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LEASE OPERATIONS PLAN AND EXPLORATION PLAN FOR EXPLORATORY DRILLING OF HARVARD PROSPECT FROM SANDPIPER GRAVEL ISLAND OCS LEASE SALE 71 - DIAPIR AREA OCS LEASES Y-0370 AND Y-0371 SHELL OIL COMPANY, OPERATOR

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~~PRIVATE AND CONFIDENTIAL~~

PACIFIC FRONTIER DIVISION
NOVEMBER, 1983

TABLE OF CONTENTS

HARVARD PROSPECT

Lease Operations Plan and Exploration Plan

Shell, Amoco and Koch

Leases OCS Y-0370 and OCS Y-0371

Cottle Island Area

Beaufort Sea, Alaska

Introduction

Shell Oil Company, as operator of leases OCS Y-0370 and OCS Y-0371, located in the Beaufort Sea off Cottle Island (Enclosure 1) hereby submits for approval our Lease Operations Plan and Exploration Plan to build a gravel island drillsite, Sandpiper, on Lease OCS Y-0370, and drill up to four wells from the island to explore and delineate the prospect. An Environmental Report, as required by 30 CFR 250.34-3 is submitted with this Exploration Plan.

Gravel Island Location

4450' FNL and 3229' FEL of OCS Block NR 6-33-424
(Tract 71-322), Lease OCS Y-0370

Alaska Zone 4 Coordinates: X = 609,959.745' (185,963.337m)
Y = 6,064,289.809' (1,848,868.844m)

Latitude: 70° 35' 4.740"N

Longitude: 149° 5' 48.804"W

UTM Zone 6: X = 1,384,867.050' (422,215.564m)
Y = 25,689,758.420' (7,832,243.421m)

Proprietary Data

Appendix 1, "Private and Confidential, Shell Oil Company, To Accompany Harvard Exploration Plan Submitted to the Minerals Management Service (MMS) of the U.S. Department of the Interior for their Exclusive Use" is enclosed as private and confidential data for use only by MMS.

Appendix 2, entitled "Private and Confidential, Shell Oil Company, Sandpiper Island Design Documentation, Submitted to MMS for Their Exclusive Use" is also Shell's proprietary information.

Description and Schedule of Proposed Activity

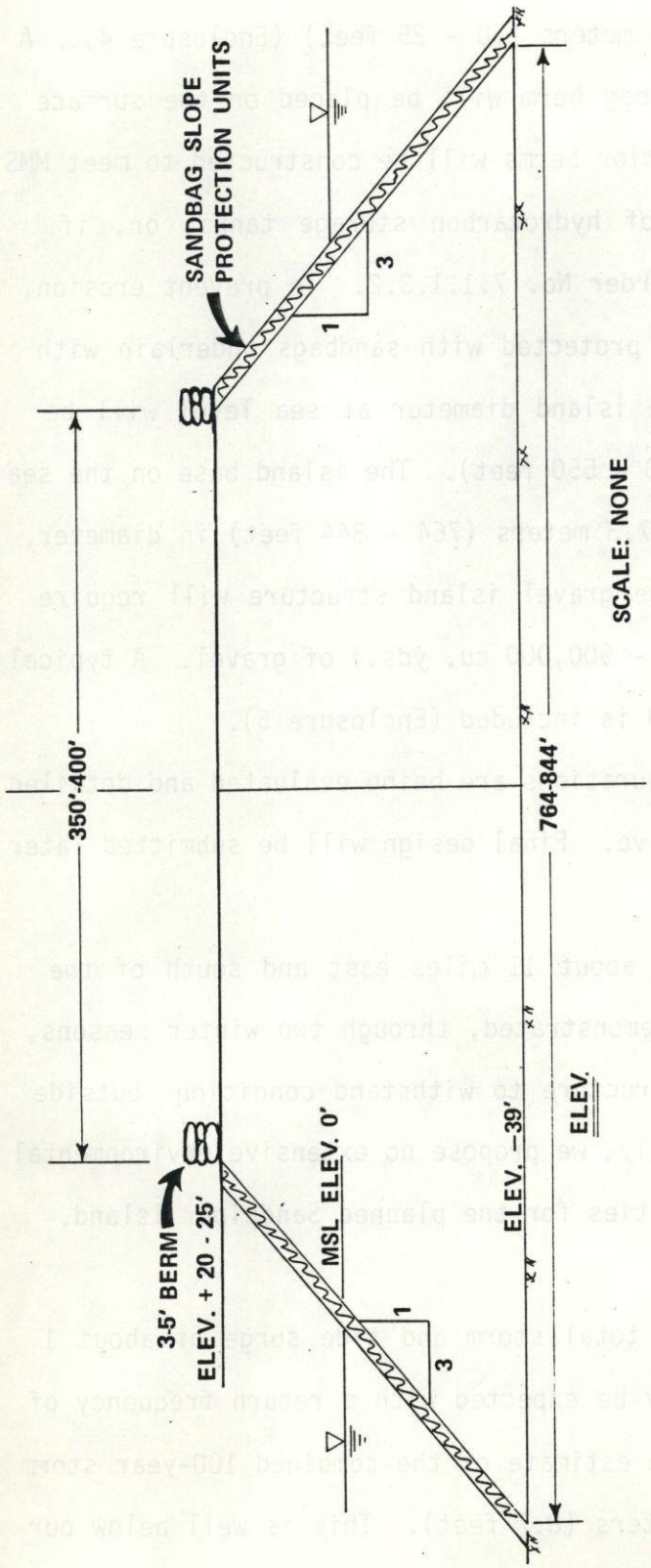
We propose to build a gravel island with a surface working diameter of approximately 350 - 400 feet, in about 14.9 meters (49 feet) water depth. (See Enclosure 2 - Schedule). Gravel will be obtained from an active gravel extraction site onshore. Upon approval of our application to build a gravel island, which we expect by early 1984, we plan to build an onshore ice road to a suitable shore site and then on to Cottle Island and on to the Sandpiper Island site over sea ice. Gravel will be transported by trucks over ice roads to the island site during the 1983-84 ice season (Enclosure 1). In the event ice conditions preclude completion of the island during the 1983-84 winter, we propose to transport the gravel for completion of island construction to Cottle Island where it will be stockpiled as shown on Enclosure 1 to transport to the island site by barge during the summer of 1984. We will plan to transport a small excess amount of gravel to the stockpile area to assure no net gravel removal from Cottle Island. The gravel required for sandbag protection of the island and the berm will be stockpiled on the gravel island. Sandbag protection of the island will

be placed either during the ice season or as early as possible during the summer. In the absence of adverse ice conditions, we anticipate completion of the island by the end of the ice season, in April, 1984. We plan to begin drilling from Sandpiper Island as soon as a drilling rig can be moved onto the island, possibly on May 1, 1984, with the expectation of drilling continuously thereafter, subject to seasonal drilling restrictions in effect at the time. Drilling operations would be terminated upon obtaining the desired information, after one or up to four wells have been drilled. Enclosure 2 depicts the schedule planned for construction and the drilling of up to three of the four exploratory wells.

The sequence of events on Enclosure 2 shows drilling operations on Well No. 1 commencing before the island's slope protection is complete. This will happen only if weather conditions dictate moving the rig in over ice roads before slope protection can be completed. At this time of the year, with heavy ice cover, lack of complete slope protection would pose no threat to the island's integrity and it could be expeditious to begin drilling during slope protection operations. If the rig cannot be moved in over ice roads, slope protection may be deferred to the open water season (Option B), as would rig move in. In any event, slope protection will be complete before breakup, when it is most needed, if a rig is drilling on the island.

Island Description

We contemplate construction of a gravel island using proven techniques in a water depth of 14.9 meters (49.0 feet) with a surface diameter of 106.7 - 121.9 meters (350 - 400 feet) (Enclosure 3).

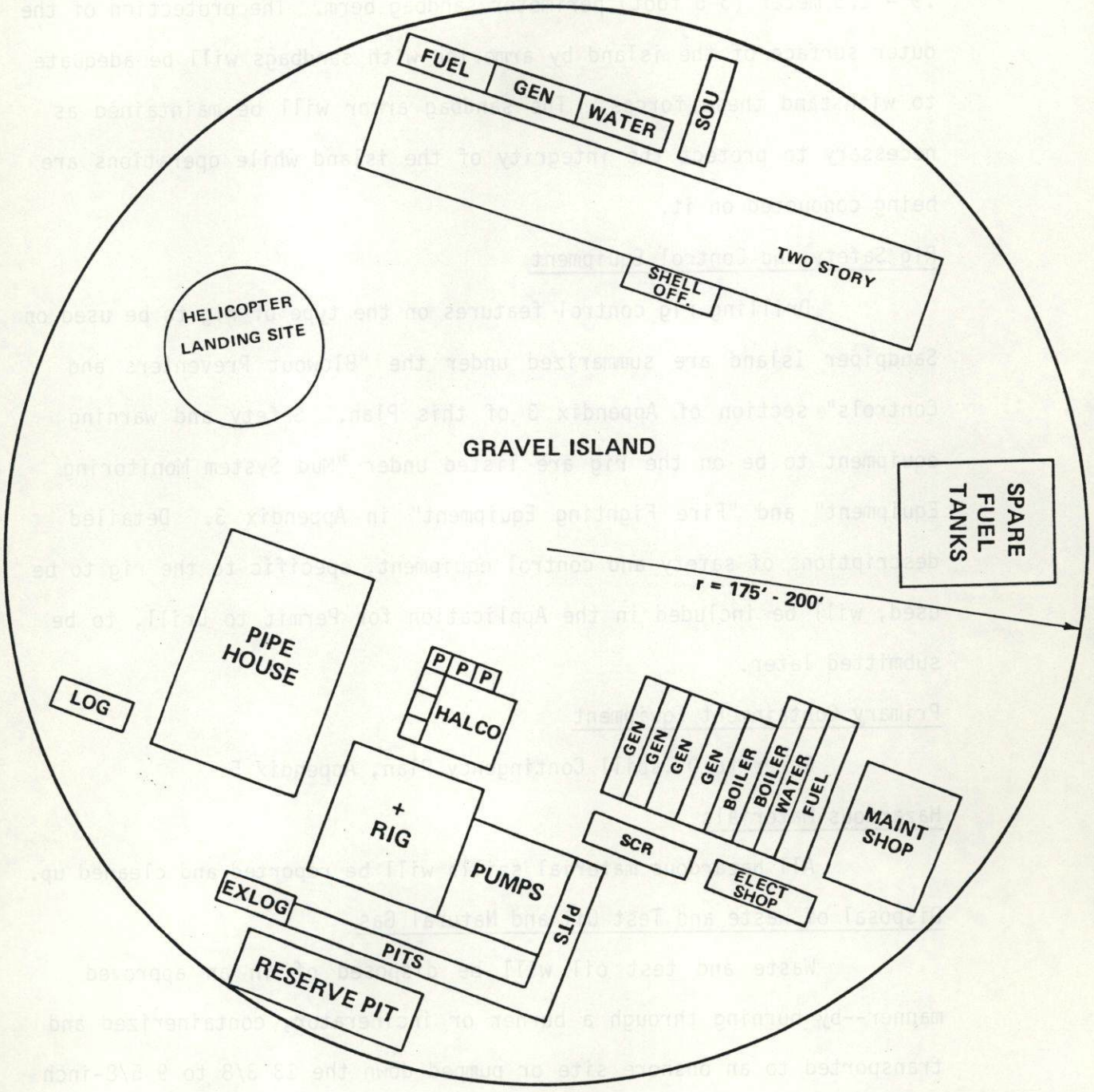


SHELL OIL COMPANY	WESTERN E&P OPERATIONS PACIFIC FRONTIER DIV	PRODUCTION DEPARTMENT

TYPICAL ISLAND SECTION
SANDPIPER GRAVEL ISLAND
HARVARD PROSPECT

Report: EXPLORATION PLAN		
Province/Field: BEAUFORT SEA		State: ALASKA
County:		Figure:
Author:	Date:	File: 2Z01761–02

ENCLOSURE–4



SHELL OIL COMPANY	WESTERN E&P OPERATIONS PACIFIC FRONTIER	PRODUCTION DEPARTMENT

TYPICAL RIG LAYOUT
SANDPIPER ISLAND
HARVARD PROSPECT
1" = 50'

Report: EXPLORATION PLAN	
Province/Field: BEAUFORT SEA	State: ALASKA
County:	Figure:
Author:	Date: File: 2Z01760—00

ENCLOSURE 5

Solid and Liquid Waste Disposal

Drill cuttings, drilling muds and wastewater will be discharged as approved in the required NPDES ocean discharge permit. Federal Lease Stipulation No. 7 governs the discharge of mud and cuttings into marine waters or on ice, and will be complied with. Permission will be requested to pump oil contaminated mud and waste water, lube oil and other liquids down the 13 3/8 to 9 5/8-inch casing annulus and/or down the last casing string below the 13 3/8-inch casing as warranted. Table I lists our estimate of the quantities and planned disposition of the waste materials resulting from the proposed exploration. All putrescible wastes and sewage sludge will be incinerated in an approved unit. Wood, paper, and cardboard will be open-burned in a manner that will not emit black smoke. Tin cans will be incinerated before disposal and incinerator residue backhauled to an approved site. Nonburnable items (steel drums, rubber, metals, batteries, etc.) will also be backhauled to an approved site.

Air Emissions

Our estimates of air emissions from island drilling operations, onshore support and transportation equipment are detailed on Table II. As prescribed for drilling on an OCS lease, we have calculated the exemption level "E" for each air pollutant based on a distance of 5.2 statute miles to the nearest "land," Cottle Island. Based on the formula given at 30 CFR 250.57-1, the exemption level "E" for CO is 10200 TPY and the exemption level for SOx, TSP, NOx, and VOC is 173 TPY each. Table II shows that the total emissions of CO, SOx,

TABLE II
PROJECTED AIR EMISSION
HARVARD PROSPECT - ALASKA

SOURCE	SOX		TSP		NOX		VOC		CO	
	lb/D	T/W	lb/D	T/W	lb/D	T/W	lb/D	T/W	lb/D	T/W
1.Camp at Location Power Generation 1 Model 3408 Cat Eng. 400 Continuous HP 550 gpd	19.7(2)	0.7(2)	21.2(2)	0.7(2)	99.5(1)	3.5(1)	5.3(1)	0.2(1)	31.7(1)	1.1(1)
2.Drilling Rig Power Generation 3 Model 398 Cat Eng. 600 Continuous HP ea. 2250 gpd	88.7(2)	3.1(2)	95.2(2)	3.3(2)	381.0(1)	13.3(1)	23.8(1)	0.8(1)	142.9(1)	5.0(1)
Steam Boilers (3) 2-150 hp McWilliams Davis 2000 gpd	56.8	2.0	4.0	0.1	44.0	1.5	2.0	0.1	10.0	0.4
Hot Air Heaters (3) 2-Tioga Heaters 4.2 MMBTU-1000 gpd	28.4	1.0	2.0	0.1	22.0	0.8	1.0	<0.1	5.0	0.2
Incinerators (3) 1-8' x 15' 1 SDU Type Neptune Micro Floc PC Chemical Waste Plt 200 gpd	5.7	0.2	0.4	<0.1	4.4	0.2	0.2	<0.1	0.5	<0.1
3.Vehicles										
1-Model 966 Cat Loader (2)	2.0	0.1	2.2	0.1	31.2	1.1	2.5	0.1	6.8	0.2
1-400 amp Welder) 2-4X4 Crew Cab Truck) (4)	0.1	<0.1	0.2	<0.1	5.7	0.2	4.4	0.2	27.0	0.9
Helicopter (5) (2 trips/days)	0.4	<0.1	0.5	<0.1	1.0	<0.1	1.0	<0.1	12.0	0.4
4.Gas Flaring During Tests (6)	-	0.1(7)	- NA	-	-	1.7	-	0.3	-	2.5
TOTAL	201.8	7.2	125.7	4.3	588.8	22.3	40.2	1.7	235.9	10.7

(1) Based on emission factors provided by Caterpillar Engine Company for these particular diesel engines.

(2) Based on emission factors from EPA AP-42 Table 3.3 3.1 Diesel Powered Industrial Engines.

(3) Based on emission factors from EPA Ap-42 Table 1.3-1 Industrial & Commercial Boilers (0.2% S by wt).

(4) Based on emission factors from EPA AP-42 Table 3.1 1-1 Average Emission Factors for Highway Vehicles corrected.

(5) Based on emission factors from EPA AP-42 Table 3.2 1-3 Emission Factors per Aircraft landing - take off cycle.

(6) Based on emission factors from EPA AP-42 Table 1.4-1 (Estimated emissions based on three tests/well and 2000/MCF/test).

(7) Assumes 15 graines sulfur/100 SCF of gas.

IBMIRD:sm-r-1

TABLE III

BEAUFORT SEA AREA, ALASKA

DRILLING MUD COMPONENTS

HARVARD EXPLORATION (3 WELLS)

MATERIAL

Bentonite (Gel)

Barite (Barium sulfate)

Caustic Soda

Drispac-Polanionic
Cellulose Polymer

XC Polymer

Separan-Polymer

Lubrikleen-Organic
detergent, lubricant, with amines

Lost circulation material as required

Water

Resenix

Chrome Free Lignosulfonate

Chrome Lignosulfonate

Sodium Bicarbonate

Sodium Sulfite

Potassium Chloride

IBMIRD:sm-r-1

TABLE III (CONTINUED)

Mud Aqueuous Fraction (MAF). One part by volume of drilling fluid is added to nine parts seawater. The mixture is stirred thoroughly and then allowed to settle for 20 hr. The resulting supernatant (100 percent MAF) is siphoned and is used immediately in the bioassays. The MAF is similar to the SPP except that longer settling times of MAF allow for a lower concentration of particulates.

Filtered Mud Aqueous Fraction (FMAF). The mud aqueous fraction (MAF) or whole drilling fluid is centrifuged and/or passed through a 0.45-u filter eliminating all particulates greater than this size.

SW is used in these tables as an abbreviation for seawater, and chrome lignosulfonate is abbreviated CLS.

The toxicity of drilling fluids for Alaskan test species has been compiled and compared to the toxicity of drilling fluids for all species tested. A total of 43 fluids has been tested on Alaskan species in short-term lethal or sublethal toxicity tests (42 for lethal tests) (see Table A-1). This compares with 78 fluids that have been tested in lethal or sublethal tests for all species, or 55 percent of the total. Lethal tests for all species examined 68 fluids. Thus, Alaskan fluids comprised 62 percent of all fluids tested for short-term lethal effects.

Among 82 species that have been tested, Alaskan species numbered 34, for a 41 percent share (Table A-2). The distributions of these Alaskan species among the major taxonomic groups (Table A-3) may be compared with those for all species (Table A-4). The distributions

Table A-1. Drilling Fluids Used as Test Substances[1] in Short-Term Lethal or Sublethal Toxicity Tests

Study	Number of Toxicity Tests	Drilling Fluids Tested	
EG&G Marine Research Laboratory (1976)	32	VC-10 RD-111 RD-2000	RD-111 + Imco Spot Lime Nondispersed
EG&G Bionomics (1976a, 1976b)	14	Seawater (SW) - gel Lightly-treated FW/SW lignosulfonate FW - lignosulfonate	
Dames and Moore (1978)	25	FW - lignosulfonate	
Environmental Protection Service (Canada) (1975)	75	SW polymer Kipnik KCl polymer W'td KCl-XC-polymer KCl-XC-polymer	W'td-gel-XC-polymer Gel-chemical-XC W'td polymer Gel-XC-polymer
Tornberg et al. (1980)	44	CMC-gel (1803,1807,2780,2876m) CMC-gel-Resinex (2786,3466m) CMC-gel-Resinex-Tannathin (3375m) CMC-Resinex-Tannathin-gel (3252m) XC-polymer-Unical (3786,3938,4029,4109,4175m) XC-polymer (2778,2922,2929,3064,3065,3082,3319,3323,3646m) Lignosulfonate (2256,2389,2535,2692m)	
Carls and Rice (1981)	19	Low density (9.9 lb/bbl) new Low density (9.8 lb/bbl) new Medium density (13.8 lb/bbl) lignosulfonate Low density (9.4 lb/bbl) used Low density (8.9 lb/bbl) used Spud (9.8 lb/bbl) used Lignosulfonate (2605-3095m)	
Crawford and Gates (1981)		Mobile Bay XI/XVI	

NOTES: [1]Total number of fluids tested = 43 (48- to 144-hour LC_{50} = 42)

Table A-2. Continued

Major Taxonomic Group	Species	WM[2]	MAF	SPP	SSP	LSP
Echinodermata	Strongylocentrotus droehbachiensis	X	X			
	*Echinarachnius parma		X			
Fishes						
	*Oncorhynchus gorbuscha	X				
	*Oncorhynchus keta	X				
	*Oncorhynchus kisutch	X				
	Salmo gairdneri	X				
	*Coregonus nasus	X	X			
	*Coregonus autumnalis	X				
	*Elegonus navaga	X				
	*Boreogadus saida	X				
	*Myoxocephalus quadricornis	X				
	*Leptocottus armatus	X				
	Fundulus heteroclitus	X	X			
	Fundulus similis		X			
	Menidia menidia	X				
	Menidia beryllina	X	X			
	Cyprinodon variegatus		X			

NOTES: [1]Asterisk indicates Alaskan species.

[2]Abbreviations: WM = whole mud (fluids plus solids).
MAF = mud aqueous fraction - the supernatant fraction after centrifugation, filtration, or a 24-hour settling period for a 1:4 or 1:9 seawater dilution.
SPP = suspended particulate phase - the aqueous fraction of a 1:4 or 1:9 seawater dilution, after a 1- or 4-hour settling period.
SSP = suspended solids phase - the settled material from an MAF or SPP preparation, added to the test container and maintained in suspension by aeration or stirring.
LSP = layered solids phase - the settled material as for the SSP, but added as a layer on the bottom of the test container.

Table A-4. Distribution of Toxicity Tests, Drilling Fluids, and Species Tested[1]

Taxonomic Group	Number of Tests	Percent of Tests	Number of Fluids	Percent of Fluids	Number of Species	Percent of Species
Phytoplankton	12	2.8	9	12	1	1.2
Invertebrates						
Anthozoa (corals)	19	4.4	4	5.1	11	13
Annelida (all)	34	7.8	14	18	7[2]	8.5
Pelecypoda	59	14	22	28	11	13
Gastropoda	10	2.3	5	6.4	5[3]	6.1
Copepoda	11	2.5	9	12	1	1.2
Isopoda	6	1.4	4	5.1	2	2.4
Amphipoda	22	5.1	11	14	4[4]	4.9
Mysidacea	64	15	17	22	4[5]	4.9
Decapoda (all)	105	24	24	31	19	23
Shrimp	66	15	31	29	10	12
Crab	32	7.4	18	23	8	9.8
Lobster	7	1.6	2	2.6	1	1.2
Echinodermata	4	0.9	2	2.6	2	2.4
Fishes	88	20	39	50	15	18
Totals	434	100.2	78	NA	82	98.6

NOTES: [1]Adapted from: EG&G Marine Research Laboratory 1976; EG&G Bionomics 1976a; Dames and Mare 1978; Gerber et al. 1980; Carr et al. 1980; McCulloch et al. 1980; Neff et al. 1980, 1981; Conklin et al. 1980; Tornberg et al. 1980; ERCO 1980, 1981; Normandeua Associates 1980, 1981; Carls and Rice 1981; Krone and Biggs 1980; Thompson 1980; Thompson and Bright 1977, 1980; Crawford and Gates 1981; Derby and Atema 1981; Atema et al. 1982.

[2]Seven genera; six identified to species level.

[3]Five genera; four identified to species level.

[4]Four genera; two identified to species level.

[5]Four genera; three identified to species level.

and planning guidelines issued by the MMS for the Alaska OCS Region on July 29, 1982.

Emergency Situation Provisions

Plans for dealing with emergency situations are presented in Appendix 6 which includes:

- Critical Operations Curtailment Plan
- Relief Well Discussion
- Hydrogen Sulfide Contingency Plan

Consistency Certification

The activities proposed in this Exploration Plan are consistent with Alaska's Coastal Management Program and will be conducted in a manner consistent with the program. (See Enclosure 7.) Consistency will be certified again in our application for a Corps of Engineers Permit and in our application to EPA for an NPDES permit.

Environmental Training Program

Federal Lease Stipulation No. 3 requires that any exploration plan shall include a proposed environmental training program for all personnel involved in exploration activities (including personnel of the lessees' contractors and subcontractors) for review and approval by the Minerals Management Service. Shell Oil Company will be using, in its training program, an approved videotape presentation prepared by Mobil, Sohio, and Exxon. The program will be given to all personnel involved in the exploration activities. These tapes have been edited for industry-wide application under guidance from the Alaska Oil and Gas Association. The tapes are narrated by qualified instructors to insure that personnel understand and use techniques necessary to preserve

archaeological, geological and biological resources. The program is designed to increase the sensitivity and understanding of personnel to community values, customs and lifestyles in areas in which such personnel will be operating. Shell has also participated in development of the required continuing technical environmental briefing program for supervisory and managerial personnel involved including those of Shell, its agents, contractors and subcontractors. The resulting program consists of a videotape presentation and manuals for retention by individuals. It has been approved by MMS and will be used by Shell for training of supervisory personnel.

APPENDIX 1

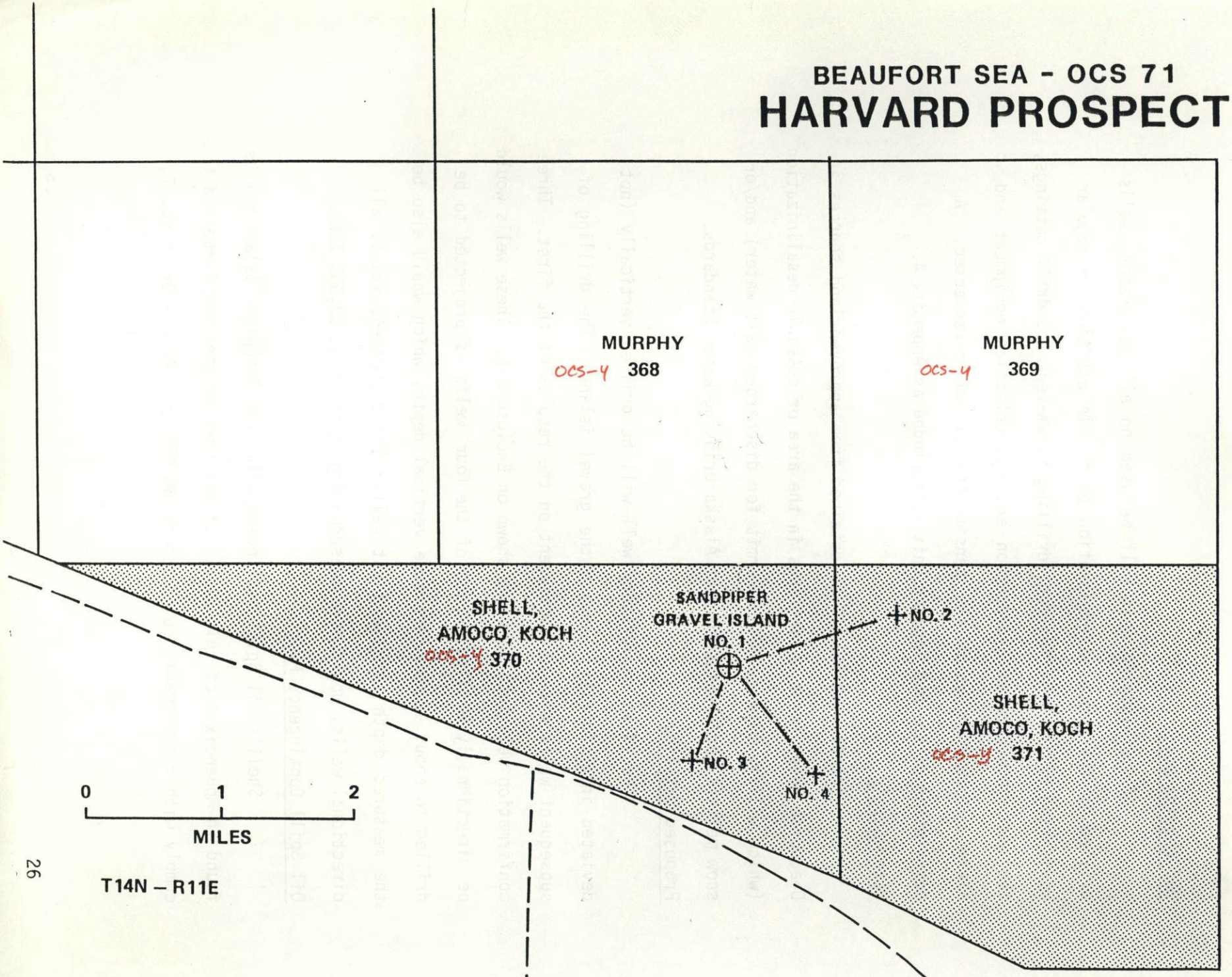
GEOLOGIC DATA

~~PRIVATE AND CONFIDENTIAL~~

The "Harvard" Prospect is a faulted anticline (Figures 1-3). The principal objective is the Permo-Triassic Sadlerochit Formation. The Sag River Sandstone (Jurassic) is probably too tight to produce, but is thought to possess a common oil-water contact with the Sadlerochit Formation. The accumulation is sealed by the overlying Kingak Shale (Figure 2). Figure 4 is a preliminary drilling prognosis. A complete prognosis will be submitted with the Application for Permit to Drill.

BEAUFORT SEA - OCS 71

HARVARD PROSPECT



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CLOSURE 6

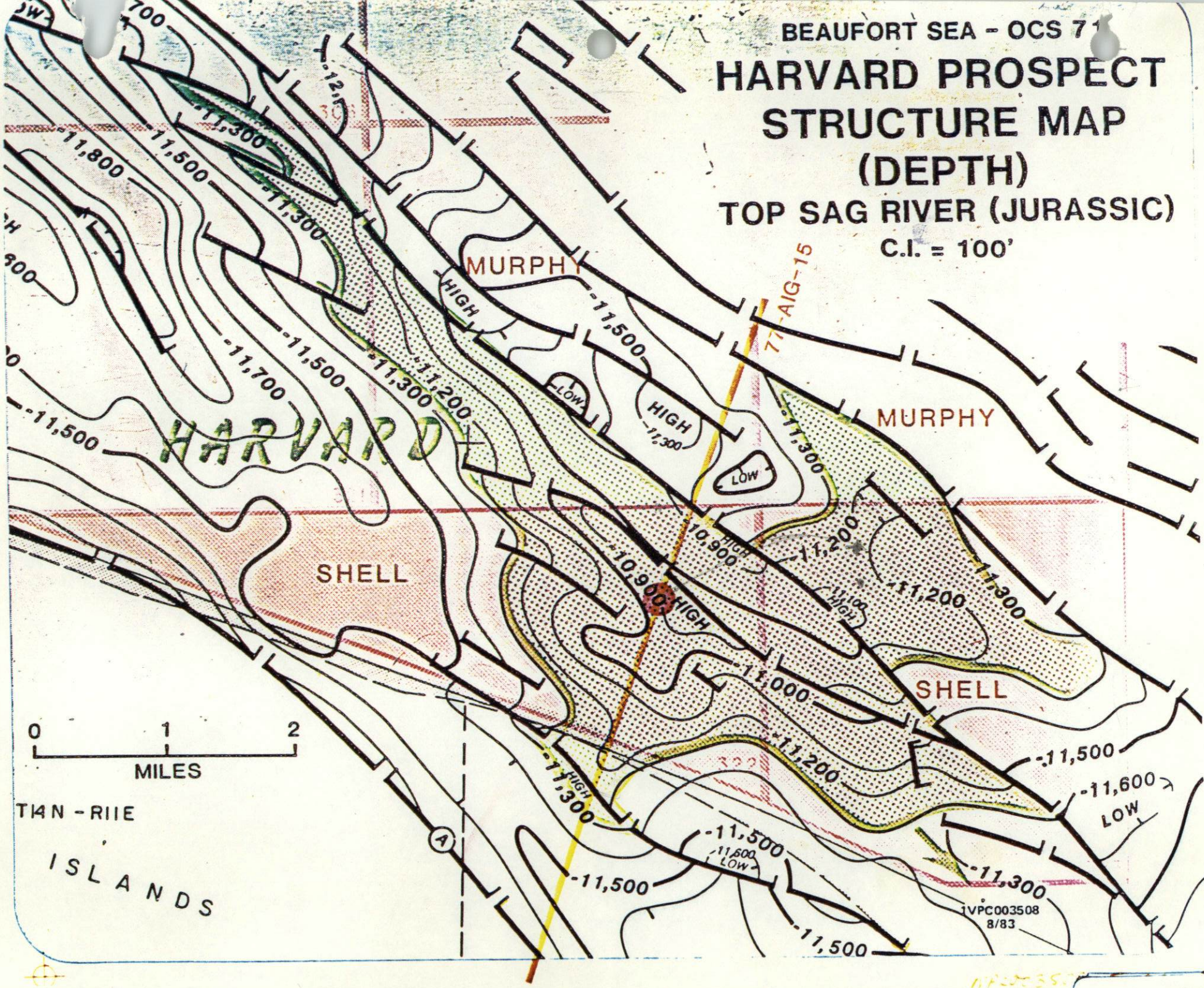
BEAUFORT SEA - OCS 71
HARVARD PROSPECT
STRUCTURE MAP
(DEPTH)
TOP SAG RIVER (JURASSIC)
C.I. = 100'
MURPHY
HIGH
LOW
-11,500
-11,300
-11,200
-11,700
-11,800
-12,100
HARVARD
SHELL
MURPHY
SHELL
-10,900
-11,000
-11,600
71-AIG-15
0 1 2
MILES
T14N - R11E
ISLANDS
1VPC003508
8/83

Figure 1

HARVARD DIP SECTION: 77-AIG-15

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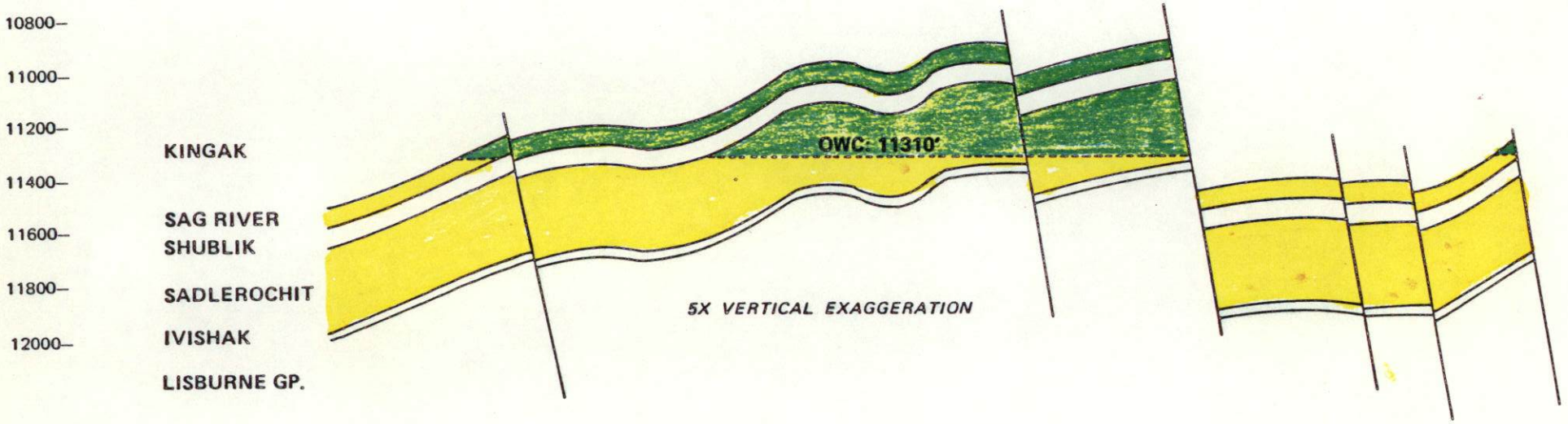


Figure 2

BEAUFORT SEA
OCS SALE 71
HARVARD PROSPECT
77-152X-AIG-15

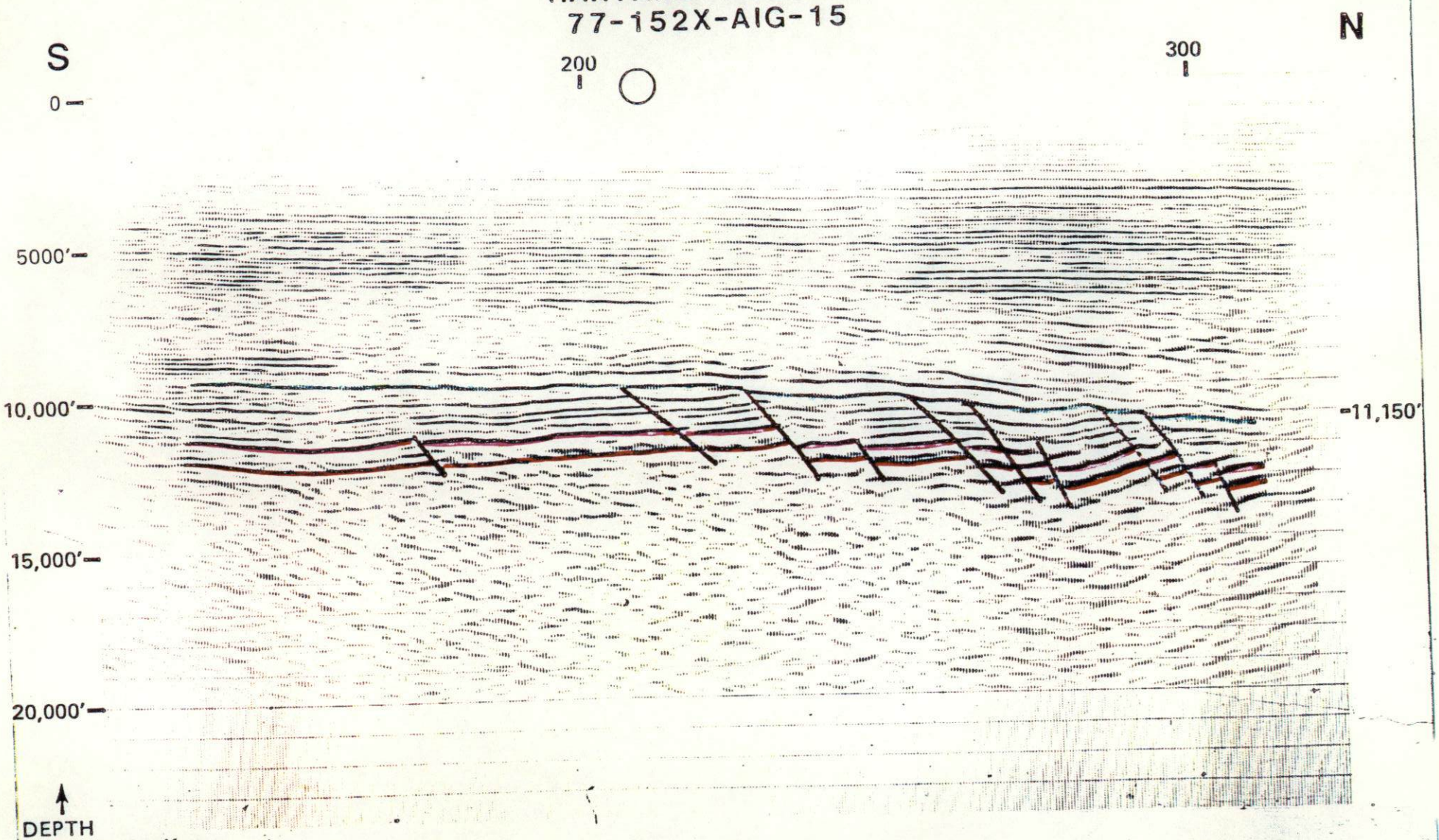


Figure 3

Figure 4

PACIFIC FRONTIER
DRILLING PROGNOSIS

WELL: OCS-0370#1 (Sandpiper Island)

AFE NO:

LOCATION: X 422,215 M Lat: 70° 35' 4.7" N
UTM Zone 6 Y 7,832,243 M Long: 149° 5' 48.8" W
OBJECTIVE:

FIELD: Harvard Prospect

EST. ELEVATION: Sea Level

EVALUATION			GEOLOGY			DRILLING		
CORES	ELEC. SURVEYS	MUD LOGGER	SIGNIFICANT FORMATIONS	WELL DEPTH TVD MD	CASING AND CEMENT	HOLE SIZE	HOLE DEV. AND DIR. CONTROL	MUD PROGRAM
Cores As Req.	SP/GR/DIL/BHCS/LSS/FDC CNL/ML/MLL/HDT/SWS	Mud Logger/Drilling Data Unit, Surface to TD	Base of Permaf.	2000	surface csg. cmt. to surface	Well #1 straight hole surface to TD	Build to angle @ 2-1/2°/100 in direction Well #2 & 3 Straight to KOP	Gel. chemical mud Mud & Vis as req.
As Above SP/GR/DISF BHCS	As Above			2500				Hi Vis Extended Gel
			KOP For Well #2 & 3	2800				
				10500	Intermediate csg., cmt. as req.			
			Sag River	10900				
			Sadlerochit	11150	Prod. csg. Cmt. as req.			
			Basement	11775				
			TD	12100				

APPENDIX 2

SANDPIPER ISLAND DESIGN DOCUMENTATION

~~PRIVATE AND CONFIDENTIAL~~

ENCLOSED SEPARATELY

APPENDIX 3

RIG DESCRIPTION

The drilling rig used for this proposed exploration operation will be BSI-1 or an equivalent. The following is a list and description of equipment for BSI-1.

