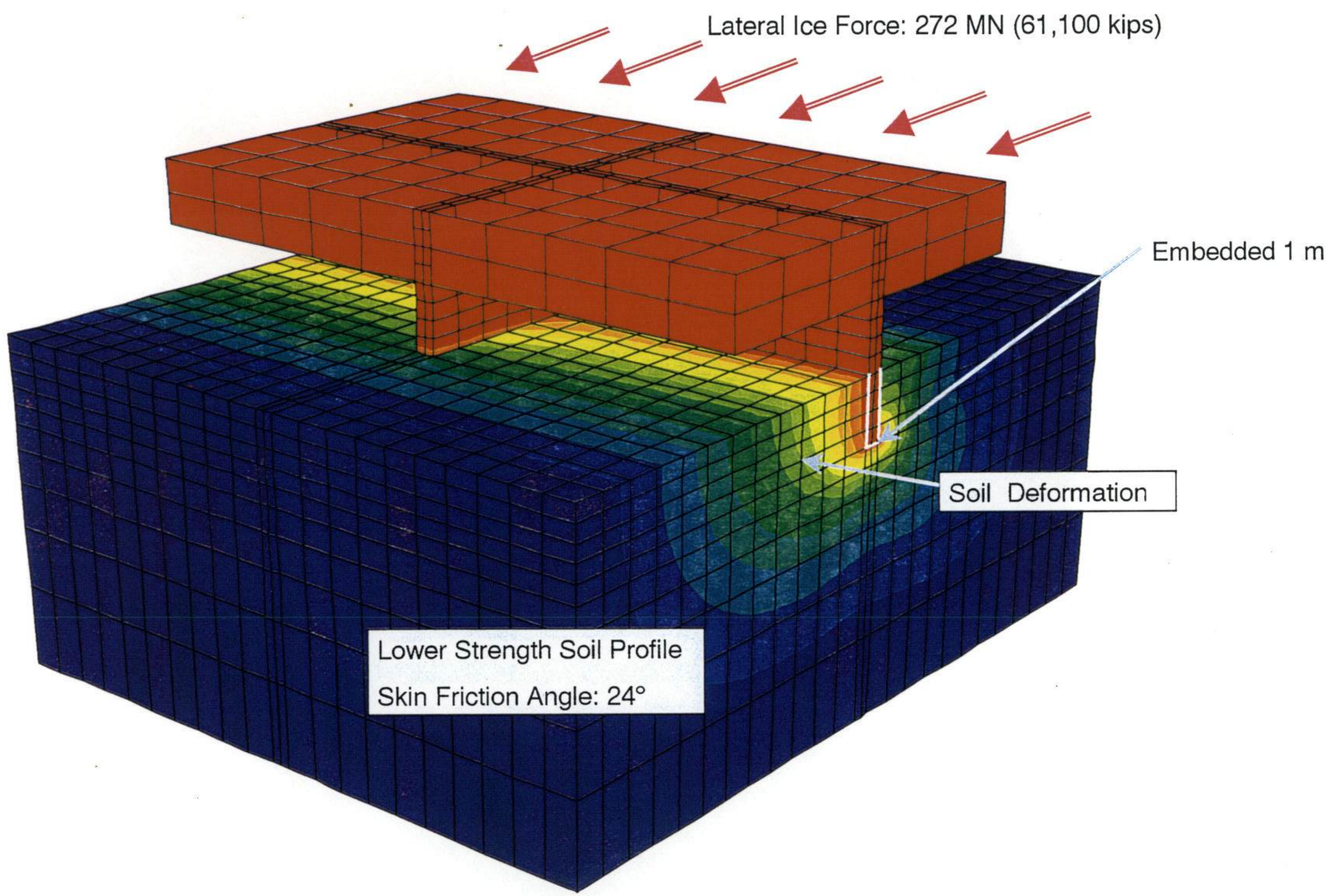

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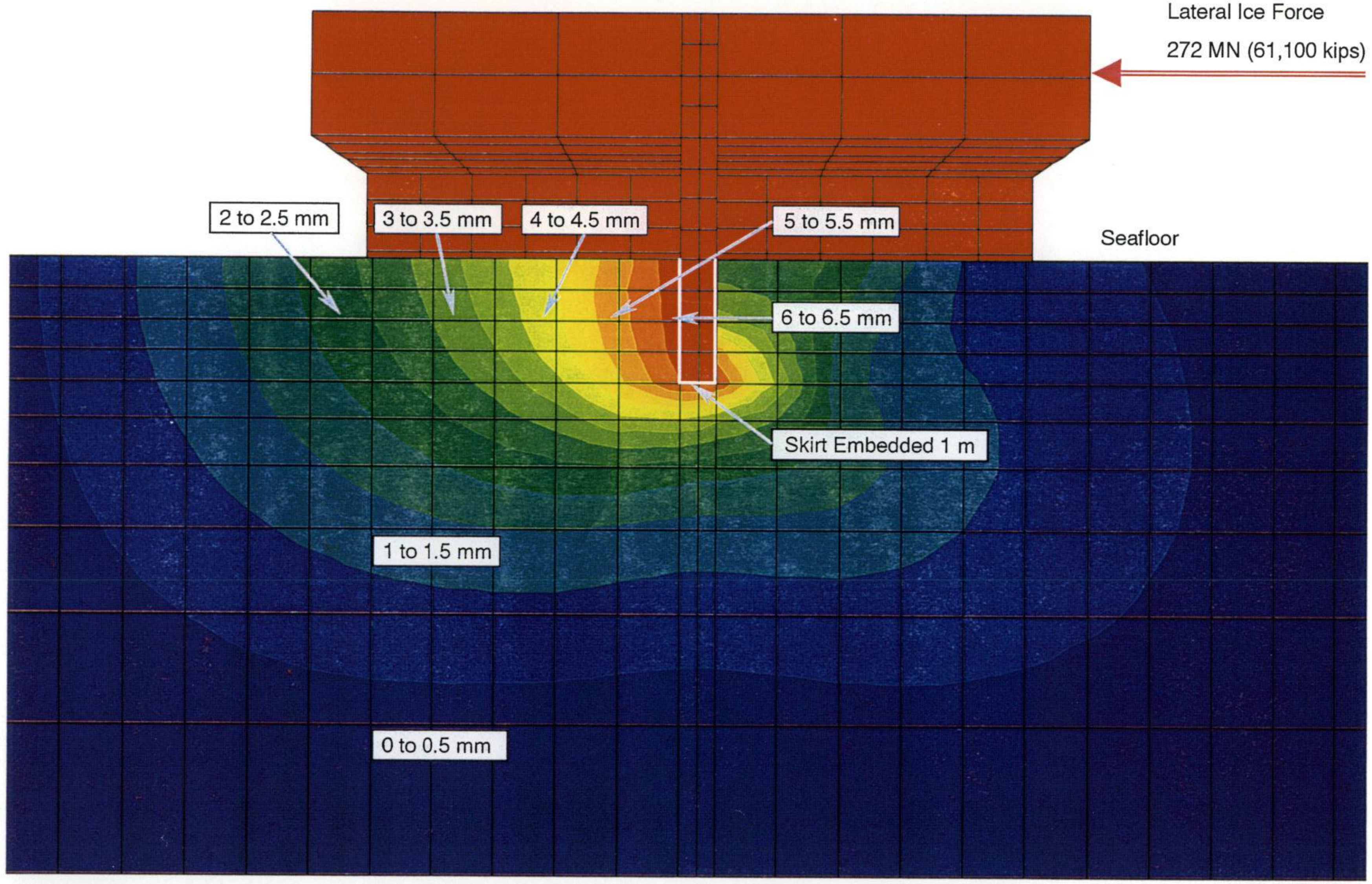

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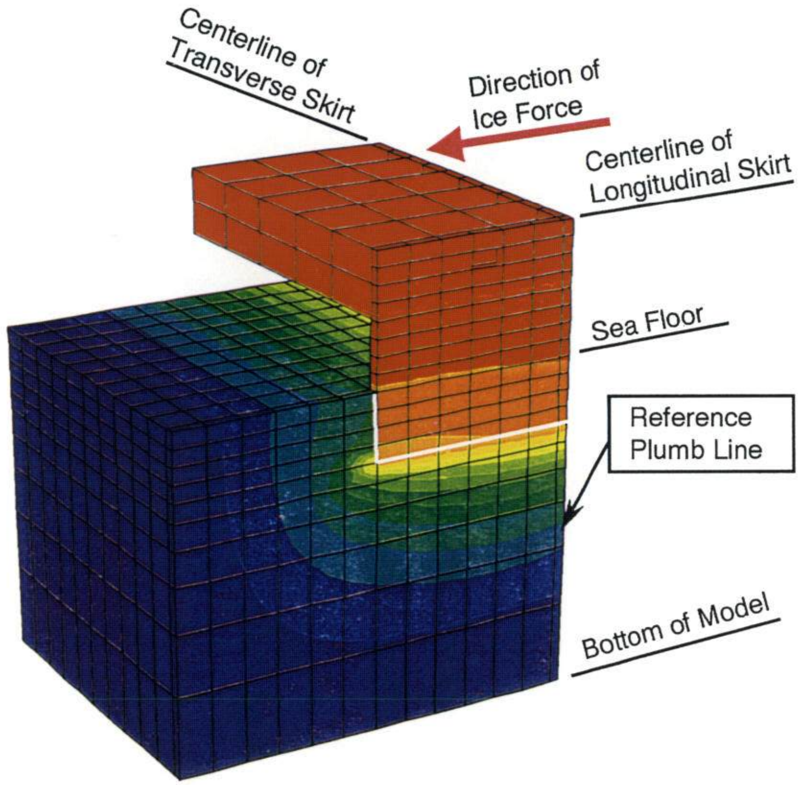

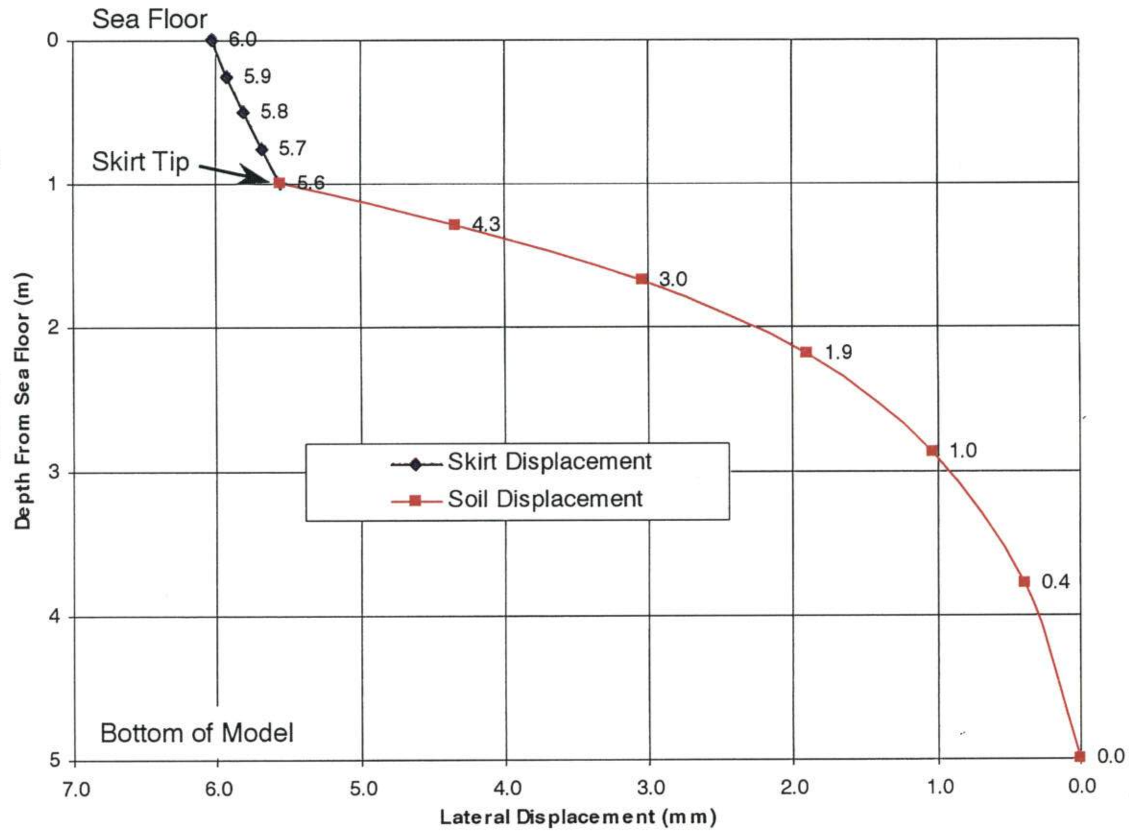

Skirt & Soil Friction Angle: 24°
Lower Strength Soil Profile

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Appendix A:

Design Parameters for SDC Setdown and Deformation Analysis

at McCovey Prospect

Kevin Hewitt, November 7, 2001.

DESIGN PARAMETERS
for
SDC STABILITY and DEFORMATION ANALYSES
at
McCOVEY PROSPECT

DESIGN ICE LOAD

Based on analyses undertaken by K.R. Croasdale and Associates Ltd., the recommended design ice load for the deployment of the SDC at McCovey is 61,100 kips. This load acts horizontally on the MAT at the ice line. This compares with a design ice load of 48,900 kips used for the last deployment of the SDC at the Cabot location in 1991/2. The difference is attributable to the interpretation of load measurements from full-scale ice interactions.

According to API RP2A-WSD, a factor of safety of 1.5 should be used for evaluating sliding stability. Therefore the SDC foundation resistance must be sufficient to withstand the design ice load of 61,100 kips plus 50% (i.e. 91,650 kips).

NET WEIGHT OF SDC (CONTACT FORCE)

Because of the relatively shallow water depth at the McCovey location, it is proposed that only the MAT be ballasted. The SSDC will have sufficient weight for stability without ballast (55,000 tonnes /120,000 kips) as it will be totally above the waterline. The net weight of the ballasted MAT will be in the order of 25,000 tonnes (35,000 tonnes of steel less some voids). Therefore the total contact force of the SDC (the combined SSDC and MAT) on the seabed will be in the order of 80,000 tonnes (175,000 kips).

FRICTION ANGLE AT SKIRT TIPS

The uppermost soil unit at McCovey is described as mainly fine to medium grained sand with a dense to very dense consistency. This layer may contain some less compact layers close to the surface (above a depth of three feet). However, based on a continuous footing analysis, the SDC will most likely penetrate these less compact layers and come to rest on the dense to very dense sands.

According to API RP2A-LRFD (Pile Design) a friction angle of 30 degrees would be appropriate for the skirt tips resting on dense sand, and 35 degrees on very dense sand. A review of the literature produced recommended values ranging from 30 to 35 degrees. Considering that some of the recommendations in the literature are given for situations where little information is available on the actual density of the soil, it could easily be argued that a value of 30 degrees for dense sand represents a lower bound.

Based on the above information, a friction angle of 30 degrees at the SDC skirt tips is considered an appropriate value to use in the stability analyses.

Appendix B:

Technical Research and Analysis of Friction Angles

The coefficient of friction was discussed in the literature in three general applications: 1) skin friction of piles, 2) friction angle of sheet pile walls, and 3) sliding resistance of retaining walls. Many times the materials were not identified. In general, the friction angles were lower for steel and greatest for timber, with concrete being in between. The friction angle associated with retaining walls is high because they are generally constructed by pouring concrete directly on the soil. This creates an irregular contact surface and often times the failure plane is not at the interface between the concrete and the soil.

Two summary tables have been prepared as a result of the technical literature search. Table B-1 includes a summary of the friction angles from all of the references. Table B-2 includes a summary of the friction angles from just the references that have values for steel – sand. The friction angles shown are for sand with an internal friction angle, ϕ, of 36.5°, such as was determined to be present at a depth of three feet from the ECPT data collected at the McCovey site. (See Figure 4.)

Tables B-1 and B-2 have been sorted and displayed as bar graphs (Figures B-1 and B-2) to better visualize the range of values reported in the literature. Both high and low values have been included. Where the friction angle was presented as a singular value, it has been included twice (high and low) so as not to bias the data set. The mean (average) values and the standard deviations have been calculated and plotted, as well. As can be seen from Table B-2 and Figure B-2, the mean value of the friction angle, δ, between sand and steel, as reported in the literature, is 24.3° or 0.67ϕ. The standard deviation of this data set is 5.63°, resulting in a range of friction angles of between 18.7° and 30.0°, or 0.51ϕ to 0.82ϕ. The low and high friction angles, reported in the literature for sand/steel, were 11° and 31.5°, respectively. These values correspond to 0.30ϕ and 0.86ϕ.

References (with citations) that AGSI considered when determining the friction angle, δ, between the SDC skirts and the soil:

1. Bowles, Joseph E. *Foundation Analysis and Design*, 3rd edition. McGraw-Hill, New York, 1982.
   a) Referenced NAVFAC (Reference No. 7)
2. Das, Braja M. *Principles of Foundation Engineering.* PWS Engineering, Boston, Mass., 1984.
   a) p. 358: "The values of δ from various investigations appear to be in the range of 0.5ϕ to 0.8ϕ." [Piles]
   b) pp. 247-8: Reduce ϕ to 0.5ϕ to 0.67ϕ [Retaining Wall]
3. Peck, Ralph B., Walter E. Hanson, and Thomas H. Thornburn. *Foundation Engineering*, 2nd edition. John Wiley & Sons, New York, 1974.
   a) p. 423: "…for concrete retaining walls, the value $\delta = 2/3\phi$ is usually a reasonable approximation. [Retaining Wall]
4. Spangler, Merlin G., and Richard L. Handy. *Soil Engineering*, 4th Edition. Harper & Row, New York, 1982.
   a) p. 534: "The angle δ can never be greater than the angle ϕ of internal friction of the soil. In practice δ is frequently assumed to be about two-thirds of ϕ." [Retaining Wall]
   b) p. 632: Figure 23.12 suggests a side friction reduction factor of between 0.5 and 0.7 for drilled piers in sand. [Pile]
5. Terzaghi, Karl, Ralph B. Peck, and Gholamreza Mesri. *Soil Mechanics in Engineering Practice*, 2nd Edition. John Wiley & Sons, New York, 1996.
   a) p. 430: "For a steel pile tan δ has been taken as 2/3 tan ϕ, and for a concrete pile as tan ϕ." [Pile]
6. U.S. Army Corps of Engineers. *"Design of Pile Foundations," EM 1110-2-2906.* Department of the Army, Washington, DC, January 15, 1991.
   a) p. 4-12: Table 4-3 lists a value of δ for steel piles in a cohesionless soil as $0.67\ \phi$ to $0.83\ \phi$. [Pile]

7. Department of the Navy. *"Foundations and Earth Structures," Design Manual 7.2.* Department of the Army, Naval Facilities Engineering Command, Alexandria, VA, May 1982.

   a) p. 7.2-63: Table 1 lists δ for steel sheet piles against clean sand as 17°. [Wall]

   b) p. 7.2-194: Table 1 lists δ for steel piles in granular soil as 20°. [Pile]

8. Tomlinson, M.J. *Foundation Design and Construction*, Fifth Edition. Longman Scientific & Technical, Essex, England, 1986.

   a) p. 405: Table 7.1 lists δ for steel piles in cohesionless soil as 20°. [Pile]

   b) p. 316: "The peak value of the angle of wall friction (δ) can be taken as $2/3\phi$." [Retaining Wall]

9. Winterkorn, Hans F., Hsai-Yang Fang. *Foundation Engineering Handbook.* Van Nostrand Reinhold Company, New York, NY, 1975.

   a) p. 411: "For concrete retaining walls, this shearing resistance is approximately equal to the shearing resistance of the soil." ($\tan\delta = \tan\phi$) [Retaining Wall]

   b) p. 426: " For calculating active pressure, δ may be taken as one-half the value of ϕ." and "In the calculation of passive pressure it is usual to take $\delta = 2/3\ \phi$ for anchored sheet pile walls." [Sheet Pile Walls]

   c) p. 562: Table 19.2 lists the friction angle between wet sand and steel as 26°. [Pile]

10. *Recommended Practice for Planning, Design and Constructing Offshore Platforms – Load and Resistance Factor Design (RP 2A-LRFD).* American Petroleum Institute, Washington D.C., July 1, 1993.

    a) p. 67: Table G.4.3-1 lists the soil-pile friction angle, δ, for a dense sand as 30° and for a dense sand-silt as 25°. [Pile]

11. Sower, George B., George F. Sowers. *Introductory Soil Mechanics and Foundations*, 3rd Edition. MacMillan Publishing Co., Inc., New York, NY, 1970.

    a) p. 350: "For smooth concrete it (δ) is often $1/2\phi$ to $2/3\phi$, and for rough stone it (δ) is equal to ϕ. [Retaining Wall]

    b) p. 463: Table 10:3 lists the soil-pipe friction angle, δ, for cohesionless soil and clean steel as $\delta = 11°$, and for rusty steel as $\delta = 22°$. [Pile]

12. *Thrust Restraint Design for Ductile Iron Pipe*, 4th Edition. Ductile Iron Pipe Research Association, Birmingham, Alabama, 1997.

    a) p. 12: Table 3 lists δ for steel pipe and sand w/ silt as $\delta = 0.5\phi$ to 0.75ϕ. [Pipe]

References (with citations) supplied by Mr. Kevin Hewitt that AGSI considered in determining the friction angle, δ, between the SDC skirts and the soil:

13. *Canadian Foundation Engineering Manual*, 1985.

    a) p. 285: $\tan \delta / \tan \phi$ ranges from 0.7 to 1.0 for piles, depending on the pile material and method of installation. [Pile]

14. Tschebotarioff, Gregory P. *Foundations, Retaining and Earth Structures*, 2nd Edition. McGraw-Hill, New York, 1973.

    a) p. 226: "In noncohesive soils… δ... can be taken as $\delta = 30°$." [Pile]

15. Le Tirant, Pierre. *Seabed Reconnaissance and Offshore Soil Mechanics for the Installation of Petroleum Structures.* Editions Technip, Paris, 1979.

    a) p. 318: "Angle of friction between pile and sand (API recommends the adoption of $\delta = \phi - 5°$)" [Pile]

    b) p. 375: "The recommendations of *Det Norsk Veritas (DNV)* advocate the adoption of: $\tan \phi / \tan \delta$ ratio of 1.2 for sands." [Slip of Structures]

16. Graff, W.J. *Introduction to Offshore Structures.* Gulf Publishing Company, Houston, 1981.

    a) p. 83: Table 7-1 lists a value of δ for a driven pipe pile in clean sand ($\phi = 30° – 35°$) as 30° and for a silty sand ($\phi = 25° – 30°$) as 25°" [Pile]

17. George, P. and D. Wood. *Offshore Soil Mechanics*, 1976.

    a) p. 191: "It is recommended where $\phi = 35°$, $\delta = 30°$." [Unknown]

18. *Rules for the Design, Construction and Inspection of Offshore Structures.* Det Norske Veritas, 1980.

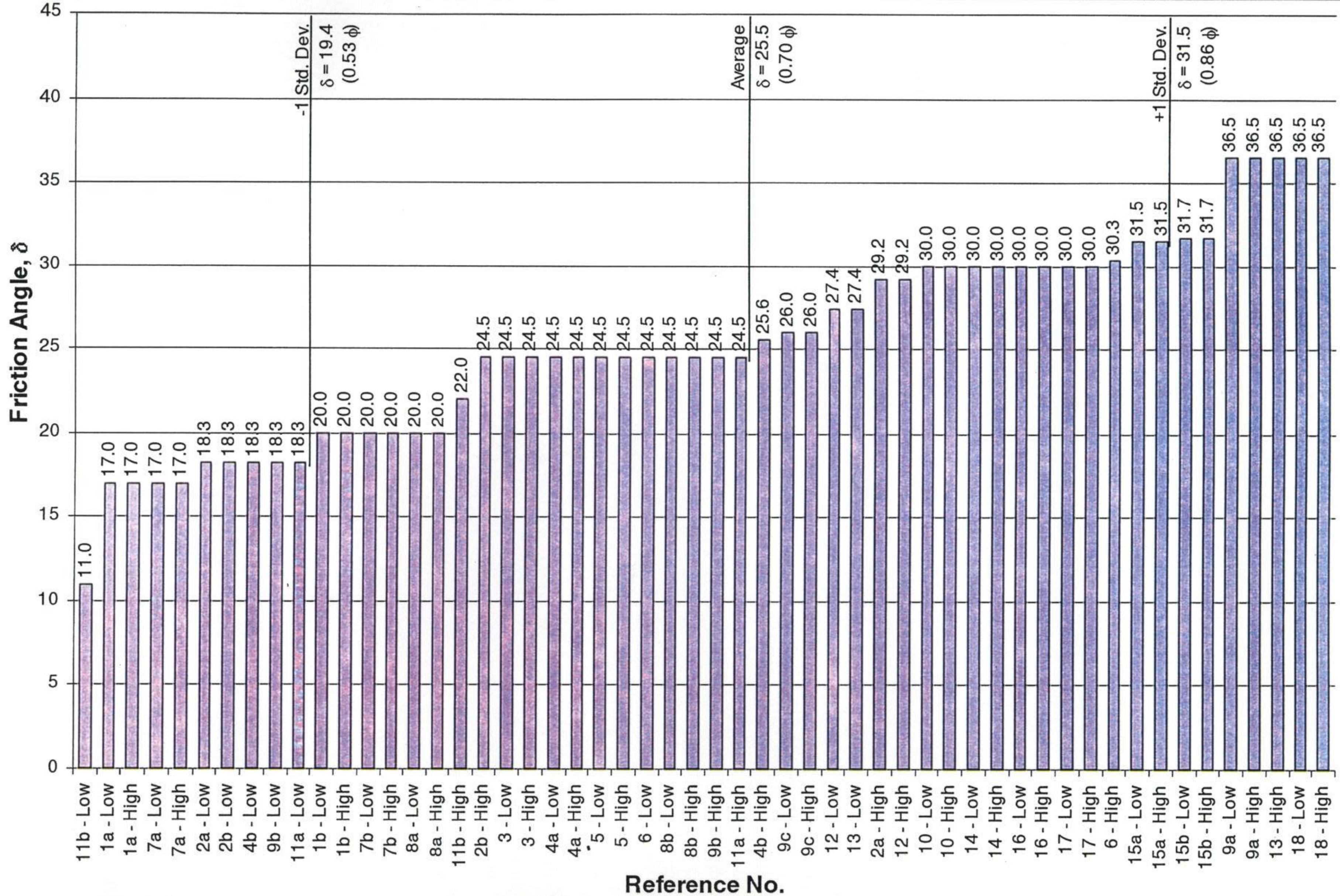
    a) p. F10: "It is recommended that $\delta = \phi$." [Unknown]

Table B-1: Summary of Friction Angles, δ – All Data Gathered; ϕ = 36.5°.

Ref. No	Range of δ (deg)	Low δ (deg)	High δ (deg)	Application	Comment
1	17	17.00	17.00	Sheet Pile	Steel Sheet Pile against Clean Sand
1	20	20.00	20.00	Pile	Steel Pile in Granular Soil
2	0.5ϕ to 0.8ϕ	18.25	29.20	Pile	No mention of material types.
2	0.5ϕ to 0.67ϕ	18.25	24.46	Retaining Wall	Generally, Poured Concrete on Soil
3	0.67ϕ	24.46	24.46	Retaining Wall	Concrete - Soil
4	about 0.67ϕ	24.46	24.46	Retaining Wall	Generally, Poured Concrete on Soil
4	0.5ϕ to 0.7ϕ	18.25	25.55	Pile	Unknown pile material in Sand
5	0.67ϕ	24.46	24.46	Pile	Steel: 2/3 ϕ; Concrete: ϕ
6	0.67ϕ to 0.83ϕ	24.46	30.30	Pile	Steel Pile in Cohesionless Soil
7	17	17.00	17.00	Sheet Pile	Steel Sheet Pile against Clean Sand
7	20	20.00	20.00	Pile	Steel Pile in Granular Soil
8	20	20.00	20.00	Pile	Steel Pile in Cohesionless Soil
8	0.67ϕ (peak)		24.46	Retaining Wall	Generally, Poured Concrete on Soil
9	ϕ	36.50	36.50	Retaining Wall	Concrete only
9	0.5ϕ to 0.67ϕ	18.25	24.46	Sheet Pile	
9	26	26.00	26.00	Pile	Steel Pile and Wet Sand
10	30	30.00	30.00	Pile	Pipe Pile (Steel) in Dense Sand
11	0.5ϕ to 0.67ϕ	18.25	24.46	Retaining Wall	Smooth Concrete - Soil
11	11 to 22	11.00	22.00	Pile	Cohesionless Soil - Clean/Rusty Steel
12	0.75ϕ to 0.8ϕ	27.38	29.20	Pipe	Steel Pipe – Clean Sand
13	tan δ / tan ϕ = 0.7 to 1.0	27.38	36.50	Pile	Unknown pile and soil types
14	30	30.00	30.00	Pile	Assume Steel pile in Noncohesive soil
15	ϕ - 5	31.50	31.50	Pile	Unknown pile (assume Steel) in Sand
15	tan ϕ/tan δ = 1.2	31.66	31.66	Structure Slip	Unknown structure material in Sand
16	30	30.00	30.00	Pile	Pipe pile (steel) in Clean Sand
17	30	30.00	30.00	Unknown	Assume Steel pile in ϕ = 35 soil
18	ϕ	36.50	36.50	Unknown	Unknown
	Averages	24.28	26.67		
	Average δ as % of ϕ	0.67	0.73		

Table B-2: Summary of Friction Angles, δ – Steel / Sand Data Only; ϕ = 36.5°.

Ref. No	Range of δ (deg)	Low δ (deg)	High δ (deg)	Application	Comment
1	17	17.00	17.00	Sheet Pile	Steel Sheet Pile against Clean Sand
1	20	20.00	20.00	Pile	Steel Pile in Granular Soil
5	0.67ϕ	24.46	24.46	Pile	Steel: 2/3 ϕ; Concrete: ϕ
6	0.67ϕ to 0.83ϕ	24.46	30.30	Pile	Steel Pile in Cohesionless Soil
7	17	17.00	17.00	Sheet Pile	Steel Sheet Pile against Clean Sand
7	20	20.00	20.00	Pile	Steel Pile in Granular Soil
8	20	20.00	20.00	Pile	Steel Pile in Cohesionless Soil
9	0.5ϕ to 0.67ϕ	18.25	24.46	Sheet Pile	
9	26	26.00	26.00	Pile	Steel Pile and Wet Sand
10	30	30.00	30.00	Pile	Pipe Pile (Steel) in Dense Sand
11	11 to 22	11.00	22.00	Pile	Cohesionless Soil – Clean/Rusty Steel
12	0.75ϕ to 0.8ϕ	27.38	29.20	Pipe	Steel Pipe – Clean Sand
14	30	30	30	Pile	Assume Steel pile in Noncohesive Soil
15	ϕ - 5	31.50	31.50	Pile	Unknown Pile (assume Steel) in Sand
16	30	30.00	30.00	Pile	Pipe Pile (Steel) in Clean Sand
17	30	30	30	Unknown	Assume Steel pile in ϕ = 35 soil
	Averages	23.56	25.12		
	Average δ as % of ϕ	0.65	0.69		
	Extremes	11	31.5		
	(as % of ϕ)	0.30	0.85		
	Std. Deviation		5.63		
	+/- 1 Std. Dev.	18.71	29.97		
	(as % of ϕ)	0.51	0.82		
	+ 0.5 Std. Dev.		27.16		
	(as % of ϕ)		0.74		



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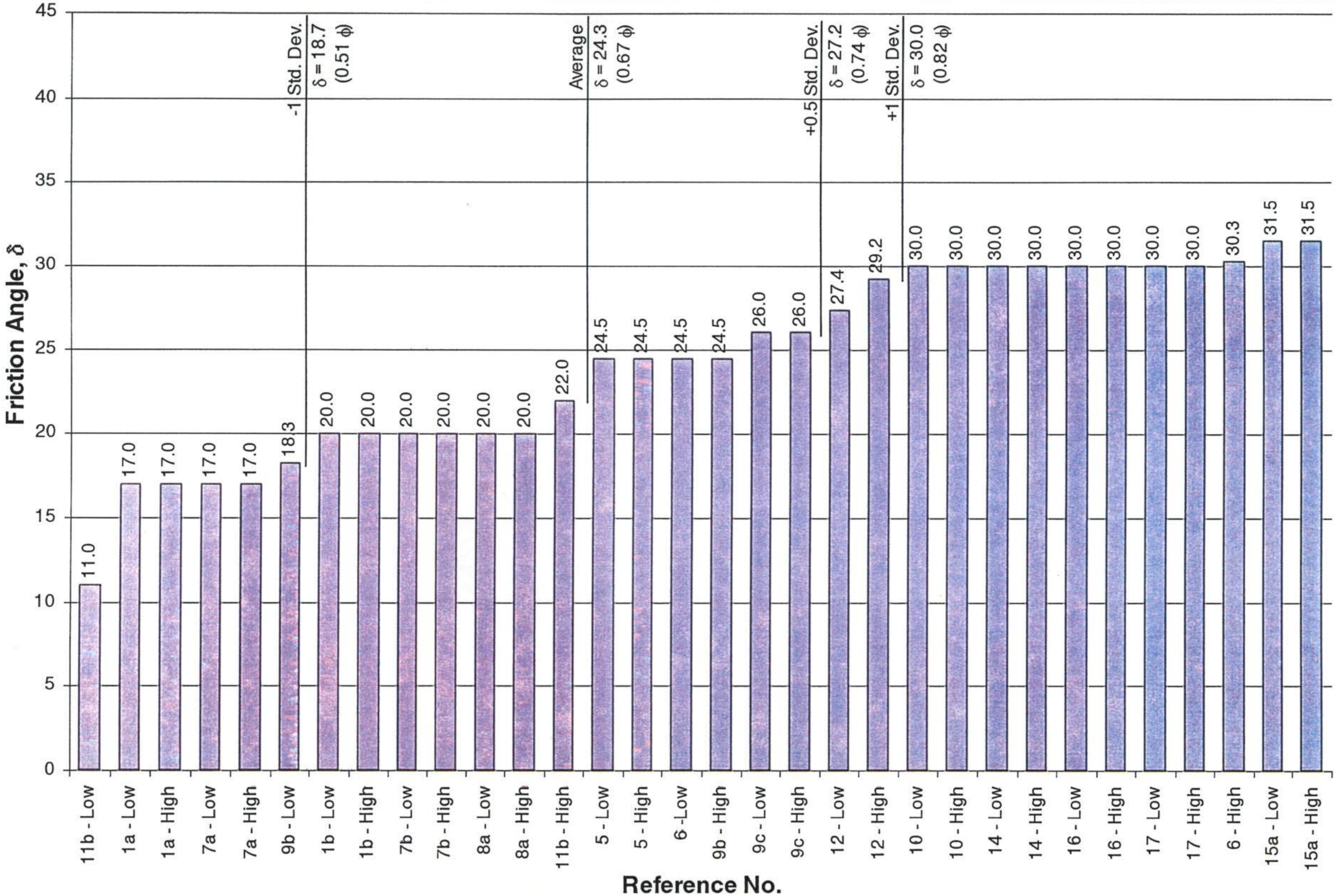

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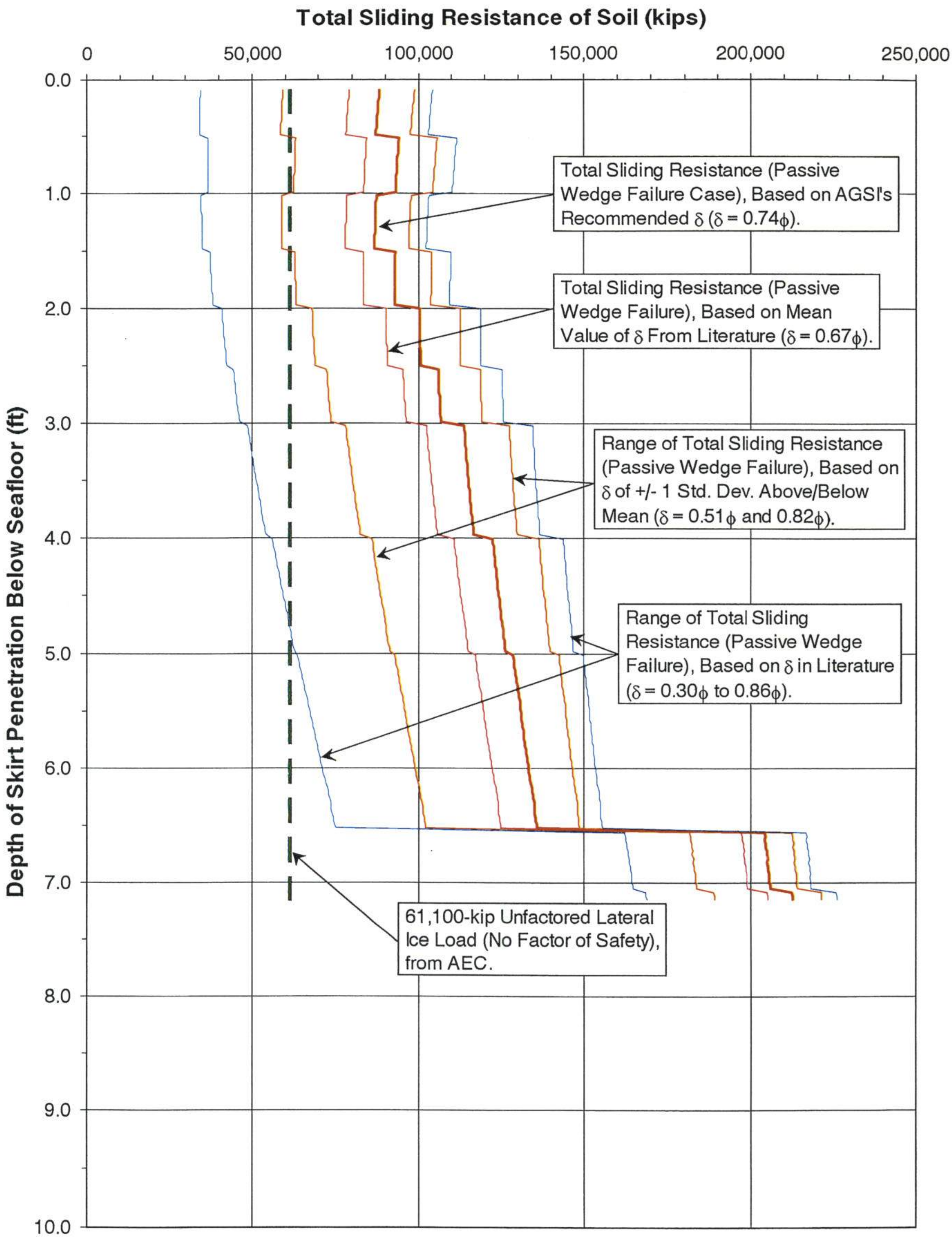

ARCTIC GEOSCIENCE, INC.	Title: Total Sliding Resistance (Passive Wedge Failure) As a Function of Friction Angle, δ	Design By: SEC	Date: 11-27-01	Job No.: 01-0603wo2
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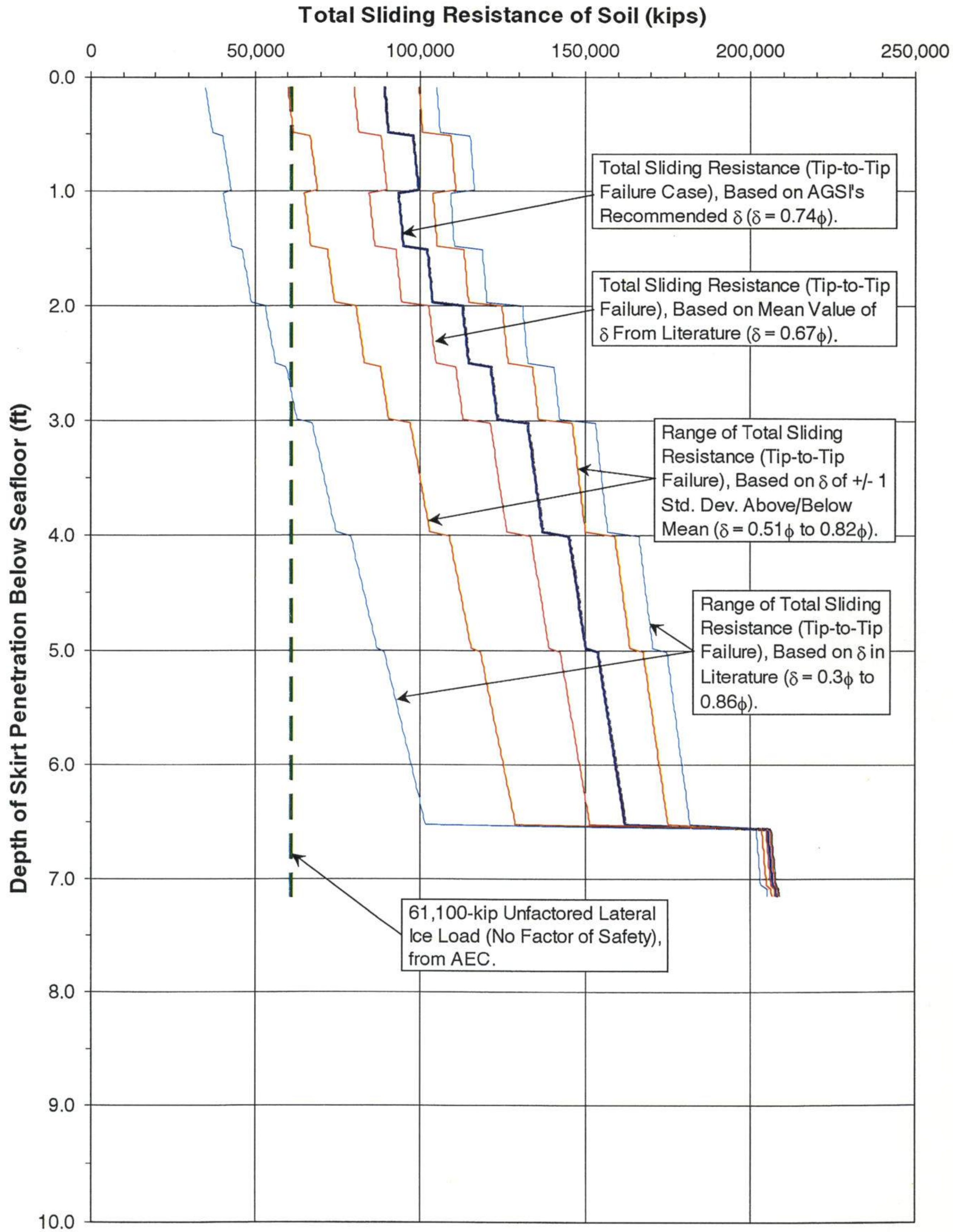

ARCTIC GEOSCIENCE, INC.

Title: Total Sliding Resistance (Tip-to-Tip Failure) As a Function of Friction Angle, δ	Design By: SEC	Date: 11-27-01	Job No.: 01-0603wo2
Project: SDC Setdown and Deformation Analysis McCovey Prospect, Beaufort Sea, Alaska	Drawn By: SEC	File Name: Figure_B-4	Figure No.: B-4
	Checked By: CJL	Scale: NTS	

DEPLOYMENT OF THE SDC AT THE

McCOVEY LOCATION

ALASKA

ICE DESIGN CRITERIA

PREPARED BY

K. R. CROASDALE & ASSOCIATES LTD.

FOR

AEC OIL & GAS (USA), INC.

NOVEMBER 28, 2001

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EXECUTIVE SUMMARY

AEC Oil and Gas (USA), Inc. (AEC) and its partners propose to drill an exploratory well at the McCovey prospect during the winter 2002/2003. AEC plans to use the mobile offshore drilling unit (MODU) known as the SDC. This unit has been used at six sites in the Beaufort Sea since it was constructed in 1982. The SDC consists of a concrete-reinforced steel Hull supported by a steel Mat. This document provides supporting calculations and documentation for the Exploration Plan submitted to the Minerals Management Service (MMS) and includes evaluations of ice loads on the SDC Hull and Mat, separately, specific to the McCovey site.

The McCovey site is located approximately 11.5 miles northeast of West Dock in Prudhoe Bay and 4.3 miles northeast of Reindeer Island at a water depth of 36 feet. Since ice loads typically decrease with decreasing water depths, it is expected that ice loading on the SDC at McCovey will be less than at any previous deployment. In 36 feet of water, the majority of the force acts on the sloping face of the Mat rather than on the vertical face of the Hull. In general, ice failure on sloping surfaces occurs at lower ice loads than on vertical faces, so this configuration should also be advantageous in further lowering ice loads over previous deployments. The sloping interface also provides a superior ability to tolerate rare ice events such as interaction with multi-year ice.

The McCovey site is also located in an area that traditional knowledge shows is proximal to a common shear zone that can cause open leads and pressure ridges regardless of the time of the winter season or depth of ice pack. Provided these circumstances, ice loads have been estimated using deterministic methods for a variety of scenarios. Design loads are included for the anticipated annual ice processes and for rare events that would lead to impacts from moving ice features. These analyses yield the required structural capacity to resist these loads and aid in identifying conditions requiring operational constraints.

The methods presented in this report have been used during the design of numerous platforms and successful deployments of MODUs in similar settings. Most of the methods have either been derived from measured ice loads on platforms or calibrated against full-scale ice interaction processes.

Based on the analyses supported in the text of this report, the recommended design ice load for the McCovey deployment is 61,100 kips (272MN) acting horizontally on the Mat at the ice line. The recommended design ice load for the Hull, due to ice ride-up and rubble formation against it, is 28,775 kips (128 MN). Although considered conservative, these loads are related to normal winter processes. Rarer events have also been reviewed and loads estimated which show lower values than at previous deployments. Even so, ice monitoring activities are recommended to assess the stability of the SDC for such scenarios.

INTRODUCTION

AEC Oil and Gas (USA), Inc (AEC) and its partners propose to drill an exploratory well at the McCovey prospect during the winter 2002/2003. The McCovey site is located approximately 11.5 miles northeast of West Dock in Prudhoe Bay and 4.3 miles northeast of Reindeer Island at a water depth of 36 feet (11m). AEC plans to use the mobile offshore drilling unit (MODU) known as the SDC. Since it was constructed in 1982, the SDC has been used at 6 drill locations in the Beaufort Sea in water depths ranging from 53 to 102 feet. (See Table 1)

The SDC consists of a concrete-reinforced steel Hull supported by a steel Mat. Dimensions of the SDC are shown in Figure 1. A representation of it in ice is shown as Figure 2.

The purpose of this document is to review the ice interaction issues relating to the deployment of the SDC at the McCovey location and develop design ice loads which can be used to assess overall stability for the expected foundation conditions.

The water depth of this deployment at 36 ft is the shallowest drill location for the SDC. Therefore, based on the fact that ice loads generally increase with water depths and exposure, the ice loads acting on the SDC for this deployment should be less that at previous deployments. The main difference between this deployment and previous ones is that in 36 ft of water the ice acts on the sloping face of the Mat rather than on the vertical face of the Hull. In general, ice failure on sloping surfaces occurs at lower ice loads than on vertical faces, so this configuration should be advantageous in further lowering ice loads over previous deployments.

The overall approach to ice load estimates is to first assess the ice conditions at the location, subsequently develop ice loading scenarios and then calculate the corresponding ice loads.

Typically, for exploratory drilling, deterministic methods are used to estimate design ice loads. In the process, notional 25-year values are specified for the various input parameters. This gives about the same level of risk as designing a production platform for the 100-year load (an accepted industry practice). As will be discussed, the ice load scenarios developed and associated design loads for this region are usually conservative when assessed against actual experience.

Nevertheless it is always prudent to evaluate each deployment independently, incorporating the latest knowledge and understanding of ice-structure interaction. This document describes such an evaluation.

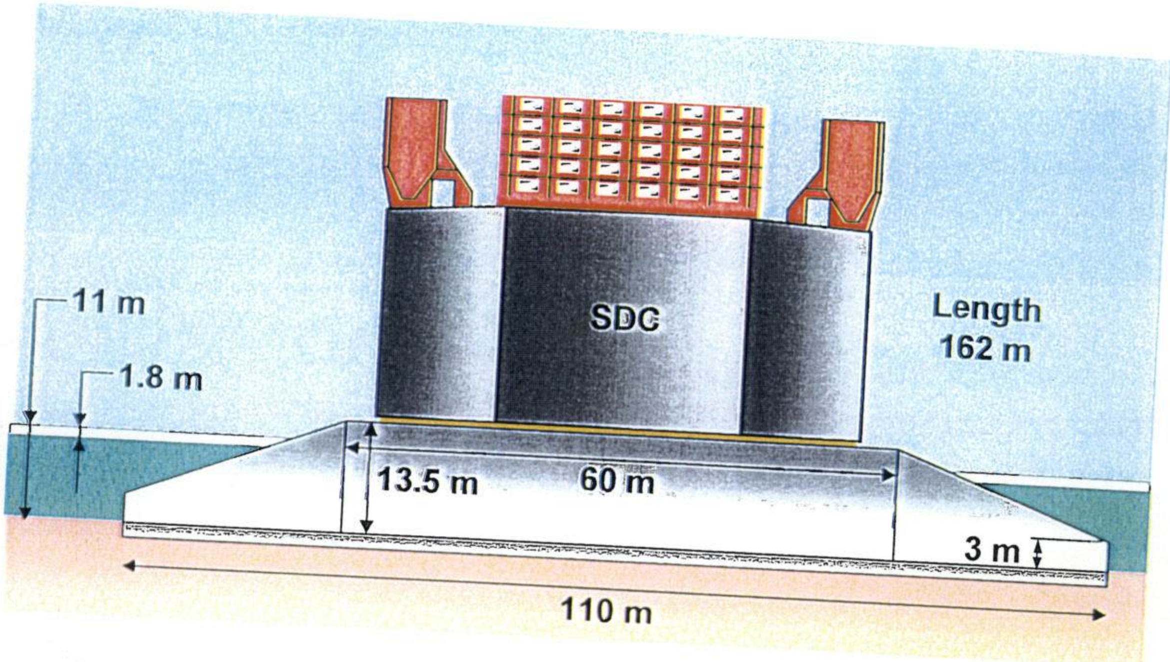

Figure 1: Key SDC Dimensions

Figure 2: The SDC in Ice with Typical Ice Rubble Build up

Date	Well	Water Depth		Comments
		m	ft	
1982/83	UVILUK P-66	31	102	Hull on berm
1983/84	KOGYUK N-67	28	92	Hull on berm
1986/87	PHOENIX	18	60	Hull & Mat on sea floor
1987/88	AURORA	21	69	Hull & Mat on sea floor
1990/91	FIREWEED	16	53	Hull & Mat on sea floor
1991/92	CABOT	17	56	Hull & Mat on sea floor

Table 1: Previous SDC Deployments

ICE CONDITIONS

The industry, regulators, and others have collected ice information in this region for over 30 years and the general ice conditions are well known.

In this region, the ice clears by about the end of July and a location at this water depth would normally be ice-free until the start of freeze up in early October. However, with winds out of the North, the pack ice can be driven towards the shore. This is usually in the form of loose pack ice of mostly second year ice. However, only periodically would second-year or multi-year ice be driven into the area in late summer.

New ice will begin to form during the first week in October. As the new ice forms a narrow strip close to shore becomes landfast as it is stabilized by coastline, shoals and the barrier islands. An image of the ice conditions a few weeks after freeze up is shown as Figure 3. It shows fast ice extending to the location, with a lead about 5.5 miles North. Sometime between the end of October to mid November, the ice will reach a thickness of about 0.5m (1.6ft). This is about the maximum thickness of mobile ice (prior to its becoming landfast) at the McCovey location. As mentioned above, old ice can sometimes be driven into the area by Northerly winds during the Fall. This happens on average about one year in five. Figure 4 shows an image of conditions on October 26, 1985. Old ice reached within about 8.5 miles of the location. In 2000, a piece of multi-year ice was grounded near the location. As will be discussed later, the edge of the old ice will be monitored. Furthermore, the interaction of isolated old ice floes can be tolerated (depending on their size and thickness). Once the ice has become landfast, any old ice in the area cannot move against the platform (until breakup).

As the winter progresses, the still mobile ice forms ridges, many of which ground on the sea floor. These grounded ridges (also called stamukha) provide further stabilization for the ice, and the fast ice will usually extend to the 20m (66ft) water depth by mid December (or even earlier). This so-called fast ice will now only move under the action of thermal strains and creep due to wind stress. The strain rates associated with these motions, which are usually less than about 5m are small, resulting in small associated ice loads. Only rarely is the fast ice subject to a "break out" when it can move several hundred metres in one event. However this is an event that forms one of the ice load scenarios discussed later.

At break up, the landfast ice gets released from its anchor points as shoreline melting occurs and grounded features ablate under strong solar radiation through May and June. By early July, large remnant floes of once fast ice can move over the location and interact with the platform.

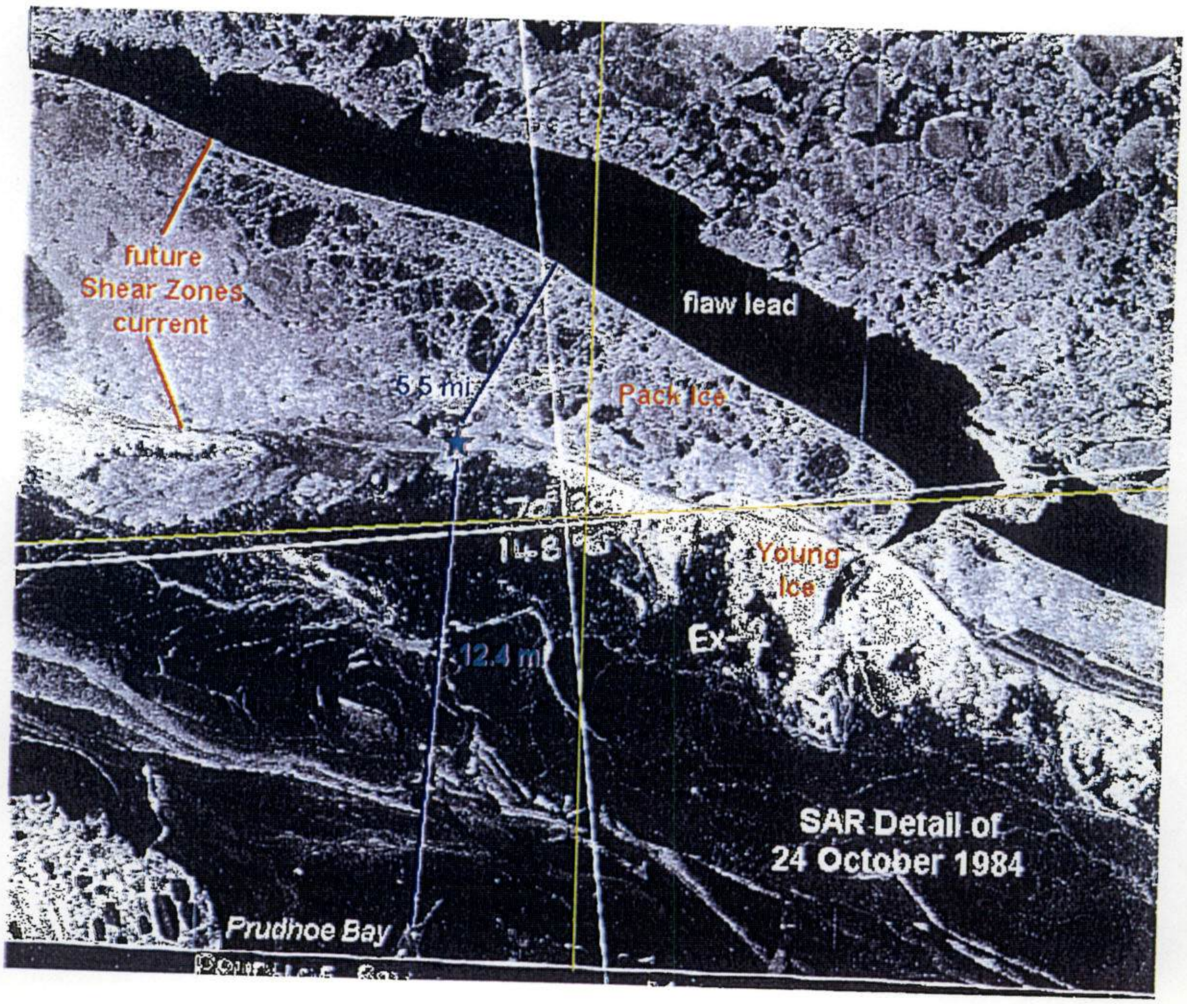

Figure 3: Early Ice Conditions Showing Fast Ice Reaching the Location (Oct 24, 1984).

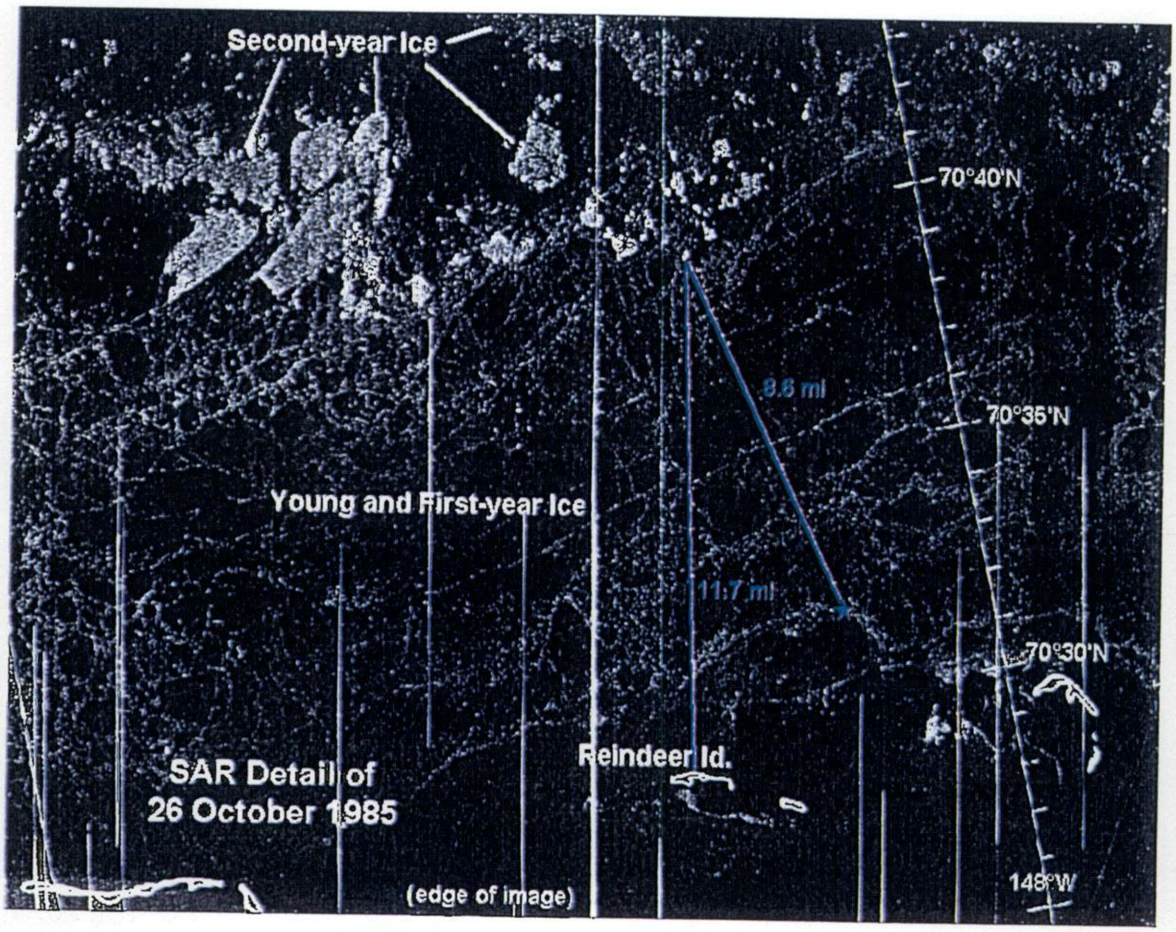

Figure 4: Example of Early Ice Conditions with Old Ice to the North (Oct 26 1985)

ICE INTERACTION SCENARIOS AND LOADS

In order to develop the ice interaction design criteria for the deployment of the SDC at the McCovey Site, it is first necessary to define the ice interaction scenarios which can occur. These will be developed:

a) In the context of potential annual events
b) For unlikely, rare events

It is also appropriate to consider the elements of the SDC that need to be checked for ice loading. At the water depth of this deployment (36 ft or 11m), it is the sloping side of the Mat which will be at the ice line, see Figure 1. The vertical sides of the Hull will only be subject to ice which may ride up the slope of the Mat. Therefore in design criteria development for this deployment, we will specify:

a) The total horizontal and vertical global ice loads acting on the long sides of the platform - applied at the ice line. (These are the key loads for foundation design).
b) The horizontal loads acting on the Hull due to ice ride up on the Mat.
c) End on loading on the short side of the Mat (this has vertical sides)

EXPECTED ANNUAL EVENTS

Early Winter Scenario

Ice up to 0.5m (1.6ft) thick acts directly on the Mat prior to grounded rubble field formation.

As already discussed under the section on ice conditions, in a normal winter, ice will begin to form over the location in October but will be mobile until the location is contained within the fast ice sometime in December. During the period when the ice is mobile, oncoming ice will interact with the sloping face of the Mat in bending. The ice will fail in bending at low loads on the Mat, but can ride up and act on the sides of the Hull. A very conservative value for the thickness of early ice that will interact cleanly with the Mat before ice rubble builds up is about 0.5m (1.6ft).

For this scenario, the loads are calculated using an accepted algorithm for sloping structures. Several are available, including those by Ralston (1980), Nevel (1992), Croasdale et. al. (1994). It has been shown that they generally give similar results for the same inputs (Chao,1992).

Using the Croasdale method, the total global load is given as:

Early Winter Global Loads (0.5m):
Horizontal Load = 51.9 MN (11,667 kips)
Vertical Down Load = 61.65 MN (13,859 kips)

The load on the Hull is caused by ice riding up the slope of the Mat and being turned to the vertical by the vertical face of the Hull (see Figure 5). This load is given as:

Early Winter Horizontal Load on Hull = 3.13 MN (703.6 kips)

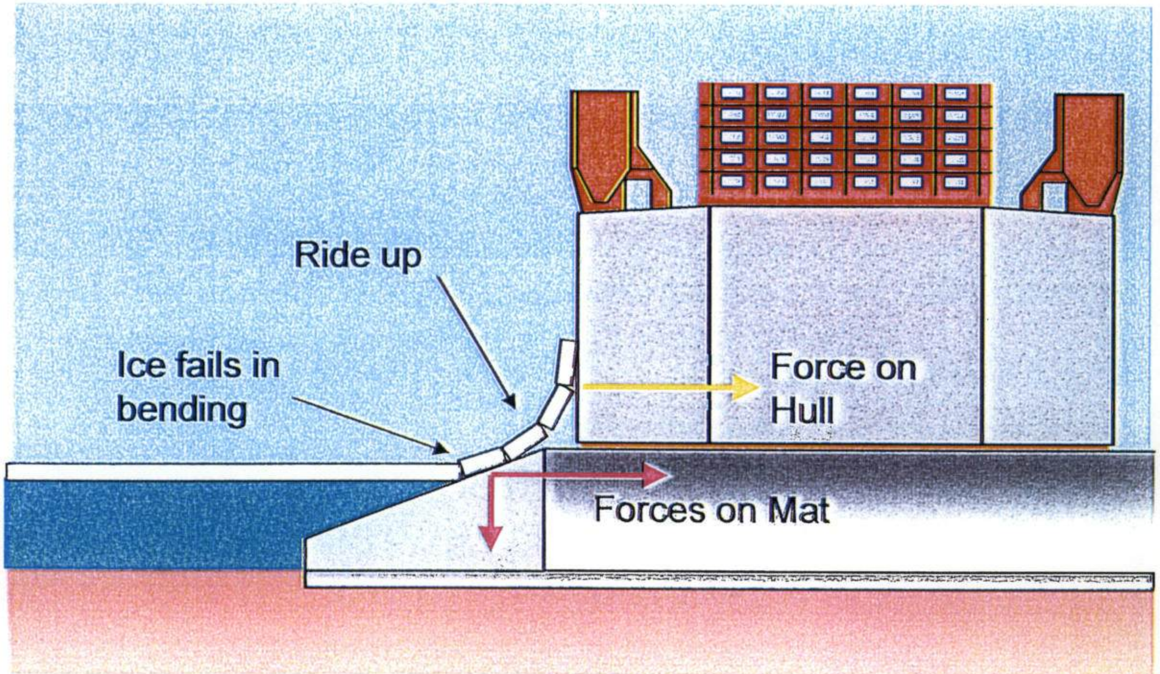

Figure 5: Bending Failure with Ride Up

The spreadsheet output for these loads and other interaction cases with ice failing in bending on the Mat is given as Table 2 (the other cases will be discussed later).

It can be seen that the key input parameters for the above loads (Column labelled as Early Winter), are:

Ice flexural strength = 72.5 psi (500 kPa) (an accepted conservative winter value for large scale bending strength).
Ice to steel friction coefficient = 0.25
Ice rubble height above the ice line = 26.24ft (8m)

Level Ice Loads On Sloping Structures - SDC at McCovey

22-10-01 14:01

Level Ice Loads On Sloping Structures - Vertical Loads

Developed by K.R. Croasdale and Associates Ltd.

