DRILLING ICE MANAGEMENT PLAN
Chukchi Sea, Alaska

Submitted to:
U. S. Department of the Interior
Bureau of Safety and Environmental Enforcement
Alaska Outer Continental Shelf Region

Submitted by:
Shell Gulf of Mexico Inc.
DRILLING ICE MANAGEMENT PLAN

Approval: Approved for the Alaska Asset

<table>
<thead>
<tr>
<th>Shell Exploration &amp; Production Company</th>
<th>Approved</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>VP Wells Arctic &amp; Industry Regulatory Affairs</td>
<td>Signature on file</td>
<td>7/9/2014</td>
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</tbody>
</table>

Effective

This document is effective per the latest approval date above.

Expires

In force until revised and/or superseded.

Custodian

Alaska Marine Manager

Author

Ice Management Lead (July, 2014 Revision)

Reviewers

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VP Arctic HSSE
VP Alaska Operations
Alaska Maritime Assurance Manager
Alaska Wells Operations Manager
Arctic Execution Manager
Offshore Regulatory Team Lead
**Topic**

Define the method and system to ensure the safe departure of the drilling unit from the well site due to incursion of hazardous sea ice.

**Purpose/Scope**

The purpose of this Drilling Ice Management Plan is to provide a consistent, safe method for full compliance with the Alaska Venture operating / permitting requirements with regard to the Critical Operation Curtailment Plan which encompasses the Drilling Ice Management Plan.

**Applies to**

This document applies to all Shell employees and contractors conducting operations on behalf of the Shell Alaska Venture.

**Primary Responsibility**

Alaska Venture Maritime & Logistics supervision shall be responsible for assuring that this plan is provided and that operators are instructed to use this procedure prior to all marine drilling operations in Arctic waters where sea ice incursion is expected.
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I. INTRODUCTION

A. Scope

A Critical Operations Curtailment Plan (COCP) is in place for the Shell Gulf of Mexico Inc. (Shell) Chukchi Sea Exploration Drilling Program. As part of the COCP, this Drilling Ice Management Plan (DIMP) has been developed. The description of notification of curtailment (an excerpt from the COCP) is presented in Attachment 1.

Drilling operations in the Chukchi Sea will be conducted using two drilling units operating simultaneously. The drilling units are the “Noble Discoverer” and the “Polar Pioneer”. Both drilling units will operate according to this Drilling Ice Management Plan.

The DIMP addresses the following activities:

- Vessels
- Shell Ice and Weather Advisory Center (SIWAC), located in Anchorage
- Ice Alerts and Procedures
- Ice Management Philosophy
- Well Suspension Contingencies
- Mooring System Recovery and Release
- Moving onto or returning to the Drill Site
- Training

The DIMP:

- Defines Roles and Responsibilities
- Establishes Alert Levels
- Establishes Responses to Alert Levels

The DIMP facilitates appropriate decision-making and responses to the threat of hazardous ice and procedures set forth in the DIMP to prevent damage or harm to personnel, assets, or the environment.

Nothing in this document takes away the authority and accountability of the Master(s) of the vessels for the safety of their personnel and vessels, and for protection of the environment.

This plan is not a substitute for good judgment.

Guidance Note: This document is not intended to contain detailed procedures. Detailed procedures are contained within the vessel-specific operating manuals and the Shell Ice Management Guidance and Procedures manual.
B. Drilling Ice Management Plan Objective

- The objectives of the DIMP are to detect and monitor sea ice conditions, identify hazardous ice and determine manageability as per the DIMP and Alert System in order to ensure risk to personnel, drilling units, vessels or wells is reduced to ALARP.
- The Ice Alert System is central to the function of the DIMP. It is based on five progressive alert levels. Each level defines operational status, roles, responsibilities and actions required.

C. Drilling Ice Management Principles

- Early detection of ice features
- Assessment of the ice regime
- Identification of Hazardous Ice
- Assessment of Ice Management Vessel (IMV) capabilities to manage ice
- Calculation and monitoring of Hazardous Ice arrival at drill site, Hazard Time (HT)
- Continuous assessment of time required to secure the well, Secure Time (ST)
- Continuous assessment of time required to move rig off location, Move Time (MT)
- Alert Level assignment which triggers the appropriate responses
- Development of ice management strategy
- Monitoring effectiveness of strategy
- Predefined roles and responsibilities

II. DEFINITIONS

A. Roles and Responsibilities

Responsibilities have been defined for key on-site personnel in Section V. In addition to the defined personnel the following onshore positions have a role to play in the DIMP.

Wells Operations Manager

Shell’s Wells Operations Manager is the senior Shell shore-based manager responsible for all Shell well operations offshore Alaska.

Wells Operations Team Leads

The Wells Operations Team Leads are responsible for Shell well operations at a specific well site. There is a Wells Operations Team Lead ashore for each drilling location who will update the OEMT on Ice Alert Status or changes to the Ice Alert Level.
**Ice Management Lead Anchorage**

The Ice Management Lead heads the ice management team and works with the offshore Ice Advisors (IAs) stationed on vessels to develop daily strategies and designate areas or ice features which are of concern. The Ice Management Lead liaises with the Shell Wells Operations Team Lead, SIWAC and the OEMT.

**Shell Ice and Weather Advisory Center (SIWAC)**

Based in Anchorage Alaska SIWAC develops ice and weather forecasts and analysis for Shell Management and the marine fleet. A full description is available in section IV.

**SIMOPS Coordinators**

The SIMOPS Coordinators working under the direction of the OEMT, will assist in coordinating the cascading activities of the entire fleet from the consequences of having to relocate a drilling unit(s) per the DIMP.

**Operations Execution Management Team (OEMT)**

The OEMT, comprised of leadership from each business function and representation from support functions, implements the control and recovery of the 7-day operational Integrated Activity Plan (IAP) in accordance with the Integrated Operations Management Procedures (IOMP). The scope of the IOMP is to support field operations by maintaining up-to-date information, providing resources as needed, coordinating activities, and to bring decision-makers together to coordinate exploration and support activities.