MAJOR DRILLING EQUIPMENT

Drawworks

1 - Oilwell E-2000 drawworks, 2000 hp, drum for 1-3/8" line, and TOTCO instrumentation console.

Brake

1 - PARMAC hydromatic brake.

Engines and generators

4 - GE generators, 900 KVA, each driven by a Caperpillar D-399, 1200 hp diesel engine.
1 - GE SCR power distribution center.

Drill Pipe and Collars

10,500' of 5" - 19.5# Grade E drill pipe
5,000' of 5" - 19.5# Grade S-135 drill pipe
18- 8" x 2-13/16" drill collars
18- 6-3/4" x 2-13/16" drill collars

1000 Barrel Mud System

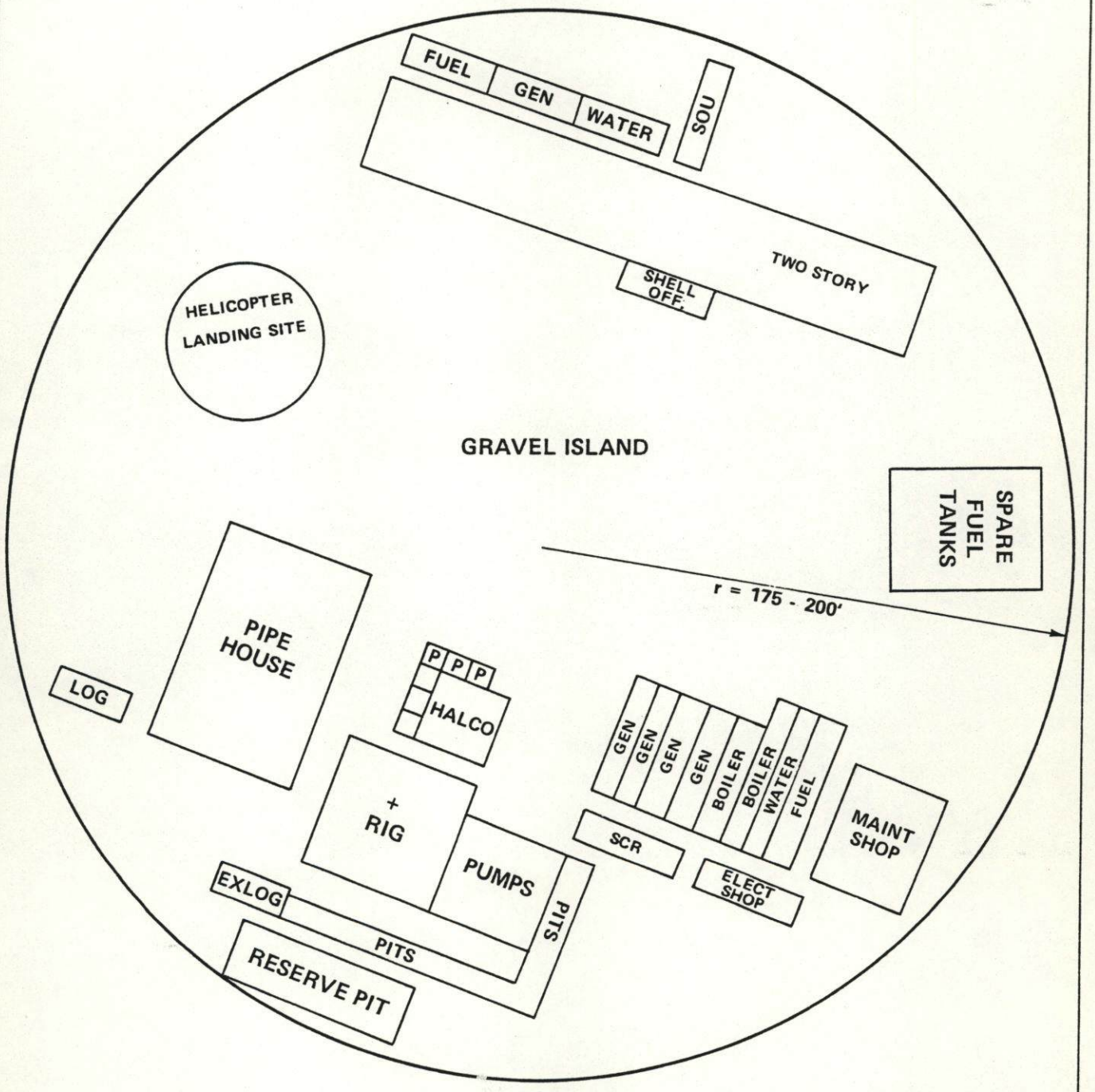
1 - BRANDT dual shale shaker.
1 - DRILCO degasser.
3 - BRANDT mud cleaner with MISSION MAGNUM 5" x 6" pump driven by GENERAL ELECTRIC motor, 50 hp.
2 - PIONEER MARK II Centrifuges.
5 - BRANDT mud mixers, 7½ hp.

Mast

1 - Dreco - 146' mast, 1,300,000# gross nominal capacity with 7 sleeve crown block.

Substructure

1 - 33' custom pin type substructure.



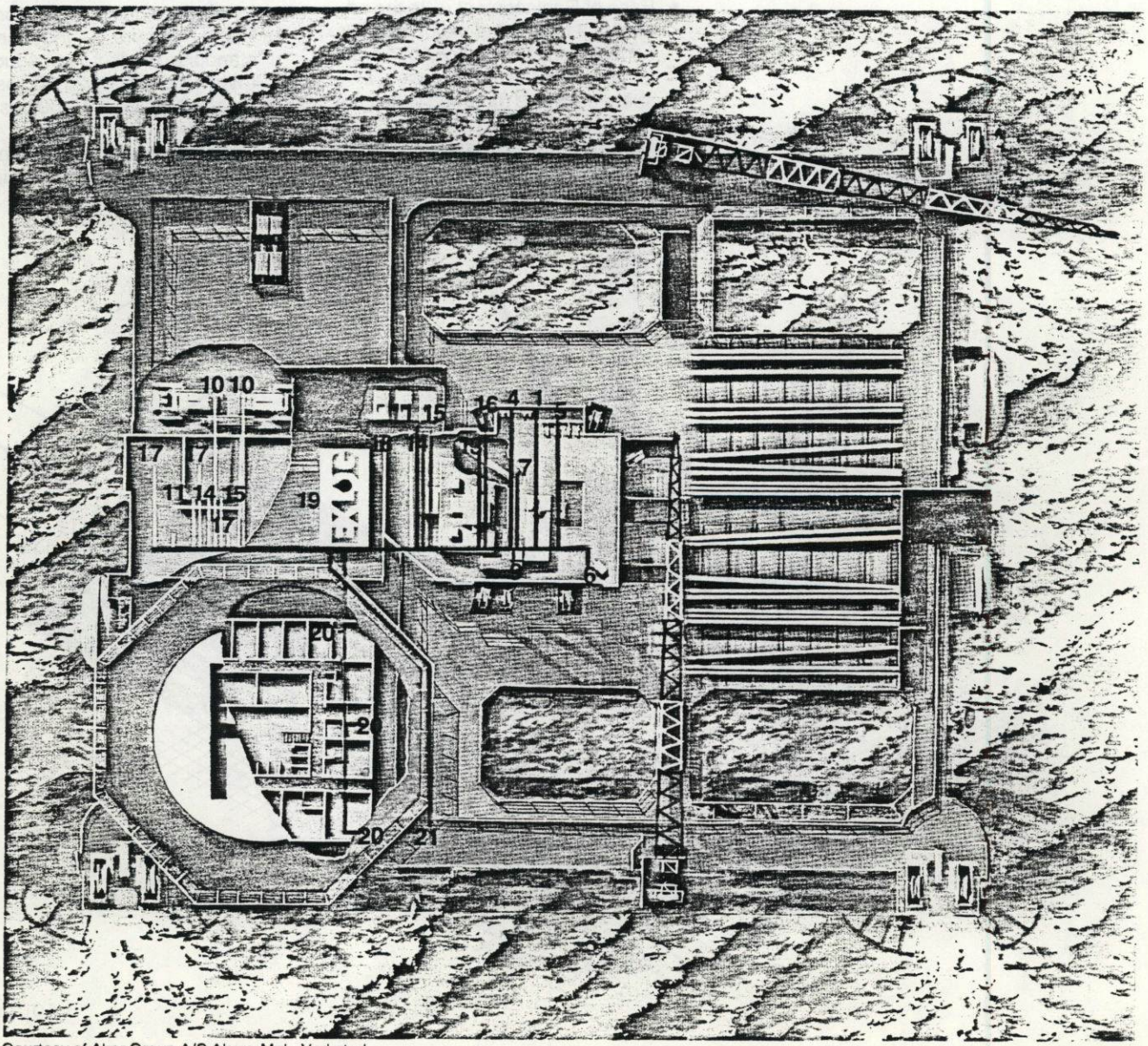
SHELL OIL COMPANY	WESTERN E&P OPERATIONS PACIFIC FRONTIER	PRODUCTION DEPARTMENT

TYPICAL RIG LAYOUT
SANDPIPER ISLAND
HARVARD PROSPECT

Report: EXPLORATION PLAN		
Province/Field: BEAUFORT SEA		State: ALASKA
County:		Figure:
Author:	Date:	File: 2Z01760—00

ENCLOSURE 3-1

6) Hookload/WOB — Strain gauge transducer (attached to rig dead-line gauge system).
7) Rotary Speed — Magnetic proximity switch.
8) Total Bit Revolutions — Accumulative digital electronic count device using impulses received from Rotary Speed sensor.
9) Rotary Torque — Electrical or mechanical (may be independent or slaved to rig sensor).
10) Pump Stroke — Microswitch counter.
11) Mud Weight In and Out — Strain gauge transducer.
12) Mud Flow In — Pump stroke sensor.
13) Mud Flow Out — Strain gauge transducer.
14) Mud Temperature In and Out — Platinum thermistor.
15) Mud Resistivity In and Out — Induction closed loop.
16) Rig Heave — Magnetic/reed switch type (attached to Rucker tensioner).
17) Pit Volume — Magnetic/reed switch type.
18) Gas Detectors — Catalytic and flame ionization methods.
19) GEMDAS Unit.
20) Remote Video Displays
21) Pressurization Line Intake.



Courtesy of Aker Group A/S Akers Mek. Verksted.

Figure 4-3

GEMDAS: STANDARD FORMATION EVALUATION

The integration of Exlog's geological formation evaluation services with the engineering data base yields a most comprehensive picture of drilling-in-progress. Formation evaluation remains an important and complementary part of GEMDAS.

Geological services include:

- Show evaluation
- Total gas curve plotting
- Drilled cuttings gas analysis
- Chromatographic gas analysis
- Lithological analysis

Computerized drilling data analysis benefits the wellsite geologist in several important areas:

- Formation tops may often be more accurately predicted by evaluation of changes in drilling parameters.
- Torque and drilling exponent plots may help interpret lithology and assist in detecting fractures and faults.
- Geological data entered into the computer can be plotted alongside data from offset wells as a powerful aid to correlation.
- Correlation of formation tops in deviated wells is simplified by the automatic computation of true vertical depth.
- Tooth wear estimates may aid in evaluating drilling breaks.
- Formation porosity and pore pressure estimates may aid in evaluating hydrocarbon shows.
- Temperature regression analysis yields the estimated bottom hole temperature, aiding in determining temperature gradient.

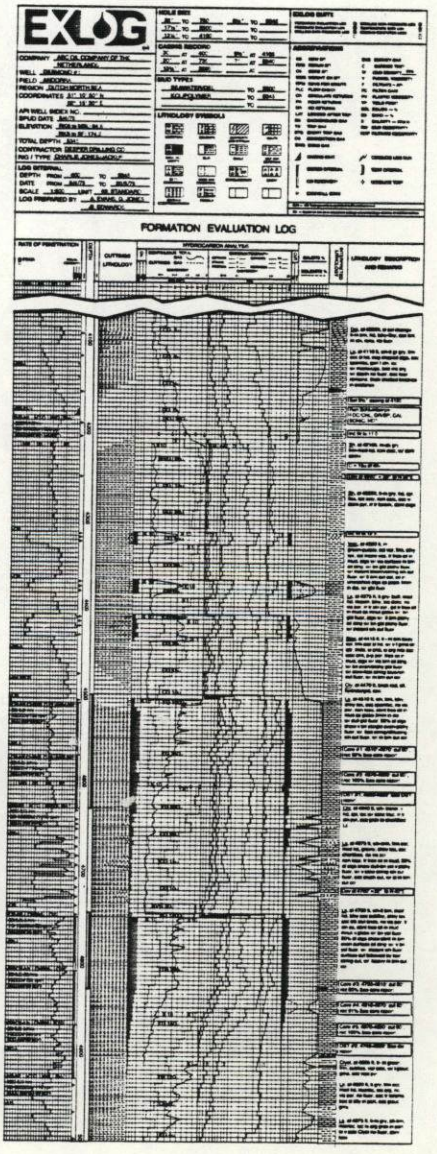
Standard Equipment

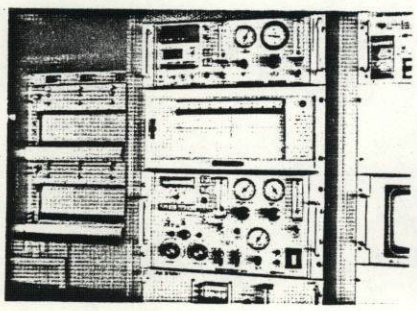
- Full GEMDAS instrumentation and analysis equipment
- H_2S Detector (continuous recording type)
- Continuous resistivity "in" and "out"
- Shale density
- Binocular microscope (10x30)
- Ultra Violet viewing box (fluoroscope)
- Oil show evaluation chemicals
- Blender and cuttings gas detector
- Chemical testing equipment
- Sample drying oven
- Copy machine

Specialized Equipment:

- CO_2 analyzer (continuous recording type)
- H_2S tube indicator
- O_2 detector
- Continuous conductivity "in" and "out"
- Portable resistivity meter
- Nitrate ion tracer testing kit
- Shale factor
- Autocalcimeter (quantitative carbonate analysis)
- Rock stain kit (carbonate, evaporite)
- External alarm system (audio and/or optical)
- Intercom System
- Wellsite mud check and special mud test equipment
- Additional video monitors
- Wellsite core analysis (porosity, permeability, SG and oil/water saturation)
- Core slabber
- Plastic heat sealer
- Geothermal and air/foam equipment service

Two principle wellsite tools provide geologists and engineers with the basic data needed to make recommendations for further exploration, deepening, stepouts, or abandonment. Exploration Logging's Masterlog, illustrated below, is one of these tools. It provides a unique "first-look" prior to extensive invasion or formation damage and can reveal features easily lost with other post-drilling investigative methods. Often the only chronological record of the well encompassing both geological and engineering features, the Masterlog delineates potentially productive zones and provides detailed evaluation of shows.





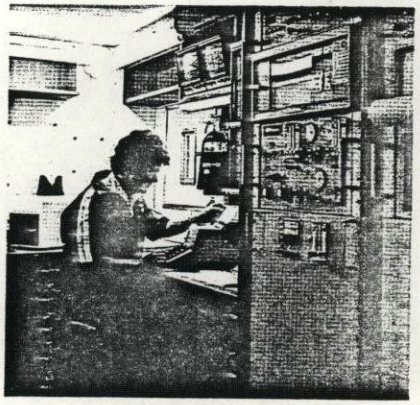


Figure 4-1

Offline Plots

Data Editing

Lag Data Storage and Formatting

Data Re-evaluation and Analysis

Data Tape Copying

7.1.3 Engineering Assistance Programs -

Complete Mud Hydraulics Analysis

Swab and Surge Calculation

Bit Hydraulics Optimization

D-exponent Analysis

Advanced D-exponent Analysis

Normalized Exponent Analysis

Formation Abrasiveness and Tooth Wear

Bit Cost/Foot Breakeven Analysis

Fast Kick Analysis

Complete Kick Analysis

Fracture Gradient Analysis

Overburden Gradient Computation

Directional Survey Computation and Graphical Presentation

Cementation Volume Calculation

Pressure Build-up Analysis

Electric Log Analysis Including:

Resistivity Crossplots

FDC, CNL Plot -

M&N Plot

SW, SXO, Porosity Calculation

station individually alarmed for low and high concentrations of H_2S. Calibrations performed every 2-3 days or on demand.

1.6 Depth Recording System.

1.7 Analog Chart Recorders for Data Output.

1.8 Patch Panel for routing of data to chart recorders.

1.9 Drill Monitoring Panel (DMP) to display and record normal drilling parameters. These parameters are computed to aid pore pressure prediction.

1.10 Mud Monitoring System (flow, density, temperature, resistivity). All systems measure mud in and mud out automatically with data being displayed around rig.

1.11 Pit Volume Totalizer (PVT), Microprocessor System. Capable of monitoring up to 12 pits with ± 2 bbl. accuracy.

5. Formation Evaluation Systems

5.1 Binocular Microscope

5.2 Ultra Violet Viewing Box

5.3 Sample Drying Oven

5.4 Typewriter with geological symbols

5.5 Field copying machine

5.6 Equipment to aid in ditch cuttings analysis

5.7 Equipment to aid in drilling mud analysis

5.8 Single Solution Shale Density System

5.9 Light Table

6. Data Monitoring and Acquisition System

6.1 Two computers with 64K memory are interfaced with the drilling data sensors via a multiplexer unit.

APPENDIX 5

OILSPILL CONTINGENCY PLAN

FOR

SANDPIPER ISLAND

TABLE OF CONTENTS

LIST OF FIGURES

1. FACILITY DESCRIPTION

This contingency plan is for the Shell Oil Company Sandpiper exploratory drilling facility located on an artificial gravel island in 49 feet of water in the Beaufort Sea approximately 20 miles northwest of Prudhoe Bay, Alaska (Figure 1-1). This location is at latitude 70° 35' 4.740" north, longitude 149° 05' 48.804" west. The purpose of the facility is to drill a number of exploratory wells to a subsea depth of approximately 13,000 feet in order to evaluate possible hydrocarbon accumulations.

The gravel island is designed to accommodate the drilling rig, camp, and necessary supplies for a year-round drilling operation. Figure 1-2 presents a plot plan of the facility. The island, with a freeboard in excess of 20 feet, is designed to resist ice override and lateral movement and is above the maximum indicated tide and storm surge based on observations along the surrounding coast.

If necessary, this island can later be enlarged for production purposes. The design of the island also includes a 3- to 5-foot berm around the island's perimeter and slope protection to control slope erosion. Plans call for trucking the rig and associated equipment and supplies to the location over ice roads.

The operator of the Sandpiper facility is:

Shell Oil Company
P.O. Box 527
Houston, TX 77001
(713) 870-4440

The layout of the rig as assembled in an operating status is shown on Figure 1-2.

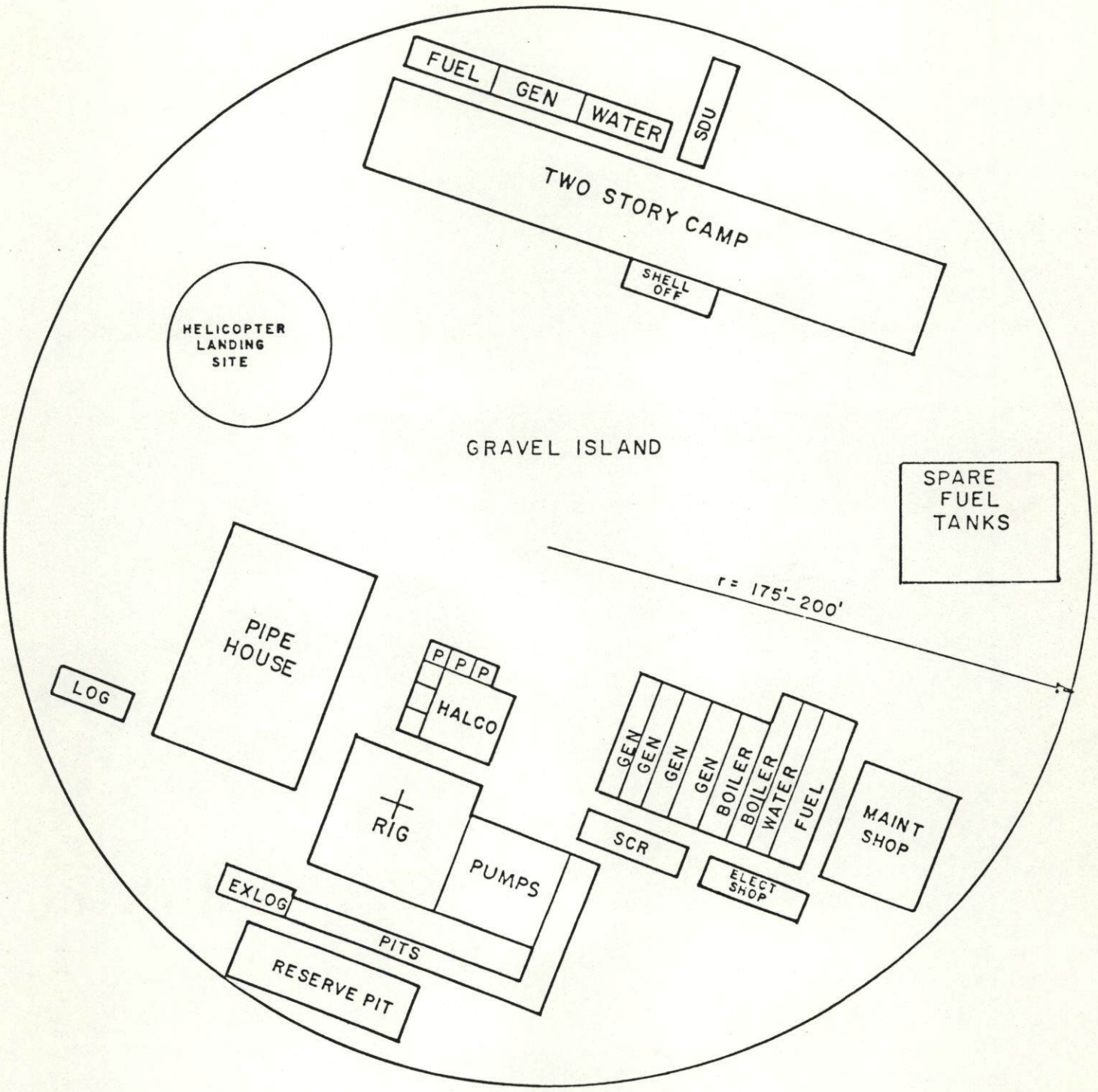


FIGURE 1-2

LAYOUT OF SANDPIPER FACILITY

2. SPILL PREVENTION

2.1 GENERAL SITE DETAILS

The rig location and operating plan have been designed to provide containment of all drilling operation effluents that could be considered pollutants. This design includes an impermeable sheet placed under the drilling rig to collect and divert any liquid waste for proper disposal. In addition to this, drip pans and other containment measures are provided under the engines and rig machinery. Good housekeeping is stressed for all operations, with emphasis on minimizing contamination of the peripheral drainage from the island. Fuel storage is provided in double-walled steel tanks located on an impervious area inside a gravel berm. A mud pit provides space for emergency discharge of fluids, if required, and is normally kept dry to maximize storage capacity.

Additional precautions are taken to prevent drainage of hydrocarbons to the sea. After freezeup, the rig operating plan calls for spraying the surface of the island with water to form an impervious ice seal and thus enhance cleanup of spilled liquids. Also, any spills will be cleaned up as soon as possible. Snow contaminated by toxic substances will be incinerated on site or hauled to a disposal site on shore.

2.2 PRIMARY CONTAINMENT EQUIPMENT

The following specifications apply to the fuel storage and transfer equipment and to the drilling rig.

(1) All fuel storage tanks are of steel construction and are atmospheric vessels, with permanently installed vents.

(2) The fuel discharge connection on each tank is equipped with manually operating valves.

(3) The fuel tanks have no automatic fluid-level control devices and are unprotected from the weather. Arctic conditions frequently

covers tripping, hole filling practices, and blowout preventer hookups and use. The well plan is on file along with this contingency plan at the drillsite. Shell Oil Company's on-site Drilling Foreman is responsible for seeing that procedures are carried out and that proper records are kept.

Under normal drilling operations, the Shell Drilling Foreman is responsible for conducting frequent reviews of the drillsite to ensure that equipment maintenance is kept up to standards and that proper on-site procedures are followed. The items to be checked during site surveillance include, but are not limited to:

(1) Mechanical condition of tankage, lines and pumps (Daily)
(2) Correct positioning of flowline valves (Installation)
(3) Operation of relief valves (Weekly)
(4) Fluid levels in drip pans, containment pits, etc. (Daily)
(5) Condition of drains (ensure clean and unfrozen) (Daily)
(6) General condition and cleanliness of rig (Daily)
(7) Condition of spill removal equipment and material (Daily)
(8) Proper operation of sewage treatment facilities (Continuous)
(9) Snow removal status (Daily)
(10) Outer edges of location to ensure there is no seepage from pad (Daily)

In addition, the following procedure is followed while operating on these locations:

(1) The Shell Drilling Foreman designates "Briefing Areas" where all personnel will meet in case of emergency and where emergency equipment will be kept.

(2) The site is equipped with a Shell-operated radio system.

(3) A list of current emergency telephone numbers and a map of the local area are maintained by the Drilling Foreman.

(3) Each well program is designed, utilizing the most current data available regarding subsurface conditions, to meet the requirements of Items 1 and 2 above. Casing and blowout prevention equipment of greater containment capacity will be utilized any time the need develops.

(4) Further, the blowout prevention equipment is periodically tested (and repaired as required) to insure continued performance of this equipment as specified by the manufacturer.

3. RESPONSE ORGANIZATION

3.1 GENERAL ORGANIZATION

The purpose of this section is to describe Shell's organization for conducting an oil spill cleanup operation. This organization consists of two teams: the Shell Sandpiper On-Site Spill Response Team and the Shell Major Spill Response Team. The On-Site Spill Response Team consists of members of the work crews stationed at the island and is led by the on-site Shell Assistant Drilling Foreman. The Major Spill Response Team, which is led by the Shell Operations Manager in Anchorage, consists of personnel from other Shell operations in Alaska, Texas, and California. This team is supplemented by personnel from contractors and from ABSORB.

Overall responsibility for oil spill prevention and oil spill cleanup for Shell facilities in Alaska rests with:

M.L. Woodson
Operations Manager
Alaska Production Division
601 W. 5th Avenue, Suite 810
Anchorage, Alaska 99501
(907) 276-2545
(907) 344-8957 (Home)

Mr. Woodson's alternate is:

W.F. Simpson
(907) 276-2545
(907) 243-6992 (Home)

Mr. Woodson will serve as Operations Manager for cleanup of any spill requiring activation of the Major Spill Response Team. It is envisioned that Mr. Woodson and most other members of the Shell Major Spill Response Team would assume control of only a major spill operation. The Shell Drilling

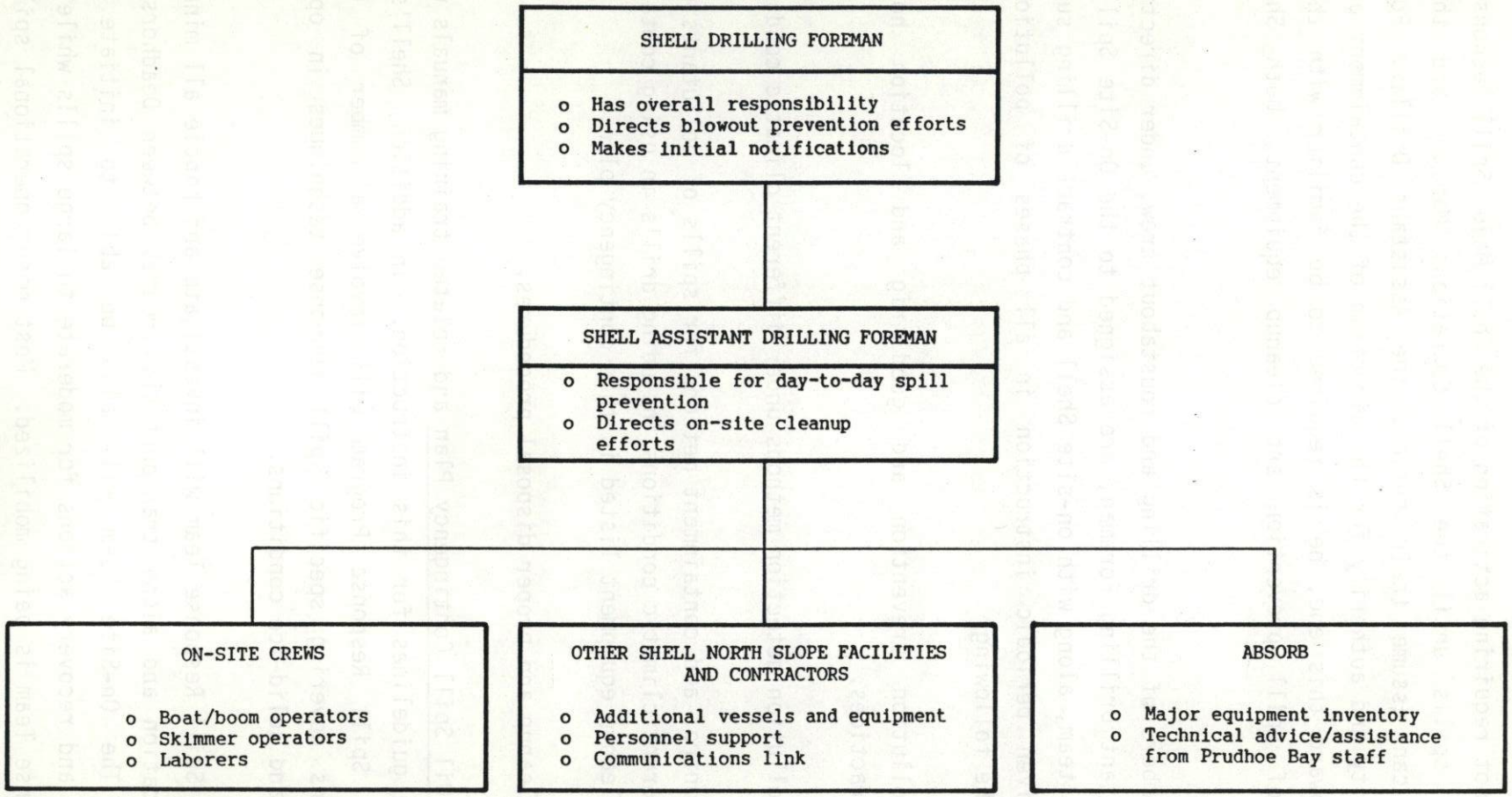


FIGURE 3-1 SHELL ON-SITE SPILL RESPONSE TEAM

will be collected manually and disposed of by incineration (if appropriate). At the discretion of the Shell Assistant Drilling Foreman, additional labor crews and material can be mobilized from Prudhoe Bay to assist the On-Site Team in cleanup.

As shown in Figure 3-1, the On-Site Team can obtain additional equipment and labor support from other Shell facilities in the Beaufort Sea region and from ABSORB at Prudhoe Bay. Shell crews stationed at Seal Island operate under the same basic contingency plan as Sandpiper. These crews have similar equipment and receive similar training. In addition, as a member of ABSORB, Shell has ready access to ABSORB's extensive inventory of equipment at Prudhoe Bay and can call upon the expertise of ABSORB's full-time staff there. Contract labor is also available at Prudhoe Bay to provide additional manpower. Shell has agreements with a number of contractors to provide manpower and equipment as required for a spill emergency. Copies of such agreements are available for agency review upon request.

3.3 SHELL MAJOR SPILL RESPONSE TEAM

Figure 3-2 shows the organization of the Shell Major Spill Response Team. This organizational scheme allows for varying levels of response to different spill situations. As such, the entire team would be mobilized only in the event of a full-scale response to a major blowout. Selected members of the team can be sent to Sandpiper to support the On-Site Spill Response Team. For example, the On-Site Team may require supervisory assistance in dealing with a moderate-sized spill from a fuel barge at the island. In such a case, the Cleanup Supervisor from the Major Spill Response Team and several members of his staff may be brought in to direct the efforts of cleanup crews obtained from other Shell facilities in the area or from contractors at Prudhoe Bay. As soon as possible after a spill, the Shell Drilling Foreman at Sandpiper will consult with the Shell Operations Manager in Anchorage to determine the level of response needed. The Operations Manager of the Shell Major Spill Response Team has the authority to obtain as much labor support as necessary to mount a spill response operation. He also maintains contact with the Shell Production Manager in Houston on company policy matters.

The following subsections contain detailed descriptions of the duties of each member of the Operations Manager's staff.