- ◆ First developed in 1978. This version 1994.Updated 2000
- ◆ To be used for research purposes only. Not valid for design without consultation with K.R. Croasdale
- ◆ To use the table, change the values in the Initial Data section of the worksheet. (all input numbers are blue)
- ◆ Some rows and columns in the input and results are hidden to reduce clutter of the spreadsheet

Initial Data:

	Early winter	Break Up	Level Ice After Adfreeze Broken	Rubble field	Polar Ice 3m	Polar Ice 4m	Polar Ice 5m
Flexural strength of ice (kPa)	500	250	500	400	650	600	550
Specific weight of ice (kN/m^3)	8.98	8.98	8.98	8.98	8.98	8.98	8.98
Specific weight of water (kN/m^3)	10.20	10.20	10.20	10.20	10.20	10.20	10.20
Young's modulus (kPa)	5.00E+06	5.00E+06	5.00E+06	5.00E+06	5.00E+06	5.00E+06	5.00E+06
Poisson's ratio	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Cone Angle (deg)	23	23	23	23	23	23	23
Rubble angle of repose (deg)	15	15	15	20	20	20	20
Rubble friction angle (deg)	45	45	45	45	45	45	45
Rubble height (m)	8	10	10	12	11	12	13
Waterline diameter (m)	162	162	162	162	162	162	162
Ice-cone friction	0.25	0.2	0.3	0.25	0.2	0.2	0.2
Ice-ice friction	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Ice thickness (m)	0.5	1.8	1.8	3.2	3	4	5
Rubble porosity	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cohesion of rubble (kPa)	0	0	0	0	0	0	0

Results:

	Early winter	Break Up	Level Ice After Adfreeze Broken	Rubble field	Polar Ice 3m	Polar Ice 4m	Polar Ice 5m
Characteristic Length	8.654945	22.619926	22.619926	34.825654	33.180104	41.170088	48.670331
C	0.754546	0.682408	0.830194	0.754546	0.682408	0.682408	0.682408
P	133.343856	342.073064	409.945367	612.556471	483.486262	690.685577	925.092562
HB	0.747354848	1.990494	4.843133	8.227621	10.971941	15.683196	20.334556
HP	2.834896	4.429525	4.429525	0.701636	0.589569	0.701636	0.823448
HR	26.253191	65.786512	82.674402	120.602195	92.982694	132.830673	177.911153
HT (Load on SSDC Hull)	3.126726	31.496333	56.799711	128.070710	87.489814	155.537448	243.027262
HL	18.081466	25.551227	31.084738	4.814059	3.658410	4.353810	5.109680
Total horizontal load (MN)	51.043634	129.254092	179.831509	262.416222	195.692429	309.106764	447.206099
In-plane stress correction							
w	183.355220	217.812430	217.812430	247.928857	243.868624	263.583120	282.089229
Flex'	1056.773170	579.677368	958.680865	730.760486	917.483403	893.177693	867.067122
HB'	1.579569	4.615378	9.286037	15.031051	15.487037	23.346468	32.057136
HT'	51.875848	131.878975	184.274413	269.219652	200.207525	316.770036	458.928679
Flex'	1065.850787	586.372434	970.013002	739.335816	923.654890	900.446057	875.378378
HB'	1.593138	4.668684	9.395803	15.207437	15.591211	23.536454	32.364419
Corrected horizontal load (MN)	51.889416	131.932281	184.384179	269.396038	200.311699	316.960021	459.235962
Flex'	1065.998788	586.508397	970.292973	739.558141	923.797281	900.626252	875.596241
HB'	1.593359	4.669766	9.398515	15.212010	15.593615	23.541164	32.372474
Corrected horizontal load (MN)	51.889637	131.933364	184.386891	269.400611	200.314102	316.964731	459.244017
Vertical Load (MN)	61.65	146.99	165.39	218.39	181.97	266.63	364.24
Total horizontal load. (MN)	51.89	131.93	184.39	269.40	200.31	316.96	459.24
In kips	11,661	29,648	41,435	60,539	45,014	71,228	103,201
Effective Pressure (MPa)	0.64	0.45	0.63	0.52	0.41	0.49	0.57

Table 2: Loads due to Bending Failures of Ice on the Mat (Various cases)

Mid to Late Winter Scenario

(a) *Grounded ice rubble field forms symmetrically around the platform. Moving ice acts on the outside of grounded ice rubble.*

By mid winter, based on experience with Arctic structures in this water depth, it is expected that grounded ice rubble will have formed around the SDC. This will protect it against direct action of the thicker ice which will occur later in the winter. By the end of the winter at this location, maximum first year ice thickness is about 6 feet (1.8m).

A typical ice rubble field, as experienced by the SDC at the Fireweed location is shown in Figure 6.

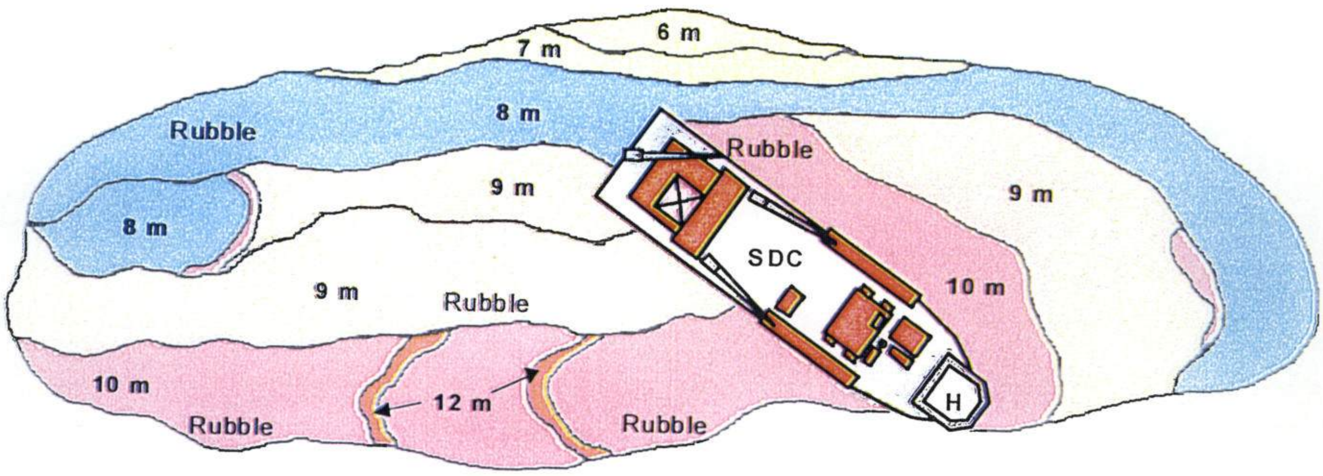

Figure 6: Rubble Field around the SDC at Fireweed

There is considerable evidence to support the benefits of grounded ice rubble around a platform (see the summary report 'Overview of Load Transmission through Grounded Ice Rubble', NRC 1994). For example, when the Molikpaq was deployed at Amauligak F-24 on a berm at –16m, the ice loads experienced by the caisson were about 10% of those experienced at a prior deployment, with the berm at –20m, where there was no protective ice rubble.

However, the actual geometry of ice rubble - extent and degree of grounding - is not easily predicted. In view of this difficulty, it is suggested that the ice loads be checked for a number of simplified, plausible (but conservative) conditions for the ice rubble; these are:

Ice rubble extends to a diameter twice the length of the SDC before the ice becomes landfast (Figure 7). The rubble absorbs 50% of the load applied around its perimeter. (This is a very conservative assumption. Given the experience quoted in the NRC report, it is more likely to be 100%).

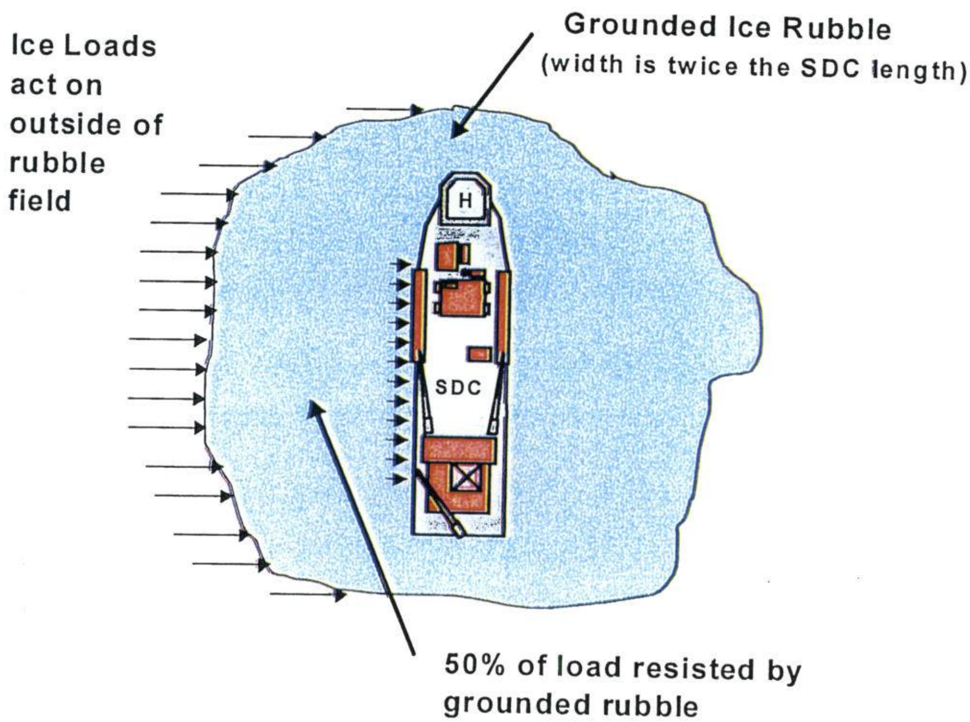

Figure 7: Symmetrical Ice Rubble Scenario

Before calculating the applied load, it is appropriate to discuss the range of ice pressures that could apply. The following discussion is in the context of ice moving at a speed or strain rate that creates the highest ice failure loads. As already mentioned, the ice once landfast, will generally move only slowly, and the loads will be lower than at high strain rates. However, to be conservative we will use ice pressures which correspond to the high strain rates.

The most conservative approach to the ice pressure would be to assume pure crushing as would occur with direct ice action on a vertical structure. Even the values to be used in such a situation are subject to a lot of debate and disagreement between experts (see Croasdale, 1996).

In a recent paper, Masterson and Spencer (2000) proposed the following for wide structures. They commented that it was an upper bound of pure crushing data.

$$p = 1.3\, t^{-0.174}\, [16.3(D/t)^{-0.64}] \qquad (1)$$

Where, t is the ice thickness in metres, and D is the structure width in metres.

If applied, to the outside of the ice rubble (Diameter = 324m), with an ice thickness of 1.8m, the above equation gives an ice pressure of 0.8MPa (116 psi).

Using the assumption, of 50% absorption by the ice rubble, the net load on the platform is 232MN (52,154 kips).

However, the above ice pressure and ice load is not really appropriate for ice failing on the outside of a grounded rubble field. Random edge failures of the rubble due to cracks and flaws, plus the tendency for out of plane and eccentric forces at this uneven interface, will lead to lower effective ice pressures.

In this case, it is data gathered on structures when a rubble field has been present which is more relevant. The Canmar data base (Blanchet,1990) contains such data, at least on wide structures. It specifically excludes most of the Molikpaq data, but includes all SDC data. The data normalized for 1.8m of ice, plotted as a function of loaded width, is shown in Figure 8.

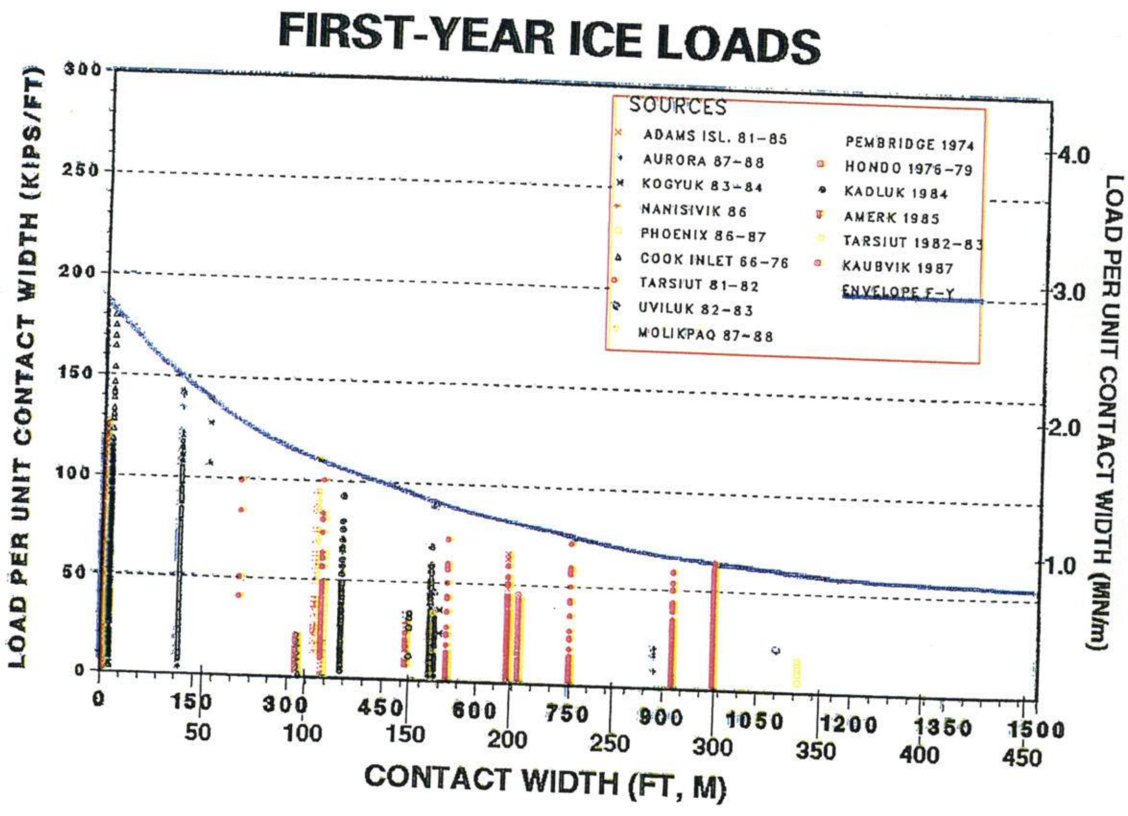

Figure 8: Ice Load Criteria from the Canmar Full Scale Data Base

For this situation with an effective width of 324m, (1060 ft), the load/unit width is given as 60kips/ft.

Based on a 50% absorption, the net load on the platform is given as:

Load = 1060 x 60 x 0.5 = 31,800 kips (141.5MN)

Another check on the load applied is to use an equation based on interpretation of full scale data for ice acting on ice in a mixed mode failure (mixture crushing and rubbling). Applying Croasdale, et. al.,1992, the load is given by the equation:

$$\text{Load} = D(900 - 1.5(D-100))t^{1.25} \quad \text{(in kN for D and t in m)} \qquad (2)$$

(Note that the equation is only valid for widths between 50 and 450m)

Using this relationship, the net load on the platform is given as:

$$\text{Load} = (0.5 \times 324(900 - 1.5(224))1.8^{1.25})/1000 = 190 \text{ MN } (42{,}712 \text{ kips})$$

In summary, the range of loads estimated for this condition is from 142 MN to 232 MN. The recommended load is 190 MN (42,712 kips).

However, it is suggested that this condition still represents a conservative assessment of a normal late-winter annual loading case (because the grounded ice rubble would likely take more than the 50% assumed, and strain rates associated with landfast ice motions will be low).

In terms of the rubble field, a more conservative annual scenario can be looked at as follows:

(b) Assume that the rubble is of elliptic shape in plan, with the long axis in the same direction as the long sides of the SDC.

On the long sides of the SDC, it is assumed there is a strip of grounded ice rubble but not sufficient to provide significant sliding resistance. (See Figure 9). Even in this case, the wings of rubble could likely take all of the applied load and prevent any load from being felt by the SDC. However, to be conservative, we will assume that cracks develop as shown in Figure 9 and the load acting on the width of ice rubble, equal to the length of the SDC, is transmitted to the SDC.

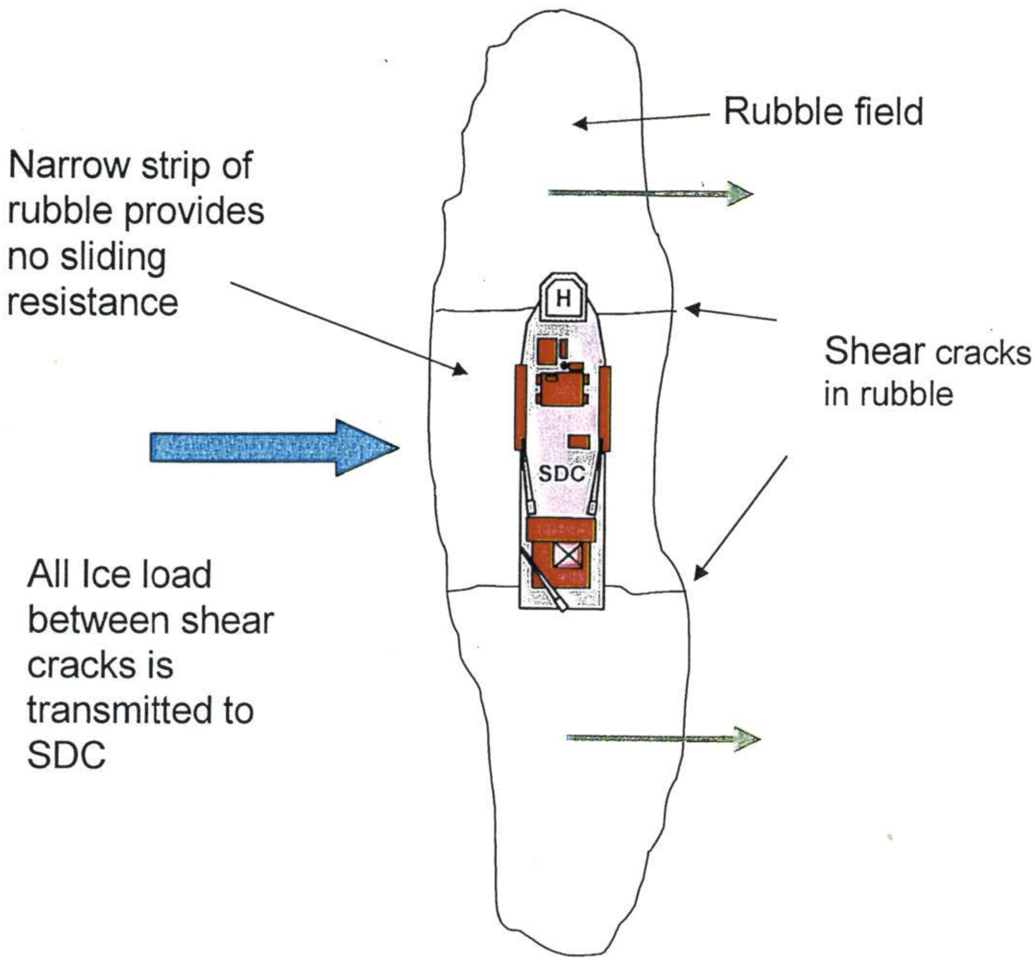

Figure 9: Unsymmetrical Ice Rubble Field

On a width of 162m, the ice load from the rubbling equation (2) is given as

$$\text{Load} = 162(900 - 1.5(62))1.8^{1.25}/1000 = 272 \text{ MN (61,145 kips)}$$

In the above scenario, it is assumed that the ice is frozen to the slope of the Mat and this bond is not broken. However, as reviewed later, it is likely that the load to fail the adfreeze bond is less than the above load. In which case, this scenario could be controlled by failure of the adfreeze bond followed by the bending failure of the rubble field against the Mat.

This has been calculated assuming:

Consolidated layer thickness of the ice rubble = 3.2m
The ice to structure friction = 0.25
The rubble height reaches 12m above the ice line

As shown in Table 2 (column titled rubble field)

The total horizontal load is 269.4 MN (60,560 kips)
The total vertical load is 218.4 MN (49,096 kips)
The associated horizontal load acting on the Hull is 128 MN (28,774 kips)

This load is approximately the same as the load calculated assuming the rubble field remains frozen to the platform but offers no additional sliding resistance.

Break Up Scenario

Remnant landfast ice sheets up to 1.8m (5.9 ft), which are now mobile, act on the platform with no rubble field around it.

Even though it is probable that the grounded rubble will stay around the structure until all landfast ice remnants have melted, this scenario will be checked for ice loads. The remnant ice sheets will interact with a bare structure and fail in bending, creating the following loads (using Croasdale, et. al., 1994):

Global Horizontal Load = 131.9 MN (29,650 kips)
Global Vertical Down Load = 147 MN (33,045 kips)
Load on Hull = 31.5 MN (7,081 kips)

End Loading

A conservative assessment is to assume crushing of 1.8m ice across a 72m width. We will use the equation $p = 1.5t^{-0.174}$ (with p in MPa and t in m) from Masterson and Spencer, 2000.

Then the effective pressure = 1.35MPa (196 psi)

And the End Load = 175 MN (39,340 kips)

This is very conservative, as it assumes no protective ice rubble and a conservative pure crushing ice pressure.

In summary, the recommended Design Load for "Potential Annual Events" is 272MN or 61,100 kips. This is considered to be a conservative "notional 25 year load". It is higher than was used at the last SDC deployment in 1991/2.

Unlikely and Rare Events

Polar Ice Invasion Late Summer/Early Winter

Old thick ice collides with the bare platform before freeze up starts.

A review of historical ice data indicates that about one year in five there was old ice (either second or multi-year) within about 10nm from the McCovey location in the late summer. In 2000, an isolated multi-year floe was grounded near the location (Masterson, 2001). It can be assumed that in an extreme year, polar ice could interact with the platform after placement. It should be noted that this situation did occur once with the SDC as described below:

"The SDC was installed at the Kogyuk site in 28 m (92 ft) of water on a subsea sand berm on September 25, 1983. A significant ice event occurred shortly after touchdown while the effective contact force between the SDC and the berm was only 300 MN (67,500 kips). A one nautical mile diameter multi-year floe, travelling at 0.25 m/s (0.5 knots), impinged upon the SDC on the port side and was stopped. The ice was between 3 m and 4 m thick (10 and 13 ft) in the contact area and failed by crushing. The maximum SDC resistance at the time was estimated at about 175 MN (39,375 kips), calculated simply from the coefficient of friction between the SDC base and the sand berm. The maximum ice force as derived from mass and deceleration estimates was under 100 MN (22,500 kips). Only about half the people on board were aware that there had even been an impact. No changes were recorded by the total pressure cells on the base of the SDC, implying there was no disturbance to the berm. These 'geotechnical' observations would imply a load less than 100 MN (22,500 kips).

Also, during break-up on June 25, 1984, a thick deteriorated second-year ice floe impacted the SDC on its short side. At the time the ice pad was no longer in place. This interaction resulted in a load not exceeding 100 MN (22,500 kips), as interpreted from the MEDOF panels installed on the hull of the SDC. The load was relatively high due to the failure of a large 5 to 6 m thick (16 to 20 ft) ridge."

Despite this favourable experience, it is prudent to address this possibility which could be managed in several ways, i.e.

1) No drilling starts until after the ice has become landfast, then any old ice in the vicinity cannot interact with the structure until after breakup, when drilling will be finished.
2) To demonstrate that the platform can take the loads from the old ice by failing it in bending on the slope of the Mat.

The loads are calculated using the sloping structure algorithm already used for early winter and breakup. Table 3 shows the global loads and the loads on the SDC for multi-year ice of various thicknesses.

Polar Ice Thickness	m	3	4	5
	Ft	9.84	13.1	16.4
Global Horizontal Load	MN	191	305	445
	kips	42,937	68,564	100,036
Global Vertical Load	MN	169	250	344
	kips	37,991	56,200	77,331
Horizontal Load on Hull	MN	88	156	243
	kips	19,782	35,069	54,626

Table 3: Loads due to Multi-Year Ice

It can be seen that multi-year ice up to about 3.8m (12.5ft) can be withstood before the load gets higher than the winter design load. It might be argued that this rare event could be considered with a reduced factor of safety. For a factor of safety of 1.1, the multi-year ice thickness that can be withstood before exceeding the winter factored load is about 4.5m (15ft). Also note that these loads are associated with downward vertical loads of almost equal magnitudes, so the foundation capacity should be increased over that taken for the winter load (with no downward load). If the vertical loads do increase the sliding resistance, then the capability of the system becomes even greater than the 15ft of multiyear ice discussed above.

It is important to note that ice floes are usually not uniform in thickness. The keels of pressure ridges can protrude much deeper than the average floe thickness. For example, a pressure ridge keel will be about 4 to 5 times the sail of the ridge. So a ridge with a sail of about 10ft can ground in 40 to 50ft of water. Ridge keels are approximately of triangular cross section with underwater slopes of about 30 degrees from the horizontal. So a typical ridge width would be about 150 ft (for a keel depth of about 40ft). This is the typical extent of the local thickening of a grounded floe at the location. It can be shown that the horizontal load to fail a solid ridge (40ft thick and 150ft wide and 1000ft long) on the slope of the Mat is actually less than the load due to a uniform floe of average thickness of 13 ft (4m). (i.e. 21,350 kips vs 42,900 kips).

In reviewing photos of the multi-year floe grounded near the site in November 2000, it appears to be thicker than the example discussed above but smaller in size (no more than about 500ft long). It was also observed to be in two pieces. It is most likely that the splitting occurred during grounding. A similar fracturing process would be expected in interaction with the slope of the Mat, at loads less than 30,000 kips.

No Protective Ice Rubble in Winter

Freeze up with no Ice Rubble around SDC - Subsequent Movement in Late Winter

The only scenario which would lead to no ice rubble around the SDC is if the ice becomes landfast almost instantaneously at freeze up. This would be extremely rare. The scenario which might cause no ice rubble is an invasion of thick old ice floes in the late summer, which ground out in the vicinity of the SDC and stabilize the ice creating instant landfast ice.

If this happens, then it also very likely that the ice will remain landfast for the remainder of the winter, with insignificant loads due to thermal strains later in the Spring. At break up, sheets of weak landfast ice may be detached and act directly on the SDC. (This has already been covered under the Normal Winter Break Up Scenario).

The worst possible outcome of this scenario would be if an ice movement occurred with the ice frozen to the sloping sides of the SDC. In this situation, the load to fail the adfreeze bond between the ice and the sloping face would govern. However, this situation is largely a conceptual one. It is expected that small lateral motions and tidal action will usually stop the adfreeze bond from occurring. As well, it can be shown that at low strain rates, as will occur prior to a significant landfast ice motion, the adfreeze strengths will be creep dependent.

Table 4 shows how the adfreeze strength changes with strain rate based on Glenn's Law for the creep of ice. In this table, the peak strength of about 70psi (0.5 MPa) is associated with the highest strain rate. A typical strain rate for the initial strains which might precede a landfast ice motion would be about 10^{-5} or 10^{-6}. For these strains, the adfreeze strengths would be in the range of 10 to 22psi (0.07 to 0.15 MPa).

Strain Rate	(sec^{-1})	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}
Adfreeze	psi	73	35	16	7.4	3.5
Strength	MPa	0.5	0.24	0.11	0.051	0.024

Table 4: Adfreeze Strengths vs. Strain Rates (After Croasdale & Metge, 1989)

It is also noted that in a review of adfreeze strengths obtained experimentally in sea ice, the bond is often reduced by the formation of a high brine layer between the ice and the steel. Oksanen (1983) obtained strengths of between 0.023 and 0.041MPa for saline ice (typical of sea ice).

The adfreeze load (F_{ad}) is given by the following equation (Cammaert, 1986)

$$F_{ad} = 3.142C_1C_2\,Dtq/(\sin\alpha.\cos\alpha) \qquad (3)$$

Where, C_1 and C_2 are factors to allow for uneven bonding and uneven stress distribution (their product is taken as 0.5), q is the adfreeze strength, α is the slope angle, t is the ice thickness and D the structure width.

The loads for various strain rates are given in Table 5. The highest strain rates are not likely for the reasons already discussed. Also note that if the values from Oksanen are used for saline ice, the adfreeze load is in the range of 29 to 52 MN. Therefore, a reasonable assessment of the force to fail the adfreeze bond would be less than 100 MN (22,500 kips).

Strain Rate	(sec^{-1})	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}
Adfreeze Load	kips	140,275	67,440	30,798	14,387	6,744
	MN	624	300	137	64	30

Table 5: Loads to Break the Adfreeze Bond

It should also be noted, that the scenario itself is not very likely, and one might argue that the conditions which may cause it will be obvious once the ice has become landfast. (i.e. no protective ice rubble) and well before the ice has grown to its late winter thickness. Under these circumstances, there are ice defence measures that could be implemented. For example, an inclined dry slot can be cut through the flat ice sheet to create a weak plane of failure for the ice if it starts to move. Such methods have been used successfully in the Canadian Beaufort Sea around low freeboard islands in landfast ice (Croasdale and Marcellus, 1978). However, with a predicted load of 22,500 kips (100 MN) to break the adfreeze bond, such measures should not be necessary.

Assuming the ice continues to move (after the breaking of the adfreeze bond), the ice will ride up the Mat and fail in bending. The initial bending failure load on the Mat is only about 10MN (2,250 kips). However, if several 100ft of movement occurs (as could happen in a rare landfast ice breakout), ice will move up the slope and create a rubble pile against the Hull. The load for this condition, as shown in Table 1, is predicted to be 185 MN (41,588 kips). This is less than the proposed design load of 61,100 kips.

LOCAL ICE LOADS

Areas subject to direct ice contact will experience local ice pressures which can be greater than the global ice pressures derived in this document. The local ice pressure design criteria for the SDC have been reviewed and approved by the Regulatory Authorities for previous deployments of the structure. The actual design criterion was a multi-year ice feature 8 metres (26 ft) thick with an average through thickness temperature of –12°C. Furthermore, it has been demonstrated that under local ice loads, steel structures have considerable reserve capacity. Therefore, even if the design criteria for local loads are exceeded, the consequences for the global integrity of the platform are not considered serious.

LOADS SUMMARY

Maximum ice loads for annual events are summarized in Table 6
The controlling case is shown in bold type.

Scenario	Case (All loading on long side unless stated otherwise)	Global Horizontal Load on SDC		Global Vertical Load on SDC		Associated Load on Hull	
		Kips	MN	kips	MN	kips	MN
Early winter (ice not landfast)	Ice up to 0.5m fails in bending on Mat	11,660	52	13,850	61.65	7,036	31.3
Mid to late winter(ice is landfast but break-out movement occurs when ice is (6ft) 1.8m thick	Grounded ice rubble twice SDC width but absorbs 50% of load	42,712	190	0	0	0	0
	Ice fails against narrow strip of ice rubble frozen to Mat – rubble absorbs no load	**61,100**	**272**	**0**	**0**	**0**	**0**
	Consolidated ice rubble pushed against the Mat and fails in bending. After initial adfreeze bond failure at less than 250MN	60,600	269.4	49,096	218.4	28,775	128
Ice break up	Remnant landfast Ice fails in bending on Mat	29,650	131.9	33,044	147	7,081	31.5
Any time	Worst case of ice crushing on short side of Mat	39,340	175	0	0	0	0

Table 6: Estimated Maximum Loads for Annual Events

The estimated loads for rare events are summarized in Table 7.

Scenario	Case (All loading on long side unless stated otherwise)	Global Horizontal Load on SDC		Global Vertical Load on SDC		Associated Load on Hull	
		kips	MN	kips	MN	kips	MN
Polar ice invasion – late summer or early winter	Average polar ice thickness is 3m (10ft)	42,937	191	37,991	169	19,782	88
	Average polar ice thickness is 4m (13ft)	68,564	305	56,200	250	35,069	156
	Average polar ice thickness is 5m (16.5ft)	100,036	445	77,331	344	54,626	243
Mid to late winter - freeze up with no ice rubble around SDC – ice frozen to Mat - subsequent ice movement in late winter	Load to break adfreeze bond	22,480	100	0	0	0	0
	Load after adfreeze bond is broken – 1.8m (6ft) ice fails in bending on Mat	41,588	185	37,092	165	12,814	57

Table 7: Estimated Maximum Loads for Rare Events

ICE MONITORING NEEDS

Monitoring of ice conditions at the location are recommended in the context of the following:

DURING SET DOWN OPERATIONS.

Ice monitoring during set down will be governed by the needs, and tolerance of the marine equipment to ice.

AFTER SET DOWN BUT PRIOR TO THE ICE BECOMING LANDFAST

The issue here is whether any old ice is within a critical radius such that it could move against the platform and cause loads higher than the design load. Experience indicates that once an ice cover has formed, it is very unlikely that any ice to the North can be driven South. This is because the new ice forms a buffer zone. Furthermore when ice tries to move to the South against the shore, it is compressed and ridges form. Many of these ridges ground in the shallow water and create anchor points for the ice which in turn speeds up the development of a landfast ice zone around the platform.

It is further noted that these old floes, if they did move against the platform, are being pushed by thin ice. Depending on the size of an impacting floe, it is quite likely that the driving force will be less than the design ice load. The estimation of limit force ice loads has been described in several key references, but the essence of the limit is shown in Figure 10.

Table 8, shows typical limit force loads for various floe sizes (assuming 0.5m thick ice surrounding them).

Floe Size (km)	0.5	1.0	2.0	3.0	5.0
Limit Force Load	42 MN 9,450 kips	84 MN 18,900 kips	168 MN 37,800 kips	252 MN 56,700 kips	420 MN 94,400 kips

Table 8: Limit Force Loads for Various Floe Sizes

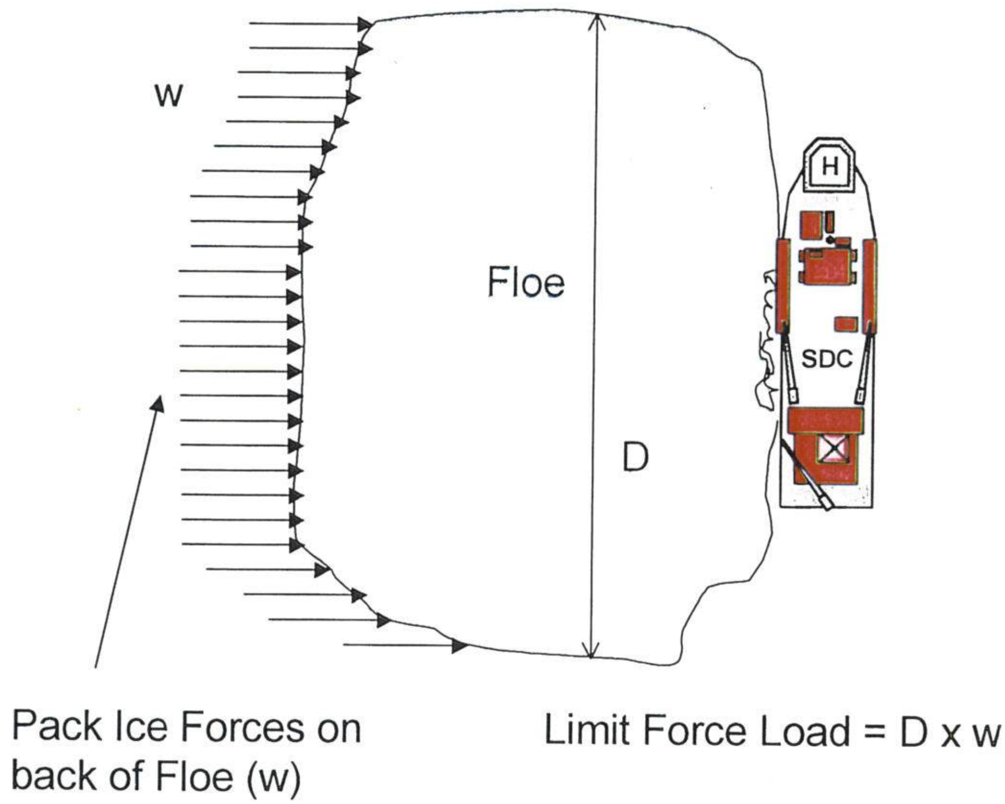

Figure 10: Limit Driving Force Ice Load

Recommended monitoring is as follows:

- Immediately after set down, an overview of ice conditions is obtained from satellite imagery. The distance to the edge of the old ice is determined.
- A decision is taken as to whether to start drilling, noting the estimated rate and direction of ice movement at that time and anticipated from the weather and ice forecasts.
- Depending on its proximity and the state of freeze up, a more detailed monitoring procedure may be implemented, or the first step is repeated a week later.
- If old ice is close, i.e. less than 10 miles (16km), then an aerial reconnaissance should be undertaken to measure floe sizes and assess the competence of the larger floes. Potential ice loads are estimated using the Limit Force and Limit Momentum methods, based on floe sizes, anticipated impact speeds, estimated floe thickness and surrounding ice thickness.
- If these loads are shown to be less than the structural resistance, then normal operations can continue.

- If they are greater, then decisions may be made to suspend operations until the threat from old ice has dissipated, either because the old ice moves out, or the ice becomes landfast.

During the Winter after the Ice is Landfast

Grounded rubble geometries should be mapped. If the grounded rubble is deemed sufficient by the Company's ice advisor to protect the SDC, no further monitoring is needed.

If there is no grounded ice rubble around the SDC, or it is limited, then the Ice Advisor will inspect the interface between the SDC and the ice. If a severe adfreeze situation appears to be developing, the potential adfreeze loads as a function of time will be supplied to the Platform Operator. If necessary, a Ditch Witch machine will be brought to the location and the ice slotted (dry slot) to reduce the potential adfreeze loads (if significant ice motion was to occur). Note however, that based on the review of adfreeze loads in this document, such measures are not thought to be needed.

Prior to Break Up

The only concern might be if there was old ice trapped in the landfast ice, which could be released at breakup. If old ice is within a 2km (1.25 mile) radius of the platform, then sometime during the winter, an on-ice inspection of this ice should be made to assess its thickness. An assessment of potential ice loads during break up will be made.

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Wave Loads on the SDC

in 11 meters of Water Depth

in the US Beaufort Sea.

By

John Fitzpatrick P. Eng.

CJK Engineering Ltd

Calgary, Canada.

November 2001

WAVE LOADS ON SDC IN 11.0 METERS WATER DEPTH

INTRODUCTION

In general terms, the seas offshore Alaska are calmest in July and get progressively rougher through August, September and October. Studies have suggested that 9 to 10 meters is the maximum possible 1/100 year wave for the US Beaufort.

Maximum possible waves versus water depth have also been evaluated. These evaluations are based on wave mechanics properties and are independent of wind velocity and fetch. In fact, they assume an infinite energy source and are based on the relationship that water depth equals 1.3 times the maximum wave height. Thus for a water depth of 12 meters (11 meters plus 1 meter storm and tide) the maximum possible wave that can exist is about 9.0 meters. Therefore the assumption of a maximum wave of 9.0 meters will produce conservative results.

The SDC is a combination of two units, the SSDC and MAT. The upper SSDC has vertical sides and the underlying MAT has sides that slope at 23 degrees to the horizontal.

WAVE LOADS

For a maximum wave of 9 meters there are two scenarios that need to be considered:

- **Non-Breaking Wave:** A single solitary reflected non-breaking wave.
- **Breaking Wave:** A breaking wave that will impact the sloping face of the MAT and that will also impact a portion of the vertical side of the SSDC.

For each scenario, it is necessary to determine the sliding forces on the foundation. It is also necessary to determine the horizontal and corresponding uplift forces on the SSDC as these buoyancy forces reduce the contact force between the SSDC and MAT.

Non Breaking Wave

The method used for the solitary non-breaking wave is that of *Sainflou*, which is a relatively straightforward method for the derivation of loads from a non-breaking wave on a vertical breakwater wall. This method compares well with wave load estimates that are derived from 3-D finite element wave diffraction programmes. The essential components of the Sainflou method are:

- Establishing the maximum height to which the wave will climb above still water. This is given by $H+H_{oc}$, where H is the wave height and H_{oc} is $3.14(H^2/L)x(Coth(6.28xD/L))$, D is the water depth and L the wavelength, all units in meters.

- Establishing the net transverse water pressure at the toe of the structure and this is given by the equation $P_2=H/(Cosh(6.28xD/L))$ in units tonnes/m^2.

- Establishing the net transverse water pressure at the still water elevation. This is given by $P_1= (P_2+D)(H+H_{oc})/(D+H+H_{oc})$ in units tonnes/m^2.

Thus the force per meter run of structure can be calculated from a pressure diagram with values of zero tonnes/m^2 at $H+H_{oc}$ above still water, rising to P_1 tonnes/m^2 at still water and dropping to P_2 tonnes/m^2 at the sea bottom. This force per meter run evaluates as:

190 tonnes per meter run.

This force is only applicable at the central portion of the SSDC. At both ends the boundary conditions change and it is impossible to maintain the hydrostatic pressure at the ends due to spillage and lack of confinement. Calculations show that this reducing effect is approximately 20 %. Additionally for a wave height of 9 meters in 12 meters of water the Sainflou method is non conservative by a factor of approximately 20%. These two effects, one conservative and the other non-conservative tend to be self canceling. The broadside force therefore on the SDC from a non-breaking wave is:

190 t/m x 0.8 x 1.2 x 162m =29,548 tonnes or 30,000 tonnes.

Because of the presence of the edge or toe of the MAT there is no additional buoyancy force on the total unit as the water pressure down on the MAT cancels with the increased pressure under the toe. However there is an additional buoyancy force between the SSDC and the MAT and this will be addressed later.

Breaking Wave

When the maximum wave height approaches about 75% of the water depth it can start to break. There is a point at which it spills forward and takes on a net forward motion rather than a sinusoidal over and back motion. While it is unlikely that all factors will combine to give the precise maximum impact force at the same time along the length of the unit it is nevertheless prudent to investigate its effects. Additionally the duration of such a load is so short that it is impact-like in nature and would not be able to contribute to actual movement of the unit.

Several methods have been developed to determine the impact forces of breaking waves and the one used here is the method of R.R. Miniken. According to Miniken the total pressure is a combination of dynamic and hydrostatic pressures. The dynamic component is expressed by:

$P_d = 6.28\ D_1/LD\ (HgW((D+D_1)/2))$, where D_1 is the depth at the structure and D is the depth at one wavelength (L) away. W is the specific weight of water and g is the acceleration due to gravity.

The hydrostatic component is expressed by:

$P_h = WH/2(D_1 + 0.25H)$

The total pressure is calculated by combining the two components. The vertical variation in pressure is expressed in terms of a triangle (dynamic) superimposed on a rectangular (hydrostatic) distribution.

Because of the water depth and the fact that the SSDC lies above the still water depth only a portion of the breaking wave hits the vertical sides of the SSDC. The other portion of the wave disperses its energy on the sloping side of the MAT face. For the present case the horizontal force on the SSDC is about 75 tonnes per meter run and the horizontal component of force on the MAT is about 45 tonnes per meter run. The total force is about 120 tonnes per meter run and the final breaking wave force on the unit is 120t/m by 162m equal to 19,440 tonnes or about 20,000 tonnes. For the breaking wave no allowance for end spillage has been made. If the entire length were totally vertical then the breaking wave horizontal force would have turned out to be larger than the non breaking wave. The presence of the MAT slope however reduces the horizontal component of force significantly.

The maximum lateral force on the foundation from waves is therefore estimated to be the greater of the above two calculations i.e. **30,000 tonnes**.

Forces on SSDC alone.

It is necessary to investigate both the horizontal and uplift forces on the SSDC as the SSDC is attached by gravity only to the MAT beneath. The weight of the SSDC on the MAT is about 50,000 tonnes when the SSDC is above the water line and when there is no ballast water or topsides consumables on board. The frictional angle of resistance between the SSDC and the MAT is 45 degrees and the ultimate horizontal resistance is therefore Tan 45 by the contact weight. In the case of the non-breaking wave there is a buoyancy force that tends to separate the SSDC from the MAT. This buoyancy force is calculated to be approximately 30,000 tonnes, ($9t/m^2$ by 162m by 53m by 0.5 by 0.8). The horizontal portion of force from the non-breaking wave that is applied to the SSDC is only about 25% of the total or about 7,500 tonnes. The contact force between the SSDC and MAT is 50,000 tonnes minus 30,000 tonnes equal to 20,000 tonnes. The horizontal resistance is 20,000 tonnes times Tan 45 which is 20,000 tonnes. Thus the factor of safety against sliding of the SSDC is 20,000/ 7,500 or about 2.5.

In the case of the breaking wave the horizontal portion of the wave force that impacts the SSDC is estimated to be approximately 15,000 tonnes or about 75% of the total horizontal breaking force. In this instance however the buoyancy force is significantly reduced to less than half that of the non-breaking case and the contact force would only reduce by approximately 15,000 tonnes maximum and the horizontal resistance would be at least 35,000 tonnes. The factor of safety in this case is therefore 35,000/15,000 or about 2.3. We may conclude therefore that even though the SSDC has no ballast water in it that it has sufficient contact weight on the MAT top to prevent relative movement between it and the MAT under the most adverse assumptions of the effects of a 9m breaking or non-breaking wave.

CONCLUSIONS:

- The analyses have been carried out using a 9 meter maximum wave. The wave has been examined under non-breaking and breaking conditions. Opinions have been expressed that the maximum 1/100 year wave height possible, even in deep water, is approximately 9 to 10 meters. Therefore the assumptions on wave height are considered conservative.

- It has been assumed that the wave hits exactly beam on throughout the length of the SDC unit.

- Additionally, when establishing the weight on bottom in order to resist this force, it is not considered necessary to reduce the net weight on bottom by an additional buoyancy factor. This is because of the presence of the MAT toe which lies under water.

- End on forces per meter run could be as high as 250 tonnes per meter (because of the total verticality of the SDC ends). However due to the reduced width of the ends versus the sides of the SDC the maximum total force would only be about 15,000 tonnes.

- ***For the purposes of foundation evaluation the maximum horizontal wave force considered possible, under these circumstances, is 30,000 tonnes or about 65,000 kips.***

APPENDIX D

OIL SPILL RESPONSE PLAN (OSRP)
OIL DISCHARGE PREVENTION CONTINGENCY PLAN (ODPCP)

APPENDIX E

NPDES PERMIT AND CORRESPONDENCE

ARCO Alaska, Ir
Post Office Box 100360
Anchorage, Alaska 99510-0360
Telephone 907 276 1215

May 1, 2000

Director, Water Division
U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Alaska Department of Environmental Conservation
Attn: Water Quality & Wastewater Programs
555 Cordova Street
Anchorage, Alaska 99501

Attn: Mr. Robert Robichaud - Manager, NPDES Unit

RE: Request for Coverage and Authorization to Discharge Under Final Arctic General NPDES Permit No. AKG 284200

Dear Mr. Robichaud:

On April 17, 2000, ARCO Alaska, Inc. (AAI) submitted a request for coverage under the Arctic General NPDES Permit No. AKG 284200. Effective April 27, 2000, AAI was purchased by Phillips Alaska, Inc. At this time, we request that the authorization be addressed to Phillips Alaska, Inc. All other information contained in the April 17 request is still applicable. If you need any further information, please contact me at 907-265-1173.

Sincerely,

Lisa L. Pekich
Permit Coordinator

008.03/llp

Cc: Cindi Godsey, EPA/Anchorage
Ted Rockwell, EPA/Anchorage
Phyllis Casey, MMS/Anchorage
Glenn Grey, DGC/Juneau

ARCO Alaska, Inc.
Post Office Box 100360
Anchorage Alaska 99510-0360
Telephone 907 263 4587
Fax 907 265 6339

Michael A. Richter
Vice President
Exploration and Land

April 17, 2000

Director, Water Division
U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Alaska Department of Environmental Conservation
Attn: Water Quality & Wastewater Programs
555 Cordova Street
Anchorage, Alaska 99501

Attn: Mr. Robert Robichaud - Manager, NPDES Unit

RE: Request for Coverage and Authorization to Discharge Under Final Arctic General NPDES Permit No. AKG 284200

Dear Mr. Robichaud:

ARCO Alaska, Inc. hereby requests Coverage and Authorization to Discharge under the above-referenced General NPDES Permit. The discharge would occur from the ARCO Alaska, Inc. (ARCO) McCovey exploration project located on OCS Lease Block Y-1578 in the Beaufort Sea, Alaska. An Exploration Plan covering this exploration drilling activity will be submitted to the Minerals Management Service (MMS), and a copy of that Plan will be forwarded to you at that time.

The proposed drilling activity will be carried out during the 2000-2001 winter drilling season. In the event that further delineation drilling is required, activities may continue through 2003. Mud and cuttings discharges under the General Permit will be above stable ice and will be limited to rates defined in Part II.A.1 in the General Permit due to water depth. In compliance with Notification Requirements of Part I.A of the General Permit, ARCO submits the following information:

1) <u>Name and Address of Permittee:</u>
   ARCO Alaska, Inc.
   Post Office Box 100360
   Anchorage, Alaska 99510-0360
   Attention: Lisa L. Pekich, Permit Coordinator

2) <u>Lease and Block Number of Operations and Discharges:</u>
   OCS Block No. 6515/ Lease No. Y-1577
   The proposed discharge location is:

Lat: 70°31'45" N
Long: 148°13'22" W
Water Depth: 45 ft MLLW
(See attached Location Map)

3) Any Discharge of Operating Condition Which Will Require Special Monitoring (Part II.A.4):
   No special monitoring will be required since mud and cutting discharges will be:
   a) to above stable ice and
   b) more than 4000 meters from areas of biological concern identified in the General Permit Part II.A.4.

In addition ARCO submits the following information in compliance with Part I.B:

1) Name and Location of Discharge Site:
   OCS Block No. 6515/ Lease No. Y-1577
   The proposed discharge location is:
   Lat: 70°31'45" N
   Long: 148°13'22" W
   Water Depth: 45 ft MLLW
   (See attached Location Map)

2) Range of Water Depth in Lease Block and Depth of Discharge:
   Discharges will be to above stable ice at the site.
   Water Depth: 45 ft MLLW

3) Initial Date and Expected Duration of Operations:
   Discharges will commence when the drilling vessel is ballasted down on the drilling location in August 2000. These discharges will initially be limited to non-drilling discharges during the warm shutdown period while waiting for stable ice cover to form. Drilling discharges are anticipated to begin in November 2000. The EPA will be notified both orally and in writing no less than seven (7) days prior to initiating discharges as per Part I.C of the General Permit. Discharges are expected to continue until August 2001 depending on well results. (See attached Project Schedule.) In the event that additional delineation drilling is desired from this location, discharges may continue for two more years (August 2003).

The information required in Part I.C will be submitted to the EPA no later than seven (7) days prior to initiation of discharges.

AAI is aware that the General Permit is set to expire on June 23, 2000. On April 6, 2000, AAI sent a request to EPA requesting that this permit be administratively extended until it can be reissued (copy attached). In a subsequent conversation with you on April 13, 2000, you stated that while a General Permit cannot be administratively extended, any discharges authorized by EPA prior to the permit expiration date can still discharge under the project specific authorization. We request that approval of this coverage request include a statement addressing discharge authorization after the expiration of the General Permit.

We appreciate your attention to this Coverage and Authorization request. If you need any further information, please contact Lisa Pekich at 907-265-1173.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

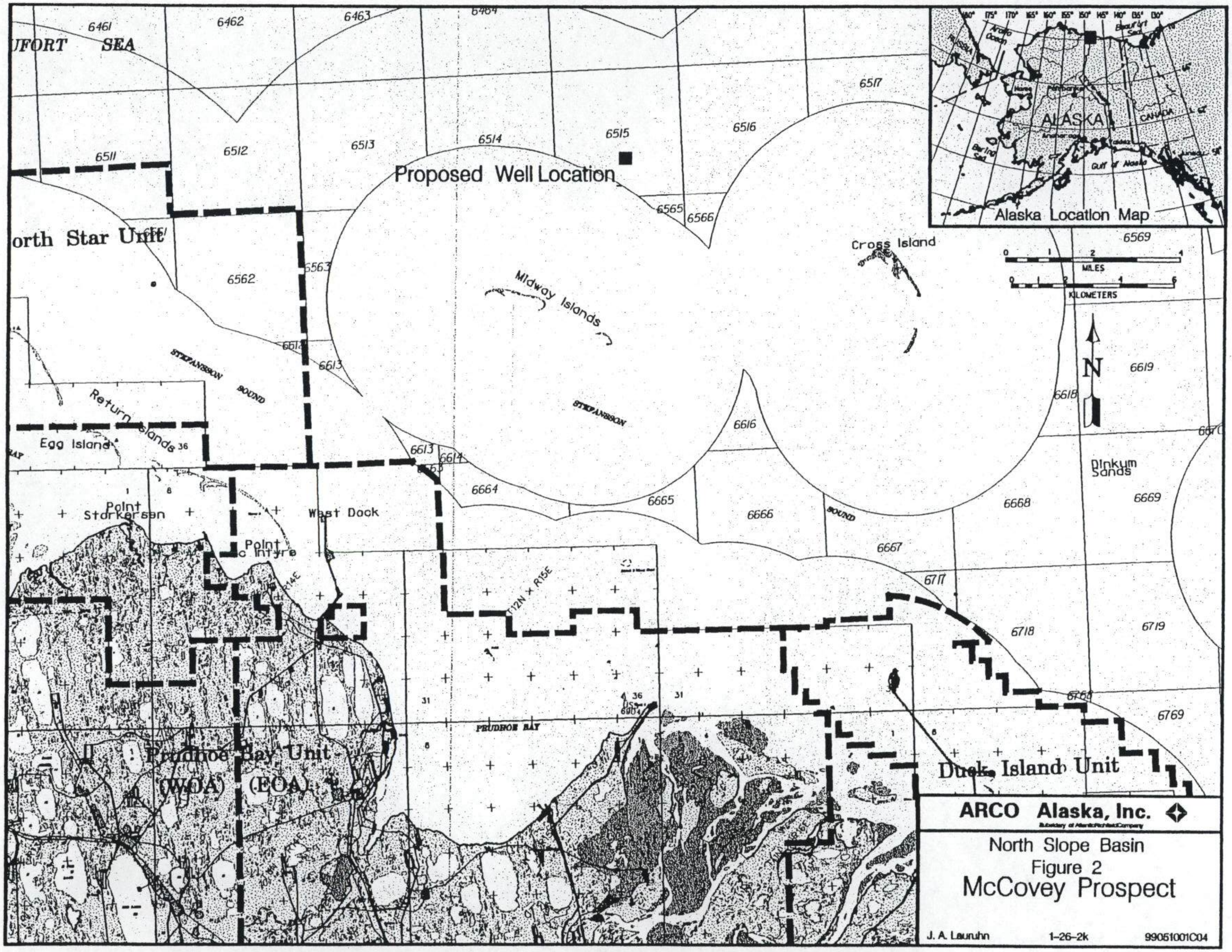
Sincerely,

Michael A. Richter

Michael A. Richter
Vice President
Exploration & Land

Attachments - 3

Cc: Cindi Godsey, EPA - Anchorage
Ted Rockwell, EPA - Anchorage
Phyllis Casey, MMS - Anchorage
Glenn Grey, DGC - Juneau



ARCO Alaska, Inc.

North Slope Basin
Figure 2
McCovey Prospect

J. A. Lauruhn 1-26-2k 99051001C04

UNI' 'STATES ENVIRONMENTAL PROTECT' AGENCY
REGION 10
ALASKA OPERATIONS OFFICE
Room 537, Federal Building
222 W. 7th Avenue, #19
Anchorage, Alaska 99513-7588

May 1, 2000

Reply to
Attn of: OW-130

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Phillips Alaska, Inc.
Michael A. Richter
Vice President, Exploration and Land
PO Box 100360
Anchorage, Alaska 99510-0360

Re: NPDES Permit No. AKG-28-4205, McCovey Exploration Project

Dear Mr. Richter:

We have reviewed your April 17, 2000, request for coverage and authorization to discharge from exploratory drilling operations under the Arctic General National Pollutant Discharge Elimination System (NPDES) permit. Listed below is the permit number assigned to the site and the information identifying the site in our records. Future correspondence and Discharge Monitoring Reports should reference the permit number.

NPDES No.:	AKG-28-4205
Site Name:	McCovey
Latitude:	70º31'45"
Longitude:	148º13'22"
Water Depth:	45 feet below mean lower low water (MLLW)

Note that you must provide the exact coordinates (latitude and longitude) and water depth of the discharge site when you notify EPA of the commencement of discharges (Part I.C.). It is understood that additional delineation drilling may take place from the same site in future years. The discharges indicated in the request for coverage will be covered as long as the operation does not relocate to another site.

Any questions may be addressed to Cindi Godsey at (907) 271-6561.

Sincerely,

Cindi Godsey
for Robert R. Robichaud, Manager
NPDES Permits Unit

Enclosure

cc: Judy Kitigawa - ADEC/Valdez
Lisa Pekich, Permit Coordinator - Phillips Alaska, Inc.

NPDES General Permit
U.S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
FOR OIL AND GAS EXPLORATION FACILITIES
ON THE OUTER CONTINENTAL SHELF AND CONTIGUOUS STATE WATERS

In compliance with the provisions of the Clean Water Act, 33 U.S.C. §1251 *et seq*., the following discharges are authorized in accordance with this National Pollutant Discharge Elimination System ("NPDES"):

Discharge Name	Discharge No.
Drilling Fluid and Drilling Cuttings	001
Deck Drainage	002
Sanitary Wastes	003
Domestic Wastes	004
Desalination Unit Wastes	005
Blowout Preventer Fluid	006
Boiler Blowdown	007
Fire Control System Test Water	008
Non-Contact Cooling Water	009
Uncontaminated Ballast Water	010
Bilge Water	011
Excess Cement Slurry	012
Mud, Cuttings, Cement at Seafloor	013
Test Fluids	014

from oil and gas exploratory facilities in offshore areas (defined in 40 CFR Part 435, Subpart A), to all federal waters of the U.S. located in the Beaufort Sea and Chukchi Sea planning basins as defined by U.S. Department of Interior, Minerals Management Service (1992) and to all state waters contiguous to the Beaufort Sea and Chukchi Sea Minerals Management Service planning areas in accordance with effluent limitations, monitoring and reporting requirements, and other conditions set forth in Parts I through V herein. The discharge of pollutants not specifically set out in this permit is not authorized.

Table of Contents

I. NOTIFICATION REQUIREMENTS

This permit does not authorize the discharge of pollutants to waters of the United States until the following three requirements, which are set out in more detail in subparagraphs A. through C. below, are met. First, the permit applicant must send in a request to be covered by the permit and authorization to discharge. Second, the applicant must receive from EPA an authorization to discharge. Third, once authorized, the permittee must notify EPA of its intent to discharge at least seven days in advance of the discharge. Failure to comply with any of these requirements will vitiate any prior authorization to discharge under this general permit.

A. **Requests for Coverage and Authorization to Discharge Under the General Permit.** Persons requesting coverage under this general permit shall provide to EPA written request to be covered by this permit at least 60 days prior to initiation of discharges. All requests for coverage and authorization to discharge under the general permit shall be provided to the Alaska Department of Environmental Conservation Joint Pipeline Regional Office in Anchorage. The request shall include the following information:

1. Name and address of the permittee.
2. Lease and block numbers of operations and discharges.
3. Any discharge or operating conditions which will require special monitoring (Part II.A.4.).

B. **Authorization to Discharge.** The permittee's discharges are not authorized until the permittee receives from EPA written notification that EPA has assigned a permit number under this general permit to operations at the discharge site. A permit number cannot be assigned until the following information is received. This information shall be provided to EPA in the request for coverage, if possible, but in no case less than 30 days prior to commencement of discharges.

1. Name and location of discharge site, including lease block number and approximate coordinates.
2. Range of water depths (below mean lower low water) in lease block, and depth of discharge.
3. Initial date and expected duration of operations.

All monitoring reports and notifications of non-compliance:

Director, Water Division
U.S. Environmental Protection Agency, Reg. 10
Attn: Water Compliance Section, WD-135
1200 Sixth Avenue
Seattle, Washington 98101
(206) 553-6513

G. Changes from Authorization Under General Permit to Authorization Under an Individual Permit.

1. The Director may require any permittee discharging under the authority of this permit to apply for and obtain an individual NPDES permit when any one of the following conditions exist:

    a. The discharge(s) is (are) a significant contributor of pollution.

    b. The permittee is not in compliance with the conditions of this general permit.

    c. A change has occurred in the availability of the demonstrated technology or practices for the control or abatement of pollutants applicable to the point source.

    d. A Water Quality Management Plan containing requirements applicable to such point source is approved.

    e. The point sources covered by this permit no longer:

        (1) involve the same or substantially similar types of operations,
        (2) discharge the same types of wastes,
        (3) require the same effluent limitations or operating conditions, or
        (4) require the same or similar monitoring.

    f. In the opinion of the Director, the discharges are more appropriately controlled under an individual permit than under a general NPDES permit.

2. The Director may require any permittee authorized by this permit to apply for an individual NPDES permit only if the permittee has been notified in writing that

A. **Drilling Mud and Drilling Cuttings (Discharge 001).**

1. Effluent Limitations and General Requirements. The permittee may discharge drilling muds and drilling cuttings subject to the effluent limitations and related requirements set forth herein. Permittee shall limit and monitor the following parameters in accordance with Parts II.A.2.-4., II.E., III., and the requirements set out herein.

EFFLUENT LIMITS and MONITORING REQUIREMENTS

Effluent Characteristic	Discharge Limitation	Measurement Frequency	Sample Type/Method	Reported Value(s)
Toxicity	30,000 ppm SPP minimum	See Part II.A.1.g.,k.	Drilling Fluids Toxicity Test	96 hr LC50
Flow rate/Water depth[1/]				
0-5 meters	No discharge	Hourly during discharge	Estimate	Maximum hourly rate
>5-20 meters	500 bbl/hr			
>20-40 meters	750 bbl/hr			
>40 meters	1000 bbl/hr			
Oil-based fluids	No discharge	Daily & before bulk discharges	Grab/Static Sheen Test[2/]	Presence or absence
Diesel oil[3/]	No discharge	Daily & before bulk discharges	Grab/GC	Presence or absence
Free oil	No discharge	Daily & before bulk discharges	Grab/Static Sheen Test[2/]	Number of days sheen observed
Hg and Cd in barite	1 mg Hg/kg barite 3 mg Cd/kg barite	Once per well	AAS	Concentrations (mg/kg, dry wt.)
Total volume	[4/]	Daily	Estimate	Monthly total
Mud plan	NA	Prior Certification	See Parts II.A.d.,e.,f.	NA
Chemical inventory	NA	Once/mud system	See Part II.A.i.	NA
Chemical analysis	NA	Once/mud system	See Part II.A.j.	NA

1/ Maximum flow rate of total muds and cuttings into waters of given depths and under open water, broken ice, and stable ice conditions. A 9:1 predilution is required in open water, under-ice, and unstable or broken ice conditions.

2/ For discharges during stable ice, below ice, to unstable ice or broken ice conditions, a water temperature that approximates surface water temperatures after breakup shall be used.

3/ The measurement for diesel oil is daily if muds and cuttings fail static sheen test, before bulk discharges, and end-of-well.

4/ Exploratory drilling discharges are limited to discharges from no more than five wells at a single drilling site. If a step-out or sidetracked well is drilled from a previously drilled well hole, the step-out well is counted as a new well. Requests to discharge the wastes from more than five wells per site will be considered by the Director on a case-by-case basis.

each day of discharge and prior to bulk discharges. The test shall be conducted in accordance with "Approved Methodology": Laboratory Sheen Tests for the Offshore Subcategory, Oil and Gas Extraction Industry " which is Appendix 1 of Subpart A of 40 CFR Part 435. For discharges during stable ice, below ice, to unstable ice or broken ice conditions, a water temperature that approximates surface water temperatures at breakup shall be used. The discharge of drilling muds or cuttings which fail the Static Sheen Test is prohibited.

Whenever muds or cuttings fail the Static Sheen Test and a discharge has occurred in the past 24 hours, the permittee is required to analyze an undiluted sample of the material which failed the test to determine the presence or absence of diesel oil. The determination and reporting of results shall be performed according to Part II.A.1.b. above.

d. <u>Planned discharge of drilling muds and additives - Mud Plan</u>. The permittee shall develop and have on-site at all times a written procedural plan for the formulation and control of drilling mud/additive systems (hereafter "the mud plan"). The mud plan must specify the mud/additive systems to be used. The plan shall be implemented during drilling operations.

The mud plan shall be available to the Agency upon request. Prior to commencement of discharges from a given operation, the permittee shall provide EPA and ADEC with written certification that a mud plan does exist and is available to the agencies (<u>See</u> Parts I.C. and II.A.1.f. of the permit).

At a minimum, the mud plan shall provide the following information:

(1) Types of muds proposed for discharge, the well name, well number, NPDES permit number and mud types as basic plan identification

(5) An outline of the mud planning process which shall be consistent with other permit requirements. Names and titles of personnel responsible for the mud planning process shall be included.

e. Drilling mud and additive formulations. Only those drilling muds, specialty additives, and mineral oil pills that meet the criteria of this permit and are contained in the operator's mud plan (see Part II.A.1.d. above) shall be discharged. In no case shall toxicity of the discharged mud exceed the toxicity limit of 30,000 ppm SPP (see Part II.A.1. above).

f. Certification of planning for drilling mud discharge. For each well the operator shall submit written certification which states that a mud plan is complete, on-site, and available upon request. In addition, each certification shall identify the well it pertains to by well name, well number, and the NPDES permit number. The certification shall be submitted no later than the written notice of intent to commence discharge (see Part I.C.).

If the operator elects to use a particular drilling mud/additive system on subsequent wells, the original mud plan may be re-used. Information identifying the plan (see Part II.A.1.d(1), above), however, must reflect use of the plan for the current well.

g. Restrictions on the Use of a Mineral Oil Pill in Drilling Fluid. The discharge of residual amounts of mineral oil pills (mineral oil plus additives) is authorized by this permit provided that the mineral oil pill and at least a 50 bbl buffer of drilling fluid on either side of the pill are removed from the circulating drilling fluid system and not discharged to the waters of the United States. In the event that more than one pill is applied to a single well, the previous pill and buffer shall be removed prior to application of a discharged, as determined from amounts added and total mud volume circulating prior to pill application;

(9) Measured oil content of the mud samples, as determined by the API retort method; and

(10) An itemization of other drilling fluid specialty additives contained in the discharged mud.

h. Mercury and cadmium content of barite. The permittee shall not discharge a drilling mud to which barite was added if such barite contained mercury in excess of 1 mg/kg or cadmium in excess of 3 mg/kg (dry weight basis). The permittee shall analyze a representative sample of stock barite once prior to drilling each well and submit the results for total mercury and total cadmium in the Discharge Monitoring Report upon well completion. If more than one well is drilled at a site, new analyses are not required for subsequent wells if no new supplies of barite have been received since the previous analysis. In this case, the DMR should state that no new barite was received since the last reported analysis. Operators may provide certification, as documented ~~by the supplier(s),~~ that the barite will meet the above limits. The concentration of the mercury and cadmium in the barite shall be reported on the DMR as documented by the supplier. Analyses shall be conducted by atomic absorption spectrophotometry and results expressed as mg/kg (dry weight) of barite.

i. Chemical inventory. For each mud system discharged, the permittee shall maintain a precise chemical inventory of all constituents added downhole, including all drilling mud additives used to meet specific drilling requirements. The permittee shall report the following for each mud system:

In addition, permittees shall analyze mud samples for oil content (percent by weight and by volume). The analytical method shall be the retort distillation method for oil (American Petroleum Institute, Recommended Practice 13-1, 1990).

Results of chemical analyses shall be submitted within 45 days following well completion. Results shall be submitted with the end-of-well chemical inventory, <u>see</u> Part II.A.1.i., and shall identify the corresponding mud system from the end-of-well inventory.

k. <u>Toxicity Test</u>. If no mineral oil is used, the toxicity test shall be conducted monthly to determine compliance with the toxicity limit.