**B. Definitions and Abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AHTS</td>
<td>anchor handling tug supply</td>
</tr>
<tr>
<td>Aiviq</td>
<td>MV Aiviq – Secondary IMV and anchor handling vessel</td>
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<tr>
<td>APD</td>
<td>Applications for Permit to Drill</td>
</tr>
<tr>
<td>AT</td>
<td>Alert Time - The result of (HT) – (T-Time) which translates to Alert Level</td>
</tr>
<tr>
<td>API</td>
<td>American Petroleum Institute</td>
</tr>
<tr>
<td>bbl</td>
<td>barrel(s)</td>
</tr>
<tr>
<td>BHA</td>
<td>Bottom Hole Assembly</td>
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<tr>
<td>BOP</td>
<td>Blowout preventer</td>
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<tr>
<td>BSEE</td>
<td>Bureau of Safety and Environmental Enforcement</td>
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<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>CIS</td>
<td>Canadian Ice Services</td>
</tr>
<tr>
<td>cm</td>
<td>centimeter(s)</td>
</tr>
<tr>
<td>COCP</td>
<td>Critical Operations Curtailment Plan</td>
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<tr>
<td>Dia.</td>
<td>diameter</td>
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<td>DNV</td>
<td>Det Norske Veritas</td>
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<tr>
<td>Abbreviation</td>
<td>Definition</td>
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<tr>
<td>DP</td>
<td>Dynamic Positioning</td>
</tr>
<tr>
<td>ea</td>
<td>each</td>
</tr>
<tr>
<td>Fennica</td>
<td>M/V Fennica – Primary IMV</td>
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<tr>
<td>ft</td>
<td>foot/feet</td>
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<tr>
<td>FTP</td>
<td>file transfer protocol</td>
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<tr>
<td>FY</td>
<td>First-year ice. Sea ice of not more than one winter’s growth, developing from young ice; 12 inches (in.) (30 centimeters [cm]) or greater. It may be subdivided into thin FY 30-70 cm – sometimes referred to as white ice, medium FY 70-120 cm and thick FY &gt;120 cm up to 2 m.</td>
</tr>
<tr>
<td>gals.</td>
<td>gallons</td>
</tr>
<tr>
<td>GFS</td>
<td>Global Forecast System</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>Hazardous Ice</td>
<td>Ice, which due to its size, stage of development, concentration, set and drift is considered to be a threat to the safety of personnel, the drilling unit and well operations. Close proximity of an ice feature regardless of its set and drift may determine it to be hazardous ice. Guidance Note: Sea state as well as visibility may influence what is categorized as hazardous ice.</td>
</tr>
<tr>
<td>HOS</td>
<td>Hang-off Sub</td>
</tr>
<tr>
<td>hp</td>
<td>horsepower</td>
</tr>
<tr>
<td>HT</td>
<td>Hazard Time. The estimated time it will take for hazardous ice to reach the drill site.</td>
</tr>
<tr>
<td>Hz</td>
<td>hertz</td>
</tr>
<tr>
<td>IA</td>
<td>Ice Advisor</td>
</tr>
<tr>
<td>IAP</td>
<td>Integrated Activity Plan</td>
</tr>
<tr>
<td>IOC</td>
<td>Integrated Operations Center</td>
</tr>
<tr>
<td>IOMP</td>
<td>Integrated Operations Management Procedures</td>
</tr>
<tr>
<td>IMO</td>
<td>International Maritime Organization</td>
</tr>
<tr>
<td>DIMP</td>
<td>Drilling Ice Management Plan</td>
</tr>
<tr>
<td>IMV</td>
<td>Ice management vessel. Any ice class vessel tasked with ice management duties in support of the drilling unit. This includes the primary ice management vessel (IMV) and the ice class Anchor Handling Tug Supply (AHTS)</td>
</tr>
<tr>
<td>in.</td>
<td>Inch(es)</td>
</tr>
<tr>
<td>kg</td>
<td>kilogram(s)</td>
</tr>
<tr>
<td>kW</td>
<td>kilowatt(s)</td>
</tr>
<tr>
<td>lb</td>
<td>pound(s)</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>LMRP</td>
<td>Lower Marine Riser Package</td>
</tr>
<tr>
<td>m</td>
<td>meter(s)</td>
</tr>
<tr>
<td>m²</td>
<td>square meter(s)</td>
</tr>
<tr>
<td>m³</td>
<td>cubic meter(s)</td>
</tr>
<tr>
<td>MHz</td>
<td>megahertz</td>
</tr>
<tr>
<td>MODU</td>
<td>Mobile Offshore Drilling Unit. MODU’s are facilities designed or modified to engage in drilling and exploration activities. The term MODU includes drilling vessels, semisubmersibles, submersibles, jack-ups, and similar facilities that can be moved without substantial effort. These facilities may or may not have self-propulsion equipment on board and may require dynamic positioning equipment or mooring systems to maintain their position.</td>
</tr>
<tr>
<td>mt</td>
<td>metric tons</td>
</tr>
<tr>
<td>MT</td>
<td>Move-off Time. The time required to clear decks on the anchor handler recover or release moorings conventionally and move off the drill site in an orderly fashion.</td>
</tr>
<tr>
<td>M/V</td>
<td>Motor Vessel</td>
</tr>
<tr>
<td>MY</td>
<td>Multi-year ice. Old Ice (OI) up to 3 m or more thick which has survived at least two summers’ melt. Hummocks are smoother than on SY and the ice is almost salt-free. Where bare, this ice is usually blue in color. The melt pattern consists of large interconnecting, irregular puddles on the surface in summer and a well-developed drainage system.</td>
</tr>
<tr>
<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
</tr>
<tr>
<td>Noble Discoverer</td>
<td>Turret-moored drilling vessel (MODU)</td>
</tr>
<tr>
<td>Nordica</td>
<td>M/V Nordica – Primary IMV</td>
</tr>
<tr>
<td>OCS</td>
<td>Outer Continental Shelf</td>
</tr>
<tr>
<td>OEMT</td>
<td>Operations Execution Management Team</td>
</tr>
<tr>
<td>OI</td>
<td>Old ice. Sea ice which has survived at least one summer’s melt. Topographic features generally are smoother than FY. It may be subdivided into Second-year (SY) ice and Multi-Year (MY) ice.</td>
</tr>
<tr>
<td>OIM</td>
<td>Offshore Installation Manager</td>
</tr>
<tr>
<td>OSR</td>
<td>Oil Spill Response</td>
</tr>
<tr>
<td>OSV</td>
<td>Offshore Supply Vessel</td>
</tr>
<tr>
<td>PIC</td>
<td>person in charge</td>
</tr>
<tr>
<td>Polar Pioneer</td>
<td>Column stabilized semi-submersible drilling unit (MODU).</td>
</tr>
<tr>
<td>psi</td>
<td>pounds per square inch</td>
</tr>
<tr>
<td>RAR</td>
<td>rig anchor release</td>
</tr>
<tr>
<td>RP</td>
<td>Recommended Practice</td>
</tr>
</tbody>
</table>
III. VESSELS COVERED BY THE DRILLING ICE MANAGEMENT PLAN

- Drilling Unit – “Noble Discoverer”
- Drilling Unit – “Polar Pioneer”
- Primary Ice Management Vessel (IMV) – “M/V Fennica”
- Primary Ice Management Vessel (IMV) – “M/V Nordica”
- Secondary Ice Management Vessel (IMV) and Anchor Handler – “M/V Tor Viking II”
- Secondary Ice Management Vessel (IMV) and Anchor Handler – “M/V Aiviq”

Guidance Note: The term “drilling unit” is used throughout this document and refers to both the “Noble Discoverer” a self propelled drilling vessel and the “Polar Pioneer” a non self-propelled semi-submersible. Both units are defined as MODU’s. The final authority with regard to safety onboard a drilling vessel is the Master. The final authority for safety onboard a non self-propelled semi-submersible is the OIM.
A. Drilling Units

All planned exploration drilling in the identified lease blocks will be conducted with the Noble Discoverer and the Polar Pioneer.

The Noble Discoverer is a turret moored self-propelled drillship. Station keeping is accomplished using a turret-moored, 8-point anchor system. The underwater fairleads prevent ice fouling of the anchor lines. Turret mooring allows orientation of the vessel’s bow into the prevailing metocean conditions to present minimum hull exposure to drifting ice. The vessel is rotated around the turret by hydraulic jacks. Rotation can be augmented by the use of the fitted bow and stern thrusters. Ice-strengthened sponsons have been retrofitted to the ship’s hull.

The Noble Discoverer is classed by Det Norske Veritas (DNV) as a Mobile Offshore Drilling Unit (MODU) for worldwide service. It is a “1A1 Ship-Shaped Drilling Unit l” and is capable of performing drilling operations offshore Alaska. The Noble Discoverer has been issued with a DNV Appendix to Class stating:

“The structural strength and material quality of the ‘Ice Belt’ formed by the sponsons below the 8,950 mm A/B level, have been reviewed against the requirements for the DNV ICE-05 Additional Class Notation and found to meet those requirements (as contained in DNV Rules for Classification of Ships, Pt 5 Ch 1, July 2006) for a design temperature of -15 degrees C.”

The Polar Pioneer is classed by Det Norske Veritas (DNV) as a Mobile Offshore Drilling Unit (MODU) for worldwide service. It is a non-self-propelled, “SPM thruster assisted” (TA) semisubmersible offshore drilling unit of twin-hull configuration. The rig is a “+ A1 Column Stabilized Unit” and is capable of performing drilling operations offshore Alaska.

Positioning is accomplished with a combination of an eight-point all chain catenary mooring system and dynamic positioning system.

Polar Pioneer was built in 1985, with unlimited operation area, in accordance with the “Norwegian Maritime Directorate” and to “Det Norske Veritas regulations,” current at that time. While operating in Norwegian waters, the installation, with its inventory, equipment, crew and machinery was required to comply with current rules and regulations for operation on the Continental Shelf of Norway.

The drilling units will undergo inspections by BSEE and Det Norske Veritas (DNV) for certification before entering the theater. The DNV certificates will be forwarded to BOEM.