OPERATIONS MANAGER

In compliance with company policy and in coordination with senior management, has complete responsibility and total authority for directing field operations and for making or revoking decisions regarding procedural matters.

Reports directly to Shell's management and represents their interests throughout the cleanup operation.

Establishes the field command post.

Directs all line supervisors.

Establishes priorities on use of radios and telephones.

With the daily input of his supervisors, monitors the spill and its cleanup to determine if more manpower and/or equipment are required.

Oversees and approves the deployment of men and equipment.

Approves the movement and activities of all visitors (press, public, etc.) on-scene. Provides liaison with these groups as necessary through the Support Services and Logistics Supervisors.

Clears all press releases after they are checked by the Legal/Insurance Coordinator and sends them on to Shell upper management for approval.

Meets routinely with government on-scene observers and as necessary with Regional Response Team (RRT) personnel to discuss cleanup plans and priorities and the adequacy of results.

Arranges for men and equipment through the Logistics Supervisor.

Monitors performance of field foremen and work crews, directs crew shifts, settles disputes, insures that safety procedures are followed, and signs daily worksheets.

Recovery Coordinator

Directs operation of oil recovery equipment.

Determines action required and assigns work crews and equipment.

Arranges for men and equipment through the Logistics Supervisor.

Monitors performance of field foremen and work crews, directs crew shifts, settles disputes, insures that safety procedures are followed, and signs daily worksheets.

Storage/Transfer Coordinator

Directs the movement of oil from recovery devices to transfer vessels to storage or disposal locations.

Determines action required and assigns work crews and equipment.

Arranges for men and equipment through the Logistics Supervisor.

Coordinates with the Recovery and Disposal Coordinators.

Monitors performance of field foremen and work crews, directs crew shifts, settles disputes, insures that safety procedures are followed, and signs daily worksheets.

Is responsible for directing the efforts of the Communications Coordinator, Manpower Coordinator, Equipment/Materials Coordinator, Transportation Coordinator, and the Food/Housing Coordinator.

Depending on the size of the spill cleanup operation, may elect to assume the responsibilities of one or several of these coordinators.

Communications Coordinator

Sets up and maintains the field communications system.

Sees that a detailed log of all communications (other than routine operational transmittals) is kept by command post personnel manning telephones and radios. Provides this log to the Documentation Coordinator.

Checks out portable radios to authorized personnel according to the provisions of this contingency plan.

Assigns a dispatcher as necessary to take and relay messages.

Manpower Coordinator

Arranges for manpower needs as requested by the cleanup coordinators.

Keeps time records of all workers.

Keeps current list of all personnel involved in the cleanup operation.

Provides necessary personnel information to the Accounting Coordinator for maintenance of payroll records.

Food/Housing Coordinator

At the request of the Operations Manager, arranges for the mobilization of required portable camp facilities.

Coordinates meals and lodging at available facilities at Prudhoe Bay.

Supervises efforts of workers assigned to food preparation and housekeeping at the portable camps.

Arranges for acquisition and delivery of food supplies.

TECHNICAL SUPERVISOR

Is responsible for providing the Operations Manager and the other supervisors with the technical information they need on equipment and the environment and for ensuring the safety of the operation.

Directs the Environmental Coordinator, the Safety Coordinator, and the Engineering Coordinator, but will assume their roles for a smaller operation.

Environmental Coordinator

Maintains liaison in the field with environmental/ scientific representatives of governmental agencies. Coordinates with the Government Liaison Coordinator.

Provides the Operations Manager with damage assessments.

Surveys the spill area and advises the Operations Manager of environmentally sensitive areas to protect.

Responds to requests for technical information concerning environmentally sensitive areas.

Coordinates wildlife rehabilitation activities.

Dispenses first-aid, safety, and survival equipment and maintains the inventory of these items.

Coordinates the staging of fire control equipment.

Arranges for procurement and distribution of safety equipment and survival gear as requested by the Logistics Supervisor.

Contacts first-aid centers at the North Slope and hospitals in Anchorage and Fairbanks to prepare them for possible injured response team members.

Engineering Coordinator

Determines the magnitude of the spill and associated flowrates.

Monitors spill movement and behavior.

Advises the Operations Manager on technical aspects of containment and cleanup, i.e., adequacy of techniques and equipment, effects of ice and reduced temperatures, etc.

Advises on physical/chemical aspects of ice loading, oil combustion, strength of materials, etc.

Works with the Environmental Coordinator to determine best disposal techniques.

Provides needed technical information from company files and establishes liaison as necessary with engineers from other companies and with consultants.

SUPPORT SERVICES SUPERVISOR

Handles the public affairs, legal, governmental, and financial aspects of the cleanup operation.

Assists in the preparation of a comprehensive final report and in submitting required reports to government agencies (this task is to be coordinated with the Government Liaison Coordinator).

Government Liaison Coordinator

At the request of the Operations Manager, obtains necessary government approvals and permits for actions subject to regulation such as use of dispersants, access to lands, location and use of disposal sites, use of government-owned equipment, etc. Coordinates with the Environmental Coordinator on these matters.

Establishes and maintains contact with representatives of government agencies and conveys information and requests to the Operations Manager.

With approval of the Operations Manager, arranges for observation visits to the spill site by representatives of government agencies and serves as a guide during these visits.

Works closely with the Environmental Coordinator, sharing the responsibility of conducting site visits with government on-scene observers.

Serves as Shell representative to the Regional Response Team or any other committee formed by government to assist in the cleanup.

Keeps accurate notes for use in the spill history.

Security Coordinator

Insures that only authorized personnel enter the field office and spill cleanup zone.

Assigns security officers to area as required.

With approval of Operations Manager, issues passes to members of the press, government agencies, and other visitors.

Provides qualified claims adjusters to investigate claims of damage.

Obtains rights-of-way and permits as necessary for a cleanup operation.

Handles inquiries from insurance companies and accompanies claims adjusters on tours of site.

Public Affairs Coordinator

Serves as the response team's interface with the news media.

Coordinates with public relations representatives assigned to the spill site.

Prepares regular press releases and statements for release after approval by Shell management, the Operations Manager, and the Legal/Insurance Coordinator.

Arranges for and chaperones tours by members of the news media.

Maintains a close working relationship with the news media, government agencies, conservation groups, and public organizations during the cleanup operation.

Keeps accurate notes for use in the spill history.

DRILLING SUPERVISOR

Responsible for ongoing drilling operations in the event that additional rigs are brought in to assist in emergency situations, i.e., to drill relief wells, etc.

Drilling Operations Coordinator

Advises Drilling Supervisor on operational aspects of techniques and equipment required for relief well or other activities.

4. RISK ASSESSMENT

The development of a meaningful oil spill response plan for Shell's offshore exploration activities at the Sandpiper location must include an assessment of:

- Potential spills (type, number and size of spills that could occur);
- Trajectory analysis (where the oil might go, how it will change, and times till impact with shore); and
- Sensitive areas (what shorelines, natural resources or other facilities need special consideration during shoreline protection/cleanup).

This section contains a summary of Shell's risk analysis involving the above spill source, movement and impact considerations. To the extent possible, Shell has considered only site- and/or area-specific spill statistics and environmental conditions. Broad oil spill statistical bases generally introduce irrelevant information involving many phases of activity (exploration, development and production), along with environmental constraints that are not comparable to the area under consideration. Instead, this section focuses on a range of plausible spill types and volumes (including a major blowout) and how such spills could conceivably move within and/or threaten the natural resources surrounding the Sandpiper drillsite.

4.1 POTENTIAL SPILLS

The probability that an oil spill will occur at the Sandpiper drillsite is of little value in preparing an adequate oil spill response plan. All preplanning, equipment purchases, personnel arrangements and training must be based on the assumption that a spill is possible and that a meaningful response must be achievable under a broad range of environmental conditions for both minor and major spills.

hypothetical flow-rate of 10,000 barrels of oil per day (bopd) used by other North Slope operators as a major blowout scenario. Because of the potential for igniting (accidentally or deliberately) a blowout, it is recognized that as much as 90% to 95% of the spilled oil could be burned at or adjacent to the drilling island. The potential spillage from a blowout is therefore envisioned as a source rate of from 500 to 1,000 bopd. Prior to ignition, the higher rate of 10,000 bopd is conceivable.

A third type of potential spillage that might involve the off-site surroundings results during the testing phase of a well. During testing it is possible, though unlikely, that the nature and amount of oil and/or gas released from the well could exceed the handling capabilities of storage or flare-burning equipment on scene. Every reasonable precaution is taken by Shell to prepare for such a release during testing operations, including having on standby four 500-barrel storage tanks, state-of-the-art burners (with redundancy), backup diversionary flow lines for emergency use, and huge specially designed drip pans to collect even the slightest discharge of unburned oil particles during the flaring.

In addition, well testing operations are carefully planned with weather and ice conditions in mind to insure that any unexpected event would occur under favorable response conditions. Experience has shown that the potential for spillage during testing is not only rare but that such spills are small (typically 10's of gallons) and of short duration.

Other potential oil spills are those that would fall into the category of minor operational spills. In all cases, such spills are typically of a barrel or less, easily detected, and capable of being contained on the drilling island. There are, for example, twelve 25,000-gallon storage tanks maintained on the island for storage of arctic diesel oil. These tanks are stored within an approved berm capable of holding more than 110% of any one tank. Since the tanks are not manifolded together, the contents of one could not flow to any other tank.

In addition, a review of statistics for the entire U.S. outer continental shelf region shows that there has never been an oil spill from a blowout during offshore exploratory drilling operations in the OCS region.

In Shell's view, oil spill contingency plans should address the range of possible spill volumes for a given activity, regardless of the probability of the spill's occurrence. Shell has therefore elected to use a potential spill rate of 10,000 bopd for its major blowout scenario and a range of from 5 to 500 barrels for its potential instantaneous (operational) spill. These spill sizes are consistent with Shell's previous spill contingency planning documents for the Beaufort Sea and with the industry's reports of it recently completed efforts to obtain permission for year-round drilling in the Beaufort Sea.[2]

4.2 TRAJECTORY ANALYSIS

The Alaska Clean Seas (ACS) oil spill trajectory model was used to run four computer simulations of spills from the Sandpiper drillsite. The results of four computer simulations are provided in Appendix A for the following spill scenarios:

Condition:	Continuous crude oil spill in open water
Source:	10,000 bopd from Sandpiper drillsite
Wind:	10 knots from NE and from NW
	30 knots from NE and from NW

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[2] Oil Spill Response in the Arctic: An Assessment of Containment, Recovery, and Disposal Techniques (April 1983) and Oil Spill Response in the Arctic, Part 2: Field Demonstrations in Broken Ice (August 1983).

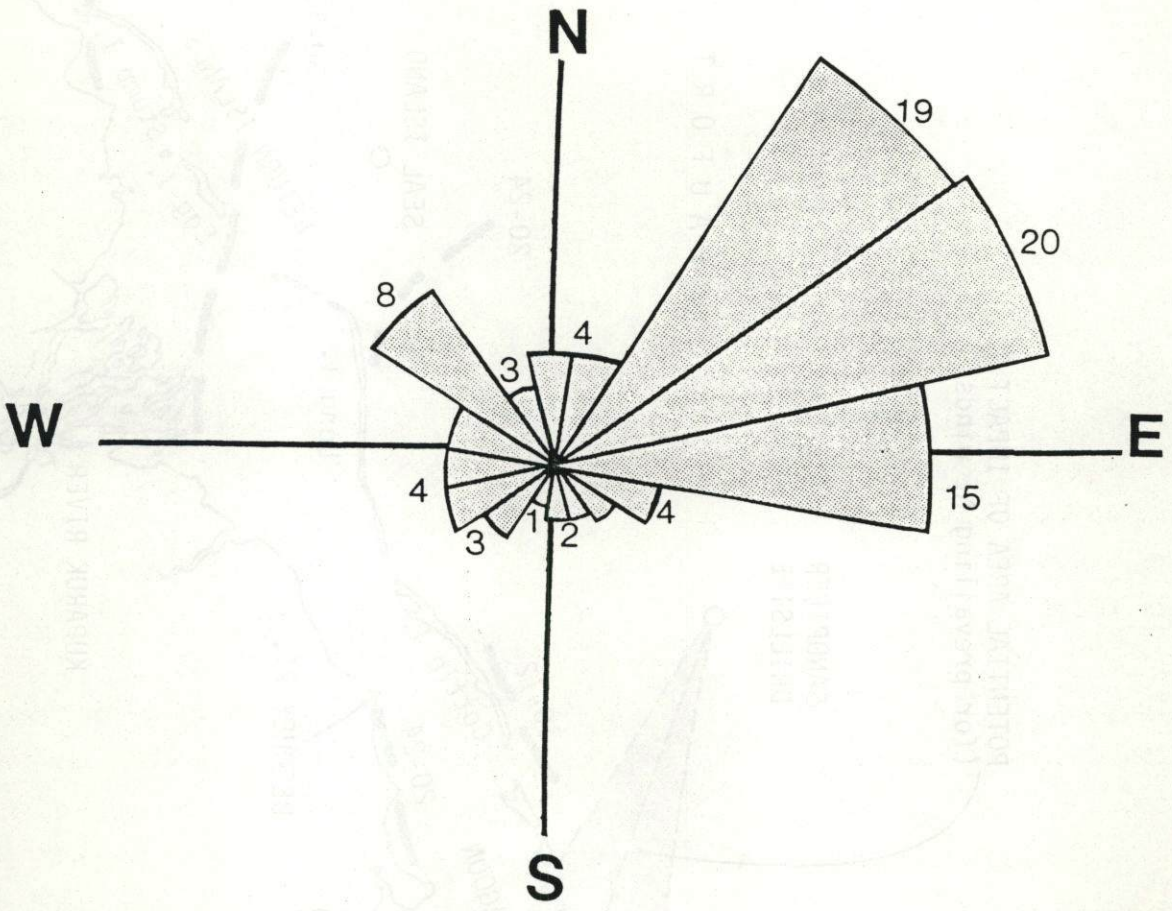


FIGURE 4-1

PERCENT DISTRIBUTION OF SUMMER WIND DIRECTION
FROM HARRISON BAY TO PRUDHOE BAY

SOURCE: ACS ALASKA BEAUFORT SEA COASTAL REGION MANUAL

Loss or Damage to Support Craft

Support craft for the island drilling site, when ice road travel is not possible, would be helicopters (year-round) or tug powered barges (during open water). Helicopter or barge availability in the area is such that a lost or damaged support craft would be readily replaced.

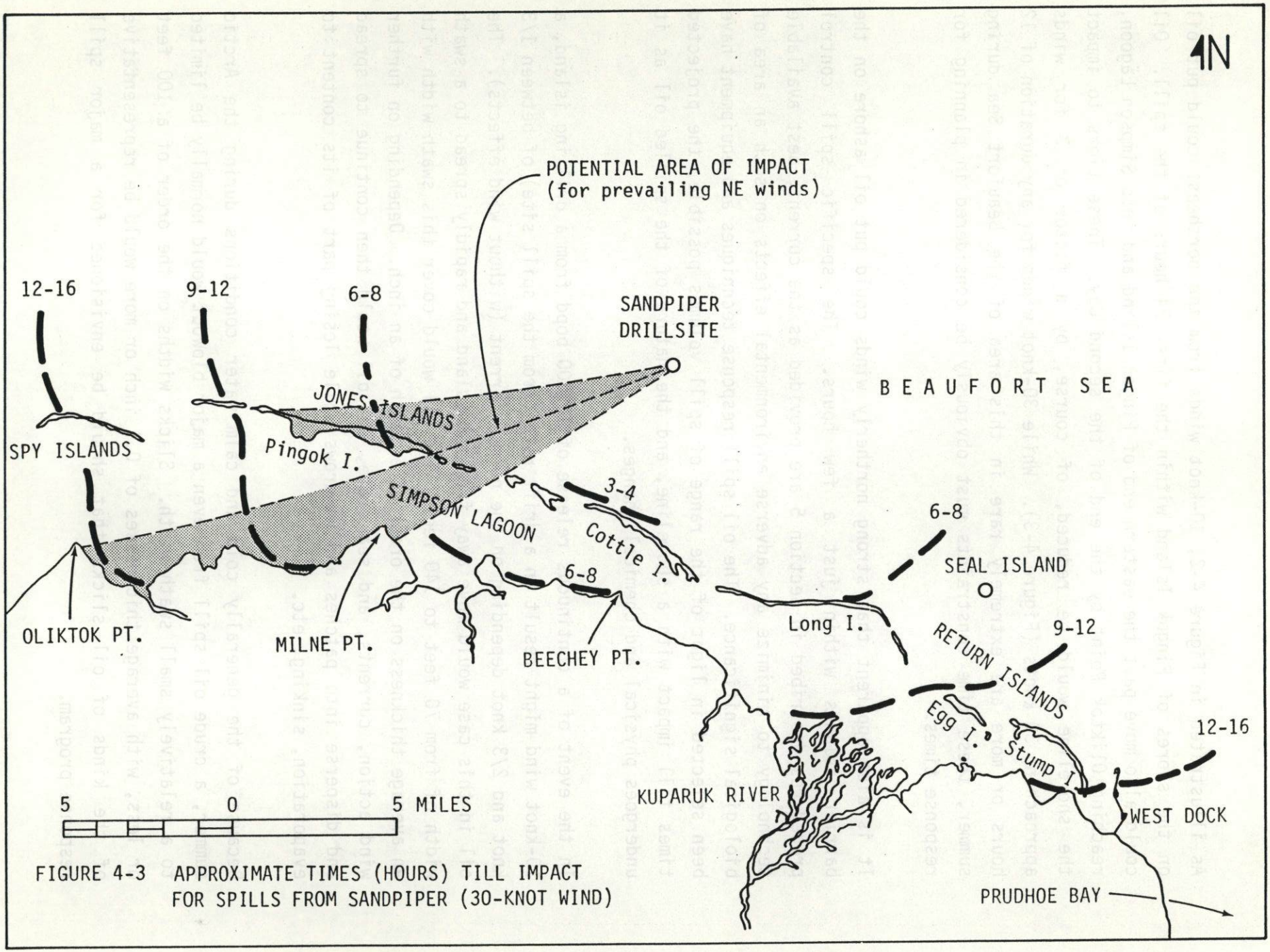


FIGURE 4-3 APPROXIMATE TIMES (HOURS) TILL IMPACT FOR SPILLS FROM SANDPIPER (30-KNOT WIND)

4.3 SENSITIVE AREAS

The potential for impact throughout the region between Oliktok Point and Prudhoe Bay has been assessed using the ACS Oil Spill Response Considerations Manual and the ACS Biological Resources Atlas for the Alaskan Beaufort Sea Coastal Region. These documents are available to all ACS member companies for use in spill contingency planning and in the event of an actual spill. Shell has reproduced portions of these documents involving maps numbered 40 through 47.

A master location map (Figure 4-4) is provided in this section and again in Appendix B, which contains the individual descriptive maps covering such topics as shoreline types, biological/social considerations, countermeasures limitations, and special considerations (Figures B-2 through B-9). Specific biological information on birds, terrestrial mammals, fish and marine mammals for the area of interest has been included on the same maps in Appendix B (Figures B-10 through B-17). These maps from the ACS coastal region manual represent an important element in Shell's overall effort for preparedness in the event of a spill from the Sandpiper drillsite.

For example, Figures B-4 and B-5 reveal several biological and socio-cultural resources that deserve special consideration in the primary area of concern (for prevailing northeasterly winds). The remains of several native houses and grave sites still exist on Leavitt Island and near Oliktok Point and Milne Point. In addition, the area immediately south of the Jones Islands is an important high-use area for oldsquaws during molting in late July and early August (Figures B-12 and B-13).

Personnel responsible for the planning, supervision or implementation of shoreline protection and cleanup activities will be familiar with these maps. There are many shoreline features that could significantly influence the nature and location of an effective response. The region between Oliktok Point and Milne Point, for example, is a low-energy area consisting of a vegetated shoreline washed over with sand-silt sediments. Because of the expected high oil retention in this region, it is essential that every effort be made to prevent oil from reaching the shoreline.

The overall region that could become exposed to a major oil spill at the Sandpiper drillsite within approximately 48 hours (even under relatively light winds) represents more than 50 miles of mainland and a long chain of barrier islands typically 2 to 4 miles offshore. The Simpson Lagoon and Gwydyr Bay regions inside the barrier islands are somewhat protected from drifting oil by the islands; however, between the islands there are many large breaks through which oil could move toward the mainland. The waters inshore of the islands are typically 4 to 6 feet in depth, with many nearshore areas heavily used by marine and anadromous fish during the open water season. The entire coast is a high-density waterfowl-use area in the summer. The seaward shores of most of the islands provide feeding and staging areas for juvenile shorebirds. Several coastal salt marshes and backwater areas are also important feeding and staging areas.

These conditions, along with the number of terrestrial and marine mammals that commonly use the region, emphasize the need for early containment and recovery of a spill from the Sandpiper drillsite. The spill control procedures described in the following section take into consideration these environmental conditions, as well as the potential spill volumes and zones of impact.

5. SPILL CONTROL PROCEDURES

In the event of an oil spill at the Sandpiper drillsite, immediate reactions will include:

(1) **ELIMINATION OF SPILL SOURCE AND PROTECTION OF PERSONNEL AND EQUIPMENT**

- For a blowout, initiate well control procedures and evacuate personnel.
- For other spills, shut off source of oil (if possible) and alert personnel.

(2) **NOTIFICATION OF SHELL MANAGEMENT AND GOVERNMENT**

Provide essential information to Shell (Deadhorse or Anchorage). They alert others as necessary including:[1]

Evacuation Assistance	Spill Cleanup Assistance	Government Notification
ERA Helicopters 659-3158 659-2465	ABSORB 659-2405/2623	MMS 271-3777 271-4303
Evergreen Helicopters 659-2261 659-2457	Crowley Env. Serv. 659-2326	USCG 271-5137 (211) Zenith 5555
Crowley Arctic Marine Freighters 659-3118	Alaska Off. Inc. 659-2409	ADEC 452-1714 (211) Zenith 9300
Kodiak Oilfield Haulers 659-2532 659-2544		
Seal Island 659-3185		

(3) **INITIATION OF IMMEDIATE ONSITE RESPONSE TECHNIQUES**

- For a blowout, all activity will be restricted to a safe operating distance from the well.

[1] For a spill of 5 bbl or less, Sandpiper will notify the government agencies.

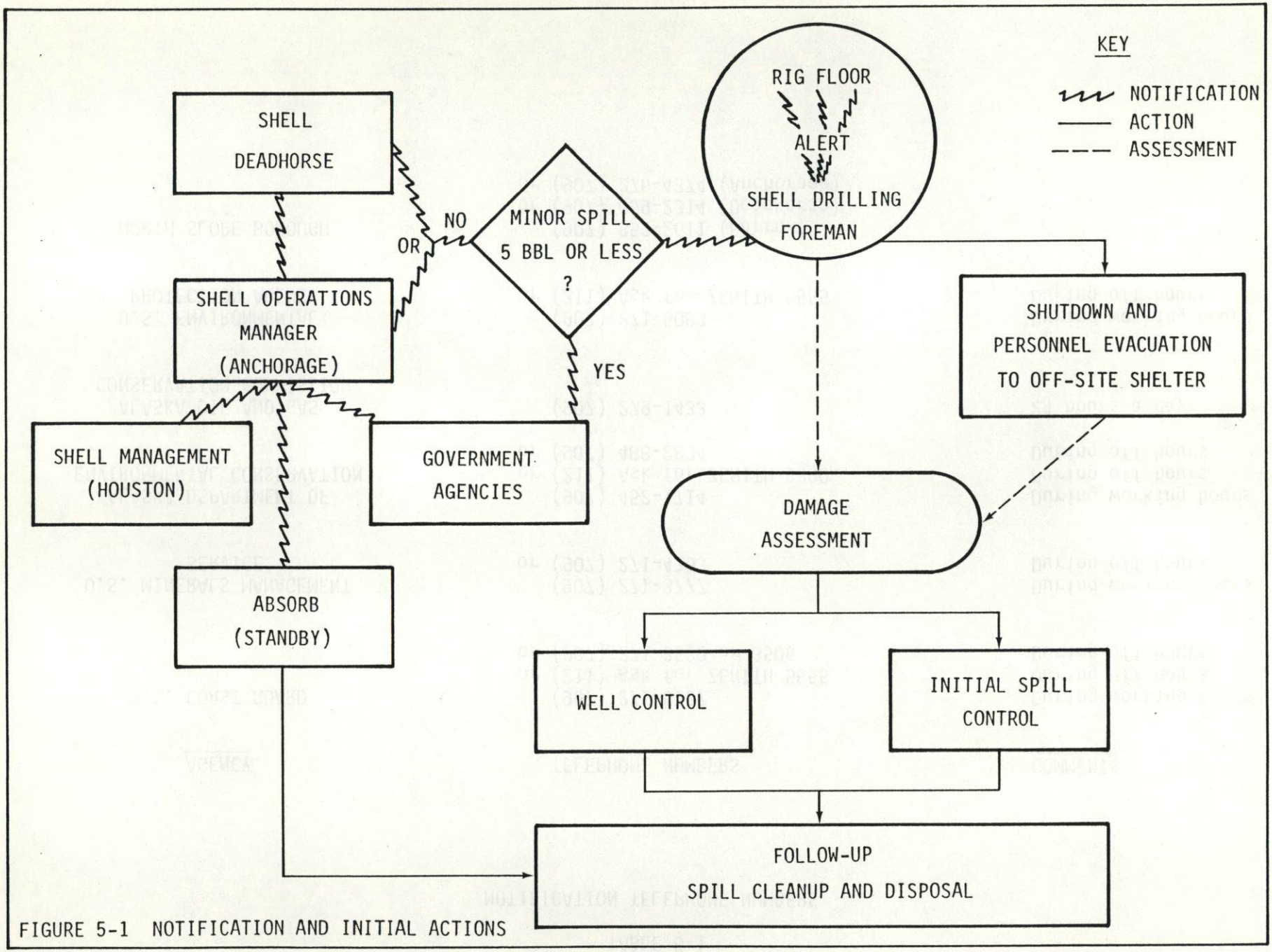


FIGURE 5-1 NOTIFICATION AND INITIAL ACTIONS

5.1.2 Emergency Shutdown and Evacuation Procedures

In the event of a blowout, blowout prevention equipment can be activated on the drill floor and from a remote location. Should emergency shutdown procedures be implemented, personnel on the rig floor would give immediate warning over the rig's intercom system. This warning would be received at the Shell office in the camp and at other key locations around the drillsite. The camp's fire alarm system would then be activated.

Depending on wind conditions, the time of the year, etc., personnel would immediately evacuate the camp and other facilities, taking with them boots and warm clothing, and head for the safest upwind location available. During solid ice conditions, vehicles, loaders and some movable shelters such as the spill response van could be moved on the ice away from any existing/potential fire danger. During other periods, vehicles, boats, inflatable life rafts, etc. could be moved to the upwind side of the island to assist with evacuation efforts.

During the camp evacuation, the bullcook would be responsible for making a complete inspection of the camp to insure that no one was left behind. At the same time, the SDU operator would shut down the camp generators, incinerators and any other ignition sources. Throughout the evacuation and after everyone is assembled off-site, the medic would be responsible for a complete head count.

5.2 IMMEDIATE RESPONSE TECHNIQUES

During the initial response to an oil spill at the Sandpiper drillsite, spill control activities should focus on those containment techniques that are safe to execute without undue risk to personnel and equipment. If it is safe to do so, efforts would be made to keep oil on or adjacent to the drilling island. In the event of a blowout, containment may occur initially within and around the island's facilities and surrounding berm. Such containment, however, could hinder access to the well and reduce the chances for surface well control measures. Should the well become ignited, and surface well control

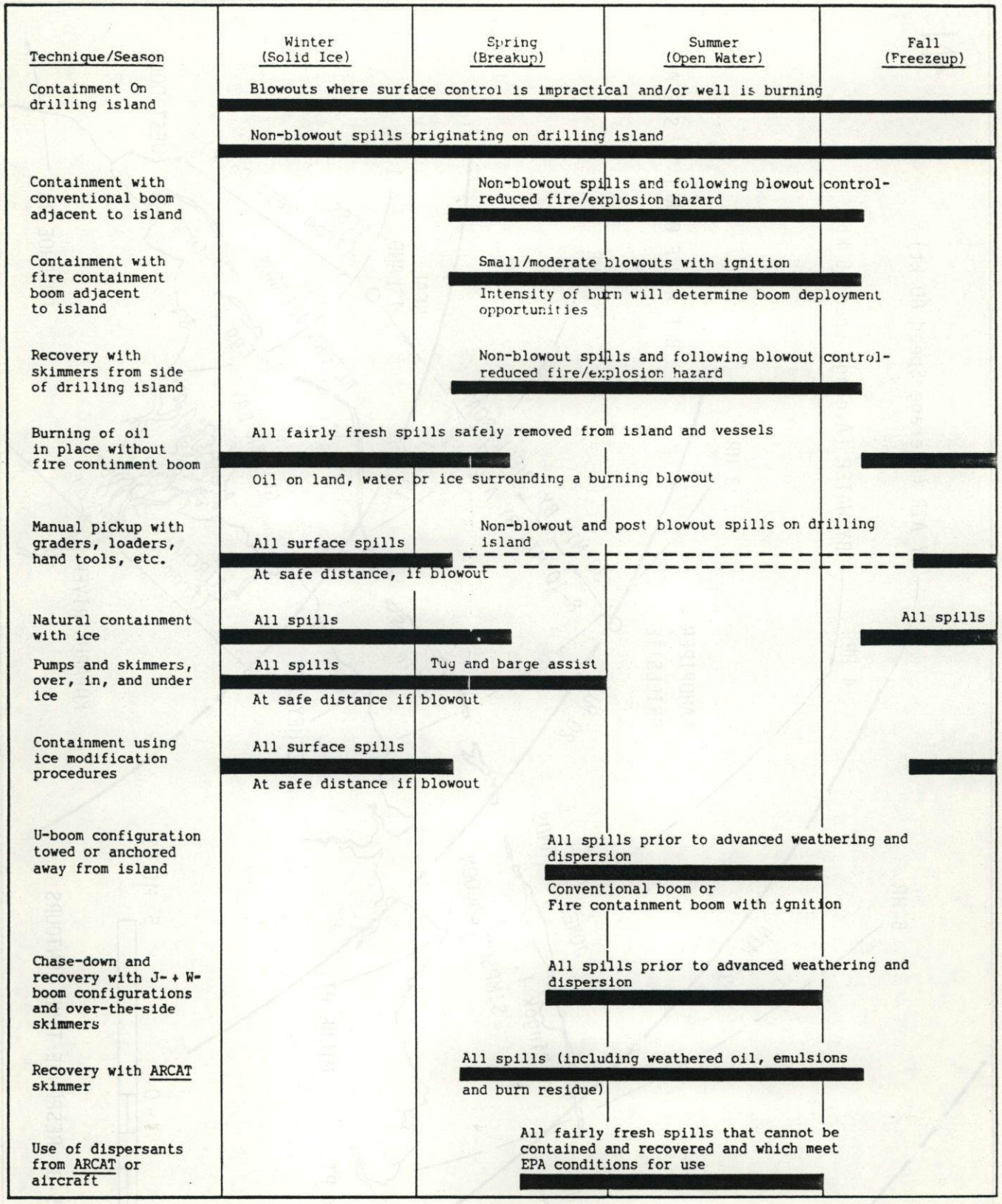


FIGURE 5-2 APPLICABILITY OF RESPONSE TECHNIQUES AT/NEAR SANDPIPER DRILLSITE

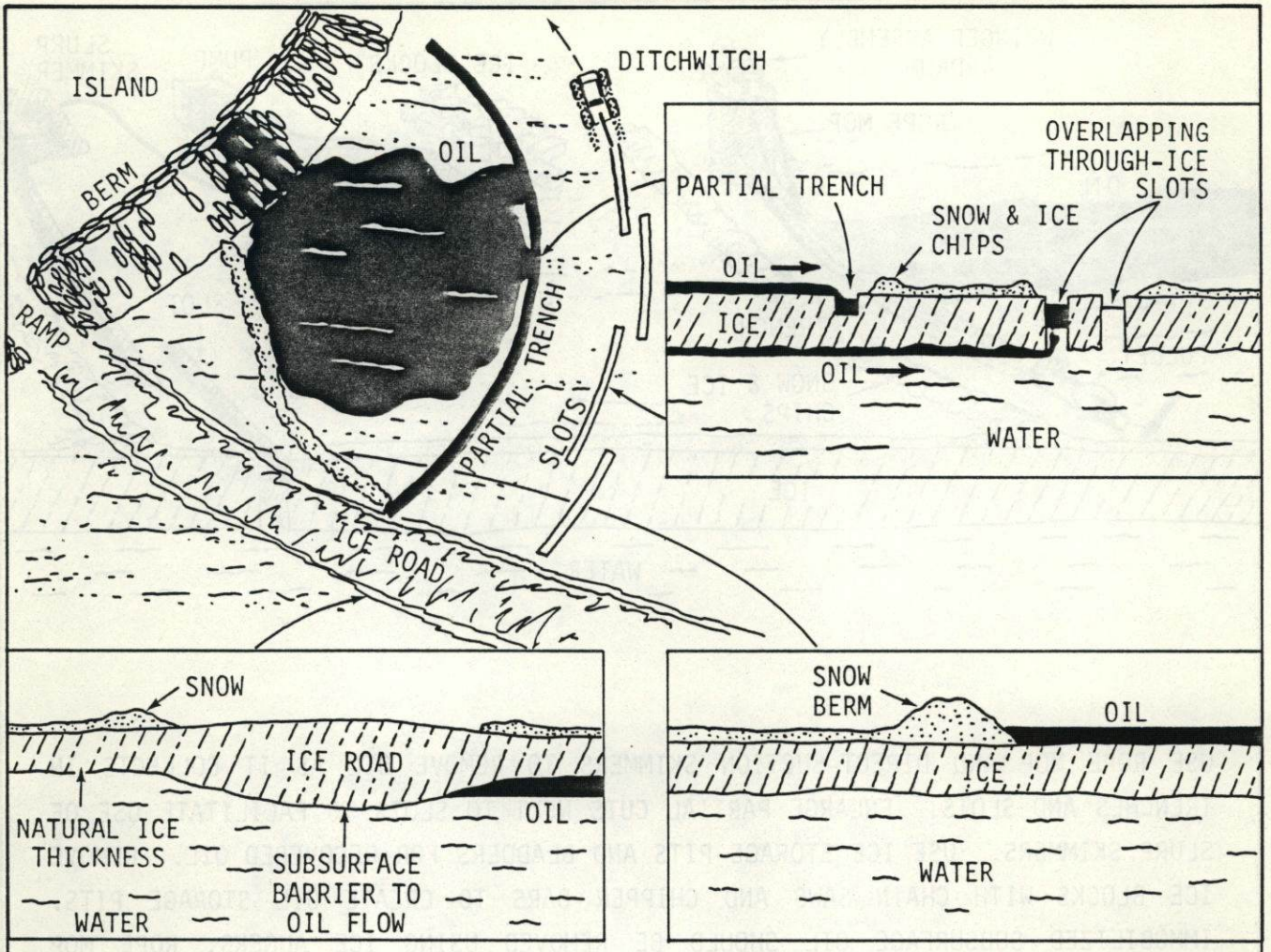
The following subsections focus on those specific response techniques for each season that could be used by on-site personnel to initiate immediate countermeasures at or near the Sandpiper drillsite. It is not the intent to describe every possible response method that could be used, but to indicate those that would most likely be implemented under the range of probable conditions for a spill at Sandpiper. For each seasonal response, Shell's combined containment, recovery and/or disposal capabilities provide for many thousands of barrels of oil per day. Where backup support could be needed, particularly during breakup and open water, the nature of such support is described.