At end-of-well, a sample shall be collected for toxicity testing. This sample can also serve as the monthly monitoring sample. The sample shall be a representative subsample of that collected for chemical analysis (<u>see</u> Part I.A.1.j.).

The permittee shall complete a minimum of two toxicity tests on each mud system where a mineral oil lubricity or spotting agent is used. One sample shall be collected before applying the pill and one after removing the pill (<u>see</u> Part II.A.1.g.). The "after pill" sample test results can be used as the monthly monitoring sample. If the well is completed within 96 hours of collection of the "after pill" drilling mud sample, then these test results can also serve as the end-of-well test.

The testing and reporting of results shall be in accordance with Appendix 2 to Subpart A of 40 CFR Part 435. Results of toxicity tests shall be reported on monthly DMRs. Full copies of the toxicity test reports shall be attached to the DMRs and be accompanied by an inventory of all base mud components and specialty additives present in the sampled mud (including concentrations of each). Results are due within

e. During unstable or broken ice conditions, the following conditions apply for discharges shoreward of the 20 meters isobath as measured from MLLW:

(1) Discharge shall be prediluted to a 9:1 ratio of seawater to drilling muds and cuttings.

(2) Environmental monitoring is required as specified in Part II.A.4. below.

f. During stable ice conditions, unless authorized otherwise by the Director, the following conditions apply:

(1) Discharges shall be to above-ice locations and shall avoid to the maximum extent possible areas of sea ice cracking or major stress fracturing.

(2) Predilution and flow rate restrictions do not apply.

4. Environmental Monitoring Requirements.

a. Purpose/Areas to be Monitored.. Monitoring is required in the following areas which have been identified as requiring further information on the fate and, in some cases, the effects of discharged drilling muds. If the location authorized for discharge of drilling muds and drill cuttings is within 4000 meters of the following areas, then environmental monitoring is required:

(1) below-ice to water depths shallower than 20 meters as measured from MLLW,

(2) the Steffansson Sound Boulder Patch (see Part II.A.3.a. of this permit for further definition),

(3) the protected areas of Kasegaluk Lagoon and the seven identified passes (see Part II.A.3.b. for further definition),

(3) a statistically valid sampling design,

(4) all monitoring procedures and methods,

(5) a quality assurance/quality control program,

(6) a detailed discussion of how data will be used to meet, test and evaluate the monitoring objectives, and

(7) a summary of the results of previous environmental monitoring as they apply to the proposed program plan.

d. Reporting and Data Submission Requirements. The Permittee shall analyze the data and submit a draft report by within 180 days following the completion of sample collection. Copies of the draft report shall be sent concurrently to ADEC and the North Slope Borough. The report shall address the environmental monitoring objectives by using appropriate descriptive and analytical methods to test for and to describe any impacts of the effluent on sediment pollutant concentrations, sediment quality, water quality and/or the benthic community. The report shall include all relevant quality assurance/quality control (QA/QC) information, including but not limited to instrumentation, laboratory procedures, detection limits/precision requirements of the applied analyses, and sample collection methodology.

EPA and ADEC will review the draft report in accordance with the environmental monitoring objectives and evaluate it for compliance with the requirements of the permit. If revisions to the report are required, the Permittee shall complete them and submit the final report to EPA and ADEC within two months of the Director's request. Copies of the final report shall be sent concurrently to the North Slope Borough. The Permittee will be required to correct, repeat and/or expand environmental monitoring programs which have not fulfilled the requirements of the

B. Deck Drainage, Sanitary Wastes, and Domestic Wastes (Discharges 002-004).

Permittees shall limit and monitor discharges from deck drainage, sanitary wastes, and domestic wastes in accordance with Parts II.E., III. and the following requirements.

EFFLUENT LIMITS and MONITORING REQUIREMENTS

Effluent Characteristic	Discharge Limitation	Measurement Frequency	Sample Type/Method	Reported Value(s)
All Discharges (002-004)				
Flow rate	NA	Monthly	Estimate	Monthly average
Deck Drainage (002)[1/]				
Free oil	No discharge	Daily, during discharge	Visual/sheen on receiving water[2/]	Number of days sheen observed
Sanitary Wastes (003)[3/]				
Solids	No floating solids	Daily	Observation[4/]	Number of days solids observed
Residual chlorine[5/]	As close as possible to, but no less than, 1.0 mg/l	Monthly	Grab[6/]	Concentration (mg/l)
BOD		Weekly[9/]	Grab	
30 day average	30 mg/l			Monthly average
24-hr maximum	60 mg/l			Daily maximum
TSS		Weekly[9/]	Grab	
30 day average	30 mg/l		Monthly average[10/]	
24-hr maximum	60 mg/l		Daily maximum[10/]	
Domestic Wastes (004)				
Floating solids	No discharge	Daily	Observation[4/]	Number of days solids observed
Foam	No discharge	Daily	Observation[4/]	Number of days foam observed
All other domestic waste (garbage)	No discharge[7/]	Daily	Observation[8/]	Number of days solids observed

C. **Miscellaneous Discharges (Discharges 005-013).**

Permittee shall limit and monitor discharges from desalination unit wastes (005), blowout preventer fluid (006), boiler blowdown (007), fire control system test water (008), non-contact cooling waster (009), uncontaminated ballast water (010), bilge water (011), excess cement slurry (012), and mud, cuttings, and cement at the seafloor (013) in accordance with Parts II.E., III., and the following requirements.

EFFLUENT LIMITS and MONITORING REQUIREMENTS

Effluent Characteristic	Discharge Limitation	Measurement Frequency	Sample Type/Method	Reported Value(s)
All Discharges (005-013)				
Flow rate (MGD)	NA	Monthly	Estimate	Monthly average
Free oil	No discharge	Once/discharge for intermittent or once/day for continuous discharges	Visual/sheen on receiving	No. of days sheen observed

1. Bilge water (011) shall be processed through an oil-water separator prior to discharge. If discharge of bilge water occurs during broken, unstable, or stable ice conditions, the sample type/method used to determine compliance with the no free oil limitation shall be "Grab/Static Sheen Test." For discharges above stable ice, below ice, to unstable, or to broken ice, a water temperature that approximates surface water temperatures after breakup shall be used.

2. The permittee shall maintain an inventory of the quantities and rates of chemicals (other than water or seawater) added to cooling water (009) and desalination (005) systems. The inventory shall be submitted with the monthly Discharge Monitoring Report.

E. General Discharge Limitations for All Waste Streams (001 through 014).

1. Floating Solids, Visible Foam, or Oily Wastes. There shall be no discharge of floating solids or visible foam in other than trace amounts, nor of oily wastes which produce a sheen on the surface of the receiving water.

2. Surfactants, Dispersants, and Detergents. The discharge of surfactants, dispersants, and detergents shall be minimized except as necessary to comply with the safety requirements of the Occupational Health and Safety Administration and the Minerals Management Service. The discharge of dispersants to marine waters in response to oil or other hazardous spills are not authorized this permit. *See also* Part III.G.

3. Applicable Marine Water Quality Criteria. There shall be no discharge of any constituent in concentrations which will result in an exceedence of applicable marine water quality criteria at the edge of a permitted mixing zone. Initial mixing in federal waters is defined at 40 CFR §227.29.

4. Rubbish, Trash, and Other Refuse. The discharge of any solid material not authorized in the above permit is prohibited. Under U.S. Coast Guard regulations, discharges of garbage, including plastics, from fixed and floating platforms engaged in exploration of seabed mineral resources are prohibited with one exception - victual waste. Victual waste may be discharged beyond 12 nautical miles from nearest land if it has passed through a comminuter or grinder and can pass through a screen with openings no greater than 25 millimeters (approximately one inch). Discharge of putrescible wastes is prohibited within and beyond 12 nautical miles of nearest land.

5. Other Toxic and Non-conventional Compounds. There shall be no discharge of diesel oil, halogenated phenol compounds, trisodium nitrilotriacetic acid, sodium chromate or sodium dichromate.

c. The permittee shall establish specific objectives for the control of pollutants by conducting the following evaluations.

(1) Each facility component or system shall be examined for its waste minimization opportunities and its potential for causing a release of significant amounts of pollutants to waters of the United States due to equipment failure, improper operation, natural phenomena such as rain or snowfall, etc. The examination shall include all normal operations and ancillary activities including material storage areas, site runoff, in-plant transfer, process and material handling areas, loading or unloading operations, spillage or leaks, sludge and waste disposal, or drainage from raw material storage.

(2) Where experience indicates a reasonable potential for equipment failure (e.g., a tank overflow or leakage), natural condition (e.g., precipitation), or other circumstances to result in significant amounts of pollutants reaching surface waters, the program should include a prediction of the direction, rate of flow and total quantity of pollutants which could be discharged from the facility as a result of each condition or circumstance.

4. <u>Requirements</u>. The BMP Plan shall be consistent with the objectives in Part 3 above and the general guidance contained in the publication entitled "Guidance Document for Developing Best Management Practices (BMP)" (EPA Document Number EPA 833-B-93-004, U.S. EPA, 1993) or any subsequent revisions to the guidance document. The BMP Plan shall:

a. Be documented in narrative form, and shall include any necessary plot plans, drawings or maps, and shall be developed in accordance with good engineering practices. The BMP Plan shall be

b. Include the following provisions concerning BMP Plan review:

(1) Be reviewed by plant engineering staff and the plant manager.

(2) Be reviewed and endorsed by the permittee's BMP Committee.

(3) Include a statement that the above reviews have been completed and that the BMP Plan fulfills the requirements set forth in this permit. The statement shall be certified by the dated signatures of each BMP Committee member.

c. Establish specific best management practices to meet the objectives identified in Part 3 this section, addressing each component or system capable of generating or causing a release of significant amounts of pollutants, and identifying specific preventative or remedial measures to be implemented.

d. Establish specific best management practices or other measures which ensure that the following specific requirements are met:

(1) Ensure proper management of solid and hazardous waste in accordance with regulations promulgated under the Resource Conservation and Recovery Act (RCRA) and the Alaska Solid Waste Management Regulations (18 AAC 60). Management practices required under RCRA regulations shall be referenced in the BMP Plan.

(2) Reflect requirements within Oil Spill Contingency Plans required by the Minerals Management Service (<u>see</u> 30 CFR 254). Permittees in state waters must also reflect the requirements within Oil Discharge Prevention and Contingency Plans as required by ADEC. Permittees may incorporate any part

III. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. **Representative Sampling (Routine and Non-Routine Discharges).** The Permittee shall collect all effluent samples from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge.

In order to ensure that the effluent limits set forth in this permit are not violated at times other than when routine samples are taken, the Permittee shall collect additional samples at the appropriate outfall(s), and analyze them for the parameters limited in Part I.A.-E. of this permit (as applicable for the wastestream), whenever any discharge occurs that may reasonably be expected to cause or contribute to a violation that is unlikely to be detected by a routine sample.

The Permittee shall collect such additional samples as soon as possible after the spill or discharge. The samples shall be analyzed in accordance with paragraph C., below. In the event of an anticipated bypass, as defined in Part IV.G. of this permit, the Permittee shall collect and analyze additional samples as soon as the bypassed effluent reaches the outfall. The Permittee shall report all additional monitoring in accordance with paragraph D., below.

B. **Reporting of Monitoring Results.** The Permittee shall summarize monitoring results each month on the Discharge Monitoring Report (DMR) form (EPA No. 3320-1). The Permittee shall submit reports monthly, postmarked by the 10th day of the following month. The Permittee shall sign and certify all DMRs, and all other reports, in accordance with the requirements of Part V.E. of this permit ("Signatory Requirements"). The Permittee shall submit the legible originals of these documents to the Director, Water Division, with copies to ADEC at the following addresses:

analyses;

5. the analytical techniques or methods used; and

6. the results of such analyses.

F. Retention of Records. The Permittee shall retain records of all monitoring information, including, but not limited to, all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, copies of DMRs, a copy of the NPDES permit, and records of all data used to complete the application for this permit, for a period of at least five years from the date of the sample, measurement, report or application, or for the term of this permit, whichever is longer. This period may be extended by request of the Director or ADEC at any time.

A copy of the final permit shall be maintained at the drilling site.

G. Twenty-four Hour Notice of Noncompliance Reporting.

1. The Permittee shall report the following occurrences of noncompliance by telephone within 24 hours from the time the Permittee becomes aware of the circumstances:

   a. any noncompliance that may endanger health or the environment;

   b. any unanticipated bypass that results in or contributes to an exceedence of any effluent limitation in the permit (See Part IV.G., "Bypass of Treatment Facilities");

   c. any upset that results in or contributes to an exceedence of any effluent limitation in the permit (See Part IV.H., "Upset Conditions"); or

   d. any violation of a maximum daily discharge limitation for any of the pollutants listed in the permit .

a. One hundred micrograms per liter (100 ug/l);

b. Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

c. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

d. The level established by the Director in accordance with 40 CFR 122.44(f).

2. That any activity has occurred or will occur that would result in any discharge, on a non-routine or infrequent basis, of any toxic pollutant that is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

a. Five hundred micrograms per liter (500 ug/l);

b. One milligram per liter (1 mg/l) for antimony;

c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

d. The level established by the Director in accordance with 40 CFR 122.44(f).

c. Knowing Endangerment. Section 309(c)(3) of the Act provides that any person who knowingly violates a permit condition implementing Sections 301, 302, 303, 306, 307, 308, 318, or 405 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine of not more than $250,000 or imprisonment of not more than 15 years, or both. A person that is an organization shall be subject to a fine of not more than $1,000,000.

d. False Statements. Section 309(c)(4) of the Act provides that any person who knowingly makes any false material statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under this Act or who knowingly falsifies, tampers with, or renders inaccurate any monitoring device or method required to be maintained under this Act, shall be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or by both.

Except as provided in permit conditions in Part IV.G., ("Bypass of Treatment Facilities") and Part IV.H., ("Upset Conditions"), nothing in this permit shall be construed to relieve the Permittee of the civil or criminal penalties for noncompliance.

C. **Need to Halt or Reduce Activity not a Defense.** It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. **Duty to Mitigate.** The Permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

3. Prohibition of bypass.

a. Bypass is prohibited, and the Director or ADEC may take enforcement action against the Permittee for a bypass, unless:

(1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment shall have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance; and

(3) The Permittee submitted notices as required under paragraph 2 of this Part.

b. The Director and ADEC may approve an anticipated bypass, after considering its adverse effects, if the Director and ADEC determine that it will meet the three conditions listed above in paragraph 3.a. of this Part.

H. Upset Conditions.

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the Permittee meets the requirements of paragraph 2 of this Part. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

permit, nor to notification requirements under Part III.I.

The Permittee shall give notice to the Director and ADEC as soon as possible of any planned changes in process or chemical use whenever such change could significantly change the nature or increase the quantity of pollutants discharged.

K. **Anticipated Noncompliance.** The Permittee shall also give advance notice to the Director and ADEC of any planned changes in the permitted facility or activity that may result in noncompliance with this permit.

V. GENERAL PROVISIONS

A. **Permit Actions.** This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

B. **Duty to Reapply.** If the Permittee intends to continue an activity regulated by this permit after the expiration date of this permit, the Permittee must apply for and obtain a new permit. ~~The application shall be~~ submitted at least 180 days before the expiration date of this permit.

C. **Duty to Provide Information.** The Permittee shall furnish to the Director and ADEC, within the time specified in the request, any information that the Director or ADEC may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The Permittee shall also furnish to the Director or ADEC, upon request, copies of records required to be kept by this permit.

D. **Other Information.** When the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or that it submitted incorrect information in a permit application or any report to the Director or ADEC, it shall promptly submit the omitted facts or corrected information.

representative.

4. Certification. Any person signing a document under this Part shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

F. **Availability of Reports.** Except for data determined to be confidential under 40 CFR 2, all reports prepared in accordance with this permit shall be available for public inspection at the offices of the state water pollution control agency and the Director and ADEC. As required by the Act, permit applications, permits, Best Management Practices Plans, Mud Plans, and effluent data shall not be considered confidential.

G. **Inspection and Entry.** The Permittee shall allow the Director, ADEC, or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

If the notice described in paragraph 3 above is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.

L. **State Laws.** Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Act.

M. **Reopener Clause.**

1. This permit shall be modified, or alternatively, revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the Act, as amended, if the effluent standard, limitation, or requirement so issued or approved:

   a. Contains different conditions or is otherwise more stringent than any condition in the permit; or

   b. Controls any pollutant or disposal method not addressed in the permit.

   The permit as modified or reissued under this paragraph shall also contain any other requirements of the Act then applicable.

2. This permit may be reopened to adjust any effluent limitations if future water quality studies, waste load allocation determinations, or changes in water quality standards show the need for different requirements.

14. *Desalination unit wastes* means wastewater associated with the process of creating freshwater from seawater.

15. *Diesel oil* means the grade of distillate fuel, as specified in the American Society for Testing and Materials Standard Specification D975-81, that is typically used as the continuous phase in conventional oil-based drilling fluids, which contains a number of toxic pollutants. For the purpose of this permit, *diesel oil* includes the fuel oil present at the facility.

16. *Domestic wastes* means materials discharged from showers, sinks, safety showers, eye-wash stations, hand-wash stations, fish-cleaning stations, galleys, and laundries.

17. *Drill cuttings* means the particles generated by drilling into subsurface geological formations and carried to the surface with the drilling fluid.

18. *Drilling fluid* means the circulating fluid (mud) used in the rotary drilling of wells to clean and condition the hole and to counterbalance formation pressure. A water-based drilling fluid is the conventional drilling mud in which water is the continuous phase and the suspended medium for solids, whether or not oil is present. An oil-based drilling fluid has diesel oil, mineral oil, or some other oil as its continuous phase with water as the dispersed phase.

19. *Drilling Fluids Toxicity Test* means a toxicity test conducted and reported in accordance with the following approved toxicity test methodology: "Drilling Fluids Toxicity Test" as defined in Appendix 2 to Subpart A of 40 CFR 435.

20. *Excess cement slurry* means the excess cement including additives and wastes from equipment washdown after a cementing operation.

21. *Exploratory facilities* means any fixed or mobile structure subject to subpart A of 40 CFR 435 that are engaged in drilling of wells to determine the nature of

34. *Mineral oils* means a class of low volatility petroleum product, generally of lower aromatic hydrocarbon content and lower toxicity than diesel oil.

35. *Mineral oil pills* (also called mineral oil spots) are formulated and circulated in the mud system as a slug in attempt to free stuck pipe. Pills generally consists of two parts; a spotting compound and mineral oil.

36. *Minimum* means the lowest measured discharge or pollutant in a wastestream during the time period of interest.

37. *Monitoring month* means the period consisting of the calendar weeks which end in a given calendar month.

38. *Monthly average* means the average of *daily discharges* over a monitoring month, calculated as the sum of all *daily discharges* measured during a monitoring month divided by the number of *daily discharges* measured during that month.

39. *MSD* means marine sanitation device.

40. *Muds, cuttings, cement at sea floor* means the materials discharged at the surface of the ocean floor in the early ~~phases of drilling~~ operations, before the well casing is set, and during well abandonment and plugging.

41. *M9IM* means those offshore facilities continuously manned by nine (9) or fewer persons or only intermittently manned by any number of persons.

42. *M10* means those offshore facilities continuously manned by ten (10) or more persons.

43. *No discharge of free oil* means that waste streams may not be discharged when they would cause a film or sheen upon or a discoloration of the surface of the receiving water or fail the static sheen test defined in Appendix 1 to 40 CFR 435, Subpart A.

52. *Sidetracked well* means a new hole drilled from a main well to a different bottom hole location.

53. *Site* means the single, specific geographical location where a mobile drilling facility (jackup rig, semi-submersible, or arctic mobile rig) conducts its activity, including the area beneath the facility, or to a location on a single gravel island.

54. *Slush ice* occurs during the initial stage of ice formation when unconsolidated individual ice crystals (frazil) form a slush layer at the surface of the water column.

55. *SPP* means suspended particulate phase.

56. *Stable ice* means ice that is stable enough to support discharged muds and cuttings.

57. *Static Sheen Test* means the standard test procedure that has been developed for this industrial subcategory for the purpose of demonstrating compliance with the requirement of no discharge of free oil. The methodology for performing the static sheen test is presented in Appendix 1 to Subpart A of 40 CFR 435.

58. *Step-out well* means a new hole drilled from a main well to a different bottom hole location.

59. *Test fluid* means the discharge which would occur should hydrocarbons be located during exploratory drilling and tested for formation pressure and content. This would consist of fluids sent downhole during testing along with water and particulate matter from the formation.

60. *Toxicity* as applied to BAT effluent limitations for drilling fluids and drill cuttings shall refer to the toxicity test procedure presented in Appendix 2 to Subpart A of 40 CFR 435.

61. *Unstable or broken ice conditions* means greater than 25 percent ice coverage within a one (1) mile radius of the discharge site after spring breakup or after the start of ice formation in the fall, but not stable ice.

VII. REFERENCES

CENTEC. 1985.
Analysis of Diesel Oil in Drilling Fluids and Drill Cuttings. Attachment to a letter dated 4/22/95 from David F. Tompkins, Centec Analytical Services, to Janis Hastings, EPA Region 10.

U.S. Department of Interior. 1992.
Outer Continental Shelf Natural Gas and Oil Resource Management: Comprehensive Program (1992-1997). Proposed final. Minerals Management Service.

U.S. Environmental Protection Agency. 1993.
Guidance Manual for Developing Best Management Practices (BMP). Office of Water. EPA 833-B-93-004. October 1993. (Note - this can be obtained free of charge from the EPA Water Resource Center by calling 202/260-7786.)

APPENDIX F

ENVIRONMENTAL REPORT

Environmental Report

McCovey

AEC Oil & Gas (USA) INC.

January 2002

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1.0 INTRODUCTION

The purpose of the Environmental Report is to provide the Minerals Management Service (MMS), Alaska Outer Continental Shelf (OCS) Region, and other appropriate Federal and State agencies with sufficient information for evaluation of the AEC Oil and Gas (USA) Inc. (AEC) McCovey No. 1 Exploration Well project and its compliance with the National Environmental Policy Act (NEPA) and its implementing regulations. Detailed information about the project is included in other sections of the Exploration Plan prepared for this project.

Substantial scientific data is available in this document to describe the existing environment and to assess any potential impacts resulting from exploration activities at the McCovey Prospect using the Mobile Offshore Drilling Unit SDC/MAT. This prospect is located in OCS Lease Blocks Y-1578 and Y-1577. As required by NEPA regulations, the MMS has, in cooperation with the U.S. Environmental Protection Agency (USEPA) prepared a Final Environmental Impact Statement (EIS) for the Alaska OCS Beaufort Sea Planning Area Oil and Gas Lease Sale 124.

In addition, previous studies have addressed the environmental impacts associated with exploration activity in the Beaufort Sea. The AEC McCovey Exploratory Well No. 1, located approximately 13 miles offshore, would not be expected to result in new or different impacts to the surrounding environment. Site-specific environmental information prepared by Phillips Alaska, Inc. (PAI, 2000), Lynx Enterprises, Inc. (Lynx, 2001), and Air Sciences, Inc. (ASI, 2001) are hereby incorporated by reference. Finally, an EIS, as well as several monitoring reports that describe the results of a number of studies, were prepared for the BP/Amoco Northstar Development Project in 1999 near the McCovey project area. These documents, included in the references section of this report, are hereby incorporated by reference.

The McCovey Prospect activities are detailed in the McCovey No. 1 Exploratory Well Exploration Plan, Mobile Offshore Drilling Unit Option (AEC, 2001). The Exploration Plan and its appendices include details of the proposed action as specified under 30 CFR 250.203 and are hereby incorporated by reference.

2.0 DESCRIPTION OF THE PROPOSED ACTION

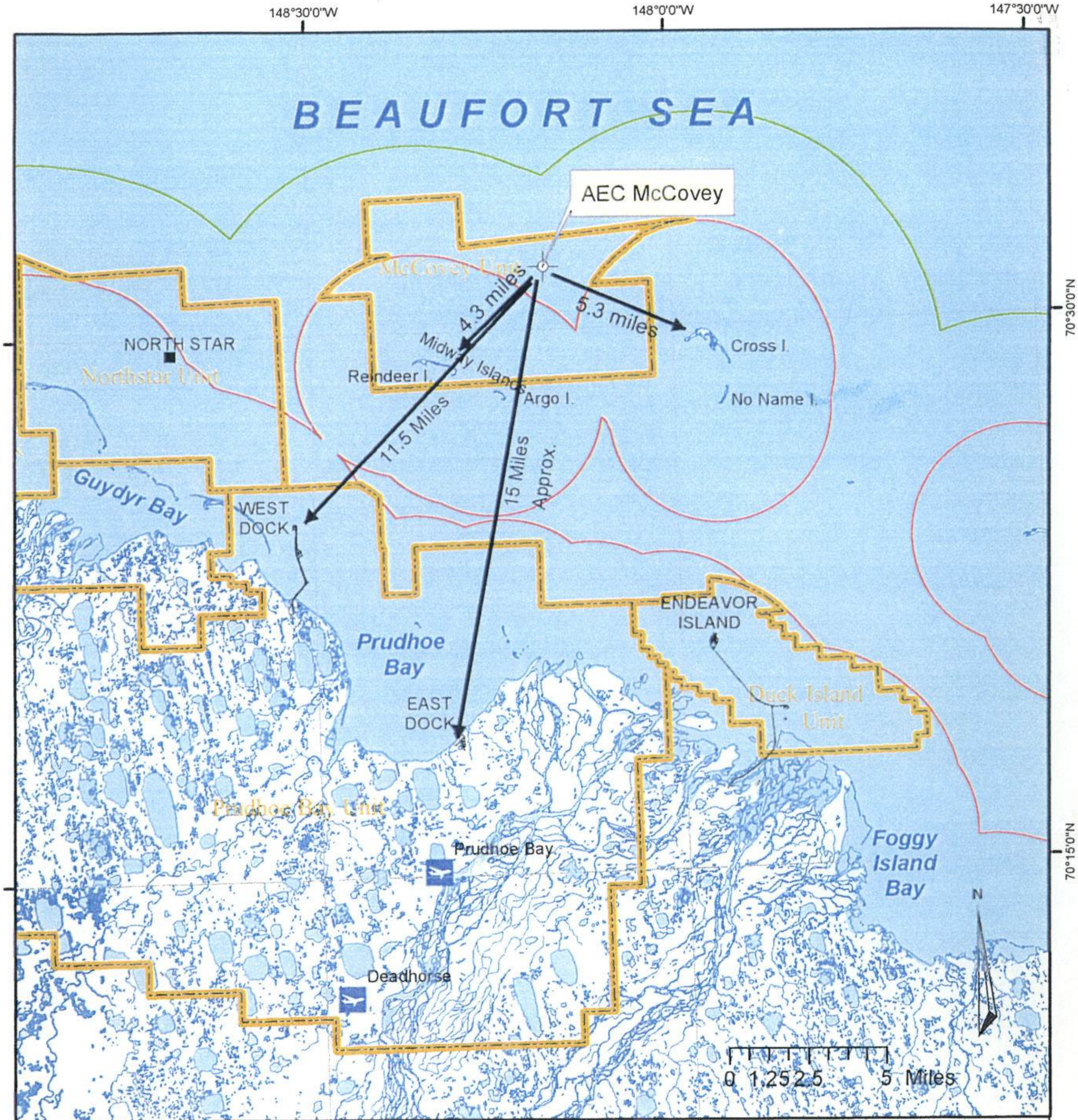
2.1 Background

The McCovey project consists of drilling an exploratory well during the 2002-2003 winter drilling season to evaluate the oil and gas potential of AEC operated leases in the McCovey Prospect Area, which is offshore Prudhoe Bay, Alaska. A project location map is provided as Figure 1. At present, a single exploration well and a potential sidetrack have been identified in the area. The initial exploration well, hereinafter referred to as "AEC McCovey No. 1" is to be drilled from a surface location in OCS Lease Block Y-1577 to bottom hole locations on lease block Y-1578. AEC is the operator of the proposed drilling program and will be the permittee of record.

The SDC/MAT system will be used for the proposed drilling activity. The SDC/MAT is designed specifically for year-round exploratory drilling in harsh offshore arctic environments, in water depths ranging from 25 to 80 feet. A drawing of the SDC/MAT is provided as Figure 2. The SDC/MAT is described in detail in the MMS exploration plan and supporting documents. Any additional exploration/delineation drilling is dependent on the outcome of the McCovey No. 1 well and further review of geologic, geophysical, and reservoir data. The AEC McCovey No. 1 well will be expendable, and therefore plugged and abandoned, regardless of any commerciality demonstrated during testing and evaluation. If this initial well shows potential for hydrocarbon development, a well flow test may be conducted. Assuming a positive result, the potential exists for a sidetrack well in 2003, or future exploration/delineation drilling in subsequent years.

2.2 Site Surveys/Spring 2000 Activities

As part of the McCovey Prospect Exploration Program, a site survey was conducted to collect geotechnical and subsurface imaging data. A Notice of Preliminary Activities to the MMS for the shallow hazard survey was submitted on March 1, 2000, and received approval from the MMS on March 16, 2000 for these activities. Additional subsurface imaging data was collected during August 2000. The results of the survey were presented to MMS in October 2000 and September 2001. A location map of the shallow hazard survey can be found in Figure 3.



Horizontal Datum NAD 27, coordinate system Alaska State Plane Zone 4. Hydrology derived from 1:63360 USGS DLG Data.

Proposed Exploration Well Location

8(g) Boundary

Alaska Seaward Boundary

Oil & Gas Units

AEC OIL & GAS (USA) INC.

AEC McCovey Exploration Prospect
Environmental Report

PROJECT LOCATION MAP

SCALE:	FIGURE:
1 inch equals 5 miles	1

Lynx: aec045.mxd, December 27, 2001, Rev 2

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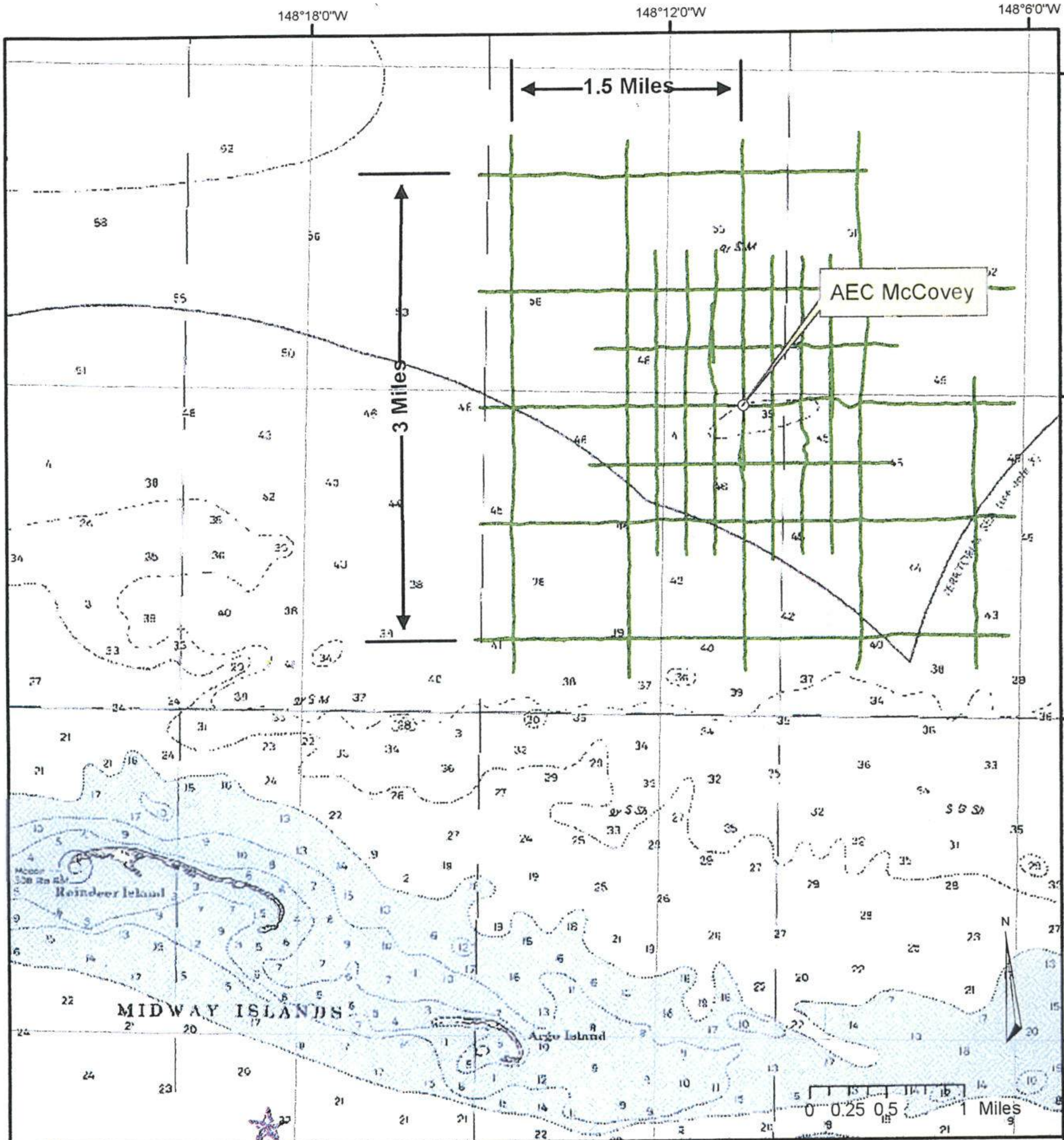
AEC McCovey Exploration Prospect
Environmental Report

SDC/MAT CONFIGURATION

SCALE: Not to Scale	FIGURE: 2



Horizontal Datum NAD27, coordinate system UTM Zone 6N. OBC seismic grid data provided by Arctic GeoScience. Background Digital Raster Image (DRG) was created by scanning NOA map #16061 at a resolution of 300 dpi and georeferenced using lat/long taken from the original map.

Proposed Exploration Well Location

OBC Seismic Grid

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AEC McCovey Exploration Prospect
Environmental Report
SITE SPECIFIC SHALLOW
HAZARD SURVEY GRID

SCALE:	FIGURE:
1 inch equals 1 miles	3

Lynx: aec046.mdx, December 18, 2001, Rev 1

2.3 Winter 2002-2003 Activities

As the AEC McCovey program will be conducted from the SDC/MAT, there will be no on-ice activities carried out in the winter season beyond occasional on-ice activities including vertical seismic profile (VSP) surveys. The potential effect of the winter program on specific activities is discussed below.

After acceptance by the MMS, the McCovey well will be spudded and drilled in accordance with the program that will be defined in the Application for Permit to Drill (APD). Activity is expected to begin in mid-August 2002 for a short period during re-supply operations with the driving of surface casing. Drilling commencement will be in mid-November 2002. The drilling operation is expected to take approximately 40 days to reach target depth (TD). This timeline is based on drilling data from the Gulf Oil Cross Island #1 well, the AMOCO No Name Island well, and the Sohio Reindeer Island Well. Any additional exploration/delineation drilling in the prospect is dependent on the outcome of the McCovey No. 1 well, and further review of geologic and geophysical data.

At the conclusion of drilling and log evaluation, several options are presented, depending on what is discovered in the McCovey No. 1 well and sidetrack (if completed). If the well is a dry hole and the operator elects to cease all further work, the well would be permanently plugged and abandoned (P&A), and the SDC/MAT demobilized. If drilling results are encouraging, the operator may elect to flow test the well. This activity is anticipated to take one to two weeks depending on the test program. At the conclusion of testing, the well will be plugged and the SDC/MAT is returned to cold stack/quiet mode.

In a dry hole scenario, the AEC McCovey No. 1 well would be plugged and abandoned. If results require additional testing during another drilling season, the well would be plugged in a suspended state using Minerals Management Service (MMS) approved methods.

3.0 DESCRIPTION OF AFFECTED ENVIRONMENT

3.1 Physical Environment

The project site is located within 5 miles of near shore barrier islands in the Beaufort Sea as shown on Figure 1. Water depths at the surface location are approximately 37 feet Mean Lower Low Water (MLLW). The surface location is located on a small shoal that has been determined to be acceptable for the SDC/MAT. Refer to the Exploration Plan (AEC, 2001) for a detailed description.

The Central Beaufort Sea Shelf is characterized by up to 1200 feet of Holocene to Pliocene age sediments (Gubik Formation) overlying the Tertiary rocks and sediments of the Sagavanirktok Formation. These sediments are divided into Plio-Pleistocene sediments, deposited prior to the end of the last glaciation, and recent Holocene marine deposits. Sedimentation rates at the McCovey location are expected to be low because of its distal position to the Sagavanirktok River and delta system. Minor sediment input of sands and clays into this area would be from longshore drift. Ice rafting may have brought some erratic cobble size material into this area. Wave action, marine currents, and ice scour are expected to be the principal reworking processes of sediments in this area.

The geology of the surface site is typical of proximal Beaufort Sea barrier island formations. The sediments consist of a mixture of unconsolidated sands and clays and are similar to the sediments of the nearby barrier island formation.

Near the drilling location, a series of migrating, low-lying sand/gravel deposits also known as the Barrier Islands occur immediately south of the McCovey No. 1 Exploratory Well location. A site investigation conducted in the project area included: 1) geotechnical borings and 2) a geophysical program including, seismic and sub-bottom profiler surveys, a bathymetric survey, and a side scan sonar survey. This site investigation was conducted in mid April 2000 with additional data collected in August 2000. These reports are included in the Exploration Plan submitted to the MMS (January 2002).

The Beaufort Sea Barrier Islands are located in earthquake Zone 1; earthquake possibility is highly unlikely for this region.

The nature and extent of known mineral deposits in the McCovey Prospect is unknown. Geophysical surveys have identified the potential for hydrocarbon reservoir(s), which are to be explored by this project.

Onshore aquifers will not be affected, as the project is approximately 13 miles offshore.

3.2 Meteorology

The AEC McCovey No. 1 Exploratory Well is located in the Arctic climate zone, characterized by cold temperatures, nearly constant wind, and low precipitation. Barter Island meteorological data (Table 3-1) includes the largest set of data representing this zone. Mean temperatures are approximately 10°F. The maximum-recorded temperature in the region is 78°F and the minimum is –59°F. Freezing temperatures are reached for an average of 310 days per year. Mean sky cover varies from 0 to 9.2 tenths; Barter Island reports 0 to 8.6 tenths (WCC 1981). Fog is common from May through September and cloudy weather is common from February through October. Barter Island reports 50 days/year as clear, 68 days/year partly cloudy, and 192 days/year cloudy. Annual precipitation averages less than 10 inches, and winter snowfall is generally less than 3.5 feet.

Winds consistently average 21.3 km/hour (13.3 mph) along the Beaufort Sea coast with the prevailing wind direction being easterly (ENE to NE). From January to April, the prevailing wind direction is westerly (U.S. Army Corps of Engineers, Alaska District, 1999). Gale force winds blow frequently along the coast, and hurricane velocities have been recorded for this region.

The sun remains below the horizon in the project area from November 24 to January 17. Daylight hours representative of the area (70°N) are presented below:

January	0.0
February	4.9
March	9.5
April	14.0
May	18.9
June	24.0
July	24.0
August	21.2
September	15.5
October	11.2
November	6.1
December	0.0

Table 3-1 Barter Island Meteorological Station

Latitude: 70^0 07' N
Longitude: 143^0 40' W
Elevation: 40 feet

Temperature (Degrees F)													Precipitation (Inches)									
	Means			Extremes				Mean Days				Heat Degree Days							Snow			
								Max		Min						Mean Precip	Days Exceeded					
Mth	Max	Min	Mth	Rec Hi	Yr	Rec Lo	Yr	70+	32-	0-	32-	Mth Mean	Mean Mth Tot	Max Day	Yr	0.5	.25	0.1	Mean Mth Tot	Max Dpth	Yr	Mean Days 1.0
Jan	-7.8	-20.5	-14.2	39.0	62	-54.0	75	0.0	30.8	28.6	31.0	2465.0	0.48	2.25	62	0.1	0.5	1.0	5.0	43.0	50	31.0
Feb	-13.9	-26.4	-20.1	37.0	82	-59.0	50	0.0	28.1	27.1	28.3	2407.1	0.23	1.22	55	0.0	0.0	0.6	2.7	43.0	50	28.2
Mar	-8.5	-22.4	-15.5	36.0	67	-51.0	73	0.0	31.0	30.0	31.0	2495.8	0.22	0.54	67	0.0	0.0	0.7	2.6	47.0	55	31.0
Apr	6.8	-9.5	-1.3	43.0	58	-44.0	87	0.0	29.3	23.6	30.0	1992.6	0.19	0.44	63	0.0	0.0	0.3	2.4	47.0	55	30.0
May	26.2	15.4	20.8	52.0	64	-16.0	64	0.0	24.3	3.0	30.9	1359.0	0.30	0.73	54	0.1	0.0	0.8	3.0	40.0	50	28.4
Jun	38.3	30.2	34.3	68.0	76	13.0	74	0.0	3.0	0.0	22.8	912.5	0.52	1.20	52	0.1	0.0	1.5	1.6	35.0	55	5.8
Jul	45.3	34.7	40.0	78.0	74	24.0	67	0.2	0.0	0.0	9.0	765.5	1.00	1.64	71	0.3	0.7	3.3	0.5	2.0	54	0.1
Aug	43.9	34.4	39.2	72.0	57	20.0	86	0.1	0.9	0.0	10.8	794.8	1.08	0.90	48	0.3	0.7	3.4	1.3	3.0	69	1.0
Sep	35.4	27.9	31.6	66.0	86	4.0	70	0.0	10.2	0.0	24.7	993.1	0.68	0.91	57	0.1	0.3	2.2	5.0	20.0	54	6.0
Oct	20.5	10.3	15.4	46.0	69	-26.0	83	0.0	29.1	6.7	31.0	1539.0	0.77	1.98	54	0.1	0.7	1.7	9.0	24.0	54	25.7
Nov	5.6	-6.2	-0.2	37.0	50	-51.0	48	0.0	29.8	20.0	30.0	1962.3	0.41	0.43	54	0.0	0.3	1.0	4.9	24.0	50	30.0
Dec	-6.0	-18.5	-12.1	37.0	73	-51.0	61	0.0	30.9	28.1	31.0	2389.9	0.26	0.52	49	0.0	0.7	0.7	3.3	26.0	49	31.0
Year	Avg 15.5	Avg 4.1	Avg 9.8	Rec 78.0		Rec -.0		Tot 0.2	Tot 247.3	Tot 167.0	Tot 310.4	Tot 20076.7	Tot 6.12	Rec 2.25		Tot 1.2	Tot 3.8	Tot 17.0	Tot 41.2	Rec 47.0		Tot 248.2

3.3 Air Quality

The existing onshore air quality for most areas adjacent to the Beaufort Sea Planning Area Lease Sale 124 is considered to be relatively pristine, with concentrations of regulated air pollutants that are far less than the maximum allowed by the National Ambient Air Quality Standards and State air quality statutes and regulations. Over most of this onshore area, there are only a few small, scattered emissions from widely scattered sources (primarily diesel-electric generators in small villages). Industrial sources exist at the Prudhoe Bay, Kuparuk, Endicott, Milne Point, Greater Point McIntyre, and Lisburne oil production facilities. Ambient air quality standards are generally met in this region even at the sites expected to have the highest concentrations, as shown in various monitoring programs (USAED/AK, 1999).

During the winter and spring, pollutants known as arctic haze are transported to arctic Alaska from Europe and Asia. Data collected by atmospheric chemists in these regions indicate high concentrations of sulfate and vanadium at Barrow. Vanadium is a pollutant resulting from the burning of heavy industrial oils, commonly used as fuel (USAED/AK, 1999).

Existing and anticipated offshore air quality conditions at the McCovey Prospect have been evaluated as part of the project's permitting effort (ASI, 2001). A copy of the air permit application is included in the Exploration Plan (AEC, 2002).

3.4 Physical Oceanography

3.4.1 Summer Conditions

Tides in the Beaufort Sea are generally small and are characterized by a mixed semi-diurnal signal with mean ranges from 10 to 30 cm (4 to 12 inches). The tide appears to approach from the north with little phase change from Barrow to Demarcation Point (USDOI/MMS 1990).

Storm surges significantly increase or decrease sea level from this mean level; in the Beaufort Sea, storm surges are the most important factor in sea level variation. The storm surges are a result of meteorological conditions (wind, pressure gradients, temperature) interacting with the physical elements of the water surface (open water, fetch, density gradients, bathymetry, shoreline topography) creating wave, current, and water mass accumulations that can change sea level conditions by up to 3 m (9.8 feet). Storm surges most frequently occur in September and October when eastward moving storms cross the face of the Beaufort coast and long stretches of open water are present. A vertical rise in water surface will occur on those beachfronts impinged by the wave train, and a negative vertical change in the water surface may help drive upwelling of warm saline water onto the shelf (Aagaard 1988). Much of the water flowing northward from the Chukchi Sea is carried by this current and results in a great expanse of warm water extending eastward across the Beaufort Sea during the summer and fall (Aagaard 1984).

The inner shelf region of the Beaufort Sea is characterized by mean westward water and ice motion primarily driven by the prevailing winds, which are from the east. Strong winds periodically develop from the west causing major flow reversals in the surface current; the response time is rapid, usually a matter of hours. Bottom currents also tend to travel from east to west. Nearshore currents are modified by bottom topography, the presence of ice, river discharge, and the location of offshore barrier islands and shoals (USDOI/MMS, 1990).

Seaward of the 40 m (131 feet) isobath, and north of the project site, the circulation is dominated by the Beaufort Gyre that controls surface ice movement and by the Beaufort undercurrent that generally runs counter to the predominantly westward ice drift (Aagaard 1984). The long-term mean speeds of this current are normally in the 5 to 10 cm/sec (0.09 to 0.2 knots) range, although maximum speeds near 75 cm/sec (1.5 knots) have been recorded (Aagaard 1988). Frequent current reversals have been observed and appear to be due to the long-shore wind component; they will occur on the lee side of large embayments and extended promontories.

Previous surveys in the region noted water temperatures for coastal areas on the Inner Shelf (i.e., less than 40 m water depths) generally ranged from 0ºC to 9ºC; salinity in true marine waters is greater than 25 parts per thousand (ppt) while more inshore areas range from 15 ppt to 25 ppt. During the early to mid-summer, temperature and salinity are stratified with depth because open-water areas adjacent to river deltas are dominated largely by river water and offshore by ice-melt water that forms a 3- to 4-m-thick surface layer. The colder, high salinity marine water lies below this surface layer. Due to the large density difference between the layers and the retreating ice cover, mixing of the fresh- and marine-water layers by winds is negligible in the early summer. Later in the summer, open water areas become large enough for winds and storms to affect mixing and circulation; strong easterly or westerly winds especially have sufficient force to bring about mixing. As a result, late summer storms can cause water temperatures along the coast to decrease from 8 to 12ºC, to 3 to 5ºC and salinities to increase 10 or more ppt within 24 hours.

The only industrial activity occurring in this section of the Beaufort Sea is BP Exploration's Northstar project. The Northstar project is expected to be in the construction and start-up phase from December 2001 to April 2002. This phase of the project is expected to have a minimal effect on the marine water quality.

Due to the limited industrial activity, offshore water quality at the McCovey Prospect in the Beaufort Sea Planning Area Lease Sale 124 is good with most contaminants occurring at low levels (USDOI/MMS 1990). However, turbidity, trace metals, and hydrocarbons are introduced into the marine environment through river runoff, coastal erosion, atmospheric deposition, and natural seeps.

3.4.2 Winter Conditions

During winter exploration operations at the McCovey No. 1 Exploratory Well, the region will be covered by ice. Ice cover exists from approximately late September or early October until late June. Winter sea ice on the Beaufort Sea shelf consists of landfast ice (fast ice), drifting pack ice (seasonal pack ice), and a region of pronounced ice ridging and shear line formation (Stamukhi or shear zone), which develops between the pack ice and fast ice. At the project site, ice is generally within the floating-fast subzone of the landfast ice zone. This area is between the 2-meter isobath (the bottomfast ice zone) and the 15-meter isobath, the beginning of the Stamukhi zone (WCC 1981). The ice sheet in the project area will grow to a thickness of approximately 2 meters by April with breakup expected by late June or July. Ice gouging of seabeds and interaction with the highly mobile pack ice leads will typically occur in water depths of 13.7 to 18.3 meters (45 to 60 feet). Gouge intensity is defined as the density of occurrence by the maximum depth of gouging. The project area is located in an area considered to have a low gouge intensity (USAED/AK, 1999).

Negative tide surges (i.e., levels falling below mean sea level) occur primarily during December and January and are up to -1.6 m (-5.2 feet) (Norton and Sackinger 1981). Extensive fracturing of shorefast ice is possible during such surge events.

Previous surveys in the general area noted under-ice water temperatures of -1.7°C in February, -2.2°C in March, and -2.4°C in April. Average salinity was 33 ppt, ranging from a minimum of 28 ppt to a maximum of 33.7 ppt. Temperature and salinity were uniform with depth. Currents under ice were tidally driven and of very low magnitude (WCC 1981).

In winter, nearshore ocean currents are generally westerly and less than 5 cm/sec (0.09 knots) and may not exceed 10 cm/sec (0.2 knots). In fact, less than 5 percent of the registered under-ice current speeds exceeded 5.0 cm/sec (0.16 ft/sec) (WCC 1981; USDOI/MMS, 1990).

3.5 Other Uses of Area

3.5.1 Commercial Fishing

No commercial fishing exists or is anticipated in the immediate project area. The one commercial fishery present along the Alaskan Beaufort Sea coastline occurs on the Colville River more than 50 miles to the west of the McCovey Prospect (USDOI/MMS 1996).

The USDOI/MMS (1996) notes that this commercial fishing operation began more than 25 years ago and occurs during the summer and fall months. Arctic cisco, least cisco, and, to a lesser extent, broad whitefish are the primary species harvested. They are sold for human consumption and for dog food in Fairbanks and Barrow.

3.5.2 Shipping

The only commercial offshore activities in the project area, other than oil and gas exploration, are open water barge traffic providing fuel and other materials to North Slope villages, occasional barge traffic between Prudhoe Bay and the Mackenzie River in Canada, and infrequent traversing of the Beaufort Sea by small cruise ships. Barge travel is usually limited to regions north of the Barrier Islands and does not occur during winter months. Cruise ship activity also occasionally occurs north of the Barrier Islands and does not take place during winter months.

3.5.3 Military Use

No regular military use of the area exists or is known to be planned.

3.5.4 Recreation/Sport Fishing/Boating

No sport fishing occurs in the immediate project area. Local boating occurs in the area as part of normal subsistence fishing and whaling activities for the village of Nuiqsut. See Section 3.7, Socioeconomics for a discussion of subsistence activities in the project area.

3.5.5 Kelp Harvesting or Mariculture

No kelp harvesting or mariculture exists or is anticipated in the project area.

3.5.6 Known Cultural Resources

There have been a significant number of archaeological and cultural/historical sites identified in the general North Slope area. The closest archaeological resources to the McCovey project area are the cabins and house depressions located on Cross Island, 5.3 miles to the southeast. Although there are known to be numerous shipwrecks along the coast of the Beaufort Sea, no surveys for locations of these shipwrecks have been made. The probability that any possible shipwreck has survived the level of ice gouging in the project area (within the 25 meter isobath) is very low (USDOI/MMS 1990). In addition, there is an existing whaling camp located on Cross Island. An archeological survey of Reindeer Island was conducted during August 2000. No resources were found and the island has experienced significant erosion this summer.

3.5.7 Refuges, Preserves, and Sanctuaries

The only refuge, preserve, or sanctuary in the immediate vicinity of the McCovey Prospect is the Arctic National Wildlife Refuge. The McCovey project location is approximately 13 miles offshore and 60 miles west of the refuge. The McCovey project will have onshore support staged from Prudhoe Bay/Deadhorse and a fuel barge from NWT Canada.

3.5.8 Existing Pipelines/Cables

There are no existing cables in the area. The Northstar (buried) pipeline was installed in the 1999-2000 winter season and is located approximately 12 miles to the west southwest of the McCovey location.

3.5.9 Other Mineral Uses

There are no other existing or anticipated mineral uses in the project area.

3.5.10 Ocean Dumping Activities

Not applicable.

3.6 Flora and Fauna

3.6.1 Pelagic Environment

Plankton: Phytoplankton species are abundant in the region, but are unlikely to be abundant during winter months between September and April when decreased daylight hours and frozen ice conditions exist. Ice algae are likely to be present, but are not expected to be abundant in the project area (WCC 1981). The MMS/DOI (1996) notes that the contribution of ice algae to annual productivity in the Beaufort Sea is probably relatively small (e.g., one-twentieth of the annual total primary production of the nearshore Beaufort). Zooplankton (e.g., copepods) are not likely to be abundant between September and May when frozen ice conditions exist and food sources are minimal.

Marine Fisheries: The MMS/DOI (1996) notes that 43 marine species have been identified in the Alaskan Beaufort Sea, with the most widespread and abundant species being the Arctic cod (*Boreogadus saida*). Other prevalent species include saffron cod (*Eleginus gracilis*), fourhorn sculpin (*Myoxocephalus quadricornis*), twohorn sculpin (*Icelus bicornis*), Canadian eelpout

(*Lycodes* sp.), capelin (*Mallotus villosus*), and the Arctic flounder (*Liopsetta glacialis*) (Craig 1984 as cited in USDOI/MMS 1996).

Arctic cod is a key species in the ecosystem of the Arctic Ocean due to its widespread distribution, abundance, and importance in the diets of other fishes, marine mammals, and birds (Andriashev 1984; Quast 1974; Bain and Sekerak 1978; Craig et al. 1982; Sekerak 1982; Craig 1984a).

With the exception of capelin, which spawn in August, most marine species spawn primarily during the winter. Craig and Haldorson (1981) suggest that Arctic cod spawn under the ice between November and February in shallow coastal areas, as well as in offshore waters (USDOI/MMS 1990).

Freshwater Fish: Freshwater fish, which occur in coastal waters of the Alaskan Beaufort Sea, are found almost exclusively in association with fresh waters off of major river deltas. Their presence in the marine environment is generally sporadic and brief, with peaks during and immediately following breakup. Freshwater species, which have been observed in these areas, include Arctic grayling (*Thymallus arcticus*), round whitefish (*Prosopium cylindraceum*), and burbot (*Lota lota*) (USDOI/MMS 1987).

Migratory Fish: Fish species that move between marine waters and fresh waters as part of their life history (e.g., to spawn) or on a seasonal basis in response to food sources tend to concentrate in the nearshore waters of the Beaufort Sea. Species most commonly found in the region include Arctic char (*Salvelinus alpinus*), Arctic cisco (*Coregonus autumnalis*), least cisco (*Coregonus sardinella*), Bering cisco (*Coregonus laurettae*), rainbow smelt (boreal *Osmerus mordax*), and whitefish (*Coregonus nasus* and *C. clupeaformis*). These fish generally spawn in fall, with the exception of boreal smelt, which spawn in spring or early summer. Spawning occurs in river deltas, as well as further upstream in the Sagavanirktok, Canning, Hulahula, Aichilik, Kongakut, and Colville Rivers (USDOI/MMS 1984). The Colville River Delta west of the prospect area supports spawning populations of Arctic char, ciscoes, whitefish, and smelt plus small runs of salmon, and is an overwintering area for ciscoes, smelt, and other species (ACS 1983).

During early June, adult and juvenile fishes move into and disperse in coastal waters. During the 3 to 4 month open water season, migratory fishes use the nearshore environment as a feeding area. Food is abundant in this area, the source being mainly epibenthic invertebrates (mysids and amphipods). Temperature and/or salinity parameters, rather than food, appear to be the limiting factors in migratory fish distributions in the warm nearshore brackish water (Craig and Haldorson 1981; Moulton et al. 1985). Although most migratory fish feed in nearshore waters during the summer, both Arctic and least cisco may continue to feed throughout the winter in Colville River Delta habitats (USDOI/MMS 1990).

Within the nearshore brackish waters, fish tend to concentrate along the mainland shoreline and the edges and lee sides of the Barrier Islands, rather than offshore or in lagoon centers as exemplified in the general coastal distributions of four major Beaufort Sea migratory species illustrated in Figure 4. Arctic cisco, which apparently originate from the Canadian Mackenzie River, can range as far west as Point Barrow, Alaska, whereas Arctic char are found east of the Colville River and spawn and overwinter in mountain streams. Migratory least cisco occur from the Colville River west to Wainwright and in rivers on the northern coast of the Yukon and Northwest Territories, but are absent from the central Beaufort Sea (between the Colville River and the Babbage River in Canada). In the Alaskan Beaufort Sea, broad whitefish occur in association with the freshwater discharges of larger rivers from Point Barrow east to the Sagavanirktok River Delta and also have been reported from the Canning River (USDOI/MMS 1990). A more detailed description of Alaskan Beaufort Sea migratory fishes can be found in the Lease Sale 124 FEIS (USDOI/MMS 1984, 1990, 1996; Morrow 1980; Craig 1984a; and Moulton et al. 1986).

In summary, during the winter months the offshore marine environment in the immediate project area includes marine species with no current commercial value and minimal subsistence value. Arctic cod are the dominant pelagic fish in the region, but earlier surveys show that significant numbers are not present in the project area during the ice-covered months (WCC 1981) as these fish most likely move farther offshore. Marine species that have been associated with the region's benthic environment are unlikely to be present at the well site due to the absence of boulders and cobbles. Fourhorn sculpin are abundant in the area during open water, but move offshore during winter.

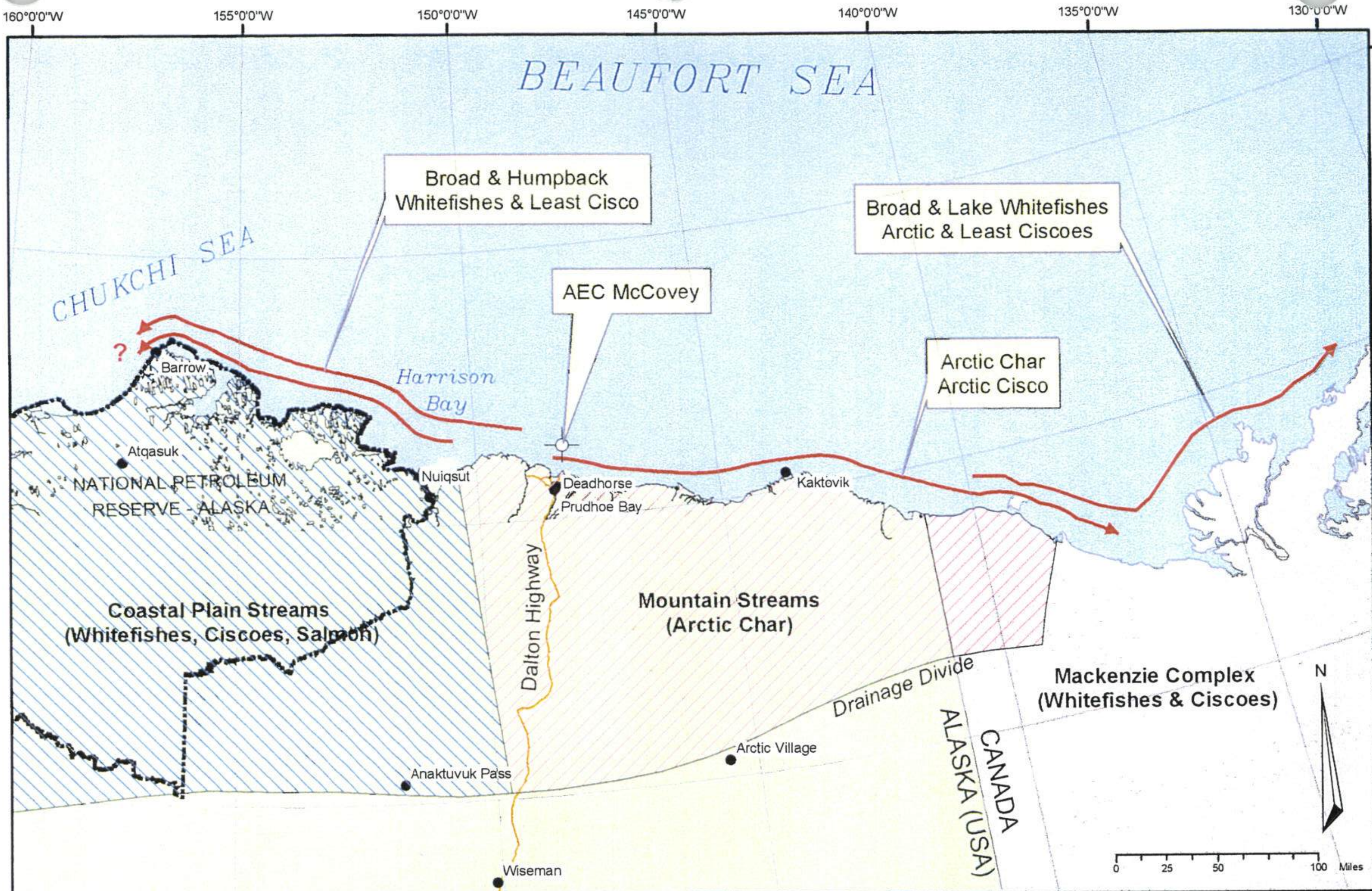
Freshwater and migratory fish (e.g., Arctic cisco, broad whitefish, and least cisco) are present in summer, but overwinter in the Colville and Sagavanirktok Rivers and in the Mackenzie River system, and therefore are not likely to be present during exploration activities. As with marine species, few of these fish will likely be encountered due to the absence of boulders and cobbles or similar hard-bottom habitats in the project area.

3.6.2 Benthic Environment

Benthic organisms in the project area include sessile species living within the substrate (bivalves, polychaetes) and mobile organisms living on or near the bottom surface sediments (amphipods, isopods, mysids, and some polychaetes). Benthic organisms are abundant during the summer, but can have decreased numbers/diversity in winter months between September and May when frozen ice conditions exist and grounding of ice occurs. Benthic species diversity increases with water depth until the shear zone is reached at about 15 to 25 meters; biodiversity then declines due to ice gouging between the landfast ice and the moving polar pack ice (BPXA 1996). The Boulder Patch located near the mouth of the Sagavanirktok River provides a substrate for a hard-bottom community of invertebrates and algae as well as the associated epifauna (USAED/AK, 1999).

3.6.3 Breeding Habitats and Migration Routes

The McCovey Prospect is located within the migratory path and range of a number of marine mammals, and a variety of marine and freshwater fish and invertebrates. Few of these species, however, are likely to be present during the exploration program (i.e., the winter exploration activities). Critical life periods for North Slope mammals, fish, and birds are contained in USDOI/MMS (1990, 1996). The SDC/MAT will be towed to location and set down during the July/August period and placed in a cold stack or "quiet" mode. (no personnel on board, no machinery or generators operating) until commencement of drilling activities.



Horizontal datum NAD 1927, coordinate system Alaska Albers Equal Area Conic, Source: Craig, 1984.

AEC McCovey Well Site

Coastal Dispersal Patterns

Coastal Plain Streams (Whitefishes, Ciscoes, Salmon)

Mountain Streams (Arctic Char)

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Environmental Report
FRESHWATER SOURCES AND COASTAL DISPERSAL PATTERNS OF THE PRINCIPAL MIGRATORY FISHES OCCURING ALONG THE BEAUFORT SEA COASTLINE

SCALE:	FIGURE:
1 inch equals 75 miles	4

Marine Mammals

Species in this group are the pinnipeds (ringed, bearded, and spotted seals and Pacific walrus), polar bear; and the beluga, bowhead, and gray whale. All marine mammals in U.S. waters are protected under the Marine Mammal Protection Act of 1972. Note that bowheads are also discussed in Section 3.6.5, Endangered and Threatened Species.

Pinnipeds: Ringed seals are the most abundant seal in the Beaufort Sea. Densities of ringed seals in the floating shorefast ice zone where the project is located generally range from 1.5 to 2.4 seals per square nautical mile (Frost et al. 1983). Bearded seals are much more abundant in the Bering and Chukchi Seas than in the Beaufort. Densities of bearded seal are greatest during the summer and lowest in winter. Important winter and spring habitat is the Arctic ice zone, which is shoreward of the prospect area. The spotted seal is a seasonal visitor to the Beaufort Sea.

Estimated seal populations in the Bering-Chukchi-Beaufort area are: spotted seals, 250,000; bearded seals, 300,000; and ringed seals, 1.5 million (BPXA 1996). Ringed seals, the most abundant of the three seal species present in the Beaufort Sea, would be expected to be encountered infrequently at the project site.

Most Pacific walrus are associated with the moving pack ice. During the summer, a few walrus migrate through the Beaufort Sea to Canadian waters. The Beaufort Sea is on the eastern limit of the range of the Pacific walrus, and they are only seen infrequently in this region. Pacific walrus would not migrate near the project area during the ice-covered winter season. Year-round there are no walrus concentration areas near the prospect.

Polar bears: Polar bears (*Ursus maritimus*) are found throughout the Arctic. The southern Beaufort Sea population (from Cape Bathurst in Canada to the northern Chukchi Sea) is estimated at 1,500 to 1,800 bears, while the Alaskan population is estimated at 3,000 to 5,000 (USAED/AK, 1999). Polar bear distribution exhibits substantial annual variation in the Beaufort Sea. Average density appears to be about one bear to every 30 to 50 square miles. During the summer in the Alaskan Beaufort Sea area, very few polar bears are found on land; most are found along the edge of the permanent pack ice (Frame 1972; Moore and Quimby 1975; Eley and Lowry 1978). With the advance of the ice sheet in winter, most polar bears are found along the shear zone between the landfast ice and drifting pack ice (Lentfer 1971; Stirling 1974; Moore and Quimby 1975; Eley and Lowry 1978).

Polar bears are most abundant where seals are common in drifting pack ice or shorefast ice in winter, near the pack-ice edge in summer, and along new ice and leads in the fall. Polar bears can be expected to be occasional visitors around the project site during winter exploration activity.

Polar bear den locations in the region have been mapped, historically, by the U.S. Fish and Wildlife Service and the National Biological Service and are scattered throughout the Lease 124 Sale Area (USDOI/MMS 1996).

Whales: Three species of whales are seasonal visitors in the Beaufort Sea: the beluga, the bowhead, and the gray whale. Bowhead whales are on the endangered species list and are discussed in Section 3.6.5, Endangered and Threatened Species; gray whales were recently delisted.

Although small numbers of beluga and bowhead whales have been observed migrating along the coast, most migration occurs further offshore (Figure 5). The Bering-Chukchi-Beaufort Sea beluga whale population may exceed 25,000 animals. An estimated 11,500 beluga migrate from the Bering Sea to the eastern Beaufort Sea during April and May (BPXA 1996).

Gray whales are uncommon or rare in the Beaufort Sea. They occur more frequently in the Chukchi Sea, which comprises part of the feeding area for the species. Gray whales may be present from June through September and into October before migrating south (USDOI/MMS 1996).