The drilling units will comply with all of the regulations of DNV, the International Maritime Organization (IMO), and the U.S. Coast Guard (USCG). All exploration drilling operations will be conducted under the provisions of 30 CFR Part 250 Subpart D, and other applicable regulations and notices including those regarding the avoidance of potential drilling hazards, safety and pollution control.

Procedures for monitoring and reacting to ice in the prospect areas are provided in the Critical Operations and Curtailment Plan (COCP) and the Drilling Ice Management Plan (DIMP)
**Drillship Principal Dimensions**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>&quot;Noble Discoverer&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length Overall</td>
<td>514 ft</td>
</tr>
<tr>
<td>Transit Draft</td>
<td>27 ft</td>
</tr>
<tr>
<td>Drilling Draft</td>
<td>25.12 ft</td>
</tr>
<tr>
<td>Breadth</td>
<td>85 ft</td>
</tr>
<tr>
<td></td>
<td>156.7 m</td>
</tr>
<tr>
<td></td>
<td>8.2 m</td>
</tr>
<tr>
<td></td>
<td>7.67 m</td>
</tr>
<tr>
<td></td>
<td>26 m</td>
</tr>
</tbody>
</table>

**Drill Rig Principal Dimensions**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>&quot;Polar Pioneer&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length Overall</td>
<td>400 ft</td>
</tr>
<tr>
<td>Breadth over all</td>
<td>292 ft</td>
</tr>
<tr>
<td>Transit Draft</td>
<td>30 ft</td>
</tr>
<tr>
<td>Drilling Draft</td>
<td>75.44 ft</td>
</tr>
<tr>
<td>Survival Draft</td>
<td>62.32 ft</td>
</tr>
<tr>
<td></td>
<td>122 m</td>
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<tr>
<td></td>
<td>89 m</td>
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<tr>
<td></td>
<td>9.15 m</td>
</tr>
<tr>
<td></td>
<td>23 m</td>
</tr>
<tr>
<td></td>
<td>19 m</td>
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</tbody>
</table>

**B. Ice Management Vessels**

Ice management support to the drilling units will be provided by the *Fennica*, *Nordica*, *Tor Viking II* and *Aiviq*. The drill units will be supported by these IMVs from the beginning of the campaign until the vessel departs the area. A description of these vessels is provided in Attachment 2.

**Ice Management Vessel Principal Dimensions**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Fennica &amp; Nordica DNV Icebreaker Polar-10</th>
<th>Tor Viking II DNV Icebreaker Ice-10</th>
<th>Aiviq ABS A-3 Icebreaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length Overall</td>
<td>380 ft (116 m)</td>
<td>275 ft (83.7 m)</td>
<td>361 ft (109.9 m)</td>
</tr>
<tr>
<td>Draft</td>
<td>27 ft (8.4 m)</td>
<td>20 ft (6.0 m)</td>
<td>Ice Max 25 ft (7.62 m)</td>
</tr>
<tr>
<td>Breadth</td>
<td>85 ft (26 m)</td>
<td>59 ft (18.0 m)</td>
<td>80 ft (24.38 m)</td>
</tr>
<tr>
<td>Bollard Pull</td>
<td>230 tonnes</td>
<td>200 tonnes</td>
<td>200 tonnes</td>
</tr>
</tbody>
</table>

**1. Primary Ice Management Vessels**

The *Fennica* and the *Nordica* are designated as the primary IMVs. Both vessels are classed by DNV as +1A1 Tug Supply Vessel Icebreaker Polar-10. Designed for ice management, maintenance and service of offshore oil wells, the 380-ft (116-m) *Fennica* and *Nordica* are multi-purpose vessels specialized in marine construction and icebreaking. The *Fennica* and *Nordica* are equipped with diesel-electric propulsion systems and their innovative combination of capabilities, based on extensive design and engineering work, facilitates use of these systems in arctic conditions.
2. Secondary Ice Management Vessels / Anchor Handlers

The Aiviq is designated as a secondary IMV and anchor handler. The Aiviq is classed by ABS as A1, A3 (Icebreaker). Designed for ice management, anchor handling, and maintenance and service of offshore oil wells, the 361-ft (109.9-m) Aiviq is a multi-purpose vessel specialized in anchor handling and icebreaking.

The Tor Viking II is designated as a secondary IMV and anchor handler. The Tor Viking II is classed by DNV as +1A1 Supply Tug Icebreaker Ice-10. Designed for ice management, anchor handling, and maintenance and service of offshore oil wells, the 275-ft (83.7-m) Tor Viking II is a multipurpose vessel specialized in anchor handling and icebreaking.

Guidance Note: Ice Management Vessels supporting the drilling units may be deployed to assist other vessels or assigned to assist other Shell drilling units as operations and ice conditions dictate. Diverting ice management resources away from the drilling units may require a curtailment of activities. The decision to curtail activities as a result of diverting ice management resources away from the drilling vessel shall be made jointly by the Shell Drilling Supervisor and the Drilling Vessel Master/OIM. The onshore Shell Wells Operations Team Leader (in consultation with the drilling contractor’s Rig Manager) will endorse the plan or set priorities if agreement cannot be reached at the field level.

IV. SHELL ICE AND WEATHER ADVISORY CENTER

SIWAC is an integrated forecasting service staffed 24/7 by industry-leading specialists under Shell contract in Anchorage, Alaska. SIWAC’s primary function is to provide present and forecast ice and weather conditions directly to field operations and planning managers during the operational season. SIWAC provides information to decision makers and field principals to help them minimize risks when operating in the presence of ice. To provide quality and accurate information, SIWAC depends on skilled forecasters, subscription and public satellite imagery, numerical models, field observations, Geographic Information System (GIS) software tools, and a robust communication network.
A. SIWAC ICE DATA INPUTS

Ice forecasts are developed and issued daily. The Lead Ice Analyst compiles available data from subscription, specialized, and public services in ArcMAP (GIS Software) such as:

- MDA RadarSat 2 imagery
- MODIS satellite
- Canadian Ice Services
- National Ice Center
- Contract weather services
- Field observations
- IceNav images

B. Data Transmission

Effective communication of SIWAC ice and weather guidance and reciprocal feedback and field observations requires a robust and capable data network. The drilling units and IMVs are equipped with high-speed data and voice satellite service that has been proven to perform well in the U.S. Chukchi and Beaufort Seas.

Data, including satellite imagery and observations, are relayed through a file transfer protocol (FTP) site between SIWAC and the field vessels using automated processes. This keeps both the field and forecasters continuously refreshed with the latest information. In addition, SIWAC maintains a secure website that allows direct, on demand access to all forecast reports and data products. Additional information about SIWAC is provided in Appendix 3.
**Ice Information Flow Chart**

NOTE: This graphic depicts the constant two-way communication that would occur between the various components of the system.

**Guidance Note:**

Additional information regarding ice may be requested by the Master of the drilling units. Any means appropriate to the circumstances, shall be used to provide this information. Where this information is to be obtained by aerial reconnaissance, the Ice Management Lead in Anchorage will liaise with Shell Logistics to provide the appropriate resources.
V. ICE ALERT LEVELS AND PROCEDURES

These procedures define five Alert Levels that are linked to the time that hazardous ice is forecast to be at the drilling location, and the time required to secure the well and move the drilling unit off location if it becomes necessary. Roles, responsibilities, and actions required are specified according to the Alert Level.