Immediate On-Site Response

Backup Off-Site Response

Comatz
2 to 3 times a week

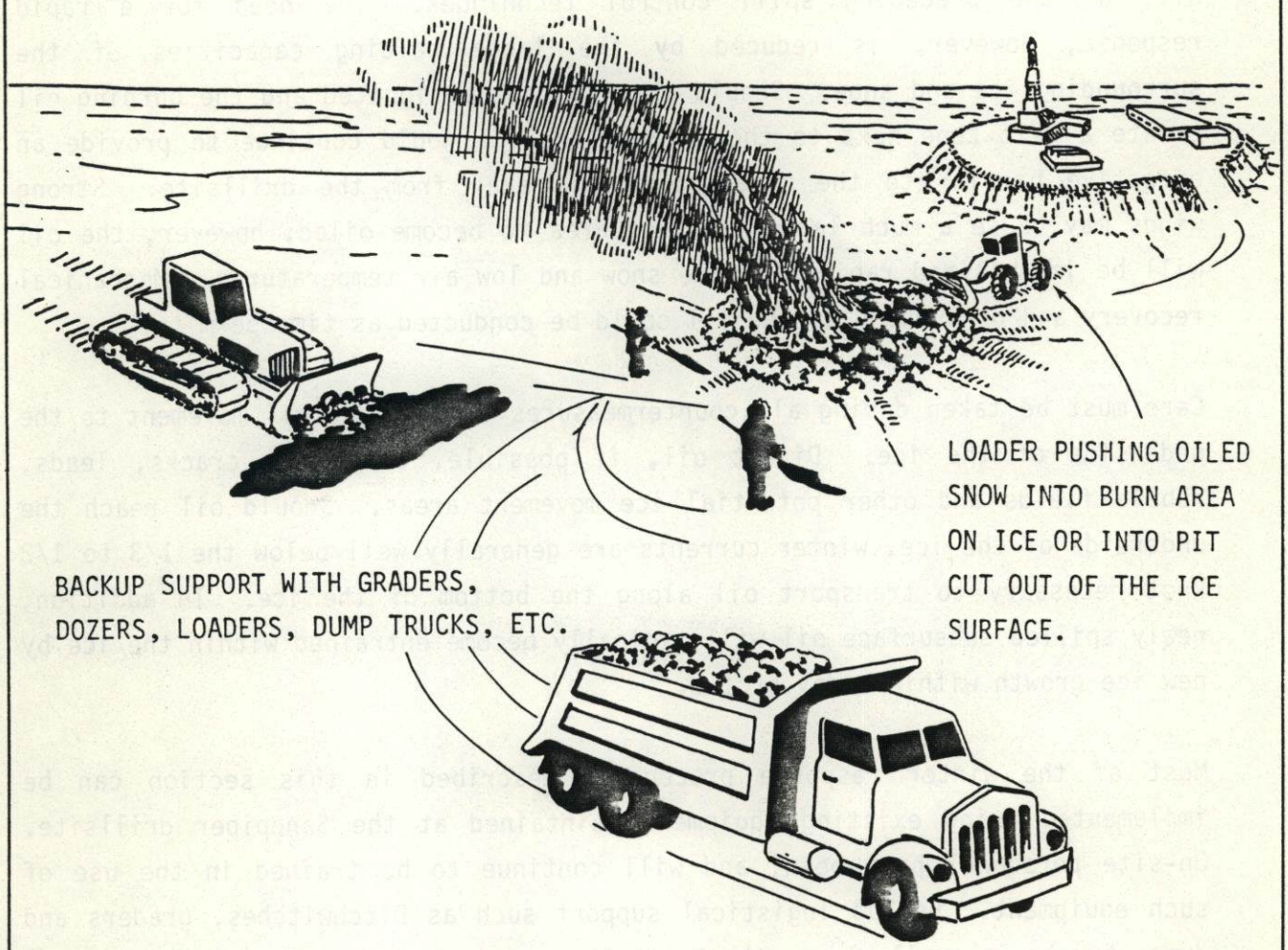
CONTAINMENT USING ICE MODIFICATION PROCEDURES



IF SAFE TO WORK AT OR NEAR THE ISLAND, USE ICE TRENCHES, SNOW BERMS AND SLOTS TO LIMIT THE SPREAD OF OIL. THICKER ICE SUCH AS AN ICE ROAD CAN BE USED TO ADVANTAGE AS A SURFACE AND SUBSURFACE BARRIER. USE SMALL SNOW BERMS ONLY WHERE ICE IS SUFFICIENTLY THICK AND/OR GROUNDED TO PREVENT CRACKING, EXCESSIVE POOLING AND FORCED MIGRATION BELOW THE ICE. CUT PARTIAL TRENCHES AND THROUGH-ICE SLOTS TO CAPTURE OIL AND FACILITATE RECOVERY OPERATIONS. SHOULD CRACKS OPEN UP IN OILED AREA, STUFF WITH SORBENTS AS NECESSARY.

FIGURE 5-5 CONTAINMENT USING ICE MODIFICATION PROCEDURES

MECHANICAL PICKUP AND IN-SITU BURNING OF OIL ON ICE



HEAVILY OILED SNOW SHOULD BE SCRAPED UP BY HAND AND/OR WITH HEAVY EQUIPMENT AND REMOVED FOR PROPER DISPOSAL ONSHORE. IF BURNING IS APPROVED, THE OILED SNOW SHOULD BE PUSHED INTO A VOLCANO-SHAPED HOLLOW CONE AND IGNITED AT THE CENTER. LOADERS CAN THEN CONTINUE TO FEED THE FIRE BY PUSHING OILED SNOW IN TOWARD THE CENTER. IF OIL CONCENTRATIONS ARE SUFFICIENTLY HEAVY, BURNING MAY BE POSSIBLE IN PLACE (WITHOUT SCRAPING AND PILING). IF THE WELL IS IGNITED, IN-SITU BURNING ON AND ADJACENT TO THE ISLAND WILL LIKELY ACCOUNT FOR 90% TO 95% OF THE OIL RELEASED (IF NOT MORE).

FIGURE 5-7 MECHANICAL PICKUP AND IN-SITU BURNING OF OIL ON ICE

- Crude oil pooled in an area of only 50 feet by 50 feet could be burned at a rate in excess of 5,000 bopd.

- One SLURP skimmer (rated at 30 gpm) could remove oil from a trench or slot in the ice at approximately 1,000 bopd.

- One rope mop skimmer (rated at 7 gpm) could similarly remove oil at about 240 bopd.

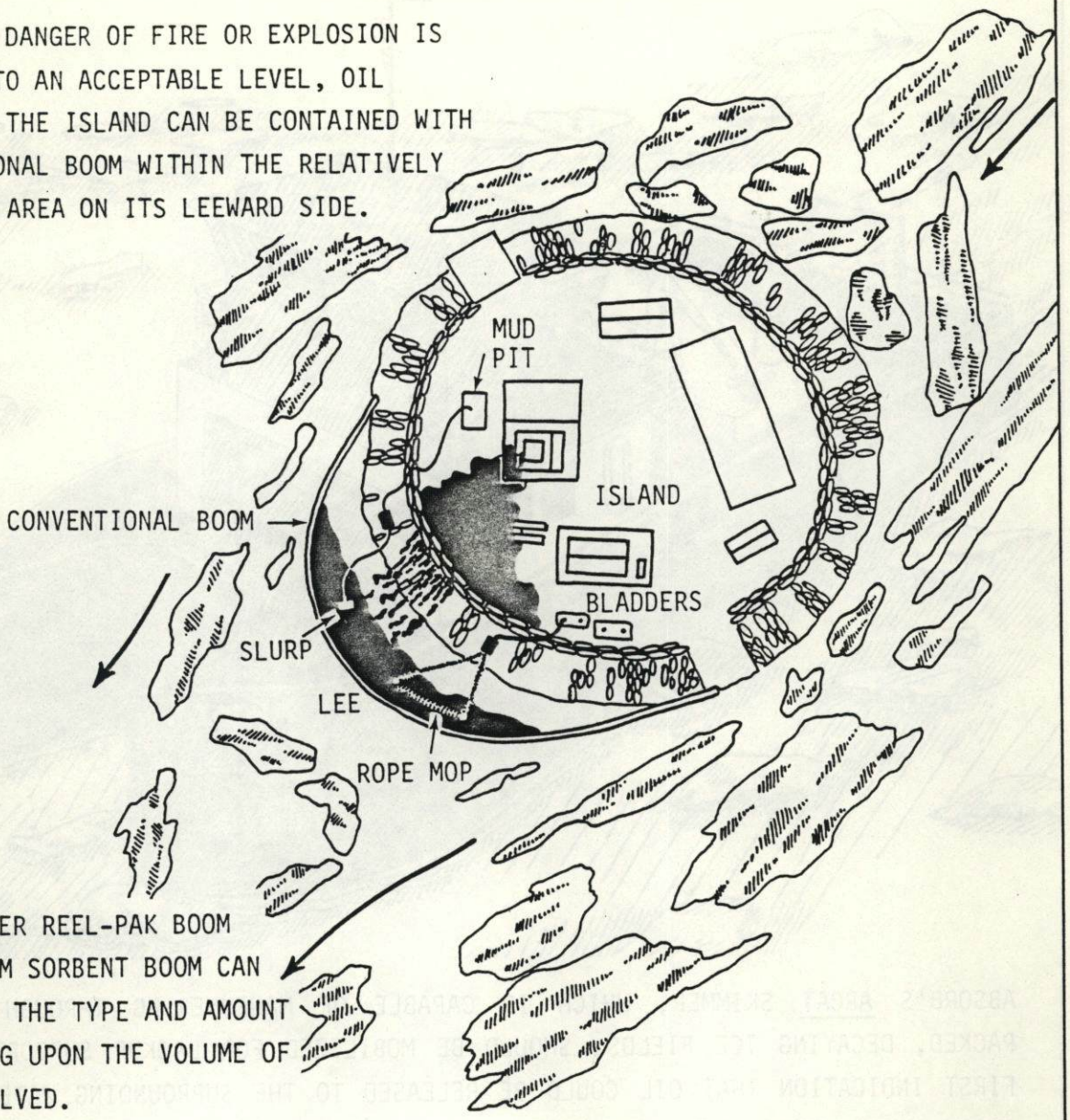
These oil containment, pickup and elimination capabilities do not include such procedures as incineration on-site, the scraping and trucking of oiled snow to onshore facilities, and the use of a variety of other skimming and pumping systems available from Shell's Seal Island, ABSORB, and other North Slope contractors.

Immediate On-Site Response

Backup Off-Site Response

CONTAINMENT AND RECOVERY IN LEE OF ISLAND

ONCE THE DANGER OF FIRE OR EXPLOSION IS REDUCED TO AN ACCEPTABLE LEVEL, OIL ESCAPING THE ISLAND CAN BE CONTAINED WITH CONVENTIONAL BOOM WITHIN THE RELATIVELY ICE-FREE AREA ON ITS LEEWARD SIDE.



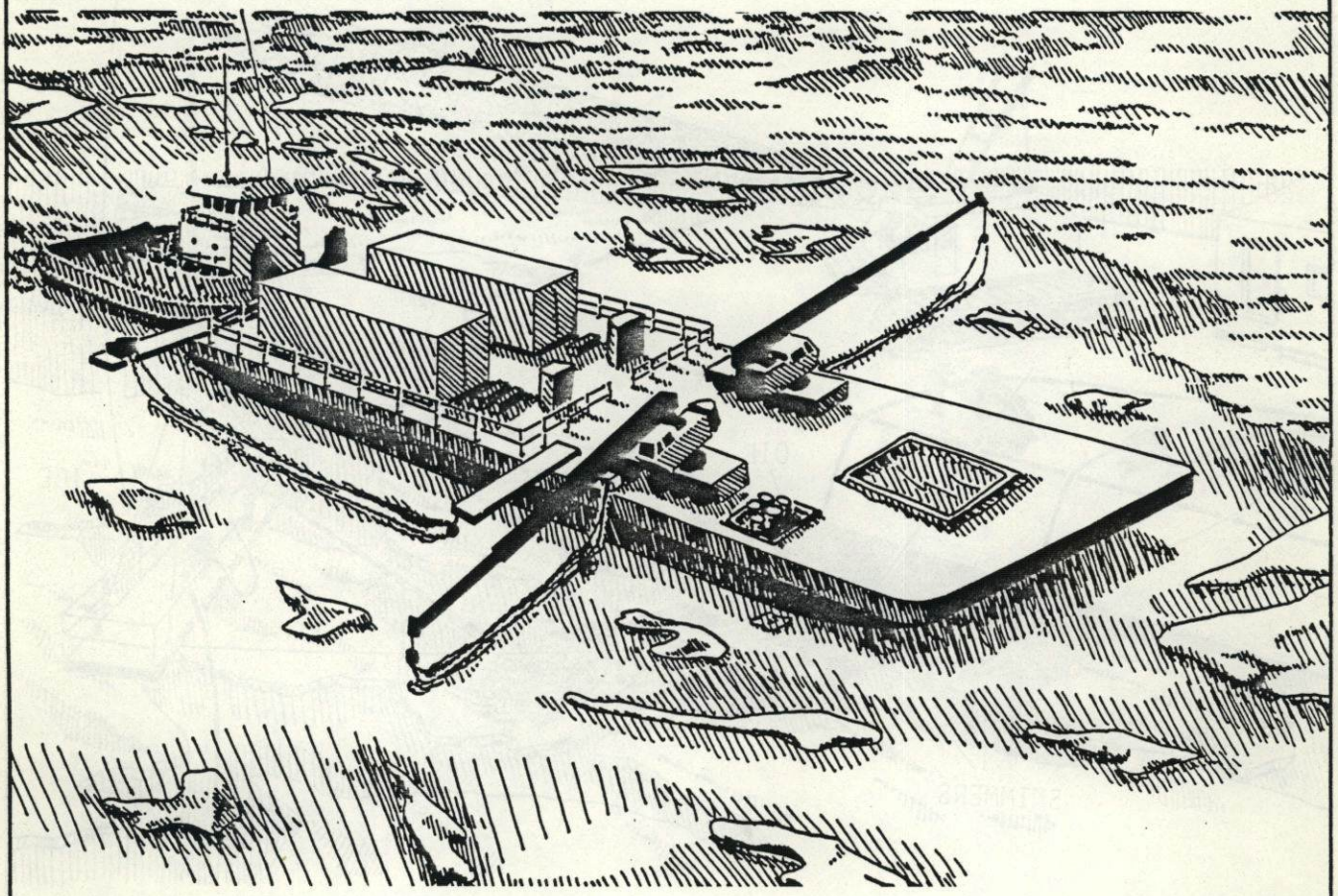
THE KEPNER REEL-PAK BOOM AND/OR 3M SORBENT BOOM CAN BE USED, THE TYPE AND AMOUNT DEPENDING UPON THE VOLUME OF OIL INVOLVED.

AS ICE AND OIL DISCHARGE CONDITIONS CHANGE, ADJUST THE LENGTH AND POSITION OF THE BOOM TO FACILITATE THE OIL RECOVERY OPERATIONS. IF IT IS IMPRACTICAL OR UNSAFE TO ANCHOR TAIL PULLEYS FOR ROPE MOP SKIMMING WITHIN THE BOOMED AREA, THE ROPE MOP CAN BE USED IN A LOOSE DRIFT MODE. RECOVERED OIL FROM THE ROPE MOP AND/OR SLURP SKIMMERS SHOULD BE PUMPED ONTO THE ISLAND FOR STORAGE IN THE MUD PIT OR BLADDERS. AVOID UNNECESSARY OIL CONTACT WITH THE ISLAND BY LINING THE EXPOSED SURFACES WITH PLASTIC AND/OR SORBENTS.

FIGURE 5-9 CONTAINMENT AND RECOVERY IN LEE OF ISLAND

RECOVERY WITH BARGE-MOUNTED SKIMMERS

TUGS AND BARGES (AVAILABLE AT PRUDHOE BAY) SHOULD BE MOBILIZED AS LOGISTICAL SUPPORT PLATFORMS FOR OFFSHORE RECOVERY OPERATIONS. ROPE MOP SKIMMERS CAN BE OPERATED IN A VARIETY OF CONFIGURATIONS FROM A BARGE TO REMOVE OIL FROM ICE-INFESTED WATERS (UP TO 7 TO 8 OKTAS OF DECAYING ICE).

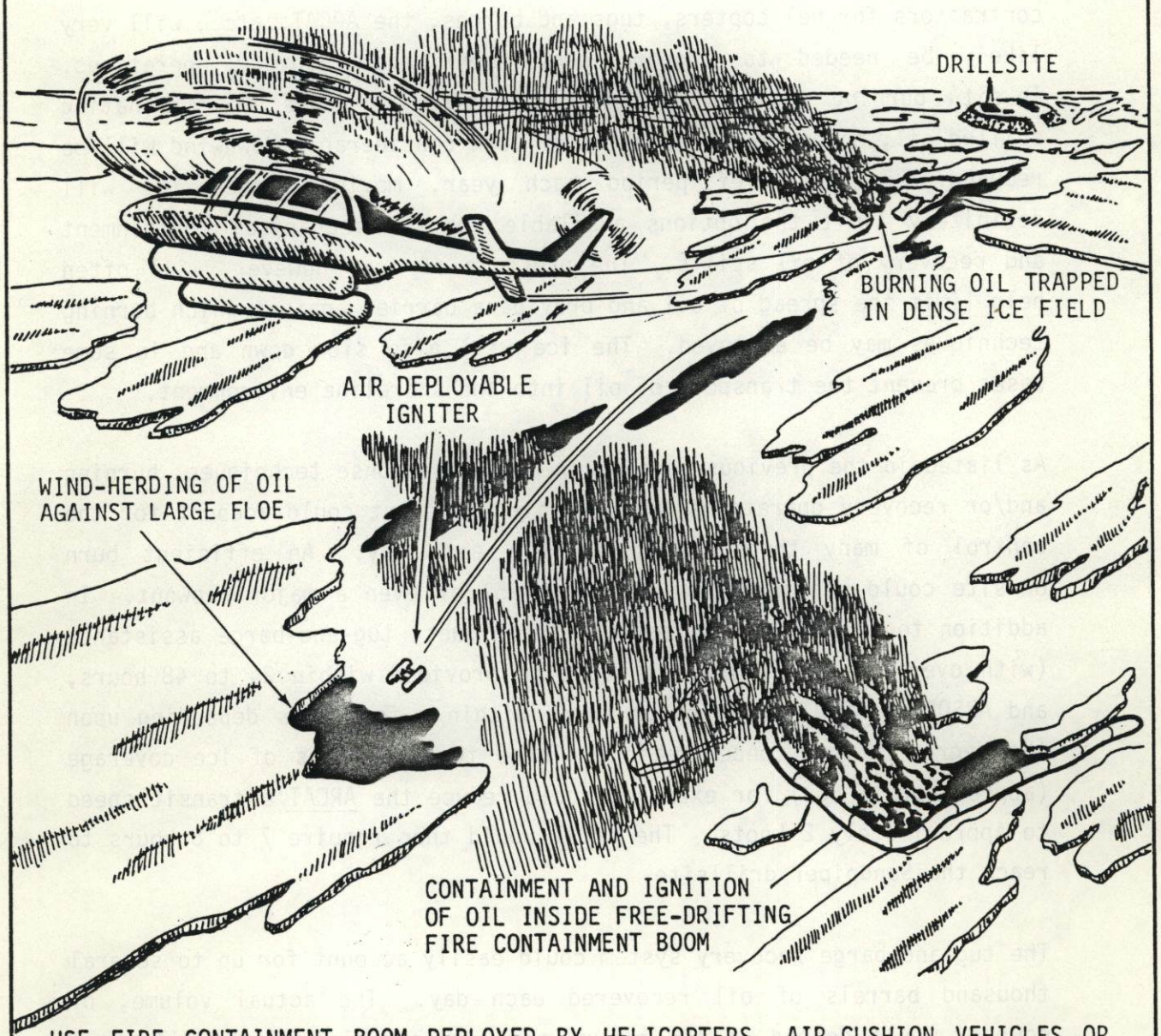


USE FIXED-WING AIRCRAFT OR HELICOPTERS TO DIRECT THE TUG-AND-BARGE UNITS TO THE REGIONS OF HEAVIEST OIL CONCENTRATION. WHEREVER POSSIBLE, USE THE SIDE OF THE BARGE AS A BARRIER FOR DIVERTING OIL FLOW TO THE RECOVERY POINTS. FAVORABLE SURFACE CURRENTS CAN ALSO BE ESTABLISHED WITH THE TUG'S PROPELLERS TO ENCOURAGE OIL MIGRATION FROM INACCESSIBLE LEADS OR POCKETS IN THE ICE. IN THE EVENT OF A MAJOR SPILL, THE TUG-AND-BARGE COMBINATIONS WILL FILL MANY OTHER NEEDS, INCLUDING A MOBILE BASE OF OPERATIONS, A REMOTE HELICOPTER-LANDING/REFUELING SITE, STORAGE FOR DISPERSANTS AND RECOVERED OIL, AND A PLATFORM FOR OIL/WATER SEPARATION AND FLARE-BURNING EQUIPMENT.

FIGURE 5-11 RECOVERY WITH BARGE-MOUNTED SKIMMERS

IN-SITU BURNING AWAY FROM DRILLSITE

UNDER THE INFLUENCE OF WIND, OIL WILL TEND TO DRIFT WITH A GREATER SPEED (AND AT TIMES A DIFFERENT DIRECTION) THAN INDIVIDUAL ICE PIECES. AERIAL MONITORING OF THE OIL MOVEMENT WILL PERMIT THE LOCATION AND IGNITION OF OIL CONCENTRATIONS AS THEY OCCUR IN OR AGAINST TIGHTLY PACKED ICE FIELDS OR AGAINST THE WINDWARD SIDE OF LARGE FLOES.



USE FIRE CONTAINMENT BOOM DEPLOYED BY HELICOPTERS, AIR-CUSHION VEHICLES OR TUGS TO ENHANCE THE NATURAL WIND-HERDING OF OIL FOR SUBSEQUENT IGNITION. HELICOPTERS AND/OR AIR-CUSHION VEHICLES AND TUGS CAN BE USED FOR RELEASING IGNITERS INTO THE POOLS OF OIL.

FIGURE 5-13 IN-SITU BURNING AWAY FROM DRILLSITE (IN MOVING BROKEN ICE)

5.2.3 Summer (Open Water)

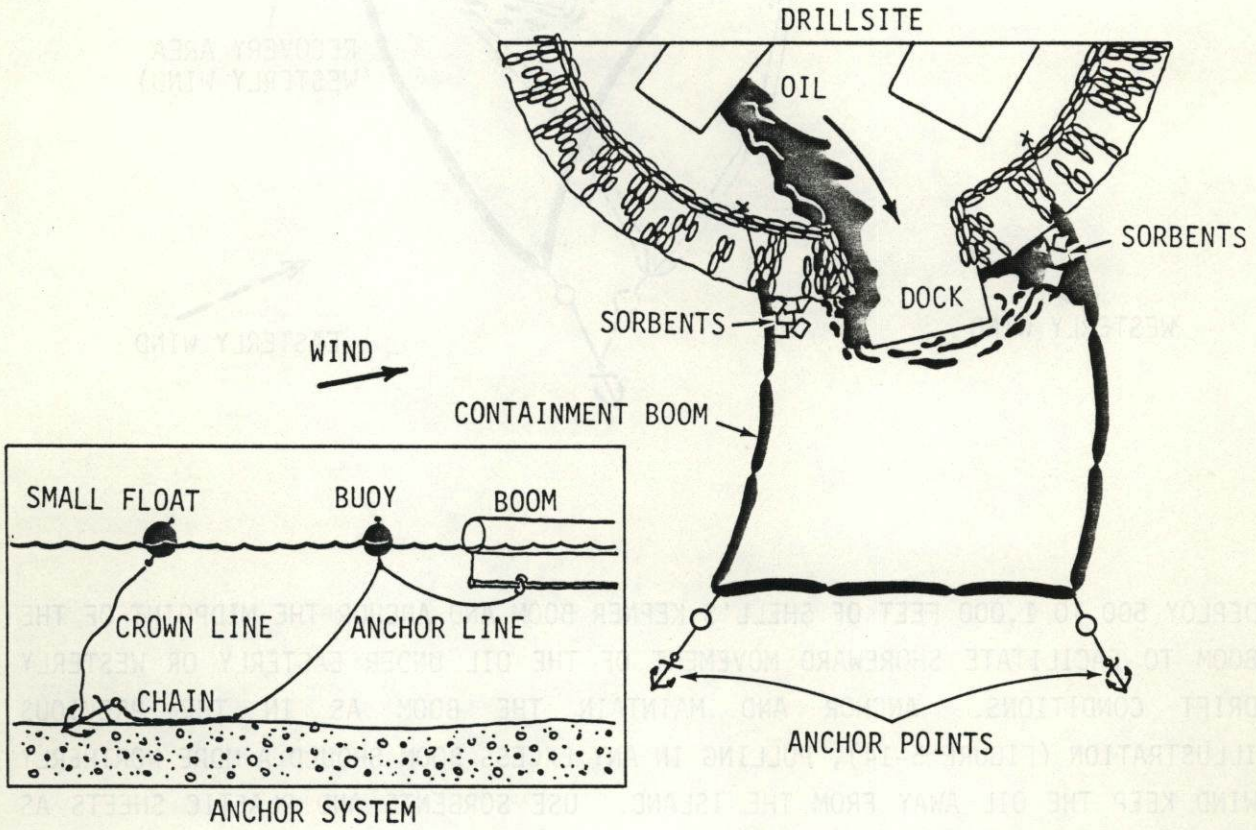
As ice concentrations drop below 2 oktas (25%), open water conditions at the drillsite permit use of many conventional spill response techniques. As in breakup, the open water period (typically 2 months) is also characterized by nearly 24 hours of daylight each day. Since the Beaufort Sea is generally calm with light winds through most of the spring and summer, there is ample opportunity to work with small boats and lightweight boom should a spill occur.

Practically all of the spill response techniques listed in Figure 5-2 are applicable for one or more potential spill situations during the open water period. Those techniques that are applicable are listed below in two categories: those that could be used at the drillsite by on-site personnel and those that would require backup support from Seal Island, ABSORB, and/or contractors. Page numbers are provided for each response technique including those that have already been described in previous sections.

Immediate On-Site Response

CONTAINMENT WITH CONVENTIONAL BOOM AT DRILLSITE

DEPLOY 500 TO 1,000 FEET OF SHELL'S KEPNER BOOM USING THE TWO BOATS MAINTAINED AT THE DRILLSITE. POSITION THE BOOM AND ANCHOR IT IN PLACE TO ALLOW WINDS AND CURRENTS TO MOVE THE OIL INTO A QUIET-WATER AREA ADJACENT TO THE ISLAND.

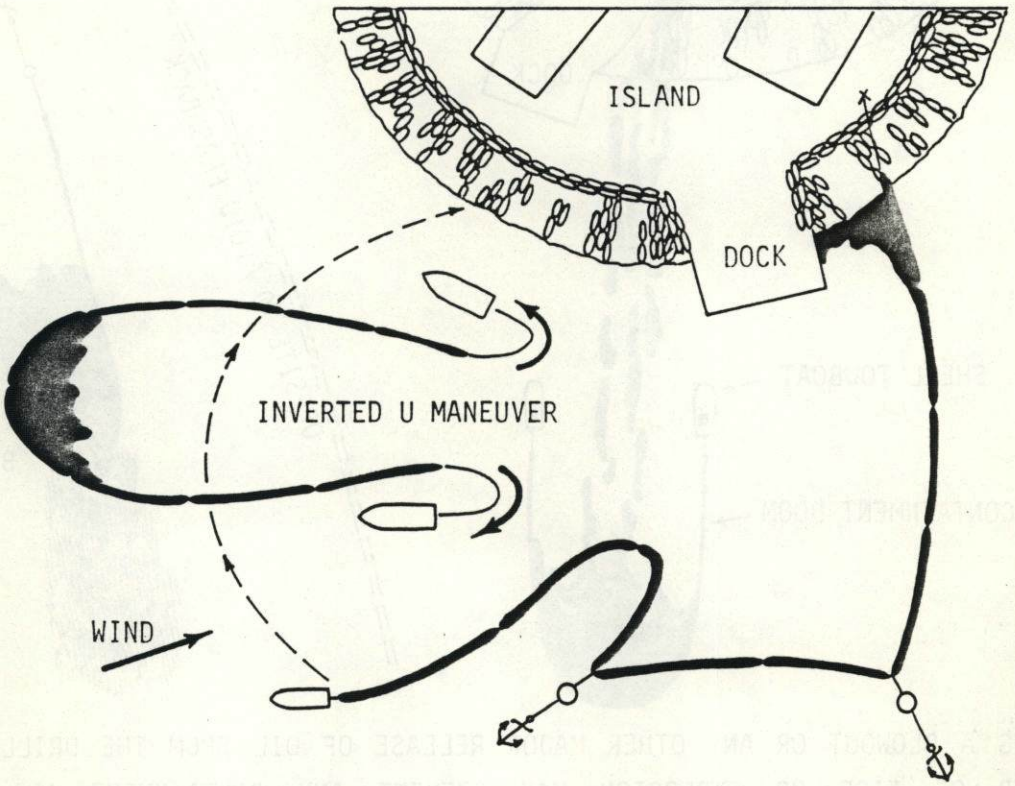


IF WIND OR CURRENTS TEND TO HOLD THE OIL OFF THE ISLAND, PULL IN ENOUGH BOOM TO PLACE THE OIL WITHIN REACH FOR RECOVERY OPERATIONS. DEPLOY SECONDARY CONTAINMENT BOOM AS NECESSARY, AND USE SORBENTS TO PROVIDE A GOOD SEAL AT THE BOOM/ISLAND INTERFACE. USE PLASTIC SHEETS AT THE WATER LINE TO REDUCE OIL PENETRATION OF THE ISLAND. CHECK ANCHOR POINTS FREQUENTLY AND REPOSITION AS NECESSARY BY LIFTING CROWN LINE.

FIGURE 5-14 CONTAINMENT WITH CONVENTIONAL BOOM AT DRILLSITE

CONTAINMENT AND TRANSPORT OF OIL TO ISLAND RECOVERY SITE

DEPENDING ON WIND AND SEA CONDITIONS IT WILL SOMETIMES BE EASIER TO RECOVER OIL AT THE ISLAND THAN IN OPEN WATER. SHOULD DRIFTING OIL BE CAPTURED IN A

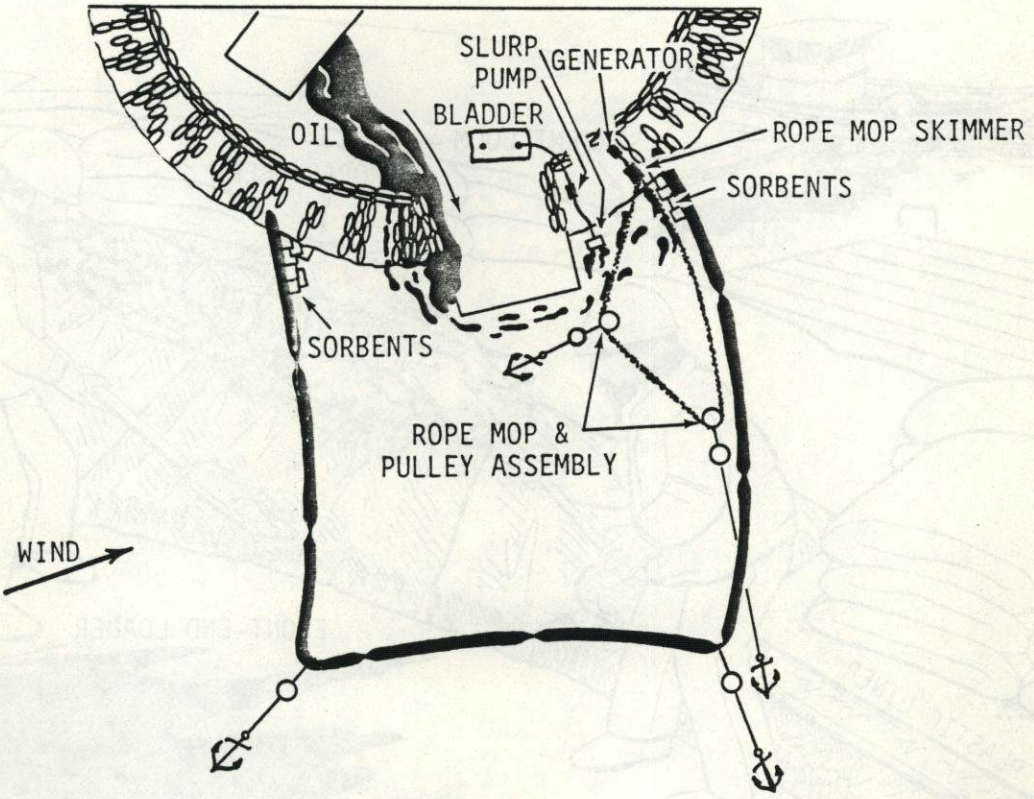


U-CONFIGURATION, THE ENTIRE BOOM AND CONTAINED OIL CAN BE TRANSPORTED (AT 1/2 KNOT OR LESS) TO THE UPSTREAM SIDE OF THE ISLAND CONTAINMENT SITE. THE TOW BOATS CAN THEN USE AN INVERTED U MANEUVER TO DEPOSIT THE OIL WITHIN THE CONTAINMENT SITE, AFTER WHICH THE UPSTREAM ANCHORED BOOM IS RECONNECTED TO SHORE. WHILE IT IS NOT NECESSARY, A THIRD BOAT GREATLY SIMPLIFIES THIS OPERATION.

FIGURE 5-16 CONTAINMENT AND TRANSPORT OF OIL TO ISLAND RECOVERY SITE

RECOVERY WITH SKIMMERS FROM SIDE OF ISLAND

RECOVERY EQUIPMENT SHOULD BE MOVED INTO POSITION PRIOR TO OR DURING THE PLACEMENT OF BOOM. ROPE MOP PULLEY ASSEMBLIES AND THEIR ANCHORS SHOULD BE SET AS QUICKLY AS POSSIBLE TO AVOID INTERRUPTION TO THE BOOM POSITIONING.



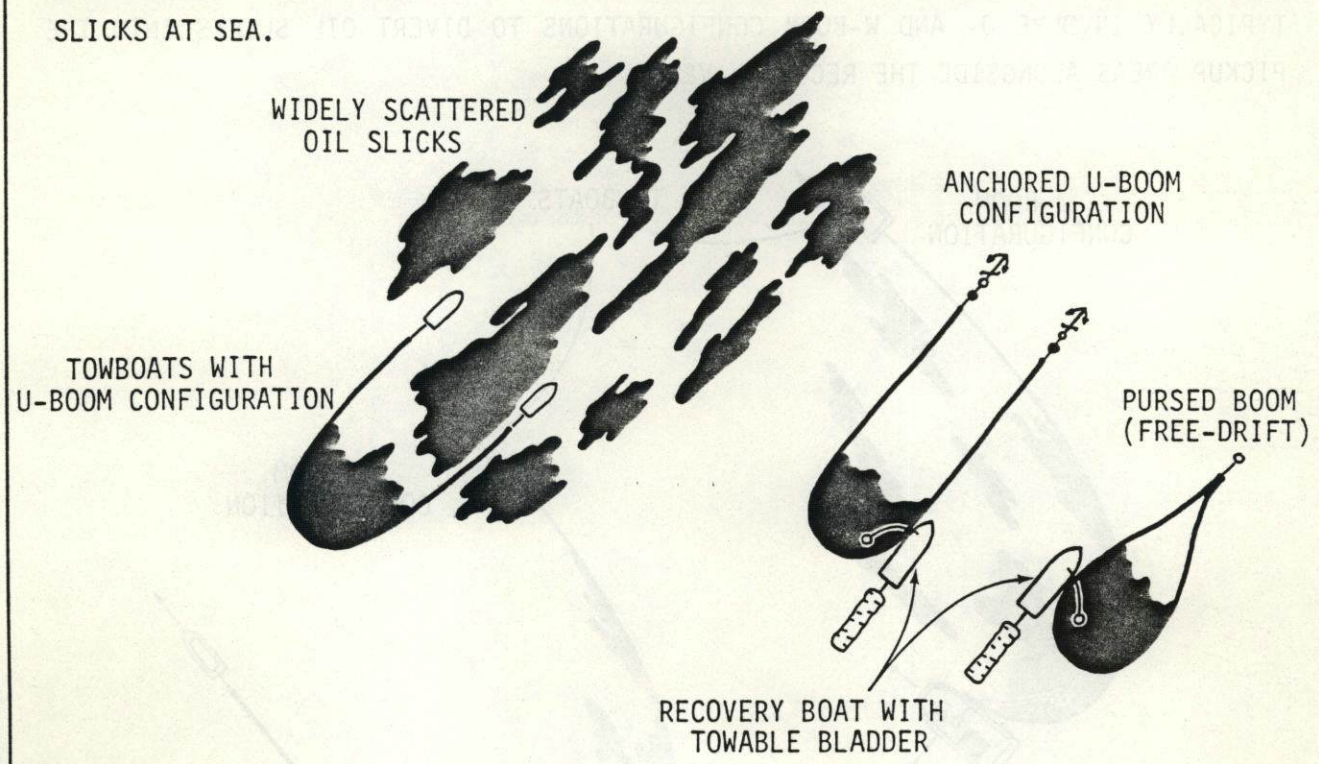
TAIL PULLEY ANCHORS (AND THEIR CROWN LINES) SHOULD BE POSITIONED SO THAT THE ROPE MOP CAN BE MOVED AS NECESSARY FOR OIL CONTACT AND PROPER TENSION WITH MINIMUM DISTURBANCE OF THE OIL AND THE BOOM. PULLEYS CAN BE MOVED INSIDE THE CONTAINMENT AREA, IF NECESSARY, BY ENTERING WITH SMALL BOATS ON THE UPSTREAM SIDE. USE THE SLURP SKIMMER AS NEEDED FOR HIGH SPILL RATES AND THICKER CONCENTRATIONS. GENERATORS, PUMPS, ETC. CAN BE POSITIONED ON THE GRAVE BAGS OF THE ISLAND WITH DUE CONSIDERATION FOR POTENTIAL FIRE/EXPLOSION HAZARDS. PUMP ALL RECOVERED OIL TO THE ISLAND'S MUD PIT, BLADDERS AND DRUMS. SHOULD THEIR STORAGE CAPACITY BE MET, DIG AND LINE TEMPORARY PITS ON THE ISLAND, AND FILL CONTAINMENT BOOMS WHILE AWAITING BACKUP SUPPORT.