Beluga, bowhead, or gray whales will not be present in the area during winter exploration activity. Bowhead whales will be within range of the SDC/MAT during late summer/early autumn in the course of their westward migration from Canada. Beluga whales are likely to migrate further offshore in the mid- Beaufort in early fall. See further discussion of bowhead whale in Section 3.6.5, Endangered and Threatened Species.

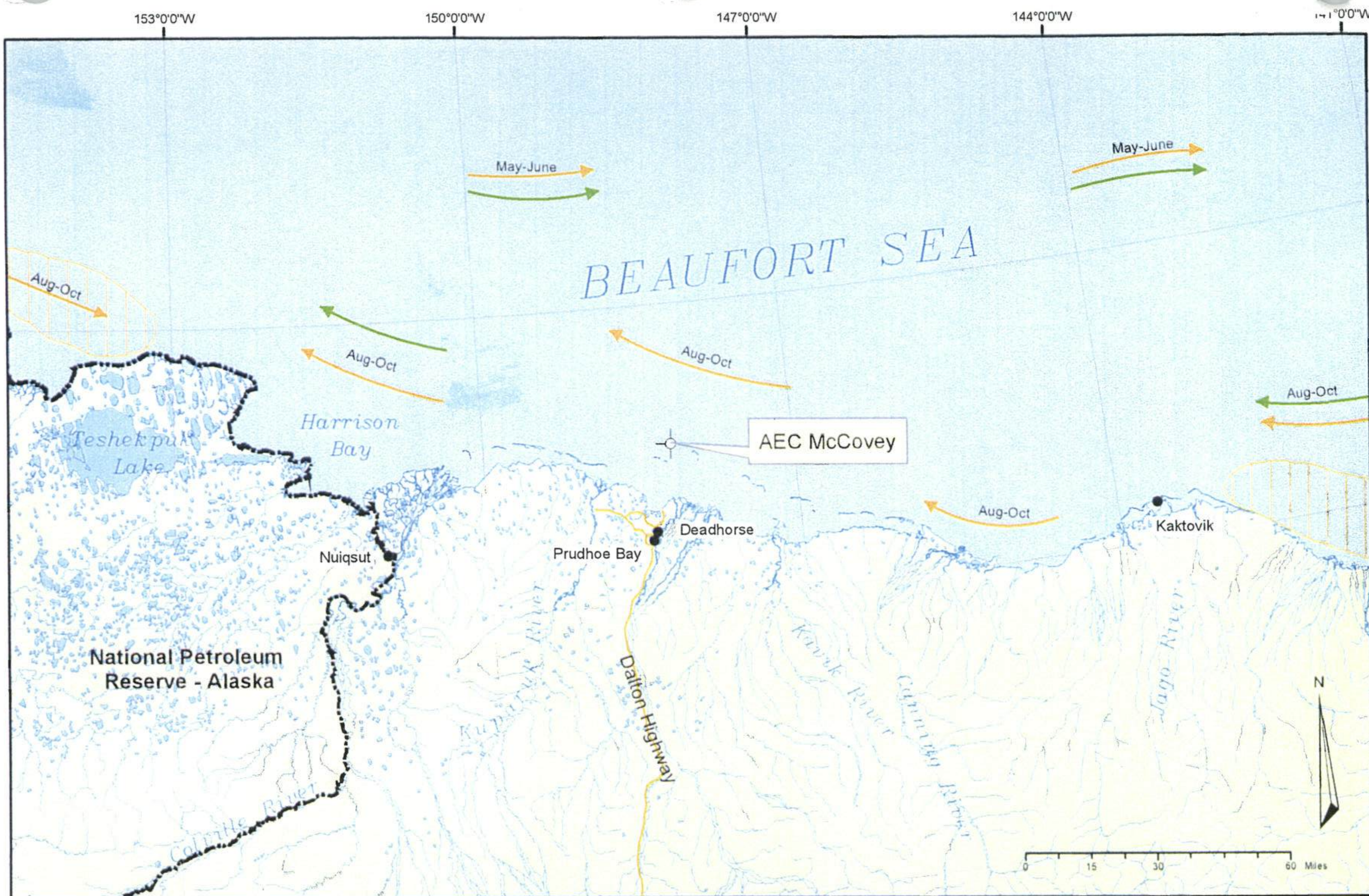
Avian Species

Several million birds of approximately 150 species containing seabirds, waterfowl, shorebirds, passerines, and raptors (including the recently delisted Arctic peregrine falcon and the proposed threatened Steller's eider) occur on the North Slope. Nearly all of these species are found in the Arctic seasonally from May through September. Approximately 75 regularly occurring species would be expected to occur in the general project area.

In the Beaufort Sea, major concentrations of birds occur nearshore (in waters less than 20 meters) and in coastal areas, such as at coastal lagoons and river deltas (Figures 6 and 7). In proximity to the AEC McCovey No. 1 site there are Common Eider and seabird nesting areas located on Cross Island (5.3 miles to the southeast) and both Reindeer Island and Argo Islands (4 miles to the south). The coastal areas of Prudhoe Bay have documented Brant rearing areas and colonies ranging from 12 to 16 miles south of the project area.

Although an estimated 10 million birds use the Beaufort Sea area for spring migration/pre-nesting, nesting, molting and brood-rearing, and fall staging/migration (Johnson and Herter 1989), few birds are expected to be present during winter exploration activities. Most of the 75 regularly occurring aquatic and terrestrial species are migratory, arriving in late May or early June to breed and departing by late September. Few birds (e.g., gyrfalcon, snowy owl, and common raven) overwinter in the project area. Of these, only ravens are expected to occur at the exploration site during drilling operations.

The population of Arctic peregrine falcons in Alaska appears to be increasing and has been delisted as threatened or endangered. They are present in Alaska from about mid-April to mid-September. Egg laying on the North Slope begins in the middle of May, and the young fledge from about the end of July to mid-August. There are no known active nest sites on the Barrier Islands or along the coast. Nest sites closest to the coast occur about 25 miles inland from the coast of Prudhoe Bay.



Horizontal datum NAD 1927, coordinate system Alaska Albers Equal Area Conic, Source: ADF&G, 1988, Alaska Habitat Management.

- AEC McCovey Well Site
- Beluga Whale Migration
- Bowhead Whale Migration
- Bowhead Whale Feeding Areas

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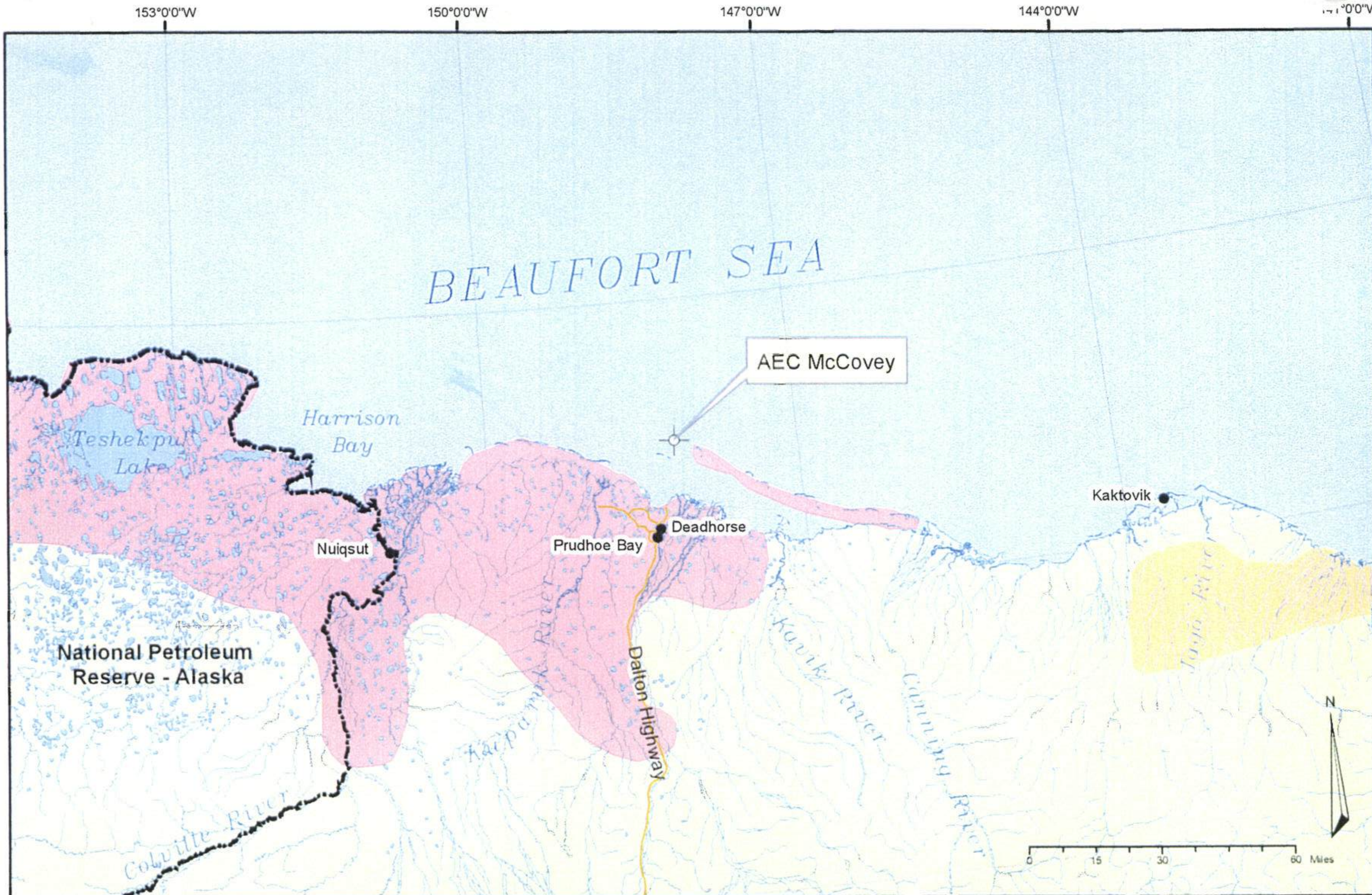
AEC McCovey Exploration Prospect
Environmental Plan

WHALE MIGRATION AND FEEDING AREAS

SCALE:	FIGURE:
1 inch equals 35 miles	5



Horizontal datum NAD 1927, coordinate system Alaska Albers Equal Area Conic, Source: ADF&G, 1986, Alaska Habitat Management.

AEC McCovey Well Site
Nesting concentration area
Fall concentration of snow geese

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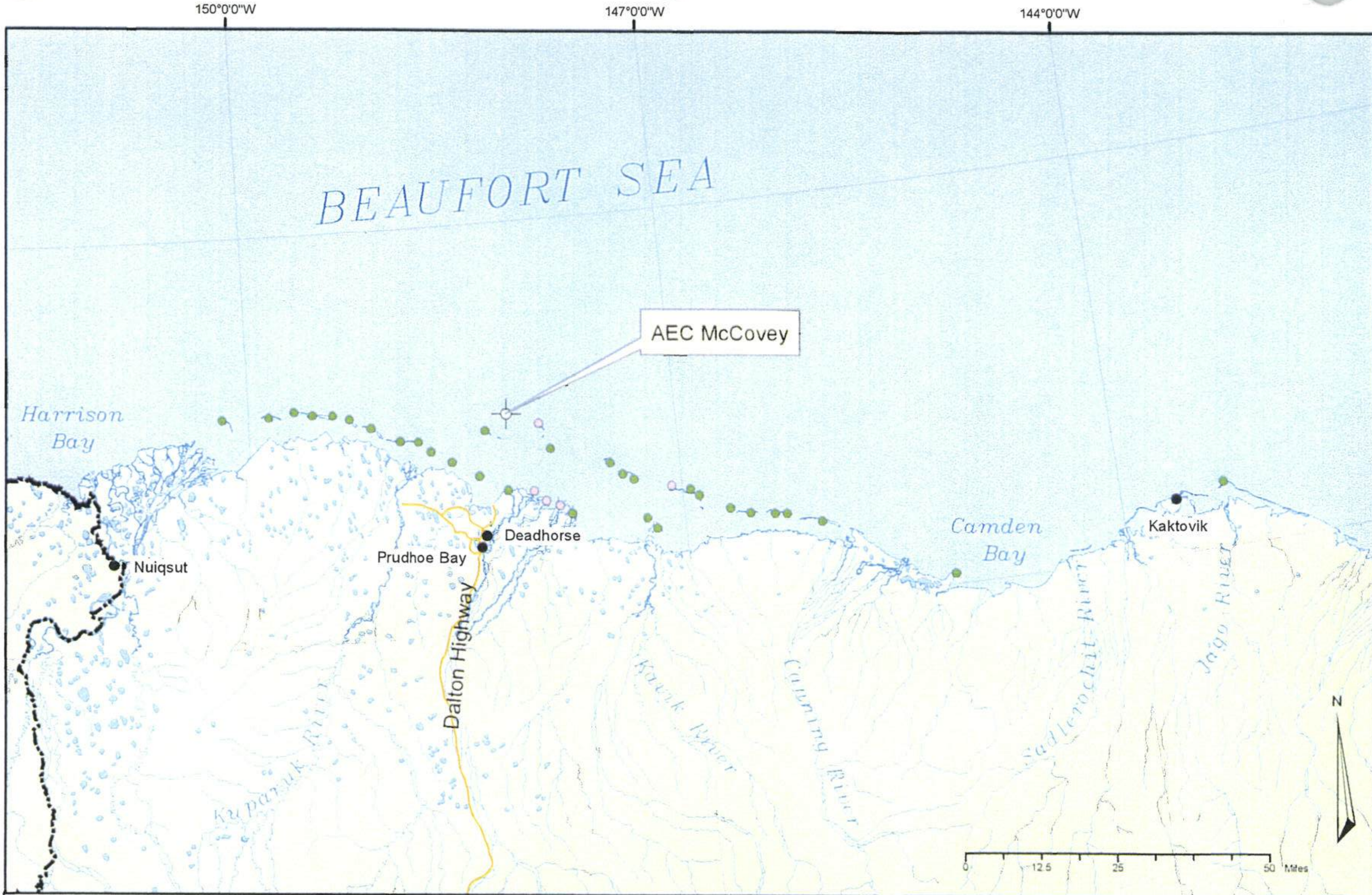
AEC McCovey Exploration Prospect
Environmental Plan

WATERFOWL CONCENTRATION AREAS ON THE NORTH SLOPE

SCALE:	FIGURE:
1 inch equals 35 miles	6



Horizontal datum NAD 1927, coordinate system Alaska Albers Equal Area Conic, Source: US Fish and Wildlife Service, 1976 (and 1992 update). Catolog of Alaskan Seabird Colonies.

AEC McCovey Well Site

Seabird Colonies of 10 - 100 individuals

Seabird Colonies of 101- 1000 individuals

National Petroleum Reserve - Alaska

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AEC McCovey Exploration Prospect
Environmental Plan

SEABIRD CONCENTRATION ON THE NORTH SLOPE

SCALE:	FIGURE:
1 inch equals 25 miles	7

3.6.4 Presence of Sensitive Underwater Features

The Boulder Patch is an area in Stefansson Sound with patches of scattered rocks on the sea bottom ranging in size from pebbles to boulders. These cobbles and boulders, discovered in the early 1970s by the U.S. Geological Survey, provide the substrate that supports a highly diverse and productive biota, including Arctic kelp and sessile invertebrates (Reimnitz and Ross 1979). Because of its rarity in a region known for soft sediments, the Boulder Patch was intensively studied as part of the National Oceanic and Atmospheric Administration/Outer Continental Shelf Environmental Assessment Program (Sekerak, 1982) in the late 1970s and early 1980s. This significant and unique biological community is located approximately 10 miles southeast of the proposed site near the Sagavanirktok River Delta (BPXA 1996). Significant environmental information has been collected on the location and distribution of this colony (LGL 1992).

Based upon the best available data, no confirmed Boulder Patch type of habitat has been identified at the McCovey drilling location (Reimnitz and Ross 1979). Additionally, shallow hazard work (which included underwater video camera activities) conducted under the ice in April 2000 for the McCovey project area did not identify any sensitive underwater features.

3.6.5 Endangered or Threatened Species

The only endangered or threatened species listed for the Beaufort Sea area are the endangered bowhead whale, the threatened spectacled eider, and the threatened Steller's eider. The Arctic peregrine falcon was recently delisted. These endangered/threatened species will not be encountered near the project area during the winter exploration activity. The Environmental Information Section of the State of Alaska Regional Oil and Hazardous Substance Spill Contingency Plan for the North Slope Region, (and the Alaska Clean Seas Technical Manual Volume II) identifies when these species are present in the Beaufort Sea area.

Bowhead Whales: The Bering Sea population of bowhead whales, based on data collected during the 1993 census off Point Barrow, was estimated at 8,200 individuals (USAED/AK, 1999). Bowhead whales northward spring migration appears to be timed with the ice breakup, usually beginning in April. After passing Barrow from April through mid-June, they move through or near offshore leads in an easterly direction. The USDOI/MMS (1996) notes that east of Point Barrow, the lead systems divide into numerous branches varying in their location and extent from year to year. Bowheads arrive on their summer-feeding grounds in the Canadian Beaufort Sea and Amundsen Gulf and remain there until late August or early September (Moore and Reeves as cited in USDOI/MMS 1996).

In late August, bowheads begin migrating westward from summer feeding grounds located in the Canadian Beaufort Sea to wintering areas in the Bering Sea. Generally, few bowheads are seen in Alaskan waters until the major portion of the fall migration occurs, typically between mid-September and mid-October. The migration route and extent of ice cover may influence the timing or duration of the fall migration. However, based on aerial surveys from 1982 through 1993, the typical water depth over which the greatest number of whales appear to migrate is from 66 to 165 feet (USDOI/MMS 1996).

Spectacled and Steller's Eiders: Both species of eiders are very unlikely to occur in the immediate project area. Spectacled eiders are present on the arctic slope from May to September; it is estimated a few thousand pairs nest on the Alaskan arctic slope. Nest success for spectacled eiders has been relatively high in the Prudhoe Bay area (e.g., 40 percent), suggesting that the recently observed declines in their numbers is caused by factors operating outside the nesting period. Brood-rearing occurs in tundra-pond habitat. The Steller's eiders are coastal migrants along the western Beaufort Sea and the only confirmed nesting area is currently in the vicinity of Barrow (USDOI/MMS 1996).

Socioeconomics

Land use in the region has traditionally revolved around subsistence resources. Residents of the village of Nuiqsut are the primary subsistence users in the project area. The village of Nuiqsut is located on the Colville River, 70 miles to the west southwest of the AEC McCovey No. 1 Exploratory Well. Many of Nuiqsut's marine subsistence-harvest areas lie within the Lease Sale 124 Area and the village may access the McCovey Prospect project area for this purpose. Harvest use patterns and subsistence seasonal cycles for these communities are described in detail in USDOI/MMS (1996).

As a result of the subsistence lifestyle that occurs in the villages of the nearshore Beaufort Sea, many marine resources are utilized by subsistence users. Regional subsistence activities include whaling, fishing, waterfowl and seaduck harvests, hunting for seals, polar bears, walrus, and beluga whales (the latter two very infrequently). Travel in the region is likely to be by small boat in summer and snowmachine in winter. Residents of Nuiqsut have historically used coastal areas near the Barrier Islands for subsistence activity. Onshore subsistence activity has typically occurred near the mouths of river deltas. Hunting for ringed seals and polar bears are the activities most likely to occur in or near the project area and primarily occur during the open water season.

The subsistence hunting of bowhead whales is the most valued activity in the subsistence economy of the Nuiqsut community today. General harvest use patterns and subsistence seasonal cycles for the Nuiqsut community are described for bowhead whales and other species in USDOI/MMS (1996). This village hunts bowhead only during the fall season between September and early October, depending on ice and weather conditions. The whalers use small (i.e. less than 25 feet) aluminum and fiberglass boats with outboard motors to hunt bowheads in open water. Whalers may travel 20 miles or more offshore during the hunts. Bowhead whales are commonly harvested by Nuiqsut Whalers that stage their operations on Cross Island (Figure 1).

Drilling at the McCovey Prospect is scheduled to avoid conflicts with subsistence whaling activities. The SDC/MAT will be placed in a cold stack/quiet status after loading consumables and supplies in mid to late August 2002. It will remain in this quiet status through the completion of the fall whaling season as determined by the Alaska Eskimo Whaling Commission. Activities and exploratory operations using the SDC/MAT will be addressed by a Conflict Avoidance Agreement (CAA) arrived at between the AEWC and AEC.

The most important migratory fish caught for human subsistence use in nearshore Beaufort Sea waters are Arctic cisco, least cisco and Arctic char. Recent catch statistics also indicate that broad whitefish are an important and preferred species in subsistence harvest (George and Nageak 1986; Moulton et al. 1986; Craig 1984a, 1984b). Migratory fishes, particularly cisco, whitefish, and char, are the focal point of the subsistence fishery. Fishing is conducted during both the open water season and the winter months.

During late spring to early fall, Nuiqsut residents hunt for waterfowl and coastal birds. Nuiqsut residents also hunt for caribou during the summer migration and in the winter using snowmachines for travel. Additionally, Nuiqsut residents hunt moose in the late summer (August). This activity typically occurs south of the village.

Subsistence activities by Nuiqsut and Kaktovik villages occur year round with the exception of marine subsistence activities, which mostly occur during the open water summer months.

Activities at the McCovey Prospect will commence with placement of the SDC in mid to late August 2002. The SDC will then be coldstaked with no activity on board from September 1, 2002 until warm up on October 25th 2002. Drilling will commence soon thereafter.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 General

In general, direct and cumulative impacts on the offshore and onshore environments expected to occur from exploration activity at the McCovey Prospect will be limited. Some local disturbance of bottom sediments and a temporary increase in turbidity during breakup, and increased potential for certain wildlife encounters are expected as a result of the drilling and drilling cuttings disposal, but general effects to the marine and coastal environment are likely to be minimal (USDOI/MMS 1996).

4.2 Geologic Hazards

No H_2S was encountered in previous wells near the project area or in the nearby Endicott and Northstar fields. In addition, a shallow hazard survey was conducted in order to identify any potential shallow gas zones that may be encountered during drilling operations. None were identified.

4.3 Meteorology

4.3.1 Weather

There will be no impacts from the project on weather conditions.

4.3.2 Air Quality

The drilling program at the McCovey Prospect is not expected to cause an exceedance of the National or State of Alaska ambient air quality standards (AAQS). No significant primary adverse environmental effects should result from air emissions generated by the project. Secondary impacts on induced growth, transportation and construction, and subsistence living are believed to be negligible, particularly due to the temporary nature of the project.

Further discussion of air quality project impacts are contained in the project's Exploration Plan (AEC, 2002) and the pending air permit application with the USEPA (AEC, 2001).

4.4 Physical Oceanography

There will be no impacts from the project on the physical oceanography of the area.

4.5 Other Uses of the Area

4.5.1 Shipping

The SDC will be transported to the McCovey site by August 15, 2002. Resupply will be conducted and coordinated with other industry operator's projects and in compliance with the terms of the Alaska Eskimo Whaling Commissions Conflict Avoidance Agreement. No impacts are expected during this brief window from August 15 – September 1, 2002. The majority of the project activities will take place during the winter months when shipping does not occur.

4.5.2 Commercial and Sport Fishing

There will be no impacts from this project on these activities since commercial fishing and sport fishing do not occur in the immediate project area. See Section 4.5.6, Cultural Resources, for a discussion of potential impacts on fishing by subsistence users.

4.5.3 Military Use

There will be no impacts from this project since known military use does not occur in the area.

4.5.4 Existing Pipelines and Cables

There will be no impacts from this project since existing cables do not occur in the project area. The Northstar pipeline is located about 12 miles west southwest of the McCovey project area.

4.5.5 Mineral Resource Development Other than Oil and Gas

There will be no impacts from this project since other resource development activities do not occur in the project area.

4.5.6 Subsistence/Cultural Resources

Every effort will be made to move the SDC, have it placed on the McCovey location, refueled, and resupplied by August 15, 2002 and no later than September 1, 2002 unless uniquely authorized by AEWC and Whaling Captains Associations. When these re-supply operations are completed (approximately 6 to 10 days) the rig will go into a cold stack mode whereby it will be temporarily unmanned ("go quiet") with no personnel on board and no sound producing machinery or generators operating. The SDC will be reactivated for warm-up approximately (October 25, 2002) with drilling operations commencing shortly thereafter but only occurring above a specific casing point as approved by the MMS. Drilling below the above referenced casing point will only occur after the MMS has determined that the sea ice is fully formed around the rig (likely mid-November 2002).

Since the McCovey project will be in "quiet mode" during the September to late October time period, there will be no impact to the subsistence bowhead whaling activities. Other impacts to subsistence users or subsistence resources are likely to be low given the project location and time of season of project activities. Impacts to seals and polar bears are expected to be highly localized with no population-level impacts (USDOI/MMS 1996).

The community of Nuiqsut is the primary subsistence user in the McCovey Prospect area and they may hunt seals year round; however, the primary sealing area is off the Colville Delta, extending as far west as Fish Creek and as far east as Pingok Island. Most seal hunting is done during early summer in open water. AEC does not anticipate any adverse impact on the availability of the species or stocks of marine mammals for subsistence uses will occur.

No impacts to cultural resources are expected. This is based on geotechnical and geophysical data that indicates the substrata has been substantially reworked by normal geomorphic process. Supporting documentation is provided in the Exploration Plan submitted to the MMS.

4.5.7 Mariculture Activities

There will be no impacts from this project since mariculture activities do not occur in the area.

4.6 Flora and Fauna

Impacts to lower trophic-level organisms (phytoplankton, zooplankton, benthic, and epontic communities) and fishes are expected to be negligible to none due to their limited presence during winter months. Few fish will likely be encountered in the project area due to the scarcity of boulders and cobbles or similar hard-bottom habitats and the presence of ice during the majority of planned activities and operations. However, fish present in the project area will experience temporary, non-lethal effects (i.e., displaced location) as a result of the planned exploration activities (USDOI/MMS 1996).

Polar bears are likely to be present during winter operations, but AEC will have a Polar Bear Interaction Plan and safety-training program in place prior to operations to minimize and, in many cases, avoid interaction between bears and humans. Any polar bear encounter will be avoided if at all possible. While field operations are underway, a polar bear monitoring person will be on site and will be responsible for implementation of a Polar Bear Interaction Plan. Any interaction between a polar bear and personnel will be promptly reported to both the Alaska Department of Fish and Game and the U.S. Fish and Wildlife Service.

Arctic foxes are common inhabitants of the project area during winter. Arctic foxes are one of the primary vectors of rabies in northern Alaska. If a person is bitten by a fox, efforts will be made to trap the animal for observation and rabies testing. Encounters with Arctic foxes will, therefore, be avoided if at all possible. A safety-training program will also be in place to educate on-site personnel about Arctic foxes and to minimize and avoid interaction between foxes and humans.

4.7 Onshore Impacts

4.7.1 Socioeconomics

All project activities will be staged from Deadhorse/Prudhoe Bay. Therefore, with the minor exception pertaining to subsistence described under Cultural Resources in Section 4.5.6, there will be no onshore impacts to nearby village communities or landfall areas. Local communities, primarily Nuiqsut and Kaktovik will be requested to provide goods and services in support of the proposed project. This would result in the economic benefit of additional local jobs.

4.7.2 Demand for Goods and Services

All project activities associated with AEC McCovey No. 1 will be staged from existing infrastructure located in Deadhorse/Prudhoe Bay. Goods and services will be obtained from local village contractors when available and qualified as discussed in 4.7.1 during the entire duration of the project with exception of fuel barged from NWT Canada.

4.7.3 Environmental Impacts

The McCovey project location is approximately 5.3 miles from Cross Island and 13 miles from the Beaufort Sea coast. Minimal environmental impacts are expected from the exploration activities associated with this project.

Direct environmental impacts resulting from exploration activity at the AEC McCovey Prospect include short-term air emissions, exploratory activity, drilling discharges to the ice under the Arctic Offshore General NPDES permit, and noise related to drilling and limited site survey activities. Short-term air emissions created by exploration drilling should be adequately dispersed by local wind patterns, thereby mitigating any adverse impacts (EPA 1995c). Drilling-related noises will be present, but are unlikely to affect the few seals and polar bears that may be present in the project area (USDOI/MMS 1996). AEC has applied for a Letter of Authorization (LOA) from the United States Fish and Wildlife Service (USFWS) for taking of polar bears incidental to project activities. AEC has applied for an Incidental Harassment Authorization (IHA) from the National Marine Fisheries Services for the taking of ringed and bearded seals incidental to exploration drilling operations.

Under the terms of the Final NPDES General Permit for Offshore Oil and Gas Operations on the OCS and State Waters of Alaska (Arctic NPDES General Permit No. AKG284200), drill cuttings and drilling fluids will be discharged to sea ice adjacent the ice island. Material submitted in support of the Arctic NPDES General Permit, including the final Ocean Discharge Criteria Evaluation (ODCE) and the Final Biological Evaluation, are hereby incorporated by reference (EPA 1995a and 1995b). A request for coverage under the General Permit was applied for with the EPA on April 17, 2000 and approved on May 1, 2000 for the McCovey exploration site.

Some short-term effects resulting from NPDES discharges include disturbance of bottom sediments, an increase in local turbidity, elevated concentrations of some mud constituents (i.e., barium) in the water. However, these effects would only be evident during breakup and would be limited to the initial discharge on the ice surface. The ice in the disposal area will melt in place, limiting deposition of muds and cuttings to a localized area, with only limited impacts to a wider area.

Previous studies of the effects of NPDES discharges show no long-term or significant impacts due to the low toxicity of barium sulfate with no adverse effects on the composition of the benthic macroinvertebrate communities (ENSR 1991). In general, projected discharges from all exploration activity in the Beaufort Sea Lease Sale 124 area are small compared to the natural sediment load of the Beaufort Sea. EPA has stated that discharges authorized under this General Permit are not likely to adversely affect any endangered or threatened species, nor adversely affect their critical habitat (USGS 1981). Under the terms of the General Permit, discharges will not occur "within 1,000 m of the Stefansson Sound Boulder Patch (near the mouth of the Sagavanirktok River) or between individual units of the Patch where the separation between units is greater than 2,000 m but less than 5,000 m." Under the terms of the General Permit, discharges during stable ice conditions "shall be to above-ice locations and shall avoid to the maximum extent possible areas of sea ice cracking or major stress fracturing."

No over-ice supply is expected for the SDC/MAT based project. However, should circumstances require over ice traffic, it will be limited to essential rolligons/ ATV, no ice road will be required.

Aircraft travel will be controlled by FAA- approved flight paths. Aircraft will avoid Native land areas and will comply with flight restrictions imposed by the Beaufort Lease Sale 124 stipulations regarding sensitive biological areas (USDOI/MMS 1990, 1996). Most logistical support of the drilling program will be by helicopter.

In addition, specific lease stipulations addressing Protection of Biological Resources, Orientation Programs, Transportation of Hydrocarbons, and Subsistence Activities will be followed as applicable to prevent and mitigate environmental impacts (USDOI/MMS 1996).

No significant cumulative impacts are expected from exploration activity at the AEC McCovey No. 1 Exploratory Well. Any cumulative impacts that could result from development of the McCovey Prospect will be addressed as part of the NEPA review for that project.

During the 2002-2003 solid sea ice season, BPX's Northstar project may be constructing an ice road from West Dock to the Northstar gravel island as part of its drilling resupply phase. Since their ice road route is further east than the majority of any winter subsistence hunting activities, the cumulative impact should be minimal.

4.8 Accidents

Adverse environmental impacts that could occur as a result of exploration activity at this site include an oil spill. However, the probability of a spill from winter exploration activity is very low and advanced well control equipment and procedures will be used for the AEC McCovey project. An Oil Discharge Prevention and Contingency Plan (ODPCP) has been prepared for this project and is included with project's Exploration Plan.

AEC will use best management practices to reduce potential impacts from all spills. In addition, as noted in the Exploration Plan, AEC will separate any contaminated ice that results from normal operations in a snow melter and fluid will be injected in a permitted Class I or Class II injection well. This practice will prevent contaminated ice from reaching the environment.

Alaska Clean Seas (ACS) technicians will be employed full time to prevent and respond to any spills. Initial response equipment will be aboard the SDC/MAT.

5.0 ALTERNATIVES TO THE PROPOSED ACTION

Per the MMS guidelines, discussion of alternatives is not required in Environmental Reports for Plans of Exploration.

6.0 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

AEC intends to employ several mitigation measures to minimize any potential adverse environmental effects. Table 6.1 identifies the mitigation actions proposed by AEC and the expected benefits.

Table 6-1 Proposed Actions for Avoidance and Minimization of Environmental Impacts During McCovey Exploration.

Proposed Action	Expected Benefit
Conduct drilling activities during the winter.	Avoids potential spill to broken ice and open water conditions; avoids activities during bowhead whale migration and subsistence harvest.
Use SDC/MAT to drill well.	Eliminates permanent impacts associated with a gravel island, ice road, or ice pad alternatives. Also eliminates activities that could conflict with subsistence activities.
Place SDC/MAT on cold stack/quiet status during whale migration and hunting season	Eliminates potential noise disturbance source during subsistence harvesting.
Provide full-time, on-site environmental presence in the form of Alaska Clean Seas technician during drilling activities to ensure compliance with permit requirements.	Assist with spill prevention and provide initial response activities in the event of a spill. Minimizes variances from permitted activities.
Employ local village personnel to participate in polar bear monitoring program.	Increases awareness and understanding of polar bears.
Coordinate with U.S. Fish and Wildlife Service on historic and recent locations of polar bear den sites and report all sightings.	Avoids actions that would disturb polar bears.
Use existing Prudhoe Bay Unit (PBU) West Dock facilities to avoid need for on-shore ice roads.	Reduces potential impacts to on-shore areas.
Train personnel in proper interactions with wildlife and actions necessary to comply with permit stipulations.	Reduces potential for harassment of wildlife; reduces adverse effects on personnel from interactions; ensures compliance with permit requirements

No additional unavoidable adverse environmental effects have been identified beyond those described in Section 4.0 of this Environmental Report.

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APPENDIX G

REANIER LETTER OF CONFIRMATION – ARCHEOLOGICAL ASSESSMENT

REANIER & ASSOCIATES

Environmental Science Consultants

1807 - 32nd Avenue
Seattle, WA 98122
[206] 323-8450

December 13, 2001

Mr. Soren Christenson
AEC Oil and Gas (USA) Inc.

Dear Mr. Christenson:

Reanier & Associates has completed a cultural resources review of geotechnical information for the McCovey Prospect from the perspective of a professional archaeologist experienced in North Alaskan prehistory. This review is based on data developed for the McCovey Prospect by Arctic GeoSciences, Inc. (AGSI) in 2000 and revised in 2001. This report in letter-form outlines my comments and conclusions.

First, I may state that I am in agreement with the AGSI conclusion that there will be no impact to historic or prehistoric cultural resources from the McCovey exploration plans as currently envisioned. The AGSI authors are to be commended on the thoroughness of the geotechnical investigations that support their conclusions. It is this thoroughness that allows me to evaluate the report's conclusions, and to draw some of my own. My report relies upon the geotechnical documentation provided by AGSI, and the reader is referred to these for details.

The potential concerns over impact to potential cultural resources at the proposed drill site center on the nature of the seabed at that location. If the location is substantially intact and was not completely reworked by shoreline processes during the Holocene marine transgression, and/or by later nearshore marine processes, there is a possibility of intact archaeological resources that would need evaluation and possible protection under federal and state antiquities legislation and regulations.

The proposed McCovey drill site is situated slightly southeast of the highest point of a large, low submarine mound. "Mound" in the terrestrial sense is perhaps a misleading term, since the feature is more than 3 km long and 1.5 km wide, yet rises only about 3 m above the surrounding seabed. On land, one would be hard-pressed to notice such a subdued feature. This feature is not the kind of terrestrial mound that one associates with archaeological sites on the North Slope (cf. Lobdell 1986, 1995; Lobdell et al. 2000). Nevertheless, a careful evaluation of the archaeological potential of this feature is appropriate.

The highest point of the McCovey rise lies at a depth of 10.4 m below modern sea level. The eastern Beaufort Sea coast is a relatively stable tectonic area, and it is therefore reasonable to apply estimates of global eustatic sea level rise during the Holocene to estimate the time at which this feature would have been inundated. Holocene sea level data from Barbados (Fairbanks 1989) indicate the McCovey rise would have been flooded by about 6000 radiocarbon years ago. Data from Papua New Guinea (Edwards et al. 1993) indicate that the McCovey rise would have been flooded somewhat earlier – by about 7000 radiocarbon years ago. If these sea level curves are corrected for the growth depths of corals upon which they are based, the times of inundation could be as much as 1000 and 600 years older, respectively. Direct evidence of Holocene sea level rise is sparse in northern Alaska, but recent data from the Bering Sea is consistent with the Barbados curve (Elias et al. 1996). Therefore, only sites older than about 6,000 radiocarbon years could have existed on the rise before flooding. Known sites on the North Slope older than 6,000 years ago are rare (Reanier 1995), and this makes it highly unlikely that such a site would exist on the McCovey rise, even if the sub-aerial surface had been perfectly preserved during the Holocene marine transgression.

A slightly northward-dipping gravel unit lies 12 to 14 m beneath the surface of the McCovey rise (ASGI: Figure 27). Stratigraphically above this unit are Pleistocene sediments capped with up to 5 m of Holocene deposits (AGSI: Figure 26). Contours of the isopach map of Holocene sediment thickness (AGSI: Figure 26) mirror those of the bathymetric map (AGSI: Figure 2), suggesting the topography of the rise is largely due to the stack of Holocene sediments. AGSI explores the origins of the rise and concludes it is either a relict, submerged constructional barrier island, like the present-day Reindeer and Cross islands, or it is a shoal formed after flooding by the Holocene rise in sea level.

Either of these possibilities implies that the McCovey rise sandy surface sediments have been heavily reworked by nearshore and/or intertidal geomorphic processes. The southwestward migration of these constructional barrier islands is well documented. Observations by Reanier & Associates in the summer of 2000 indicate Reindeer Island (only 7.5 km from the McCovey Prospect) has migrated more than 300 meters to the southwest from its 1955 position and has split into two islands, and that none of the 1955 island remains intact only 45 years later. If it had been a barrier island during a lower stand of sea level, the McCovey rise would have faced these same processes and its surface sediments would be heavily reworked. Thus, the likelihood of discovering undisturbed archaeological sediments pre-dating 6,000 years ago on McCovey rise is vanishingly small. This is confirmed in part by sediment borings taken by AGSI within the vicinity of the proposed drill site. Careful examination of the recovered sediments revealed no chert or other toolstone lithic debitage.

The ASGI investigations also revealed the existence of a paleochannel or erosional feature north and west of the proposed drill site (AGSI:Figure 6). Regardless of its origin, the channel is 75 m from the proposed drill site, and its "banks" are 5 to 6 m below the seabed (AGSI: Figure 5), corresponding to a depth of 15.5 - 16.5 m below sea level. The feature would not be affected by drilling, and the overburden would protect it from the presence of the SDC if it were a relict fluvial channel. The skirts of the SDC are calculated to penetrate approximately 1 meter into the seafloor, leaving 4-5 meters of undisturbed sediment between the bottom of the skirts and the banks of the possible paleochannel.

In summation, the above analysis indicates that the chances of having an archaeological site at the McCovey location at depth of 10.4m (corresponding to an age of 6,000 years or older) is exceedingly slim, the chance of any such site surviving the Holocene sea level transgression and subsequent nearshore marine sediment transport processes is even slimmer. The operating design of the SDC and analysis of its impact to the seabed suggest that in the unlikely event any potential buried cultural resources are present, they would be unaffected by the project. The actual disturbance to the sediments from the drill hole and casing will be only 20 inches in diameter. For these reasons I concur with AGSI's conclusion that the proposed McCovey Prospect will have no impact on cultural resources.

Thank you for the opportunity to assist AEC Oil and Gas, Inc. with its cultural resources needs. Please contact me if you require any additional clarification of the issues raised in this report.

Sincerely,

Richard E. Reanier, Ph.D.
Principal

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APPENDIX H

ENVIRONMENTAL AND CULTURAL ORIENTATION PROGRAM

AEC Oil and Gas (USA) Inc.
Environmental and Cultural Orientation Program
For Employees and Contractors
McCovey Exploration Project
Beaufort Sea, Alaska

Submitted by

AEC Oil and Gas (USA) Inc.
US Bank Tower
950 17th Street, Suite 2600
Denver, Colorado 80202

To

U.S. Minerals Management Service
949 W 36th Ave Room 308
Anchorage, Alaska 99503-4302

Prepared by

Lynx Enterprises Inc.
Resolution Plaza
1029 W. 3rd Avenue, Suite 400
Anchorage, Alaska 99501

January 2002

AEC Oil and Gas (USA) Inc.
Environmental and Cultural Orientation Program
McCovey Exploration Project

1. INTRODUCTION

Exploration Project Overview

AEC Oil & Gas (USA) Inc. (AEC) is proposing to conduct oil and gas exploration activities in the McCovey Unit, Stefansson Sound Alaska during the 2002-2003 winter drilling season (Figure 1). The drilling will be conducted from the Mobile Offshore Drilling Unit (MODU) known as the SDC/MAT System. The area of interest covered by this Exploration Plan lies entirely within the Federal Outer Continental Shelf (OCS) Leases (Figure 2). The proposed program includes a single proposed exploration well, referred to as "AEC McCovey No. 1" that is scheduled to be drilled from a surface location in federal OCS Lease Block Y-1577 to a bottom hole location on OCS Lease block Y-1578. AEC is the operator of the proposed exploration well and will be the permittee of record.

Additional exploration/delineation drilling may be considered and is dependent on the outcome of the AEC McCovey No. 1 drilling and testing program. If this initial well shows potential for hydrocarbon development, the original hole may be plugged back and sidetracked to a different bottomhole location (McCovey 1a) on OCS Lease Block Y-1578, within the 2002-2003 drilling season, as well as allow advanced reservoir testing and evaluation. In a dry hole scenario, the AEC McCovey No. 1 well would be plugged and abandoned. If results require additional testing during another drilling season, the well would be plugged in a suspended state using Minerals Management Service (MMS) approved methods. Assuming favorable results from this drilling program, the potential exists for future exploration/delineation drilling in subsequent years within the McCovey Unit.

AEC submits this Exploration Plan (EP) to the MMS in accordance with the requirements of 30 CFR 250.203. AEC is also submitting this EP to the State of Alaska Resource agencies pursuant to the McCovey Unit Agreement and Alaska

Coastal Management Program (ACMP) consistency certification. Additionally, it is being submitted to the North Slope Borough Planning Department to evaluate consistency with the North Slope Borough Coastal Management Program. AEC will abide by all terms and conditions of the OCS Lease Sale 124 (See Section 12.0 of this report), permits and authorizations required for oil and gas exploration drilling, as well as applicable local, state, and federal laws and regulations.

2. CULTURAL ORIENTATION PROGRAM

AEC employees and contract personnel will receive Orientation Training before beginning work at the AEC McCovey exploration project. The Orientation will include those topics listed in this plan. Qualified lecturers in a classroom environment will conduct instructed training on each topic. Participants will be provided with appropriate documentation of the training (guidelines and procedures) pertinent to environmental, social, and cultural concerns for their reference during the project. Relevant law, regulations, and permit stipulations will also be provided.

Orientation training will be provided to cover all phases of the project including but not limited to mobilization of the SDC from Port Clarence Alaska to the McCovey location in the Beaufort Sea, resupply operations from Prudhoe Bay by marine vessels and aircraft, transport of fuel by marine vessels from Hay River NWT Canada, and all other operations that occur at McCovey through and including demobilization.

AEC will ensure that training is available to all personnel (Including AEC's, agents, contractors, and subcontractors) including all supervisory and managerial personnel involved for the duration of the project.

A record will be maintained of all personnel who attend the program. This record will include the name and date(s) of attendance of each attendee and will be kept onsite for so long as the site is active. An Identification card for proof of training certification will be provided to each trainee to be carried at all times during the exploration project.

2.1. Archaeological Resources and Protection of Archaeological Resources

General discussion on archaeological resources and protection of these resources will be provided to include AEC's information on archaeological clearance of the McCovey site.

2.2. Biological Resources and Habitats

There will be a presentation on the biological resources and habitats of the Beaufort Sea and those that may be encountered during the project.

2.2.1 Endangered and Threatened Species (Endangered - Bowhead Whale, Threatened - Spectacled Eider)

There will be a presentation on endangered and threatened species, introducing concepts of conservation and protection of listed species and designated critical habitats.

2.2.2 Marine Mammals - Fisheries - Bird Colonies - Avoidance and Non-Harassment of Wildlife Resources

Information will be provided from AEC's IHA documents prepared for the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. Discussions will include marine mammal monitoring, polar bear interaction and encounter, and a review of pertinent law and regulation.

2.3 Community Values, Customs, and Lifestyles (Three North Slope Villages)

Barrow, Nuiqsut, and Kaktovik - Plan of Cooperation and Conflict Avoidance with Subsistence Activities

Information will be provided from AEC's consultation with the Alaska Eskimo Whaling Commission (AEWC), the Mayor of the North Slope Borough, affected village Whaling Captains Association, and affected village public. AEC expressed its willingness to participate in a 2002 Conflict Avoidance Agreement (CAA) to be developed in consultation with the AEWC (50 CFR §216.104 (a) (12), "Plan of Cooperation"). Future meetings with these entities have been tentatively scheduled in Barrow, Nuiqsut, and Kaktovik to respond to comments received to-date and to further develop a plan of cooperation associated with operations during the whaling season.

The purpose of the plan will be to identify and implement measures that will be taken to minimize any adverse effects on the availability of marine mammals (including whales, seals, and polar bears) for subsistence uses, and to ensure efficient and effective communications between AEC and the affected communities for the duration of the McCovey Project.

3. PERTINENT PERMIT AND LEASE SALE STIPULATIONS AND LESSEE PROVISIONS INCLUDING ALL RELEVANT PERMITS AND STIPULATIONS REQUIRED TO CONDUCT THE MCCOVEY PROJECT.

A presentation and classroom discussion will be provided to ensure that orientation participants understand the relevance of environmental law, and stipulations as they apply to the tasks assigned on the McCovey project and how personnel performance will affect AEC's license to operate.

APPENDIX *I*

REQUEST FOR INCIDENTAL HARASSMENT APPLICATION (IHA)

MARINE MAMMAL MONITORING PLAN
DECEMBER 18, 2001 STATUS REPORT: PLAN OF COOPERATION
POLAR BEAR AWARENESS AND INTERACTION PLAN

AEC Oil & Gas

3900, 421 - 7th Avenue S.W.
Calgary, Alberta, Canada T2P 4K9
Phone (403) 266-8111
Fax (403) 266-8154
www.aec.ca

December 18, 2001

Ms. Donna Wieting
Chief
Marine Mammal Division
Office of Protected Resources
National Marine Fisheries Service (NMFS)
1315 East - West Highway
Silver Spring, MD 20910-3226

Subject: Request for Approval, Incidental Harassment Authorization
McCovey Exploration Well, Beaufort Sea, Alaska

Dear Ms. Wieting,

AEC Oil & Gas (USA) Inc. (AEC) hereby submits the enclosed request, pursuant to Section 101 (a) (5) (D) of the Marine Mammal Protection Act ("MMPA"), 16 U.S.C § 1371 (a) (5), for issuance of an Incidental Harassment Authorization ("IHA") allowing non-lethal takes of whales and seals incidental to its planned exploration drilling and associated operations in the Beaufort Sea, Alaska, during the Fall of 2002 and Winter of 2002 – 2003. Items to be addressed pursuant to 50 C.F.R. § 216.104, "Submission of Requests", and § 216.107, "Incidental Harassment Authorization for Arctic Waters", are presented in the attached IHA application. The application includes descriptions of the specific operations to be conducted, proposed measures to mitigate any potential injurious effects on marine mammals, measures to be taken to avoid or minimize potential conflicts between operations and subsistence hunting, and a plan to monitor effects of AEC operations. A status report of AEC's Plan of Cooperation with potentially affected villages is also included as an attachment.

You may recall that the McCovey Prospect was previously proposed by another operator named Phillips Alaska, Inc. Please be advised that operatorship of the McCovey Prospect has recently been transferred to AEC. AEC is a highly experienced oil and gas operator with operations primarily in Canada, but also in worldwide locations. AEC's success in establishing and maintaining relationships with aboriginal groups in the Canadian Arctic will provide a foundation for dealing with Native issues at McCovey. AEC's corporate policy (see attached AEC Aboriginal Affairs Practice) on aboriginal affairs is attached for your reference.

You will note that the project description proposed in this IHA Application is unique in several ways. Native and NMFS comments regarding the previously proposed project were considered when redesigning McCovey operations to avoid or minimize potential impact by using a different drilling structure, "going quiet" during the subsistence hunt, avoiding seasonal access issues, and starting drilling early-finishing drilling early. Additionally, AEC has hired Lynx Enterprises, Inc. (Lynx) to assist with regulatory approval acquisition. Lynx is a highly experienced permitter of North Slope onshore and Beaufort Sea offshore drilling operations where Native entities are key interest groups. Of particular note is Lynx's previous and ongoing relationships with Nuiqsut (Alpine Development Project). These insights and previous AEWC coordination will assist AEC in developing an effective Plan of Cooperation.

AEC would like to express its appreciation for the early cooperation demonstrated by the Alaska Eskimo Whaling Commission (AEWC) and the North Slope Borough Mayor. Although their review of the project is evolving, their leadership in the villages already visited has allowed AEC to re-propose this project in an objective manner.

As mentioned, AEC has met with the AEWC and initiated preliminary negotiation discussions toward reaching a Plan of Cooperation within the NMFS IHA and a Conflict Avoidance Agreement with AEWC who will represent village subsistence hunters. AEC has also met with and obtained comments from the North Slope Borough (partially through the Mayor), potentially affected Village Whaling Captains Associations, and potentially affected North Slope Villages. AEC will later respond to these comments and concerns in writing (also to be posted in public places in the Villages) and will continue to develop an effective Plan of Cooperation throughout the IHA review process. A summary of comments collected during village meetings to date is contained in the Plan of Cooperation Status Report which is attached for your reference. The final Plan of Cooperation will be sustained during the life of the project.

AEC proposes to drill one primary and one sidetrack exploration well at the McCovey Prospect, located in the Beaufort Sea, Alaska, during the 2002-2003 Winter drilling season. The McCovey Prospect area is approximately 11.5 miles northeast of West Dock at Prudhoe Bay, 60 miles northeast of Nuiqsut, 5.3 miles northwest of Cross Island, and 110 miles west of Kaktovik generally within OCS Lease Blocks Y-1578 and Y-1577.

The purpose of this project is to evaluate the oil and gas potential of AEC operated leases in the McCovey Prospect Area. The well(s) will be drilled using the Steel Drilling Caisson (SDC), a bottom-founded mobile offshore drilling unit (MODU). The specific drilling and testing period is November 1, 2002 to March 15, 2003. Exploratory drilling and testing operations will not occur in broken ice or open water conditions. AEC believes the project will have a negligible impact on the marine mammal species or stocks and will not have an immitigable impact on the availability of such species or stock for subsistence uses.

AEC respectfully requests that NMFS issue an IHA within 120 days or less of the date of this application, pursuant to 16 U.S.C. Sec. 1371(a)(5)(D)(iii). AEC looks forward to expanding its consultation and coordination to date with interested parties. We expect this to be an iterative process to include many more face-to-face meetings with Native entities and regulators. If you have questions or comments, please do not hesitate to call me at (403) 261-2426 or Mark Schindler at (907) 277-4611.

Sincerely,

For Kevin Bolton
Land Manager
Alaska New Ventures

Enclosures

cc: w/enclosures
Maggie Ahmaogak, Alaska Eskimo Whaling Commission - Barrow, AK
Doug DeMaster, NMFS - Seattle, WA
Ken Hollingshead, NMFS - Silver Spring, MD
Brad Smith, NMFS - Anchorage, AK
Mayor George Ahmaogak - NSB, Barrow

AEC

ALBERTA ENERGY COMPANY LTD.

ABORIGINAL AFFAIRS PRACTICE

Alberta Energy Company is a growing oil and gas company. Headquartered in Calgary, Alberta, AEC is active in exploration, production, marketing and pipeline transportation. AEC's values, developed by our employees, have been integral to the growth and success of the Company and will be reflected in our day-to-day relations with the Aboriginal community. These values include Open Communication, Integrity, Mutual Respect, Trust, and Competitive Shareholder Return.

PRACTICE GUIDELINES

Community Relations

AEC's Community Relations Program will build, enhance and maintain positive relations in the Aboriginal community by:

- Maintaining dialogue between the Company and Aboriginal people to support AEC's values.
- Ensuring timely discussions with local Aboriginal communities on AEC activities which may impact them.
- Considering support to Aboriginal events and programs in areas where AEC is conducting its business.

Employment Opportunities

AEC's Employment and Training Program will attract, retain, and develop qualified Aboriginal employees throughout the Company by:

- Considering summer and co-op employment in both field and office locations
- Promoting industry training and work experience to improve the skills of recruits.

In implementing this practice, AEC policies on purchasing, employment standards, environment, health and safety will be upheld.

Business Opportunities

AEC's activities will encourage the development of community based Aboriginal businesses which benefit both the Aboriginal communities and the Company by:

- Advising local Aboriginal administration of Company activities planned within their communities.
- Maintaining vendor lists of local Aboriginal businesses and personnel who are qualified to provide services for use by AEC.
- Including both qualified Aboriginal and Non-Aboriginal businesses on bid request lists for work on and off reserve or settlement lands. Awarding bid work on a competitive basis having regard for the standard business criteria of acceptable performance record and price.
- Supporting relationships with and between the Aboriginal community and non-Aboriginal businesses and contractors.

Education

AEC will support higher learning by Aboriginal people through educational scholarships, work experience and skill development. AEC's Education Support Program will continue to include financial assistance to accredited institutions and programs related to the Oil and Gas industry that provide training for Aboriginal students.

Request by AEC Oil and Gas (USA) Inc. for an Incidental Harassment Authorization (IHA) to Allow Taking of Marine Mammals Incidental to Exploratory Drilling and Associated Activities at the McCovey Exploration Prospect Beaufort Sea, Alaska

Submitted by

AEC Oil and Gas (USA) Inc.
US Bank Tower
950 17th Street, Suite 2600
Denver, Colorado 80202

To

National Marine Fisheries Service
Silver Spring, MD
Anchorage, AK
Seattle, WA

Application Prepared by

Lynx Enterprises Inc.
Resolution Plaza
1029 W. 3rd Ave., Suite 400
Anchorage, Alaska 99501

December 18, 2001

Request by AEC Oil and Gas (USA) Inc.
for an Incidental Harassment Authorization (IHA)
to Allow Taking of Marine Mammals Incidental to Exploratory Drilling
and Associated Activities
at the McCovey Exploration Prospect
Beaufort Sea, Alaska

INTRODUCTION

AEC Oil and Gas (USA) Inc. ("AEC") pursuant to Section 101 (a) (5) (D) of the Marine Mammal Protection Act ("MMPA"), 16 U.S.C § 1371 (a) (5), requests that it be issued an Incidental Harassment Authorization ("IHA") allowing non-lethal takes of whales and seals incidental to its planned exploration drilling and associated operations in the Beaufort Sea, Alaska, during the Fall of 2002 and Winter of 2002 – 2003. The items to be addressed pursuant to 50 C.F.R. § 216.104, "Submission of Requests", and § 216.107, "Incidental Harassment Authorization for Arctic Waters", are presented below. This includes descriptions of the specific operations to be conducted, proposed measures to mitigate against any potential injurious effects on marine mammals, the measures to be taken to minimize potential conflicts between operations and subsistence hunting, and a plan to monitor effects of operations on these marine mammals.

AEC has met with the Alaska Eskimo Whaling Commission (AEWC) to initiate preliminary negotiation discussions toward reaching a Conflict Avoidance Agreement (CAA) with the AEWC who will represent the subsistence hunters. AEC will continue to work together with the North Slope Borough, AEWC, affected Village Whaling Captains Associations, and affected North Slope Villages to develop and sustain an effective plan of cooperation.

AEC meetings with the NSB, AEWC, other Native Entities, and Regulators include:

- Various planning meetings with the U.S. Minerals Management Service (MMS).
- October 8, 2001: AEC Introduction Meeting with NSB Mayor and AEWC in Barrow
- October 9, 2001: AEWC received an Executive Summary of the proposed McCovey Plan of Exploration Operations from AEC as requested by AEWC.
- October 24, 2001: AEC hosted a reception for AEWC members and Native Entities during the Alaska Federation of Natives Convention (AFN) in the Chart Room, Hilton Hotel Anchorage.
- October 25, 2001: AEC presented the McCovey Plan of Exploration Operations as an agenda item at the AFN, AEWC Board of Commissioners Meeting in Anchorage.
- The AEWC, North Slope Borough Mayor, and AEC visited potentially affected villages of Kaktovik November 13, 2001, Nuiqsut November 15, 2001, and Barrow

November 15, 2001. Meetings were held with Village Whaling Captains Associations and the public.

- AEC and the Alaska Division of Governmental Coordination held a pre-application meeting with State, Federal (including NMFS) and local (NSB) agencies.
- AEC (and its contractor Lynx Enterprises, Inc.) continue coordination and consultation with AEWC and set preliminary schedules to repeat village visits.
- (Proposed) - AEWC and AEC visit affected villages again (proposed January 13-17, 2002) to assist IHA Application and CAA processing.
- (Proposed) - NMFS processes and issues IHA, April 18, 2002, or sooner based on agreements with AEWC.

Summary Plan

AEC proposes to drill one primary and one sidetrack exploration well at the McCovey Prospect, located in the Beaufort Sea, Alaska, during the 2002-2003 winter drilling season. The McCovey Prospect area is approximately 11.5 miles northeast of West Dock at Prudhoe Bay, 60 miles northeast of Nuiqsut, 5.3 miles northwest of Cross Island, and 110 miles northwest of Kaktovik within OCS Lease Blocks Y-1578 and Y-1577 (See Figure 1 attached).

The purpose of this operation is to evaluate the oil and gas potential of AEC operated leases in the McCovey Prospect Area. The well(s) will be drilled using the Steel Drilling Caisson (SDC), a bottom-founded mobile offshore drilling unit (MODU). The specific drilling and testing period is November 1, 2002 to March 15, 2003. Exploratory drilling and testing operations will not occur in broken ice or open water conditions. AEC believes the project will have a negligible impact on the marine mammal species or stocks and will not have an immitigable adverse impact on the availability of such species or stock for subsistence uses.

AEC Oil and Gas (USA) Inc.
Request for Approval
Incidental Harassment Authorization (IHA)
For
Taking of Marine Mammals Incidental to Exploratory Drilling
And Associated Activities
McCovey Exploration Prospect
Offshore Prudhoe Bay, Beaufort Sea, Alaska

Information Required by 50 CFR § 216.104 (a):

(1) Detailed description of specific activity or class of activities that can be expected to result in incidental taking of marine mammals.

One primary and one sidetrack well is planned to be drilled from a surface location in Outer Continental Shelf (OCS) Lease Block Y-1577. The bottom hole locations will be on federal leases within the McCovey Prospect Area. Depending on the results found in the primary well, well tests may be performed and one sidetrack well may be drilled and tested. The SDC would not need to be moved to drill the primary well and sidetrack. Drilling would begin sometime after the Minerals Management Service (MMS) determines that the ice is fully formed, which is expected to be in November 2002. Drilling and testing would conclude (estimated March 15, 2003) well before spring break-up which normally occurs in May.

Detailed information on the SDC bottom-founded MODU drilling platform is provided in Drawings 1, 2 and 3, attached.

The SDC is presently stored at Port Clarence, Seward Peninsula, Alaska. Crews will board the SDC in May 2002 to perform a variety of maintenance operations and prepare the rig for movement to the McCovey Prospect Area. The SDC will be deballasted and thence towed (mid July early August) by as many as three tugs north through the Bering Strait and the Chukchi Sea to Point Barrow and eastward through the Beaufort Sea to the McCovey Prospect Area (approximately 700 nautical miles (nm)) in compliance with a Conflict Avoidance Agreement currently being prepared, and prior to the Fall bowhead hunt by residents of the Kaktovik (Barter Island) and Nuiqsut (Cross Island) Native Villages. Ice, bad weather conditions, and other possible operational considerations may affect the timing of the move, which could require that some activities take place beyond the scheduled target date (to be specifically addressed in the Conflict Avoidance Agreement).

Every effort will be made to move the SDC, have it placed on the McCovey location, refueled, and resupplied by August 15, 2002 and no later than September 1, 2002 unless uniquely authorized by AEWC and Whaling Captains Associations. (See Figure 2 attached).

After the SDC is sited at McCovey, drilling materials and ancillary equipment will be transported to the MODU from West Dock at Prudhoe Bay. Fuel required to drill and test the proposed well(s) will be transported to the SDC by barge from Hay River N.W.T. Canada. When these re-supply operations are completed (approximately 6 to 10 days) the rig will go into a cold stack mode whereby it will be temporarily unmanned ("go quiet") with no personnel on board and no sound producing machinery or generators operating. This mode is different from past uses of the SDC where during the period after set-down and re-supply, and commencement of drilling activities the SDC remained in "warm stack" mode during which camp generators were operated and personnel remained onboard. The SDC will be reactivated for warm-up approximately (October 25, 2002) with drilling operations commencing shortly thereafter but only occurring above a specific casing point as approved by the MMS. Drilling below the above referenced casing point will only occur after the MMS has determined that the sea ice is fully formed around the rig (likely mid-November 2002). Crew changes and camp provisioning will be provided by helicopter based in Deadhorse, Alaska.

As previously mentioned, drilling and well testing operations will be performed during the 2002-2003 Winter drilling season. None will occur during periods of broken ice or open water conditions. Depending upon the timing and completion of drilling and well testing activities, the SDC will "go quiet" and remain in the cold stack mode until either the resumption of drilling from the same location in the following season (2003-2004), or the movement of the MODU to a different location (likely Herschel Island, Canada).

AEC does not anticipate that any of the activities described above will result in the harassment or other taking of marine mammals.

(2) The date(s) and duration of such activity and the specific geographic region where it will occur. Please see (1) on pages 3 and 4.

(3) The species and numbers of marine mammals likely to be found in the activity area.

The species and number of marine mammals likely to be encountered during the McCovey operation depends on activity location and season. During the movement of the SDC from Port Clarence to the McCovey Prospect, visual encounters of walrus and polar bears are expected wherever ice floes are encountered (although walrus are not expected to be seen much east of Point Barrow). Because it is imperative that the tow operation avoid ice as much as possible, close encounters of these animals will also be inherently avoided as much as possible. The number of walrus and polar bears expected to be encountered during the tow is unknown and totally contingent on summer ice conditions. Potential incidental takes of these two species will be addressed under a separate application to the U.S. Fish and Wildlife Service (USFWS) for a Letter of Authorization under USFWS regulation. The tow route will also pass through summering grounds for the Kotzebue Sound and Kasegaluk Lagoon populations of beluga whales and the Chukchi feeding grounds for gray whales. The number that might be visually encountered during the tow is unknown. Ringed seals, bearded seals, and possibly spotted seals, harbor porpoise, and killer whales may occasionally be encountered during the tow. The best available information suggests that gray whales, beluga whales, polar bears, walrus, ringed seals, and bearded seals will be visually encountered during the tow; however, based on rarity or annual distribution, bowhead whales, killer whales, harbor porpoise, and spotted seals are not.

Marine mammals potentially found in the vicinity of the McCovey Prospect include bowhead whales, beluga whales, ringed seals, bearded seals, polar bears, and, occasionally, spotted seals and walrus. Based on past experiences at other offshore drilling locations in the mid-Beaufort Sea (e.g., Warthog, Kuvlum), the only marine mammal expected to be encountered on a regular basis during the resupply period is the ringed seal. We expect fewer than a dozen resident seals to frequent the visual range of the SDC. It is also possible that passing bearded and spotted seals, and walrus, might be noted, but they are not expected. Visual encounters of bowhead and beluga whales are not expected during the resupply period. Both are expected to migrate well north of the McCovey Prospect during the period the SDC is in cold stack mode, although a few bowheads moving along the extreme southern edge of their migration corridor may pass by the SDC. The exception is if it becomes necessary to recommence resupply efforts during the period after the Native bowhead whale hunt and before freeze up. At this point it is possible that observers aboard supply vessels or the SDC might observe the occasional bowhead whale. However, most and possibly all of the resupply travel activity will occur in Stefansson Sound, between the mainland and the Midway and Cross Islands barrier island chain where bowhead whales are rarely ever encountered.

Once freeze up occurs, polar bears are expected to frequent the project area as they hunt for ringed and bearded seals.

(4) A description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected by such activities.

The species that may be affected by the McCovey activities are bowhead whales, gray whales, beluga whales, polar bears, ringed seals, and other pinnipeds. All species are protected by the Marine Mammal Protection Act of 1972 (as amended) and, in the case of the bowhead whale, the Endangered Species Act of 1973.

The great majority of the population of beluga and bowhead whales annually migrates through waters significantly north from the McCovey location. The beluga migrations are through ice leads well beyond the junction of the land fast ice with the arctic ice pack and would be extremely unlikely to encounter the SDC at McCovey. The annual fall migration of bowhead whales is normally well seaward of the Midway-Cross barrier

The great majority of the population of beluga and bowhead whales annually migrates through waters significantly north from the McCovey location. The beluga migrations are through ice leads well beyond the junction of the land fast ice with the arctic ice pack and would be extremely unlikely to encounter the SDC at McCovey. The annual fall migration of bowhead whales is normally well seaward of the Midway-Cross barrier islands and thus beyond the range of McCovey associated activities. Depending on environmental conditions present in any given year (particularly extent of ice coverage), the extreme southern edge of the fall bowhead whale migration corridor may pass close to the McCovey Prospect. Regardless, results from 23 years of bowhead whale survey data collected by the MMS, studies by the NSB and those studies coordinated by the AEWC, and traditional knowledge from Cross Island-based whale hunters, demonstrate that the vast majority of bowhead whales pass many miles north of the McCovey Prospect. Nevertheless, it is possible a few dozen whales might pass within two miles of the cold stacked SDC.

AEC does not anticipate that its planned activities (movement to location, fueling, and re-supply of the SDC) will have a greater than negligible impact on the whales from noise generated by vessel movements in the area. Bowhead whales are not expected to be encountered during the tow, although some temporary noise disturbance of gray and beluga whales might occur as the SDC is towed through summering areas. Collisions between tugs and marine mammals is not of concern because of the very slow tow speed (2 knots) and on-board observers (See Monitoring Plan). There will be no impact (status, distribution, seasonal distribution) on whale species as a result of noise disturbance from the SDC while on-site as it will be shutdown (cold stack "quiet" mode) through September and almost all of October, the months during which the westward bowhead and beluga migrations occur. The fuel barge transiting from Hay River, NWT, will dock at West Dock, Prudhoe Bay, following fueling of the SDC. It will not return to Hay River during the whale hunt unless uniquely authorized by the CAA or AEWC. Ringed seals and possibly other pinnipeds are winter residents of mid-Beaufort waters. However, there is no evidence that these animals are disturbed from their normal habitat use by the presence of an active drilling operation. Polar bears are expected to enter the project area during winter operations and their presence is specifically addressed in the polar bear/personnel interaction and monitoring plan designed for the McCovey project and to be approved by the USFWS.