A. Ice Alert Levels

<table>
<thead>
<tr>
<th>ALERT LEVEL</th>
<th>TIME CALCULATION</th>
<th>STATUS</th>
</tr>
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<tbody>
<tr>
<td><strong>Green</strong></td>
<td>Alert Time is greater than 24 hours</td>
<td>Normal operations</td>
</tr>
<tr>
<td><strong>Blue</strong></td>
<td>Alert Time is greater than 12 hours Less than 24 hours</td>
<td>Initiate risk assessment Validate secure times (ST) &amp; move time (MT)</td>
</tr>
<tr>
<td><strong>Yellow</strong></td>
<td>Alert Time is greater than 6 hours Less than 12 hours</td>
<td>Limited well operations in line with COCP, Commence securing well</td>
</tr>
<tr>
<td><strong>Red</strong></td>
<td>Alert Time is less than 6 hours</td>
<td>Well securing operations completed. Commence anchor recovery operations.</td>
</tr>
<tr>
<td><strong>Black</strong></td>
<td>Drillsite evacuated</td>
<td>Move drilling unit to a safe location</td>
</tr>
</tbody>
</table>

HT = Hazard Time
MT = Move Time
ST = Secure Time
T-Time (Total Time) = ST + MT
AT = Alert Time
AT = HT – T-Time

Guidance Note:
If the Alert Time (AT) value becomes negative at any time well securement and drillsite evacuation contingency plans will be initiated. Ice Alert Roles and Responsibilities
The following tables summarize roles, responsibilities and actions required for key on-site personnel for each Ice Alert Level.
## ROLES AND RESPONSIBILITIES FOR ALL ALERT LEVELS

<table>
<thead>
<tr>
<th>Drilling Unit Master / OIM</th>
<th>Shell Ice Advisor Drilling Unit</th>
<th>Shell IMV Ice Advisor</th>
<th>IMV Master</th>
<th>Rig Manager – Noble Drilling OIM – Transocean Drilling Unit</th>
<th>Shell Drilling Supervisor Drilling Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Master / OIM is the person in charge (PIC) of the drilling unit. He is the final authority in regards to safety of the vessel, crew and compliment. All changes of Alert Level are issued by the Master / OIM. The responsibility to evacuate the drill site in response to a hazard rests with the Master / OIM. Evaluates information from SIWAC, IAs and Vessel Management Team (VMT). Establishes MT in conjunction with the AHTS Masters. Establishes Ice Alert Level on advice from IA and is responsible for ice management operations. Ensures Alert Level status is broadcast to fleet and internally throughout drilling unit at intervals dependent on Alert Level or at change of Alert Level.</td>
<td>Collates and evaluates information from the SIWAC, IMV IAs and VMT. Advises Master / OIM on establishing Ice Alert Level. Directs ice management operations as required. Correlates Secure Time (ST) and Move Time (MT) with information from rig operations. Establishes Hazard Time (HT) in conjunction with IMVs and advises Master / OIM. Works in conjunction with IAs on IMVs to develop and establish effective ice management strategies and advises Master / OIM. Ensures current ice drift is broadcast to fleet, and liaises with SIWAC.</td>
<td>The IA is Shell’s IM representative onboard the IMVs and is the primary contact for all communications with the Master / OIM. He advises the IMV Master in executing the ice management strategies. Works in conjunction with Master of IMVs to determine the local ice conditions and hazardous ice. Works in conjunction with drilling unit IA and IMV Master to develop and implement effective ice management strategies. Provides feedback on effectiveness of strategy and reports any anomalies pertaining to ice.</td>
<td>The Master is the PIC of the IMV. He is the final authority in regards to safety of the vessel, crew and complement. Evaluates advice from SIWAC and IAs (drilling unit and IMVs). Works in conjunction with IA on drilling unit and IA of IMV to develop and execute effective ice management strategies within the capability of the vessel. Provides feedback on effectiveness of the strategy to the IA on the IMV. Reports to IMV / IA any condition which inhibits vessel performance.</td>
<td>The Rig Manager / OIM is the drilling contractor on-site supervisor responsible for all drilling-related operations aboard the drilling unit. Establishes (ST) and informs VMT of (ST) and well conditions. Validates drilling team is aware of their duties under present Ice Alert status. Validates well secure contingency plans.</td>
<td>The Drilling Supervisor is the senior on-site Shell supervisor with responsibility for overseeing drilling and well operations and for initiating spill response as the Onsite Incident Commander for spills originating from the well site. Validates well ST in conjunction with the Rig Manager / OIM. Informs Master / OIM regarding ongoing and upcoming critical operations and curtailment plans. Communicates status of well and Ice Alert level to Shell shore management and SIMOPS coordinator. Under the authority of the Shell Wells Operations Team Lead, the Shell Drilling Supervisor may raise the Ice alert level at any time. He may order the suspension of drilling operations, and securing of the well.</td>
</tr>
</tbody>
</table>

---

Shell Gulf of Mexico Inc.  
July, 2014
<table>
<thead>
<tr>
<th>Alert</th>
<th>Condition</th>
<th>VMT Meeting Frequency</th>
<th>Drilling Unit</th>
<th>Shell Ice Advisor Drilling Unit</th>
<th>Shell IMV Ice Advisor</th>
<th>IMV Master</th>
<th>Rig Manager – Noble Drilling OIM – Transocean Drilling Unit</th>
<th>Shell Drilling Supervisor Drilling Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Alert Time is greater than 24 hours.</td>
<td>Every 24 hours, or more frequently as needed.</td>
<td>Discharges duties as per accountabilities.</td>
<td>Discharges duties as per accountabilities.</td>
<td>Discharges duties as per accountabilities.</td>
<td>Discharges duties as per accountabilities.</td>
<td>Discharges duties as per accountabilities.</td>
<td></td>
</tr>
<tr>
<td>Blue</td>
<td>Alert Time is greater than 12 hours and less than 24 hours.</td>
<td>Every 12 hours, or more frequently as needed.</td>
<td>Ensures readiness to execute contingency plans. Ensures primary IMV is available to execute Ice Management strategies for the given ice regime. Ensures AHTS / IMV readiness for ice management and anchor handling operations. Establishes Ice Management Strategies in conjunction with IMVs and IA onboard IMVs. Directs ice management operations.</td>
<td>Proposes appropriate Ice Management Strategies based on real time assessment of the Ice Regime and advises IMV Master and drilling unit IA. Validates readiness of IMV to execute ice management strategy.</td>
<td>Executes Ice Management Strategies in conjunction with IA on IMVs. Establishes and states readiness of IMV to execute ice management strategy.</td>
<td>Establishes ST and assesses upcoming well operations for changes to ST with regard to COCP. Validates ST in conjunction with the Rig Manager / OIM. Informs Master / OIM regarding ongoing and upcoming critical operations and COCP. Reports Alert changes to Shell shore-based management and SIMOPS coordinator.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td>Alert Time is greater than 6 hours, and less than 12 hours.</td>
<td>Every 6 hours, or more frequently as needed.</td>
<td>Establishes and Validates MT. Establishes departure strategy. Ensures Alert status is broadcast to fleet and internally at 1-hour intervals or at change of Alert Level. Establishes HT, and advises Master / OIM and VMT. Works in conjunction with IA on IMVs to initiate ice management strategies. Directs ice management operations. Ensures current ice drift is broadcast to fleet.</td>
<td>Implements ice management strategies as directed by drilling unit IA in conjunction with IMV Master. Provides feedback on effectiveness of strategy.</td>
<td>Executes ice management strategies as directed by drilling unit IA. Provides feedback on effectiveness of the strategy.</td>
<td>Commences securing well in accordance with agreed plan. Informs VMT of progress.</td>
<td>Monitors Well Securing Operations and effectiveness of ice management operations. Communicates overall drilling unit status to Shell shore management and SIMOPS coordinator.</td>
<td></td>
</tr>
</tbody>
</table>
VI. ICE MANAGEMENT PHILOSOPHY

An effective Drilling Ice Management Plan is designed to enable execution of the exploration program, with the appropriate barriers in place to manage and mitigate against risks associated with ice. Additionally, it also identifies the worst case scenario that is caused by the failure of barriers and addresses the procedures to deal with consequences of escalation.

The worst case scenario for the purpose of the DIMP is the forced and uncontrolled departure of the drilling unit from the drillsite by incursion of hazardous ice. This section addresses the activities associated with ice management as a barrier to this worst case scenario. The strategy to prevent this event is to have the following elements as effective barriers:
- proper equipment,
- skilled people,
- appropriate information, and
- work processes

The key elements identified above are discussed herein.