FIGURE 5-18 RECOVERY WITH SKIMMERS FROM SIDE OF ISLAND

CONTAINMENT WITH U-BOOM (TOWED OR ANCHORED)

BACKUP RESPONSE

SHOULD OIL SPREAD BEYOND THE REACH OF THE ON-SITE RESPONSE TEAM AT THE DRILLSITE, BACKUP SUPPORT CAN BE MOBILIZED TO CHASE DOWN AND CONTAIN OIL SLICKS AT SEA.



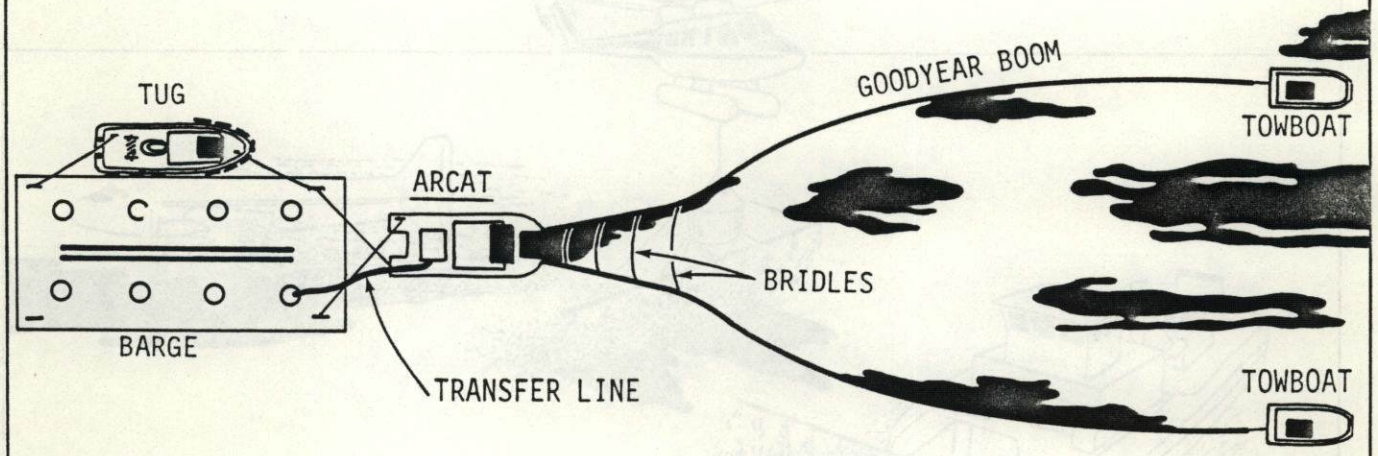
AS NEEDED, ADDITIONAL SHELL RESPONSE BOATS AND ABSORB VESSELS WOULD BE MOBILIZED AND THEN DIRECTED FROM THE AIR TO THOSE HEAVIEST OIL SLICKS APPROACHING LAND. TYPICALLY 500 TO 1,500 FEET OF CONVENTIONAL BOOM WOULD BE USED TO CAPTURE AND CONCENTRATE OIL FOR SUBSEQUENT RECOVERY. OIL COULD BE RECOVERED WITH SMALL OVER-THE-SIDE SKIMMERS AND PUMPED TO TOWABLE BLADDERS. THE SAME BACKUP SUPPORT COULD INVOLVE THE USE OF FIRE CONTAINMENT BOOM AND THE SUBSEQUENT BURNING OF THE CAPTURED OIL.

FIGURE 5-20 CONTAINMENT WITH U-BOOM (TOWED OR ANCHORED)

RECOVERY WITH ARCAT SKIMMER

BACKUP RESPONSE

DURING BACKUP RESPONSE ACTIVITIES, ABSORB'S ARCAT SKIMMER CAN BE USED TO CHASE DOWN WIDELY SPREAD OIL SLICKS, OR IT CAN BE POSITIONED IMMEDIATELY DOWNSTREAM OF A CONTINUOUS SPILL FROM THE ISLAND. THE ARCAT'S OIL COLLECTION AND STORAGE CAPABILITIES CAN BE INCREASED GREATLY BY OPERATING THE SKIMMER WITH A V-BOOM CONFIGURATION AND A SECONDARY STORAGE SYSTEM SUCH AS A BARGE OR TOWABLE BLADDER.



THE APPROPRIATE CONFIGURATION, TOWBOAT SWATH OPENING, AND SKIMMING SPEED WILL DEPEND ON THE NATURE AND EXTENT OF THE OIL BEING RECOVERED. THE ARCAT AND V-BOOM WOULD BEST BE OPERATED INDEPENDENTLY OF ITS STORAGE BARGE WHEN RECOVERY RATES ARE VERY LOW (I.E., WITH WIDELY SCATTERED, THIN FILMS). WHEN SURFACE CONCENTRATIONS ARE HEAVY, THE SWATH WIDTH AND/OR THE SPEED SHOULD BE REDUCED TO KEEP THE ARCAT'S OIL ENCOUNTER RATE WITHIN ITS MAXIMUM RECOVERY RATE.

FIGURE 5-22 RECOVERY WITH ARCAT SKIMMER

SUMMARY - SUMMER RESPONSE

Open-water response techniques cover a broad range of options for the control of oil spills in the Arctic. Ice concentrations of 2 oktas (25%) or less permit the use of conventional oil containment and recovery operations. In addition, long days, calm seas and light winds commonly associated with the summer months offer excellent conditions for the efficient monitoring and control of oil on arctic waters.

In-situ burning remains an important option for the elimination of large volumes of oil at and downstream of the drillsite; however, the number of backup response techniques available during the summer period provides additional insurance that oil can be dealt with effectively at sea. With equilibrium oil thicknesses on the order of 1/10 inch, the areal extent of oil slicks in the Arctic will be 100 to 1,000 times smaller than the same volume oil slick produced in warmer climates. Containment and recovery systems positioned immediately downstream of even a major blowout (e.g., 10,000 bopd) would be exposed to oil slicks with widths on the order of 100 feet.

In the event of a major blowout, burning rates and recovery rates of many thousands of barrels of oil per day can be achieved with existing equipment on-site as described in the two previous sections (solid ice and broken ice conditions). During open water conditions, containment booms provide an additional means of holding oil until it can be burned or recovered. For example, a circular boom 1,000 feet in circumference (diameter about 160 feet) would hold approximately 1,200 bbl of oil for each inch of oil depth within the boom. A 1,000-foot-long section of Shell's Kepner boom (8-inch skirt) could therefore be used in a U-configuration to capture oil and then be pursed shut to provide a temporary holding capacity of several thousand barrels.

When these on-site containment and recovery volumes are added to the oil pickup capabilities of the techniques described in this section, there is a very strong possibility that a major portion of a 10,000 bopd blowout could be

5.2.4 Fall (Freezeup)

For a period of a few weeks during the fall of each year (September/October), the Beaufort Sea begins to freeze up. During this period, oil spill control techniques gradually shift from an open water type of response to a broken ice response. A summary of these response techniques is best observed by referring to Figure 5-2 in the beginning of this section.

Toward the end of the freezeup period, the sea ice becomes sufficiently stable to provide excellent natural containment of an oil spill at the drillsite. Then as the weeks pass, the ice becomes thick enough to support personnel and small machinery. By December the ice will usually support small trucks and other vehicles commonly used in the construction of ice roads.

Even during the early phases of freezeup, new thin ice will normally be quite helpful in limiting the spread and transport of oil on the surface. Once immobilized by the ice, oil will typically become entrained as new ice grows beneath it. It is during this phase that careful consideration must be given to the advantages and disadvantages of deliberately letting an oil spill become entrained in the ice.

If there is reason to believe that a delay in response could involve wind or sea conditions that might break up and disperse the oil/ice mixture, it may be wise to consider ignition of the oil right away. A delay of ignition could result in the above-mentioned disturbance and dispersal of the oil, or in the covering of the oil with snow and/or ice due to overflow conditions.

Should it be determined that burning is not safe or appropriate at the time of the spill, markers should be dropped around the perimeter of the oil to identify its location later on. When the ice is thick enough for personnel to travel on it safely, the original markers can be supplemented or replaced with stakes and reflectors. Standard road-marker stakes with reflecting panels make it easier to find the spill site during periods of reduced visibility.

Once the ice is thick enough to support personnel and heavy equipment, the options for oil removal expand to include mechanical scraping and pickup with

5.3 STRATEGIES FOR SHORELINE PROTECTION AND CLEANUP

Specific shoreline protection and cleanup techniques are presented in this section for the beaches and their adjacent waters between Oliktok Point and Milne Point and for Pingok Island. The techniques described for this region of highest potential impact are representative of those that could be used for other Beaufort Sea shorelines as well.

It is important to note that this section, the risk assessment section (Section 4), and the ACS Alaskan Beaufort Sea Coastal Region manual are not intended as directives for a specific spill response procedure that is best for a particular time and location. The strategies and response examples provided here must be evaluated by the Operations Manager at the time of an actual spill to establish appropriate shoreline response priorities. These priorities should reflect the actual resources threatened, human safety considerations, weather, estimated times till impact, type and volume of oil spilled, and the availability of response personnel and equipment.

It is also important to recognize that while certain immediate shoreline response strategies must be planned for in advance, the ongoing protection and cleanup of beaches during a major spill would involve professional input from Shell's own in-house resource specialists, its own oil spill advisors and the Regional Response Team members on-scene. The status of the spill, the weather, etc. would be monitored constantly to provide the Operations Manager with up-to-date information that could alter priorities and/or require a major shift in response strategies. The on-scene advisors, for example, might determine that while shoreline cleanup crews are being mobilized, there also exists a zone of acceptable dispersant use between the shoreline and the offshore area where all other spill countermeasures are being applied.

In this latter case, it may be advisable to mobilize people and equipment for a range of potential activities including shoreline protective booming, beach cleanup, and dispersant application. With adequate preplanning, an approval (from EPA) to use dispersants could arrive in time for implementation of an effective dispersant program, which could substantially reduce the amount of oil entering the more sensitive nearshore/onshore regions.

EXCLUSION BOOMING AND MULTIPLE DIVERSIONARY BOOMING

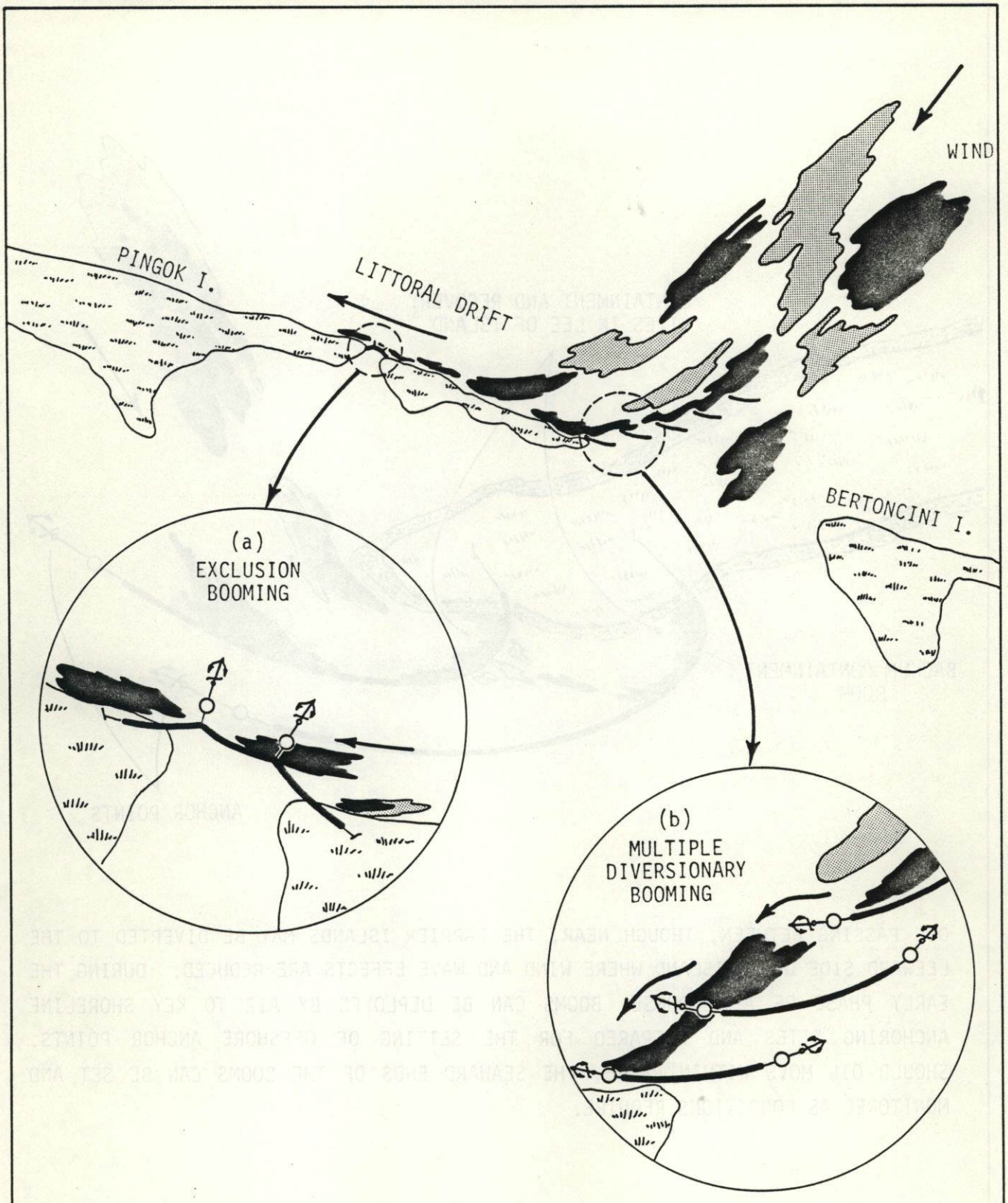
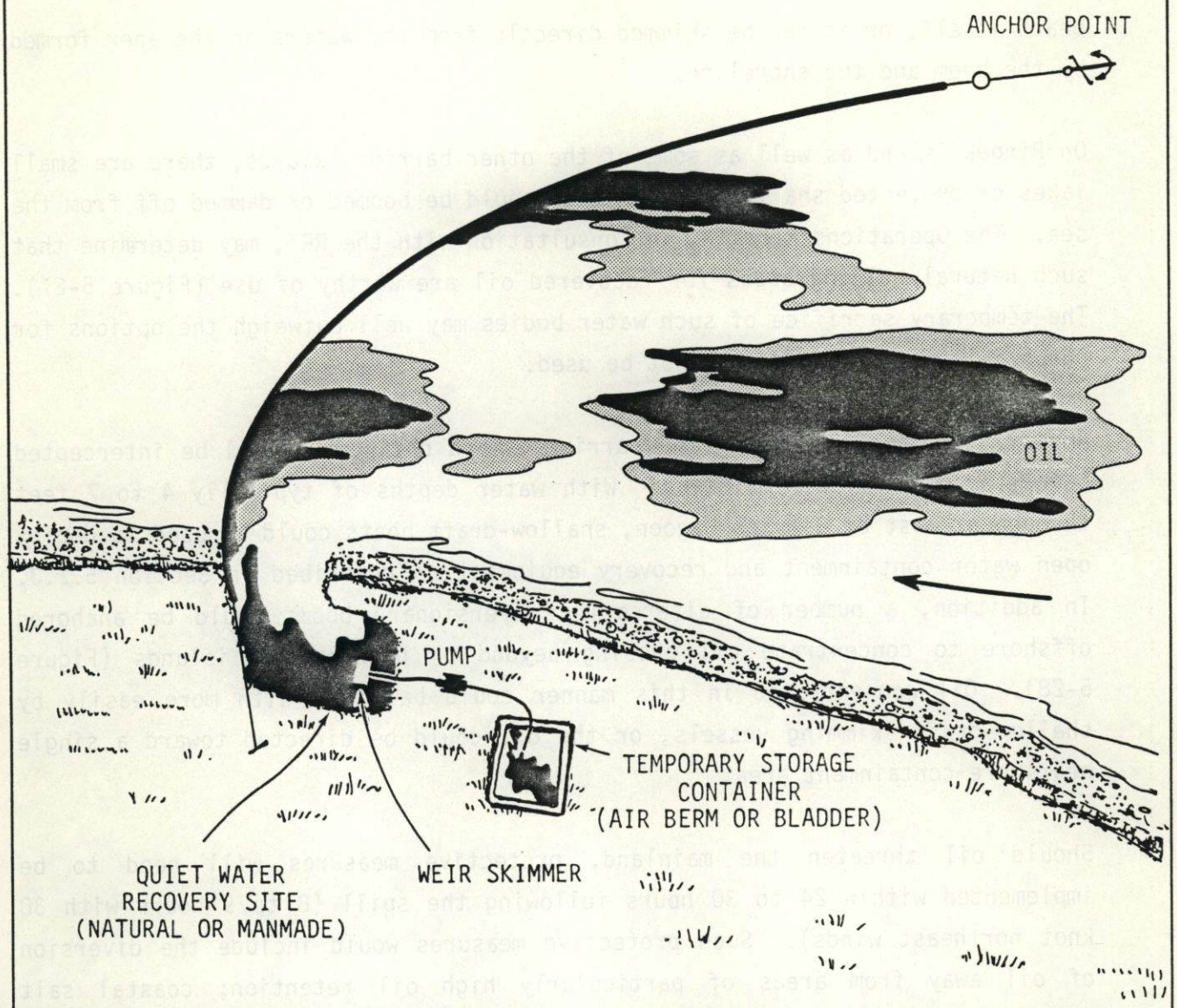


FIGURE 5-24 EXCLUSION BOOMING AND MULTIPLE DIVERSIONARY BOOMING BETWEEN ISLANDS

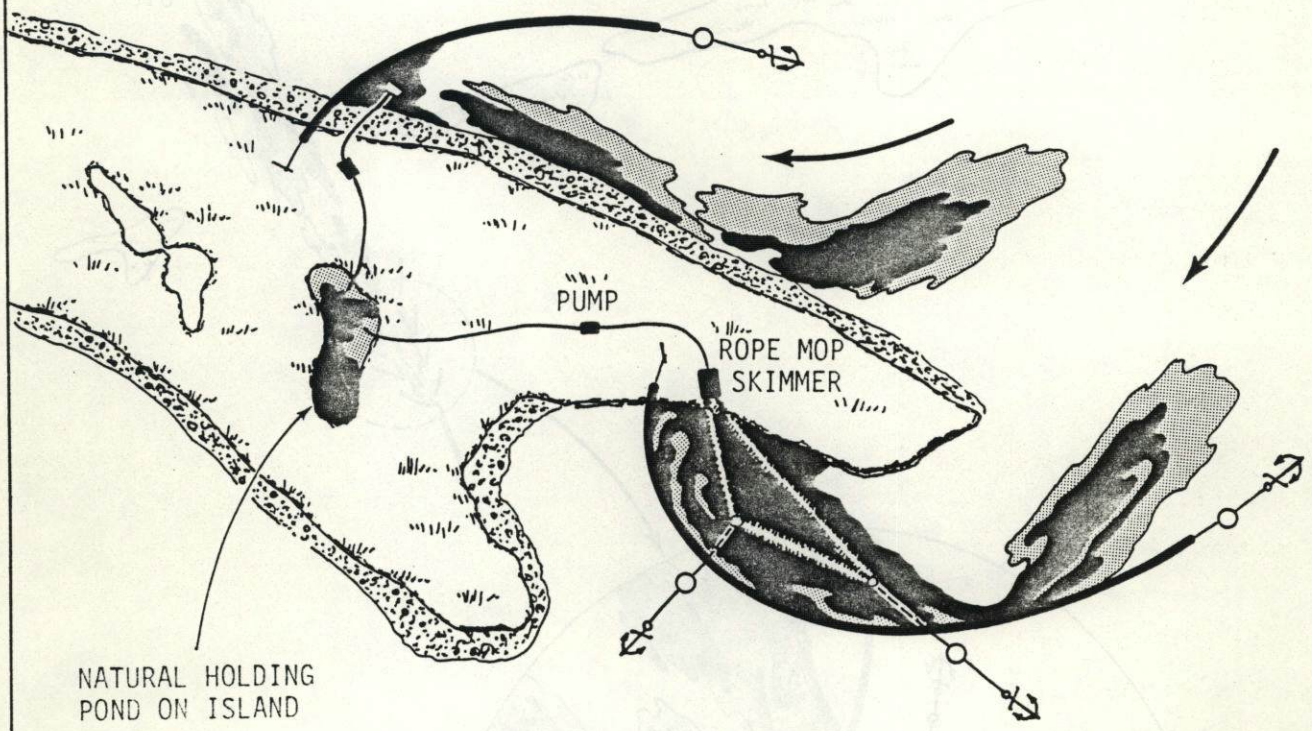
DIVERSIONARY BOOMING AND RECOVERY OF OIL ALONG SHORELINE



BE SURE TO COORDINATE ANY SHORELINE MODIFICATIONS WITH APPROPRIATE REGIONAL RESPONSE TEAM MEMBERS IN ORDER TO AVOID OR MINIMIZE ANY ADVERSE IMPACTS FROM THE SHORELINE CLEANUP ACTIVITY. USE PLASTIC LINERS AND/OR SORBENTS TO LINE THE RECOVERY SITE AND THEREFORE REDUCE OIL PENETRATION INTO THE ISLAND. FLY IN BACKUP STORAGE CONTAINERS (DRUMS, BLADDERS, AND AIR BERMS) AS SOON AS POSSIBLE. AIR-DEPLOYABLE BURNERS OR INCINERATORS MAY BE CONSIDERED FOR DISPOSAL OF THE OIL ON-SITE.

FIGURE 5-26 DIVERSIONARY BOOMING AND RECOVERY OF OIL IN LITTORAL DRIFT ALONG SHORELINE

RECOVERY OF OIL AND STORAGE IN NATURAL HOLDING POND ON ISLAND



IN THE EVENT THAT TEMPORARY OIL STORAGE CONTAINERS ARE NOT IMMEDIATELY AVAILABLE, SMALL LAKES MAY BE CONSIDERED AS NATURAL WASTE OIL HOLDING SITES. SUCH HOLDING AREAS MUST BE OF RELATIVELY LOW BIOLOGICAL SIGNIFICANCE AND OFFER SIGNIFICANT ADVANTAGES OVER ALL OTHER TEMPORARY STORAGE OPTIONS. THE SELECTION OF A NATURAL HOLDING POND OR LAKE MUST BE COORDINATED WITH THE REGIONAL RESPONSE TEAM; AND EVERY EFFORT MUST BE MADE TO PROTECT THE POND'S PERIMETER WITH PLASTIC SHEETS AND/OR SORBENTS.

FIGURE 5-27 RECOVERY OF OIL AND STORAGE IN NATURAL HOLDING POND ON ISLAND

likely that initial steps would include the exclusion booming of entrances to backshore areas such as the unnamed streams southeast of both Oliktok and Milne Points (Figure 5-29).

The mainland region with the greatest potential for oil contact from a spill at Sandpiper during open water (Oliktok Point to Milne Point) is a low-energy area characterized by a vegetated shoreline. Much of the shore is washed over with sand-silt sediments with peat blocks still exposed. Scarps are typically 2 to 8 feet in height with the highest around Milne Point. In spite of the generally low energy levels in this region, the coast is eroding at an average yearly rate of 4 to 5 feet (much higher rates have been reported during heavy sea conditions).

These erosion rates, the associated sediment and peat transport alongshore, and the extreme difficulty of working with equipment on this type of shoreline will limit beach cleanup activity to operations involving handtools, the burning of oiled debris, and the recovery of oil with sorbents. While many other options for cleanup may at first appear reasonable for beaches of this kind, extreme caution should be used to avoid unnecessary risks to personnel and to avoid the potential for loss of equipment and for cleanup-related damage to the environment.

Shoreline cleanup strategies, particularly in remote areas of the Beaufort Sea, must include careful consideration of the full range of factors influencing the need for such cleanup. Such factors include:

- The shoreline type (i.e., sand, mud, peat, etc.);
- Oil volume, areal extent and depth of penetration;
- Oil condition and expected rate of decomposition;
- Accessibility of the shoreline;
- Availability of personnel and equipment;
- Size, weight and transportability of equipment;
- Support needs (fuel, food, water, shelter, toilets, etc.);
- Equipment maintenance and repair;
- Backup for extreme conditions (storms, fog, etc.); and
- First aid and emergency evacuation.

In situations where shorelines are inaccessible, non-trafficable and subject to high erosion rates, serious consideration should be given to "natural recovery" as the most practical and sensible approach. When the conditions for natural recovery are recognized in advance, preplanning activities should emphasize the potential need for countermeasures involving burning and dispersant use before the oil impacts the shoreline.

Beyond the potential area of impact (for prevailing northeast winds) identified in this contingency plan, there are numerous other shoreline types and configurations. Each of these shoreline types may require one or more cleanup methods that are unique for each beach condition. Summary tables have been provided listing the primary methods of shoreline response. Tables 5-2, 5-3 and 5-4 indicate the applicability of potential cleanup methods for most shoreline types found in the Arctic. Included is a brief description of each method and the impacts that could result from its use.

TABLE 5-2 (Cont'd)

METHOD	DESCRIPTION	APPLICABILITY	IMPACT
MIXING (Cont.)	B-mechanical equipment used to push oil/sediment down beach into the water	- accelerates natural cleaning - wave action disperses and degrades oil - sediment is returned to the beach - applicable for "asphalt pavements" or coarse-sediment beaches	- does not remove oil - should not be used if storm waves are expected before sediment is returned to the beach; could result in waves overtopping the beach and/or causing backshore erosion
Removal			
GRADERS, SCRAPERS	- remove thin layer of oiled sediments - graders form windrows for scraper or front-end loader to remove - scraper removes oil/sediment layer directly	- effective on sand or pebble beaches with low oil penetration depths (less than 3 cm) - scraper can remove up to 25 cm layer of oil/sediment - some spillage which can be removed manually	- removes sediment from the beach, amount of sediment removed usually not sufficient to affect beach stability
FRONT-END LOADERS	- loader removes material directly from beach to collection sites	- used on beaches with poor traction or for high oil penetration depths (25 cm or more) - high spillage - usually large amounts of uncontaminated sediment are removed - rubber-tired vehicles are preferred to tracked vehicles	- can result in excessive sediment removal that could cause beach or backshore erosion - grinds oil into the beach
BULLDOZERS	- push material into collection sites for removal	- can remove oil/sediment where penetration is 25 cm or greater - not recommended unless other equipment unavailable or traction is too low for other equipment	- can result in excessive sediment removal that could cause beach or backshore erosion - large spillage and grinds oil into sediments
DRAGLINE, CLAMSHELL	- sediment collected in bucket dragged towards equipment, or by crane-operated bucket	- useful where beach access or trafficability is poor	- can result in excessive sediment removal that could cause beach or backshore erosion
SUMP COLLECTION AND PUMP REMOVAL	- sump excavated and used to collect oil which is then removed by pump or vacuum system	- useful for large spills with oil washed onshore over a period of days	- does not remove all the oil from the beach

TABLE 5-3

Method/Equipment for Cleanup of Sand and Gravel Beaches

SIZE OF AREA	TYPE OF OIL	DEPTH OF PENETRATION	TYPES OF BEACHES		
			FINE SAND	COARSE SAND	GRAVEL
LARGE	HEAVY	SHALLOW, 1cm to 2.5cm	GRADER and ES or FFL	GRADER and ES or FFL	--
		MODERATE, 2.5cm to 25cm	ES	ES	ES
		DEEP, 25cm +	WFEL*	WFEL	WFEL
	LIGHT	--	BEACH CLEANING MACHINES		
SMALL	HEAVY	--	MANUAL REMOVAL OR WFEL*		
	LIGHT	--	MANUAL REMOVAL, RAKE		

ES - Elevating Scraper
FFL - Forced Feed Loader
WFEL* - Wheeled Front-end Loader, firm gr. only
Tracked front-loader for low bearing cap. soils

Source: Alaska Clean Seas Shoreline Protection School (prepared by Woodward-Clyde)

6. EQUIPMENT

Table 6-1 presents a summary of the oil spill cleanup equipment maintained at the Sandpiper drillsite. This equipment, with the exception of the front-end loader, some sorbents, and the two response vessels, is stored in the 36'x9'x8' spill response building normally positioned near the island's access ramp. The purpose of this equipment is primarily for the immediate containment and cleanup of any operational spills on or adjacent to the island. All equipment is maintained in a ready state and is accessible within minutes of a spill alert. In the event of a large spill such as a blowout, this equipment could be used to begin containment and cleanup operations until backup equipment arrives.

A similar inventory of spill cleanup equipment is maintained at Shell's Seal Island, which is approximately 12 miles from Sandpiper. Backup support boats and certain pieces of equipment could be transported to Sandpiper in about 30 minutes during the open water period. Equipment can also be airlifted from Seal Island to Sandpiper Island within 8 to 10 minutes (Figure 5-3).

For a major spill, Shell will call upon ABSORB in order to access its large inventory of oil spill cleanup equipment. The ABSORB equipment is stored at Prudhoe Bay and can be mobilized and transported to deployment locations at or near Sandpiper within a few hours by boat. Helicopters can reach Sandpiper from Prudhoe Bay within 20 minutes. Table 6-2 contains an inventory of the ABSORB equipment. Extensive lists of cleanup equipment available from contractors and other sources in Alaska are contained in ABSORB's Oil Spill Contingency Plan.

Contract agreements for emergency services are currently in effect between Shell Oil Company and its primary spill response contractors: Alaska Offshore, Inc.; Crowley Environmental Services, Inc.; and Spiltec. Copies of such agreements are available for agency review upon request.

TABLE 6-2

ALASKA CLEAN SEAS
(ABSORB CPA)
SPILL CLEANUP EQUIPMENT
As of July 20, 1983

CATEGORY	QUANTITY	TYPE
FACILITIES	--	Major warehouse equipment
	--	20-man camp
	--	Prudhoe Bay warehouse (leased)
VESSELS	1	32' workboat - North Star w/trlr
	1	16' jon boat w/25hp motor and trailer
	1	65' ARCAT II skimmer
	1	21' Munson workboat w/trlr
	1	21' Munson workboat
	6	15' jon boats w/15 hp motors and trailers
VEHICLES	1	18' 6-ton van truck (4 wheel drive)
	2	Snow machines & sleds
	1	1 ton crewcab
	1	Kawasaki ATV w/trlr
	1	VC50 forklift
DETECTION	1	Current meter (hand-held)
	1	Current meter (self-recording)
	8	Ice augers
	3	Gas detector
	2	Orion Tracking System
	1	Viscometer
CONTAINMENT EQUIPMENT	2035'	Goodyear Sea Sentry boom
	1000'	Kepner Reel Pak boom (on two separate 500' reels)
	3000'	Kepner Reel Pak boom (on 12 250' reels)
	5400'	Ocean Dike containment boom
	3000'	Mini boom
	3000'	American Marine Simplex oil boom
OIL DISPOSAL EQUIPMENT	200	Air deployable igniters (w/storage magazine)
	1	Seaward Int'l Flareburner (USCG) (in Anchorage)

TABLE 6-2 (Cont'd)

CATEGORY	QUANTITY	TYPE
Communications Gear (Continued)		
	1	High frequency SSB
	1	Comco Air Ground
	1	Motorola marine VHF power supply
	1	GE Mastr II Contingency Network
	1	GE Mastr II Logistics Network
	1	GE Mastr II Operations Network Base Station (ACS)
	1	GE Mastr II Logistics Network repeater
	1	GE Mastr II Operations Network repeater - (ACS)
	8	GE Deskon II telephone sets
	5	GE Mastr II UHF portable radios
	1	Raytheon marine VHF
Logistical Support - Various		
	--	Bird rehabilitation center
	16	Bird scare-away cannons
	1	1.5 kw Homelite generator (gas)
	5	Pincor 3.0 kw generators (gas)
	4	Pincor 5.0 kw generators (gas)
	1	Multiquip 5.0 kw generator (gas)
	2	Pincor 8.5 kw generators (gas)
	2	Pincor 13.0 kw generator (diesel)
	1	40 kw diesel generator and housing
	1	Light plant w/8 kw generator
	9	TPA500-4 tripod lights w/4 tungsten halogen floodlights
	1	100,000 btu direct-fired space heater
	9	150,000 btu direct-fired space heaters
	2	320,000 btu direct-fired space heaters
	3	Herman Nelson multi-duct heaters
	7	Chain saws, 4 w/36" bars; 1 w/7' bar
	20	Response boxes w/small hand tools, personnel protection gear, and miscellaneous supplies (beach cleanup).
	20	Life support packages w/Life support and protection gear
	3	MSA air packs
	2	40' van containers
	2	20' van containers

7. COMMUNICATIONS PLAN

The communications plan for the Sandpiper drillsite is designed for compatibility with the communications network available through ABSORB. The ABSORB communications unit can be mobilized for a major spill or it can be left at its present location (Deadhorse) to supplement the system Shell has in place at Sandpiper.

The communications system at Sandpiper includes:

- o Telephone/telex network: Ties into the Deadhorse telephone exchange and thus the entire commercial system.

- o VHF system: Involves a base station and 4 portable 20-watt radios that tie into Shell's North Slope operational frequencies (158.280 and 153.215 MHz), 8 identical radios at Deadhorse, and 14 smaller portable units (5 watt and 1 watt) as backup at Deadhorse.

The telephone/telex network would permit the Shell Drilling Foreman or his assistant to make immediate contact with Shell management in Anchorage, with other Shell facilities, with ABSORB, and with other contractors as needed. The VHF system would provide the on-site communications needed for the Assistant Drilling Foreman to coordinate with his on-site response team supervisors. The Assistant Drilling Foreman would use the same VHF system to speak directly with Shell personnel at Deadhorse and at Seal Island.

Should backup response personnel and/or equipment be needed, Shell's on-site communications equipment could be supplemented with additional portable units from ABSORB. Such backup support from ABSORB's Deadhorse warehouse might include:

- o 20 Motorola UHF portable radios w/chargers and accessories (454.000 and 459.000 MHz)

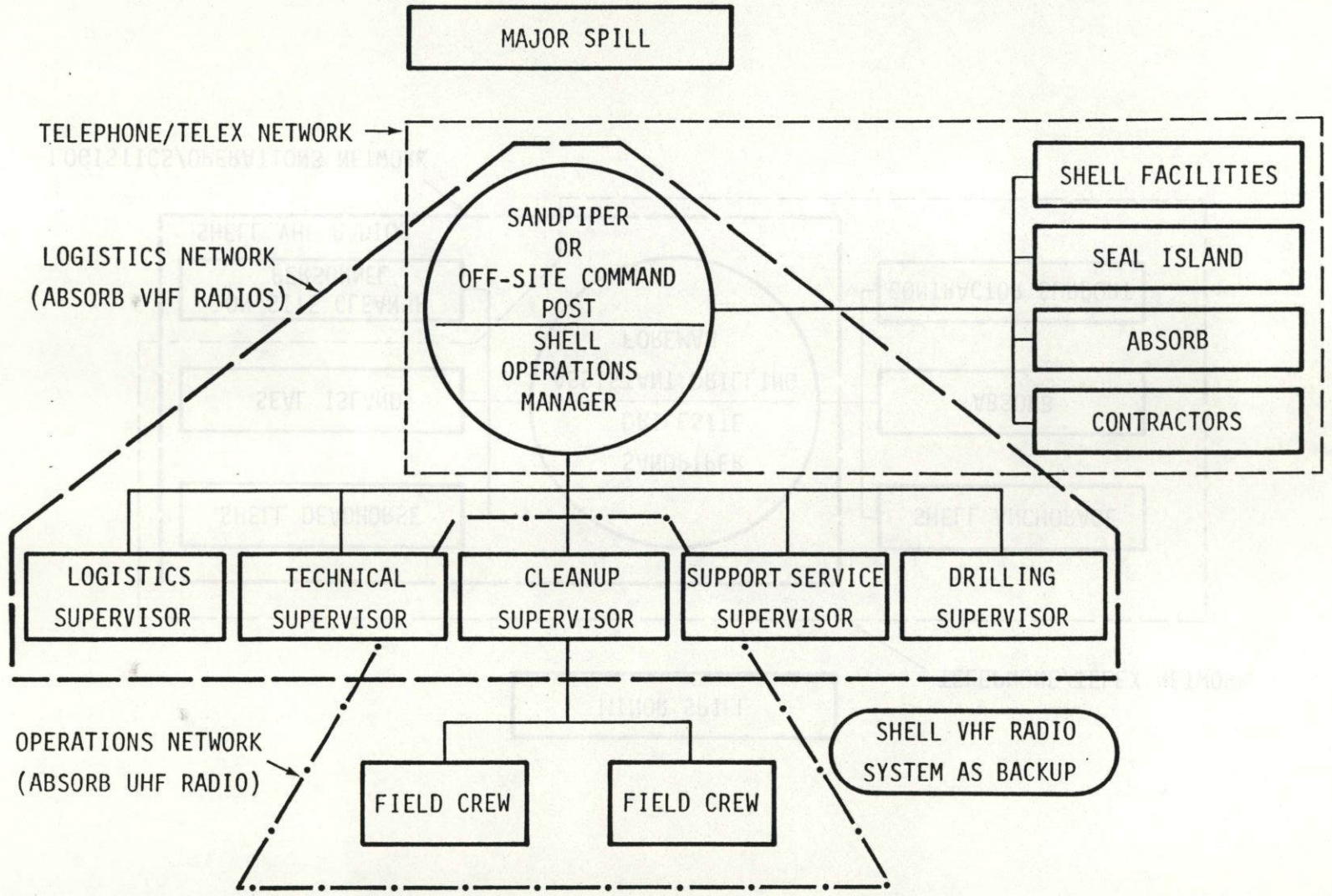


FIGURE 7-1 COMMUNICATIONS NETWORK: MAJOR SPILL

8. STORAGE AND DISPOSAL

During the winter season, recovered oil can be incinerated at the drillsite or transported by truck to the gravel extraction site near the Shaviovik River and burned in an approved burner. Oil can also be trucked to Prudhoe Bay for disposal in an approved disposal well or incineration system or (after processing) through the Trans-Alaska Pipeline.