AEC expects no immitigable adverse impacts on the availability of any of these species or stocks for subsistence purposes.

(5) The types of incidental taking authorization that is being requested.

AEC is requesting authorization for incidental taking by harassment of the whales and seals described in (3) and (4), above. The only anticipated harassment will be that associated with noise disturbance from the operation of vessels towing the SDC to the McCovey Prospect, and refueling and re-supplying the SDC at the McCovey location. AEC will request by separate Letter of Authorization from the USFWS an IHA covering polar bears and Pacific walrus. As noted, this authorization is conditioned by the

(6) By age, sex, and reproductive condition (if possible), the number of marine mammals (by species) that may be taken by each type of taking identified in paragraph (1) (5) of this section and the number of times such taking are likely to occur.

The number of marine mammals, regardless of age, sex, or reproductive condition, that may be taken as a result of the McCovey operation is unpredictable other than all operations will be suspended during the Kaktovik and Nuiqsut bowhead whale hunts to purposely avoid any take of this species. Gray whales, beluga whales, and polar bears of all ages and sexes might be encountered during the tow, but all females should be post-partum. Noise disturbance from transiting tow and supply vessels, or from noise generated from the stationary SDC, might qualify as harassment to seals, but previous surveys have indicated little behavioral reaction of these animals to slow-moving or stationary vessels. The monitoring program will attempt to collect age and sex data where possible.

(7) The anticipated impact of the activity upon the species or stock of marine mammal.

AEC anticipates no impacts other than possible exposure to noise disturbance during vessel movements will occur to any species or stock of marine mammal during McCovey operations. Such impacts as may occur as a result of animal avoidance behavior to noise will be no greater than negligible.

(8) The anticipated impact of the activity on the availability of the species or stocks of marine mammals for subsistence uses.

No impact is anticipated on the availability of marine mammal species and stocks for subsistence uses since a CAA and Plan of Cooperation will be established and since the SDC will go into a cold stack "go quiet" mode during the period of the bowhead whale hunt.

(9) The anticipated impact of the activity upon the habitat of the marine mammal populations, and the likelihood of restoration of the affected habitat.

The SDC has a "footprint" measuring 531' by 360' as it rests upon the ocean bottom. This area is negligible when compared to the several thousand square mile area of the Beaufort Sea. When exploratory drilling and testing operations (dry hole outcome) are completed at the McCovey prospect area, the wells will be plugged and abandoned, and a final site clearance will be performed in accordance with MSS and Alaska Oil and Gas Conservation Commission regulations. This abandonment activity will leave the McCovey Prospect area in an essentially undisturbed condition since there will be no wellhead or appurtenances remaining above the ocean floor. In a discovery outcome, wells would be plugged and abandoned in a suspended status in accordance with the MMS and movement of the SDC will be in accordance with the AEWC and the MMS.

(10) The anticipated impact of the loss or modification of the habitat on the marine mammal populations involved.

The temporary presence of the SDC on the ocean floor will not cause either permanent or long-term impacts on marine mammal habitat.

(11) The availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.

The principal mitigation employed in the McCovey project regarding subsistence involves a CAA, Plan of Cooperation, and placing the SDC in cold stack "go quiet" status during the annual bowhead subsistence hunt.

No identified rookeries, mating grounds, or areas of similar significance for marine mammals exist in the immediate vicinity of the McCovey project. The nearest islands are the Midway Islands and Cross Island. Neither of these places is known to be used as a rookery or mating ground for marine mammals.

(12) Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, the applicant must submit a plan of cooperation or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses. A plan must include the following:

i. A statement that the applicant has notified and provided the affected subsistence community with a draft plan of cooperation;
ii. A schedule for meeting with the affected subsistence communities to discuss proposed activities and to resolve potential conflicts regarding any aspects of either the operation or the plan of cooperation;
iii. A description of what measures the applicant has taken and/or will take to ensure that proposed activities will not interfere with subsistence whaling or sealing; and
iv. What plans the applicant has to continue to meet with the affected communities, both prior to and while conducting activity, to resolve conflicts and to notify the communities of any changes in the operation.

The principal measures undertaken to ensure that the McCovey operations will not have an adverse impact on subsistence activities is a CAA, Plan of Cooperation, and to completely shutdown (cold stack "go quiet") the SDC during the period of the annual bowhead whale subsistence hunt. These actions eliminate potential source(s) of noise disturbance to westward migrating whales, which are hunted in the area northeast of the project.

AEC has already taken steps to disclose its project plans in initial consultation with the Executive Director of the Alaska Eskimo Whaling Commission (AEWC), the Mayor of the North Slope Borough, affected village Whaling Captains Association, and affected village public (See Introduction). AEC expressed its willingness to participate in a 2002 CAA to be negotiated with the AEWC (§ XII, "Plan of Cooperation"). Future meetings with these entities are being scheduled in Barrow, Nuiqsut, and Kaktovik to further develop plans of cooperation associated with its operations during the whaling season.

(13) The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity.

A summary of the proposed AEC Monitoring Plan is provided below. A formal monitoring plan is also appended to this application. Additional information will be forwarded to NMFS and AEWC as needed after submission of this application. AEC understands that the Monitoring Plan will be subject to review by the AEWC, the NMFS and to a peer review process, and that mutually acceptable modifications may be required.

AEC proposes to conduct a program of visual observations from the SDC during its 700 nm transit from Port Clarence to the McCovey Prospect, and while on-site during the resupply period(s). Observers will also operate from all resupply vessels. Qualified observers will include an appropriate mix of professional marine biologists and experienced Native observers. The observer(s) will scan the area around vessels/SDC with 7x50 reticule binoculars during the daylight hours, supplemented by night vision equipment during low light. Laser range finding binoculars will be available to assist with distance estimation. This program of shipboard observation monitoring will document the presence, distribution, and behavior of marine mammals sighted from project associated vessels. The program will commence with the tow of SDC from Port Clarence to the McCovey location and will continue on a nearly 24-hour basis until the rig goes into cold stack "go quiet" mode (on or before September 1, 2002). Should it become necessary to recommence resupply efforts between the end of the fall whale hunt and freeze up, observers will be redeployed on the SDC and supply vessels.

The principal objective of the vessel-based observation program is to detect the presence, abundance, and behavior of bowhead whales. While it is assumed that a few bowheads will pass within visual sighting distance of the McCovey location, none are expected to pass during the August resupply period. It is known that bowhead whales have passed within sighting distance of MODU's, including the SDC, at other Beaufort Sea locations that have some comparability to the McCovey site; e.g., the CIDS at two different locations in Camden Bay (1989 – Stinson project; 1997 – Warthog Project); the SDC (1990 – Fireweed Project in west Harrison Bay). In the cited instances the MODU's were operating in warm standby mode (crews and observers aboard, generators running). In the McCovey case where the (SDC) will be in cold stack "go quiet" mode, no equipment running and no crew or observers will be onboard. (See the attached monitoring plan)

(14) <u>Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities related to reducing such incidental taking and evaluating its effects</u>.

The vessel-based observation-monitoring program will coordinate, where practicable, with the MMS 2002 Bowhead Whale Aerial Survey Program (BWASP) and other monitoring activity operating in the mid-Beaufort region. However, the SDC observer program will be shutdown (because the SDC will be in cold stack "go quiet") during most, if not all, of the period the MMS aerial survey program will be operating.

AEC will, where practicable, coordinate with workshops or similar collective efforts designed to contribute to and analyze monitoring data on Beaufort Sea marine mammals.

IHA Time Frame:

AEC requests that NMFS process this application and issue an IHA within 120 days or less of the date of this application per 16 U.S.C. Sec. 1371 (a)(5)(D)(iii). AEC regards the timely issuance of the IHA as a critical milestone to be reached in implementing the exploratory drilling program at McCovey.

Additional Information:

Spill Response:

An Oil Discharge Prevention and Contingency Plan (ODPCP) is being prepared specifically for the McCovey project. The ODPCP is an extensive document, which addresses spill response logistics; several spill scenarios, cleanup activities, and numerous other aspects of oil spill prevention and response. The ODPCP will be submitted to the Alaska Department of Environmental Conservation by mid-December 2001. During processing, the North Slope Borough, AEWC and affected Villages will review the plan.

AEC Oil and Gas (USA) Inc.
Marine Mammal Monitoring Plan For
Exploratory Drilling and Associated Activities
At the
McCovey Exploration Prospect
Beaufort Sea, Alaska

Submitted by

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To

National Marine Fisheries Service
Silver Spring, MD
Anchorage, AK
Seattle, WA

Plan Prepared by

Lynx Enterprises Inc.
Resolution Plaza
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Anchorage, Alaska 99501

December 18, 2001

AEC Oil and Gas (USA) Inc.
Marine Mammal Monitoring Plan For
Exploratory Drilling and Associated Activities
at the
McCovey Exploration Prospect
Beaufort Sea, Alaska

AEC Oil and Gas (USA) Inc. ("AEC") presents this Marine Mammal Monitoring Plan as a part of their planned exploration drilling and associated operations in the Beaufort Sea, Alaska, during the fall of 2002 and the Winter of 2002 – 2003. The items, relevant to monitoring, to be addressed pursuant to 50 C.F.R. § 216.104, "Submission of Requests" are presented below. This includes descriptions of the specific operations to be conducted and a plan to monitor effects of operations on these marine mammals. Operational activities covered by the monitoring program include tow of the Steel Drilling Caisson (SDC) mobile offshore drilling unit (MODU) from Port Clarence, Alaska to the McCovey Prospect north of Prudhoe Bay, Alaska and all resupply vessel operations between the sited SDC and West Dock and Hay River N.W.T., Canada (fuel). To avoid conflicts with migrating bowhead whales and the Native subsistence whale hunt, AEC will make every effort to complete movement setdown and resupply operations by August 15, 2002, but in any event all operations will cease during the entire month of September and most of October (October 25, 2002 warmup of SDC and possible late resupply approved by AEWC) and the SDC will be placed into cold stack "go quiet" mode (no generators running, no personnel onboard). This marine mammal monitoring will not occur during this period, nor during the winter drilling season after freeze up.

I. Introduction and Project Summary

50 CFR § 216.104 (a)

(1) Detailed description of specific activity or class of activities that can be expected to result in incidental taking of marine mammals.

One primary and one sidetrack well is planned to be drilled from a surface location in Outer Continental Shelf (OCS) Lease Block Y-1577. The bottom hole locations will be on federal leases within the McCovey Prospect Area. Depending on the results found in the primary well, well tests may be performed and one sidetrack well may be drilled. The SDC would not need to be moved to drill the primary well and sidetrack. SDC warmup would begin October 25, 2002. Drilling above an MMS approved casing point would begin November 1, 2002, and drilling below the intermediate casing point would begin sometime after the Minerals Management Service (MMS) determines that the ice is fully formed, which is expected to be in mid-December 2002. Drilling and testing would conclude (estimated March 15, 2003) well before spring break-up which normally occurs in May.

Detailed information on the SDC bottom-founded MODU drilling platform is provided in Drawings 1, 2 and 3, attached.

The SDC is presently stored at Port Clarence, Seward Peninsula, Alaska. Crews will board the SDC in May 2002 to perform a variety of maintenance operations and prepare the rig for movement to the McCovey Prospect Area. The SDC will be deballasted and thence towed (mid July early August) by as many as three tugs north through the Bering Strait and the Chukchi Sea to Point Barrow and eastward through the Beaufort Sea to the McCovey Prospect Area (approximately 700 nautical miles (nm)) in compliance with a Conflict Avoidance Agreement currently being discussed with the AEWC, and prior to the autumn bowhead hunt by residents of the Kaktovik (Barter Island) and Nuiqsut (Cross Island) Native Villages. Ice, bad weather conditions, and other possible operational considerations may affect the timing of the move, which could require that some activities take place beyond the scheduled target date (to be addressed in the Conflict Avoidance Agreement).

Every effort will be made to move the SDC, have it placed on the McCovey location, refueled, and resupplied by August 15, 2002 and no later than September 1, 2002 unless uniquely authorized by AEWC. (See Figure 2 attached).

After the SDC is sited at McCovey, drilling materials and ancillary equipment will be transported to the MODU from West Dock at Prudhoe Bay. Fuel required to drill and test the proposed well(s) will be transported to the SDC by barge from Hay River N.W.T. Canada. The fuel barge transiting from Hay River, NWT, will dock at West Dock, Prudhoe Bay, following fueling of the SDC. It will not return to Hay River during the whale hunt unless uniquely authorized by the CAA or AEWC. When these re-supply operations are completed (approximately 6 to 10 days) the rig will go into a cold stack "go quiet" mode whereby it will be temporarily abandoned with no personnel on board and no sound producing machinery or generators operating. This mode is different from past uses of the SDC where during the period after set-down and re-supply, and commencement of drilling activities the SDC remained in "warm stack" mode during which camp generators were operated and personnel remained onboard. The SDC will be reactivated for warm up approximately (October 25, 2002) with drilling operations commencing shortly thereafter but only occurring above casing point as approved by the MMS. Drilling below the above referenced casing point will only occur after the MMS has determined that the sea ice is fully formed around the rig (likely mid-November 2002). Crew changes and camp provisioning will be provided by helicopter based in Deadhorse, Alaska.

As previously mentioned, drilling and well testing operations will be performed during the 2002-2003 Winter drilling season. None will occur during periods of broken ice or open water conditions. Depending upon the timing and completion of drilling and well testing activities, the SDC will "go quiet" and remain in the cold stack mode until either the resumption of drilling from the same location in the following season (2003-2004), or the movement of the MODU to a different location (likely Herschel Island, Canada).

AEC does not anticipate that any of the activities described above will result in the harassment or other taking of marine mammals.

(2) The date(s) and duration of such activity and the specific geographic region where it will occur. Please see (1) on pages 1 and 2.

II. Monitoring Plan Overview

50 CFR § 216.104 (a)

(13) The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity.

AEC proposes to conduct a program of visual observations from the SDC during its 700 nm transit from Port Clarence to the McCovey Prospect, and while on-site during the resupply period(s). Observers will also operate from all resupply vessels. Qualified observers will include an appropriate mix of professional marine biologists and experienced Native observers. The observer(s) will scan the area around vessels/SDC with 7x50 reticule binoculars during the daylight hours, supplemented by night vision equipment during low light. Laser range finding binoculars will be available to assist with distance estimation. This program of shipboard observation monitoring will document the presence, distribution, and behavior of marine mammals sighted from project associated vessels. The program will commence with the tow of SDC from Port Clarence to the McCovey location and will continue on a nearly 24-hour basis until the rig goes into cold stack "go quiet" mode (no later than September 1, 2002 unless uniquely authorized by AEWC). Should it become necessary to recommence resupply efforts between the end of the fall whale hunt and freeze up, AEWC will be consulted for approval and observers will be redeployed on the SDC and supply vessels.

The principal objective of the vessel-based observation program is to detect the presence, abundance, and behavior of bowhead whales. While it is assumed that a few bowheads will pass within visual sighting distance of the McCovey location, none are expected to pass during the August resupply period. It is known that bowhead whales have passed within sighting distance of MODU's, including the SDC, at other Beaufort Sea locations that have some comparability to the McCovey site; e.g., the CIDS at two different locations in Camden Bay (1989 – Stinson project; 1997 – Warthog Project); the SDC (1990 – Fireweed Project in west Harrison Bay). In the cited instances the MODU's were operating in warm standby mode (crews and observers aboard, generators running). In the McCovey case where the MODU (SDC) will be in cold stack "go quiet" mode, no crew or observers will be onboard.

AEC will utilize visual observations of trained personnel combined with climatic condition measurement to locate and assess the behavior of the local species of marine mammals that are known to use or may use the McCovey Prospect Area and the transit route. The local species of marine mammals are the bowhead whale, gray whale, beluga whale, ringed seal, spotted seal, bearded seal, walrus, and polar bear. AEC will also record information on any other marine mammals (E.G., killer whale and harbor porpoise) that may be encountered in the project mobilization and operation area.

The monitoring program is expected to begin in the mid July to early August timeframe with the passage of the SDC from Port Clarence to the McCovey Prospect Area expected to be complete by early August 2002. Monitoring will continue until resupply operations at the McCovey location are completed (expected by August 15, 2002) and the SDC is placed in cold stack "go quiet" mode with no equipment running and no personnel onboard. The following measures will be included in the monitoring program:

- Qualified observers trained by a professional marine biologist and by experienced Native observer(s) will accompany each vessel (or fleet of vessels if more than one vessel will move to the same location at the same time).

- The marine biologist and Native observer(s), will be available via radios/phones located on the various vessels for provision of consultation and guidance to other observers utilized in this monitoring program.

- All vessels (including the SDC), will be equipped with basic weather monitoring equipment (i.e. temperature and barometric pressure instrumentation) which will be utilized, along with visual weather observations, to document the climatic conditions present at the time when observations of marine mammals occur.

- The attached "Marine Mammal Monitoring Form" will be used to document field observations and measurements at the time that any observations of marine mammals occur.

- All marine mammals observations will be provided daily to the NMFS and the MMS (if so desired by this agency), unless otherwise requested by the NMFS.

- If a coordination center is opened by other North Slope operators and operated during AEC's monitoring operations, all sightings of marine mammals will also be provided to that location.

- Personnel that will be stationed on the SDC (after arrival and positioning on the well location) during the open water season of 2002 will also receive training on marine mammal monitoring and will utilize the above referenced form to document any incidental takes of marine mammals that may occur.

A report documenting and analyzing any incidental takes of marine mammals that have occurred as part of this monitoring program will be provided to the NMFS and to the MMS within 90 days of completion of the monitoring activities, as well as to other qualified interested parties. This monitoring program will be coordinated with the MMS Bowhead Whale Aerial Survey Project (BWASP) to the extent practicable.

III. Monitoring Report Form
McCovey Prospect Exploration Well(s)

1. Name of Observer: ______________________________

2. Date and Time of Observation: ______________________________

3. Vessel Name: ______________________________

4. Observation Location (i.e., lat/long coordinates): ______________________________

5. Ambient Temperature: ______________________________

6. Ambient Pressure: ______________________________

7. Visual Weather Conditions (e.g. rainy, etc.): ______________________________

8. What Was Observed and How Many (fill in):

   Bowhead Whale ____________________
   Gray Whale ____________________
   Beluga Whale ____________________
   Bearded Seal ____________________
   Ringed Seal ____________________
   Spotted Seal ____________________
   Polar Bear ____________________
   Walrus ____________________
   Unidentified Pinniped ____________________
   Other Marine Mammal (Describe & provide number) ____________________
   ____

9. Estimated Distance f/ Vessel (include units of measurement) ____________________
   ____

10. Direction of Movement of Marine Mammal(s): ______________________________

11. Describe Marine Mammal Behavior Observed: ______________________________
    ____
    ____

    Describe any change in behavior noted during observation: ______________________________
    ____
    ____

13. List numbers of other vessels in area and names (if known): ______________________________
    ____
    ____

14. Other Information (complete if there is other data that may be helpful to this program): ____
____

IV. Monitoring Personnel Training

All observers utilized for this monitoring program will receive training in the identification and behavior of the local species of marine mammals known to use the project mobilization and operation area prior to conducting observation operations. This training will be conducted by the professional marine biologist and the experienced Native subsistence hunter(s) that will participate in the monitoring program, as well as by AEC personnel with expertise in wildlife and marine mammal topics. A combination of visual aids and textbook material will be incorporated into the training program. All observers will also be provided with a copy of this monitoring program document. A synopsis of the training program follows:

- Review of the Marine Mammal Protection Act and the Endangered Species Act
- Review of Incidental Take Definition
- Review of Incidental Harassment Authorization from NMFS
- Overview of Subsistence Hunting Activities in Beaufort Sea
- Overview of the Marine Mammals Known to Use Areas of Operations
- Identification Techniques for Local Species
- Typical Behavior of Local Species
- Abnormal Behavior of Local Species
- Completion of Monitoring Program Report Form
- Who to Provide Report Information To and When
- Assignment of Personnel to Vessels
- Questions and Answers / Other Issues

Representatives from the Alaska Eskimo Whaling Commission and from the North Slope Borough will be invited to participate in this monitoring program as official and/or unofficial observers.

V. Reporting Procedures

All observations of marine mammals require completion of the "Monitoring Program Report Form" provided herein. Observers will be provided with the telephone number and fax number of the individual assigned by AEC (hereinafter referred to as the AEC Reporting Contact) to collect the monitoring reports. When observers are unable to reach a fax machine but have telephone access, verbal reports will be provided to the AEC Reporting Contact with copies of written reports to be faxed to the AEC Reporting Contact at the earliest opportunity. When observers are unable to reach a telephone and fax machine (e.g., observer on vessel that is still enroute, etc.), verbal and written reports will be provided to the AEC Reporting Contact at the earliest opportunity. Copies of completed report forms are to be provided daily to the AEC Reporting Contact by each observer at a mutually agreed on time. The AEC reporting Contact will then fax copies of these reports to the NMFS and MMS representatives daily at a mutually agreed on time.

If other North Slope operators establish a communications center for coordination of sighting or other information, practicable arrangements will be made with the operator(s) of the center to receive these reports.

Under no circumstances are reports of sightings or other observations to be provided to individuals that have not been authorized by AEC or by the NMFS and/or MMS regulatory agencies to receive such information.

Radio reporting of sightings or other observations shall only be used if a communications center is established and set up to handle receipt of daily information on that basis. Individual reports of sighting or other incidents by radio will not be provided at the time of the occurrence unless such time is the established time for provision of the daily reports.

Copies of completed report forms will be maintained on the North Slope throughout the monitoring period and will also be maintained at a communications center, assuming such a center is established by other North Slope operators.

VI. Final Report

A report of the results of the monitoring program will be prepared and submitted to the NMFS and MMS within 90 days of the completion of the monitoring program. The report will address the following items:

- Dates and types of activities.
- Dates and location(s) of any activities related to monitoring the effects on marine mammals.

- Results of the monitoring activities, including an estimate of the level and type of take, species name and numbers of each species observed, direction of movement of species, and any observed changes or modifications in behavior.

December 18, 2001 Status Report:

AEC Oil and Gas (USA) Inc. Plan of Cooperation
With North Slope Native Entities regarding
The McCovey Exploration Prospect Operations during 2002 - 2003
Beaufort Sea, Alaska

AEC has initiated coordination and consultation with the Alaska Eskimo Whaling Commission (AEWC), the Mayor of the North Slope Borough, affected village Whaling Captains Association, and affected village public. AEC expressed its willingness to participate in a 2002 Conflict Avoidance Agreement (CAA) to be negotiated with the AEWC (50 CFR §216.104 (a) (12), "Plan of Cooperation"). Future meetings with these entities have been tentatively scheduled in Barrow, Nuiqsut, and Kaktovik to respond to comments received to-date and to further develop a plan of cooperation associated with operations during the whaling season.

Summary of AEC meetings with AEWC, other Native Entities and Regulatory Agency Meetings:

- Various planning meetings with the U.S. Minerals Management Service (MMS).
- October 8, 2001: AEC Introduction Meeting with NSB Mayor and AEWC Executive Director in Barrow.
- October 9, 2001: AEWC received an Executive Summary of the proposed McCovey Plan of Exploration Operations from AEC as requested by AEWC.
- October 24, 2001: AEC hosted a reception for AEWC members and Native Entities during the Alaska Federation of Natives Convention (AFN) in the Chart Room, Hilton Hotel Anchorage.
- October 25, 2001: AEC presented the McCovey Plan of Exploration Operations as an agenda item at the AFN, AEWC Board of Commissioners Meeting in Anchorage.
- The AEWC, North Slope Borough Mayor, and AEC visited potentially affected villages of Kaktovik November 13, 2001, Nuiqsut November 15, 2001, and Barrow November 15, 2001. Meetings were held with Village Whaling Captains Associations and the public.
- AEC and the Alaska Division of Governmental Coordination held a pre-application meeting with State, Federal (including NMFS) and local (NSB) agencies.
- AEC (and its contractor Lynx Enterprises, Inc.) continue coordination and consultation with AEWC.
- (Proposed) - AEWC and AEC visit affected villages, including Chukchi Sea Villages (proposed February 3-6, 2002) to assist CAA negotiations and IHA Application processing.
- (Proposed) - NMFS processes and issues IHA, April 18, 2002 or sooner.
- (Proposed) - Utilize Native subsistence hunters as marine mammal observers as part of the AEC McCovey Marine Mammal Monitoring Program.

Village Meetings November 13 – 15, 2001:

The Executive Director of the AEWC and the North Slope Borough Mayor accompanied AEC during visits to the potentially affected villages of Kaktovik November 13, 2001, Nuiqsut November 15, 2001, and Barrow November 15, 2001. Meetings were held with Village Whaling Captains Associations and the public. Comments from these meetings are presented below. Although AEC responded verbally at the meetings to some of the comments raised, AEC will respond to these comments in writing during the IHA review process. Reponses will be publicly posted in the villages.

Kaktovik Meeting –11/13/01

Participants

Name	*Company*	*Telephone*
Anita O'Brien	AEC	403-261-2581
Soren Christiansen	AEC	403-261-2464
Kevin Bolton	AEC	403-261-2426
Andy Popko	AEC	403-266-8259
Mark Schindler	Lynx	907-277-4611
George Ahmaogak	NSB	
Maggie Ahmaogak	AEWC	
Teresa Judkins	AEWC	
Kaktovik Whaling Captains Association	AEWC	
Village members	Public	

- **Question:** Does AEC have an NPDES Permit
- **Question:** What Discharges are allowed?
- **Question:** What Monitoring will be conducted?
- **Question:** What Impacts are expected by the project?
- **Question:** When would EIS start
- **Question:** Will AEC be using same chemical in the well all the way to bottom and all the time?
- **Question:** Are Amphipods under ice impacted by oil spill?
- **Statement :** Dec 1951 or 1954 wind event and ice override onshore

- **Question:** When will the public process start?
- **Question:** If McCovey is commercially successful, what development alternatives will be considered?
- **Question:** Does AEC exercise Native business preference?
- **Question:** Who's barges will be used to resupply?
- **Question:** What monitoring will the MMS/and ANES do? (Native Allotments impact)
- **Question:** Cross Island (NSB has deeded title?) has special status as National Historical Site? Application status? (Even if pending does AEC need to go through a special process?

Nuiqsut Meeting - 11/15/01

Participants

Name	***Company***	***Telephone***
Anita O'Brien	AEC	403-261-2581
Soren Christiansen	AEC	403-261-2464
Kevin Bolton	AEC	403-261-2426
Andy Popko	AEC	403-266-8259
Mark Schindler	Lynx	907-277-4611
George Ahmaogak	NSB	
Maggie Ahmaogak	AEWC	
Teresa Judkins	AEWC	
Nuiqsut Whaling Captains Association	AEWC	
Village members	Public	

- **Statement:** Isaac: An exploration bond is desired / Seals are sick!
- **Question:** How far is the McCovey site from Reindeer Island?
- **Question:** If McCovey is a commercial find, where would the production island be located?
- **Question:** How will wells be stubbed off if the project is abandoned?
- **Question:** How much oil do you need to find to be commercial?

- **Question:** Will AEC be considering information from global warming studies?
- **Question:** Will AEC have an agreement like the BP Good Neighbor Policy?
- **Question:** What happens if ice doesn't form or freeze? November thin ice?
- **Question:** How will AEC clean up an oil spill?
- **Question:** Why are you back with an offshore project when we oppose it?
- **Question:** How healthy are Amphipod whale food stocks?
- **Question:** If any animals are impacted, that impact should be studied & domino effect studied – their food?
- **Question:** Copopods and Amphipods, Why do whalers seeing less in their whales?
- **Question:** MMS studies: Which studies have been done @ pre-lease sale & what studies would happen with development - What did they show?
- **Question:** Will AEC sign CAA with village whaling captain's association?
- **Question:** Why are seals sick? Monitoring plan must cover both.
- **Question:** Why were runs of fish bad this year?
- **Statement**: 90 day report obligation

Barrow Meeting – 11/15/01

Participants

Name	*Company*	*Telephone*
Anita O'Brien	AEC	403-261-2581
Soren Christiansen	AEC	403-261-2464
Kevin Bolton	AEC	403-261-2426
Andy Popko	AEC	403-266-8259
Mark Schindler	Lynx	907-277-4611
George Ahmaogak	NSB	
Maggie Ahmaogak	AEWC	
Teresa Judkins	AEWC	
Barrow Whaling Captains Association	AEWC	
Village members	Public	

- **Question:** What about a catastrophic event? (An Earthquake for example). Would the drill pipe survive? Would the Blow Out Preventer (BOP) survive?

- **Question:** Are the ocean currents the same at McCovey as in the Canadian arctic?

- **Question:** Will an event like the historic Bullen Point ice override event (described as +300' onshore) be a concern at McCovey?

- **Question:** A North Sea rig capsized 6 months after it was towed and set on location. What will ensure that this will not happen to the SDC?

- **Question:** Are you familiar with the Russian studies, cyclonic shift of ice, currents different at surface vs. bottom of the sea?

- **Question:** What is the potential for an oil spill? What safeguards are in place?

- **Question:** Please describe who AEC is and how they acquired the McCovey leases?

- **Question:** Russian whales show toxins. Can AEC comment on our concern regarding toxins in whales?

- **Question:** What type of toxic discharges will occur during McCovey project?

- **Question:** Tenneco Island, (No Name Island well location) is 500ft south from Cross Island. Since that development, Cross Island has been shifted and the east side is breaking up. Given this, what will happen to Reindeer Island if development occurs at McCovey.

- **Question:** Maggie, Can AEC monitor coastal processes and assess any impact to Reindeer Island & Cross Island (During exploration phase).

- **Question:** How long will the period be from SDC set down to SDC removal?

- **Question:** Is there a corrective action plan in place, if impact occurs?

- **Question:** Do we have an oil spill plan?

  Question: Would you be willing to enter into these agreements? BP CAA, and $20MM Good Neighbor Policy?

- **Statement:** Leonard: AEWC is not the only party potentially impacted, i.e. fisherman and hunters had a bad year this year.

- **Statement:** Leonard: Village response teams weren't allowed on the ice due to the ice conditions, ACS didn't know what to do, Natives had to take over. Plan is a joke. Hire people who know the environment, Natives.

- **Question:** How would you clean up a spill when there are 55-knot winds and warm oil turns to jell? Ice ridges can build quickly. There is not adequate technology in your plan to deal with this. Currents & prevailing wind, plan on it.

- **Statement:** A few years ago during a storm there was a 25' swell at Cross Island. We could not get a helicopter to evacuate people.

- **Question:** How fast can we close BOP's in an ice event?

- **Request:** Thomas: Northstar Monitoring Plan – Work along with BP to have studies and render similar findings, re: cumulative impact 25miles from Northstar.

- **Statement:** Must address cumulative impact studies to date. Between the three operators or whoever is out in the Beaufort Sea.

- **Question:** Will there be a Performance Bond for the exploration phase?

- **Question:** How do you look at contracting/hiring?

- **Question:** Will U.S. Native Corporations have to compete with Canadian Firms?

- **Statement:** Environmental & safety, are criteria preferred by Kuukpik.

- **Question:** SDC will be moved during Cisco migration, will SDC impact migration? If so how will you mitigate?

- **Question:** Will there be an impact fund for poor fishing and hardships of fishermen?

- **Question:** Salinity

- **Question:** Magnetism activity has been noted in McCovey area; GPS/outboard motors not running.

- **Statement:** City of Nuiqsut Mayor opposed to offshore drilling.

- **Statement:** 1 whale was taken, 2 miles from Northstar.

- **Question:** Ice will hit SDC even when SDC has gone quiet.

- **Question:** Will AEC mitigate whales not being taken, 1 full quota of food worth?

- **Statement:** Had problems this year created by oil companies surveying in the Beaufort Sea on Canadian route for gas pipeline. Natives don't want McKenzie Route.

- **Statement:** CAA must have corrective action.

- **Question:** If gas is found at McCovey would AEC transport it to McKenzie?

- **Question:** Will AEC replace whale meat not gotten if it is their fault?

- **Question:** Will AEC tow whales for whalers?

- **Question:** If whalers are pushed offshore, how will AEC react?

- **Statement:** Odors coming from boats, whales will react;

- **Statement:** Don't say the whalers aren't impacted in quiet zone; - they will be!

- **Question:** Do you have Marine Mammal studies in area now?

- **Statement:** Design monitoring plan to study health of seals in area.
- **Statement:** Issac/Kuukpik is neutral on offshore exploration until issues are addressed, he has advised his JV partners to be neutral until further advised.
- **Question:** Will high tide, wind, current move SDC? If so it's Thomas's.
- **Question:** What if you have spill in water inside SDC? How will you cleanup?
- **Question:** If we can't get whales 5 years after your operation, how will we be impacted?
- **Question:** If McCovey is produced, will pipeline construction leave spoils on the ice the same as Northstar?
- **Question:** Will AEC monitor ice noise hitting SDC;
- **Question:** Can vessels be available as rescue support for whalers?

Polar Bear Awareness and Interaction Plan

AEC Oil and Gas (USA) Inc.
US Bank Tower
950 17th Street, Suite 2600
Denver, Colorado 80202

McCovey Exploration Project

Note:

The Encounter Plan is prepared in the event that polar bear(s) or their dens are encountered during planned activities. Since the project area is offshore in the barrier island area of the mid-Beaufort Sea, the potential for bear encounters is considered probable. The plan has been prepared to avoid harmful encounters for both bear and humans.

AEC Oil and Gas (USA) Inc.
Polar Bear Awareness and Interaction Plan
McCovey Exploration Project
Beaufort Sea, Alaska

Submitted by

AEC Oil and Gas (USA) Inc.
US Bank Tower
950 17th Street, Suite 2600
Denver, Colorado 80202

To

U.S. Fish & Wildlife Service
Marine Mammals Management
1011 Tudor Road
Anchorage, AK 99503

Prepared by

Lynx Enterprises Inc.
Resolution Plaza
1029 W. 3rd Ave., Suite 400
Anchorage, Alaska 99501

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FIGURES

ATTACHMENTS

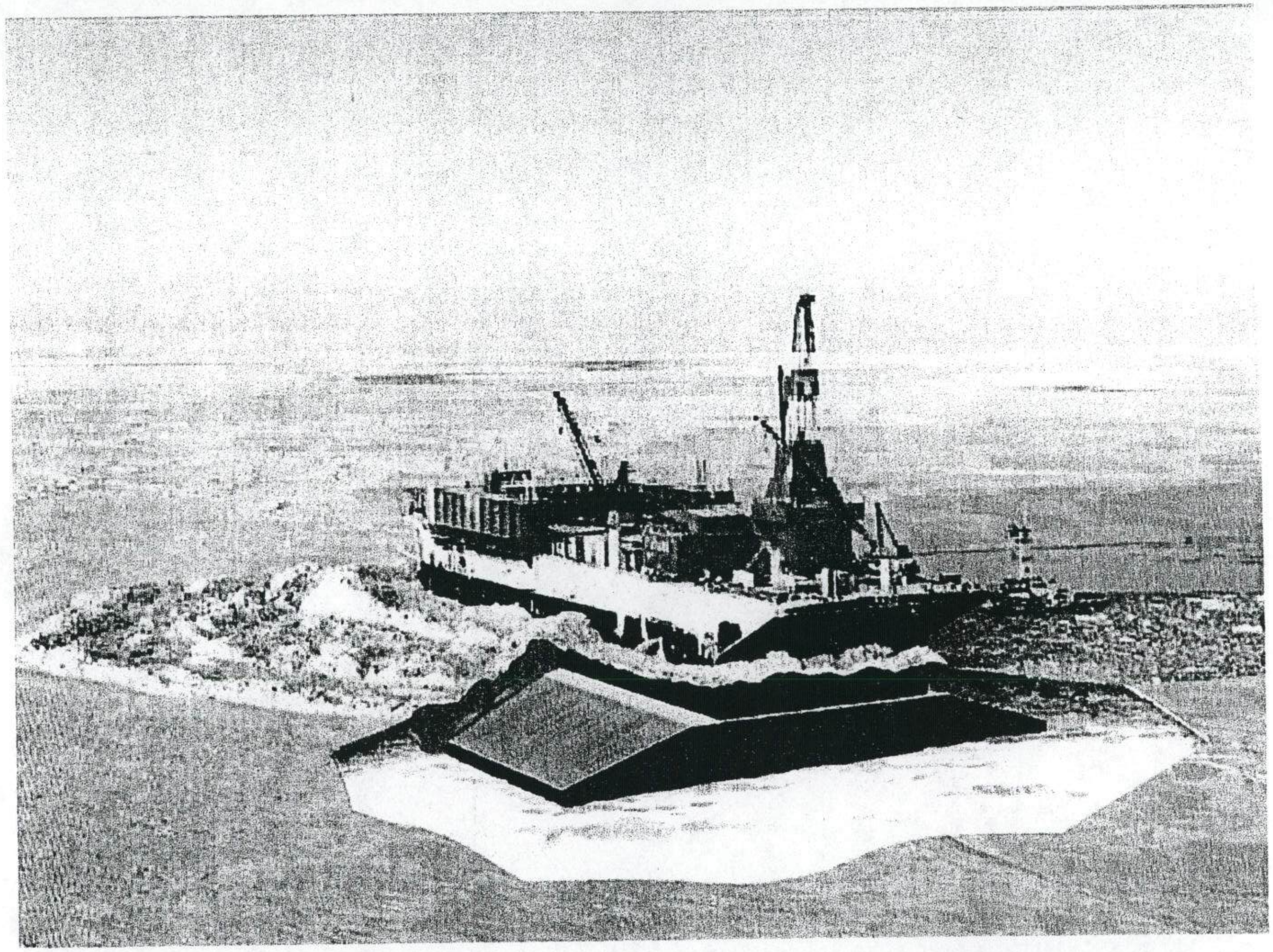
INTRODUCTION

AEC Oil & Gas (USA) Inc. is proposing to conduct an exploratory drilling program during 2002-2003 in the Beaufort Sea, North Alaska. The bottom hole locations will be on federal leases within the McCovey Prospect Area. Depending on the results found in the primary well, well tests may be performed and one sidetrack well may be drilled and tested. The well(s) will be drilled from the Mobil Offshore Drilling Unit (MODU) the SDC/MAT. A schematic of the SDC/MAT system is provided as Figure 1. The SDC/MAT will drill both the primary and sidetrack well (if necessary) from a single surface location. Drilling would begin in November 2002 after the Minerals Management Service (MMS) determines that the ice is fully formed. Drilling and testing would conclude (estimated March 15, 2003) well before spring break-up, which normally occurs in May. A project schedule is provided as Figure 2.

The SDC/MAT is presently stored at Port Clarence, Seward Peninsula, Alaska. Crews will board the SDC in May 2002 to perform a variety of maintenance operations and prepare the rig for movement to the McCovey Prospect Area. The SDC/MAT will be deballasted and towed (mid July early August) by as many as three tugs north to Point Barrow and eastward through the Beaufort Sea to the McCovey Prospect Area (approximately 700 nautical miles).

After the SDC/MAT is sited at McCovey, consumables and ancillary equipment will be transported and loaded onto the vessel. Materials will be transported via barge from West Dock at Prudhoe Bay; and fuel will be transported to the SDC/MAT by barge from the Hay River Refinery in N.W.T. Canada via the McKenzie River and Beaufort Sea. Upon completion of these re-supply operations (approximately 6 to 10 days) the rig will go into a cold stack mode whereby it will be temporarily unmanned ("go quiet") with no personnel on board and no sound producing machinery or generators operating. This mode is different from past uses of the SDC/MAT where during the period after set-down and re-supply, and commencement of drilling activities the SDC/MAT remained in "warm stack" mode during which camp generators were operated and personnel remained onboard. The SDC/MAT will be reactivated for warm-up approximately (October 25, 2002) with drilling operations commencing with timing approved by the MMS.

After the fall whaling season and activation of the SDC, crew changes and camp provisioning will be provided by helicopter based in Deadhorse, Alaska. Should a situation occur that requires overland transport of material to the SDC, rolligon type ATV's will be utilized. These vehicles will not require construction of an ice road and the approximate routes that will be followed are provided as Figure 3.



AEC OIL & GAS (USA) INC.

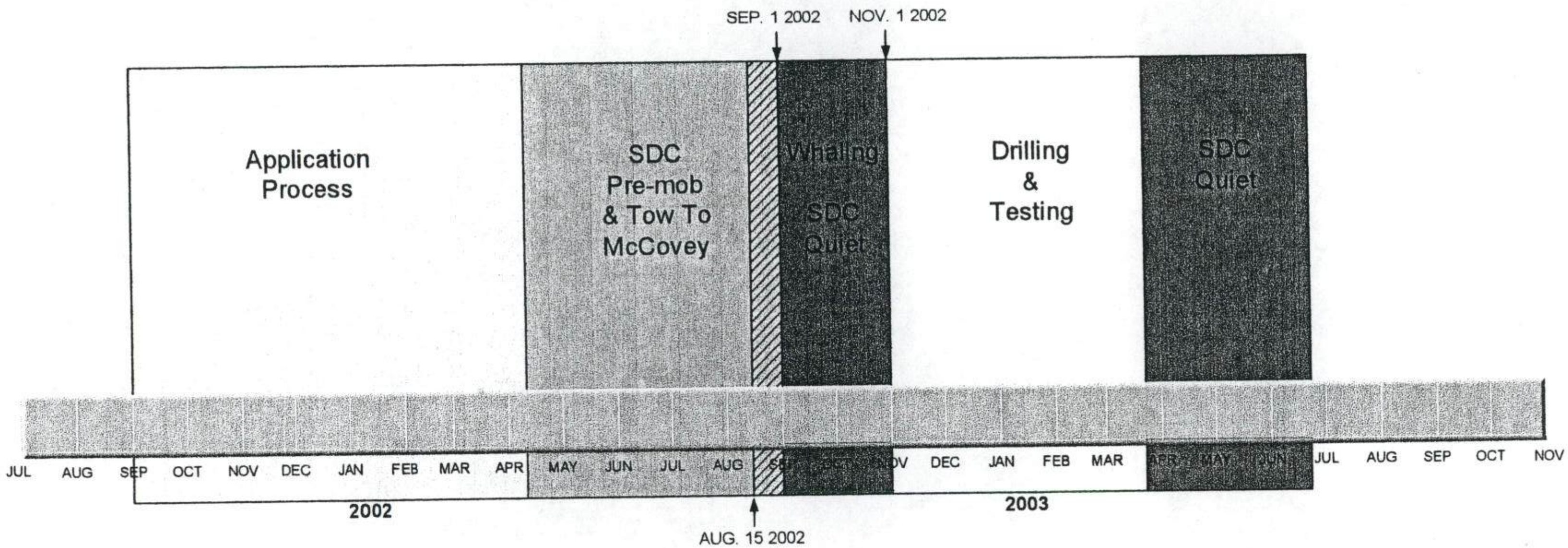
AEC McCovey Exploration Prospect
Polar Bear Awareness and Interaction Plan

SDC/MAT CONFIGURATION

SCALE: Not to Scale

FIGURE: 1

Lynx:aec051.mxd, December 28 2001, Rev1



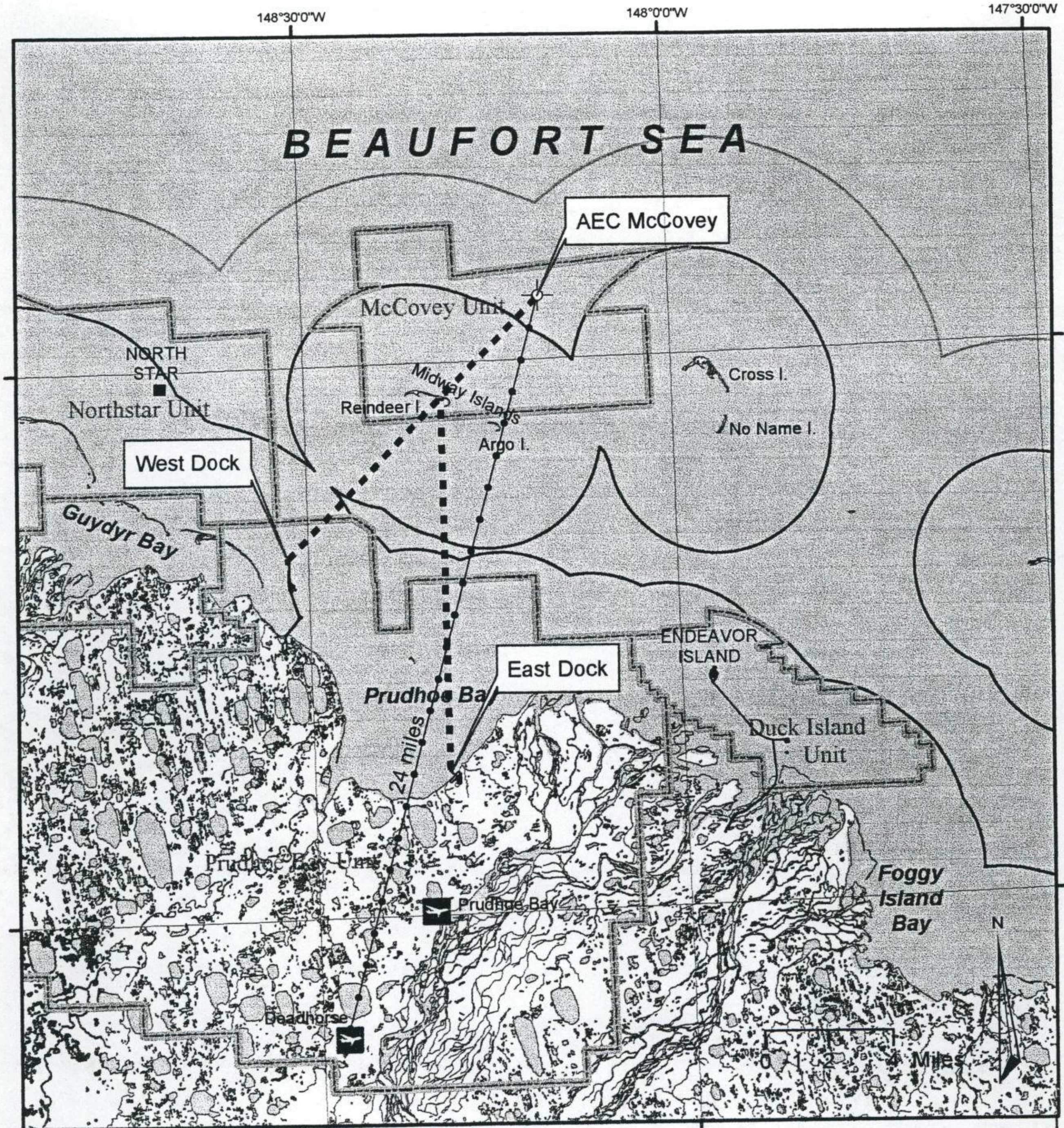
AEC OIL & GAS (USA) INC.

AEC McCovey Exploration Prospect
Polar Bear Awareness and Interaction Plan

PROJECT SCHEDULE

SCALE: N/A	FIGURE: 2

Lynx:aec050.mxd, December 28 2001, Rev1



Horizontal Datum NAD 27, coordinate system Alaska State Plane Zone 4. Hydrology derived from 1:63360 USGS DLG Data.

- Proposed Exploration Well
- Proposed Rolligon /ATV Ice Trail Routes
- Proposed Helicopter Flight Line
- 8(g) Boundary
- Alaska Seaward Boundary
- Oil & Gas Units
- Airport

AEC OIL & GAS (USA) INC.

AEC McCovey Exploration Prospect
Polar Bear Awareness and Interaction Plan

ACCESS ROUTES

SCALE:	FIGURE:
1 inch equals 5 miles	3

Lynx: aec052.mxd, December 28 2001, Rev 1

1. REGULATORY REQUIREMENT

1.1 Protected Status of the Polar Bear

The polar bear is a marine mammal species fully protected by provisions of the Marine Mammals Protection Act (MMPA), 16 U.S.C. § 1371, which states that there is a "moratorium on taking and importing marine mammals and marine mammal products." The MMPA defines "take" in 50 C.F.R. § 216.3 as "to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect or kill any marine mammal. This includes, without limitation, any of the following: The collection of dead animals, or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild." The MMPA also states that it is illegal to "harass, injure, capture, kill, or to attempt to harass, injure, capture, or kill" a marine mammal. The term used to describe any of these activities is "take". The Federal agency responsible for managing polar bears is the United States Fish and Wildlife Service-Marine Mammal Management Section (USFWS-MMMS).

The USFWS published regulations On March 30, 2000 (65 FR 16828) authorizing the incidental, unintentional take of small numbers of polar bears and walrus during oil and gas industry operations year round in the Beaufort Sea and adjacent northern coast of Alaska. The regulations, as codified in 50 CFR Part 18, Subpart J, are effective through March 31, 2003. Regardless of an authorization, this plan presents avoidance and encounter procedures to prevent any "take" of Polar Bears during the McCovey Exploration program.

1.2 Native/Subsistence Policy

The polar bear is also a subsistence resource available to Alaska Natives. Alaska Natives, in cooperation with Canadian Native hunters, have over the past few years developed a management plan to ensure that subsistence takes from this jointly shared Beaufort Sea polar bear population do not exceed biologically acceptable limits. It is likely that members of the McCovey program, AEC and contractor crews, will be Alaska Natives who, as subsistence hunters, might otherwise be authorized to take polar bears. However, Natives employed for any McCovey activity are governed by rules and procedures that extend to all McCovey personnel. During periods of their active employment, when traveling to and from the project area, and during their active service at work locations, no subsistence hunting is in any way authorized. Should a Native crew member be assigned tasks as a Polar Bear Watch (see below) and, in the course of assigned duties, be required to use deterrent measures including the use of firearms, such use is authorized only on the basis of status as a crew member designated to carry out such measures and not because the crew member might otherwise be entitled to subsistence hunting rights.

2. PREVENTION PROGRAM

While human safety is a top priority, it is also important to emphasize that the early detection and avoidance measures are equally designed to prevent encounters that might result in harm to the bears.

Prevention of polar bear encounters is the most effective method to eliminate "takes". Preventive methods include: training, monitoring program, and sighting procedures. These procedures are described in the following sections. Appropriate actions in the event of an encounter are also presented below.

On March 30, 2000 (65 FR 16828) the USFWS published regulations authorizing the incidental, unintentional take of small numbers of polar bears and walrus during oil and gas industry operations year round in the Beaufort Sea and adjacent northern coast of Alaska. Regardless of an authorization this plan presents avoidance and encounter procedures to prevent any takes of Polar Bears during the McCovey Exploration program.

The following programs and site conditions are committed to the McCovey exploratory drilling program as prevention and encounter plans. If rolligon services are needed (e.g., supply during spill event), rolligon contractors will follow the procedures outlined by their separately approved polar bear encounter plans. During any transfer of material or support of operations based at the SDC/MAT, the rolligon personnel will adhere to the stipulations presented in this polar bear avoidance plan.

2.1 Orientation and Training

All project personnel will receive an orientation on the protected status of the polar bear, its biology and life history, and its offshore habitat use. This orientation is included in the basic Environmental Orientation Program. Specific crewmembers will be assigned special responsibilities for scheduled observations, monitoring, and reporting of any polar bear sightings. Major features of the orientation consist of viewing the video "Polar Bears: Safety and Survival," a video prepared by the Alaska Oil & Gas Association, and supplemental direction on the avoidance procedures specified in this plan. All personnel receiving this additional training will be provided a copy of the McCovey Project Polar Bear Encounter Plan Information and Contact Sheet of this plan for their personal reference.

2.2 Engineered Preventive Measures

The physical configuration of the SDC/MAT constitutes the basic preventive defense against human/polar bear encounters. Most operations are conducted on the drilling platform, which is sufficiently protected from polar bear access by virtue of the high (approximately 150 ft) vertical walls, which completely surround the SDC/MAT's support structure. Access routes from the deck area to the sea ice are locked except during conditions that require on-ice activities as described in Section 2.4.

2.3 Best Management Practices to Reduce Bear Attractants

Best Management Practices (BMPs) include general housekeeping procedures that prevent activities that otherwise might attract polar bears to the SDC. BMPs for the exploration program are discussed below.

Garbage is a primary attractant that when properly managed reduces the likelihood of an encounter. All garbage on the SDC must be immediately disposed of in the appropriate containers on the deck or in the quarters. No garbage should be temporarily placed at any other location.

To the extent possible, all meals should be consumed in the mess hall and scrap food disposed of in the appropriate containers for handling. Temporary on-ice work should be conducted to the extent possible that avoids the necessity to take meals off the rig. Should work conditions require snacks or a meal while on-ice the following practices should be followed:

All food should be stored in odor proof containers;

Meals will be consumed in an enclosed area such as the cab of a rolligon; and

All packaging and scrap food will be returned to the SDC for proper disposal.

Other potential bear attractants include drilling fluids and sewage. All drilling material will be stored on the SDC including hazardous material and waste. Drill cuttings and drilling fluids will be discharged to the sea ice under the terms of the NPDES General Permit, AKG-28-4205. Discharge of drilling fluids will be minimized by on-site reuse where possible. Produced reservoir fluids will be re-injected downhole. Used oil will be recycled back to the rig or packaged in drums and hauled to Prudhoe Bay for shipment to an approved recycle facility. The production of hazardous waste is not anticipated in this operation. However, if any hazardous wastes were generated, they would be temporarily stored on the SDC and transported off-site for disposal at an approved facility.

Sewage will be processed in an approved treatment unit on the SDC, and effluent from the unit will be chlorinated. Treated effluent will be discharged to the sea ice under the NPDES general permit. Sewage sludge, kitchen trash, and non-metallic trash from the rig camp will be incinerated, and ash from the incinerator and all other garbage will be hauled to the North Slope Borough waste disposal facility as soon as conditions allow.

2.4 On-ice prevention and procedures

Occasions exist during operation of the SDC when personnel will need to descend to the sea ice. No personnel are permitted to descend from the SDC deck to the sea ice except for the following conditions:

1. Conducting general maintenance and operation requirements such as placement of reflectors;
2. Spill response, including drills;
3. Emergency evacuation, including drills;
4. Placement or retrieval of geophysical equipment;
5. Transfer of personnel or equipment to and from rolligons;

6. Sea ice measurements; and
7. Vertical seismic well profile operations.

On-Ice Procedures

If project personnel must conduct work on the sea ice the following preventive measures should be conducted:

1. Illuminate by floodlight the entire perimeter of the SDC and where work will be performed to enhance detectibility of bears;
2. Conduct a thorough visual survey of the illuminated areas, including the area beneath the cantilevered deck;
3. Conduct a helicopter reconnaissance (if available) of the area within a one mile radius of the SDC;
4. A trained and armed polar bear watch must accompany the worker or crew. Under no circumstance is an unaccompanied worker allowed on the sea ice;
5. Work must be conducted within the area illuminated by the rig lights. If work must be conducted beyond this area, temporary lighting must be established in the area and/or Rolligon or helicopter will support the work; and
6. Any workers or work party on the sea ice will maintain continuous radio contact with one or more bear watch personnel stationed on the SDC.

If a bear or bears are sighted the following immediate actions will be taken:

1. Alert the on-ice crew via radio, voice, or hand signals (if necessary) of the sighting;
2. An audible alarm system on the SDC will be activated for polar bear sighting alert; and
3. On-Ice crew immediately terminates work and returns to the SDC or predetermined protective locations such as the cab of a rolligon or a helicopter.

The use of lighting, radio, rolligon, helicopters, audible alarms, and any other protective measures are for the sole purpose of worker safety. They are not to be used in any manner to harass or deter bears from a work area.

2.5 Observation Procedures, Sightings, and Reporting

The basis for any polar bear encounter plan rests upon early detection of bears. For this reason, designated crew on the SDC or that base operations from the SDC will regularly conduct observations specifically aimed at detecting the presence of polar bears in the vicinity.

Observers

The designated observers aboard the SDC will be rig crew personnel specifically assigned and trained for that duty on a regular basis. Nominated and trained Bear Watchers are listed at the end of this document. Crewmembers who are specifically designated as Polar Bear Watches will receive an additional orientation covering:

Observation techniques;

Anticipated locations where bears are likely to remain beyond open visual identification (ice leads, jumbled ice, structures, or mobile machinery);

Non-lethal deterrence methods (cracker shells, noise, harassment, etc);

The use of firearms in potentially dangerous encounter situations; and

The need to employ three watches in conditions of limited visibility or where sea ice configuration provides ample bear hiding locations.

Experts in polar bear management techniques from the USFWS and ADF&G will assist the training and orientations described above. All rig supervisory personnel (rig foreman, crew chiefs, etc.) who have operational responsibility on location will also receive this training.

Despite training and designation, all project personnel must immediately report any polar bear sightings to their supervisor or the designated watch.

Polar Bear Watch

Observing for polar bears will begin at the commencement of the McCovey operations and continue through to the conclusion of the exploration project. The beginning and end of the McCovey project for the purpose of this Encounter Plan are defined as follows:

Beginning: The time when the SDC is secured by sea ice at the designated drilling location and the rig is manned to commence drilling;

Conclusion: The time when the SDC is placed in warm or cold shut down with no personnel.

Specifically, the polar bear watch will include two walking tours of the SDC deck perimeter during each 12-hour shift to determine the presence or absence of polar bears. The polar bear watch will be responsible for maintaining the Daily Polar Bear Activity Log and Journal provided as Appendix A and Appendix B, respectively. The second major duty of the polar bear watch is to maintain a continuous survey of on-ice work areas in order to alert personnel of the presence of bears so that they can immediately proceed to secure areas and safely return to the SDC. There may be circumstances where deterrence measures must be undertaken simultaneously with the alert given to the on-ice work parties.

Reporting

The Polar Bear Watch is responsible for maintaining the Daily Polar Bear Activity Log and Journal provided as Attachment 1 through Attachment 4. The log consists of individual sighting forms completed for each observation. The Journal is a daily record of all days of observation regardless of whether a sighting is made. Two separate records are maintained to insure the capability of cross-checking during the data Quality Assurance/Quality Control (QA/QC) process. The accurate maintenance of these records is important since it supplies important data to biologists with the USFWS and the ADF&G.

All polar bear data collected in the McCovey exploration program will be submitted to the USFWS-MMMS and the ADF&G within thirty-days (30) of the conclusion of the project. Key contacts with these agencies are:

Mr. John Bridges
USFWS - Marine Mammals
Management Section
1011 E. Tudor Road
Anchorage, AK 99503
Tel. (907) 786-3810
Fax (907) 786-3816

Mr. Dick Shideler
ADF&G - Habitat Division
1300 College Road
Fairbanks, AK 99701-1599
Tel. (907) 459-7283
Fax (907) 459-3091

The scientific management programs depend on systematically collected and recorded observational data on polar bears. Any crewmember or contractor who opportunistically sights a polar bear must immediately communicate the details of that sighting to the designated polar bear watch responsible for maintaining the Log and Journal.

3. AVOIDANCE OF POLAR BEAR DENNING SITES

Polar bear denning occurs both on the sea ice and onshore. USFWS and ADF&G will be consulted to determine whether any polar bear den locations are situated within range of proposed McCovey operations, including helicopter flight patterns from Deadhorse. Flight clearance altitudes of 1,500 feet would be maintained over known active den sites. Any work activities on sea ice or land from Rolligon or geophysical activities will respect a minimum one (1) mile avoidance distance, if practicable. Any denning sites identified during the course of McCovey operations will be reported immediately to the designated USFWS personnel as provided on the contact sheet at the front of this plan.

4. "TAKE" ACTIONS

The combination of early detection and worker awareness will reduce the chance encounters with a polar bear. If a bear should remain on-site for an extended period, the USFWS or ADF&G officials nominated on the notification sheet will be notified for advice on how to apply active deterrence, if necessary. Firearms with rubber bullets, cracker shells, and other noisemakers will be available on site. AEC has been issued a hazing authorization under sections 109 (h)(1) and 112 (c) of the Marine Mammal Protection Act to intentionally take polar bears by hazing under certain circumstances.

If despite all preventive actions, a take occurs to protect a human life the following information must be recorded and actions taken. A designated and trained bear watch is responsible for completion of these measures.

Record all details of the event including time, exact location, bear's behavior, preventive measures followed, etc.;

Record all witness statements;

Notify Mr. John Bridges with USFWS—MMMS at (907) 786-3810 immediately.

If it was a lethal take, transport the entire animal carcass to Deadhorse for sealing and butchering under direction of a responsible agent of the USFWS-MMMS or its designee. USFWS-MMMS will determine the disposition of any useable meat that may result form the butchering (e.g., donation to a neighboring Native Village).

5. ADDITIONAL ACTIVITIES

The other major activity associated with the McCovey project relative to polar bears is the 700 nm transit of the SDC between Port Clarence and the McCovey Prospect. Polar bears are likely to be visually encountered on isolated ice floes during the projected 16-day transit period. Because the SDC and its support vessels will be traveling at approximately 2 knots speed, and will be avoiding ice encounters as much as possible, potential take of polar bears will be limited to potential harassment from noise disturbance. Previous experience with towing of the CIDS in the Beaufort Sea has shown polar bear reactions to this type of operation to be largely unpredictable with a full-range of recorded behaviors including attractive curiosity, indifference, and movements away.

During the tow, all polar bear sightings will be recorded as part of an onboard professional marine mammal monitoring program being conducted as a requirement under a National Marine Fisheries Service Incidental Harassment Authorization (IHA). At the end of the transit, all sighting data, including behavioral and reaction information, will be compiled and transmitted to the USFWS – MMMS representative following both the field data log and polar bear journal formats. Any significant encounters with polar bears during the transit will be reported directly to the USFWS – MMMS representative via phone.

6. PLAN OF COOPERATION

Weather and ice conditions may affect the timing of the relocation of the SDC/MAT, set down, and re-supply. If these conditions are extreme, some activities may be coincident with local residents subsistence activities. A Plan of Cooperation for Conflict Avoidance [Conflict Avoidance Agreement (CAA)] is currently being prepared to identify and mitigate potential conflicts with subsistence activities. The terms of the CAA will coordinated with residents of Kaktovik, Nuiqsut, and Barrow as well as the Alaska Eskimo Whaling Commission.

ATTACHMENT 1 MCCOVEY PROSPECT BEAR WATCH

The following list indicates those personnel trained as a "Bear watch". All sightings and questions should be directed to the Bear Watch on duty aboard the SDC.

Name	Company	Title

ATTACHMENT 2 POLAR BEAR ENCOUNTER PLAN GENERAL FACT SHEET

General Information

Polar Bears are fully protected by a provision of the Marine Mammal Protection Act 16 C.F.R. 1371, which calls for a "moratorium on taking and importing marine mammals and marine mammal products".

"Take" means to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal. This includes, without limitation, any of the following: The collection of dead animals, or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild.

All personnel are party to these regulations, including Alaska Natives employed for any McCovey activity, who might otherwise have authorization to "take" a polar bear.

Encounter Prevention/ Best Management Procedures

All McCovey project personnel must attend a polar bear orientation prior to coming on board the Mobile Offshore Drilling Unit Steel Drilling Caisson (SDC), or immediately upon arrival.

Food and Garbage are the biggest polar bear attractants. Food should be consumed in the mess hall or enclosed areas. All food must be stored in odor free containers. Garbage must be disposed of in labeled containers on board the SDC. No garbage may be otherwise disposed of.

Trained and designated Polar Bear Watches are always present on the rig. Become familiar with who this person(s) is. Refer any questions about the Polar Bear Encounter Plan to the designated bear watch or your supervisor.

On-Ice Procedures

1. If project personnel must conduct work on the sea ice the following preventive measures must be conducted:
2. Illuminate by floodlight the entire perimeter of the SDC to enhance bear detection observations;
3. Conduct a thorough visual survey of the illuminated areas including the area beneath the cantilevered deck;
4. Conduct a helicopter reconnaissance (if available) of the area within a one mile radius of the SDC;
5. A trained and armed polar bear watch must accompany the worker or crew. Under no circumstance is an unaccompanied worker allowed on the sea ice;
6. Work must be conducted within the illuminated area. If work must be conducted beyond this area, temporary lighting must be established in the area and/or Rolligon

ATTACHMENT 3 NOTIFICATION FLOW CHART

BEAR SIGHTED

Report
to a
Designated
Bear Watch

↓

Complete
Bear Sighting Report

BEAR PERSISTANT AND REPEATED VISITS PREVENT ON ICE ACTIVITIES

Contact
John Bridges / Scott Schliebe
USFWS
907-786-3800 (work)
907-346-1423 (home)
or
Dick Shidler / Al Ott
ADF&G
907-459-7289 (work)
907-456-6897 (home)
for
Advice on Apropriate Deterent
and/or
Actions

↓

Record Recommendation and
Action on
Sighting Report
Including if Deterent Was
Successful

↓

Notify
Soren Christiansen
Alberta Energy Corporation
of Actions

LETHAL TAKE OF POLAR BEAR

Immediately Notify
John Bridges / Scott Schliebe
USFWS 907-786-3800 (work)
907-346-1423 (home)
or
Dick Shidleler, ADF&G
907-459-7289 (work)
907-456-6897 (home)

↓

Immediately Notify
Soren Christiansen
Alberta Energy Corporation

↓

Record All Details

↓

Record
Witness Statements

↓

Protect Entire Carcass
From Disturbance by
Workers or Scavengers

↓

Transport Carcass to
Deadhorse as Directed by
USFWS or ADF&G

ATTACHMENT 4 DAILY POLAR BEAR ACTIVITY LOG

Date: ________ Time: ________

Location:____

____

____

Observer Name:____

Weather Conditions: Fog _______ Snow ___________ Rain ______ Clear ______

Wind Speed ______

Wind Direction ____ Approx. Temp ___

Total number of Bears: ___ Sow/cubs ___/___ Adult ______ Subadult ________

Estimated distance of bear from personnel/facility: __________/__________

Possible attractants present: ____

Bear behavior: Curious __ Aggressive ___ Predatory ____Other __________

Description of Encounter: ____

____

____

Injuries sustained: Personnel ____

Polar bear ____

Deterrents used/distance: Vehicle ____ Noise-maker _________ Firearms ___

Other __________________

Duration of encounter: ____

Agency/AEC Contacts:

USFWS____________________ Time: ______ Date: ______

ADF&G____________________ Time: ______ Date: ______

AEC _________________ Time: ______ Date: ______

AEC representative:_________________________ Date: ______

For Additional Information Contact: ***Fill in Name Here with phone number***

Recordedi By: ________________________ **Date:** __________

Print Name

____

Signature

ENTRY: Maximum Visibility: ______________ (mi) (yds) ______________ (hrs)

GENERAL WEATHER CONDITIONS:

____

____

____

____

____

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SIGHTINGS:

____

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____

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OTHER COMMENTS:

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Weather Conditions Example: Overcast, clear, winds 3-5 knots from NE, no new snow but some slight blowing snow. 13:50-17:00 when winds picked up to 7-10 knots temporarily.