A. **Proper Equipment**

- The Primary IMVs will have the appropriate ice class with ice breaker capabilities and have been contracted to support the exploration campaign.
- IceNav: The drilling units and IMVs will be outfitted with IceNav Equipment (Enhanced radar imaging of ice and geo-synchronized satellite imagery).
- *Tor Viking II* and *Aiviq* are high specification anchor handling vessels and have been designated as the secondary IMVs and anchor handling vessels.
- Ice reconnaissance aircraft capability

B. **Skilled People**

- The drilling units and all IMVs will carry specialist IAs, in addition to the regular crew complement.
- The drilling units will have two IA’s onboard for 24/7 coverage.
- The Primary IMVs will have two IA’s onboard providing 24/7 coverage.
- The Secondary IMVs will have one IA onboard.
- The IAs supporting the exploration campaign will have documented experience of having performed ice management activities associated with supporting offshore exploration.
- SIWAC will be staffed with world-class industry-acknowledged experts in weather, satellite, and Ice Synoptic analysis.
- Qualified and experienced ice observers for ice reconnaissance flights.
- IMVs will have crews who are experienced operating in ice.

C. **Appropriate Information**

A multi-layered, systematic approach is taken to provide relevant information from SIWAC with a feedback loop from the vessels using:

- Wide Area Satellite Imagery
- High Resolution Satellite Imagery
- Meteorological Buoys
- Field Observation from IMV ice reconnaissance
- Numerical Models
- Local Radar
- Vessels are outfitted with Fit for Purpose Data and Communications link
D. Work Process

A systematic approach for risk mitigation is adopted by developing effective work processes.

- Development of effective ice management strategies based on available information (Global and Local)
- Deployment of assets to deliver strategy:
  - Threat Sectors identified
  - Assess manageability of ice feature (preferably by trial breaking as this is the only way to determine manageability)
  - Appropriate management of ice feature (breaking/deflecting)
  - Primary Icebreaker deployed at an effective perimeter to reduce floes to manageable size in advance of Hazardous Ice triggering an increase in Alert Level
- Scheduled VMT meetings (Frequency Dictated by Alert levels)
- Planning/Coordination meetings with specific focus on Ice Alert Levels

VII. WELL SUSPENSION PROCEDURES

Effectiveness of the DIMP is dependent upon being able to accurately establish HT, ST and MT. ST is time taken to secure the well, disconnect and retrieve the LMRP.

As part of securing the well, well suspension procedures have been established. These procedures will be contained within the drilling unit operating procedures. Return to the drill site following exit due to the threat of Hazardous Ice is covered in Section IX.

A. Well Suspension Options

Securing and suspending the well can be accomplished by several means. The base case is to suspend the well with mechanical and/or cement plugs. This method is to be used for Ice Alert Level calculations. Should ice or well conditions develop where ST must be reduced, the following contingencies and options or combination thereof can be chosen. The option or contingency will be dependent upon well conditions, environmental conditions and (or) equipment limitations. Shell will employ the most effective suspension procedure under the specific circumstances at the time.

Relevant information associated with well suspension will be documented in the daily drilling reports. The BSEE field representative will be apprised, and relevant records will be submitted to BSEE. Potential well suspension options are listed in the following table.
<table>
<thead>
<tr>
<th>Time Required / Preference</th>
<th>Mechanical Plugging</th>
<th>Drill pipe Hang-off</th>
<th>Pull Out of Hole</th>
<th>Shearing Drill Pipe</th>
<th>Dropping String</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Provides wellbore Isolation</strong></td>
<td>Requires most time. Is the base case procedure for securement and for Ice Alert Level calculation.</td>
<td>Less time than plugging.</td>
<td>Potentially less time, depending upon position in hole.</td>
<td>Least amount of time. Stuck pipe contingency.</td>
<td>Comparable to shearing drill pipe. Contingency to cope with mechanical hoisting failure.</td>
</tr>
<tr>
<td><strong>Hang-off Sub (HOS) Required</strong></td>
<td>Yes</td>
<td>Yes (blind/shears closed)</td>
<td>Yes (blind/shears closed)</td>
<td>Yes (blind/shears closed)</td>
<td>Yes (blind/shears closed)</td>
</tr>
<tr>
<td><strong>Packers / Bridge Plug Required</strong></td>
<td>No</td>
<td>Yes (Emergency Drill Pipe Hang-off Tool)</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Potential to Leave String in Hole</strong></td>
<td>Yes, if suspended below packer.</td>
<td>Yes</td>
<td>No</td>
<td>Yes, but access to pump through sheared string is questionable.</td>
<td>String in hole but requires fishing trip and overshot to circulate.</td>
</tr>
<tr>
<td><strong>Remarks</strong></td>
<td>Mechanical plugs are preferred method in cased hole.</td>
<td>In this case, no down hole plugging has been assumed.</td>
<td>This method is acceptable in situations where casing has been run and cemented, but not drilled out yet. Pipe can be pulled and blind/shears closed without further containment.</td>
<td>Contingency for stuck pipe situation.</td>
<td>Contingency to cope with mechanical hoisting failure.</td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td>Provides complete wellbore isolation. Equipment readily available.</td>
<td>Provides wellbore isolation via blind/shear rams. Equipment readily available. Can be done in a timely manner. Leaves kill string in place for potential well control requirements.</td>
<td>Requires less time in situations where casing has been run but not drilled out, or if already out of the hole as noted above, for logging or changing the Bottom Hole Assembly.</td>
<td>Quickest way to secure the well and prepare for move-off.</td>
<td>Next to shearing, quickest way to prepare rig for move-off. Also leaves the top of the string in the hole undamaged and ready for recovery or circulating via overshot and packoff.</td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td>Takes longer. Packers require additional tripping. Cementing requires mixing/pumping time and introduces potential for contamination.</td>
<td>No down hole wellbore isolation.</td>
<td>Not a preferred method with open hole conditions because no pipe is left in the hole for potential well control methods. No down hole wellbore isolation.</td>
<td>Potential to leave a deformed pipe profile complicating fishing and circulating operations.</td>
<td>No down hole isolation is accomplished. Requires fishing trip to reestablish down hole circulation.</td>
</tr>
</tbody>
</table>
VIII. MOORING SYSTEM RECOVERY / DISCONNECTION

A. Conditions Present to Initiate Mooring System Disconnection or Recovery

This section addresses mooring disconnection / recovery operations if ice conditions have triggered an Ice Alert Level of yellow and escalated to a red. The following discussion assumes the well has been secured and all recoverable well related equipment has been retrieved and secured.

B. Disconnection / Recovery Options

Mooring System disconnection / recovery can be accomplished by several means. The base case is to recover moorings in the conventional manner. This method and the resultant MT is to be used for the determination of the Ice Alert Level. In the event conditions develop where the drilling unit must reduce MT, the selection of a specific contingency option and the execution of the procedures rests with the drilling unit Master / OIM who informs the VMT. Potential options and contingencies are listed in the table below.

Guidance Note: Conventional recovery for the Noble Discoverer refers to the disconnection of the drilling unit mooring lines from the pre-laid anchor system by an anchor handler. For the Polar Pioneer conventional recovery refers to recovery and racking of the complete anchor system

C. Mooring System Release / Recovery

<table>
<thead>
<tr>
<th></th>
<th>Conventional Mooring Recovery</th>
<th>Rig Anchor Release (RAR)</th>
<th>Running off Wires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Required / Preference</td>
<td>Requires most time. Is the base case procedure for recovery</td>
<td>Less time than conventional recovery</td>
<td>Contingency plan if RARs fail to activate.</td>
</tr>
<tr>
<td>Advantages</td>
<td>System is intact. Ready for redeployment.</td>
<td>Reduced MT</td>
<td>Allows disconnection of mooring system in event of RAR failure.</td>
</tr>
<tr>
<td>Disadvantages</td>
<td>None</td>
<td>Increased redeployment time. Requires back up equipment. Relies on actuation by acoustic release.</td>
<td>Complicates redeployment. High potential for seabed fouling. Potential to compromise the mooring system.</td>
</tr>
</tbody>
</table>

Guidance Note: The drilling units will have a RAR release command unit onboard. A second RAR release command unit will be onboard the IMV / anchor handler.

IX. MOVING ONTO OR RETURNING TO THE DRILLSITE

The authority to move on to or return to the drillsite will be issued by the Shell Wells Operations Team Lead with the concurrence of the OEMT Shell Drilling Supervisor and Rig Manager / OIM. Relevant regulatory authorities will be notified in accordance with the requirements.