Oil can also be stored temporarily on-site in the mud pit, in the tankage provided, and/or in bladders. During the summer months, recovered oil can be pumped from such temporary holding containers to a barge and then taken ashore, or it can be pumped to an approved burner located on a barge for burning at sea. Depending on the volume and condition of the oil to be disposed of, some may be burned on-site or burned within fire containment boom off-site. As in the winter case, options also include onshore incineration, pumping to a disposal well, or processing for pipeline shipment. During other periods, the appropriate methods of transport and disposal, including the use of air-cushion vehicles, barges, and helicopters, will be selected as warranted by particular conditions.

A small incinerator is located on Sandpiper for the disposal of waste including used engine oil, machinery lubricants and small volumes of spilled and recovered fuel oils. All combustible sorbent materials used for oil spill cleanup will also be incinerated. Burning operations will be conducted under the direction of Shell's Drilling Foreman and under the terms and conditions of Shell's burning permits.

9. TRAINING

Shell Oil Company will hold classroom and field training exercises at Sandpiper to familiarize on-site personnel with pollution control equipment and operational procedures. Drills will be held within one month of placement of the drilling rig on location. During a continuous program, drills will also be held at each seasonal transition to a new environmental condition (e.g., from ice cover to open water).

The personnel identified as the On-Site Spill Response Team in this contingency plan will participate in these drills. The drills will be realistic and will include deployment of equipment maintained at the drillsite. A schedule of such field exercises, along with a list of equipment to be deployed, will be submitted to the Minerals Management Serivce (MMS) for approval, with information copies to the U.S. Coast Guard (USCG), U.S. Environmental Protection Agency (EPA), the Alaska Department of Minerals and Energy Management (DMEM), the Alaska Department of Environmental Conservation (ADEC), and the North Slope Borough. The training schedule will provide sufficient advance notice to allow agency personnel to witness any of the drills. Participants in each training exercise will be recorded, and the records will be made available to responsible agency personnel upon request.

Shell will ensure that training classes for familiarization with pollution-control equipment and operational procedures are provided for members of the Shell Major Spill Response Team. The supervisory personnel responsible for directing the oil spill response operations will receive oil spill control instruction suitable for all seasons. Shell will retain course completion certificates or attendance records for all training activities completed. These records will be available to any authorized representative of the responsible agencies upon request.

10. DOCUMENTATION AND PUBLIC RELATIONS GUIDELINES

10.1 DOCUMENTATION

The maintenance of thorough records for all events that transpire during an oil spill cleanup operation is imperative. The early hours of a spill response are frequently hectic, with the potential for numerous conflicting requests. A complete log of events and communications makes the task of reconstructing the spill response much easier. The following paragraphs present instructions for maintaining the necessary spill history information.

10.1.1 Spill Logs

For a spill handled by the Shell On-Site Spill Response Team, the Shell Assistant Drilling Foreman (or his designee) will maintain a spill log. When the Shell Major Spill Response Team is activated, the principal spill log will be the responsibility of the Operations Manager, with assistance from the Documentation Coordinator and the Cleanup Consultant as necessary. Sturdily bound logbooks (not loose leaf) will be kept by the Drilling Foreman at the drillsite for use in a spill emergency. Each logbook used will have consecutively numbered pages, all entries will be made in handwriting in ink, and each page will be dated and signed by the person making the entry. Each page will be used completely; any unused space will be crossed out. All corrections must be initialled and dated. As much information as possible will be recorded, including but not limited to:

- Records of decisions;
- Important communications;
- Summary of the day's work, including measurement of area cleaned and amount of oil recovered;
- Meeting minutes;
- Directives from government representatives;
- Arrival and departure times for visitors and inspectors; and
- Number of people involved on a daily basis.

Form 9-1880
Jan. 1974

OMB Approved
Budget Bureau No. 42-R 1695

United States
Department of the Interior
Geological Survey

POLLUTION REPORT

Lease No.:

Area: | Block:

Date: | Time (24 Hr. Clock)

Platform or Rig Name:

Lease Operator:

Type of Pollution (Oil, Diesel, etc. & Amt.)

Address:

Approximate size of slick:

Action taken to contain and recover pollutant:

Cause of pollution incident:

Reason for any equipment malfunction or human error:

Corrective action taken:

Action taken to prevent recurrence:

Wind direction: | Wind speed: | Sea status: | Direction of slick movement:

Color and nature of slick:

Remarks:

Signature: | Position title: | Date:

To Be Completed By USGS District Office:

Oral report received by: | Date: | Time:

Field inspected by: | Date:

Potential environmental damage:

Remarks:

NOTE: This report is to be submitted for all spills or leakage of oil and liquid pollutants of 15 barrels or greater and for spills or leakage less than 15 barrels when requested by the supervisor pursuant to OCS Order No. 7 and 43 CFR 250.43.

U.S. GOVERNMENT PRINTING OFFICE 1973-000-0

FIGURE 10-1 USGS POLLUTION REPORT FORM (9-1880)

10.1.4 Photography

As soon as possible after the initiation of the spill cleanup operation, arrangements will be made for a photographer to record the operation. As a minimum, 35 mm slides and prints (color and black and white) will be taken; however, the Operations Manager may also request TV tape and/or movies if he deems them necessary. Photographic documentation should include and not be limited to wide-angle pictures; aerial shots; land, beach, and ice closeups; and pictures of equipment, people, and operations. For each picture taken, the following information will be recorded:

- Location and reference to landmarks
- Date and time
- Names of photographer and any witnesses
- Description of photograph
- Shutter speed, lens opening, and film type
- Weather conditions and angle of sun

10.2 PUBLIC RELATIONS GUIDELINES

Oil spills, particularly moderate and major ones, generate public interest and its attendant media coverage. This simple fact can cause Shell a great deal of difficulty if company public relations policies are not adhered to. The purpose of this section is to provide guidelines for use in dealing with public relations problems during a spill.

The only persons authorized to speak with the news media regarding the spill cleanup operation are the Operations Manager and the Public Affairs Coordinator or their designated representatives. As soon as the operational organization is functioning, a statement will be issued advising all media representatives to contact the Public Affairs Coordinator. All members of the response team are to refer any inquiries from the news media or public to the Public Affairs Coordinator and call him (if possible) informing him of the inquiry. Depending on the situation, the Operations Manager may authorize supervisory personnel on-site or off-site to answer inquiries.

If the response of the media warrants it, the Public Affairs Coordinator will arrange for transportation and lodging for a group of newsmen to visit the site, but only after approval by the Operations Manager and Shell management. Either the Public Affairs Coordinator or his designated assistant will accompany the group and chaperone them throughout their visit. From time to time, subsequent press briefings will be held to issue further press releases and to ensure that the media receives its information from one spokesman. At all times, media representatives are to be reminded that they will contact only the Public Affairs Coordinator and his designated assistants. Unless explicit permission is given by the Operations Manager, no members of the press are to interview other members of the cleanup operation either on-site or off-site.

As soon as possible at the start of the operation, the Public Affairs Coordinator and the Government Liaison Coordinator will contact the spokesmen for the state and federal on-scene representatives. Together, they will establish procedures for handling information dissemination to avoid the issuance of conflicting statements.

APPENDIX A

ACS SPILL TRAJECTORY MODEL RESULTS

The following information is required to run the oil spill model. Please make sure you have this information before you call ACS.

1. Type of Spill

   Instantaneous spill in open water
   Continuous spill in open water
   Instantaneous spill in ice-infested water
   Continuous spill in ice-infested water
   Instantaneous spill below the ice
   Continuous spill below the ice

2. Coordinates (latitude and longitude) for the spill site

   ACS personnel will convert latitude and longitude to X and Y coordinates for input to the model

3. Type of product spilled

   Crude oil or diesel fuel

4. Volume or rate of oil spilled in barrels or barrels per day

   Please note that 1 barrel = 42 gallons

5. Average wind speed in knots and wind direction for the 12 hours preceding the spill and hourly winds after the spill

   This information can be obtained either at the drillsite or from the weather station at Deadhorse

If the spill is in ice-infested waters the following information is also needed:

1. Percent of ice cover

If the spill is below the ice the following information is also needed:

1. Average ice thickness in feet

2. General character of the ice

   Smooth ice (0 to 1 inch roughness)
   Moderately rough ice (1 to 6 inch roughness)
   Rough ice (greater than 6 inch roughness)

****

BEAUFORT SEA OIL SPILL MODEL - 01-01-1980 00:01:41
SPILL LOCATION: GRID X = 153.8   GRID Y = 20.4
PRODUCT SPILLED: CRUDE OIL
TYPE OF SPILL: CONTINUOUS SPILL IN OPEN WATER
SPILL RATE: 10000 BBL PER DAY
AVERAGE WIND SPEED FOR PRECEEDING 12 HOURS: 10 KTS   DIRECTION: NE

****

HOURLY SPILL STATUS - CONTINUOUS OIL SPILL

	WINDS		*COORDINATES*		*****VOLUME OF OIL (BARRELS)****					*SPILL SIZE**	
TIME	SPD	DIR	GRID	GRID		WATER	WATER	SEA		WIDTH	THICK
HR	KTS	T	X-CORD	Y-CORD	ATMOS	SURFACE	COLUMN	FLOOR	TOTAL	FT	CM
1	10	NE	153.46	20.19	13	390	14	0	417	116	0.254
2	10	NE	153.12	19.98	26	780	28	0	833	116	0.254
3	10	NE	152.78	19.77	39	1167	43	0	1250	116	0.254
4	10	NE	152.46	19.55	52	1556	58	0	1667	116	0.254
5	10	NE	152.13	19.33	63	1948	71	0	2083	116	0.254
6	10	NE	151.81	19.11	75	2339	85	0	2500	116	0.254
7	10	NE	151.49	18.89	87	2729	100	0	2917	116	0.254
8	10	NE	151.16	18.61	99	3118	115	0	3333	116	0.254
9	10	NE	150.82	18.34	112	3506	131	1	3750	116	0.254
10	10	NE	150.52	18.11	125	3893	148	1	4167	116	0.254
11	10	NE	150.21	17.89	138	4279	165	1	4583	116	0.254
12	10	NE	149.92	17.61	152	4664	183	1	5000	116	0.254
13	10	NE	149.69	17.39	166	5048	202	1	5417	116	0.254
14	10	NE	149.47	17.17	180	5431	221	1	5833	116	0.254
15	10	NE	149.24	16.96	195	5813	241	1	6250	116	0.254
16	10	NE	148.91	16.77	209	6194	261	2	6667	116	0.254
17	10	NE	148.58	16.57	225	6574	283	2	7083	116	0.254
18	10	NE	148.24	16.37	240	6953	304	2	7500	116	0.254
19	10	NE	147.91	16.17	256	7332	327	2	7917	116	0.254
20	10	NE	147.57	15.94	272	7709	350	3	8333	116	0.254
21	10	NE	147.12	15.71	289	8085	373	3	8750	116	0.254
22	10	NE	146.67	15.49	305	8461	397	3	9167	116	0.254
23	10	NE	146.27	15.20	322	8835	422	4	9583	116	0.254
24	10	NE	145.86	14.92	340	9209	448	4	10000	116	0.254
25	10	NE	145.49	14.63	358	9581	474	4	10417	116	0.254
26	10	NE	145.12	14.35	376	9953	501	5	10833	116	0.254
27	10	NE	144.75	14.06	394	10323	528	5	11250	116	0.254
28	10	NE	144.38	13.80	413	10693	556	5	11667	116	0.254
29	10	NE	143.99	13.58	431	11062	585	6	12083	116	0.254
SPILL ON ISLAND OR LOW COASTAL AREA - CALCULATIONS ARE CONTINUING											
30	10	NE	143.59	13.35	451	11429	614	6	12500	116	0.254
SPILL ON ISLAND OR LOW COASTAL AREA - CALCULATIONS ARE CONTINUING											
31	10	NE	143.19	13.12	470	11796	644	6	12917	116	0.254
SPILL ON ISLAND OR LOW COASTAL AREA - CALCULATIONS ARE CONTINUING											
32	10	NE	142.79	12.90	490	12162	674	7	13333	116	0.254
SPILL ON ISLAND OR LOW COASTAL AREA - CALCULATIONS ARE CONTINUING											
33	10	NE	142.46	12.67	510	12527	705	7	13750	116	0.254
SPILL ON ISLAND OR LOW COASTAL AREA - CALCULATIONS ARE CONTINUING											
34	10	NE	142.13	12.44	531	12891	737	8	14167	116	0.254
SPILL ON ISLAND OR LOW COASTAL AREA - CALCULATIONS ARE CONTINUING											
35	10	NE	141.81	12.22	552	13254	769	8	14583	116	0.254
SPILL ON ISLAND OR LOW COASTAL AREA - CALCULATIONS ARE CONTINUING											
36	10	NE	141.47	11.99	573	13616	802	9	15000	116	0.254
OIL SPILL HAS REACHED SHORE											

****

****

BEAUFORT SEA OIL SPILL MODEL - 10-03-1983 13:15:45
SPILL LOCATION: GRID X = 153.8 GRID Y = 20.4
PRODUCT SPILLED: CRUDE OIL
TYPE OF SPILL: CONTINUOUS SPILL IN OPEN WATER
SPILL RATE: 10000 BBL PER DAY
AVERAGE WIND SPEED FOR PRECEEDING 12 HOURS: 10 KTS DIRECTION: NW

****

HOURLY SPILL STATUS - CONTINUOUS OIL SPILL

	WINDS		*COORDINATES*		*****VOLUME OF OIL (BARRELS)****					*SPILL SIZE**	
TIME HR	SPD KTS	DIR T	GRID X-CORD	GRID Y-CORD	ATMOS	WATER SURFACE	WATER COLUMN	SEA FLOOR	TOTAL	WIDTH FT	THICK CM
1	10	NW	154.17	20.16	13	390	14	0	417	105	0.254
2	10	NW	154.54	19.91	26	780	28	0	833	105	0.254
3	10	NW	154.90	19.66	39	1167	43	0	1250	105	0.254
4	10	NW	155.26	19.41	52	1556	58	0	1667	105	0.254
5	10	NW	155.63	19.15	63	1948	71	0	2083	105	0.254
6	10	NW	155.99	18.89	75	2339	85	0	2500	105	0.254
7	10	NW	156.37	18.63	87	2729	100	0	2917	105	0.254
8	10	NW	156.74	18.39	99	3118	115	0	3333	105	0.254
9	10	NW	157.11	18.14	112	3506	131	1	3750	105	0.254
10	10	NW	157.48	17.92	125	3893	148	1	4167	105	0.254
11	10	NW	157.86	17.69	138	4279	165	1	4583	105	0.254
12	10	NW	158.24	17.46	152	4664	183	1	5000	105	0.254
13	10	NW	158.62	17.24	166	5048	202	1	5417	105	0.254
14	10	NW	159.01	17.02	180	5431	221	1	5833	105	0.254
15	10	NW	159.39	16.81	195	5813	241	1	6250	105	0.254
16	10	NW	159.77	16.60	209	6194	261	2	6667	105	0.254
17	10	NW	160.15	16.40	225	6574	283	2	7083	105	0.254
18	10	NW	160.53	16.17	240	6953	304	2	7500	105	0.254
19	10	NW	160.91	15.93	256	7332	327	2	7917	105	0.254
20	10	NW	161.30	15.68	272	7709	350	3	8333	105	0.254
21	10	NW	161.70	15.39	289	8085	373	3	8750	105	0.254
22	10	NW	162.10	15.09	305	8461	397	3	9167	105	0.254
23	10	NW	162.48	14.81	322	8835	422	4	9583	105	0.254
24	10	NW	162.81	14.59	340	9209	448	4	10000	105	0.254
25	10	NW	163.15	14.37	358	9581	474	4	10417	105	0.254
26	10	NW	163.52	14.14	376	9953	501	5	10833	105	0.254
27	10	NW	163.89	13.91	394	10323	528	5	11250	105	0.254
28	10	NW	164.28	13.71	413	10693	556	5	11667	105	0.254
29	10	NW	164.67	13.51	431	11062	585	6	12083	105	0.254
30	10	NW	165.06	13.30	451	11429	614	6	12500	105	0.254
31	10	NW	165.45	13.08	470	11796	644	6	12917	105	0.254
32	10	NW	165.84	12.87	490	12162	674	7	13333	105	0.254
SPILL ON ISLAND OR LOW COASTAL AREA - CALCULATIONS ARE CONTINUING											
33	10	NW	166.25	12.66	510	12527	705	7	13750	105	0.254
34	10	NW	166.65	12.45	531	12891	737	8	14167	105	0.254
35	10	NW	167.05	12.25	552	13254	769	8	14583	105	0.254
36	10	NW	167.42	12.04	573	13616	802	9	15000	105	0.254
37	10	NW	167.80	11.83	594	13977	836	9	15417	105	0.254
SPILL ON ISLAND OR LOW COASTAL AREA - CALCULATIONS ARE CONTINUING											

BEAUFORT SEA OIL SPILL TRAJECTORY MODEL

CONTINUOUS SPILL IN OPEN WATER
SPILL AT GRID X = 153.8 AND Y = 20.4
RATE OF SPILL IS 10000 BBLS/DAY
CURRENT DATE IS 10-03-1983 CURRENT TIME IS 14:55:34

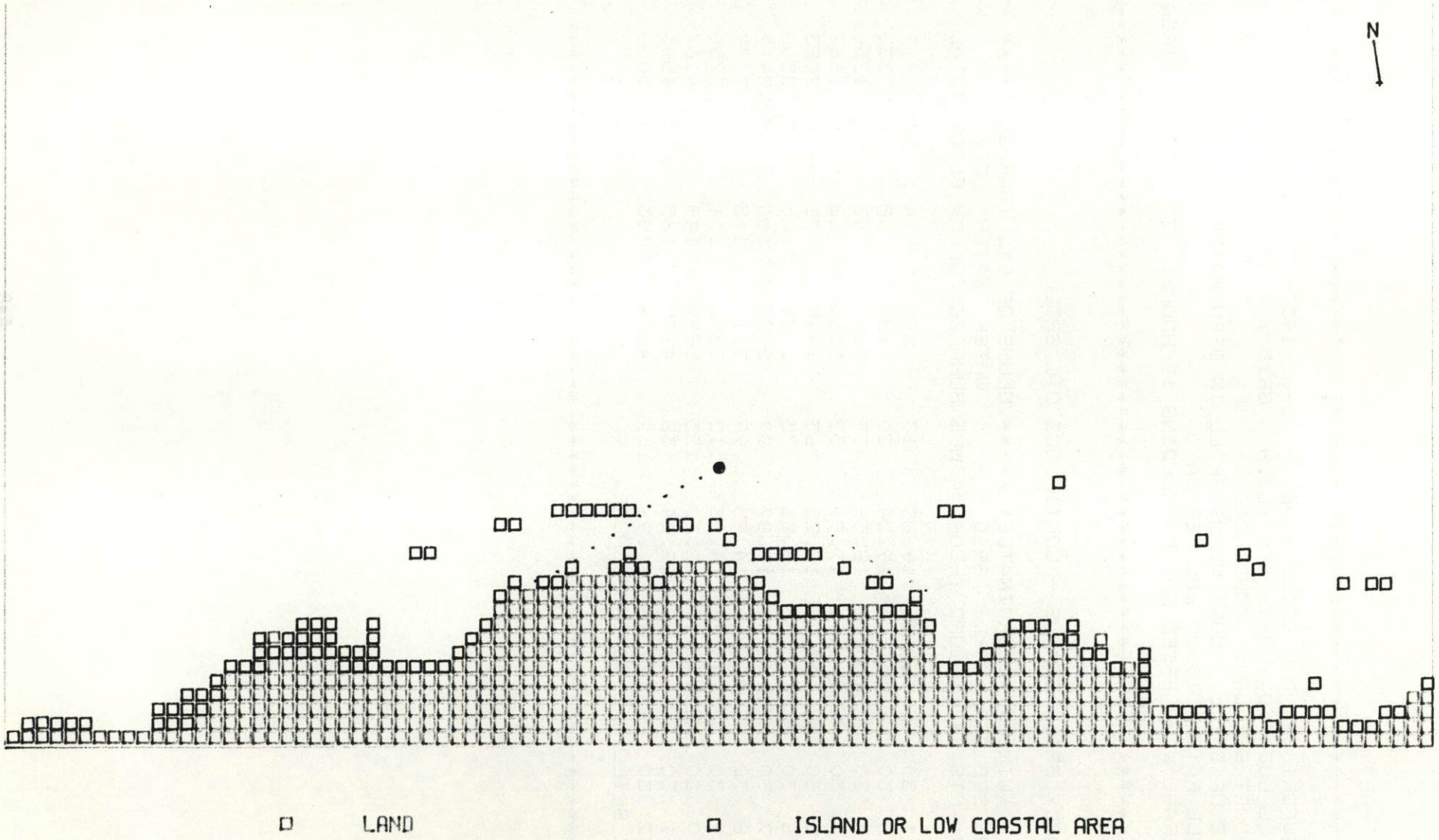


FIGURE A-3 SAMPLE TRAJECTORY FOR SANDPIPER (30 KNOT NE WIND)

BEAUFORT SEA OIL SPILL TRAJECTORY MODEL

CONTINUOUS SPILL IN OPEN WATER
SPILL AT GRID X = 153.8 AND Y = 20.4
RATE OF SPILL IS 10000 BBLS/DAY
CURRENT DATE IS 10-03-1983 CURRENT TIME IS 15:19:25

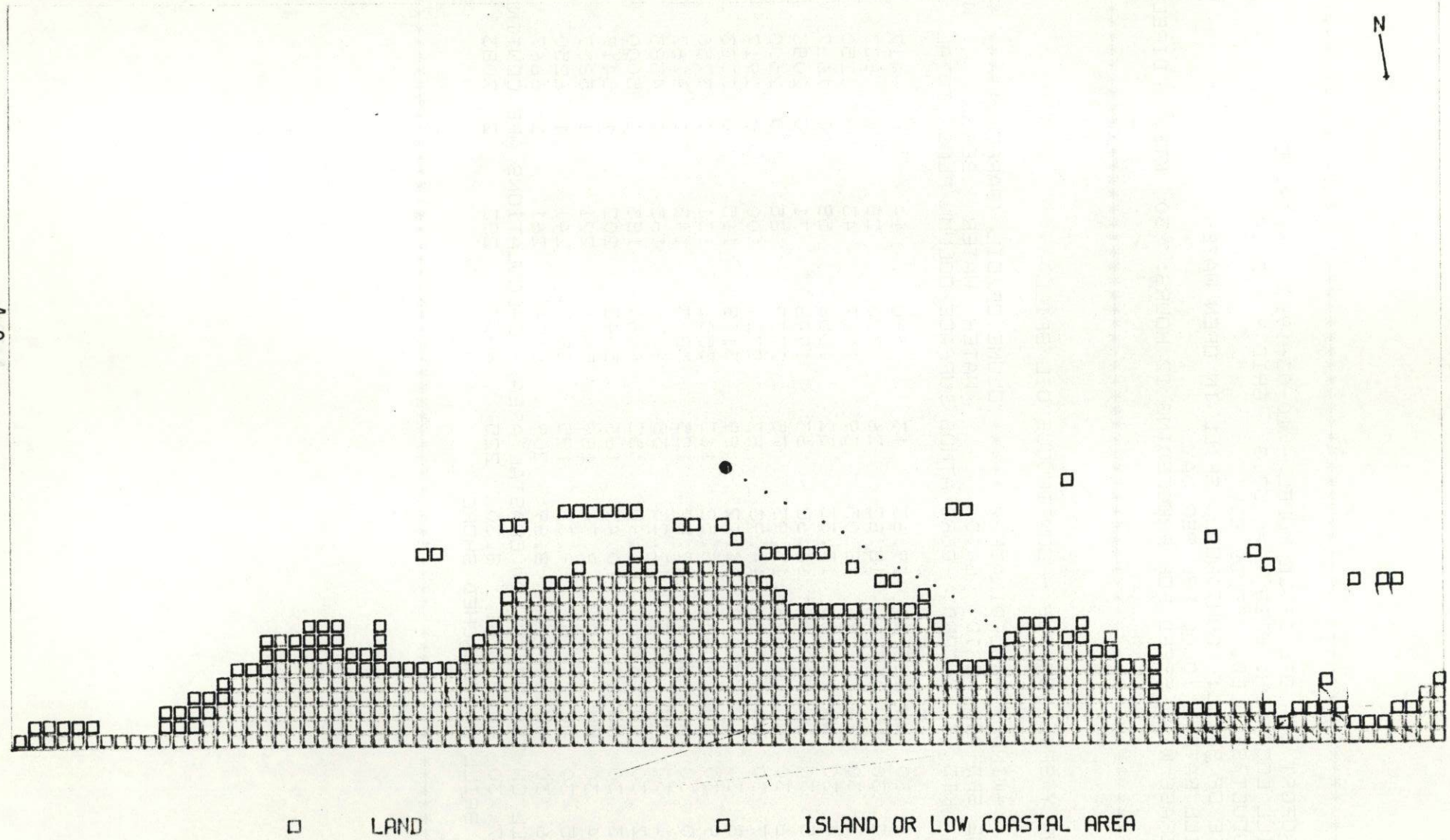
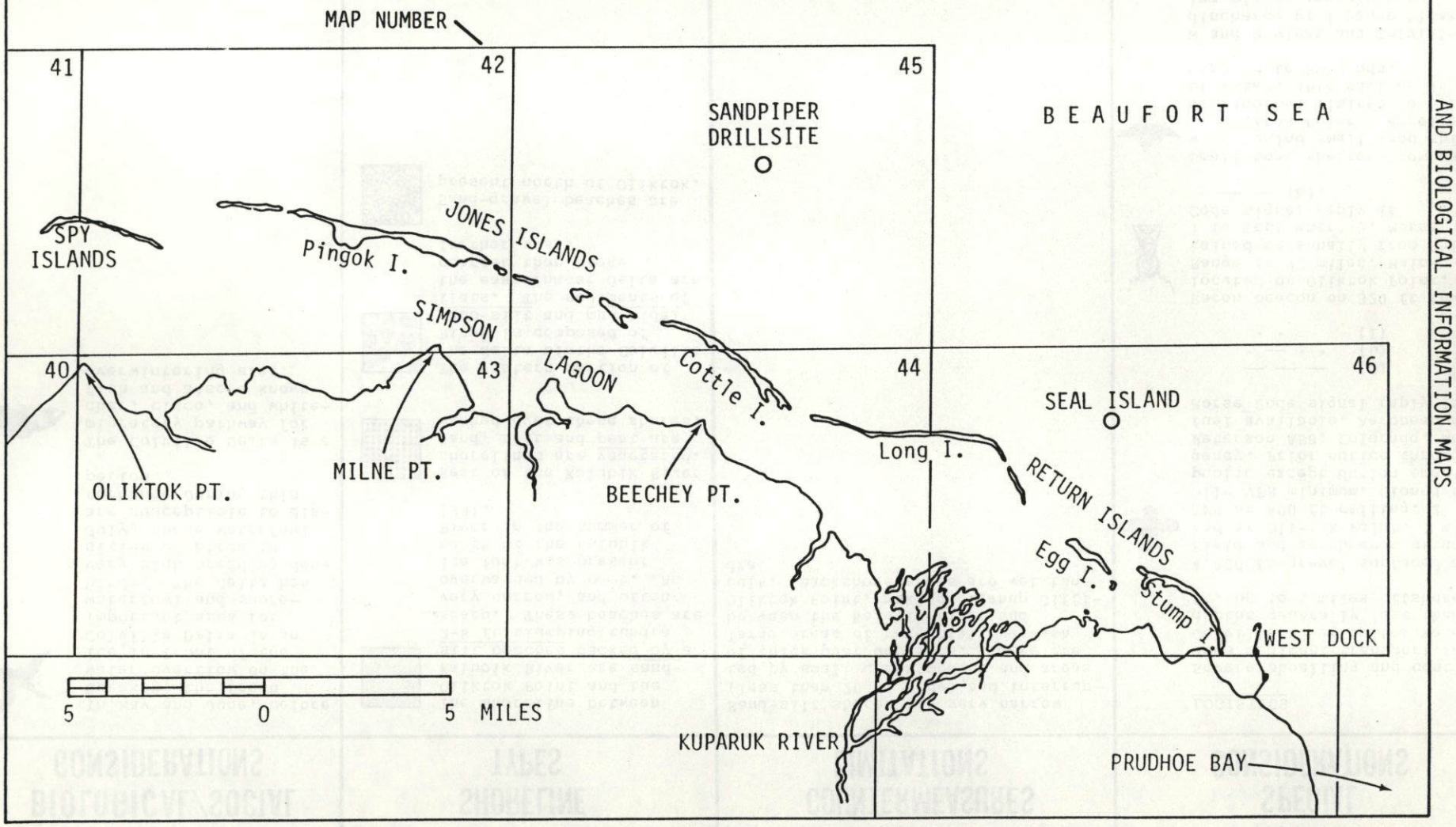


FIGURE A-4 SAMPLE TRAJECTORY FOR SANDPIPER (30 KNOT NW WIND)

FIGURE B-1

MASTER LOCATION MAP FOR FIGURES TAKEN FROM ACS
ALASKAN BEAUFORT SEA COASTAL REGION MANUAL

Volume I: Oil Spill Response Considerations Manual (Figures B-2 through B-9)
Volume II: Biological Resources Atlas (Figures B-10 through B-17)
(Published by Alaska Clean Seas, Anchorage, AK)