Sighting Example:

1) No bears sighted during past 24 hours
2) Sighted two polar bears approximately 500 yards WSW of SDC walking in NWly direction. Stopped to sniff air three times, but otherwise ignored SDC.
3) Observed 06:30-09:00 last seen walking NWly.

Other Comments Example: Helicopter circled MODU at 11:15-11:25 for signs of Polar Bears in vicinity; saw single set of tracks indicating fairly recent movement in NWly direction; followed tracks 3 miles from MODU but saw no bears. Ice thickness and current movement measurements were conducted 12:30-13:15, no bears sighted.

or helicopter will support the work;

7. Any workers or work party on the sea ice will maintain continuous radio contact with one or more bear watch personnel stationed on the SDC.

Bear Sightings

1. If a bear is sighted while personnel are on ice, alert the on-ice crew via radio, voice, or hand signals (if necessary) of the sighting;
2. The on-ice crew is to immediately terminate work and return to the MODU or predetermined protective locations such as the cab of a rolligon or a helicopter.

Procedure In The Event Of A Take

1. Record all details of the event including time, exact location, bear's behavior, preventive measures followed, etc;
2. Record all witness statements;
3. Notify Mr. John Bridges with USFWS—MMMS at (907) 786-3810 immediately;
4. If it was a lethal take, transport the entire animal carcass to Deadhorse for sealing and butchering under direction of a responsible agent of the USFWS or its designee. USFWS will determine the disposition of any useable meat that may result from the butchering (e.g. donation to a neighboring Native Village).

APPENDIX *J*

COASTAL PROJECT QUESTIONNAIRE AND CERTIFICATION STATEMENT (CPQ)

Coastal Project Questionnaire and Certification Statement

Please answer all questions. To avoid a delay in processing, **please call the department if you answer "yes" to any of the questions related to that department**. Maps and plan drawings must be included with your packet.
An incomplete packet will be returned.

■ APPLICANT INFORMATION

1. **Kevin Bolton, AEC Oil & Gas (USA) Inc.**
Name of Applicant
US Bank Tower, 950 17th Street, Suite 2600
Address
Denver, Colorado **80202**
City/State Zip Code
(403) 261-2426
Daytime Phone
(403) 716-2426 **kevinbolton@aec.ca**
Fax Number E-mail Address

2. **Mark Schindler, Lynx Enterprises, Inc.**
Agent (or responsible party if other than applicant)
1029 W. 3rd Avenue, Suite 400
Address
Anchorage Alaska **99501**
City/State Zip Code
907-277-4611
Daytime Phone
907-277-4717 **mschindler@lynxalaska.com**
Fax Number E-mail Address

■ PROJECT INFORMATION

Yes No

1. This activity is a: ☒ new project ☐ modification or addition to an existing project
If a modification, do you currently have any State, federal or local approvals related to this activity?.......... ☒ Yes ☐ No
Note: Approval means any form of authorization. If "yes," please list below:

Approval Type	Approval #	Issuance Date	Expiration Date
EPA NPDES	**GPAKG-28-4205**	**May 1,2000**	

2. If a modification, has this project ever been reviewed by the State of Alaska under the ACMP?.......... ☐ Yes ☐ No
Previous State I.D. Number: **AK 0009-02PA** Previous Project Name: **PAI McCovey Exploration Drilling**

■ PROJECT DESCRIPTION

1. Provide a brief description of your entire project and ALL associated facilities and land use conversions. Attach additional sheet(s) as needed.

AEC Oil & Gas (USA) Inc. (AEC) is proposing to conduct oil and gas exploration activities in the McCovey Unit, Steffanson Sound Alaska during the 2002-2003 winter drilling season (Figure 1). The drilling will be conducted from the Mobile Offshore Drilling Unit (MODU) known as the SDC/MAT System. The area of interest covered by this Exploration Plan lies entirely within the Federal Outer Continental Shelf (OCS) Leases (Figure 2). The proposed program includes a single proposed exploration well, hereinafter referred to as "AEC McCovey No. 1" that is programmed to be drilled from a surface location in federal OCS Lease Block Y-1577 to a bottom hole location on OCS Lease block Y-1578.

Proposed starting date for project: **July 2002** Proposed ending date for project: **August 2003**

2. Attach the following: • a detailed description of the project, all associated facilities, and land use conversions, etc. (Be specific, including access roads, caretaker facilities, waste disposal sites, etc.); • a project timeline for completion of all major activities in the proposal; • a site plan depicting property boundary with all proposed actions; • other supporting documentation that would facilitate review of the project. Note: If the project is a modification, identify existing facilities as well as proposed changes on the site plan.

■ PROJECT LOCATION

The AEC McCovey No. 1 drilling location lies approximately 12.5 miles northeast of West Dock at Prudhoe bay, 60 miles northeast of Nuiqsut, 5.3 miles northwest of Cross Island, dan 110 miles northwest of Kaktovik.

1. Attach a copy of the topographical and vicinity map clearly indicating the location of the project. Please include a map title and scale.

2. The project is located in which region (see attached map): ☒ Northern ☐ Southcentral ☐ Southeast
   ☐ within or associated with the Trans-Alaska Pipeline corridor

3. Location of project (Include the name of the nearest land feature or body of water.) **Steffanson Sound, Beaufort Sea**
   Township ____ Range ____ Section ____ Meridian ____ Latitude/Longitude 70°31'44" / 148°10'41" USGS Quad Map **Beechey Point**

4. Is the project located in a coastal district? Yes ☐ No ☒ If yes, identify: ____________
   (Coastal districts are a municipality or borough, home rule or first class city, second class with planning, or coastal resource service area.)
   Note: A coastal district is a participant in the State's consistency review process. It is possible for the State review to be adjusted to accommodate a local permitting public hearing. Early interaction with the district is important; ***please contact the district representative listed on the attached contact list.***

5. Identify the communities closest to your project location: **Nuiqsut, Kaktovik, Barrow**

6. The project is on: ☐ State land or water* ☒ Federal land ☐ Private land
   ☐ Municipal land ☐ Mental Health Trust land
   **State land can be uplands, tidelands, or submerged lands to 3 miles offshore. See Question #1 in DNR section.*
   Contact the applicable landowner(s) to obtain necessary authorizations.

■ DEPARTMENT OF ENVIRONMENTAL CONSERVATION (DEC) APPROVALS

	Yes	No
1. Will a discharge of wastewater from industrial or commercial operations occur?	☒	☐
Will the discharge be connected to an already approved sewer system?	☒	☐
Will the project include a stormwater collection/discharge system?	☒	☐
2. Do you intend to construct, install, modify, or use any part of a wastewater (sewage or greywater) disposal system?	☒	☐
a) If so, will the discharge be 500 gallons per day or greater?	☒	☐
b) If constructing a domestic wastewater treatment or disposal system, will the system be located within fill material requiring a COE permit?	☐	☒
If you answered yes to a) or b), answer the following:		
1) What is the distance from the bottom of the system to the top of the subsurface water table? Operations will be conducted in frozen ocean conditions, with discharge to ice surface		
2) How far is any part of the wastewater disposal system from the nearest surface water? **@10 feet**		
3) Is the surrounding area inundated with water at any time of the year?	☒	☐
4) How big is the fill area to be used for the absorption system? **N/A**		
(Questions 1 & 2 will be used by DEC to determine whether separation distances are being met; Questions 3 & 4 relate to the required size of the fill if wetlands are involved.)		

	Yes	No
3. Do you expect to request a mixing zone for your proposed project? *(If your wastewater discharge will exceed Alaska water quality standards, you may apply for a mixing zone. If so, please contact DEC to discuss information required under 18 AAC 70.032.)*	☐	☒
4. a) Will your project result in the construction, operation, or closure of a facility for the disposal of solid waste? *(Note: Solid waste means drilling wastes, household garbage, refuse, sludge, construction or demolition wastes, industrial solid waste, asbestos, and other discarded, abandoned, or unwanted solid or semi-solid material, whether or not subject to decomposition, originating from any source. Disposal means placement of solid waste on land.)*	☒	☐
b) Will your project result in the treatment of solid waste at the site? *(Examples of treatment methods include, but are not limited to: incineration, open burning, baling, and composting.)*	☒	☐
c) Will your project result in the storage or transfer of solid waste at the site?	☒	☐
d) Will the project result in the storage of more than 50 tons of materials for reuse, recycling, or resource recovery?	☐	☒
e) Will any sewage solids or biosolids be disposed of or land-applied to the site? *(Sewage solids include wastes that have been removed from a wastewater treatment plant system, such as a septic tank, lagoon dredge, or wastewater treatment sludge that contain no free liquids. Biosolids are the solid, semi-solid, or liquid residues produced during the treatment of domestic septage in a treatment works which are land applied for beneficial use.)*	☐	☒
5. Will your project require the application of oil, pesticides, and/or any other broadcast chemicals?	☐	☒
6. a) Will you have a facility with industrial processes that are designed to process no less than *five tons per hour* and needs air pollution controls to comply with State emission standards?	☐	☒
b) Will you have stationary or transportable fuel burning equipment, including flares, with a total fuel consumption capacity no less than 50 million Btu/hour?	☒	☐
c) Will you have a facility with incinerators having a total charging capacity of no less than 1,000 pounds per hour?	☐	☒
d) Will you have a facility with equipment or processes that are subject to Federal New Source Performance Standards or National Emission Standards for hazardous air pollutants?	☐	☒
i) Will you propose exhaust stack injection?	☐	☒
e) Will you have a facility with the potential to emit no less than 100 tons per year of any regulated air contaminant?	☒	☐
f) Will you have a facility with the potential to emit no less than 10 tons per year of any hazardous air contaminant or 25 tons per year of all hazardous air contaminants?	☐	☒
g) Will you construct or add stationary or transportable fuel burning equipment of no less than 10 million Btu/hour in the City of Unalaska or the City of St. Paul?	☐	☒
h) Will you construct or modify in the Port of Anchorage a volatile liquid storage tank with a volume no less than 9,000 barrels, or a volatile liquid loading rack with a design throughput no less than 15 million gallons?	☐	☒
i) Will you be requesting operational or physical limits designed to reduce emissions from an existing facility in an air quality nonattainment area to offset an emission increase from another new of modified facility?	☐	☒
7. Will you be developing, constructing, installing, or altering a public water system?	☐	☒

	Yes	No
8. a) Will your project involve the operation of waterborne tank vessels or oil barges that carry crude or non-crude oil as bulk cargo, or the transfer of oil or other petroleum products to or from such a vessel or a pipeline system?	☐	☒
b) Will your project require or include onshore or offshore oil facilities with an effective aggregate storage capacity of greater than 5,000 barrels of crude oil or greater than 10,000 barrels of non-crude oil?	☒	☐
c) Will you be operating facilities on the land or water for the exploration or production of hydrocarbons?	☒	☐

If you answered "NO" to ALL questions in this section, continue to next section.
If you answered "YES" to ANY of these questions, contact the DEC office nearest you for information and application forms. Please be advised that all new DEC permits and approvals require a 30-day public notice period. DEC Pesticide permits take effect no sooner than 40 days after the permit is issued.

Based on your discussion with DEC, please complete the following:

Types of project approvals or permits needed ______________________ Date application submitted ______________

	Yes	No
9. Does your project qualify for a general permit for wastewater or solid waste? *Note: A general permit is an approval issued by DEC for certain types of routine activities.*	☒	☐

If you answered "YES" to any questions in this section and are not applying for DEC permits, indicate reason:

☐ ______________ (DEC contact) told me on ____________ that no DEC approvals are required on this project because______________________

☒ Other: Federal jurisdiction on OCS; ACMP review is only Alaskan Approval required

■ DEPARTMENT OF FISH & GAME (DFG) APPROVALS

	Yes	No
1. Will you be working in, removing water or material from, or placing anything in, a stream, river or lake? (This includes work or activities below the ordinary high water mark or on ice, in the active flood plain, on islands, in or on the face of the banks, or, for streams entering or flowing through tidelands, above the level of mean lower low tide.) *Note: If the proposed project is located within a special flood hazard area, a floodplain development permit may be required. Contact the affected city or borough planning department for additional information and a floodplain determination.)* Name of waterbody: **Steffanson Sound, Beaufort Sea**	☒	☐
2. Will you do any of the following:	☐	☒

Please indicate below:

- ☐ Build a dam, river training structure, other instream impoundment, or weir
- ☐ Use the water
- ☐ Pump water into or out of stream or lake (including dry channels)
- ☐ Divert or alter the natural stream channel
- ☐ Change the water flow or the stream channel
- ☐ Introduce silt, gravel, rock, petroleum products, debris, brush, trees, chemicals, or other organic/inorganic material, including waste of any type, into the water
- ☐ Alter, stabilize or restore the banks of a river, stream or lake (provide number of linear feet affected along the bank(s)

	Yes	No
☐ Mine, dig in, or remove material, including woody debris, from the beds or banks of a waterbody ☐ Use explosives in or near a waterbody ☐ Build a bridge (including an ice bridge) ☐ Use the stream, lake or waterbody as a road (even when frozen), or cross the stream with tracked or wheeled vehicles, log-dragging or excavation equipment (backhoes, bulldozers, etc.) ☐ Install a culvert or other drainage structure ☐ Construct, place, excavate, dispose or remove any material below the ordinary high water of a waterbody ☐ Construct a storm water discharge or drain into the waterbody ☐ Place pilings or anchors ☐ Construct a dock ☐ Construct a utility line crossing ☐ Maintain or repair an existing structure ☐ Use an instream in-water structure not mentioned here		
3. Is your project located in a designated State Game Refuge, Critical Habitat Area or State Game Sanctuary?	☐	☒
4. Does your project include the construction/operation of a salmon hatchery?	☐	☒
5. Does your project affect, or is it related to, a previously permitted salmon hatchery?	☐	☒
6. Does your project include the construction of an aquatic farm?	☐	☒

If you answered "No" to ALL questions in this section, continue to next section.
If you answered "Yes" to ANY questions under 1-3, contact the Regional or Area DFG Habitat and Restoration
Division Office for information and application forms.
If you answered "Yes" to ANY questions under 4-6, contact the DFG Commercial Fisheries Division headquarters for information and application forms.

Based on your discussion with DFG, please complete the following:

Types of project approvals or permits needed	Date application submitted
____________________	____________
____________________	____________

If you answered "YES" to any questions in this section and are not applying for DFG permits, indicate reason:

☐ **________________ (DFG contact) told me on ____________ that no DFG approvals are required on this project because________________________**

☒ **Other: Federal jurisdiction on OCS; ACMP review is only Alaskan Approval required**

■ DEPARTMENT OF NATURAL RESOURCES (DNR) APPROVALS

	Yes	No
1. Is the proposed project on State-owned land or water or will you need to cross State-owned land for access? ("Access" includes temporary access for construction purposes. *Note: In addition to State-owned uplands, the State owns almost all land below the ordinary high water line of navigable streams, rivers and lakes, and below the mean high tide line seaward for three miles.)*	☐	☒
a) Is this project for a commercial activity?	☒	☐

	Yes	No
2. Is the project on Alaska Mental Health Trust land (AMHT) or will you need to cross AMHT land? *Note: Alaska Mental Health Trust land is not considered State land for the purpose of ACMP reviews.*	☐	☒
3. Do you plan to dredge or otherwise excavate/remove materials on State-owned land? Location of dredging site if different than the project site: ______ Township ______ Range ______ Section ______ Meridian ______ USGS Quad Map ______	☐	☒
4. Do you plan to place fill or dredged material on State-owned land? Location of fill disposal site if other than the project site: ______ Township ______ Range ______ Section ______ Meridian ______ USGS Quad Map ______ Source is on: ☐ State Land ☐ Federal Land ☐ Private Land ☐ Municipal Land	☐	☒
5. Do you plan to use any of the following State-owned resources: ☐ ***Timber***: Will you be harvesting timber? Amount: ______ ☐ ***Materials such as rock, sand or gravel, peat, soil, overburden, etc.***: Which material? ______ Amount: ______ Location of source: ☐ Project site ☐ Other, describe: ______ Township ______ Range ______ Section ______ Meridian ______ USGS Quad Map ______	☐	☒
6. Are you planning to divert, impound, withdraw, or use any fresh water, except from an existing public water system or roof rain catchment system (regardless of land ownership)?	☐	☒
Amount (maximum daily, not average, in gallons per day): ______ Source: ______ Intended Use: ______ If yes, will your project affect the availability of water to anyone holding water rights to that water?	☐	☐
7. Will you be building or altering a dam (regardless of land ownership)?	☐	☒
8. Do you plan to drill a geothermal well (regardless of land ownership)?	☐	☒
9. At any one site (regardless of land ownership), do you plan to do any of the following? ☐ Mine five or more acres over a year's time ☐ Mine 50,000 cubic yards or more of materials (rock, sand or gravel, soil, peat, overburden, etc.) over a year's time ☐ Have a cumulative unreclaimed mined area of five or more acres. If yes to any of the above, contact DNR about a reclamation plan.	☐	☒
If you plan to mine less than the acreage/amount stated above and have a cumulative unreclaimed mined area of less than five acres, do you intend to file a voluntary reclamation plan for approval?	☐	☐
10. Will you be exploring for or extracting coal?	☐	☒
11. a) Will you be exploring for or producing oil and gas?	☒	☐
b) Will you be conducting surface use activities on an oil and gas lease or within an oil and gas unit?	☒	☐
12. Will you be investigating, removing, or impacting historical or archaeological or paleontological resources (anything over 50 years old) on State-owned land?	☐	☒
13. Is the proposed project located within a known geophysical hazard area? *Note: 6 AAC 80.900(9) defines geophysical hazard areas as "those areas which present a threat to life or property from geophysical or geological hazards, including flooding, tsunami run-up, storm surge run-up, landslides, snowslides, faults, ice hazards, erosion, and littoral beach process." "known geophysical hazard area" means any area identified in a report or map published by a federal, state, or local agency, or by a geological or engineering consulting firm, or generally known by local knowledge, as having known or potential hazards from geologic, seismic, or hydrologic processes.*	☒	☐
14. Is the proposed project located in a unit of the Alaska State Park System?	☐	☒

	Yes	No
If you answered "No" to ALL questions in this section, continue to Federal Approvals section. **If you answered "Yes" to ANY questions in this section, contact DNR for information.**		

Based on your discussion with DNR, please complete the following:

Types of project approvals or permits needed	Date application submitted
____________________	____________
____________________	____________

If you answered "YES" to any questions in this section and are not applying for DNR permits, indicate reason:

☐ ____________ **(DNR contact) told me on** ____________ **that no DNR approvals are required on this project because**____________

☒ **Other: Federal jurisdiction on OCS; ACMP review is only Alaskan Approval required........**

■ FEDERAL APPROVALS

	Yes	No
	Yes	**No**
U.S. Army Corps of Engineers (COE)		
1. Will you be dredging or placing structures or fills in any of the following: tidal (ocean) waters? streams? lakes? wetlands*?	☒	☐
If yes, have you applied for a COE permit?	☒	☐
Date of submittal: **January 2002**		
(Note: Your application for this activity to the COE also serves as application for DEC Water Quality Certification.)		
**If you are not certain whether your proposed project is in a wetlands (wetlands include muskegs), contact the COE, Regulatory Branch at (907) 753-2720 for a wetlands determination (outside the Anchorage area call toll free 1-800-478-2712).*		
Bureau of Land Management (BLM)		
2. Is the proposed project located on BLM land, or will you need to cross BLM land for access?	☐	☒
If yes, have you applied for a BLM permit or approval?	☐	☐
Date of submittal: ____________		
U.S. Coast Guard (USCG)		
3. a) Will you be constructing a bridge or causeway over tidal (ocean) waters, or navigable rivers, streams or lakes?	☐	☒
b) Does your project involve building an access to an island?	☐	☒
c) Will you be siting, constructing, or operating a deepwater port?	☐	☒
If yes, have you applied for a USCG permit?	☐	☐
Date of submittal:		

	Yes	No
U.S. Environmental Protection Agency (EPA)		
4. a) Will the proposed project have a discharge to any waters?	☒	☐
b) Will you be disposing of sewage sludge (contact EPA at 206-553-1941)?	☒	☐
If you answered yes to a) or b), have you applied for an EPA National Pollution Discharge Elimination System (NPDES) permit?	☒	☐
Date of submittal: **PAI McCovey Issued May 1, 2000, GP being transferred to AEC**		
(Note: For information regarding the need for an NPDES permit, contact EPA at (800) 424-4372.)		
c) Will construction of your project expose 5 or more acres of soil? *(This applies to the total amount of land disturbed, even if disturbance is distributed over more than one season, and also applies to areas that are part of a larger common plan of development or sale.)*	☐	☒
d) Is your project an industrial facility which will have stormwater discharge which is directly related to manufacturing, processing, or raw materials storage areas at an industrial plant?	☐	☒
If you answered yes to c) or d), your project may require an NPDES Stormwater permit. Contact EPA at 206-553-8399.		
Federal Aviation Administration (FAA)		
5. a) Is your project located within five miles of any public airport?	☐	☒
b) Will you have a waste discharge that is likely to decay within 5,000 feet of any public airport?	☐	☒
If yes, please contact the Airports Division of the FAA at (907) 271-5444.		
Federal Energy Regulatory Commission (FERC)		
6. a) Does the project include any of the following:		
1) a non-federal hydroelectric project on any navigable body of water	☐	☒
2) a location on federal land (including transmission lines)	☒	☐
3) utilization of surplus water from any federal government dam	☐	☒
b) Does the project include construction and operation, or abandonment of natural gas pipeline facilities under sections (b) and (c) of the Federal Power Act (FPA)?	☐	☒
c) Does the project include construction for physical interconnection of electric transmission facilities under section 202 (b) of the FPA?	☐	☒
If you answered yes to any questions under number 6, have you applied for a permit from FERC?	☐	☐
Date of submittal: ______		
(Note: For information, contact FERC, Office of Hydropower Licensing (202) 219-2668; Office of Pipeline Regulation (202) 208-0700; Office of Electric Power Regulation (202) 208-1200.)		
U.S. Forest Service (USFS)		
7. a) Does the proposed project involve construction on USFS land?	☐	☒
b) Does the proposed project involve the crossing of USFS land with a water line?	☐	☒
If the answer to either question is yes, have you applied for a USFS permit or approval?	☐	☐
Date of submittal: ______		
8. Have you applied for any other federal permits or authorizations?	☐	☐

AGENCY	APPROVAL TYPE	DATE SUBMITTED
Minerals Management Service	**Exploration Plan**	**January 2002**
Minerals Management Service	**Application for Permit to Drill**	**March 2002**
Environmental Protection Agency	**Part 55 OCS Air Permit**	**November 2001**

Please be advised that the CPQ identifies permits subject to a consistency review. You may need additional permits
from other agencies or the affected city and/or borough government to proceed with your activity.

Certification Statement

The information contained herein is true and complete to the best of my knowledge. I certify that the proposed activity complies with, and will be conducted in a manner consistent with, the Alaska Coastal Management Program.

Signature of Applicant or Agent — Date: Jan 15, 2002

Note: Federal agencies conducting an activity that will affect the coastal zone are required to submit a federal consistency determination, per 15 CFR 930, Subpart C, rather than this certification statement. DGC has developed a guide to assist federal agencies with this requirement. Contact DGC to obtain a copy.

This certification statement will not be complete until all required State and federal authorization requests have been submitted to the appropriate agencies.

- **To complete your packet, please attach your State permit applications and copies of your federal permit applications to this questionnaire.**

APPENDIX K

USEPA NOTICE OF INTENT – OCS AIR PERMIT APPLICATION

AEC

AEC Oil & Gas

November 23, 2001

Mr. Daniel L. Meyer
Office of Air Quality
U.S. EPA, Region X
1200 Sixth Ave, OAQ-107
Seattle, WA 98101
U.S.A.

Dear Mr. Meyer

Re Notice of Intent – McCovey Prospect – Beaufort Sea OCS

The McCovey Prospect is a proposed petroleum drilling exploration project on the Outer Continental Shelf (OCS) of the Beaufort Sea, approximately 13 miles north of Prudhoe Bay, Alaska. The proposed project schedule is to position the drill platform (the SDC) in August, 2002 and to begin drilling in November, 2002. AEC Oil & Gas (USA) Inc. ("AEC") submits the enclosed notice of intent ("NOI") to satisfy the requirements of 40 CFR 55.4(a) and (b) for an exploratory outer continental shelf ("OCS") source. The enclosed NOI describes the McCovey Prospect and the sources (including associated vessels) that make up the SDC facility. The emissions will be limited in such a way that the facility will be a synthetic minor source with respect to PSD review.

To meet the above drilling schedule AEC, the project operator, will need a Pre-Construction Permit by April, 2002. As this requires a somewhat expeditious processing of the NOI, the associated modeling protocol, and the application for the pre-construction permit, we make ourselves available to assist in whatever ways may be appropriate to process these documents, including this NOI. We will follow this NOI submission immediately with the dispersion modeling protocol and soon thereafter the application for pre-construction permit. If you have any questions regarding this submittal, please contact Mr. Rodger Steen, Air Sciences Inc., at (303) 988-2960, ext. 308. For any questions about our project, please contact Mr. Soren Christiansen, with AEC, at (403) 261-2464.

Sincerely

AEC Oil & Gas
on behalf of
AEC OIL & GAS (USA) INC.

Kevin Bolton, Land Manager
New Ventures – Alaska Project

Enclosure

cc: James Baumgartner – ADEC
√Glenn Ruckhaus – Lynx Enterprises, Inc.
Roger Steen – Air Sciences Inc.

AIR SCIENCES INC

NOTICE OF INTENT
MCCOVEY PROSPECT
BEAUFORT SEA OCS

AEC OIL AND GAS
(USA) INC.

PROJECT 180-1
NOVEMBER 2001

NOTICE OF INTENT
(TO SUBMIT AN APPLICATION FOR PRE-CONSTRUCTION PERMIT)
MCCOVEY EXPLORATION PROSPECT - BEAUFORT SEA

The following items are the required content of a Notice of Intent (NOI) per the provisions of 40 CFR 55.4(b). This NOI has been organized with the requirements in the same order as found in the CFR. The required information is contained in the response immediately following each requirement.

Requirement (1): General Company Information

Drilling Contractor's Name: Fairweather E & P Services, Inc.
Drilling Contractor's Address: 715 L. Street, Anchorage, AK 99501
Contact Name: Mr. Bill Penrose
Contact Phone Number: (907) 258-3446

Operator's (Permittee's) Name: AEC Oil and Gas (USA) Inc. ("AEC")

Facility Site Contact: Mr. Soren Christiansen
Contact Phone Number: (403) 261-2464

Requirement (2): Facility Description

The McCovey Prospect is to be an exploratory drilling project (SIC code 1381) at a location 12.5 miles north of Prudhoe Bay in the Beaufort Sea. As shown on the attached figure (Attachment A), this location is 4.3 miles from the Midway Islands, the nearest islands. This location is in Federal Waters and is considered to be on the Outer Continental Shelf on OCS block 6514. The nearest State of Alaska waters are approximately one mile south of the project site.

The McCovey Prospect will utilize the mobile offshore drilling unit (MODU) known as the SDC. The SDC is a converted tanker that has been mated with a large supporting structure called the MAT. The SDC has been used in the Beaufort Sea previously and was last used for the Cabot Project drilled by ARCO in 1992. The SDC is designed to be ballasted to the ocean floor as the anchor, which for the McCovey Prospect is 37 feet below the surface. The drilling platform is on the vessel's main deck and will be approximately 90 feet above sea level (ASL). All combustion sources, consisting of internal combustion engines, boilers, heaters, and an incinerator, will be diesel-fired. There will be a test flare for purposes of combusting field gas released from the well. One well and one sidetrack will be included in this exploratory project, which includes testing of both wells.

This exploratory process consists of three phases, placement of the SDC, drilling, and cold stack. The SDC will be towed from its current location at Pt. Clarence to the McCovey site during July and August 2002. At McCovey, the SDC will be ballasted to the sea floor and loaded with consumables and fuel. Drilling is to proceed for the five-month period from November 2002 through March 2003 at the latest. Upon completion of the drilling program, the SDC will be placed into a cold stack/quiet mode until completion of the project evaluation. Any future drilling or movement of the SDC will depend upon the drilling and testing results. During the drilling season, there may be flaring of gas from a well, which will last for no more than a maximum of six weeks.

Requirement (3): Estimate of the proposed project's potential emissions [PTE].

Annual McCovey Prospect potential emission estimates are presented in Table 1, with the calculation of emissions by source provided on the attached calculations (Attachment B). These emissions represent the project emissions restricted by proposed federally enforceable operational limits (listed under Requirement (7)). For purposes of determining the PSD review applicability, the supply vessel emissions are excluded, and the facility emissions are under the 250 tons per year (tpy) threshold for each pollutant. Note that there will be no support vessels associated with the project in the sense of vessels fixed to either the SDC or the seabed. Thus, the facility is a "synthetic minor source" and PSD review is not triggered.

TABLE 1
SDC
ESTIMATED POTENTIAL EMISSIONS
(Tons per year)

NO_x	CO	PM	SO_2	VOC
123.6	34.9	8.4	5.6	16.9

Before drilling, supporting vessels will be required to position the SDC and transfer consumables. However, drilling will not commence until these vessels are gone and ice has formed. During the drilling, the only anticipated re-supply will be by helicopter. These vessel emissions are summarized in Table 2 with the calculation detail included in Attachment B.

TABLE 2
TOWING AND SUPPLY VESSELS
ESTIMATED POTENTIAL EMISSIONS
(Tons per year)

NO_x	CO	PM	SO_2	VOC
19.3	4.4	0.6	2.0	0.6

Requirement (4): Description of all emission points including associated vessels.

Four Caterpillar D-399 diesel-fired engines provide electricity for the drill motor. There are two additional D-399 engines, located in the camp area, for power production. A seventh D-399 is available for emergency purposes. These constitute the largest emission sources (nearly 90 percent of the estimated potential emissions). The remaining emissions are distributed among the following remaining sources. The flares are used only during the testing phase of the well and only one at a time. The combined use of the flares will be limited to 504 hours per year. Three cranes are fixed to the deck, and each has its own diesel power. There is one mobile crane and one mobile forklift, also diesel-fueled. Two Lister diesel-fired boilers will provide space heating. One boiler is fitted with a burner made by Saacke designed to combust the used oil drained from the engines and gearboxes, and used hydraulic oil. The trash generated by the workers will be burned in a 100 kilogram per hour waste combustor made by Atlas. These constitute the entire set of SDC sources. The source locations, physical characteristics as related to dispersion modeling, and emission estimates are provided on the attached calculations (Attachment B).

There will be no support vessels, defined as vessels permanently or temporarily connected to the SDC or the ocean floor.

There will be tugs and supply vessels associated with the project, but these will be used only during the project setup and dismantling phases. Emission estimates for these vessels are also presented on the attached calculations (Attachment B).

Requirement (5): Estimate of quantity and type of fuels and raw materials to be used.

TABLE 3
MAXIMUM ANNUAL QUANTITIES OF FUELS COMBUSTED AND RAW MATERIALS USED

Material	Quantity	Units
Diesel fuel	1.26	Million gallons per year
Field gas (flared)	105	Million cubic feet
Trash (incinerated)	26.4	Tons
Used oil	2000	Gallons

Requirement (6): Description of proposed air pollution control equipment.

No air pollution control equipment is proposed.

Requirement (7): Proposed limitations on source operations or any work practice standards affecting emissions.

Proposed limits are listed in Table 4, and each of the limits provides the project sufficient operational flexibility, yet effectively limits the emissions. Furthermore, each is easily monitored and documented. The diesel fuel limit is proposed in a manner that limits the total fuel consumed, but within that limit, further restricts the amount of usage for the non-generator diesel sources (the higher-emitting per unit of power output of the diesel sources). Thus, if 210,668 gallons is not consumed by the miscellaneous sources, the difference between 210,668 and the actual consumption is available for consumption by the generators.

TABLE 4
PROPOSED OPERATIONAL LIMITS ON THE VARIOUS SOURCES OF THE SDC

Nature of Limit	Quantity	Units
Total diesel fuel consumed	1,256,902	Gallons per year
Diesel fuel consumed in misc. sources	210,668	Gallons per year
Sulfur content of diesel fuel	0.05	Wt. percent
Flare (combined) usage	504	Hours per year
Incinerator usage	240	Hours per year

The fuel consumption is measured daily and documented as part of the operations procedures. The hours of flare and incinerator operation will be added to the operations monitoring and documentation tasks.

Requirement (8): Other information affecting emissions.

The SDC platform and source parameters are provided in Tables 5 and 6. These are the normal parameters used for modeling the impacts of these sources on the surrounding public domain.

TABLE 5
DIMENSIONS OF PRINCIPAL SDC STRUCTURES

Structure	General Location	Dimensions (feet) Length	Width	Height*	Dimensions (meters) Length	Width	Height*
Main Deck	-	664	174	0	202.35	53.00	0
Drilling Facilities Building	Stern	50	140	44	15.17	42.73	13.39
Accommodation Modules	Bow	54	100	42	16.44	30.61	12.75
Bulk Tanks - Port	Mid to bow	177	23	31	54.05	7.01	9.57
Bulk Tanks - Starboard	Mid to bow	177	23	31	54.05	7.01	9.57
Derrick Enclosure	Stern	56	56	75	17.07	17.22	22.96

*Distance above the Main Deck.

Requirement (9): Such other information as may be necessary to determine the applicability of onshore requirements.

The Corresponding Onshore Area (COA) for the McCovey Prospect is the Prudhoe Bay region of Stefansson Sound and it is classified as a PSD air quality Class II area.

TABLE 6

SDC STATIONARY SOURCE STACK PARAMETERS†

Stationary Source ID	Stack ID	Coordinates* X (m)	Coordinates* Y (m)	Base Elevation** (ft)	Base Elevation** (m)	Stack Parameters: Height^ (ft)	Height^ (m)	Temperature (F)	Temperature (°K)	Velocity (ft/s)	Velocity (m/s)	Diameter (in)	Diameter (m)	Flow (acfm)
ENG-1	1	27.2	4.1	89	27.1	28.2	8.6	675	630	110	33.5	12	0.30	5,181
ENG-2	2	27.2	1.5	89	27.1	28.2	8.6	675	630	110	33.5	12	0.30	5,181
ENG-3	3	27.2	-0.1	89	27.1	28.2	8.6	675	630	110	33.5	12	0.30	5,181
ENG-4	4	27.2	-2.7	89	27.1	28.2	8.6	675	630	110	33.5	12	0.30	5,181
ENG-5	5	139.7	17.5	89	27.1	28.2	8.6	675	630	110	33.5	12	0.30	5,181
ENG-6	6	139.7	13.5	89	27.1	28.2	8.6	675	630	110	33.5	12	0.30	5,181
ENG-EG	7	139.7	3.6	89	27.1	28.2	8.6	675	630	110	33.5	12	0.30	5,181
FLR Port	8	-23.0	52.3	89	27.1	16.4	5.0	***				***		***
FLR Starboard	9	-22.7	-42.5	89	27.1	16.4	5.0	***				***		***
PRTC	10	29.6	28.0	89	27.1	45.8	14.0	690	639	380	115.9	6	0.15	4,480
STBC	11	29.7	-18.3	89	27.1	45.8	14.0	650	616	344	104.8	6	0.15	4,050
AFTC	12	-33.2	0.2	89	27.1	35.4	10.8	770	683	250	76.3	4	0.10	1,310
BLR1	13	139.7	10.8	89	27.1	28.2	8.6	250	394	60	18.3	8	0.20	1,255
BLR2	14	139.7	7.3	89	27.1	28.2	8.6	250	394	60	18.3	8	0.20	1,255
INCR	15	116.7	24.9	89	27.1	28.2	8.6	800	700	15	4.7	10	0.25	500

†For each stack: the discharge direction is vertical, and there is no obstruction to the flow of exhaust gases.

* Origin of SDC coordinates is the well. The positive X direction is equivalent to the direction towards the bow and positive Y towards port.

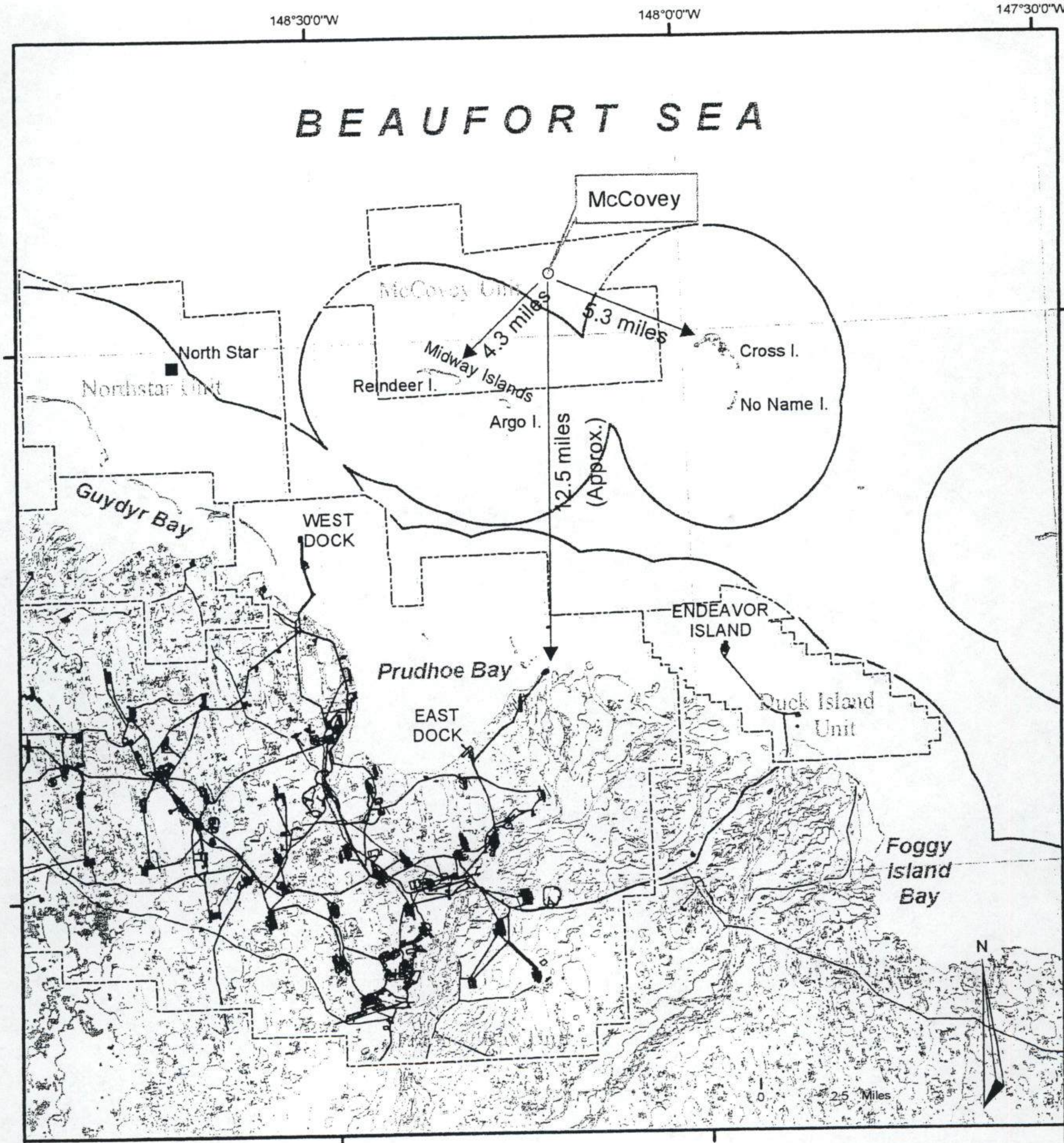
** Vertical distance from sea level to the main deck.

*** Each flare's temperature, diameter, and flow will be based on the air quality modeling guidance applicable to such a source and specified in the modeling protocol.

^Distance above the main deck.

Attachment A

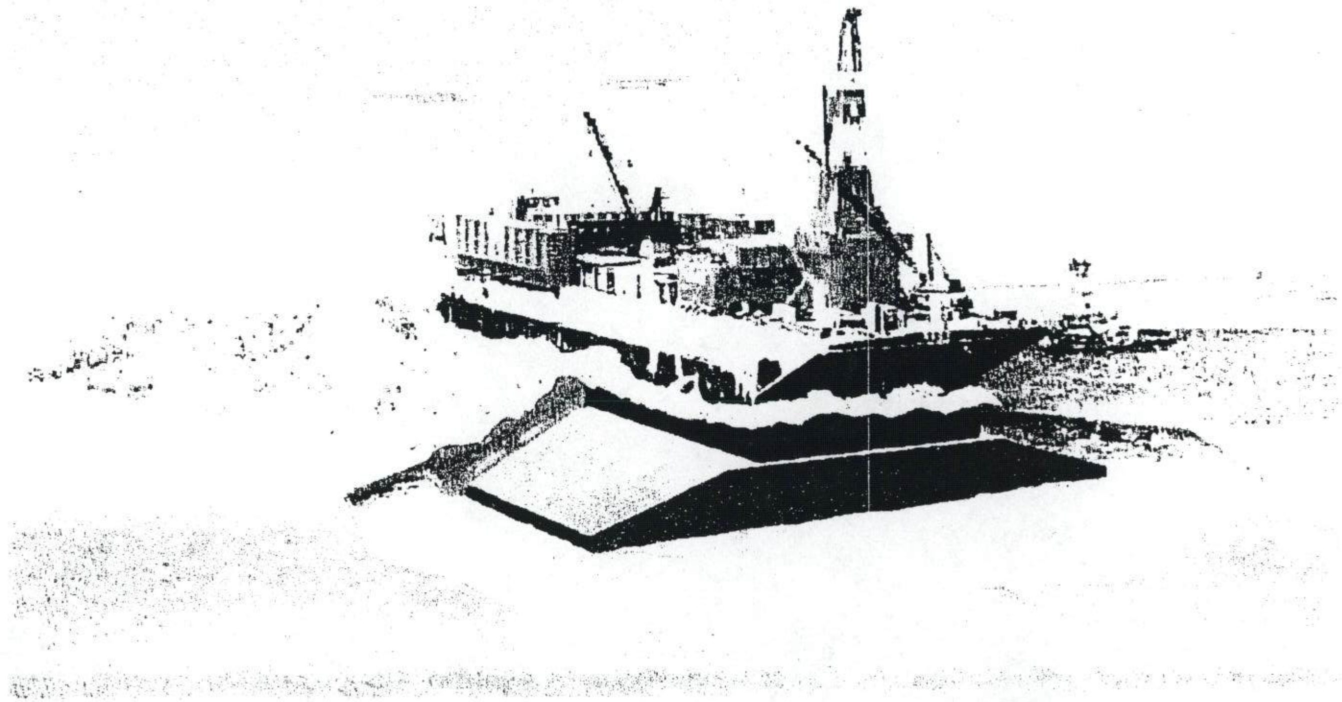
LOCATION OF PROJECT AND ILLUSTRATION OF SDC



Horizontal Datum NAD 27, coordinate system Alaska State Plane Zone 4. Hydrology derived from 1:63360 USGS DLG Data.

○ Proposed Exploration Well Location	AEC OIL & GAS (USA) INC.
8(g) Boundary	McCovey Exploration Well LOCATION MAP
—— Alaska Seaward Boundary	SCALE: 1 inch equals 5 miles
Oil & Gas Units	FIGURE: N/A

Lynx: aec010.mdx, September 25, 2001, Rev 2



AEC OIL & GAS (USA) INC.		
SDC		
SCALE: N/A	FIGURE: N/A	

Lynx:aec031.mxd, October 29 2001, Rev2

Attachment B

SOURCE INFORMATION AND EMISSION CALCULATIONS

Air Sciences Inc. (Denver • Portland)	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 1	OF: 18	SHEET: 1
		SUBJECT: Source Description	DATE: November 20, 2001		

SOURCE DESCRIPTION - SDC FACILITY

Source Information

Source Description	**Size, Manufacturer, Model**	**Source ID**
Stationary Sources		
IC engine generates power for the drilling operation	1125hp Caterpillar D-399	ENG-1
IC engine generates power for the drilling operation	1125hp Caterpillar D-399	ENG-2
IC engine generates power for the drilling operation	1125hp Caterpillar D-399	ENG-3
IC engine generates power for the drilling operation	1125hp Caterpillar D-399	ENG-4
IC engine generates power for the work and living areas	1125hp Caterpillar D-399	ENG-5
IC engine generates power for the work and living areas	1125hp Caterpillar D-399	ENG-6
IC engine that provides emergency power	1125hp Caterpillar D-399	ENG-EG
Flaring of the gas released during drilling and testing	5MMCF/day Flare	FLR Port
Flaring of the gas released during drilling and testing	5MMCF/day Flare	FLR Starbd
IC engines powers the port-side fixed crane	556hp GM 12V71T	PRTC
IC engines powers the starboard-side fixed crane	485hp GM 12V71T	STBC
IC engines powers the aft fixed crane	180hp GM 6V71	AFTC
Boiler that provides heat to the work and living areas	4.5MMBtu/hr Lister, 100 hp	BLR1
Boiler that provides heat to the work and living areas	4.5MMBtu/hr Lister, 100 hp with Saacke burner	BLR2
Incinerator used to combust the trash and garbage	100kg/hr Atlas, MAX 50S	INCR
Mobile sources		
Mobile crane	137hp GM 4-53N	MBLC
Forklift	86hp Caterpillar 3304-NA	FRKL

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 2	OF: 18	SHEET: 1
		SUBJECT: Emission Summary	DATE: November 20, 2001		

EMISSIONS SUMMARY

Source Information			**Annual Emissions (ton/yr)**				
Source ID	**Stack ID**	**Category/Description**	**NOx**	**CO**	**PM**	**SO2**	**VOC**
Stationary Sources							
ENG-1	1	1125hp Caterpillar D-399	18.72	1.30	1.15	0.66	1.16
ENG-2	2	1125hp Caterpillar D-399	18.72	1.30	1.15	0.66	1.16
ENG-3	3	1125hp Caterpillar D-399	18.72	1.30	1.15	0.66	1.16
ENG-4	4	1125hp Caterpillar D-399	18.72	1.30	1.15	0.66	1.16
ENG-5	5	1125hp Caterpillar D-399	18.72	1.30	1.15	0.66	1.16
ENG-6	6	1125hp Caterpillar D-399	18.72	1.30	1.15	0.66	1.16
ENG-EG	7	1125hp Caterpillar D-399	0.09	0.08	0.05	0.05	0.08
FLR Port	8	5MMCF/day Flare	1.96	10.68	0.20	0.05	4.04
FLR Starbd	9	5MMCF/day Flare	1.96	10.68	0.20	0.05	4.04
PRTC	10	556hp GM 12V71T	2.07	0.45	0.15	0.03	0.17
STBC	11	485hp GM 12V71T	1.80	0.39	0.13	0.02	0.15
AFTC	12	180hp GM 6V71	0.67	0.14	0.05	0.01	0.05
BLR1	13	4.5MMBtu/hr Lister, 100 hp	0.96	0.24	0.10	0.35	0.03
BLR2	14	4.5MMBtu/hr Lister, 100 hp with Saacke burner	0.96	0.24	0.10	0.35	0.03
INCR	15	100kg/hr Atlas, MAX 50S	0.01	3.96	0.46	0.66	1.32
Mobile sources							
MBLC	-	137hp GM 4-53N	0.51	0.11	0.04	0.03	0.04
FRKL	-	86hp Caterpillar 3304-NA	0.32	0.07	0.02	0.02	0.03
		Total Emissions	**123.6**	**34.9**	**8.4**	**5.6**	**16.9**

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 3	OF: 18	SHEET: 1
		SUBJECT: Operational limits	DATE: November 20, 2001		

SUMMARY OF THROUGHPUTS AND USAGES, & REQUESTED OPERATIONAL LIMITS

ID	Operating hours Yearly	Diesel Fuel use gal/hour	gal/year	
ENG-1	2920	59.04	172,404	
ENG-2	2920	59.04	172,404	
ENG-3	2920	59.04	172,404	
ENG-4	2920	59.04	172,404	
ENG-5	2920	59.04	172,404	
ENG-6	2920	59.04	172,404	
ENG-EG	200	59.04	11,809	
			Subtotal	1,046,234
PRTC	240	29.90	7,176	
STBC	240	26.20	6,288	
AFTC	240	9.60	2,304	
BLR1	2920	32.85	95,912	
BLR2	2920	32.85	95,912	
MBLC	240	8.30	1,992	
FRKL	240	4.51	1,083	
			Subtotal	210,668

	Field Gas million cubic feet	Operating hours Yearly
FLR Port	105	504
FLR Starbrd	105	504

	Trash tons per year	Operating hours Yearly
INCR	26.4	240

Requested Operational Limits

1,256,902 total gallons of diesel fuel consumed annually
0.05% sulfur by weight

210,668 gallons of diesel fuel annually for misc. sources
0.05% sulfur by weight

504 hours per year combined flare usage

240 hours per year trash incinerator usage

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 4	OF: 18	SHEET: 1
		SUBJECT: Drill motor generator	DATE: November 20, 2001		

Drill motor generator

Source ID: ENG-1, ENG-2, ... ,ENG-6

All information is for one of six identical IC-engines used to drive electric generators.

Engine Data

Engine Make and Model	Caterpillar D-399		
Engine Power Rating	1125	hp	Caterpillar's data, 6/92 (Attachment C)
Fuel Type	Diesel		
Fuel Consumption	0.37	lb/hp-hr	

Fuel Data

Diesel Sulfur Content	0.05	% S by weight	Low Sulphur Diesel light
Diesel Density	7.05	lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	416.25	lb/hr	Caterpillar's data, 6/92 (Attachment C)
	59	gal/hr	
	172,404	gal/yr	

Operation and Controls

Hours of Operation	24	hr/day	2920 max hr/yr
Control Equipment	None		

Emission Factors

NOx	5.17	g/hp-hr	Caterpillar's data, 6/92 (Attachment C)
CO	0.36	g/hp-hr	Caterpillar's data, 6/92 (Attachment C)
PM	0.0007	lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
SO2	0.00809	S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.000705	lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	12.82	18.72
CO	0.89	1.30
PM	0.79	1.15
SO2	0.46	0.66
VOC	0.79	1.16

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 5	OF: 18	SHEET: 1
		SUBJECT: Emergency Generator	DATE: November 20, 2001		

Emergency Generator

Source ID ENG-EG

Engine Data

Engine Make and Model	Caterpillar D-399		
Engine Power Rating	1125	hp	Caterpillar's data, 6/92 (Attachment C)
Fuel Type	Diesel		
Fuel Consumption	0.37	lb/hp-hr	

Fuel Data

Diesel Sulfur Content	0.05	% S by weight	Low Sulphur Diesel Light
Diesel Density	7.05	lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	416.25	lb/hr	Caterpillar's data, 6/92 (Attachment C)
	59	gal/hr	
	11,809	gal/yr	

Operation and Controls

Hours of Operation	24	hr/day	200 max hr/yr
Control Equipment	None		

Emission Factors

NOx	5.17	g/hp-hr	Caterpillar's data, 6/92 (Attachment C)
CO	0.36	g/hp-hr	Caterpillar's data, 6/92 (Attachment C)
PM	0.0007	lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
SO2	0.00809	S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.000705	lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	12.82	1.28
CO	0.89	0.09
PM	0.79	0.08
SO2	0.46	0.05
VOC	0.79	0.08

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 6	OF: 18	SHEET: 1
		SUBJECT: Flare (Port & Starboard)	DATE: November 20, 2001		

Flare (Port & Starboard)

Source ID FLR

All information is for one of two identical flares. Dependent upon the direction of the wind only a single flare is used at a time.

Source Data

Throughput	5 MMCF/day	
Fuel Type	Field Gas	
Heat input per day	5,500 MMBtu/day	
Heat input per hour	229.17 MMBtu/hr	

Fuel Data

Heat Content	1100 Btu/CF	
Sulfur Content	5824 gr/million CF	10 ppmw H2S maximum (zero ppm is expected)

Fuel Consumption

Fuel consumption	5 MMCF/day
	105.0 MMCF/year

Operation and Controls

Hours of Operation	24 hr/day	504 max hr/yr
Control Equipment	None	

Emission Factors

NOx	0.068 lb/MMBtu	AP42, Industrial Flares, Table13.5-1, 9/91.
CO	0.37 lb/MMBtu	AP42, Industrial Flares, Table13.5-1, 9/91.
PM	7.6 lb/MMCF	AP42, Natural Gas, Table1.4-2, 7/98.
SO2	1.7472 lb/MMCF	AP42, Natural Gas, Table1.4-2, 7/98.
VOC	0.14 lb/MMBtu	AP42, Industrial Flares, Table13.5-1, 9/91.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	15.58	3.93
CO	84.79	21.37
PM	1.58	0.40
SO2	0.36	0.09
VOC	32.08	8.09

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 7	OF: 18	SHEET: 1
		SUBJECT: Port Crane	DATE: November 20, 2001		

Port Crane

Source ID PRTC

Engine Data

Engine Make and Model	GM 12V71T		
Engine Power Rating	556	hp	
Fuel Type	Diesel		
Fuel Consumption	29.9	gal/hr	

Fuel Data

Diesel Sulfur Content	0.05	% S by weight	Low Sulphur Diesel Light
Diesel Density	7.05	lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption

	29.90	gal/hr
	7,176.0	gal/yr

Operation and Controls

Hours of Operation	24	hr/day	240 max hr/yr
Control Equipment	None		

Emission Factors

NOx	0.031	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
CO	0.00668	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
PM	0.0022	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
SO2	0.00809	S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.002514	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	17.24	2.07
CO	3.71	0.45
PM	1.22	0.15
SO2	0.22	0.03
VOC	1.40	0.17

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 8	OF: 18	SHEET: 1
		SUBJECT: Starboard Crane	DATE: November 20, 2001		

Starboard Crane

Source ID STBC

Engine Data

Engine Make and Model	GM 12V71T	
Engine Power Rating	485	hp
Fuel Type	Diesel	
Fuel Consumption	26.2	gal/hr

Fuel Data

Diesel Sulfur Content	0.05	% S by weight	Low Sulphur Diesel Light
Diesel Density	7.05	lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption

26.20	gal/hr
6,288.0	gal/yr

Operation and Controls

Hours of Operation	24	hr/day	240 max hr/yr
Control Equipment	None		

Emission Factors

NOx	0.031	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
CO	0.00668	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
PM	0.0022	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
SO2	0.00809	S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.002514	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	15.04	1.80
CO	3.24	0.39
PM	1.07	0.13
SO2	0.20	0.02
VOC	1.22	0.15

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 9	OF: 18	SHEET: 1
		SUBJECT: Aft Crane	DATE: November 20, 2001		

Aft Crane
Source ID AFTC

Engine Data

Engine Make and Model	GM 6V71	
Engine Power Rating	180	hp
Fuel Type	Diesel	
Fuel Consumption	9.6	gal/hr

Fuel Data

Diesel Sulfur Content	0.05	% S by weight	Low Sulphur Diesel Light
Diesel Density	7.05	lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption

9.60	gal/hr
2,304.0	gal/yr

Operation and Controls

Hours of Operation	24	hr/day	240 max hr/yr
Control Equipment	None		

Emission Factors

NOx	0.031	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
CO	0.00668	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
PM	0.0022	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
SO2	0.00809	S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.002514	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	5.58	0.67
CO	1.20	0.14
PM	0.40	0.05
SO2	0.07	0.01
VOC	0.45	0.05

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 10	OF: 18	SHEET: 1
		SUBJECT: Boiler	DATE: November 20, 2001		

Boiler
Source ID BLR1

Boiler Data

Make and Model	Lister, 100 hp	
Firing Capacity	4.5	MMBtu/hr
Fuel Type	Diesel	

Fuel Data

Diesel Heat Content	0.137	MMBtu/gal	
Diesel Sulfur Content	0.05	% S by weight	Low Sulphur Diesel Light
Diesel Density	7.05	lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	231.57	lb/hr
	32.85	gal/hr
	95,912.4	gal/yr

Operation and Controls

Hours of Operation	24	hr/day	2920 max hr/yr
Control Equipment	None		

Emission Factors

NOx	20	lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
CO	5	lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
PM	2	lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
SO2	144	S, lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
VOC	0.556	lb/1000 gal	AP42, External Comb., Table 1.3-3, Distillate oil fired, 9/98.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	0.66	0.96
CO	0.16	0.24
PM	0.07	0.10
SO2	0.24	0.35
VOC	0.018	0.03

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 11	OF: 18	SHEET: 1
		SUBJECT: Boiler	DATE: November 20, 2001		

Boiler

Source ID BLR2

Boiler Data

Make and Model	Lister, 100 hp with Saacke burner	
Firing Capacity	4.5	MMBtu/hr
Fuel Type	Diesel	

Fuel Data

Diesel Heat Content	0.137	MMBtu/gal	AP-42, Appendix A, Diesel
Diesel Sulfur Content	0.05	% S by weight	Low Sulphur Diesel Light
Diesel Density	7.05	lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	231.57	lb/hr
	32.85	gal/hr
	95,912.4	gal/yr

Operation and Controls

Hours of Operation	24	hr/day	2920 max hr/yr
Control Equipment	None		

Emission Factors

NOx	20 lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
CO	5 lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
PM	2 lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
SO2	144 S, lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
VOC	0.556 lb/1000 gal	AP42, External Comb., Table 1.3-3, Distillate oil fired, 9/98.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	0.66	0.96
CO	0.16	0.24
PM	0.07	0.10
SO2	0.24	0.35
VOC	0.018	0.03

Incinerator

Source ID INCR

Combustor Data

Make and Model	Atlas, MAX 50S		
Firing Capacity	100 kg/hr	0.1 Mg/hr	220 lb/hr
Fuel	Garbage/Trash		

Fuel Consumption

Fuel consumption	220 lb/hr
	0.11 ton/hr
	26.4 ton/year

Operation and Controls

Hours of Operation	24 hr/day	240 max hr/yr
Control Equipment	None	

Emission Factors

NOx	1 lb/ton	AP42 12.1-12, Domestic single chamber, w/o primary burner
CO	300 lb/ton	AP42 12.1-12, Domestic single chamber, w/o primary burner
PM	35.0 lb/ton	AP42 12.1-12, Domestic single chamber, w/o primary burner
SO2	50 lb/ton	AP42 12.1-12, Domestic single chamber, w/o primary burner
VOC	100 lb/ton	AP42 12.1-12, Domestic single chamber, w/o primary burner

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	0.11	0.01
CO	33.00	3.96
PM	3.85	0.46
SO2	5.50	0.66
VOC	11.00	1.32

AIR SCIENCES INC.	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
DENVER • PORTLAND		PROJECT NO: 180-1	PAGE: 13	OF: 18	SHEET: 1
		SUBJECT: Mobile Crane	DATE: November 20, 2001		

Mobile Crane

Source ID MBLC

Engine Data

Engine Make and Model	GM 4-53N	
Engine Power Rating	137	hp
Fuel Type	Diesel	
Fuel Consumption	8.3	gal/hr

Fuel Data

Diesel Sulfur Content	0.05	% S by weight	Low Sulphur Diesel Light
Diesel Density	7.05	lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption

8.30	gal/hr
1,992.0	gal/yr

Operation and Controls

Hours of Operation	24	hr/day	240 max hr/yr
Control Equipment	None		

Emission Factors

NOx	0.031	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
CO	0.00668	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
PM	0.0022	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
SO2	0.00205	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
VOC	0.002514	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	4.25	0.51
CO	0.92	0.11
PM	0.30	0.04
SO2	0.28	0.03
VOC	0.34	0.04

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 14	OF: 18	SHEET: 1
		SUBJECT: Forklift	DATE: November 20, 2001		

Forklift

Source ID FRKL

Engine Data

Engine Make and Model	Caterpillar 3304-NA	
Engine Power Rating	86 hp	
Fuel Type	Diesel	
Fuel Consumption	0.37 lb/hp-hr	

Fuel Data

Diesel Sulfur Content	0.05 % S by weight	Low Sulphur Diesel Light
Diesel Density	7.05 lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	31.82 lb/hr
	4.51 gal/hr
	1,083.2 gal/yr

Operation and Controls

Hours of Operation	24 hr/day	240 max hr/yr
Control Equipment	None	

Emission Factors

NOx	0.031 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
CO	0.00668 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
PM	0.0022 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
SO2	0.00205 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
VOC	0.002514 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	2.67	0.32
CO	0.57	0.07
PM	0.19	0.02
SO2	0.18	0.02
VOC	0.22	0.03

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 15	OF: 18	SHEET: 1
		SUBJECT: Tugs for SDC	DATE: November 20, 2001		

Tugs for SDC

Source ID Tow

1-vessel towing and 2-tugs assisting

Engine Data

Tow vessel, IC-engine info	Kigoria	2 engines	6260 kW/engine	8395 hp/engine
Each of 2, Assisting vessels, IC-engine info	-	2 engines	1200 kW/engine	1609 hp/engine
Engine Power Rating - Combined	23,226 hp			
Fuel Type	Diesel			
Fuel Consumption	0.37 lb/hp-hr			

Fuel Data

Diesel Sulfur Content	0.3 % S by weight	
Diesel Density	7.05 lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	8,594 lb/hr
	1,219 gal/hr
	42,505 gal/yr

Operation and Controls

One-way distance to site	25 miles	(maximum distance to consider is 25 miles, per 40CFR55.)	
Averge speed	2 knots	2.3 miles/hr	
Hours of Operation	10.9 hrs towing	24 hrs positioning	34.9 hrs total
Control Equipment	None		

Emission Factors

NOx	0.024 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
CO	0.0055 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
PM	0.0007 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
SO2	0.00809 S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.000705 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	557.43	9.72
CO	127.74	2.23
PM	16.26	0.28
SO2	56.37	0.98
VOC	16.37	0.29

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 16	OF: 18	SHEET: 1
		SUBJECT: Tugs with supply barges	DATE: November 20, 2001		

Tugs with supply barges

Source ID Supply

Engine Data

Engine Make and Model	Unknown, twin engines		
Engine Power Rating	3500 kW/engine	9387 hp total from both engines	
Fuel Type	Diesel		
Fuel Consumption	0.37 lb/hp-hr		

Fuel Data

Diesel Sulfur Content	0.3 % S by weight	
Diesel Density	7.05 lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	3,473 lb/hr
	493 gal/hr
	41,980 gal/yr

Operation and Controls

Total equivalent hours at max engine load	n/a hrs/day	85.21 hrs/yr	Detailed calculations on following page.
Control Equipment	None		

Emission Factors

NOx	0.024 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
CO	0.00550 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
PM	0.0007 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
SO2	0.00809 S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.000705 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	225.29	9.60
CO	51.63	2.20
PM	6.57	0.28
SO2	22.78	0.97
VOC	6.62	0.28

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey			BY: D. Young
		PROJECT NO: 180-1	PAGE: 17	OF: 18	SHEET: 1
		SUBJECT: Tugs with supply barges - Continued	DATE: November 20, 2001		

Tugs with supply barges - Continued

Operation

The following represents a generalized plan to transport provisions to the SDC.

From Prudhoe Bay (West Dock)

Loads	1	load per tug	
Number of loads to supply	8		
Number of loads to remove	3		
	11	total loads	
One-way distance to supply or remove	13	miles	
Averge speed	4	knots	4.6 miles/hour
Hours operating at maximum engine load	62.17	hours for all loads	
Hours operating at idle (10% of max load)	11	hours (1 hour per load)	
			63.27 equivalent hours at max engine load

From Hay River

Loads	1	load per tug	
Number of loads to supply	2		
Number of loads to remove	0		
	2	total loads	
One-way distance supply or remove	25	miles	(maximum distance to consider is 25 miles, per 40CFR55.)
Averge speed	4	knots	4.6 miles/hour
Hours operating at maximum engine load	21.74	hours for all loads	
Hours operating at idle (10% of max load)	2	hours (1 hour per load)	
			21.94 equivalent hours at max engine load

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 18	OF: 18	SHEET: 1
		SUBJECT: Used oil	DATE: November 20, 2001		

Used oil

Hydraulic	5 drums	42 gallon / drum		=	210 gallons
Gear	4 drums	42 gallon / drum		=	168 gallons
Generator Engines	60 gallon / change/engine	3 change / year	7 engines	=	1260 gallons
Cranes and Loaders	10% of subtotal	1638 gallons / subtotal		=	164 gallons
				Total used oil	1802 gallons

Attachment C

CATERPILLAR EMISSIONS DATA – D-399 DIESEL ENGINE

CATERPILLAR® Interoffice Memorandum

Facility LARGE ENGINE CENTER

Date June 16, 1992

Plant/Office MOS 9

Department 3500 Product Group

Attention R. P. Laird

Plant Or Office	Department	Attention

Destroy File Until (Date)

CC: D. C. Dowdall, P. S. & E. C. - AB6480

Request # 92009

The requested emissions data* presented below is based on tests conducted at Caterpillar Inc. using instrumentation and procedures equivalent to those outlined in SAE 177a & 215.

Engine Model: D399 PCTA running at 100% load, 1125 Hp at 1225 RPM, with wet manifolds.
Arr#: --- PL#: ---
Application: A continuous rated marine propulsion engine.

	Lb/Hr	g/Hr	g/Hp-Hr	PPM (Wet)	% BY Vol.	%BY Wt.
CO2	1310.9	594628	528.56	79315	7.93	12.12
N2	7979.1	3619251	3217.11	760090	76.01	73.77
O2	996.5	452009	401.79	82931	8.29	9.21
H20	518.7	235293	209.15	76754	7.68	4.80
CO	0.9	400	0.36	84	0.01	0.01
NO–	8.4	3800	3.38		0.07	0.08
NOx~	12.8	5812	5.17	748	0.00	0.00
HC	0.0	20	0.02	8	0.00	0.00
SO2^	1.7	754	0.67	70	0.01	0.02
DPM+	0.3	116	0.10			

	g/Hr	g/Hp-Hr	g/n cu.M'
NOx	5812	5.17	1.922
CO	400	0.36	0.132
HC	20	0.02	0.007

SMOKE (Cat Number)..... 0.038
FUEL RATE.............. 416.25 Lb/Hr
INLET AIR FLOW.......... 10400 Lb/Hr
EXHAUST FLOW:
Rate.................... 10816 Lb/Hr
at 60 deg F and 760mm Hg. 2373 SCFM
at 675 deg F stack temp. 5181 CFM

Notes: * This data is based on steady-state engine operating conditions of 85 deg. F and 29.38 in. Hg. and No. 2 diesel fuel. This data is also subject to instrumentation, measurement and engine-to-engine variations.