A thorough reconnaissance of ice regimes in the vicinity will be conducted and hazardous features plotted prior to commencing mooring operations.
An Ice Alert Level of green, together with a favorable ice condition forecast is required before mooring commences.

Recognizing HT will be the only argument available for the Alert Level calculation before mooring, a minimum HT of 60 hours and a minimum distance of 30 miles to Hazardous Ice is required to give a reasonable period of time to set moorings and stay within Green Alert at completion of mooring.

Upon authorization by the Shell Wells Operations Team Lead, the final decision to move on to or return to the drillsite is dependent upon the drilling unit Master or OIM who is advised by the VMT. The Master / OIM and VMT will assess the various operational, weather and ice parameters with input from the drilling unit IA supported by the IMV Masters and the IAs to determine the practicality of the decision. A decision to commence mooring operations assumes a realistic expectation that the drilling unit will be able to stay on location and commence drilling operations for a productive length of time. The OEMT will be informed of all decisions as they are made.

X. TRAINING

All personnel will be made aware of their roles and responsibilities within this DIMP through a training session on each vessel. This training will also include a Table Top Exercise, which will be executed prior to beginning operations, providing exposure to and test communications and procedures of the COCP, and the DIMP. Participants at the table top exercise will include:

- Shell and Wells leadership
- Rig Crews (both Drilling and Marine Contractor staff)
- Oil Spill Response (OSR) representative
- SIWAC representatives
- BSEE Operations representatives
- IMV Masters or Senior officers
- IAs
- Alaska Logistics (Marine and Aviation) Representatives
- SIMOPS Coordinators

Observations from the Table Top Exercise will be documented.
XI. ATTACHMENTS

Attachment 1 – Extract from Critical Operations Curtailment Plan

Per Section 8 of the COCP:

Notification of the decision for curtailments to Shell, USCG and BSEE agency representatives will be made as soon as practical, but in a manner that does not interfere with the safety of the crew, environment, or vessel. All operations curtailment decisions will be documented on the Shell Daily Operations Report and conveyed to the on-site BSEE representative as they develop. Operations curtailment decisions will also be formally conveyed to BSEE on a weekly basis via the Well Activity Report and at the end of the well operations as part of the End of Operations Report. The following chart illustrates the lines of communication in the field and from the field to the shore base.

Guidance Note:

Well Suspension procedures are described in step by step detail in a document called Secure Times and Procedures contained within Shell Applications for Permit to Drill (APD) which have been submitted to BSEE under portions of 30 CFR 250 and less so under 30 CFR 550. These Secure Times and Procedures were submitted to BOEM under 30 CFR 550.213(g)

The following chart illustrates the lines of communication in the field and from the field to the shore base.
Attachment 2 – Vessel Description

“Noble Discoverer Specifications”

**Noble Discoverer Specifications**

<table>
<thead>
<tr>
<th>TYPE: DESIGN</th>
<th>Drillship - Sonat Offshore Drilling <em>Discoverer</em> Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHAPE</td>
<td>Monohull with sponsons added for ice-resistance l</td>
</tr>
<tr>
<td>SHIP BUILDERS &amp; YEAR</td>
<td>Namura Zonshno Shipyard, Osaka, Japan - hull number 355</td>
</tr>
<tr>
<td>YEAR OF HULL CONSTRUCTION</td>
<td>1965</td>
</tr>
<tr>
<td>YEAR OF CONVERSION</td>
<td>1976</td>
</tr>
<tr>
<td>DATE OF LAST DRY-DOCKING</td>
<td>2014</td>
</tr>
</tbody>
</table>

**Noble Discoverer Dimensions**

<table>
<thead>
<tr>
<th>Length</th>
<th>514 ft</th>
<th>156.7 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length Between Perpendiculars (LBP)</td>
<td>486 ft</td>
<td>148.2 m</td>
</tr>
<tr>
<td>Width</td>
<td>85 ft</td>
<td>26 m</td>
</tr>
<tr>
<td>Maximum (MAX) Height (ABOVE KEEL)</td>
<td>274 ft</td>
<td>83.7 m</td>
</tr>
<tr>
<td>Height of Derrick Above Rig Floor</td>
<td>175 ft</td>
<td>53.3 m</td>
</tr>
</tbody>
</table>

**Noble Discoverer Mooring Equipment**

Anchor pattern symmetric 8 point system. The unit is fitted with Sonat Offshore Drilling patented roller turret mooring system giving the unit the ability to maintain favorable heading without an interruption of the drilling operations.

<table>
<thead>
<tr>
<th>Anchors</th>
<th>Stevpris New Generation 7,000 kilograms (kg) each (ea) 15,400 pounds (lb) ea.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchor Lines</td>
<td>Chain Wire Combination</td>
</tr>
<tr>
<td>Size/Grade</td>
<td>2.75-in. wire 3-in. ORQ Chain</td>
</tr>
<tr>
<td>Length</td>
<td>2,750 ft (838 m) wire + 1,150 ft (351 m) chain (useable) per anchor</td>
</tr>
</tbody>
</table>

**Noble Discoverer Operating Water Depth**

Max Water Depth | 1,000 ft (305 m) with present equipment (can be outfitted to 2,500 ft [762 m])
**Drilling Ice Management Plan**

**Chukchi Sea, Alaska**

**MAX DRILLING DEPTH**

<table>
<thead>
<tr>
<th>Draw Works</th>
<th>Emisco E-2,100 - 1,600 horsepower (hp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotary</td>
<td>National C-495 with 49 ½ -in. opening</td>
</tr>
<tr>
<td>Mud Pumps</td>
<td>2 ea. Continental Emsco Model FB-1600 Triplex Mud Pumps</td>
</tr>
<tr>
<td>Derrick</td>
<td>Pyramid 170 ft. with 1,300,000 lb nominal capacity</td>
</tr>
<tr>
<td>Pipe Racking</td>
<td>BJ 3-arm system</td>
</tr>
<tr>
<td>Drill Sting Compensator</td>
<td>Shaffer 400,000 lb with 18-ft (5.5 m) stroke</td>
</tr>
<tr>
<td>Riser Tension</td>
<td>8 ea. 80,000 lb Shaffer 50-ft (15.2 m) stroke tensioners</td>
</tr>
<tr>
<td>Crown Block</td>
<td>Pyramid with 9 ea. 60-in. (1.5 m) diameter sheaves rated at 1,330,000 lb</td>
</tr>
<tr>
<td>Traveling Block</td>
<td>Continental - Emsco RA60-6</td>
</tr>
<tr>
<td>Blowout Preventer (BOP)</td>
<td>Cameron Type U 18 ¾ -in. (48 cm) x 10,000 pounds per square in. (psi)</td>
</tr>
<tr>
<td>Riser</td>
<td>Cameron RCK type, 21-in. (53 cm)</td>
</tr>
<tr>
<td>Top Drive</td>
<td>Varco TDS-3S, with GE-752 motor, 500 ton</td>
</tr>
<tr>
<td>BOP Handling</td>
<td>Hydraulic skid based system, drill floor</td>
</tr>
</tbody>
</table>

**Noble Discoverer Displacement**

| Full Load | 20,253 metric tons (mt) |
| Drilling | 18,780 mt (Drilling, max load, deep hole, deep water) |

**Noble Discoverer Draught**

| Draft at Load Line | 27 ft | 8.20 m |
| Transi   | 27 ft (fully loaded, operating , departure) | 8.20 m |
| Drill   | 25.16 ft | 7.67 m |

**Noble Discoverer Helideck**

| Maximum Helicopter Size | Sikorsky 92N |
| Fuel Storage | 2 ea. 720-gallon tanks |

**Noble Discoverer Accomodations**

| Number of Beds | 140 |
| Sewage Treatment Unit | Hamworthy ST-10 |

**Noble Discoverer Propulsion Equipment**

| Propeller | 1 ea 15 ft 7-in. (4.8 m) diameter, fixed blade |
| Propulsion Drive Unit | Marine Diesel, 6 cylinder, 2 cycle, Crosshead type |
| Horsepower | 7,200 hp @ 135 revolutions per minute (RPM) |
| Transit Speed | 8 knots |