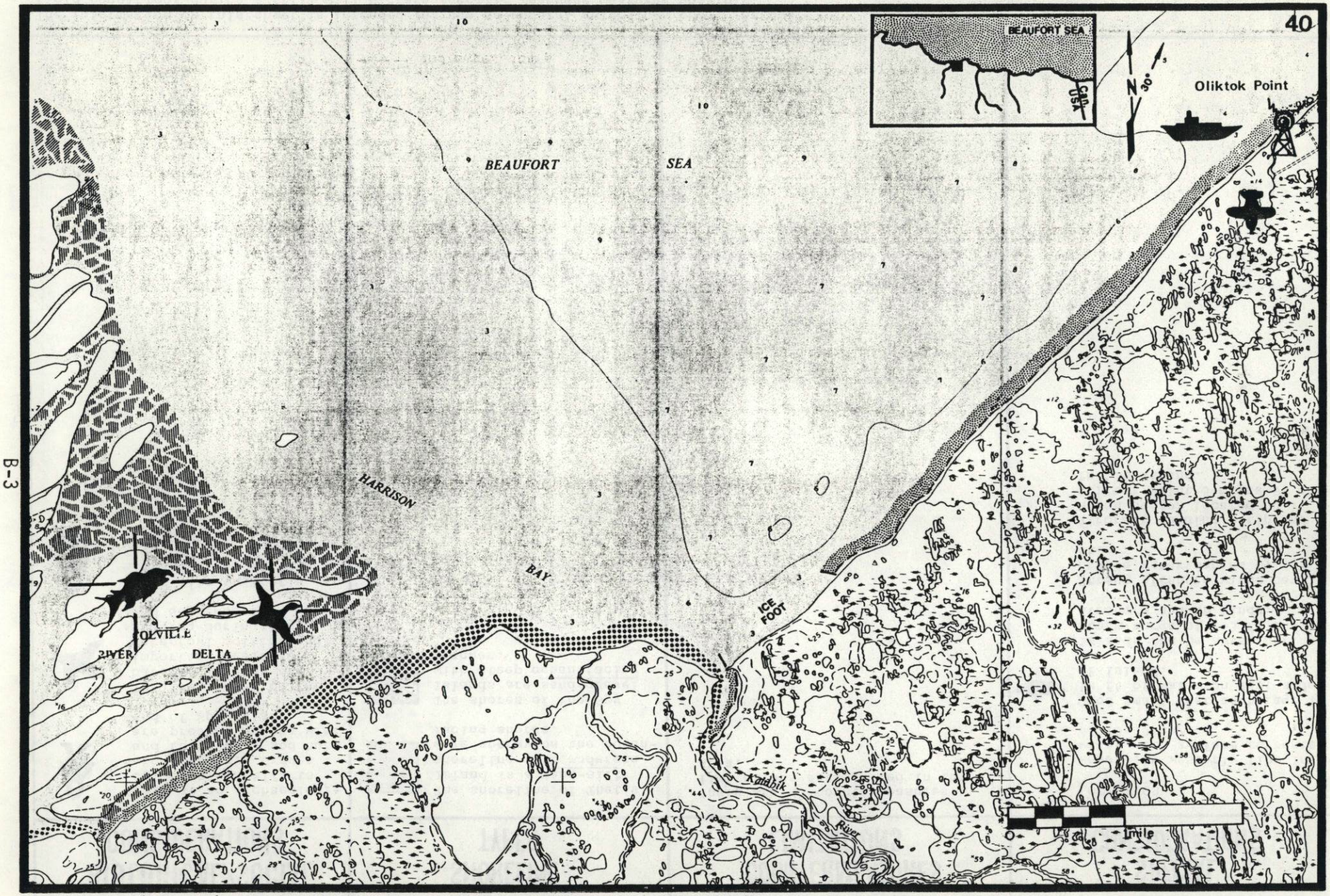


FIGURE B-2 (Cont'd) ACS MAP NO. 40: COUNTERMEASURES CONSIDERATIONS

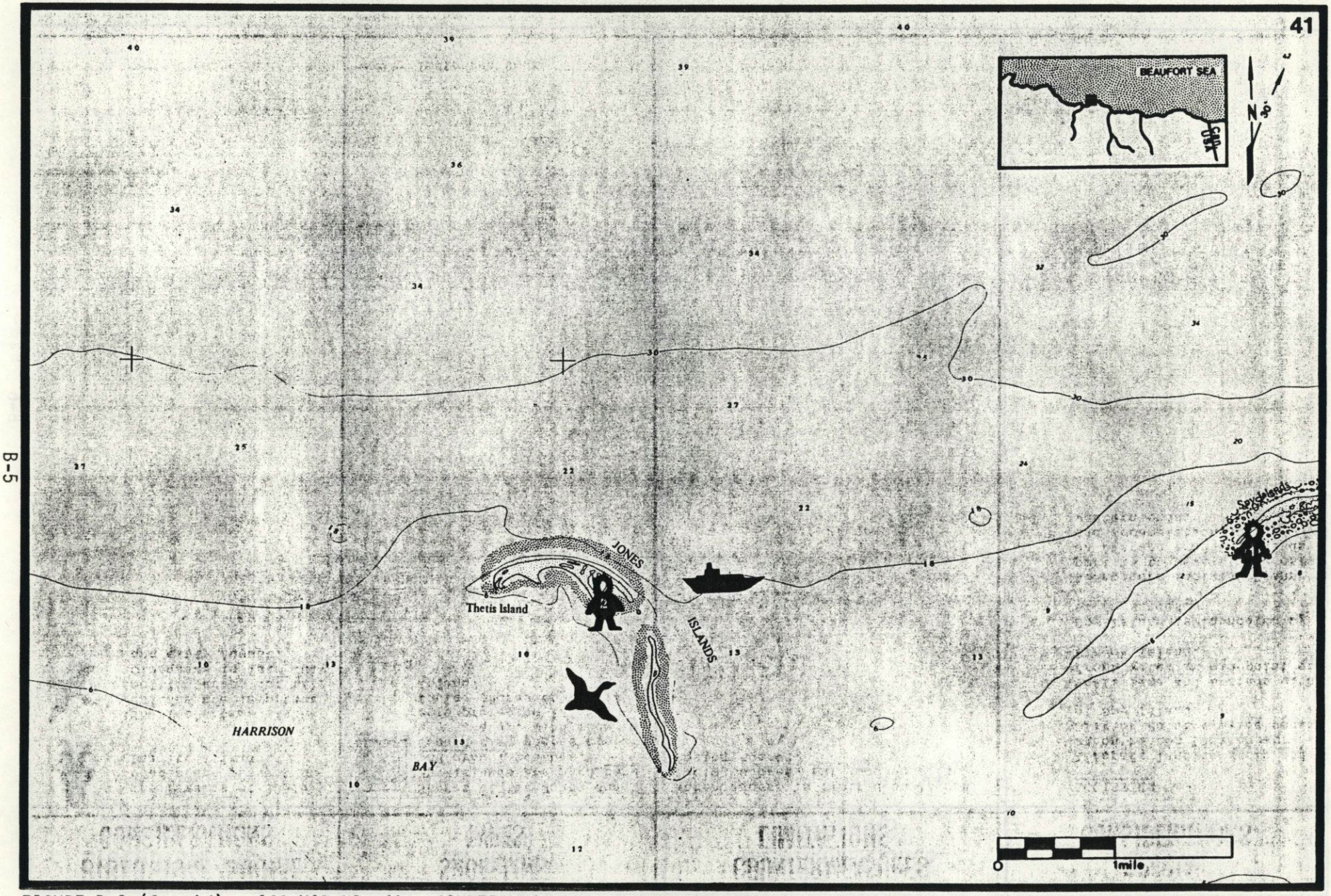


FIGURE B-3 (Cont'd) ACS MAP NO. 41: COUNTERMEASURES CONSIDERATIONS

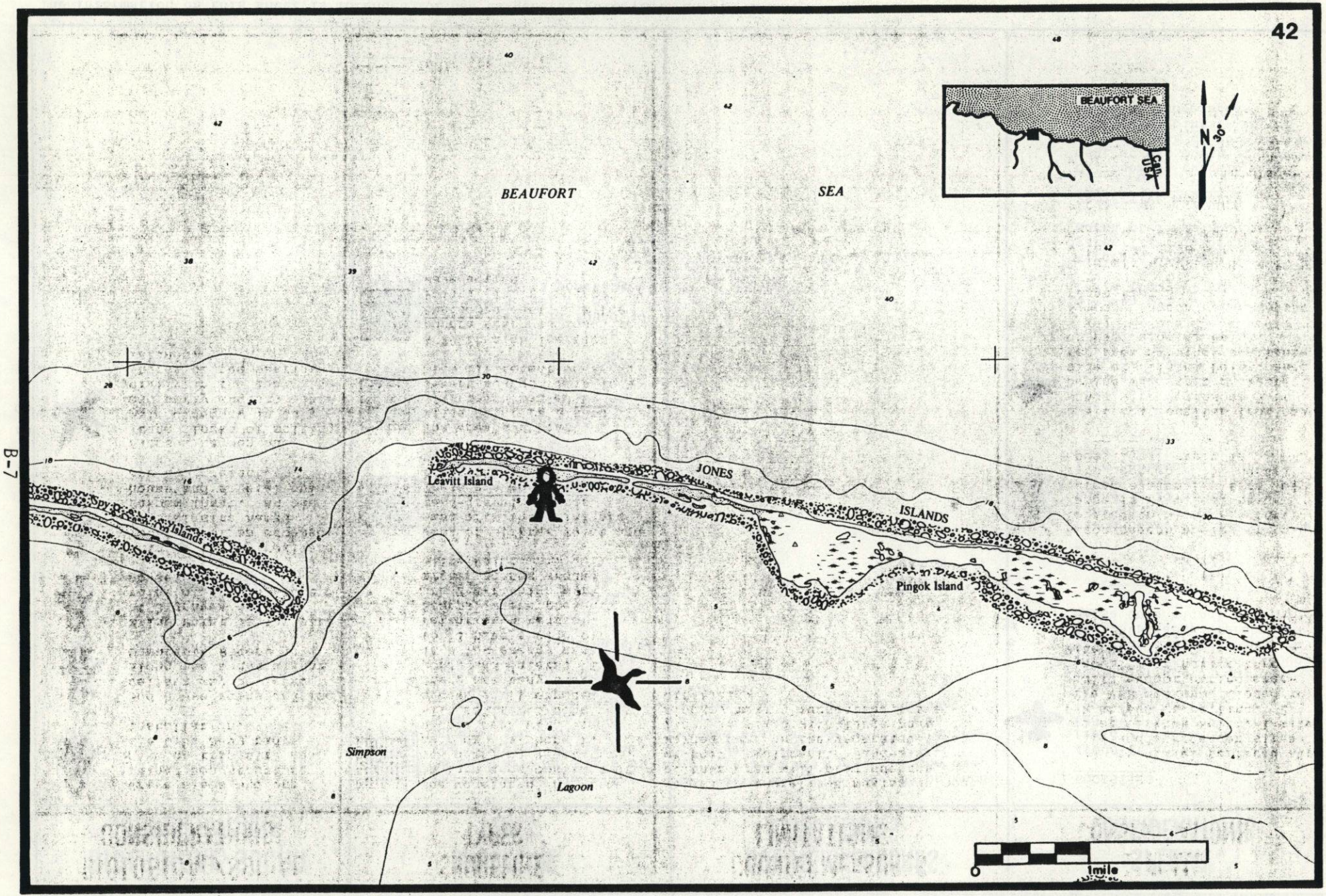


FIGURE B-4 (Cont'd) ACS MAP NO. 42: COUNTERMEASURES CONSIDERATIONS

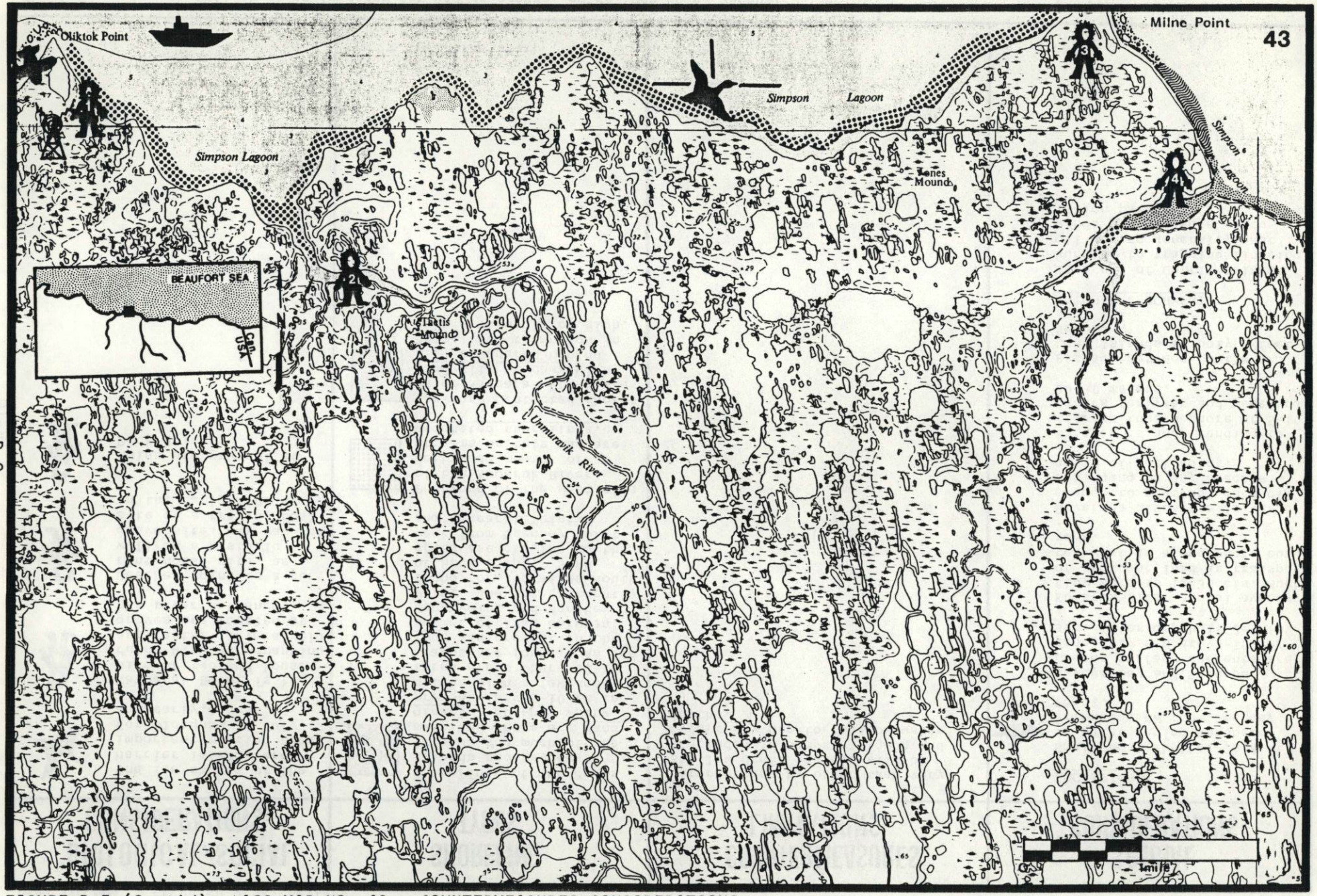


FIGURE B-5 (Cont'd) ACS MAP NO. 43: COUNTERMEASURES CONSIDERATIONS

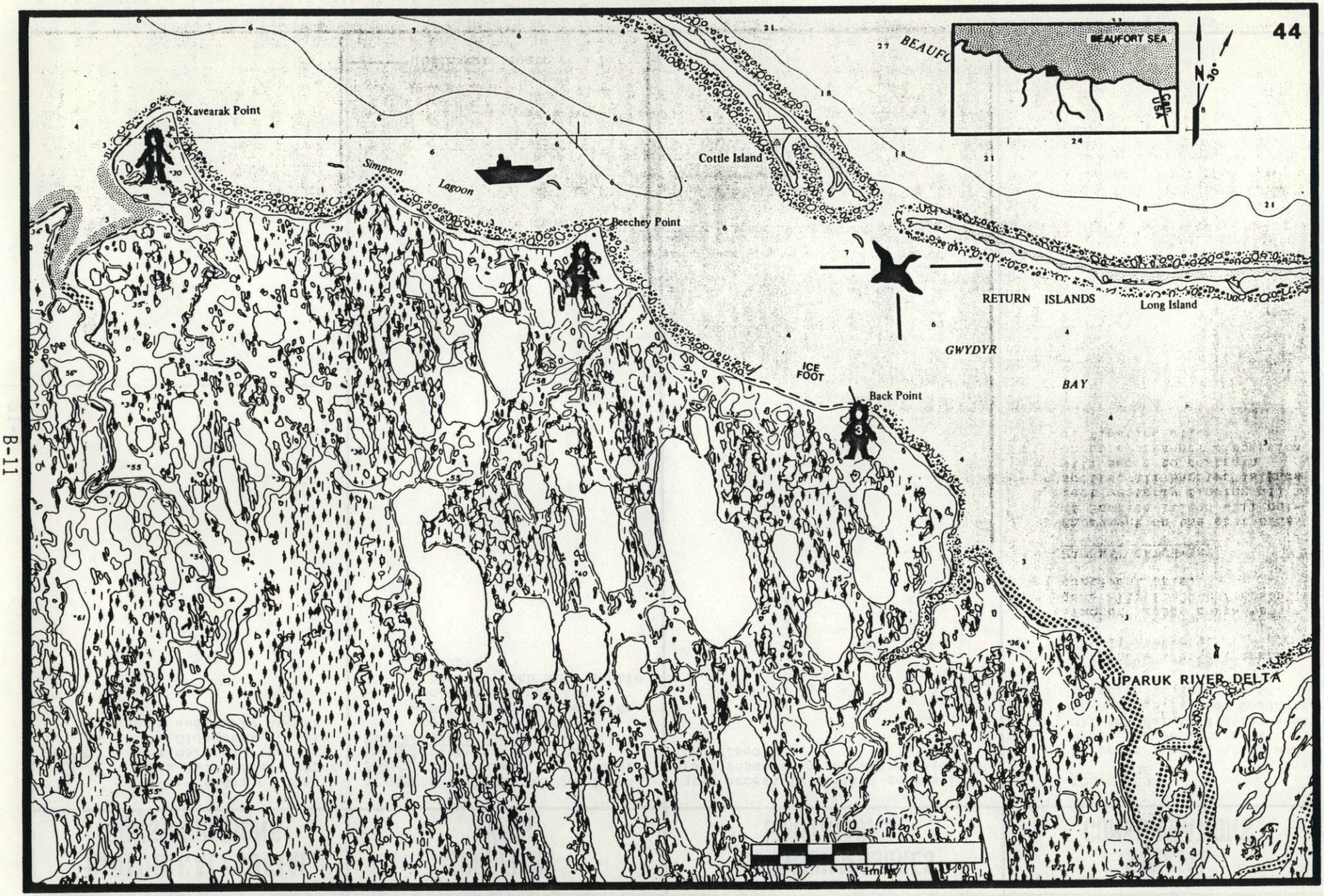


FIGURE B-6 (Cont'd) ACS MAP NO. 44: COUNTERMEASURES CONSIDERATIONS

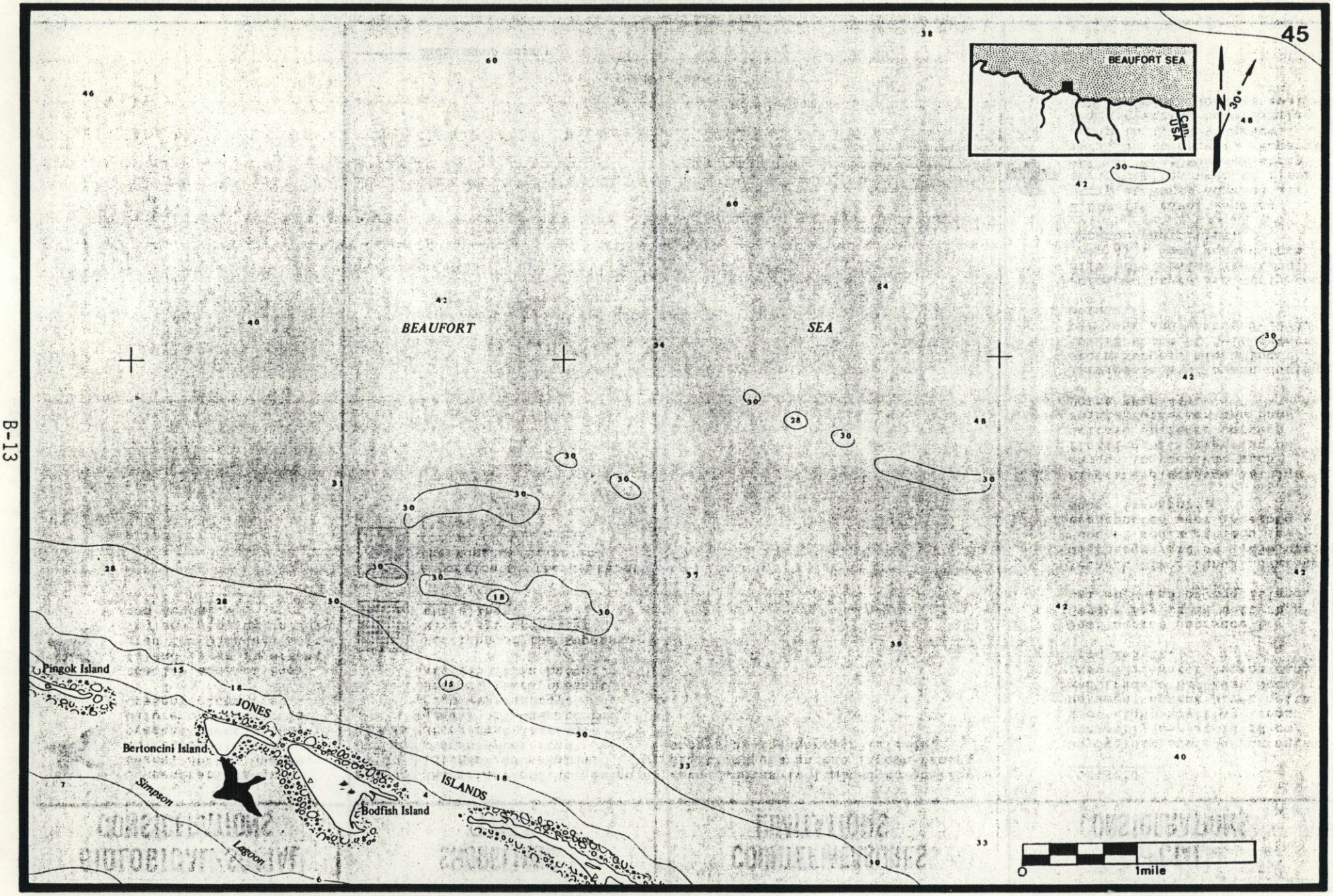


FIGURE B-7 (Cont'd) ACS MAP NO. 45: COUNTERMEASURES CONSIDERATIONS

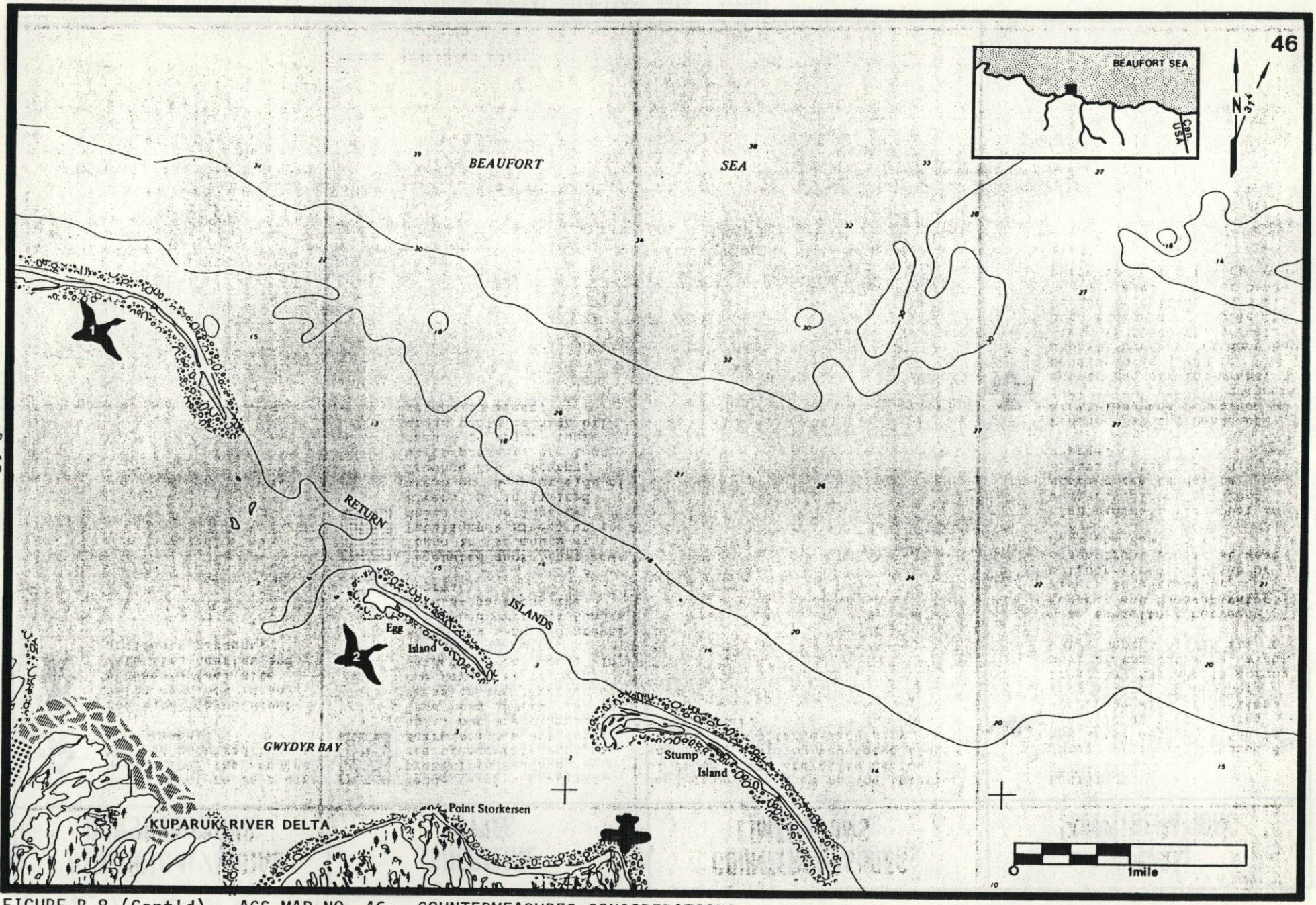


FIGURE B-8 (Cont'd) ACS MAP NO. 46: COUNTERMEASURES CONSIDERATIONS

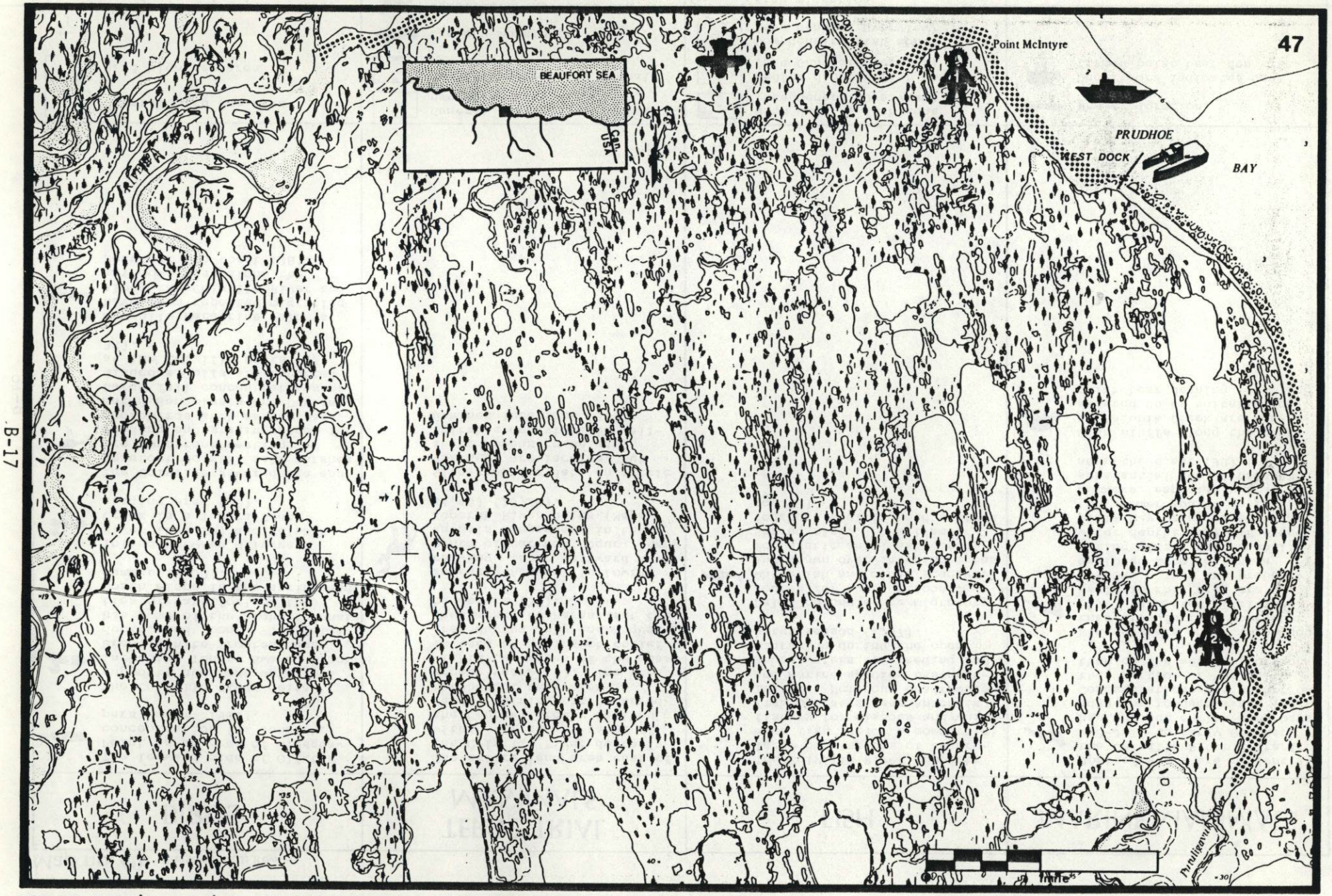


FIGURE B-9 (Cont'd) ACS MAP NO. 47: COUNTERMEASURES CONSIDERATIONS

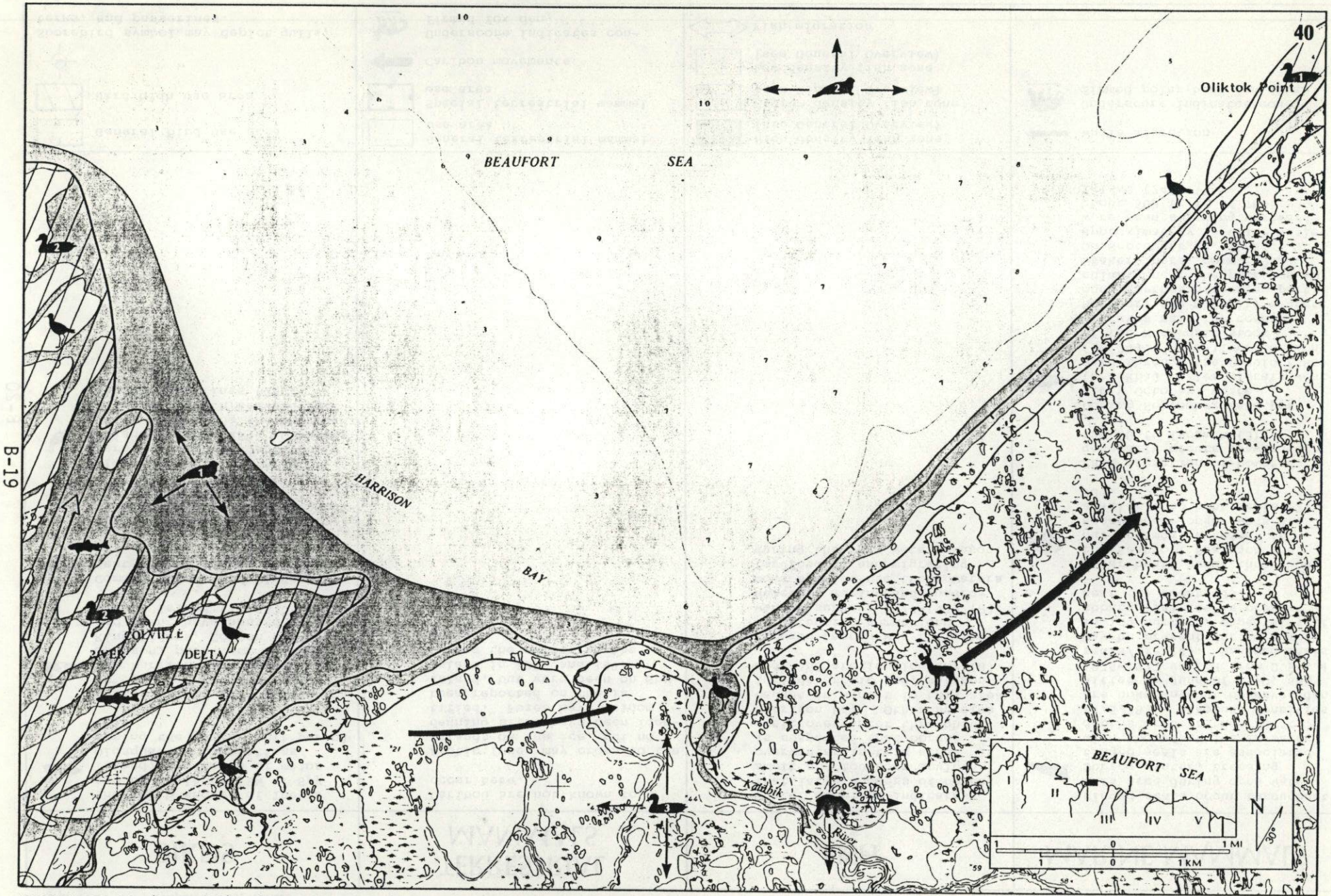


FIGURE B-10 (Cont'd) ACS MAP NO. 40: BIOLOGICAL RESOURCES

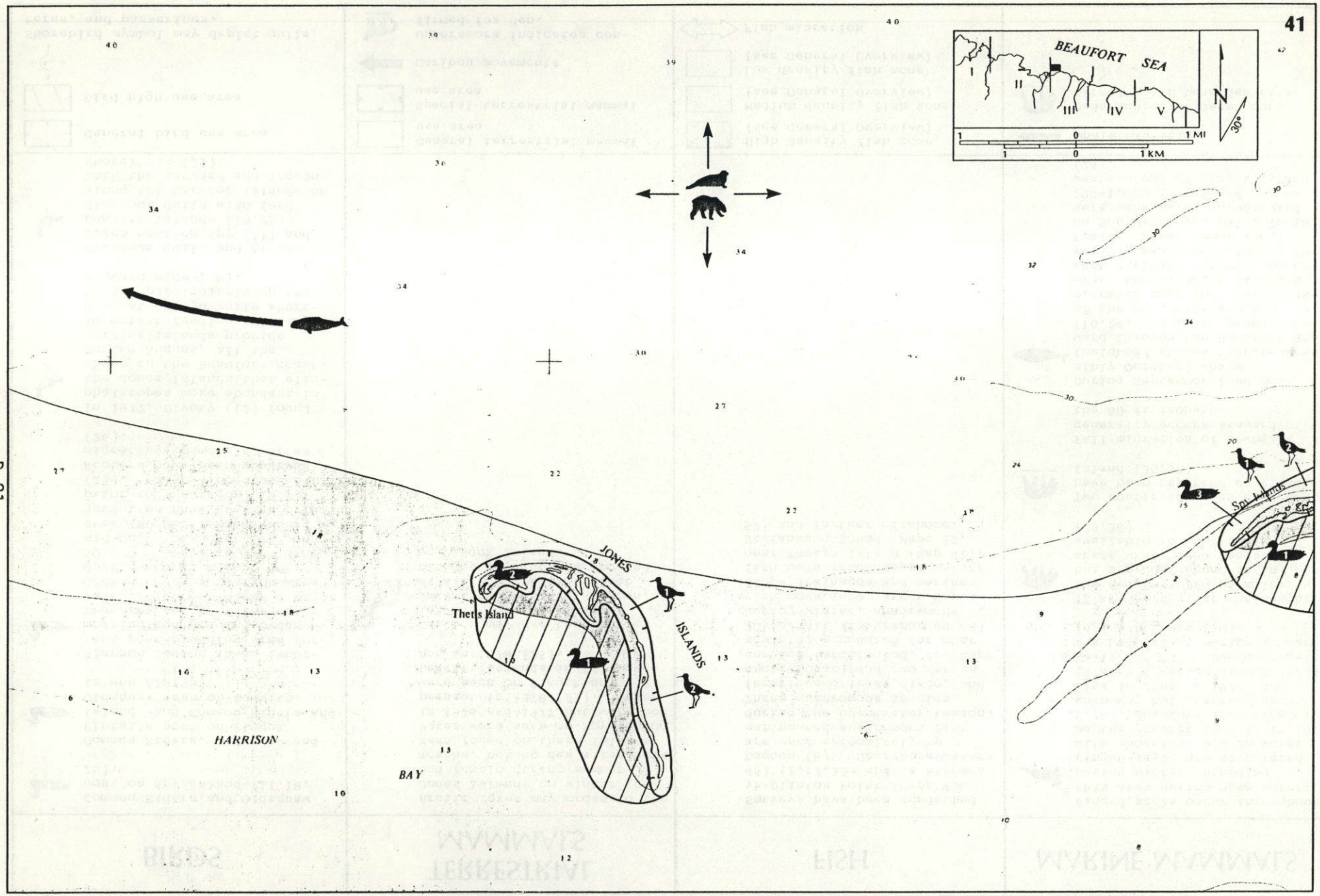


FIGURE B-11 (Cont'd) ACS MAP NO. 41: BIOLOGICAL RESOURCES

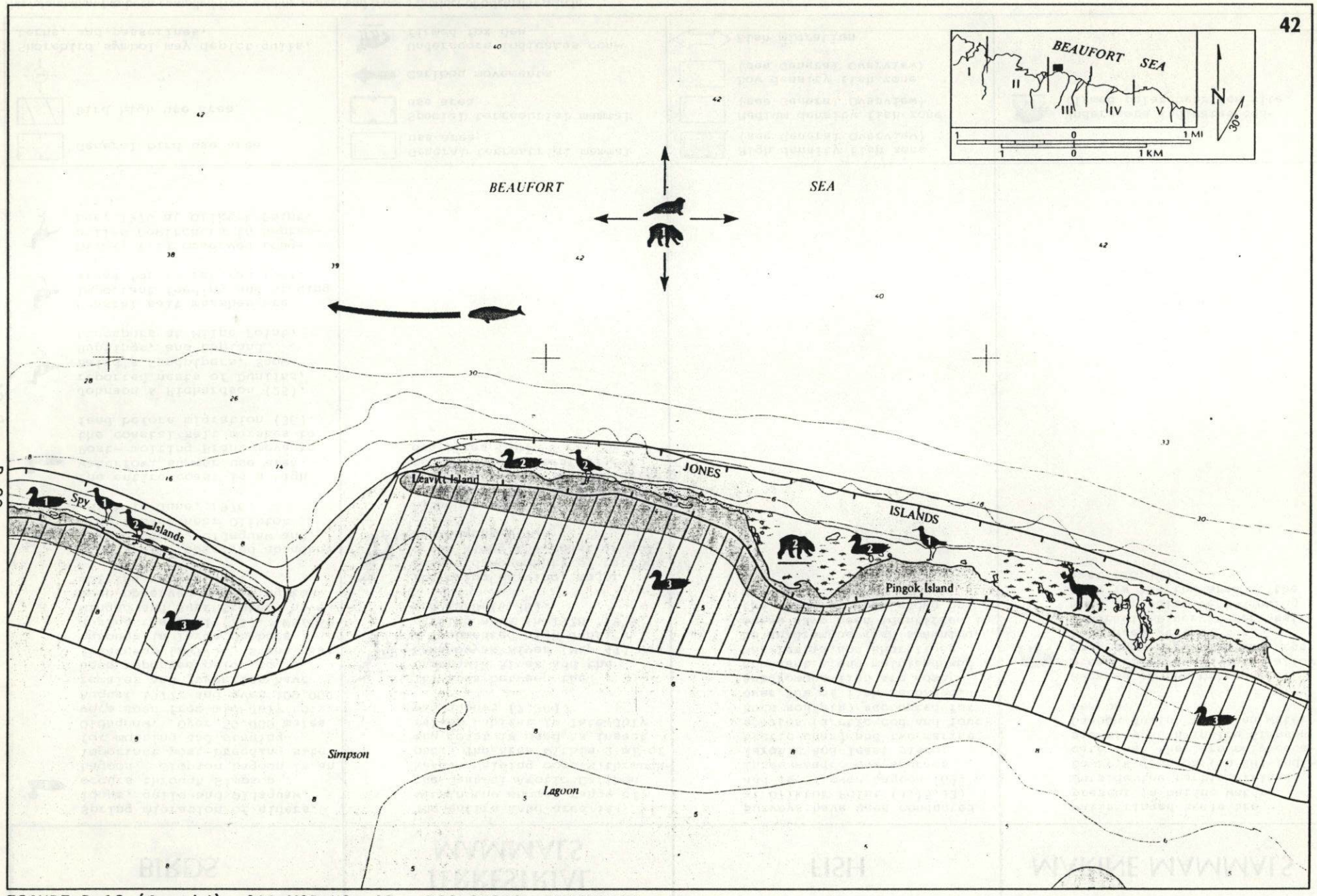


FIGURE B-12 (Cont'd) ACS MAP NO. 42: BIOLOGICAL RESOURCES

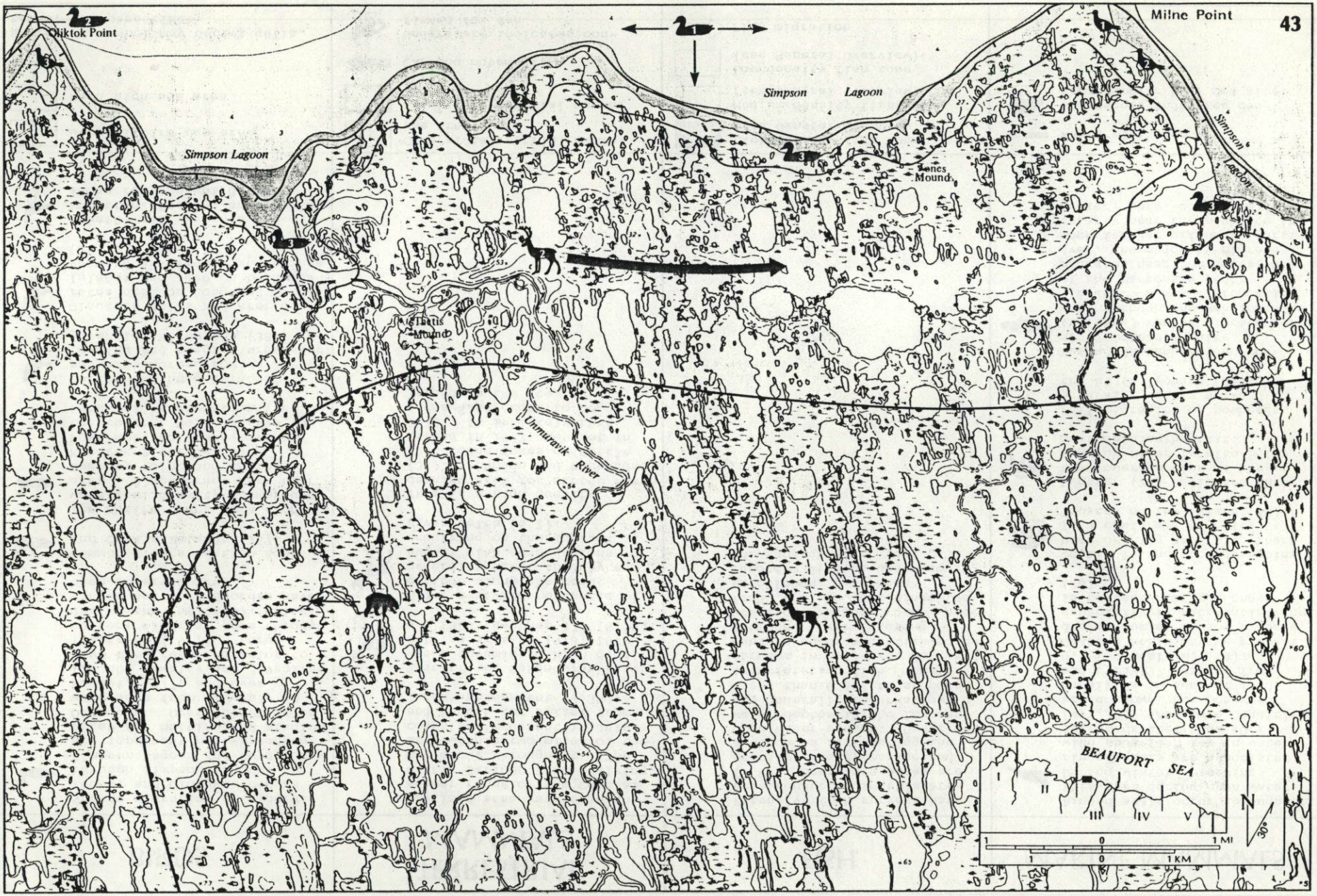


FIGURE B-13 (Cont'd) ACS MAP NO. 43: BIOLOGICAL RESOURCES

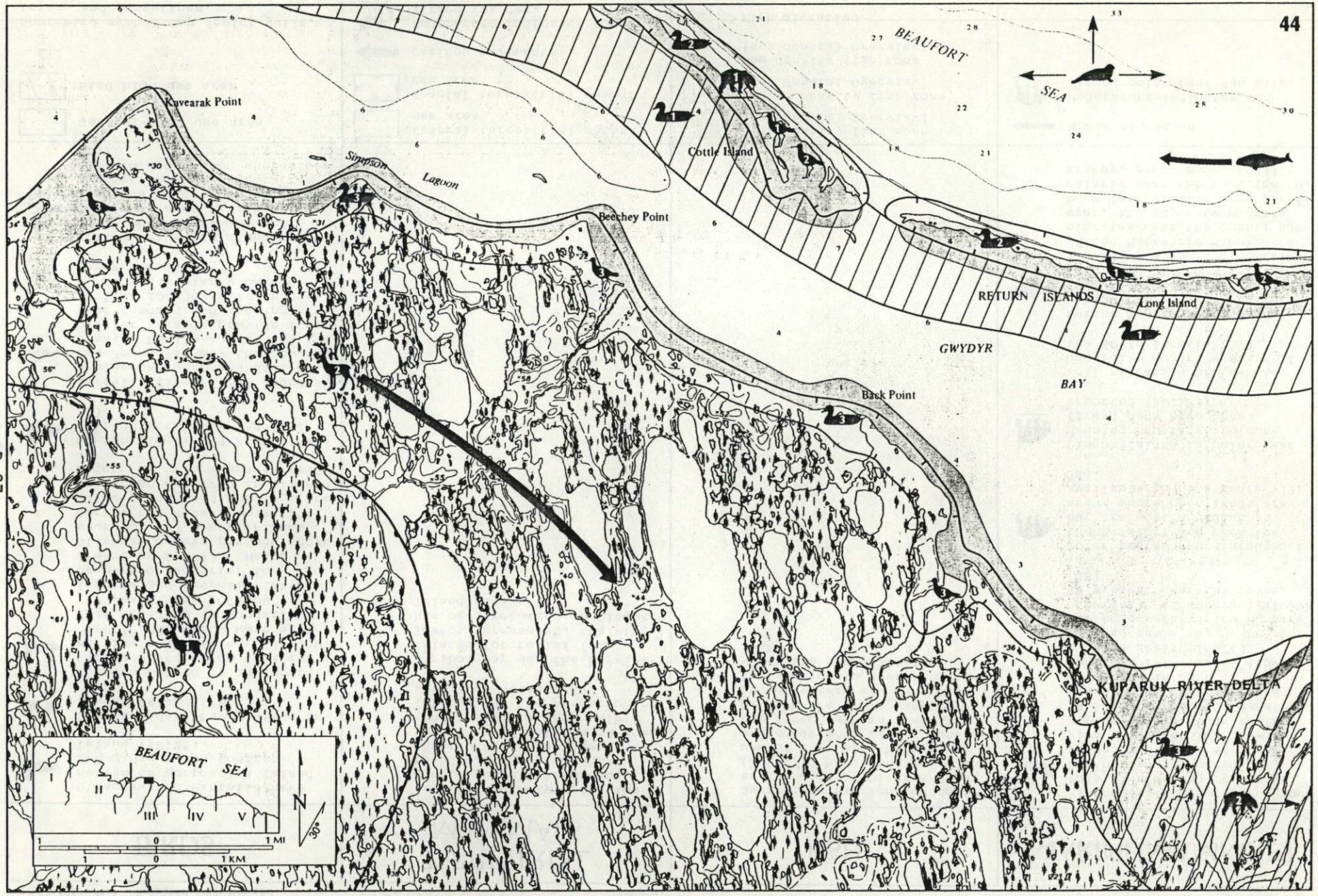


FIGURE B-14 (Cont'd) ACS MAP NO. 44: BIOLOGICAL RESOURCES

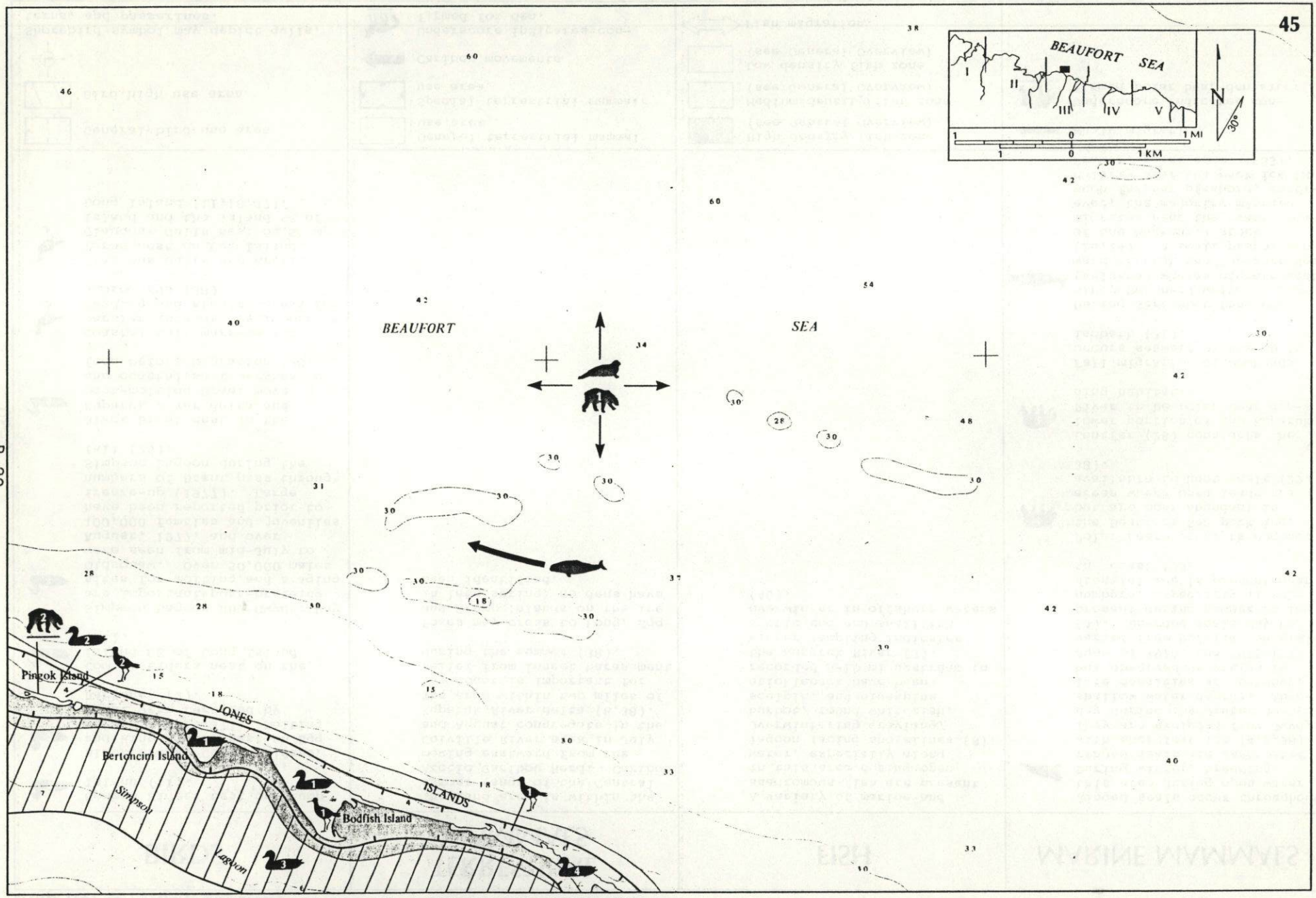


FIGURE B-15 (Cont'd) ACS MAP NO. 45: BIOLOGICAL RESOURCES

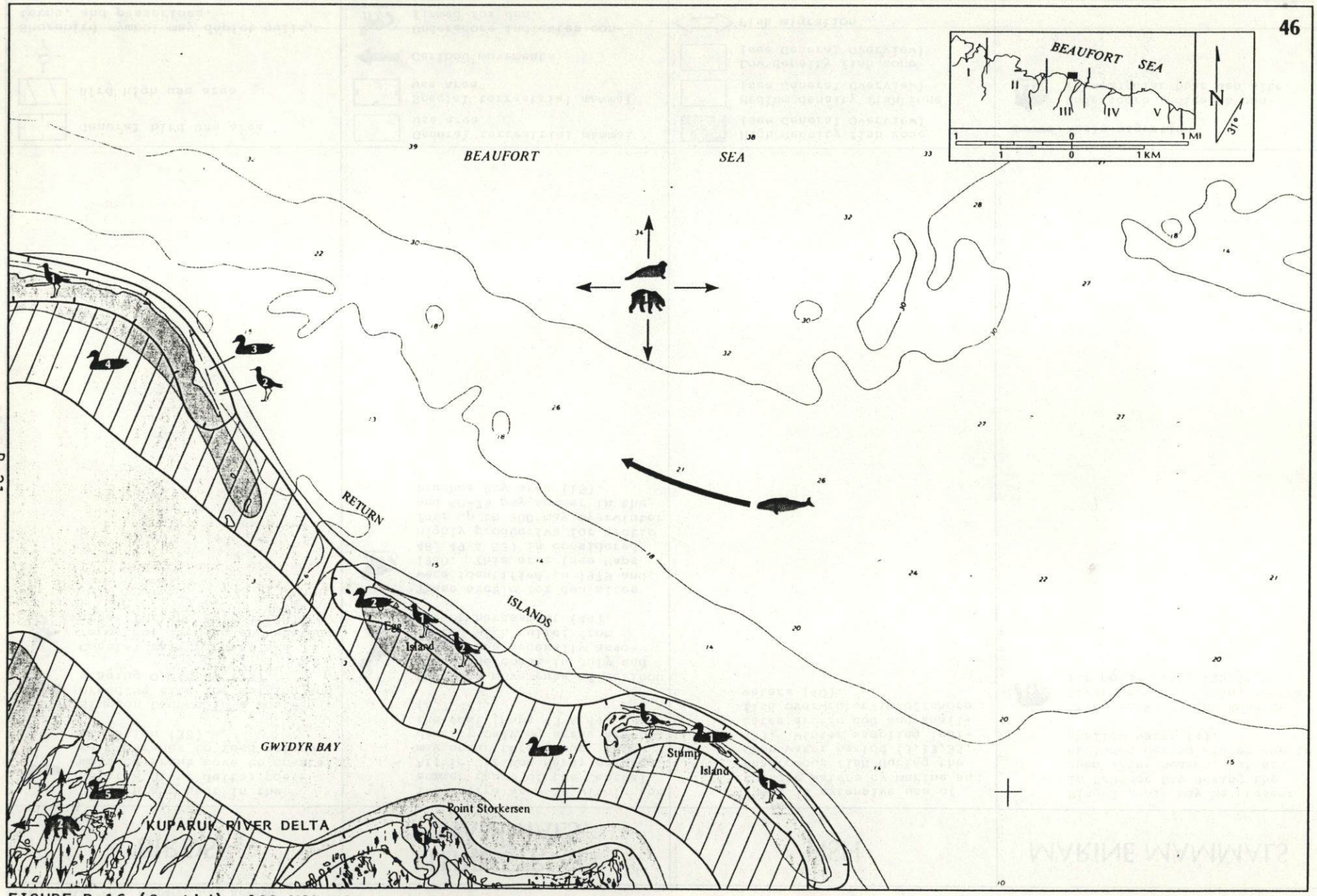


FIGURE B-16 (Cont'd) ACS MAP NO. 46: BIOLOGICAL RESOURCES

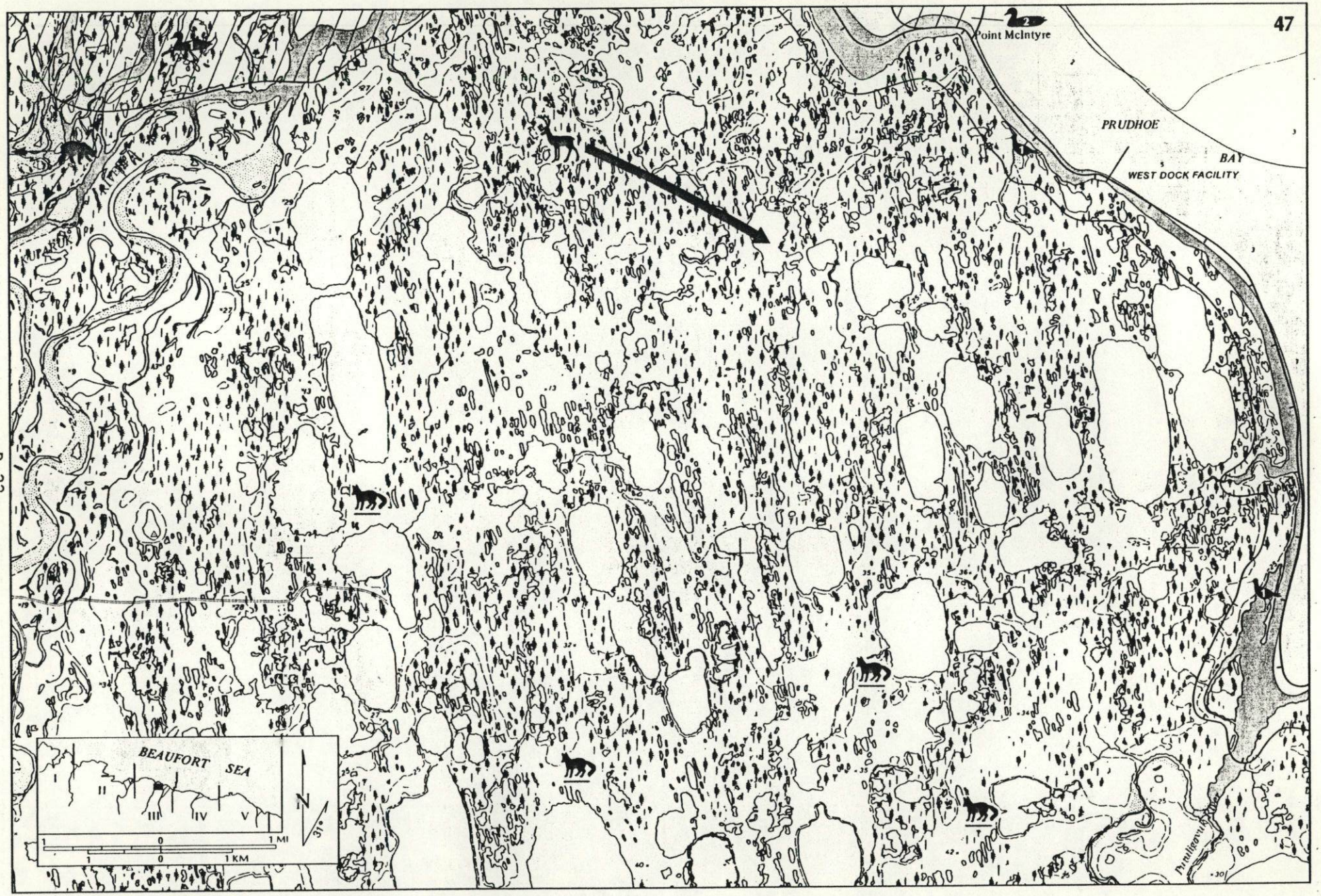


FIGURE B-17 (Cont'd) ACS MAP NO. 47: BIOLOGICAL RESOURCES

APPENDIX C
PROCEDURES FOR USE OF DISPERSANTS

It is Shell's position that physical containment and removal techniques and burning of oil will be used prior to any consideration to use chemical dispersants to treat an oil spill in the Beaufort Sea. The regulatory mechanism requires approval of the use of dispersants on a case-by-case basis by the On-Scene Coordinator in consultation with the Regional Response Team. Because of the length of time such an approval could require, Shell does not believe that it is practical at this time to stockpile dispersants and application equipment on location either at Sandpiper or at Prudhoe Bay. However, dispersants and application equipment are readily available to Shell from ABSORB at Deadhorse, and additional chemicals could be flown in from Anchorage and from Exxon Chemical Company in Houston as needed.

At the time of a spill when the use of dispersants first appears to have any potential, the Shell Operations Manager will consult with the On-Scene Coordinator to evaluate the situation using the Regional Response Team guidelines. The current draft dispersant-use guidelines for EPA Region X are illustrated in Figure C-1. The On-Scene Coordinator must consult with both state and federal members of the Regional Response Team before the authorization to use dispersants can be given. If the Shell Operations Manager and the On-Scene Coordinator determine that dispersants may be used, the Operations Manager will have his Dispersal Coordinator follow through in arranging for dispersants and dispersant application equipment on-scene while the On-Scene Coordinator is consulting with the Regional Response Team.

Chemicals acceptable for oil spill control must be listed on EPA's Acceptance List before they can be used. The following EPA-approved chemicals are currently stockpiled in Alaska:

Exxon Corexit 9527	550 gal - Prudhoe (ABSORB)
	10,010 gal - Yakutat (GOACO)
	4,950 gal - Homer (CIRO)
	4,950 gal - Kenai (CIRO)

Exxon Corexit OC-5	55 gal - Anchorage (CIRO) 330 gal - Yakutat (GOACO)
ArcoChem D-609	550 gal - Prudhoe (ABSORB)

Corexit 9527 is most likely to be used for a major dispersing operation, and additional quantities would be obtained from Exxon Chemical Company at the time of a spill.

Because dispersant use is subject to such strict regulatory control, Shell will use trained personnel from ABSORB and from contract application firms for any treatment operation. ABSORB has dispersant application equipment stored at Deadhorse. Currently, ABSORB's ARCAT skimming vessel can be mobilized, outfitted for dispersant application, and be on-scene for a spill from the Sandpiper facility in several hours. CIRO has a helicopter spray applicator stored in Kenai, while GOACO has two such applicators stored at Yakutat. The helicopter application systems could be air-lifted to Deadhorse.

For large-scale aerial application, Shell would contract with either Conair Aviation (Abbotsford, B.C.) or Globe Air (Mesa, AZ). Both companies have large aircraft outfitted for spraying. Flight times to Deadhorse would range from 12 to 24 hours depending on weather.

Hydrocarbon-base dispersants should always be applied to the slick as a light spray prior to agitation. Hydrocarbon-base formulations made from COREXIT 9527 offer superior oil dispersing qualities. When these diluted formulations are applied to an oil slick, dispersion occurs rapidly with a very minimum of mixing.

Equipment

COREXIT 9527 is particularly adaptable to use with work boats equipped with spray booms. The concentrated nature of the chemical enables the boat to increase its spraying time up to ten times the work period possible if conventional dispersants were used. COREXIT 9527 may easily be diluted during application by eduction into the water stream supplying the spray nozzles from fixed or portable high-pressure fire hose systems, or by direct injection into the water stream provided by low pressure pumps. This has proven to be one of the most effective procedures for applying the chemical. Excellent dispersing results have been obtained with ratios of sea water to COREXIT 9527 as high as 10 to 1.

Excellent results may also be obtained when dilutions of COREXIT 9527 are applied to the oil slick as a light spray — not a mist or fog. Nozzles providing a flat spray pattern are recommended. Adjacent nozzles should be positioned to allow a slight overlap at water-level. Spray booms should be mounted ahead of the workboat's bow wake. When applied from the bow of a workboat traveling at a minimum speed of about seven knots, the wake of the boat will usually provide sufficient mixing energy.

High-pressure, high volume pumps (about 150 gpm at 100 psi) are recommended for best results. Boat speed and dilution ratio can both be adjusted depending on the circumstances. For instance a 2% eduction rate at 4 knots using high-pressure equipment may be quite adequate. With a low volume pump a 10% eduction rate may be required at the same boat speed.

Aircraft (airplane or helicopter) provide the most rapid method of applying dispersant to an oil spill. A variety of aircraft may be used for low altitude spraying. Helicopters are particularly useful in hard-to-reach areas. Many types of tanks and spray attachments are available for planes and helicopters. COREXIT 9527 is used full strength as supplied when applied by aircraft. Treatment rates of about 5 gallons per acre are recommended. In all cases the spray should be adjusted to give small droplets rather than a mist.

ACUTE TOXICITY TESTS

Toxicity tests (static bioassay) using zebrafish *(Brachydanio rerio)* have been used to rank many dispersant formulations. Results of such tests are shown below.

LC_{50}* (ppm) For Various Concentrations of COREXIT 9527

Exposure Time (Hours)	Percent Corexit 9527					
	100	50	33	20	10	5
24	580	1100	1275	2300	4950	11000
48	550	940	1260	2300	4850	10650

*Concentration lethal for 50% of test species.

Similar tests on brown shrimp *(Crangon crangon)* result in a 48-hour LC_{50} of 6600 ppm.

PRODUCT INFORMATION

COREXIT OC-5 OIL COLLECTOR

PRODUCT DESCRIPTION

COREXIT OC-5, a carefully balanced blend of surface-active agents in a hydrocarbon-based system, is effective in containing spills of petroleum products. Very small quantities of COREXIT OC-5 will spread rapidly on the water surface and collect thin oil films from large areas. The spilled oil is thereby contracted into a relatively small area. The resulting thicker film may then be readily harvested by suitable equipment to remove oil from the environment.

The unique characteristics of COREXIT OC-5 may be summarized as follows:

- High spreading pressure to effectively contain a range of oils.
- Very low toxicity to fresh and sea water marine life forms.
- Low pour point (below −20°F) which permits its use even under adverse temperature conditions.
- High flash point (185°F, COC) for safe handling.
- Stable formulation for extended shelf life.
- High water tolerance which distinguishes it as a "surface collecting agent" by the Environmental Protection Agency.
- Easily applied to large or small spills with readily available, standard spray equipment.
- No health or toxicity hazards in handling the chemical when applied in the prescribed manner.

APPLICATION TECHNIQUES

Application techniques for COREXIT OC-5 vary depending upon the location and extent of the oil spill and whether the treatment is to be accomplished by hand or other mechanical means. In all instances, COREXIT OC-5 is applied "full strength" as a fine spray at the perimeter of an oil spill rather than on the spill itself.

The amount of COREXIT OC-5 required depends upon characteristics of the oil spilled; but in general, it is in the order of *2 gallons per lineal mile of spilled-oil perimeter.*

Application methods are summarized as follows:

- **Hand Sprayer**—Since COREXIT OC-5 is applied "full strength", any commercial back-pack sprayer with a capacity of 3-5 gallons is suitable. Apply the chemical as a fine spray to the water surface at the edge of a spill around the entire perimeter of the oil, or to a localized section which will direct the spill away from a critical area or towards harvesting equipment.

Oil Field Chemicals Division
PRC-Plano
P.O. Box 2819
Dallas, Texas 75221
214-424-8547

PRODUCT BULLETIN

OFC[tm] D-609 Dispersant

Outstanding Characteristics. . . . . An excellent self-mixing sea and brine water dispersant for crude oil spills and slicks

DESCRIPTION

OFC D-609 dispersant is designed to disperse crude oil spills and slicks. It acts by radically reducing the interfacial tension between crude oil and sea or brine water. When mixing energy or turbulence is applied to the treated slick, the film will then break up into small dispersed droplets. The chemical dispersant prevents coalescence of the droplets. This product is highly concentrated, biodegradable and of a reasonably low order of toxicity with reference to marine species. It is not intended for use in fresh waters.

TYPICAL PHYSICAL PROPERTIES

Form @ 70°F	Light Amber Liquid
Density @ 60°F	8.36 lbs/gal
Flash Point TCC	173°F
Pour Point (2000 cps)	-40°F
pH	6.0 - 7.5
Solubility	Crude Oil: Soluble
	High TDS Brine: Soluble
	Fresh Water: Soluble

APPLICATION METHODS

OFC D-609 dispersant is suited to all commonly used application techniques and equipment. The concentrate may be sprayed directly from helicopters, fixed wing aircraft, or diluted with water or kerosene and sprayed from work boats with boom sprayers or hand equipment. Mixing tanks, eductors or proportioning pumps may be used. Optimum dilution can vary from 1:2 to 1:10 depending on conditions.

APPLICATION GUIDE

See Application Guide Attachment

SHIPPING AND HANDLING INSTRUCTIONS

OFC D-609 dispersant is a Combustible Liquid. It can be shipped in 55-gallon steel drums and is available in bulk.

A Material Safety Data Sheet outlining recommended safe handling of D-609 is available upon request.

The information in this bulletin is believed to be accurate, but all recommendations are made without warranty since the conditions of use are beyond the control of ChemLink Petroleum, Inc. The listed properties are illustrative only and not product specifications. ChemLink Petroleum disclaims any liability in connection with the use of the information and does not warrant against infringement by reason of the use of any of its products in combination with other materials or in any process.

Oil Field Chemicals Division
P.O. Box 300
Anchorage, Alaska 99510
Bus. 907-265-6352
907-276-4830 (24 Hrs)

PB-3

R. P. Bolerjack
Regional Manager Alaska

Application Guide - OFC^{tm} D-609 Dispersant (Continued)