– The NOx shown is not actually present in the exhaust. It is based on the assumption that the NO present in the exhaust is converted to NOx in the atmosphere. NO and NOx are corrected to 75 grains humidity.

^ SO2 is proportional to a sulfur content of 0.20 % by weight of the fuel.

\+ DPM (Dry Particulate Matter) is an approximation based on a correlation to smoke density, and is not included in the total exhaust flow rate.

' Grams per normal cubic meter values are corrected to 5% oxygen.

This report provides the best information available at this time. It should not be used at a future date without verification as to its validity for the current engine.

Paul Mineart
Paul Mineart
L. C. Morris L. C. Morris
3500 Product Design
Ext. 5910

-080505-07 PC

AIR SCIENCES INC.

OUTER CONTINENTAL SHELF
PRE-CONSTRUCTION AIR
PERMIT APPLICATION

FOR THE EXPLORATION OF
THE MCCOVEY PROSPECT

*AEC OIL & GAS
(USA) INC.*

PROJECT 180-1
JANUARY, 2002

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LIST OF FIGURES

1.0 INTRODUCTION

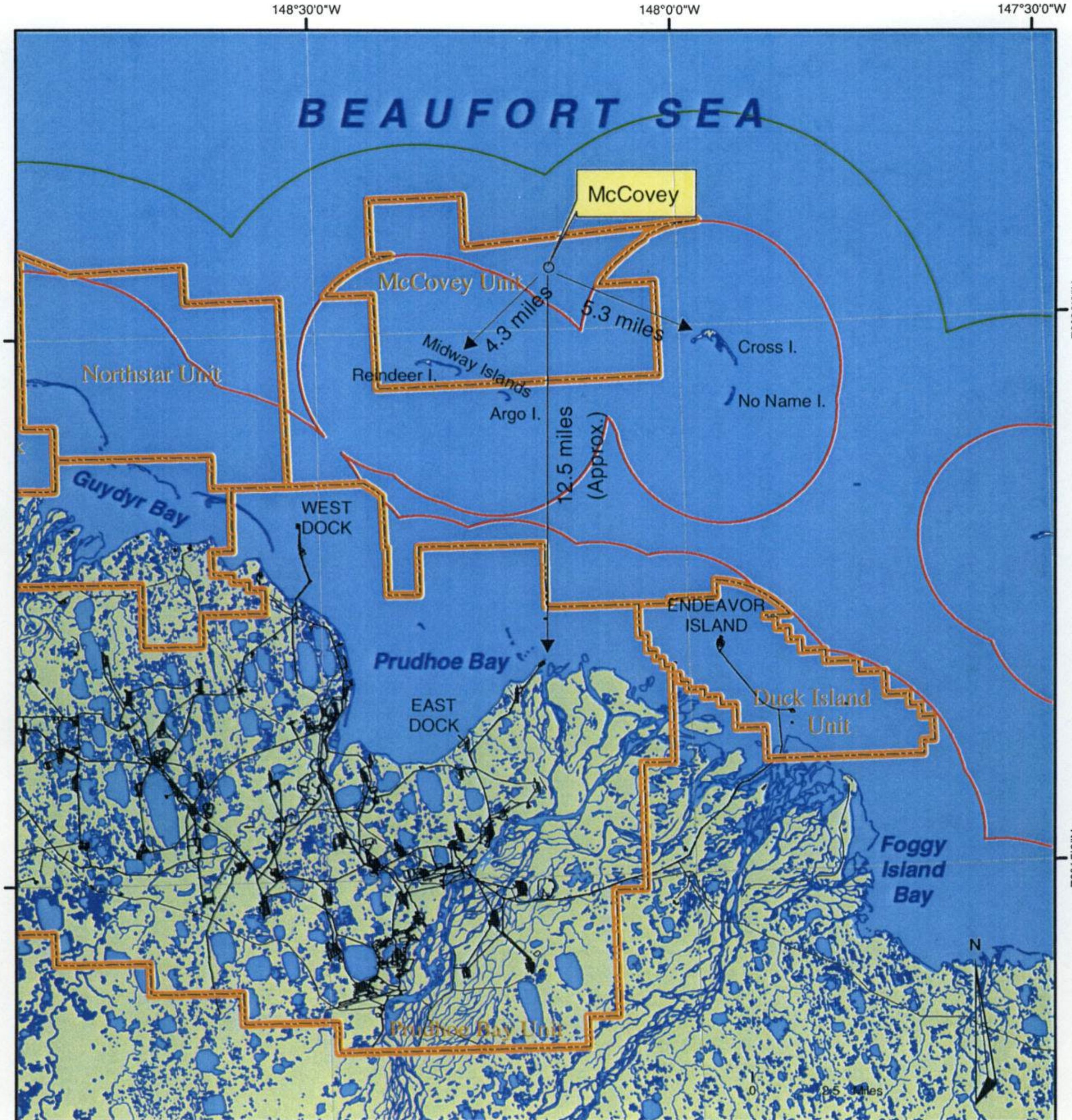
AEC Oil & Gas (USA) Inc. ("AEC") is proposing to conduct oil and gas exploration activities in the McCovey Unit, Steffanson Sound, Alaska during the 2002-2003 winter drilling season. This application is submitted to U.S.EPA's Region 10 office, pursuant to the requirements of Outer Continental Shelf Air Regulations, 40 CFR Part 55. It is AEC's application for a pre-construction air permit to allow the use of the SDC to explore the McCovey Prospect. The required Notice of Intent (NOI) for this project was filed with Region 10, on November 28, 2001 and the Air Quality Dispersion Modeling Protocol was filed on December 14, 2001. Also, copies of the NOI, Modeling Protocol and this application were submitted to the Alaska Department of Environmental Conservation (ADEC).

The McCovey Prospect drilling location lies in the Beaufort Sea approximately 12.5 statute miles northeast of the West Dock at Prudhoe Bay, Alaska. This location is about 1 mile outside the jurisdiction of Alaska and is on the Outer Continental Shelf (OCS). However it is within 25 miles of Alaska's seaward boundary and thus is subject to 40 CFR Part 55. As shown on Figure 1, this location is about 4.3 statute miles from Midway Islands, the nearest land.

This exploratory project will utilize the mobile offshore drilling unit known as the SDC/MAT system. The SDC is a converted crude tanker with topside drilling facilities that sits on top of an all steel MAT. The support MAT is a submersible barge. The SDC/MAT is designed to be ballasted to the ocean floor, which at the McCovey Prospect drilling location is about 36 feet below the surface. The drilling of an initial well, with the possibility of one sidetrack well are included in this exploratory project, which includes testing of both the initial and sidetrack wells. The configuration of the platform equipment is provided in Figure 2. The sources of air emissions are the diesel-fueled internal combustion engines, boilers, trash incinerator, and a cuttings cleaning system. An additional air emissions source is the flare used for combusting gas released from the well and sidetrack.

This exploratory process consists of three phases: placement of the SDC, drilling, and cold stack. The SDC will be towed from its current offshore location near Port Clarence, Alaska to the McCovey site during late July and early August 2002. At McCovey, the SDC will be ballasted to the sea floor and loaded with consumables, materials, equipment, and fuel. The SDC will be placed in a cold stack "go quiet" mode when whaling activities occur (early September through late October). After the ice has formed, crews and camp supplies will be transported by helicopter to the SDC. Drilling is to proceed for the five-month period from November 2002 through March 2003 at the latest. During the drilling period, there may be flaring of gas from a well, which will last for no more than a maximum of six weeks. Upon completion of the drilling program, the SDC will be placed into a cold stack "go quiet" mode. The results of the drilling and testing program will be evaluated to determine the next activity at McCovey with the SDC.

FIGURE 1
LOCATION MAP



Horizontal Datum NAD 27, coordinate system Alaska State Plane Zone 4. Hydrology derived from 1:63360 USGS DLG Data.

o Proposed Exploration Well Location 8(g) Boundary Alaska Seaward Boundary Oil & Gas Units	AEC OIL & GAS (USA) INC. McCovey Exploration Well LOCATION MAP SCALE: 1 inch equals 5 miles FIGURE: N/A

Lynx: aec010.mdx, September 24 2001, Rev 1

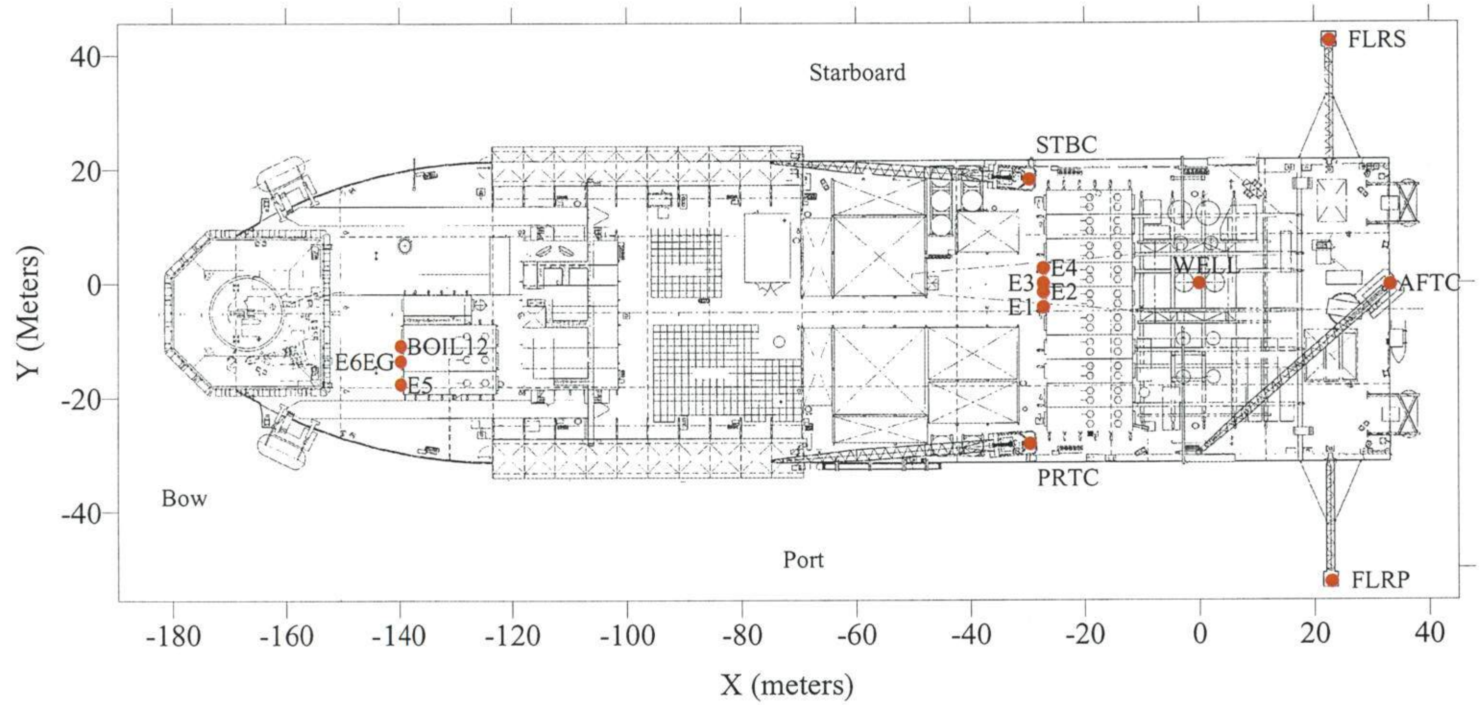


FIGURE 2
CONFIGURATION OF PLATFORM EQUIPMENT
McCOVEY PROJECT

AIR SCIENCES INC.
LAKEWOOD, COLORADO

2.0 SOURCE CHARACTERIZATION

Drilling will occur from November through March and thus the drilling-related emissions (SDC emissions) will occur only over that 5-month period of the year. Before drilling, vessels will be required to position the SDC, then transport and transfer consumables to it. Note that there will be no vessels servicing or associated with the SDC in the sense of vessels either fixed to it or to the seabed during the SDC operation. Drilling will commence after these vessels are gone and ice has formed. During the drilling, the normal re-supply of materials and exchange of workers will be by helicopter. The total annual potential emission estimates of NO_x, CO, PM_{10}, SO_2, and VOC are presented in Table 1. The emissions from the towing vessels and supply vessels have been calculated and included, following the requirements of 40 CFR 55.4(b)(3). The annual emissions of hazardous air pollutants ("HAPs") from the SDC are less than 0.5 ton for each HAP and 1 ton for all HAPs. All emission calculations are provided in Appendix B. For the impact analysis, NO_x emissions from the SDC's sources (the OCS source) have been modeled for impact.

TABLE 1
TOTAL SDC AND VESSEL
ESTIMATED EMISSIONS
(Tons per year)

	NO_x	CO	PM_{10}	SO_2	VOC
SDC emissions	123.71	34.88	8.39	5.61	32.80
Vessel emissions	26.34	6.04	0.77	2.66	0.77
Total emissions	150.05	40.92	9.15	8.28	33.57

The following equipment constitutes the entire set of the SDC's air emission sources. Four Caterpillar D-399 diesel-fueled engines provide electricity for the drill motor. There are two additional D-399 engines, located in the camp area, for power production. A seventh D-399 is available for emergency purposes. These D-399 engines constitute the largest emission sources (nearly 90 percent of the estimated potential emissions). The remaining emissions are distributed among the following remaining sources. The flares are used only during the testing and evaluation of the well and only one at a time. The combined use of the flares will be limited to 504 hours per year. Three cranes are fixed to the deck, and each has its own diesel-fueled engine. There is one mobile crane and one mobile forklift, also with diesel-fueled engines. Two Lister diesel-fired boilers will provide space heating. One boiler is fitted with a burner made by Saacke designed to combust the used oil drained from the engines and gearboxes, and used hydraulic oil. The trash (combustible solid waste) generated by the workers will be burned in a 100 kilogram per hour waste combustor made by Atlas. Cuttings from the well that are not initially disposable may be cleaned in the cuttings cleaning system (a diesel-fueled rotary dryer) or stored on the SDC.

3.0 REGULATORY APPLICABILITY

This section describes the air quality designations of the Corresponding Onshore Area (COA) and the air quality emission limits or emissions standards that are applicable to the SDC. By operation of law per 40 CFR 55.14(e) the applicable state of Alaska (the COA) requirements have been promulgated by U.S.EPA as applicable to the SDC in addition to the federal requirements per 40 CFR 55.13 that apply to OCS sources (the SDC).

3.1 Area Designations

The proposed location of the SDC is about 12.5 miles north of the Deadhorse, in the Beaufort Sea. The COA is in the Northern Alaska Intrastate Air Quality Control Region (AQCR) 9. According to 40 CFR 81.302, the attainment status for AQCR 9 is as follows:

TSP	Better than the national standard (i.e., attainment)
SO_2	Better than the national standard (i.e., attainment)
CO	Unclassifiable/attainment
Ozone	Unclassifiable/attainment
PM_{10}	Unclassifiable (i.e., attainment)
NO_2	Cannot be classifiable/better than the national standard (i.e., attainment)

This area is designated as a Prevention of Significant Deterioration (PSD) Class II Area per 18 AAC 50.015. There are no PSD Class I Areas within 100 km of the proposed site.

3.2 State Requirements Applicable to OCS Sources

The following describes the Alaska Administrative Code (AAC) emissions standards and limitations of the Alaska Department of Environmental Conservation (ADEC) that are applicable to the SDC's air emission sources. The relevant portions of the ADEC's Air Quality Maintenance forms have been completed and provided in Appendix A. The ambient air quality information, pursuant to 18 AAC 50.310(n) is presented in Section 4.

3.2.1 Incinerator Emissions Standards

Visibility through the exhaust effluent of an incinerator may not be reduced by visible emissions, excluding water vapor, by more than 20 percent for a total of more than three minutes in any one hour per 18 AAC 50.050(a)(2). This limit applies to the garbage incinerator.

3.2.2 Industrial Processes and Fuel Burning Equipment

Visible emissions, excluding condensed water vapor, from each stationary IC engine, each flare, each boiler, and the cuttings cleaning system may not reduce visibility through the exhaust effluent by greater than 20 percent for a total of more than three minutes in any one hour, per 18 AAC 50.055(a)(1).

Particulate matter emitted from each stationary IC engine, each flare, each boiler, and the cuttings cleaning system may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains, per 18 AAC 50.055(b)(1).

Sulfur-compound emissions, expressed as sulfur dioxide, from each stationary IC engine, each flare, each boiler, and the cuttings cleaning system may not exceed 500 ppm averaged over a period of three hours, per 18 AAC 50.055(c). The diesel-fueled sources are expected not to exceed this limit, per ADEC Memorandum, "Maximum SO_2 Concentration from the combustion of #2 diesel fuel," March 24, 1998. The flare's combustion of well gas is not expected to exceed this limit, per ADEC Memorandum, "Maximum SO_2 Concentration from the combustion of natural gas," October 27, 2000. Copies of both memorandums are provided in Appendix C.

3.3 Federal Requirements Applicable to OCS Sources

This section addresses the requirements of NSPS, PSD and Hazardous Air Pollutants pursuant to 40 CFR 55.13(c), (d) and (e).

Neither the SDC nor the sources on it are subject to any new source performance standard of 40 CFR Part 60.

The applicable potential emissions threshold under the Prevention of Significant Deterioration requirements of 40 CFR 52.21 for the construction of a new source is 250 tons per year for each pollutant. The potential emissions of each pollutant from the SDC is less than 250 tons per year in part because of the requested federally enforceable limitations on diesel fuel consumption and hours of operation. Thus the SDC is not subject to a review under the PSD rules. Calculations are provided in Appendix B. The requested limitations on fuel use and operating hours are provided on Form H in Appendix A.

Neither the SDC nor the sources on it are subject to a national emissions standard for hazardous air pollutants of 40 CFR Part 61. Neither the SDC nor the sources on it are subject to a national emissions standard for hazardous air pollutants for source categories under 40 CFR Part 63, subparts A, and C through to the end. The calculations provided in Appendix B show that the facility's potential emissions of each hazardous air pollutant are less than 10 tons per year and the aggregate of all hazardous air pollutant emissions is less than 25 tons per, thus it is not a major source of HAPs and therefore not subject to the control technology determination requirements of 40 CFR 63 Subpart B.

4.0 AMBIENT IMPACT ANALYSIS (DISPERSION MODELING)

The Outer Continental Sources (OCS) permitting requirements of 40 CFR Part 55.14, require that a permit application address the Corresponding Onshore Area (COA) requirements, which for the SDC are the Alaska Department of Environmental Conservation (ADEC) requirements for the Prudhoe Bay Region of Stefansson Sound (an attainment area). The SDC is anticipated to be an "Ambient Air Quality Facility" per 18 AAC 50.300(b)(s), and as such its expected impacts are evaluated in relation to the National and Alaska Ambient Air Quality Standards (AAQS). This section describes the ambient standards to be addressed, the model selected for use in addressing these standards, and the selection of inputs to the model in a manner consistent with the Alaska modeling guidelines. An air quality dispersion modeling protocol was filed with U.S.EPA Region 10 on December 14, 2001 and copied to ADEC.

The Alaska regulations require that impacts from "Ambient Air Quality Facilities" be evaluated and the SDC is considered such a facility because, among other characteristics, the flares heating rate is expected to exceed 100 million BTU/hour (Alaska 18 AAC 50.300(b)(2)). From Table 1, it is apparent that the SDC will be a minor (synthetic) source in relation to the applicable Prevention of Significant Deterioration Regulations threshold of 250 tons per year of any pollutant, so the Major Stationary Source requirements do not apply. Furthermore, from the Alaska Regulations (Alaska 18 AAC 50.310(n)(1)) it is only the significant emissions that are to be modeled for impact. Table 2 lists these significance thresholds and compares them to the estimated emissions; it is only the nitrogen oxides (NO_x) impacts that are to be modeled. Thus the remainder of this analysis focuses on the stationary sources of NO_x.

The relevant ambient standards are the Alaska and National standards. The standard for NO_x is listed in Table 3, along with the Alaska-defined NO_x Significant Impact Level (SIL). Because this project is temporary, it would not consume increment under ADEC's rules. Therefore, the impacts will not be compared with the NO_2 Class II PSD increment.

TABLE 2
SIGNIFICANT THRESHOLDS COMPARED TO ESTIMATED EMISSIONS
(Tons per Year)

	NO_x	CO	PM_{10}	SO_2	VOC
Total emissions	150.0	40.9	9.2	8.3	33.6
Significant emission rate	40	100	15	40	40
Need to evaluate?	Yes	No	No	No	No

TABLE 3
APPLICABLE AIR QUALITY STANDARDS
AND SIGNIFICANCE LEVELS FOR NO_2
($\mu g/m^3$)

Description	Value
Significant Impact Level	1
State and Federal Ambient Air Quality Standard	100

To simplify the modeling in inconsequential ways, a number of the smallest sources were merged with the larger ones, because of size and location considerations. The specific merges were:

- Because the NO_x emissions from the cuttings cleaning system ('CCS') are small (0.07 tpy) and within 10 meters of the engines, they will be equally added to Engines 1 to 4.
- Because the NO_x emissions from the emergency generator are small (< 0.1 TPY), they will be added to the Engine 6 emissions.
- The exhausts of Boilers 1 and 2 are within 10 meters of each other therefore; they will be co-located at the midway between the boilers. The single-boiler stack parameters will be used with the combined emissions.
- Because the NO_x emissions from the incinerator are very small (< 0.01 TPY), its emissions will be added to the boiler emissions.
- Because the location of the mobile crane is not known, its emissions will be combined with the emissions of the aft crane, which has the poorest dispersion characteristics of the stationary cranes.
- Since the location of the forklift on the deck is not known, its emissions will be added to the boiler emissions because the boilers have poorer dispersion characteristics.

These consolidations reduce the number of sources from 18 to 12. The locations and physical characteristics of the stationary sources are provided in Table 4. For the modeling, a coordinate system relative to the SDC drill well was used, which assumes that the bow is pointing west. The Universal Transverse Mercator (UTM) coordinates of the well are 456,174 meters Easting and 7,825,107 meters Northing in UTM zone 6 (NAD27).

Because the drilling operation will only occur from November 2002 through March 2003, the emissions have been spread uniformly over these five months.

TABLE 4
SDC SOURCE STACK PARAMETERS

Stationary Source Name	Model ID	Coordinates[a] X (m)	Y (m)	Stack Parameters NO_x Emissions (TPY)	(g/s)	Height above deck (m)	ice (m)[b]	Temperature (Kelvin)	Velocity (m/s)	Diameter (m)
Engine 1	E1	-27.2	-4.1	18.74	1.313	8.61	35.7	630.4	33.51	0.30
Engine 2	E2	-27.2	-1.5	18.74	1.313	8.61	35.7	630.4	33.51	0.30
Engine 3	E3	-27.2	0.1	18.74	1.313	8.61	35.7	630.4	33.51	0.30
Engine 4	E4	-27.2	2.7	18.74	1.313	8.61	35.7	630.4	33.51	0.30
Engine 5	E5	-139.7	-17.5	18.72	1.311	8.61	35.7	630.4	33.51	0.30
Engines 6 & Emer. Gen	E6EG	-139.7	-13.5	18.81	1.318	8.61	35.7	630.4	33.51	0.30
Port flare	FLRP	23.0	-52.3	1.96	0.138	5.0	32.1	1,273.2	20.00	2.65
Starboard flare	FLRS	22.7	42.5	1.96	0.138	5.0	32.1	1,273.2	20.00	2.65
Port crane	PRTC	-29.6	-28.0	2.07	0.145	14.0	41.1	638.7	115.91	0.15
Starboard crane	STBC	-29.7	18.3	1.80	0.126	14.0	41.1	616.5	104.78	0.15
Aft crane (+mobile crane)	AFTC	33.2	-0.2	1.18	0.083	10.8	37.9	683.2	76.26	0.10
Boilers (+forklift + incin.)	BOIL12	-139.7	-10.8	2.25	0.158	8.6	35.7	394.3	18.26	0.20

[a] Origin of SDC coordinates is the well and the bow is pointing west. The negative X direction is equivalent to the direction towards the bow and positive Y towards starboard.

[b] The deck is 89 feet above the ice surface.

The flares are characterized using the algorithm from SCREEN3, which assumes the exit temperature is 1,273 K, the exit velocity is 20 m/s, and the exit diameter (in meters) is calculated using

$$D(m) = 9.88x10^{-4}(0.45H)^{0.5}$$

where *H* is the total heat release rate in calories/sec. For this analysis, H is $1.60x10^7$ cal/sec (229.2 MMBTU/hr, flare's rate of heat input).

For emission downwash estimates, the SDC platform dimensions are provided as summarized in Table 5. The drilling platform is on the SDC's main deck and will be approximately 89 feet above sea level. For modeling purposes, the platform structure was treated as a multi-tiered building. Figure 2 shows a layout of the SDC main deck, with stack locations identified. Two additional drawings that show side views of the SDC and one illustrated image showing the SDC and the MAT are provided in Appendix D.

TABLE 5
DIMENSIONS OF PRINCIPAL SDC STRUCTURES

Structure	General Location	Height above Deck		Height Above Ice	Dimensions (meters)	
		feet	meters	meters	Length	Width
Main deck	-	0	0	27.1	202.4	53.0
Drilling facilities building	Stern	44	13.4	40.5	15.2	42.7
Accommodation modules	Bow	42	12.8	39.9	16.4	30.6
Bulk tanks – port	Mid to bow	31	9.6	36.7	54.1	7.0
Bulk tanks – starboard	Mid to bow	31	9.6	36.7	54.1	7.0
Tanks (5) – starboard	Mid	23	7.0	34.1	12.4	9.3
Tank (2) – port	Mid	23	7.0	34.1	9.2	3.7
Derrick enclosure	Stern	75	23.0	50.1	17.1	17.2

4.1 Model Selection

For this analysis, the most recent version of the Industrial Source Complex Short-Term Model (ISCST3 Version 00101) was used. ISCST3 was run with the regulatory default options and actual meteorological data. The model was run using rural dispersion mode since only ice will surround the SDC during operations when air emissions occur.

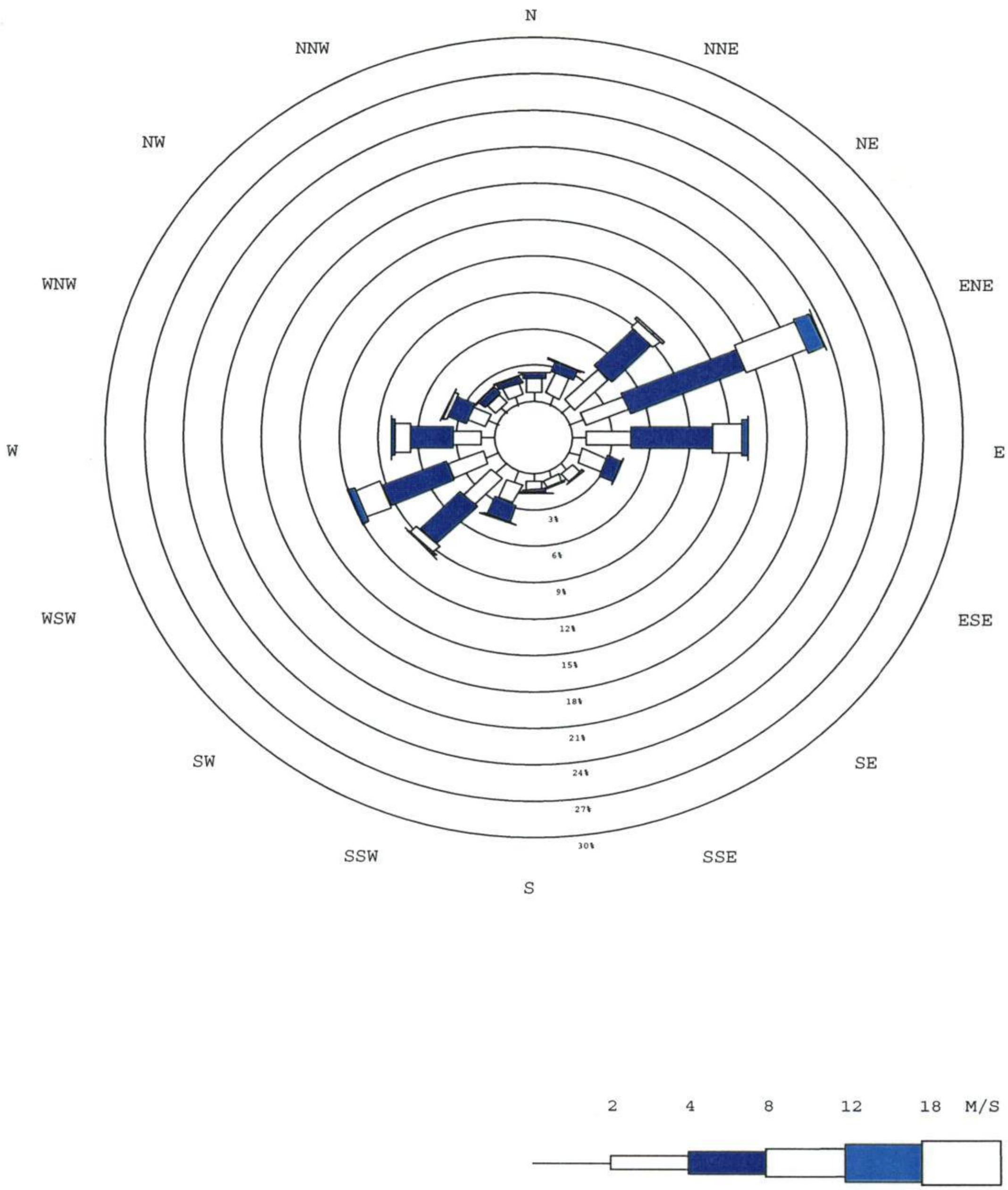
The building downwash parameters used in the ISCST3 input files were determined using the U.S.EPA's Building Profile Input Program (BPIP, Version 95086). Although, ISCST3 evaluates downwash, it only considers far-field wake effects. ISCST3 does not calculate pollutant concentrations within a downwash cavity (a re-circulating eddy on the downwind edge of a structure). Since it is assumed that the ambient air boundary comes up to the side of the SDC, cavity effects need to be considered. The SCREEN3 model (version 96043) was used to evaluate the cavity impacts, as described in Section 4.6.

4.2 Meteorological Data

For this analysis, the Alaska Department of Environmental Conservation provided five years (1991 to 1995) of ISCST3-ready meteorological data for the project. The hourly surface meteorological data were collected from Prudhoe Bay Pad A Meteorological Station, and the upper air data were from Barrow (Station 27502). The instrumentation at Pad A is PSD quality and met the PSD 90% collection criterion. This data has not been validated by ADEC, but ADEC has allowed the use of these data for modeling on other PSD and non-PSD permit applications. No processing of these data was needed because it was provided in an ISCST3-ready format. The hourly data are shown as a wind rose in Figure 3.

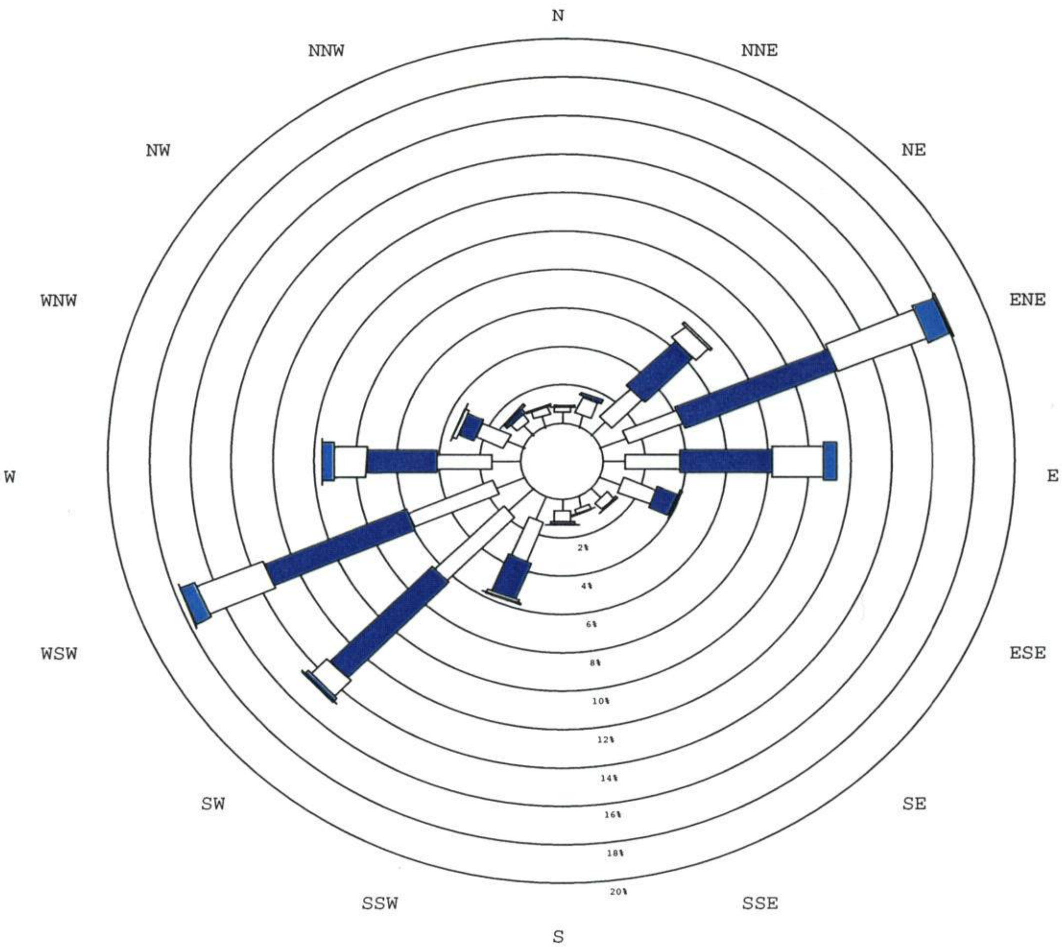
The operation of the SDC occurs between the months of November and March. Therefore, because the air emissions are only capable of being emitted during these months it is only the meteorology from these five months that are relevant to the impact analysis. The meteorological data for the five months of emissions are summarized as a wind rose in Figure 4.

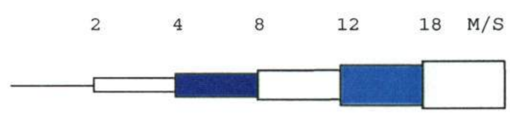
FIGURE 3
FIVE YEAR (1991-1995) WIND ROSE FOR THE PRUDHOE BAY PAD A



Purdhoe Bay Pad A
1991 to 1995
calm hours = 2422 Missing hours =0
number of non-calm/missing hours = 41402

FIGURE 4
FIVE YEAR (1991-1995) NOVEMBER-TO-MARCH WIND ROSE
FOR THE PRUDHOE BAY PAD A





Purdhoe Bay Pad A
Nov to Mar 1991 to 1995
calm hours = 1387 Missing hours =0
number of non-calm/missing hours = 16757

4.3 Background Concentrations and Competing Sources

When comparing a project's impact to the ambient air quality standards, an ambient background is needed. Two sites in the region were identified as possible candidates for background concentrations. The first site was located at Kuparuk River Unit Drill Site 1-F (DS-1F), which is located roughly 40 km SW of the project site. An annual NO_2 concentration of 5.6 $\mu g/m^3$ was measured there in 1991. These data have not been validated by ADEC but were collected using PSD quality instrumentation. This concentration value has been used for a background concentration in other recent permit efforts.

The second site is located at the village of Nuiqsut, which is located 8 miles south of Phillip's Alpine Central Production Facility and roughly 110 kilometers SSW of the project site. The Nuiqsut data was collected by Phillips Alaska, Inc. during 1999, 2000 and early 2001. Phillips is continuing to collect PSD-quality data at this station, however ADEC has not validated the data.

ADEC considers data from both sites as "regional" North Slope data sets. However, since the Nuiqsut data is newer that the DS-1F data and the annual NO_2 concentration from Nuiqsut (7.1 $\mu g/m^3$) is slightly higher than the DS-1F NO_2 concentration (5.6 $\mu g/m^3$), ADEC recommended the use of the Nuiqsut NO_2 concentration for a regional NO_2 background concentration for this region. Therefore, the NO_2 background concentration of 7.1 $\mu g/m^3$ was used in this analysis. For non-PSD, isolated, temporary sources such as this project, ADEC has not required that competing sources be included in the AAQS analysis (e-mail between Alan Schuler/ADEC and Kent Norville/Air Sciences, Dec 12, 2001).

4.4 Receptor Grid

Because the SDC will be surrounded by ice during the period when air emissions occur, flat terrain was assumed. Receptors were placed around the SDC using a series of Cartesian grids to identify the area of maximum impact. Initial modeling indicated that the highest impact occurred close to the SDC. Therefore, the spacing of the grid will depend on the distance from the facility: 50-meters within 500 meters of the SDC, 100-meter spacing within 1 kilometer, 200-meter spacing between 1 and 3 kilometers, 300-meter spacing from 3 to 5 kilometers, and 500-meter spacing beyond 5 kilometers. Receptors were also placed along the footprint (perimeter) of the SDC. Any receptors that fall within the footprint of the SDC/MAT will be excluded from the analysis. The receptor grid is shown on Figure 5.

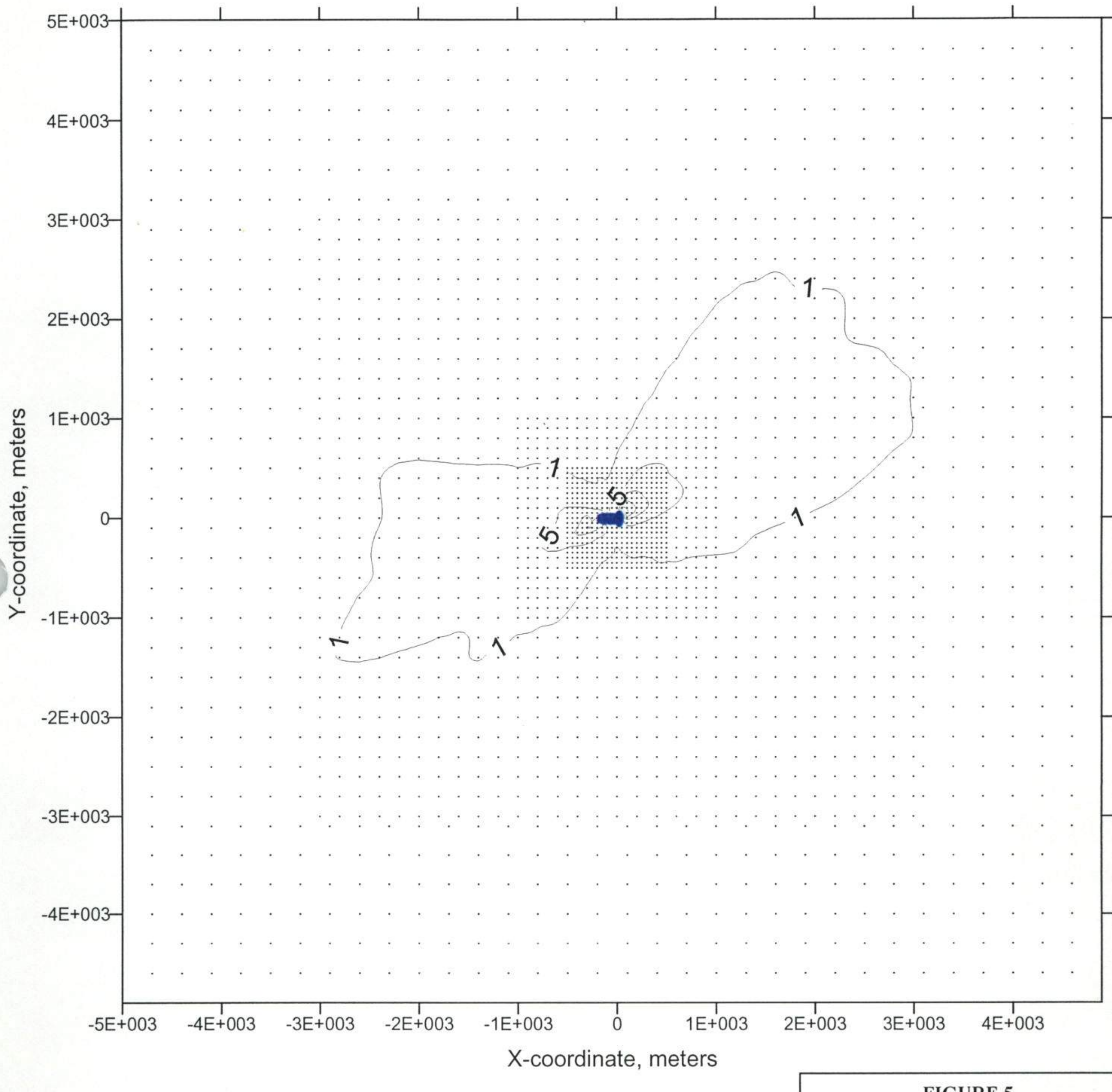


FIGURE 5
ANNUAL NOX IMPACTS (ug/m3)
1991 - 1995

McCovey Exploration Project

AIR SCIENCES INC.
LAKEWOOD, COLORADO

4.5 Impact Evaluation Outside Cavity

The ISCST3 model was run using the five years of meteorological data and the source information described above to estimate the maximum annual concentration. The maximum impact occurred on the fine 50-meter resolution grid close to the SDC. The location and value of the maximum impact are shown in Table 6.

TABLE 6
PREDICTED ANNUAL NO_X IMPACTS BY YEAR

Year	ISCST3 NO_X Concentration ($\mu g/m^3$)	Location X	Location Y
1991	22.35	100	50
1992	18.06	50	100
1993	19.39	100	50
1994	18.93	100	50
1995	16.26	50	100

Because the maximum concentration (22.35 $\mu g/m^3$) exceeds the Significant Impact Levels of 1 $\mu g/m^3$, the impact needs to be added to the background concentration of 7.1 $\mu g/m^3$ for comparison to the ambient standard. Therefore, the maximum predicted ISCST3 NO_x concentration from the SDC projects was 29.45 $\mu g/m^3$, which is less than the applicable air quality standard of 100 $\mu g/m^3$. Thus the SDC's NO_x impact outside the cavity zone is acceptable. Isopleths of the maximum annual NO_x concentrations estimated with the ISCST3 model are shown in Figure 5.

Because this project is temporary, it would not consume increment under ADEC's rules. Therefore, the impacts were not compared with the Class II PSD NO_2 increment.

4.6 Impact Evaluation Within Cavity

Because it is assumed that the ambient air boundary comes up to the side of the SDC, cavity effects need to be considered. As mentioned before, ISCST3 does not calculate pollutant concentrations within a downwash cavity. For this, the SCREEN3 model was used. SCREEN3 is a single source model that can estimate the cavity impact (1-hour average) from a single simple building. The inputs to the screen model are shown in Table 7. For this analysis, all of the emissions were combined and characterized using the stack characteristic of a single engine. This is a reasonable assumption since most (about 90%) of the emissions come from the engines. The "building" length and width were assumed to be the length and width of the SDC. The building height was assumed to be the height of the engine stack above the ice, since SCREEN3 will not make the calculation if the stack is shorter than the building height.

The SCREEN3 model makes two calculations, one with the wind blowing parallel to the long edge of the building and one with the wind blowing parallel to the short edge. Note that cavities form when winds are perpendicular to a building face. Off-angle winds tend to form vortexes that shed off the building and flush pollutant concentrations out of the cavity area. SCREEN3 predicts cavity concentrations only when the wind is parallel to the short edge, which, as shown by the wind rose in Figures 4, is not a predominate wind direction. Therefore, the cavity impacts predicted here are likely conservative. Since SCREEN3 calculates only 1-hour concentration values, the appropriate conversion factor of 0.08 is used to convert 1-hour values to annual concentration values. Impact estimates are provided in Table 8. When the background concentration of 7.1 $\mu g/m^3$ is added to the estimated SDC cavity impact of 47.9 $\mu g/m^3$, the total predicted impact is 55 $\mu g/m^3$, which is less than the standard of 100 $\mu g/m^3$. Thus, the SDC NO_x impact inside the cavity zone is acceptable.

TABLE 7
SCREEN3 CAVITY INPUTS

Parameter: Type	Units	Value Point
Emission Rate	(g/s)	8.667
Stack Height	(m)	35.7
Diameter	(m)	0.3048
Exit Velocity	(m/s)	33.51
Exit Temp.	(K)	630.4
Ambient Temp	(K)	273
Receptor Height	(m)	0
Dispersion		RURAL
Building Height	(m)	35.7
Building Length	(m)	202
Building Width	(m)	53

TABLE 8
SCREEN3 CAVITY NO_X IMPACTS
($\mu g/m^3$)

Maximum 1-hour Cavity concentrations	598.4
Annual Concentration*	47.9
With Background Concentration	55.0
Annual NO_2 Ambient Air Quality Standard	100.0

* Annual Concentration = 1-hour max * 0.08

4.7 Summary

Table 9 summarizes the results of the ISCST3 and SCREEN3 cavity analyses. These analyses show that the predicted NO_2 impact from the facility will be less than the standard. Note that this analysis conservatively assumes that all NO_x is converted to NO_2. All the associated air quality modeling files have been copied to a CD-ROM, provided in Appendix E.

TABLE 9
SUMMARY OF NO_X IMPACTS

	Maximum Annual Concentration ($\mu g/m^3$)	
	SDC Facility	SDC Facility With Background
ISCST3	22.35	29
SCREEN3	47.90	55
Standard		100

1/2002

Appendix A

ADEC Forms

Alaska Department of Environmental Conservation **AIR QUALITY MAINTENANCE**	**ADEC USE ONLY** Application Date ____________ ____________ ADEC Control # ____________ Revision #____________ AFS # ____________

AIR QUALITY CONSTRUCTION PERMIT APPLICATION FORM A
GENERAL INFORMATION (18 AAC 50.310(c)(1))

FIRM NAME AEC Oil & Gas (USA) Inc.
MAILING ADDRESS US Bank Tower, 950 17th Street, Suite 2600, Denver, Colorado, 80202
TELEPHONE NUMBER 403-261-2400

LEGAL OWNER ____________
MAILING ADDRESS ____________
TELEPHONE NUMBER ____________

OPERATOR (if different from owner) AEC Oil & Gas (USA) Inc.
MAILING ADDRESS US Bank Tower, 950 17th Street, Suite 2600, Denver, Colorado, 80202
TELEPHONE NUMBER 403-261-2400

DESIGNATED AGENT Mark Schindler
MAILING ADDRESS Lynx Enterprises, Inc. 1029 W 3rd Avenue, Suite 400, Anchorage AK 99501
TELEPHONE NUMBER 907-277-4611

BILLING CONTACT PERSON Rodger Steen
MAILING ADDRESS Air Sciences Inc, 12596 W Bayaud Ave, Suite 380, Lakewood CO 80228
TELEPHONE NUMBER 303-988-2960 ext 203
INDIVIDUALS AUTHORIZED TO BILL Alaska Department of Environmental Conservation

FACILITY NAME SDC
FACILITY CONTACT PERSON Soren Christiansen with AEC Oil & Gas
TELEPHONE NUMBER 403-261-2464
PHYSICAL ADDRESS Outer Continental Shelf, Steffanson Sound of the Beaufort Sea

UTM COORDINATES OR Surface location in meters: Zone 6 (NAD 27) 456,174 Easting, 7,825,107 Northing
LATITUDE/LONGITUDE Surface location in degrees, minutes, seconds: Lat 70 31 44 N, Long 148 10 41 W

The application is **NOT** complete unless the certification of truth, accuracy, and completeness on the back of this form bears the **notarized signature of a responsible official** of the firm making the application. The responsible official's signature must be notarized when certifying a permit application or compliance certification. (18 AAC 50.205)

CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS

"Based on information and belief formed after reasonable inquiry, I certify that the statements and information in and attached to this document are true, accurate, and complete."

______________________________	______________________________
Signature	Date
Kevin Bolton	Assistant Secretary
Printed Name	Title

This certifies that on ________________, the person named above appeared before me, a notary public in and for the State of ________________, and signed the above statement in my presence.

Notary Signature & Seal ______________________________

My commission expires ________________

Type of permit for which application is made (Check all boxes that apply):		
1. OPERATING ☐		
Initial ☐	Renewal ☐	
2. REVISION ☐		
Administrative Revision ☐	Minor Revision ☐	Significant Revision ☐
3. CONSTRUCTION X		

FACILITY EMISSION SUMMARY

Air Contaminant Regulated at facility	Potential to Emit Existing at Last Permit Action[1]	Current Potential to Emit[2]	Proposed Potential to Emit[3] *	Actual Emissions existing at Last Permit Action[4]	Current Actual Emissions[5]
PM-10	NA	NA	9 TPY	NA	NA
Sulfur oxides	NA	NA	6 TPY	NA	NA
Carbon monoxide	NA	NA	35 TPY	NA	NA
Volatile Organic Compounds	NA	NA	33 TPY	NA	NA
Oxides of Nitrogen	NA	NA	124 TPY	NA	NA
Lead	NA	NA	< 0.3 pound/yr	NA	NA
Reduced Sulfur Compounds	NA	NA	0	NA	NA
Ammonia	NA	NA	0	NA	NA
Others (list)	NA	NA	---	NA	NA
Each HAP			< 0.25 TPY		
Total HAPS			< 0.25 TPY		

*** See Appendix B to the "Outer Continental Shelf Pre-construction Air Permit Application," for the emissions calculations and descriptions of the sources. See Table 4 of the "Outer Continental Shelf Pre-construction Air Permit Application," for the emission sources' stack parameters.**

1. Complete this column only if you are applying for an emission change at an existing facility. Attach Worksheet 1 and sample emission calculations for each regulated air contaminant. Potential to emit is as defined in AS 46.14.900(19)

2. Complete this column only if you are applying for an emission change at an existing facility and have made prior emission changes since the most recent permit action. Attach Worksheet 2 and sample emission calculations for each regulated air contaminant.

3. Complete this column for all applications. Attach Worksheet 3 and sample emission calculations for each regulated air contaminant. Potential to emit is as defined in AS 46.14.900(19).

4. Complete this column only if you are applying for an emission change at an existing facility. Attach a copy of Worksheet 4 and sample emission calculations for each regulated air contaminant. Actual emissions are as defined in 18 AAC 50.910.

5. Complete this column only if you are applying for an emission change at an existing facility and have made prior emission changes since the most recent permit action. Attach a copy of Worksheet 5 and sample emission calculations for each regulated air contaminant. Actual emissions are as defined in 18 AAC 50.910.

Alaska Department of Environmental Conservation AIR QUALITY MAINTENANCE	ADEC USE ONLY Application Date ____________ ADEC Control # ____________ Revision # ____________ AFS # ____________

FORM B
Air Quality Modeling Checklist

The Alaska Department of Environmental Conservation is providing this checklist to help applicants compile the elements needed for the Department to adequately review an air quality modeling analysis. The checklist should also be attached to the permit application to assist the Department in their modeling review.

A modeling analysis may be required under 18 AAC 50.310(c)(5), (d)(2), (g) and/or (n). Applicants required to provide a modeling analysis should fully describe their analysis, including the modeling tools and assumptions, all input data, the modeling results and whether the results indicate compliance with the ambient air quality standards and increments. The following checklist provides a more complete description of what should be included in a written modeling report.

Please contact the Department's Construction Permit Group at (907) 465-5100 if you have any questions concerning modeling requirements or recommendations for your specific permit application.

Section A - General Information

A.1 FIRM NAME **AEC Oil & Gas (USA) Inc.**

A.2 APPLICATION DATE **January 2002**

A.3 APPLICANT'S MODELING CONTACT

Name **Kent Norville**

Company **Air Sciences Inc.**

Address Line #1 **421 SW 6th Ave. Suite 1400, Portland, OR 97204**

Telephone No. **(503) 525 - 9394 ext 14**

FAX No. **(503) 525 - 9412** E-Mail Address **knorville@airsci.com**

Section B - Modeling Protocol

The Department encourages all applicants to submit a modeling protocol for review and approval well in advance of submitting their modeling analysis. Modeling protocols can help identify potential modeling concerns before applicants spend considerable time and money on a modeling demonstration. Modeling protocols also provide applicants with a level of protection against later changes in a federal/state approved modeling method.

Was a modeling protocol approved by the Department before modeling began? Yes **X (USEPA)** No____

Date of protocol **Dec 2001**

Date of Department's approval letter **USEPA's Jan 2002 via e-mail**

Section C - Submittal of Modeling Analysis

C.1 Are you submitting copies of the full modeling analysis (including electronic files) to:

a.	Supervisor, Construction Permits, ADEC AWQ/AQM 410 Willoughby Avenue, Suite 105 Juneau, AK 99801	Yes X	No____
b.	Federal Land Manager[1] (if required)	Yes ____	No X

C.2 Are you also submitting electronic copies of the following:

*Note: The Department recommends that applicants provide electronic copies of all modeling input and output files, meteorological data files, and post-processing files, rather than hard copies. Electronic files save paper and make it easier for the Department to spot-check and revise the analysis, as needed. Applicants should also provide the Department with an electronic copy of the "executable" and "source" modeling files, **if** they changed and recompiled a modeling code that was previously approved by the U.S. Environmental Protection Agency or the Department.*

a. BPIP input/output	Yes X	No____	NA____
b. Model input ready for execution	Yes X	No____	
c. Dispersion model output	Yes X	No____	
d. Meteorological data (in ASCII format)	Yes X	No____	NA____
e. "Executable" modeling program, if non-EPA version	Yes X	No____	NA____
f. Postprocessing programs & files	Yes X	No____	NA____
g. A "readme" textfile that describes the submitted files, including any files that are being provided in a compressed format	Yes X	No____	

[1] **For facilities classified under 18 AAC 50.300(c), (h)(3) or (h)(4), the Federal Land Manager should be contact as early as possible regarding his/her impact analysis requirements.**

Section D - Recommended Content of General Modeling Report

D.1 SITE LOCATION

a. Does the report include or reference a scaled site plan (e.g., Form A, Attachment A) showing:

Emission Release Locations	Yes X	No____	
Nearby Buildings	Yes X	No____	
Cross Section Directions (if applicable)	Yes X	No____	NA____
Property Lines	Yes NA	No____	
Fence Lines	Yes NA	No____	
Roads	Yes NA	No____	
Coordinates (preferably UTM) shown on axes	Yes X	No____	
Origin of Coordinate system (if not UTM)	Yes X	No____	NA____
North Arrow (true north)	Yes X	No____	
Other pertinent items (as applicable)	Yes X	No____	NA____

b. Does the report include or reference a topographical map(s) or aerial photograph(s) (e.g., Form A, Attachment B) showing:

Source Location	Yes X	No____	
Facility Boundaries	Yes X	No____	
Terrain Features (Contour Lines)	Yes NA	No____	
Nearby Buildings, Roads and Adjacent Facilities	Yes X	No____	
Meteorological Tower (if applicable)	Yes____	No X	NA____
Pre-Construction Monitoring Site (if applicable)	Yes____	No____	NA X

D.2 POLLUTANTS MODELED

Does the report list the pollutants and averaging times modeled? Yes X No____

Check all that apply:

NO2 X

SO2: 3-hr ____ 24-hr ____ Annual ____

PM-10: 24-hr ____ Annual ____

CO: 1-hr ____ 8-hr ____

Other(s) ____ *list*: ____

D.3 MODEL SELECTION

Does the modeling report describe:

a. Which computer dispersion model(s), including version number, was used in the modeling analysis? Yes X No____

Check all that apply:

SCREEN3 96043

ISCST3 00101

Other(s) ____ *list*: ____

b. The types of terrain features modeled? Yes X No____

Check all that apply: Simple X Intermediate ____ Complex____

c. Whether EPA regulatory default settings were used? Yes X No____

d. Whether modifications were made to the model source codes? Yes____ No X NA____

> Only recompiled for larger arrays

If Yes:

i. Does the report describe these changes and why they were made? Yes ____ No____

ii. Are you providing a copy of EPA's approval of these changes submitting the source code for Department/EPA approval? Yes ____ No____

e. The land use option (dispersion coefficient) you assumed? Yes ___X___ No______
Check which land use option was used: Urban ______ Rural__X__

f. The post-processing models/algorithms used to predict ambient concentrations or refine the analysis? Yes_____ No__X__ NA______

If post-processing was used to predict ambient impacts, has the actual model/algorithm been approved by the EPA or the Department? Yes _______ No______

Are maximum impacts provided that do not use post-processors? Yes _______ No______

D.4 METEOROLOGICAL DATA

The report should describe the meteorological data/assumptions used in the modeling analysis, including the items listed below (as applicable).

a. If you only modeled with EPA's **SCREEN3**, did you use the "full meteorological" option? Yes__X__ No____ NA______

(If "yes," you may skip to D.5)

b. Was some other screening meteorology used? Yes _______ No__X__

If Yes:

i. Did your input contain the meteorological categories used in EPA SCREEN3? Yes _______ No______

ii. Was the neutral/unstable mixing height set equal to 1 m above plume height (with a minimum of 320 m)? Yes _______ No______

iii. Do the screening wind directions include the 36 radials plus "line up" directions (with corresponding receptors for each wind direction)? Yes _______ No______

c. Was actual meteorology used? Yes ___X___ No______

If Yes:

i. Was this data previously approved for use by the Department? Yes __X*___ No______

Indicate date of approval letter ___*___________________

***[Data provided by ADEC and has been used on a number of other permit applications]**

ii. Was *National Weather Service* Data used? Yes ___X___ No______

List Surface Station Location ______ and Number ___________

List Upper Air Station Location **Barrow** and Number ___________

What years were used? **1991-1995**

Where did you obtain the electronic data?__**______________

Have you described how the data was processed? Yes_____ No_____**_

****[From ADEC in ISCST ready format, we did not process]**

iii. Was *On-Site* Surface Data used? Yes ___X___ No______

Have you described where, what and how this data was gathered? Yes __NA__ No______

Did you document periods of missing data and describe how they were filled in? Yes __NA__ No______

Has the data set been approved by the Department's Air Quality monitoring staff? Yes _______ No__X***_

*****[ddata have now been audited by ADEC monitoring staff but data has been used on a number of recent PSD and state-level permits]**

Have you described what upper air data you used and how you obtained the electronic data? Yes _X-above_ No______

iv. Have you described what processing was conducted for model input? Yes_____ No_X-already processed___

v. Is a Wind Rose illustrating the surface data provided? Yes ___X___ No______

D.5 FACILITY EMISSIONS AND STACK PARAMETERS

The report should provide the facility emissions and stack parameters used in the modeling analysis, or reference the emissions and stack parameters provided in Form A or the equivalent.

a. Are all existing and proposed emissions from your facility included in the analysis? Yes__X__ No_____

b. Do the maximum modeled emissions agree with the requested permit emission levels? Yes__X__ No_____

c. Are all facility stack parameters (i.e., stack height and exit diameter, actual exhaust flow rate, and exit temperature) described or referenced? Yes_ X___ No_____NA _____

d. Are all facility stacks modeled at the "Good Engineering Practice Stack Height" (GEP)? Yes__X__ No_____NA _____

e. **If** the analysis includes annual average and/or part-load emissions, do the exhaust flow rates and exit temperatures reflect these conditions? Yes____ No__X___NA _____

f. **If** the facility has stacks with weather caps or non-vertical discharges, have the stack exit velocities and modeled stack diameters been adjusted in accordance with current EPA/Department guidance to simulate reduced plume momentum? Yes_____ No_____NA _X____

D.6 OTHER LOCAL EMISSION SOURCES

Does the report discuss whether other local emission sources are present and if they are included in the modeling analysis? Yes__X*__ No_____

If Yes,

Does the report describe how the emission rates and parameters were obtained, and whether any changes were made to these parameters? Yes__NA*__ No_____

Does the report list or reference the emission rates and parameters used in the modeling analysis? Yes__NA*__ No_____

***[Baseline sources not required for this application]**

D.7 BASELINE EMISSIONS FOR INCREMENT DEMONSTRATIONS (if applicable)

If your analysis included "increment" modeling, then the report should discuss the baseline emissions and stack parameters used in the modeling analysis.

a. Did you include increment modeling in your analysis? Yes_____ No_X___

(If "no," you may skip to D.8)

b. **If** your facility existed prior to the baseline date, are all baseline emissions included in the analysis? Yes_____No____NA _____

If yes,

i. Are all baseline stack parameters (i.e., stack height and exit diameter, actual exhaust flow rate, and exit temperature) described or referenced? Yes_____ No_____

c. Does the report discuss whether other local baseline emission sources were present and if so, how they are included in the modeling analysis? Yes_____ No_____

If Yes,

Does the report describe how the emission rates and parameters were obtained, and whether any changes were made to these parameters? Yes_____ No_____

Does the report list or reference the emission rates and parameters used for the other local baseline sources in the modeling analysis? Yes_____ No_____

d. Do all baseline emissions reflect "actual" emission rates instead of "allowable" rates? Yes_____ No_____

e. Are all stacks modeled at or below the "Good Engineering Practice Stack Height" (GEP)? Yes_____ No_____ NA _____

f. **If** any baseline source had stacks with weather caps or non-vertical discharges, have the stack exit velocities and modeled stack diameters been adjusted in accordance with current EPA/Department guidance to simulate reduced plume momentum?

Yes_____ No_____ NA _____

D.8 OTHER MODELING CONSIDERATIONS

The report should discuss any other modeling parameters or considerations used in the analysis. Examples are provided below.

a. Downwash: Is downwash included for all stacks with a height below formula GEP?

Yes__X__ No_____NA _____

If Yes:

Have you included all BPIP input/output data on disk? Yes__X__ No_____

Have you included Cross Section Diagrams showing:

Both Buildings & Stacks Yes__X__ No_____

Signature of Person responsible for drawing Yes__X__ No_____

For an existing source, have you included photographs of buildings and stacks *(not required, but can be helpful)* Yes__X__ No_____ NA ____

b. Dry Deposition: Did you include an algorithm to account for gravitational settling (dry deposition) of particulates? Yes_____ No____NA __X__

If Yes:

Have you documented your deposition modeling assumptions (e.g., "surface roughness") and approach? Yes_____ No_____

c. NO2 Modeling: Did you include an algorithm to refine estimates of nitrogen dioxide (NO2) concentrations? Yes_____ No__X__NA _____

If Yes:

Have you described the algorithm and whether EPA/Department approval was obtained (if needed)? Yes_____ No_____

Date of Approval _______________

If ambient NOx data was used with the *Ambient Ratio Method*, have you described where the data was obtained, provided an electronic copy of the data and obtained Department approval for use of this data in this manner?

Yes_____ No_____ NA _____

If the *Ozone Limiting Method* was used, have you described where the data was obtained, provided an electronic copy of the ozone data and obtained EPA/Department approval for use of this data in this manner?

Yes_____ No_____ NA _____

D.9 BACKGROUND DATA

Does the report describe how the background concentrations were obtained and the values used in the modeling analysis? *(Note: May not apply for an analysis demonstrating the facility impacts are below the "Significant Concentrations" in Table 6 of 18 AAC 50.310(d)(2) or corresponding federal Class I significance thresholds, as applicable.)*

Yes_X_ No_____NA ____

D.10 RECEPTOR GRID

The report should describe the receptor locations, including the items listed below (as applicable).

a. Does the report include or reference a scaled map(s) or aerial photograph(s) showing the location of the modeled receptors in relation to the sources? *(Note: may not apply for screening analysis using linear models such as SCREEN3)* Yes_X_ No_____NA ____

If yes,
Are the modeling coordinates provided along the axis? Yes_X_ No_____

b. Are actual terrain elevations used for each receptor? Yes_____ No_X_

If Yes
What was the source and scale of the terrain elevations? (e.g., 7.5' USGS maps, 1:24,000 DEM data, 1:250,000 DEM data) ________________________

c. Are Cartesian (grid) receptors used (required when modeling more than one stack)?
Yes_X_ No_____

d. If coarse modeling was performed, are receptors spaced no further apart than 250 meters in elevated terrain and 500 meters in flat terrain? Yes_X_ No_____NA ____

e. Do the receptors extend far enough to include the maximum impact location and the nearest plume height terrain at stability F and wind speed of 2.5 m/sec? Yes_X___ No_____

f. Is a fine mesh of receptors (spaced no further apart than 50 meters) used to define the maximum impact areas for all averaging times? Yes_X_ No_____

g. Are receptors placed no further than 50 meters apart along the facility fence line?
Yes_NA_ No___

h. Are there steep terrain areas that required a more dense receptor spacing? Yes_NA_ No_____

i. Are receptors included for publicly accessible locations (ambient air) within the facility? Yes_____ No_____NA _X_

D.11 RESULTS AND DISCUSSION

The report should provide the modeling results and indicate whether they demonstrate compliance with the ambient air quality standards and increments, as applicable.

a. Are the modeling results summarized for each pollutant and for each averaging period? Yes_X_ No_____

b. **If** you used multiple models, are the maximum impacts summarized for each model?

Yes__X__ No____NA ____

c. Does the report include or reference a scaled map(s) or aerial photograph(s) showing the location of the maximum ambient impact(s)? *(Notes: 1. May not apply for screening analysis using linear models such as SCREEN3. 2. May not apply for an analysis demonstrating the facility impacts are below the "Significant Concentrations" in Table 6 of 18 AAC 50.310(d)(2) or corresponding federal Class I significance thresholds, as applicable.)*

Yes____ No___X__NA ____

d. Does the analysis demonstrate compliance with the ambient air quality standards and increments, as applicable? Yes__X__ No_____

Section E - Additional Reporting Information for PSD Sources

[NA This not a PSD source.]

E.1 EXISTING AIR QUALITY

Does the report discuss the existing local air quality and it's implications? Yes_____ No____

E.2 AMBIENT AIR QUALITY DEMONSTRATION

Are the maximum modeled facility impacts greater than the Significant Air Quality Impact Levels shown in Table 6, 18 AAC 50.310(d)(2)?[2] Yes____ No_____

If Yes:

a. Are ambient background levels included in the analysis for comparison against ambient standards? Yes____ No_____

b. Are impacts from other nearby sources included in the modeling? Yes_____ No_____
* temporary source

c. Are impacts from emissions above baseline compared with the **available** PSD Class II and/or Class I increments, as applicable? Yes_____ No____

d. Are the controlling meteorology conditions[3] summarized? Yes_____ No____

e. Are the controlling receptor locations and elevations summarized? Yes_____ No_____

f. Are impacts evaluated on any nonattainment area located within 10 kilometer of the source? Yes_____ No_______

g. Was a long rang transport model required for the evaluation of Class I PSD impacts?