**General Storage Capacities**

| Sack Storage Area | 934 cubic meters (m³) |
| Bulk Storage | |
| Bentonite / Barite | 180 m³ - 4 tanks |
| Bulk Cement | 180 m³ - 4 tanks |
| Liquid Mud | |
| Active | 1,200 barrels (bbl) |
| Reserve | 1,200 barrels (bbl) |
| Total | 1,200 barrels (bbl) |
| Potable Water | 1,670 bbl / 265.5 m³ (aft peak can be used as add. pot water tank) |
| Drill Water | 5,798 bbl / 921.7 m³ |
| Fuel Oil | 6,497 bbl / 1,033 m³ |

1. Sponsons designed and constructed to meet requirements of Det Norske Veritas (DNV Additional Class Notation ICE-05)
“Polar Pioneer Specifications”

POLAR PIONEER
**INTRODUCTION TO POLAR PIONEER**

- The POLAR PIONEER is a 4th-generation semi-submersible rig of the Polar (Sonat)-Hitachi Design, built in 1998 by Hitachi Zosen, Anzali, Japan.
- The rig is specially designed and constructed for operation in cold, harsh, sub-zero environments.
- The rig is classified by the Norwegian Veritas and complies with the regulations of the flag state (NND) of Norway, UK Department of Energy and UK Health and Safety Executive and international requirements of IMO/MDU Codes and SOLAS.
- POLAR PIONEER can operate in water depths from 70 m to 500 m and is equipped with 15,000 psi well control equipment. The BOP and the choke system is specially fitted for handling high temperature and high pressure wells.

**GENERAL INFORMATION**

- Port of registry: Maguro, Marshall Island
- Unit classification: Det Norske Veritas Classification A5, Mobile Class 1A Column Stabilised Unit
- Additional data notifications: CHI, HELIX, POISON M(ATA), CRANE, EL, Non-self-propelled
- Rated drilling depth: 7,600 m (25,000 ft) RMB
- Maximum water depth: 500 m
- Minimum water depth: 70 m
- Rig design: Polar (Sonat)-Hitachi
- Year of construction: 1995
- Yard: Hitachi Zosen, Anzali, Japan
- No. of thrusters: 4 each of 2,450 kW
- Total speed forward: 6 knots
- Transit speed: 6 knots
- Fuel consumption, transit: 40 tonnes/day
- Fuel consumption, drilling: 25 tonnes/day
- Total drilling variable load: 3,514 tonnes
- Total survival variable load: 3,514 tonnes
- Total transit variable load: 3,514 tonnes
- Accommodation: 110 beds
- Ballast system: Four holding/pump rooms, one in each end of the portons
- Helicopter deck: Arranged for 5.6-N and Chinook helicopter with refueling station

**STORAGE CAPACITIES**

- Crude oil: 1150 m³
- Fuel: 10 m³
- Water: 770 m³
- Active reserve liquid mud (concrete): 20263 m³
- Reserve liquid mud (concrete): 500 m³
- Riser completion fluid: 457 m³
- Low viscosity oils: 770 m³
- Bulk ballast water: 1,780 tonnes
- Ballast water: 1,000 tonnes
- Suction: 600 tonnes
- Pipelines: 2,300 tonnes
- Miscellaneous storage area: 160 m³

**MARINE AND STATION KEEPING FACILITIES**

- Power Plant: Diesel (4) 11-18.75 kW each, two separate engine rooms.
- Total power: 37,750 kW
- Power Plant: Generators (4) 11-18.75 kW each, in two separate engine rooms.
- Total power: 37,750 kW
- Emergency Power: Diesel generator 1 x MTU 13-18.75 each of 1137 kW w/ separate 440V switchboard.

**POLAR PIONEER Executive Summary**

**AUXILIARY EQUIPMENT**

- One each Barge Crane
- Cranes: Port: 30 mt; 14 m out, max. sea 3.0 m
- 15 mt@ 48 m out, max. sea 0.8 m Hz.
- One each Double BOG 4200 & 50 Tarbon Crane:
- Barge: 50 mt@ 18 m out, max. sea 2.2 m, 25 m wind
- 11.2 mt@ 96 m out, max. sea 2.0 m Hz
- Line running equipment: As per SOLA and NND
- Fire fighting equipment: As per SOLA and NND
- Boats: Two Atlantic Industries Mission TMOS-2 x 600 kW
- Watermakers: Three JWP 36-125 75 HP/day
- Sewage/Utility: Closed drain system for OBM and cutting control transport system for OBM cuttings.

**DRILLING EQUIPMENT**

- Drilling depth: 4531 ft (1382 m)
- Drilling platform: Capacity 5.5” 90 drag: 170 tons
- Capacity 4” & 5” 90 drag: 91 tons
- Capacity 9 1/2” 60 drag: 17 tons
- Water pipe density: 60 drag: 100 ft
- Drilling line: Continental 3300 hyper, 1 3/9” drilling line, 5800 lbf 16.5”, 1500 lbf 11.5”, 1500 lbf 11.5”,...
## GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Unit Name</th>
<th>POLAR PIONEER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Owner and Operator</td>
<td>Transocean Offshore Inc.</td>
</tr>
<tr>
<td>Flag/Port of registry</td>
<td>Majuro, Marshall Island</td>
</tr>
<tr>
<td>Unit classification</td>
<td>Dil Norse Veritas Classification A/S. Malters Cross 1A1-Column</td>
</tr>
<tr>
<td>Additional class notifications</td>
<td>Stabilised Unit, Drill, Helic, POSMOOR(ATA), Crane, ED, ICE T, NON-3SELF-PROPELLED</td>
</tr>
<tr>
<td>Rated drilling depth</td>
<td>7,680 m RKB</td>
</tr>
<tr>
<td>Maximum water depth</td>
<td>500 m</td>
</tr>
<tr>
<td>Minimum operating water depth</td>
<td>30 m</td>
</tr>
<tr>
<td>Rig design</td>
<td>Polar (Sonat)/Hitachi</td>
</tr>
<tr>
<td>Year of construction</td>
<td>1985</td>
</tr>
<tr>
<td>Yard</td>
<td>Hitachi Zosen, Arika, Japan</td>
</tr>
<tr>
<td>Year placed in service</td>
<td>1985</td>
</tr>
<tr>
<td>Unit shape/plant design</td>
<td>8 x columns x 2 pontoon supported semi-submersible</td>
</tr>
<tr>
<td>No. of thrusters</td>
<td>4 each of 2,459 kW</td>
</tr>
<tr>
<td>Transit speed forward</td>
<td>6 knots</td>
</tr>
<tr>
<td>Transit speed astern</td>
<td>6 knots</td>
</tr>
<tr>
<td>Positioning system (anchor, DP, combined)</td>
<td>Eight point anchor chain system, automatic thruster assisted (ATA)</td>
</tr>
<tr>
<td>Main deck width</td>
<td>76 m</td>
</tr>
<tr>
<td>Main deck length</td>
<td>200 m</td>
</tr>
<tr>
<td>Depth lead to main deck</td>
<td>41.65 m</td>
</tr>
<tr>
<td>Draughts, Drilling</td>
<td>23 m - Displacement: 46,440 tonnes</td>
</tr>
<tr>
<td>Draught, Survival</td>
<td>19 m - Displacement: 43,312 tonnes</td>
</tr>
<tr>
<td>Draught, Transit</td>
<td>9.15 m - Displacement: 32,264 tonnes</td>
</tr>
<tr>
<td>Total draught variable load, ex. anchor tension</td>
<td>3,514 tonnes</td>
</tr>
<tr>
<td>Total survival variable load</td>
<td>3,514 tonnes</td>
</tr>
<tr>
<td>Total transit variable load</td>
<td>3,514 tonnes</td>
</tr>
<tr>
<td>Maximum accommodation</td>
<td>110 people in two-men cabins</td>
</tr>
</tbody>
</table>