DISPERSANT APPLICATION:

TABLE 1
Relations of Oil Volume per Unit Area to Slick Thickness

Gallons/Acre	Bbl/Square Mile	Bbl/Acre	Film Thickness (mm)
150	2,286	3.57	0.14
268	4,088	6.38	0.25
536	8,165	12.76	0.50
1072	16,329	25.51	1.00

TABLE 2
Dispersant Required per Square Mile

Slick Thickness (mm)	Oil Volume (Gallons)	Gallons/Acre		Dispersant - Required Gallons Dispersant to Oil Ratio			
		5 GPA	7 GPA	1:10	1:20	1:30	1:50
0.14	96,012	3200	4480	9601	4801	3200	1920
0.25	171,696	3200	4480	17197	8585	5723	3434
0.50	342,930	3200	4480	34293	17147	11431	6857
1.00	685,818	3200	4480	68582	34291	22861	13716

TABLE 3
Treatment of Barrels of Oil/Acre which can be Treated
at Various Doses of Dispersant/Acre (Gallons)

Dispersant to Oil Ratio	Gallons Dispersant/Acre		
	5	7	10
1:10	1.19	1.66	2.38
1:20	2.38	3.32	4.76
1:30	3.57	4.98	7.14
1:50	5.95	3.30	11.90

TABLE 4
Boat Spraying Data for 10 ft. Swath Width

Knots	Minutes/Acre	Acres/Hour
1	42.96	1.40
2	21.54	2.79
3	14.34	4.19
4	10.76	5.58
5	8.62	6.96
6	7.19	8.36
7	6.14	9.77
8	5.38	11.15
9	4.78	12.55
10	4.30	13.96

For wider swath widths, divide minutes/acre by one-tenth the total swath width; multiply acres/hour by one-tenth the total swath width. To determine area for higher speeds, multiply 1 knot value by desired speed. This table is for actual spraying time not including reloading and transit time.

PB-3

Application Guide - OFC[tm] D-609 Dispersant (Continued)

TABLE 9
Aerial Spray Data - Pump Rate Required (USG/Min)

MPH	Knots	Chemical Doses USG/Acre Over Swath Widths of 100 Feet		
		5 Gal/Acre	7 Gal/Acre	10 Gal/Acre
30	26	30	42	60
50	43	51	71	101
100	87	101	141	202
120	104	121	169	242
150	130	152	212	303
175	152	176	247	353
200	174	201	282	405

APPENDIX D
UNCONTROLLED BLOWOUT (RELIEF WELL) PLAN

D.1 SCOPE

This section covers the actions to be taken and the time required to initiate and effect relief well operations in the event of an uncontrolled blowout. The possibility of a blowout is considered extremely low because of the extensive precautions to be taken to prevent loss of well control. This section does not deal with the control of pollution resulting from a blowout. Specific containment and recovery operations for blowouts during various seasons are contained in other sections of this contingency plan.

D.2 WELL IGNITION

Well ignition is obviously an important element of the overall well control program. Refer to Appendix E for details.

D.3 EQUIPMENT AND SUPPLY MOBILIZATION

In the event of a blowout, all equipment necessary for constructing the relief well pad would be immediately mobilized from Prudhoe to the location. The equipment used and transported would depend upon the time of the year and the availability of logistics support equipment. The ABSORB Manual contains comprehensive lists of construction companies located at Prudhoe.

A drilling rig will also be located at this time and planned for mobilization as soon as the pad is available. The relief well drilling rig could be any industry rig in current arctic service. If all adequate rigs are under contract and in use at the time of the spill, oil industry practice dictates that any operator will release a rig if requested for relief well service.

Also, if necessary, a Herc transportable rig could be flown into Deadhorse from another area.

support the drilling rig and associated drilling support equipment, the rig and equipment may be mobilized to the pad over ice roads, ice conditions permitting. Pad size could then be expanded as necessary to accommodate the kill equipment and fluids which will not be required until the relief well is drilled to TD. Depending on timing, the kill equipment could be brought to the location on barges after breakup.

During open water periods, a relief well gravel location would be constructed by the proven technique of using barges and tugs to transport the gravel from the Prudhoe Bay West Dock to the location.

During periods of breakup and freezeup, pad construction would not be attempted until such time as conditions were safe for personnel and equipment to operate. In this case, all supplies, equipment, and material necessary for construction would be assembled at the nearest staging point such that construction could begin immediately when safe to do so.

D.6 ESTIMATES OF TIME REQUIREMENTS FOR CONTROLLING A BLOWOUT WELL

Based on the foregoing discussions and conditions, it is apparent that time requirements for the gravel island construction and relief well drilling is dependent upon a number of factors. For the conditions such as hole deviations, depth of objectives, pressure gradient and formation conditions anticipated at the Sandpiper prospect, the following time requirements are estimated for regaining control of a blowout well:

(1)	Gravel island construction, winter or summer	40 days
(2)	Rig up and prepare to spud	7 days
(3)	Drill relief well	35 days
(4)	Kill well	10 days
	Total	92 days

During periods of broken ice (breakup and freezeup), an additional 75 days may be required to allow for gravel transport by barge or truck to the relief well drillsite.

APPENDIX E
BLOWOUT IGNITION CRITERIA

A blowout well will be ignited at the discretion of the on-site Shell Drilling Foreman if there is immediate danger to personnel. Otherwise, the well will be ignited for safety and to limit the potential for adverse environmental impact only after evaluation of the alternatives available and after discussion with Shell management and the proper governmental agencies.

An initial assessment would be made of the following:

(1) Any impending danger to personnel necessitating evacuation or medical assistance;

(2) Potential environmental damage (considering estimated well flow rates, weather, oceanographic conditions, proximity to sensitive areas and other relevant factors);

(3) Mechanical conditions and present status of casing, wellhead equipment, blowout preventers, drill pipe, rig, etc., as these factors might pertain to any opportunity to regain control of the well from the surface.

The on-site Shell Drilling Foreman would take action that might be required to ensure continued safety to personnel and minimize potential environmental damage. He would also continue to make any further assessments necessary to fully evaluate the possibility for regaining control of the well from the surface. During this process, the Operations Manager would provide Shell's management in Houston with all available information pertaining to the status of personnel, potential environmental damage and the mechanical status of well equipment. Various options, including ignition, would be discussed in detail. Outside experts would be retained to assist in the evaluation of the options. Appropriate governmental agencies would also be given all available facts and any operational plan that might be emerging. This would include assessing the possibility that the well would be ignited and when ignition would likely take

APPENDIX 6

EMERGENCY SITUATION PROVISIONS

CRITICAL OPERATIONS CURTAILMENT PLAN

Certain operations performed in drilling are more critical than others with respect to well control and for the prevention of fire, explosion, oil spills and other discharges or emissions. These operations which include running and cementing casing, logging or wireline operations, well completion and testing operations, and drilling into formations anticipated to abnormally pressured will be limited or curtailed when particular meteorological, oceanographic or ice conditions are, or are predicted, to be severe enough to shut down logistical support of the operation.

Specifically, the following conditions would cause operations to be limited or curtailed:

1) Severe weather which would cause a disruption in logistics to the extent that stores of fuel or other critical supplies would be reduced below a safe minimum level. The total fuel storage capacity on the island will be in excess of 115,000 gal. When the amount of fuel stored falls below 12,000 gal., operations will be curtailed. Mud is considered another critical material. The minimum quantities of mud components to be maintained at the wellsite to assure well control to T.D. are:

Barite	200 tons
Bentonite	500/100 lb sacks

The equipment to be used and method of transport will depend upon the time of year and weather conditions. For such an emergency it is customary for all operators in the area to cooperate in making a suitable drilling rig immediately available. An agreement or contract assuring the availability of a drilling rig for a relief well will be submitted with the APD. If required, a rig adapted to transport by a Hercules (C-130) cargo carrier could be used. Depending upon the time of year, the rig could be transported by helicopter or an air-cushioned vehicle.

Immediately, supplies such as tubulars and wellhead equipment would be stockpiled at Deadhorse for use at the relief well. Normal supplies such as mud, cement, bits, fuel and other items utilized in drilling the relief well and for killing the uncontrolled well are available at Deadhorse and would be transported to the relief wellsite when the site is completed or near completion. Gravel for the relief well drilling pad will be available at the gravel source for the Sandpiper Island or from supplies at Prudhoe, depending upon the season.

Transportation during the ice season would be over ice roads already built and by boat and/or barge during the open-water season. During freeze up and breakup, transportation will be by helicopter or possibly by an air-cushioned vehicle.

During the ice season, a gravel island of design similar to that proposed herein would be constructed using proven techniques. Because of the temporary nature of the relief well drilling, an island somewhat smaller than the presently proposed island would be constructed. The drilling rig would be moved onto the site at the

Amoco Production Company
P. O. Box 100779
Anchorage, Alaska 99510

August 31, 1988

Mr. Rodney Smith
Regional Supervisor/Field Operations
Minerals Management Service
Alaska OCS Region
939 East 36th Avenue
Anchorage, Alaska 99503

Dear Rodney:

I understand that you have received a letter from the North Slope Borough indicating that certain residents were concerned about the sandbags and similar debris which reportedly washed up along the coast of Harrison Bay. The Borough asked that these materials be cleaned up.

As you are aware, Amoco is in the process of doing certain work at Sandpiper Island which will result in permanent abandonment of the wells on that island. Amoco expects to file a plan for permanent abandonment of the island itself in the near future. As part of our operations we will be removing the bags and other debris from the island.

Amoco also will be removing any bags and similar material which has come ashore. We have made arrangements with Piquniq Management Corporation to hire three residents of Nuiqsuit. These residents will be employed to remove bags and similar debris from the coast ranging from Oliktok Point to West Dock on the mainland and from Spy Island to Stump Island on the Barrier Islands including westward to Eskimo Island and Harrison Bay area. Amoco also plans to have helicopter overflights to spot and remove any debris not recovered by those people employed with Piquniq. We have asked that these three Nuiqsuit residents begin work as soon as possible so as much of the debris as possible can be picked up.

As you are aware, islands other than Sandpiper sustained damage as a result of the winter weather and ice. There is apparently no way to accurately determine which island a particular bag came from. Therefore, it is not possible to ascribe responsibility for a particular bag. In spite of this, we will ask those under contract to Amoco to pick up any bags and debris they encounter.

Amoco recognizes the need to remove the bags from the coast and we hope that the effort we are undertaking will result in the recovery of all the bags and debris which are in the area. If you or the Borough have any questions concerning Amoco's plans, please give me a call.

Sincerely,

Cheryl

Cheryl A. Winkler
Environmental Coordinator

cc: Warren Matumeak
Land Management Administrator, North Slope Borough

Thomas Napageak
Mayor, Village of Nuiqsuit

Dave Germann
Permitting Division, North Slope Borough

/sls