Yes_____ No____

[2] **Note: The Significant Air Quality Impact Levels are not small enough to protect Class I increments.**

[3] **This should include the time period, wind direction, wind speed, stability category and mixing heights that lead to the maximum predicted impacts for each averaging time and pollutant.**

E.3 VISIBILITY ANALYSIS

The report should describe the visibility analysis and discuss the results.

a. Was the visibility analysis performed in accordance with EPA's *Workbook for Plume Visual Impact and Screening Analysis (revised)*, as adopted by reference in 18 AAC 50.035? Yes_____ No_____

b. Does the report discuss the visibility analysis and the results? Yes_____ No_____

E.4 SOILS AND VEGETATION IMPACT ANALYSIS

Are other Air Quality Related Values (AQRVs) addressed? Yes_____ No_____

If Yes,

Did you evaluate the modeled impacts from **all** local facilities (including background) for evaluation against Federal Land Manager AQRV protection levels? Yes_____ No_____

Section F - Additional Reporting Information for Facilities near Non-Attainment Areas

For facilities classified under 18 AAC 50.300(e) or 18 AAC 50.300(h)(9), the analysis must demonstrate that the expected maximum emissions of the *nonattainment air contaminant* will not cause ambient concentrations that exceed the concentrations in Table 6 in 18 AAC 50.310(d)(2) at any location that does not or would not meet the ambient air quality standard for that contaminant.

Does the analysis demonstrate this? Yes____ No_____NA __X__

Alaska Department of Environmental Conservation **AIR QUALITY MAINTENANCE**	**ADEC USE ONLY** Application Date ______ ______ ADEC Control # ______ Revision #______ AFS # ______

FORM H
Checklist for Owner Requested Limits to Avoid Classification

The Alaska Department of Environmental Conservation is providing this checklist to outline the required steps for submitting a complete and adequate application for requesting a physical or operational limit to allow a facility to avoid classification under subsections of 18 AAC 50.300. This information is only needed for owners/operators submitting an application under 18 AAC 50.305(a)(4) in accordance with 18 AAC 50.310(l) and 315(e)(8). The following checklist should be attached to the permit application to assist the Department during our review of the application package.

Please contact the Department's Construction Permit Group at (907) 465-5100 if you have any questions regarding Alaska's air quality permit requirements for constructing or modifying a facility.

1. Complete and attach each applicable form for your facility classification (See Standard Application Procedures) Yes **X*** No____

***Form A and Form B have also been completed.**

2. List each Facility Classification(s) you are proposing to avoid

Classification	Regulation Citation
PSD, new major source.	40 CFR 52.21
Title V, operating permit.	40 CFR Part 70.

2. Describe the physical or operational restrictions you are proposing: PSD: Restrictions on the quantity and type of fuel burned and the hours of operation. Title V: A Construction permit that only allows 12-months of operation after the SDC commences operation or that expires 12-months after the SDC commences operation.

3. List proposed permit terms or conditions to limit operations or emissions

Number	Suggested terms or condition
1.	Fuel consumed by the IC engines, boilers, trash incinerator and the cutting cleaning system is limited to diesel number 1 or number 2.
2.	The sulfur content of the diesel fuel may not exceed 0.05 percent by weight.
3.	The monthly rolling annual total of diesel fuel consumed may not exceed 1,263, 909 gallons.
4.	The combined monthly rolling annual total hours of operation for both flares may not exceed 504.
5.	The monthly rolling annual total hours of use of the trash incinerator may not exceed 240.

List or attach the proposed monitoring techniques of each proposed terms or conditions to ensure emissions will be restricted to the level proposed:

Number	Proposed Monitoring Technique
1.	Copies of the diesel-fuel specifications, as provided by the fuel supplier, shall indicate the sulfur content of the fuel, in units of percent by weight
2.	Same as above.
3.	The level of the fuel in each of the SDC's storage vessel shall be measured monthly and the amount of fuel use calculated.
4.	For each flare, the start and end time for each continuous period of operation shall be recorded and the duration of use calculated.
5.	For the trash incinerator, the start and end time for each continuous period of operation shall be recorded and the duration of use calculated.

List or attach your record keeping proposals to document monitoring results from each technique:

Number	Record keeping Proposals
1.	The copies of all diesel fuel specifications as provided by the fuel supplier shall be kept.
2.	Same as above.
3.	Records of the fuel level measurements, example calculation, and calculation results shall be kept.
4.	Records of the start and stop time of each flare and the calculations of the duration of use shall be kept.
5.	Records of the start and stop time of the incinerator and the calculations of the duration of use shall be kept.

Appendix B

EMISSIONS CALCULATIONS

AIR SCIENCES INC.	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application	BY: D. Young		
DENVER • PORTLAND		PROJECT NO: 180-1-2	PAGE: 1	OF: 23	SHEET: 1
		SUBJECT: Table of Contents	DATE: January 23, 2002		

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DENVER • PORTLAND		PROJECT NO: 180-1-2	PAGE: 2	OF: 23	SHEET: 1
		SUBJECT: Source Description	DATE: December 11, 2001		

SOURCE DESCRIPTION - SDC FACILITY

Source Information

Source Description	Size, Manufacturer, Model	Source ID
Stationary Sources		
IC engine generates power for the drilling operation	1125hp Caterpillar D-399	ENG-1
IC engine generates power for the drilling operation	1125hp Caterpillar D-399	ENG-2
IC engine generates power for the drilling operation	1125hp Caterpillar D-399	ENG-3
IC engine generates power for the drilling operation	1125hp Caterpillar D-399	ENG-4
IC engine generates power for the work and living areas	1125hp Caterpillar D-399	ENG-5
IC engine generates power for the work and living areas	1125hp Caterpillar D-399	ENG-6
IC engine that provides emergency power	1125hp Caterpillar D-399	ENG-EG
Flaring of the gas released during drilling and testing	5MMCF/day Flare	FLR Port
Flaring of the gas released during drilling and testing	5MMCF/day Flare	FLR Starbd
IC engines powers the port-side fixed crane	556hp GM 12V71T	PRTC
IC engines powers the starboard-side fixed crane	485hp GM 12V71T	STBC
IC engines powers the aft fixed crane	180hp GM 6V71	AFTC
Boiler that provides heat to the work and living areas	4.5MMBtu/hr Lister, 100 hp	BLR1
Boiler that provides heat to the work and living areas	4.5MMBtu/hr Lister, 100 hp with Saacke burner	BLR2
Incinerator used to combust the trash and garbage	100kg/hr Atlas, MAX 50S	INCR
Volatilization unit used to clean the cuttings	4MMBtu/hr Volcano burner fitted to a rotary dryer	CCS
Mobile sources		
Mobile crane	137hp GM 4-53N	MBLC
Forklift	86hp Caterpillar 3304-NA	FRKL

AIR SCIENCES INC.	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application		BY: D. Young	
		PROJECT NO: 180-1-2	PAGE: 3	OF: 23	SHEET: 1
DENVER • PORTLAND		SUBJECT: Emission Summary		DATE: January 23, 2002	

EMISSIONS SUMMARY

Source Information			Annual Emissions (ton/yr)				
Source ID	**Stack ID**	**Category/Description**	**NOx**	**CO**	**PM**	**SO2**	**VOC**
Stationary Sources							
ENG-1	1	1125hp Caterpillar D-399	18.72	1.30	1.15	0.66	1.16
ENG-2	2	1125hp Caterpillar D-399	18.72	1.30	1.15	0.66	1.16
ENG-3	3	1125hp Caterpillar D-399	18.72	1.30	1.15	0.66	1.16
ENG-4	4	1125hp Caterpillar D-399	18.72	1.30	1.15	0.66	1.16
ENG-5	5	1125hp Caterpillar D-399	18.72	1.30	1.15	0.66	1.16
ENG-6	6	1125hp Caterpillar D-399	18.72	1.30	1.15	0.66	1.16
ENG-EG	7	1125hp Caterpillar D-399	0.09	0.08	0.05	0.05	0.08
FLR Port	8	5MMCF/day Flare	1.96	10.68	0.20	0.05	4.04
FLR Starbd	9	5MMCF/day Flare	1.96	10.68	0.20	0.05	4.04
PRTC	10	556hp GM 12V71T	2.07	0.45	0.15	0.03	0.17
STBC	11	485hp GM 12V71T	1.80	0.39	0.13	0.02	0.15
AFTC	12	180hp GM 6V71	0.67	0.14	0.05	0.01	0.05
BLR1	13	4.5MMBtu/hr Lister, 100 hp	0.96	0.24	0.10	0.35	0.03
BLR2	14	4.5MMBtu/hr Lister, 100 hp with Saacke burner	0.96	0.24	0.10	0.35	0.03
INCR	15	100kg/hr Atlas, MAX 50S	0.01	3.96	0.46	0.66	1.32
CCS	16	4MMBtu/hr Volcano burner fitted to a rotary dryer	0.07	0.02	0.01	0.03	15.88
		Subtotal	122.88	34.70	8.33	5.56	32.73
Mobile sources							
MBLC	-	137hp GM 4-53N	0.51	0.11	0.04	0.03	0.04
FRKL	-	86hp Caterpillar 3304-NA	0.32	0.07	0.02	0.02	0.03
		Subtotal	0.83	0.18	0.06	0.05	0.07
		Total Emissions	**123.71**	**34.88**	**8.39**	**5.61**	**32.80**

Hazardous Air Pollutants

SDC Combustion Source	ton/yr
Well gas	0.099
Large diesel engines	0.113
Small diesel engines	0.008
Boilers	0.007
Total HAPS	**0.220**

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application	BY: D. Young		
		PROJECT NO: 180-1	PAGE: 4	OF: 23	SHEET: 1
		SUBJECT: Operational limits	DATE: November 20, 2001		

SUMMARY OF THROUGHPUTS AND USAGES, & REQUESTED OPERATIONAL LIMITS

ID	Operating hours Yearly	Diesel Fuel use gal/hour	gal/year		Requested Operational Limits
ENG-1	2920	59.04	172,404		
ENG-2	2920	59.04	172,404		
ENG-3	2920	59.04	172,404		
ENG-4	2920	59.04	172,404		
ENG-5	2920	59.04	172,404		
ENG-6	2920	59.04	172,404		
ENG-EG	200	59.04	11,809		
		GenSet, Subtotal		1,046,234	
PRTC	240	29.90	7,176		
STBC	240	26.20	6,288		
AFTC	240	9.60	2,304		
BLR1	2920	32.85	95,912		
BLR2	2920	32.85	95,912		
CCS	240	29.20	7,007		
MBLC	240	8.30	1,992		
FRKL	240	4.51	1,083		
		Miscellaneous Sources, Subtotal		217,675	

1,263,909 total gallons of diesel fuel consumed annually
0.05% sulfur by weight
217,675 gallons of diesel fuel annually for misc. sources
0.05% sulfur by weight

	Field Gas million cubic feet	Operating hours Yearly
FLR Port	105	504
FLR Starbrd	105	504

504 hours per year combined flare usage

	Trash tons per year	Operating hours Yearly
INCR	26.4	240

240 hours per year trash incinerator usage

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application	BY: D. Young		
		PROJECT NO: 180-1-2	PAGE: 5	OF: 23	SHEET: 1
		SUBJECT: Drill motor generator	DATE: January 23, 2002		

Drill motor generator

Source ID: ENG-1, ENG-2, ... ,ENG-6

All information is for one of six identical IC-engines used to drive electric generators.

Engine Data

Engine Make and Model	Caterpillar D-399	
Engine Power Rating	1125 hp	Caterpillar's data, 6/92 (Attachment A)
Fuel Type	Diesel	
Fuel Consumption	0.37 lb/hp-hr	

Fuel Data

Diesel Sulfur Content	0.05 % S by weight	Low Sulphur Diesel light
Diesel Density	7.05 lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	416.25 lb/hr	Caterpillar's data, 6/92 (Attachment A)
	59 gal/hr	
	172,404 gal/yr	

Operation and Controls

Hours of Operation	24 hr/day	2920 max hr/yr
Control Equipment	None	

Emission Factors

NOx	5.17 g/hp-hr	Caterpillar's data, 6/92 (Attachment A)
CO	0.36 g/hp-hr	Caterpillar's data, 6/92 (Attachment A)
PM	0.0007 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
SO2	0.00809 S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.000705 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	12.82	18.72
CO	0.89	1.30
PM	0.79	1.15
SO2	0.46	0.66
VOC	0.79	1.16

Page 21 provides estimates of hazardous air pollutant emissions.

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application			BY: D. Young
		PROJECT NO: 180-1-2	PAGE: 6	OF: 23	SHEET: 1
		SUBJECT: Emergency Generator	DATE: January 23, 2002		

Emergency Generator

Source ID ENG-EG

Engine Data

Engine Make and Model	Caterpillar D-399	
Engine Power Rating	1125 hp	Caterpillar's data, 6/92 (Attachment A)
Fuel Type	Diesel	
Fuel Consumption	0.37 lb/hp-hr	

Fuel Data

Diesel Sulfur Content	0.05 % S by weight	Low Sulphur Diesel Light
Diesel Density	7.05 lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	416.25 lb/hr	Caterpillar's data, 6/92 (Attachment A)
	59 gal/hr	
	11,809 gal/yr	

Operation and Controls

Hours of Operation	24 hr/day	200 max hr/yr
Control Equipment	None	

Emission Factors

NOx	5.17 g/hp-hr	Caterpillar's data, 6/92 (Attachment A)
CO	0.36 g/hp-hr	Caterpillar's data, 6/92 (Attachment A)
PM	0.0007 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
SO2	0.00809 S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.000705 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	12.82	1.28
CO	0.89	0.09
PM	0.79	0.08
SO2	0.46	0.05
VOC	0.79	0.08

Page 21 provides estimates of hazardous air pollutant emissions.

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application	BY: D. Young		
		PROJECT NO: 180-1-2	PAGE: 7	OF: 23	SHEET: 1
		SUBJECT: Flare (Port & Starboard)	DATE: November 20, 2001		

Flare (Port & Starboard)

Source ID FLR

All information is for one of two identical flares. Dependent upon the direction of the wind only a single flare is used at a time.

Source Data

Throughput	5 MMCF/day	
Fuel Type	Field Gas	
Heat input per day	5,500 MMBtu/day	
Heat input per hour	229.17 MMBtu/hr	

Fuel Data

Heat Content	1100 Btu/CF	
Sulfur Content	5824 gr/million CF	10 ppmw H2S maximum (zero ppm is expected)

Fuel Consumption

Fuel consumption	5 MMCF/day
	105.0 MMCF/year

Operation and Controls

Hours of Operation	24 hr/day	504 max hr/yr
Control Equipment	None	

Emission Factors

NOx	0.068 lb/MMBtu	AP42, Industrial Flares, Table13.5-1, 9/91.
CO	0.37 lb/MMBtu	AP42, Industrial Flares, Table13.5-1, 9/91.
PM	7.6 lb/MMCF	AP42, Natural Gas, Table1.4-2, 7/98.
SO2	1.7472 lb/MMCF	AP42, Natural Gas, Table1.4-2, 7/98.
VOC	0.14 lb/MMBtu	AP42, Industrial Flares, Table13.5-1, 9/91.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	15.58	3.93
CO	84.79	21.37
PM	1.58	0.40
SO2	0.36	0.09
VOC	32.08	8.09

Page 22 provides estimates of hazardous air pollutant emissions.

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application		BY: D. Young	
		PROJECT NO: 180-1-2	PAGE: 8	OF: 23	SHEET: 1
		SUBJECT: Port Crane	DATE: November 20, 2001		

Port Crane

Source ID PRTC

Engine Data

Engine Make and Model	GM 12V71T	
Engine Power Rating	556	hp
Fuel Type	Diesel	
Fuel Consumption	29.9	gal/hr

Fuel Data

Diesel Sulfur Content	0.05	% S by weight	Low Sulphur Diesel Light
Diesel Density	7.05	lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption

29.90	gal/hr
7,176.0	gal/yr

Operation and Controls

Hours of Operation	24	hr/day	240 max hr/yr
Control Equipment	None		

Emission Factors

NOx	0.031	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
CO	0.00668	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
PM	0.0022	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
SO2	0.00809	S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.002514	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	17.24	2.07
CO	3.71	0.45
PM	1.22	0.15
SO2	0.22	0.03
VOC	1.40	0.17

Page 21 provides estimates of hazardous air pollutant emissions.

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application		BY: D. Young	
		PROJECT NO: 180-1-2	PAGE: 9	OF: 23	SHEET: 1
		SUBJECT: Starboard Crane	DATE: November 20, 2001		

Starboard Crane

Source ID STBC

Engine Data

Engine Make and Model	GM 12V71T	
Engine Power Rating	485	hp
Fuel Type	Diesel	
Fuel Consumption	26.2	gal/hr

Fuel Data

Diesel Sulfur Content	0.05	% S by weight	Low Sulphur Diesel Light
Diesel Density	7.05	lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption

26.20	gal/hr
6,288.0	gal/yr

Operation and Controls

Hours of Operation	24	hr/day	240 max hr/yr
Control Equipment	None		

Emission Factors

NOx	0.031	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
CO	0.00668	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
PM	0.0022	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
SO2	0.00809	S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.002514	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	15.04	1.80
CO	3.24	0.39
PM	1.07	0.13
SO2	0.20	0.02
VOC	1.22	0.15

Page 21 provides estimates of hazardous air pollutant emissions.

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application	BY: D. Young		
		PROJECT NO: 180-1-2	PAGE: 10	OF: 23	SHEET: 1
		SUBJECT: Aft Crane	DATE: November 20, 2001		

Aft Crane
Source ID AFTC

Engine Data

Engine Make and Model	GM 6V71	
Engine Power Rating	180	hp
Fuel Type	Diesel	
Fuel Consumption	9.6	gal/hr

Fuel Data

Diesel Sulfur Content	0.05	% S by weight	Low Sulphur Diesel Light
Diesel Density	7.05	lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption		
	9.60	gal/hr
	2,304.0	gal/yr

Operation and Controls

Hours of Operation	24	hr/day	240 max hr/yr
Control Equipment	None		

Emission Factors

NOx	0.031	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
CO	0.00668	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
PM	0.0022	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
SO2	0.00809	S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.002514	lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	5.58	0.67
CO	1.20	0.14
PM	0.40	0.05
SO2	0.07	0.01
VOC	0.45	0.05

Page 21 provides estimates of hazardous air pollutant emissions.

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application		BY: D. Young	
		PROJECT NO: 180-1-2	PAGE: 11	OF: 23	SHEET: 1
		SUBJECT: Boiler	DATE: November 20, 2001		

Boiler

Source ID BLR1

Boiler Data

Make and Model	Lister, 100 hp	
Firing Capacity	4.5	MMBtu/hr
Fuel Type	Diesel	

Fuel Data

Diesel Heat Content	0.137	MMBtu/gal	
Diesel Sulfur Content	0.05	% S by weight	Low Sulphur Diesel Light
Diesel Density	7.05	lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	231.57	lb/hr
	32.85	gal/hr
	95,912.4	gal/yr

Operation and Controls

Hours of Operation	24	hr/day	2920 max hr/yr
Control Equipment	None		

Emission Factors

NOx	20	lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
CO	5	lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
PM	2	lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
SO2	144	S, lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
VOC	0.556	lb/1000 gal	AP42, External Comb., Table 1.3-3, Distillate oil fired, 9/98.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	0.66	0.96
CO	0.16	0.24
PM	0.07	0.10
SO2	0.24	0.35
VOC	0.018	0.03

Page 23 provides estimates of hazardous air pollutant emissions.

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application	BY: D. Young		
		PROJECT NO: 180-1-2	PAGE: 12	OF: 23	SHEET: 1
		SUBJECT: Boiler	DATE: November 20, 2001		

Boiler
Source ID BLR2

Boiler Data

Make and Model	Lister, 100 hp with Saacke burner
Firing Capacity	4.5 MMBtu/hr
Fuel Type	Diesel

Fuel Data

Diesel Heat Content	0.137	MMBtu/gal	AP-42, Appendix A, Diesel
Diesel Sulfur Content	0.05	% S by weight	Low Sulphur Diesel Light
Diesel Density	7.05	lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	231.57	lb/hr
	32.85	gal/hr
	95,912.4	gal/yr

Operation and Controls

Hours of Operation	24 hr/day	2920 max hr/yr
Control Equipment	None	

Emission Factors

NOx	20 lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
CO	5 lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
PM	2 lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
SO2	144 S, lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
VOC	0.556 lb/1000 gal	AP42, External Comb., Table 1.3-3, Distillate oil fired, 9/98.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	0.66	0.96
CO	0.16	0.24
PM	0.07	0.10
SO2	0.24	0.35
VOC	0.018	0.03

Page 23 provides estimates of hazardous air pollutant emissions.

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application	BY: D. Young		
		PROJECT NO: 180-1-2	PAGE: 13	OF: 23	SHEET: 1
		SUBJECT: Incinerator	DATE: January 17, 2002		

Incinerator

Source ID INCR

Combustor Data

Make and Model	Atlas, MAX 50S	
Firing Capacity	100 kg/hr	220 lb/hr
Fuel	Garbage/Trash/Domestic waste-water solids	

Fuel Consumption

Fuel consumption	220	lb/hr
	0.11	ton/hr
	26.4	ton/year

Operation and Controls

Hours of Operation	24 hr/day	240 max hr/yr
Control Equipment	None	

Emission Factors

NOx	1 lb/ton	AP42 12.1-12, Domestic single chamber, w/o primary burner, 10/96.
CO	300 lb/ton	AP42 12.1-12, Domestic single chamber, w/o primary burner, 10/96.
PM	35.0 lb/ton	AP42 12.1-12, Domestic single chamber, w/o primary burner, 10/96.
SO2	50 lb/ton	AP42 12.1-12, Domestic single chamber, w/o primary burner, 10/96.
VOC	100 lb/ton	AP42 12.1-12, Domestic single chamber, w/o primary burner, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	0.11	0.01
CO	33.00	3.96
PM	3.85	0.46
SO2	5.50	0.66
VOC	11.00	1.32

AP42 does not provide emission factors for hazardous air pollutant emitted from these types of domestic waste combustors.

Cuttings cleaning system

Source ID CCS

Burner Data

Make and Model	Volcano burner fitted to a rotary dryer	
Firing Capacity	4 MMBtu/hr	
Fuel Type	Diesel	
Hydrocarbon feed rate	1.0 kg/min	132.3 pound per hour

Fuel Data

Diesel Heat Content	0.137 MMBtu/gal	
Diesel Sulfur Content	0.05 % S by weight	Low Sulphur Diesel Light
Diesel Density	7.05 lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	205.84 lb/hr
	29.20 gal/hr
	7,007.3 gal/yr

Operation and Controls

Hours of Operation	24 hr/day	240 max hr/yr
Control Equipment	None	

Emission Factors

NOx	20 lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
CO	5 lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
PM	2 lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
SO2	144 S, lb/1000 gal	AP42, External Comb., Table 1.3-1, Boilers <100mmBtu/hr, distillate, 9/98.
VOC	0.556 lb/1000 gal	AP42, External Comb., Table 1.3-3, Distillate oil fired, 9/98.

Emission Estimates

Pollutants from combustion of Diesel Fuel	lb/hr	ton/yr	
NOx	0.58	0.07	
CO	0.15	0.02	
PM	0.06	0.01	
SO2	0.21	0.03	
VOC	0.016	0.002	
Pollutant from volatilization of Hydrocarbons in the cuttings cleaning system			
VOC	132.30	15.88	Assuming all is volatilized.

Page 21 provides estimates of hazardous air pollutant emissions.

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application	BY: D. Young		
		PROJECT NO: 180-1-2	PAGE: 15	OF: 23	SHEET: 1
		SUBJECT: Mobile Crane	DATE: November 20, 2001		

Mobile Crane

Source ID MBLC

Engine Data

Engine Make and Model	GM 4-53N	
Engine Power Rating	137 hp	
Fuel Type	Diesel	
Fuel Consumption	8.3 gal/hr	

Fuel Data

Diesel Sulfur Content	0.05 % S by weight	Low Sulphur Diesel Light
Diesel Density	7.05 lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption

8.30 gal/hr

1,992.0 gal/yr

Operation and Controls

Hours of Operation	24 hr/day	240 max hr/yr
Control Equipment	None	

Emission Factors

NOx	0.031 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
CO	0.00668 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
PM	0.0022 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
SO2	0.00205 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
VOC	0.002514 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	4.25	0.51
CO	0.92	0.11
PM	0.30	0.04
SO2	0.28	0.03
VOC	0.34	0.04

Page 21 provides estimates of hazardous air pollutant emissions.

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application	BY: D. Young		
		PROJECT NO: 180-1-2	PAGE: 16	OF: 23	SHEET: 1
		SUBJECT: Forklift	DATE: November 20, 2001		

Forklift

Source ID FRKL

Engine Data

Engine Make and Model	Caterpillar 3304-NA	
Engine Power Rating	86 hp	
Fuel Type	Diesel	
Fuel Consumption	0.37 lb/hp-hr	

Fuel Data

Diesel Sulfur Content	0.05 % S by weight	Low Sulphur Diesel Light
Diesel Density	7.05 lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	31.82 lb/hr
	4.51 gal/hr
	1,083.2 gal/yr

Operation and Controls

Hours of Operation	24 hr/day	240 max hr/yr
Control Equipment	None	

Emission Factors

NOx	0.031 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
CO	0.00668 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
PM	0.0022 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
SO2	0.00205 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.
VOC	0.002514 lb/hp-hr	AP42, Stationary IC Sources, Table 3.3-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	2.67	0.32
CO	0.57	0.07
PM	0.19	0.02
SO2	0.18	0.02
VOC	0.22	0.03

Page 21 provides estimates of hazardous air pollutant emissions.

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application	BY: D. Young		
		PROJECT NO: 180-1-2	PAGE: 17	OF: 23	SHEET: 1
		SUBJECT: Tugs for SDC	DATE: November 20, 2001		

Tugs for SDC

Source ID Tow

1-vessel towing and 1 or more assisting

Engine Data

Tow and Assisting vessels

Specific vessels have not been chosen; the hp requirements are estimated based on the pull required.

Engine Power Rating - Combined	40,000 hp	
Fuel Type	Diesel	
Fuel Consumption	0.37 lb/hp-hr	

Fuel Data

Diesel Sulfur Content	0.3 % S by weight	
Diesel Density	7.05 lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	14,800 lb/hr
	2,099 gal/hr
	73,201 gal/yr

Operation and Controls

One-way distance to site	25 miles	(maximum distance to consider is 25 miles, per 40CFR55.)	
Averge speed	2 knots	2.3 miles/hr	
Hours of Operation	10.9 hrs towing	24 hrs positioning	34.9 hrs total
Control Equipment	None		

Emission Factors

NOx	0.024 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
CO	0.0055 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
PM	0.0007 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
SO2	0.00809 S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.000705 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	960.00	16.74
CO	220.00	3.84
PM	28.00	0.49
SO2	97.08	1.69
VOC	28.20	0.49

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application	BY: D. Young		
		PROJECT NO: 180-1-2	PAGE: 18	OF: 23	SHEET: 1
		SUBJECT: Tugs with supply barges	DATE: November 20, 2001		

Tugs with supply barges

Source ID Supply

Engine Data

Engine Make and Model	Unknown, twin engines	
Engine Power Rating	3500 kW/engine	9387 hp total from both engines
Fuel Type	Diesel	
Fuel Consumption	0.37 lb/hp-hr	

Fuel Data

Diesel Sulfur Content	0.3 % S by weight	
Diesel Density	7.05 lb/gal	AP-42, Appendix A, Distillate Oil

Fuel Consumption

Fuel consumption	3,473 lb/hr
	493 gal/hr
	41,980 gal/yr

Operation and Controls

Total equivalent hours at max engine load	n/a hrs/day	85.21 hrs/yr	Detailed calculations on following page.
Control Equipment	None		

Emission Factors

NOx	0.024 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
CO	0.00550 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
PM	0.0007 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
SO2	0.00809 S, lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.
VOC	0.000705 lb/hp-hr	AP42, Stationary IC Sources, Table3.4-1, 10/96.

Emission Estimates

Pollutant	lb/hr	ton/yr
NOx	225.29	9.60
CO	51.63	2.20
PM	6.57	0.28
SO2	22.78	0.97
VOC	6.62	0.28

Tugs with supply barges - Continued

Operation
The following represents a generalized plan to transport provisions to the SDC.

From Prudhoe Bay (West Dock)

Loads	1	load per tug	
Number of loads to supply	8		
Number of loads to remove	3		
	11	total loads	
One-way distance to supply or remove	13	miles	
Averge speed	4	knots	4.6 miles/hour
Hours operating at maximum engine load	62.17	hours for all loads	
Hours operating at idle (10% of max load)	11	hours (1 hour per load)	
			63.27 equivalent hours at max engine load

From Hay River

Loads	1	load per tug	
Number of loads to supply	2		
Number of loads to remove	0		
	2	total loads	
One-way distance supply or remove	25	miles	(maximum distance to consider is 25 miles, per 40CFR55.)
Averge speed	4	knots	4.6 miles/hour
Hours operating at maximum engine load	21.74	hours for all loads	
Hours operating at idle (10% of max load)	2	hours (1 hour per load)	
			21.94 equivalent hours at max engine load

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application	BY: D. Young		
		PROJECT NO: 180-1-2	PAGE: 20	OF: 23	SHEET: 1
		SUBJECT: Used oil	DATE: January 16, 2002		

Used oil

Hydraulic	5 drums	42 gallon / drum		=	210 gallons
Gear	4 drums	42 gallon / drum		=	168 gallons
Generator Engines	60 gallon / change/engine	3 change / year	7 engines	=	1260 gallons
Cranes and Loaders	10% of subtotal	1638 gallons / subtotal		=	164 gallons

Total used oil 1802 gallons

HAZARDOUS AIR POLLUTANTS (HAPs), as defined pursuant to Section 112(b) of the Clean Air Act

HAPs - Fuel Oil Combustion; Engines

The estimated maximum amount of diesel fuel combusted by the GenSet engines, expressed in units of heat input:

1,046,234 gallons	137,000 Btu*	MMBtu	=	143,334 MMBtu/Yr
year	gallons	1,000,000 Btu		

*AP-42 Appendix A, Diesel heating value, 9/85.

The estimated HAP emissions from IC engines with >600 hp output:

HAP	Emission Factor lb/MMBtu*	Emissions lb/yr	Emissions ton/yr
Benzene	7.76E-04	111.2	0.056
Toluene	2.81E-04	40.3	0.020
Xylenes	1.93E-04	27.7	0.014
Formaldehyde	7.89E-05	11.3	0.006
Acetaldehyde	2.52E-05	3.6	0.002
Acrolein	7.88E-06	1.1	0.001
Naphthalene	1.30E-04	18.6	0.009
Total PAH**	8.20E-05	11.8	0.006
			0.113

*AP-42, Stationary IC sources, Table 3.4-3.

**Emission factor excludes the already accounted for naphthalene.

The estimated maximum amount of diesel fuel combusted by the non GenSet engines, expressed in units of heat input:

18,843 gallons	137,000 Btu*	MMBtu	=	2,582 MMBtu/Yr
year	gallons	1,000,000 Btu		

*AP-42 Appendix A, Diesel heating value, 9/85.

The estimated HAP emissions from IC engines with ≤600 hp output:

HAP	Emission Factor lb/MMBtu*	Emissions lb/yr	Emissions ton/yr
Benzene	9.33E-04	2.4	0.0012
Toluene	4.09E-04	1.1	0.0005
Xylenes	2.85E-04	0.7	0.0004
Propylene	2.58E-03	6.7	0.0033
1,3-Butadiene	3.91E-05	0.1	0.0001
Formaldehyde	1.18E-03	3.0	0.0015
Acetaldehyde	7.67E-04	2.0	0.0010
Acrolein	9.25E-05	0.2	0.0001
Naphthalene	8.48E-05	0.2	0.0001
Total PAH**	8.32E-05	0.2	0.0001
			0.008

*AP-42, Stationary IC sources, Table 3.3-2.

**Emission factor excludes the already accounted for naphthalene.

HAZARDOUS AIR POLLUTANTS (HAPs), as defined pursuant to Section 112(b) of the Clean Air Act

HAPs - Gas Combustion; Flares

The estimated maximum amount of gas from the well that could be combusted by the flares:

5 MMCF	day	504 hours	=	105	MMCF/year
Day	24 hours	year			

The estimated HAP emissions are:

HAP	Emission Factor lb/MMSCF*	Emissions lb/yr	Emissions ton/yr
Lead**	0.0005	0.053	2.625E-05
Benzene^	2.10E-03	0.221	1.103E-04
Dichlorobenzene^	1.20E-03	0.126	6.300E-05
Formaldehyde^	7.50E-02	7.875	3.938E-03
Hexane^	1.80E+00	189.000	9.450E-02
Naphthalene^	6.10E-04	0.064	3.203E-05
Toluene^	3.40E-03	0.357	1.785E-04
POM (sum)^	8.82E-05	0.009	4.631E-06
Arsenic^^	2.00E-04	0.021	1.050E-05
Beryllium^^	1.20E-05	0.001	6.300E-07
Cadmium^^	1.10E-05	0.001	5.775E-07
Chromium^^	1.40E-05	0.001	7.350E-07
Cobalt^^	8.40E-05	0.009	4.410E-06
Manganese^^	3.80E-04	0.040	1.995E-05
Mercury^^	2.60E-04	0.027	1.365E-05
Nickel^^	2.10E-03	0.221	1.103E-04
Selenium^^	2.40E-05	0.003	1.260E-06
			0.099

Notes:

*USEPA Emission Factors are based on a fuel heating value of 1020 Btu/scf.

**AP42, Natural Gas Combustion, Table 1.4-2, 7/98.

^AP42, Natural Gas Combustion, Table 1.4-3, 7/98.

^^AP42, Natural Gas Combustion, Table 1.4-4, 7/98.

AIR SCIENCES INC. DENVER • PORTLAND	CALCULATIONS	PROJECT TITLE: McCovey - Air Permit Application	BY: D. Young		
		PROJECT NO: 180-1-2	PAGE: 23	OF: 23	SHEET: 1
		SUBJECT: HAPs - Fuel Oil Combustion; Boilers	DATE: January 22, 2002		

HAZARDOUS AIR POLLUTANTS (HAPs), as defined pursuant to Section 112(b) of the Clean Air Act

HAPs - Fuel Oil Combustion; Boilers

The estimated maximum amount of diesel fuel combusted by the boilers and cuttings cleaning system, expressed in units of heat input:

$$\frac{198{,}832 \text{ gallons}}{\text{year}} \left| \frac{137{,}000 \text{ Btu}^{*}}{\text{gallons}} \right| \frac{\text{MMBtu}}{1{,}000{,}000 \text{ Btu}} = 27{,}240 \text{ MMBtu/Yr}$$

*AP-42 Appendix A, Diesel heating value, 9/85.

The estimated HAP emissions from the boilers and cuttings cleaning system:

HAP	Emission Factor lb/1000 gal*	Emissions lb/yr	Emissions ton/yr
POM	3.30E-03	0.7	0.0003
Formaldehyde	6.10E-02	12.1	0.0061
	$lb/10^{12}$ Btu**		
Arsenic	4	0.1	0.00005
Beryllium	3	0.1	0.00004
Cadmium	3	0.1	0.00004
Chromium	3	0.1	0.00004
Lead	9	0.2	0.00012
Mercury	3	0.1	0.00004
Manganese	6	0.2	0.00008
Nickel	3	0.1	0.00004
Selenium	15	0.4	0.00020
			0.007

*AP-42, External Combustion Sources, Table 1.3-8, Distillate Oil, 9/98.

**AP-42, External Combustion Sources, Table 1.3-10, Distillate Oil, 9/98.

CATERPILLAR®

Interoffice Memorandum

Facility LARGE ENGINE CENTER

Date June 16, 1992

Plant/Office MOS 9

Department 3500 Product Group

Attention R. P. Laird

Plant Or Office	Department	Attention

Destroy File Until (Date)

CC: D. C. Dowdall, P. S. & E. C. - AB6480

Request # 92009

The requested emissions data* presented below is based on tests conducted at Caterpillar Inc. using instrumentation and procedures equivalent to those outlined in SAE 177a & 215.

Engine Model: D399 PCTA running at 100% load, 1125 Hp at 1225 RPM, with wet manifolds.
Arr#: --- PL#: ---
Application: A continuous rated marine propulsion engine.

	Lb/Hr	g/Hr	g/Hp-Hr	PPM (Wet)	% BY Vol.	%BY Wt.
CO2	1310.9	594628	528.56	79315	7.93	12.12
N2	7979.1	3619251	3217.11	760090	76.01	73.77
O2	996.5	452009	401.79	82931	8.29	9.21
H2O	518.7	235293	209.15	76754	7.68	4.80
CO	0.9	400	0.36	84	0.01	0.01
NO-	8.4	3800	3.38		0.07	0.08
NOx-	12.8	5812	5.17	748	0.00	0.00
HC	0.0	20	0.02	8	0.00	0.00
SO2^	1.7	754	0.67	70	0.01	0.02
DPM+	0.3	116	0.10			

	g/Hr	g/Hp-Hr	g/n cu.M'
NOx	5812	5.17	1.922
CO	400	0.36	0.132
HC	20	0.02	0.007

SMOKE (Cat Number)..... 0.038
FUEL RATE................ 416.25 Lb/Hr
INLET AIR FLOW.......... 10400 Lb/Hr
EXHAUST FLOW:
Rate...................... 10816 Lb/Hr
at 60 deg F and 760mm Hg. 2373 SCFM
at 675 deg F stack temp. 5181 CFM

Notes: * This data is based on steady-state engine operating conditions of 85 deg. F and 29.38 in. Hg. and No. 2 diesel fuel. This data is also subject to instrumentation, measurement and engine-to-engine variations.

\- The NOx shown is not actually present in the exhaust. It is based on the assumption that the NO present in the exhaust is converted to NOx in the atmosphere. NO and NOx are corrected to 75 grains humidity.

^ SO2 is proportional to a sulfur content of 0.20 % by weight of the fuel.

\+ DPM (Dry Particulate Matter) is an approximation based on a correlation to smoke density, and is not included in the total exhaust flow rate.

' Grams per normal cubic meter values are corrected to 5% oxygen.

This report provides the best information available at this time. It should not be used at a future date without verification as to its validity for the current engine.

Paul Mineart

Paul Mineart
L. C. Morris L.C. Morris
3500 Product Design
Ext. 5910

10505-07 PC

Appendix C

ADEC Memos

MEMORANDUM

State of Alaska

Department of Environmental Conservation
Division of Air and Water Quality - Air Quality Maintenance

TO: John Stone, Chief

DATE: March 24, 1998

FILE: 74.05.02

FROM: John Kuterbach
Air Quality Maintenance

SUBJECT: Maximum SO_2 Concentration from the combustion of #2 diesel fuel

EPA in their Title V permit reviews is requiring the department to demonstrate that limiting fuel sulfur to 0.5% will ensure compliance with our 500 ppmv SO_2 limit. This memorandum sets forth engineering calculations which demonstrate that combustion of #2 diesel fuel containing up to 0.5% sulfur will always comply with the 500 ppmv SO_2 limit regardless of the engine involved. I recommend that we reference these calculations in future "statements of basis" that we send to EPA with our draft operating permits.

Summary

This engineering calculation examined the stoichiometric combustion of #2 diesel fuel and calculated the maximum sulfur dioxide content of the flue gases. Typically, combustion of #2 diesel fuel can produce up to 338 ppmv SO_2 in the flue gas. Although this figure varies proportionally with the carbon content of the diesel fuel, the figure will never exceed the 500ppm limit.

I conclude that combustion of #2 diesel fuel with air will always comply with the 500ppmv emission limit. The ASTM specification for #2 diesel fuel limits sulfur to 0.5% or less.

Assumptions

All constituents of the fuel are burned proportionally
Any excess air typical of combustion would tend to dilute the SO_2 concentration in the flue gas, therefore only theoretical air is considered.
#2 diesel fuel is composed of Carbon, Hydrogen, Sulfur, and negligible amounts of Water and ash.
Ignore the water because the standard is a dry standard and the water will drop out of any calculations.
Ignore the ash as negligible unless the study predicts an SO_2 concentration greater than 450 ppm.
Typical #2 diesel fuel is composed of 87% Carbon, 12.5% Hydrogen, and 0.5% Sulfur
Calculations.

Using normal air for combustion (79% N_2 and 21% O_2):

For each lb-mole of Oxygen in Air, there is 3.76 lb-mole Nitrogen (1 lb-mole O_2) = (0.79/0.21) = 3.76 lb-mole N_2

The stoichiometric equations are:
$C + O_2 + 3.76\ N_2 = CO_2 + 3.76\ N_2$
$2H_2 + 0_2 + 3.76\ N_2 = 2H_20 + 3.76\ N_2$
$S + 0_2 + 3.76\ N_2 = SO_2 + 3.76\ N_2$

To calculate the dry exhaust gases (CO_2, N_2, SO_2) the following equations are used:

moles CO_2 = (lb C) x (1 lb-mole C/12.01 lb C) x (1 lb-mole CO_2/1 lb mole C)
moles N_2 = (lb C) x (1 lb-mole C/12.01 lb C) x (3.76 lb-mole N_2/lb-mole C)

+(lb H_2) x (1 lb-mole H_2/2.016 lb H_2) x (3.76 lb-mole N_2/2 lb-mole H_2)
+(lb S) x (1 lb-mole S/32.06 lb S) x (3.76 lb-mole N_2/lb-mole S)

moles SO_2 = + (lb S) x (1 lb-mole S/32.06 lb S) x (lb-mole SO_2/1 lb-mole S)

Condensing these equations leaves:

moles CO_2 = lb C/12.01
moles N_2 = 3.76 x [(lb C/12.01) + (lb H_2/4.032) + (lb S/32.06)]
moles SO_2 = lb S/32.06

Then, by Avogadro's Law and the definition of mole:

ppmv SO_2 = 1,000,000 x [moles SO_2/(moles CO_2 + moles N_2 + moles SO_2)]

Results

Using 100 pounds of fuel as a basis, we examined the following three cases:

Case	Pounds in Fuel		
	Carbon	Hydrogen	Sulfur
1	87	12.5	0.5
2	96	3.5	0.5
3	78	21.5	0.5

Case 1 is the normal case, Case 2 increases carbon by 10 percent, and Case 3 decreases carbon by 10 percent.

	Case 1	Case 2	Case 3
moles CO_2	7.24	7.99	6.49
moles N_2	38.94	33.36	44.51
moles SO_2	0.0156	0.0156	0.0156
Total Dry Moles	46.196	41.366	51.016
ppmv SO_2	338	377	306

Conclusion

The above calculations show that #2 diesel fuel combusted with air will always comply with the 500 ppmv SO_2 limit. The calculations use the conservative assumptions of complete combustion and no excess air. The real-world includes partial combustion and excess air, both of which would tend to dilute the SO_2 concentration in the exhaust effluent.

The equations above can be used as an initial screening for other petroleum fuels even with a higher sulfur content or significant ash.

If you agree this memorandum has value, please share it with the rest of the AQM staff.

MEMORANDUM

State of Alaska

Department of Environmental Conservation
Division of Air and Water Quality - Air Quality Maintenance

TO: John F. Kuterbach, Program Manager

DATE: October 27, 2000

THRU: Bill MacClarence, Operating Permits Supervisor

FROM: Matt Wilkinson
Air Quality Maintenance

SUBJECT: Maximum SO_2 Concentration from the combustion of natural gas

EPA in their Title V permit reviews is requiring the department to demonstrate that limiting hydrogen sulfide content of the natural gas to 4000 ppmv will ensure compliance with our 500 ppmv SO_2 limit. This memorandum sets forth engineering calculations which demonstrate that combustion of natural gas containing hydrogen sulfide up to 4000 ppmv will always comply with the 500 ppmv SO_2 limit regardless of the source involved. I recommend that we reference these calculations in future "statements of basis" that we send to EPA with our draft operating permits.

Summary

This engineering calculation examined the stoichiometric combustion of natural gas and calculated the maximum sulfur dioxide content of the flue gases. The maximum sulfur dioxide concentration will result from the combustion of pure methane, whereas heavier hydrocarbons (e.g. ethane or propane) with the same volumetric hydrogen sulfide concentration will result in a lower concentration of sulfur dioxide. Typically, combustion of 4000-ppmv-hydrogen sulfide natural gas can produce up to 470 ppmv SO_2 in the flue gas and will never exceed the 500ppm limit.

I conclude that combustion of 4000-ppmv-hydrogen-sulfide natural gas with air will always comply with the 500ppmv emission limit.

Assumptions

All constituents of the fuel are burned proportionally.
Any excess air typical of combustion would tend to dilute the SO_2 concentration of the flue gas, therefore only theoretical air is considered.
Natural gas is composed of carbon, hydrogen, sulfur, and negligible amounts of water and ash.
Ignore the water because the standard is a dry standard and the water will drop out of any calculations.
The heavier hydrocarbons have a higher weight percent of hydrocarbons for a given volumetric hydrogen sulfide concentration that dilutes the SO2 concentration of the flue gas, therefore the natural gas is entirely made up of methane—the lightest hydrocarbon.

By Dalton's Law and by the Ideal Gas Law, the molar fraction is equal to the volume fraction. Therefore, for 100 moles of 4000-ppmv-hydrogen sulfide natural gas there are 100 X (4,000 / 1,000,000) = 0.4 moles of hydrogen sulfide and there are 100 – 0.4 = 99.6 moles of hydrocarbons.

By definition, the formula showing the composition of hydrocarbons is C_mH_n. Each mole of hydrocarbon supplies "m" moles C and supplies "n"/2 moles H_2. Each mole of hydrogen sulfide supplies one mole S and one mole H_2.

Therefore, the following equations can be used for 100 moles of a natural gas composed of 4000-ppmv hydrogen sulfide and only of one type of hydrocarbon:

moles C = 99.6 X m
moles H_2 = (99.6 X n / 2) + 0.4

moles S = 0.4

Using normal air for combustion (79% N_2 and 21% O_2):

For each lb-mole of Oxygen in Air, there are 3.76 lb-mole Nitrogen (1 lb-mole O_2) = (0.79/0.21) = 3.76 lb-mole N_2

The stoichiometric equations are:
$C + O_2 + 3.76\ N_2 = CO_2 + 3.76\ N_2$
$2H_2 + 0_2 + 3.76\ N_2 = 2H_2O + 3.76\ N_2$
$S + 0_2 + 3.76\ N_2 = SO_2 + 3.76\ N_2$

To calculate the dry exhaust gases (CO_2, N_2, SO_2) the following equations are used:

moles CO_2 = moles C
moles N_2 = (3.76 X moles C) + (1.88 X moles H_2) + (3.76 X moles S)
moles SO_2 = moles S

Then, by Avogadro's Law and the definition of mole:

ppmv SO_2 = 1,000,000 x [moles SO_2/(moles CO_2 + moles N_2 + moles SO_2)]

Results

Using 100 moles of fuel (i.e. 99.6 moles of hydrocarbon and 0.4 moles of hydrogen sulfide) as a basis, we examined the following three cases:

Case	Moles of Fuel		
	Carbon	Hydrogen	Sulfur
Methane = CH_4	99.6	199.6	0.4
Ethane = C_2H_6	199.2	299.2	0.4
Propane = C_3H_8	298.8	398.8	0.4

	Methane	Ethane	Propane
moles CO_2	99.6	199.2	298.8
moles N_2	751.2	1313.0	1874.7
moles SO_2	0.4	0.4	0.4
Total Dry Moles	851.2	1512.6	2173.9
ppmv SO_2	470	264	184

Conclusion

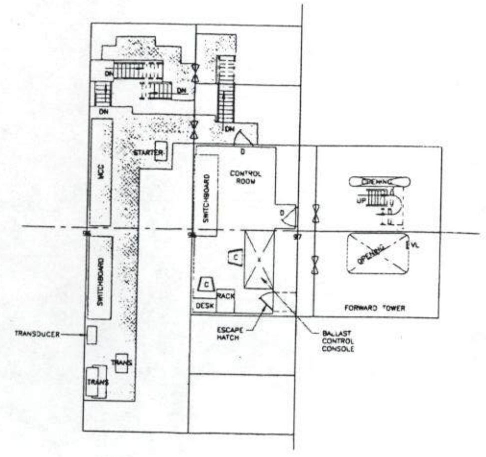
The above calculations show that 4000-ppmv-hydrogen-sulfide natural gas combusted with air will always comply with the 500 ppmv SO_2 limit. The calculations use the conservative assumptions of complete combustion and no excess air. The real-world includes partial combustion and excess air, both of which would tend to dilute the SO_2 concentration in the exhaust effluent.

The equations above can be used as an initial screening for other gaseous petroleum fuels even with a higher hydrogen sulfide content.

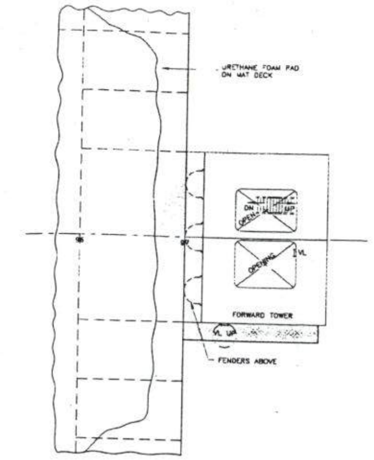
If you agree this memorandum has value, please share it with the rest of the AQM staff.

Appendix D

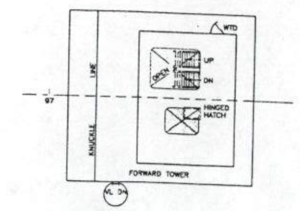
SDC Drawings



CONTROL ROOM DECK



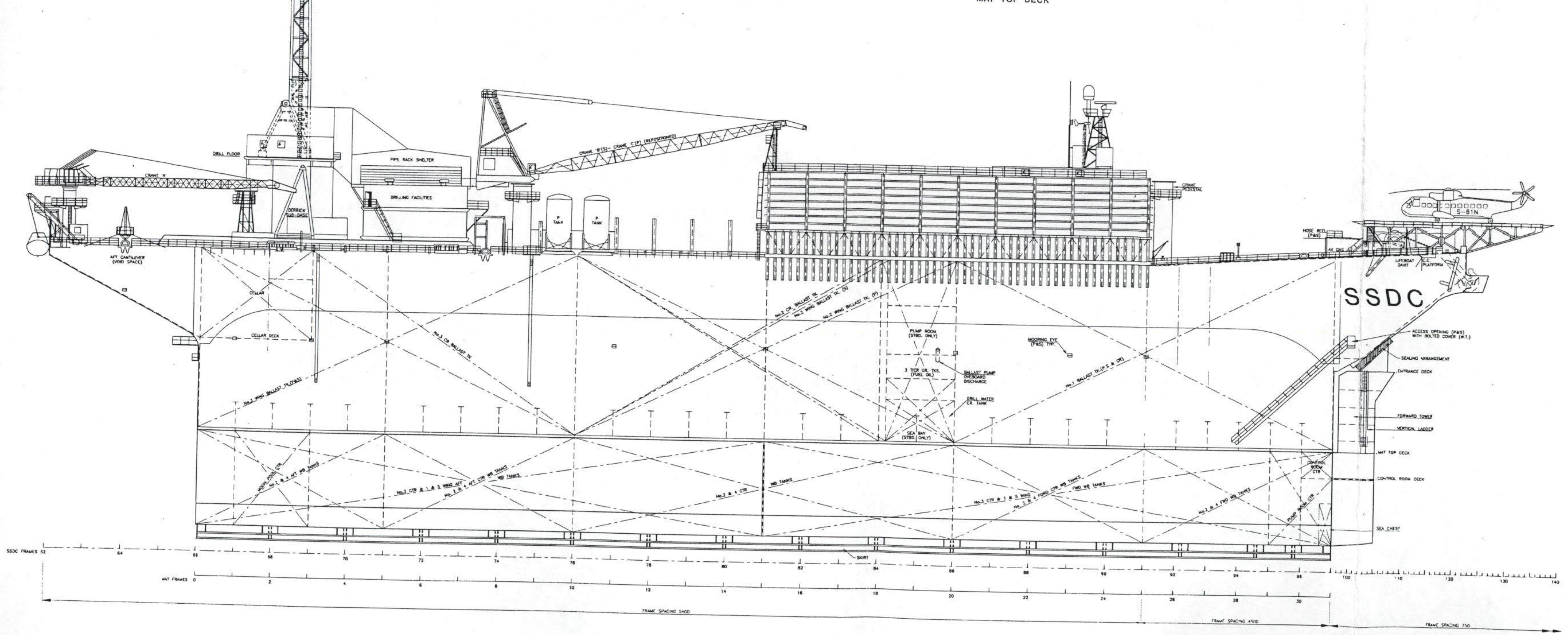
MAT TOP DECK



ENTRANCE DECK

PRINCIPAL DIMENSIONS: SSDC AND MAT:

LENGTH AT DECK	- 202.350 m (663.875ft)
LENGTH AT WATER LINE	- 168.000 m (551.179ft)
LENGTH AT BOTTOM OF SSDC (EXCL TOWER)	- 162.000 m (531.494ft)
BREADTH MLD SSDC	- 53.000 m (173.883ft)
BREADTH EXTREME AT SIDE MAT	- 110.000 m (360.891ft)
BREADTH EXTREME AT DECK MAT	- 60.000 m (196.849ft)
DEPTH MLD (BOTTOM OF SKIRT TO DECK)	- 41.135 m (134.952ft)
MAXIMUM FULL.LOAD TOWING DRAFT (BOTTOM OF SKIRT TO W.L.)	- 21.000 m (68.897ft)
DEPTH MLD SSDC	- 25.300 m (83.004ft)
DEPTH EXTREME AT SIDE MAT (INCL. SKIRT)	- 5.000 m (16.404ft)
DEPTH EXTREME AT CTR MAT (INCL. SKIRT)	- 15.500 m (50.852ft)
DEPTH OF SKIRT	- 2.000 m (6.561ft)
THICKNESS OF FOAM	- 300 mm (11.811in)
KEEL THICKNESS (S.S.D.C.)	- 33.5 mm(1.318in)



REV.	REVISION DESCRIPTION	BY	DATE
4	WIND POWER GENERATOR ADDED TO ACCOMMODATION MODULE		94-01-19
3	REDRAWN BY MAREI INC.	HM	92-09-16
2	ACCOM. LADDER RELOCATED		91-11-18
1	ADDED DIVERTER		90-08-08

DWG. NO.	REFERENCE DRAWINGS

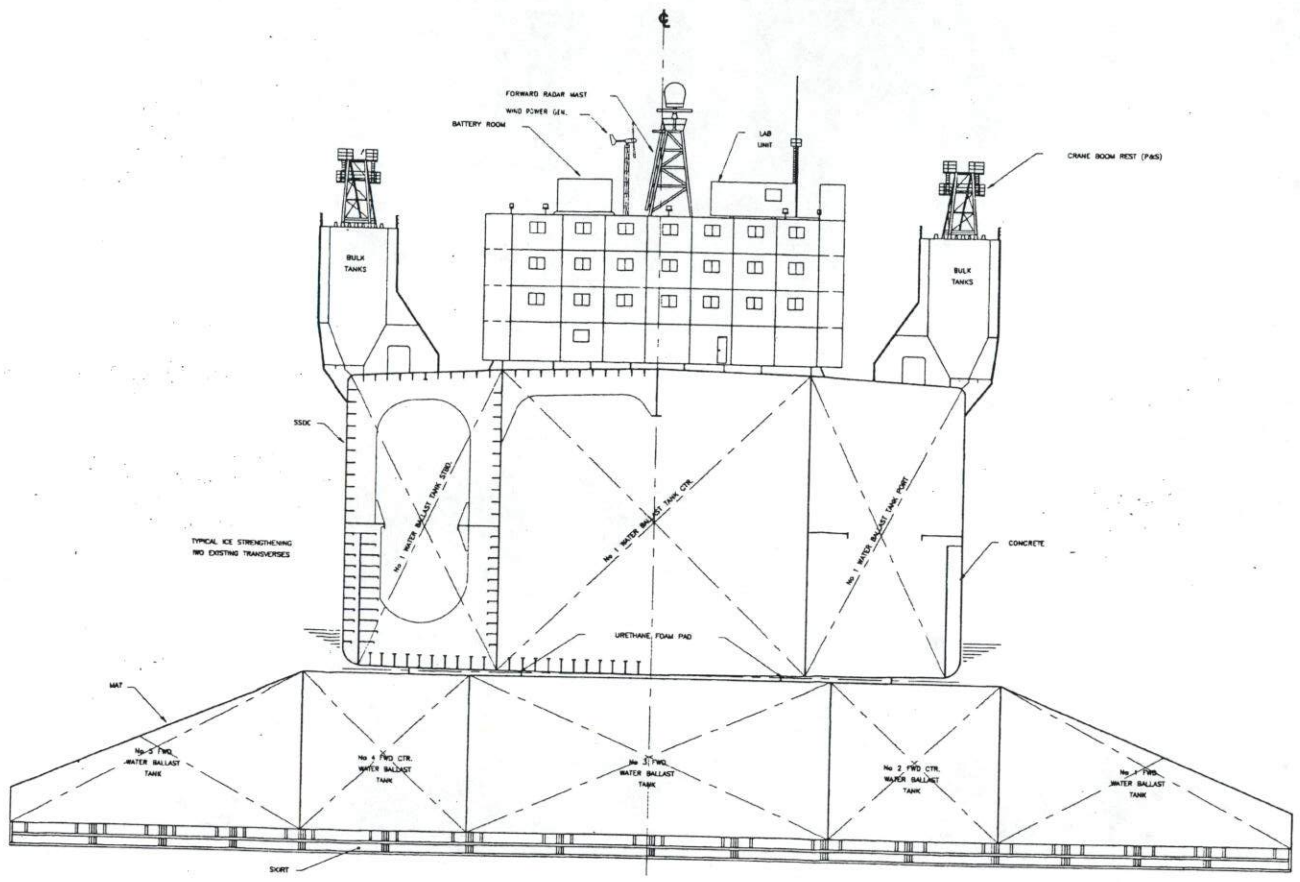
ENGINEERING RECORD		
DRAWN BY	PL	DATE
CHKD BY		
ENGINEER	WHJ	86 11 20

CANADIAN MARINE DRILLING LTD.
CALGARY ALBERTA CANADA

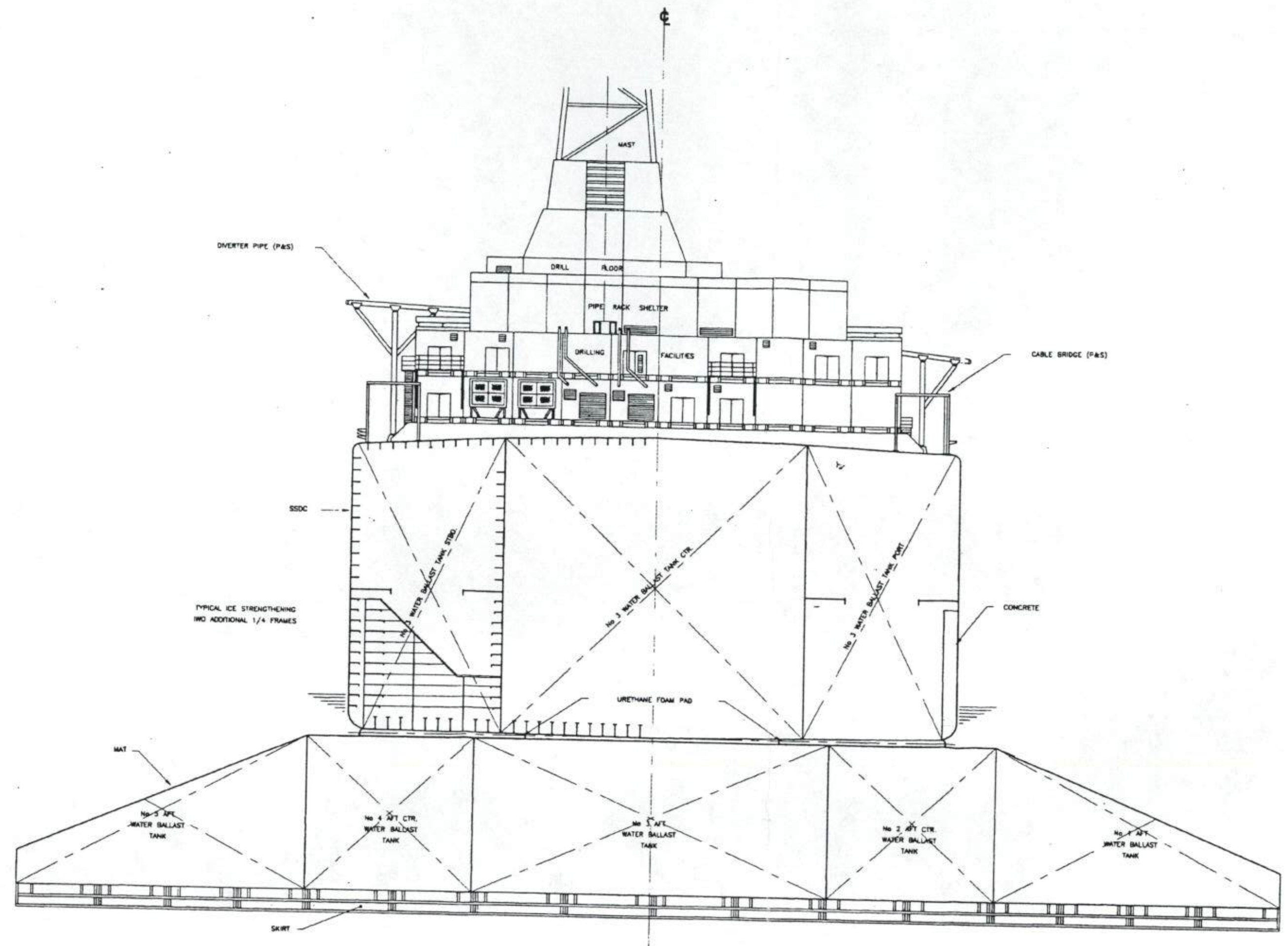
PROJECT: SSDC - MAT
PREPARED BY: ENGINEERING & DESIGN

TITLE: GENERAL ARRANGEMENT SSDC - MAT PROFILE

SCALE: 1 : 200
CONTR. DWG. NO. SHEET 4 of 5
CANMAR DWG. NO. E-SDC-861-2183
REV 4



TYPICAL SECTION IWO TWO BULK TANKS & ACCOMMODATION MODULES (LOOKING AFT)



TYPICAL SECTION IWO DRILLING FACILITIES (LOOKING AFT)

DWG. NO.	REFERENCE DRAWINGS	REV.	REVISION DESCRIPTION	BY	DATE
		2	WIND POWER GENERATOR ADDED TO ACCOMMODATION MODULE		94 01 15
		1	REDRAWN BY MAREI INC.	DE	92-09-16

ENGINEERING RECORD		
DRAWN BY PL	DATE	
CHKD BY		
ENGINEER WHJ		86 11 20

CANADIAN MARINE DRILLING LTD.
CALGARY ALBERTA CANADA

PROJECT SSDC - MAT
PREPARED BY ENGINEERING & DESIGN
TITLE
GENERAL ARRANGEMENT SSDC - MAT SECTIONS

SCALE 1 : 200
CONTR. DWG. NO. SHEET 5 of 5
CANMAR DWG. NO. E-SDC-861-2184
REV -

Appendix E

MODELING FILES

APPENDIX L

U.S. CORPS OF ENGINEERS SECTION 10 PERMIT

Lynx Enterprises, Inc.

January 24, 2002

Michiel Holley
U.S. Army Corps of Engineers
Alaska District
P.O. Box 898
Anchorage, AK 99506

Dear Mr. Holley:

Lynx Enterprises, Inc. (Lynx) as agent for AEC Oil and Gas (USA), Inc. hereby submits a request for coverage under Nationwide Permit #8 (NWP-8) for the set down of a mobile offshore drilling unit (MODU) in the Beaufort Sea, Alaska per Section 10 of Rivers & Harbors Act of 1899. This action is requested in support of conducting oil and gas exploration activities from OCS Lease Sale 124 in the McCovey Unit.

The proposed drilling structure is the SDC, a MODU currently cold-stacked near Port Clarence in the Bering Strait, Alaska. The SDC is a bottom-founded drilling structure that is capable of being re-floated, moved, and reset on the sea bottom. The drilling structure consists of a specially engineered vessel and is capable of drilling in waters from 25 to 80 feet deep.

The proposed McCovey exploratory well surface location is located offshore in the Beaufort Sea north of the existing oil and gas development at Prudhoe Bay. It is located 14.2 miles northeast of the West Dock, 5.5 miles northwest of Cross Island, and 12 miles east of the Northstar Development. The McCovey exploratory site is located on U.S. Mineral Management Service (MMS) OCS leases in approximately 10 meters (36 feet) of water. Specific information for the deployment is provided below.

Applicant:

AEC Oil and Gas (USA) Inc.
US Bank Tower
950 17th Street, Suite 2600
Denver, Colorado 80202

Agent:

Lynx Enterprises, Inc.
1029 W. 3rd Ave, Ste 400
Anchorage, AK 99501
907-277-4611
mschindler@lynxalaska.com

Project Location:

	Lease Block	Geodetic Position	UTM 6 (m) Clark 1866 (NAD 27)	UTM 6 (m) GRS 1980 (NAD 83)	ASP 4 (ft) Clark 1866 (NAD 27)	ASP 4 (ft) GRS 1980 (NAD 83)	Water Depth
Surface Location	OCS Block Y-1577	Lat: 70°31'44"N Long: 148°10'41"W	X = 456174 Y= 7825107	X = 456176 Y= 7825280	X = 722424 Y = 6046398	X = 1862831 Y = 6046256	36 Ft MLLW

Resolution Plaza
1029 W. 3rd Ave.
Suite 400
Anchorage, Alaska
99501
907-277-4611
907-277-4717 (fax)

Lynx ENTERPRISES, INC.

Waterbody:

Beaufort Sea Alaska

Directions to the Site:

The AEC McCovey No. 1 drilling location lies approximately 12.5 miles northeast of West Dock at Prudhoe bay, 60 miles northeast of Nuiqsut, 5.3 miles northwest of Cross Island, and 110 miles northwest of Kaktovik.

Nature of Activity

AEC Oil & Gas (USA) Inc. (AEC) is proposing to conduct oil and gas exploration activities in the McCovey Unit, Beaufort Sea Alaska during the 2002-2003 winter drilling season. The drilling will be conducted from the SDC. The area of interest covered lies entirely within the Federal Outer Continental Shelf (OCS) Leases. The proposed program includes a single proposed exploration well, referred to as "AEC McCovey No. 1" that is programmed to be drilled from a surface location in federal OCS Lease Block Y-1577 to a bottom hole location on OCS Lease block Y-1578, and a possible sidetrack well from the same location.

We appreciate your attention to this request. Should you have any questions, please do not hesitate to call me at 907-277-4611.

Yours truly,
Lynx Enterprises, Inc.

Mark Schindler
President and CEO

Resolution Plaza
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