## ENVIRONMENTAL CRITERIA FOR OPERATION

<table>
<thead>
<tr>
<th>ENVIRONMENTAL CONDITIONS</th>
<th>SURVIVAL CONDITIONS</th>
<th>LIMITING OPERATION CONDITION DRILLING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind speed</td>
<td>55 m/s 10 min average</td>
<td>36 m/s</td>
</tr>
<tr>
<td>Wave height</td>
<td>Hwave 32 m</td>
<td>Hmax 13.9 m</td>
</tr>
<tr>
<td>Mean wave period</td>
<td>11.15 s</td>
<td>Hmax 13.9 m</td>
</tr>
<tr>
<td>Current speed</td>
<td>1.6 m/s</td>
<td>12 s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.75 m/s</td>
</tr>
</tbody>
</table>
POLAR PIONEER
Capabilities and Marine Equipment

STORAGE CAPABILITIES AND MARINE EQUIPMENT

**Storage capacities**

- Diesel oil: 1,795 m³
- Helicopter fuel: 10 m³
- Fuel consumption: 40 tonnes/day
- Fuel consumption, drilling: 25 tonnes/day
- Drilling water: 177 m³
- Potable water: 770 m³
- Annulus/Reservoir liquid mud (on deck): 302 m³/3,063 m³
- Reserve liquid mud (in pontoon): 500 m³
- Bunkertanker: 560 m³
- Bulk cement: 390 m³
- Deck storage: All mud and additives supplied in 403 m³ containers for auto-fueling
- Pipe rack area: 2530m²
- Riser rack: 2000m²
- BCP storage: 234 tonnes/250 m³
- Miscellaneous storage area: 150 m³

**Rig power plant**

Complete power system comprising of diesel-driven generator sets supplying AC and DC power. The drilling mode sufficient power are available to control and power simultaneously two mud pumps and top drive both at full load and the drawworks at half load with thrusters working to assist positioning unit and with one diesel engine generator as a standby.

**Diesel engine plant**

- 5 each diesel engines, in two engine rooms
- Make: Bergen Diesel
- Type: KVG-18, each 2.750 kW
- Total output: 13,750 kW at 720 rpm.
- Independent fuel supply to each engine and automatic engine shut down in case of lacking.

**AC - Generator**

One generator set, capable of taking the peak demand, with a second as a 10% standby.

- Quantity: 5
- Make: NEBB
- Type: WGR 900/610 kW
- At rotation speed of: 720 RPM
- Continuous output: 2,750 kW
- Output Voltage: 6,000 V

**Emergency generator**

One emergency generator set of 1137 kW complete with its own switchboard and wiring. The emergency system is completely independent of the main system and powers all emergency lighting and functions.

**SCR system**

- Number of SCR sets: 16
- Make/Type: ABB
- Maximum power: 6,840 kW
- Output Voltage: 6,000 V

**Transformer system**

- Quantity: 2
- Make/Type: National Ind
- Continuous power: 4,000 KVA
- Output Voltage: 600, 400, 220, 230 V
- Frequency: 60 Hz

**Propulsion/thrusters**

- 4 each azimuth thrusters
- Type: Larsen TNCP 105/75-260
- Output: NEBB
- Type: Kongsberg Propulsion System
- Type: Fannine GPS/WASP Navigator GP32

**Positioning System**

- Subsea Acoustic: Transponder System
- Type: Kongsberg KV-MPS 11 - Positioning System
- Type: Kongsberg Simrad HPR 850
- Type: Fannine GPS/WASP Navigator GP32

**Mooring System**

- 8 point spread, 4F1 between the anchor lines.
- 2 double Pusan, 7800 m windlass.
- 8 Anchor, type Stanbys MK8, 15 tonnes
- 8 Anchor Chains, Type K4, 84 mm, 737 tonnes breaking strength, 151 kgm, 2000 m each.
- The mooring system is thruster assisted.

**Telecommunication equipment**

- VHF - AM aeronautical radio equipment. Minimum output power 15 W, Frequency continuously selectable.
- Aeronautical Non-Directional Beacon. Minimum output power 50 W.
- Safe Compact-GMDSS station (GMDS/SSC) VHF/MF/HF.
- V-SAT, telephone/data.
- Indium Satcom-7701 Sat. telephone

**Evacuation Systems**

- Survival craft: UMSO Scanaberg A/S
- Type: 28 MCR & 28 MCF - Fire protected
- Quantity: 2
- Capacity persons: 2 x 50 / 2 x 90
- Life raft: Viking KF
- Number on board: 6
- Capacity each: 20
- Rescue boat: 2

**Safety Equipment**

The unit is equipped with safety equipment according to IMO Code, and Norwegian Regulations.

**Firefighting Equipment**

The unit is equipped with the fire fighting equipment according to IMO Code and Norwegian Regulations.

**Fire and gas detection Equipment**

The unit is equipped with the fire and gas detection equipment according to IMO Code and Norwegian Regulations.
AUXILIARY EQUIPMENT

Revolving cranes

One each Braathens Crane
Port: 30 mt @ 14 m outlay, max. sea 2.0 m
15 mt @ 40 m outlay, max. sea 0.5 m

One each Liebherr BCS 420 - 50 Lronic Crane
SB: 50 mt @ 18 m outlay, max. sea 2.2 m
11.2 mt @ 30 m outlay, max. sea 1.0 m

The cranes are fitted with instrumentation, safety devices and alarms according to Norwegian regulations.

Overhead deck cranes for pipe handling in accordance with Norwegian Regulations

3 each Pipe Rack Overhead Crane for tubular handling. Make: Miko, Cap: 20 tonnes SWL
Equipped with lifting arrangements.
1 each Riser Rack Overhead Crane for Riser handling. Make: Miko, Cap: 23 tonnes SWL

Pneumatic winches

Make: Atlas Copco
Type: A516
Capacity in Tonnes: 3.25
Wire diameter in mm: 19
No. on drillfloor: 1
No. on center deck: 4
No. in tension system: 8
No. in derrick: 1
On top of BOP crane: 1
Make: Ingersoll Rand
Type: FA5
Capacity in Tonnes: 5
No. on drillfloor: 2

‘Man-riding’ winches

Satellite NIPQ requirement for man-riding winches.
Make: Vestvold Engineering A/S
Locations: 2 each on Drill Floor
2 each on Center Deck

Auxiliary machinery

3 each Water maker, Cap: 75 m³/day total
2 each, Surface CH4-90, Steam generators, 13,000 kg/hr
3 each Rig air compressors and 2 each bulk air compressors
Cap: each, 21.5 m³/min at 3.6 bar pressure

Winterization for operation in Harsh Environmental Conditions

All escape vessels are electrically heated. The Drill Floor is electrically heated.

Drillstring is protected by a 6-spot heater, each with cap of 35 kW, total output 210 kW
Cellar Deck is covered with an insulated cover.

Crown block

Make: Maritime Hydraulics
Type: CRJ 270-35
Capacity: 265 mt
Max. load hydraulics: 453 mt

Active heave compensator

Make: Maritime Hydraulics
Type: Hydraulic
Stroke: 7 m
Capacity: max. hydraulic force + 15 mt

Rotary table

Type: CONT. ENSCO T46H.65 Maximum opening: 1,257.3 (49.12"
Rated capacity in mt: 500

Driven by an independent electric motor,
Drilling Ice Management Plan
Chukchi Sea, Alaska

POLAR PIONEER
Drilling Equipment

- Well head Connector, Venoco H4
- Two double “Hydruladder” rams containing four ram type preventers with MPL ram locks, of which three preventers for drill pipe and one with single-piece shearing bridles rams.
- Acoustic control System
- 1000 litres subsea accumulators

Pipe rams available
Rams available to dress BOP with shearblind ram and variable rams to suit ranges from 3½” to 7 5/8” OD. Ramps dressed for Sour service.

Lower Marine Riser Package
[From bottom to top]
- Hydraulic connector, Make Conversion Mod 70, Size 18-3/4”, WIP 46600 (10,000 psi)
- Bag type Preventer, Make Hydril, Type “GM”, Size 16” OD, WIP 46700 (10,000 psi)
- Flex joint, Make Oil State, “Type Flex Joint Assy” 16-3/4”

Choke and kill valves
4 each: OW DF. 3-1/16”, WIP 46400 (15,000 psi)

BOP stack handling system
The BOP is moved by sliding arrangement from storage area to micro hold and under the rotary table.

Marine riser
Rig equipped with marine riser for 455 meter depth
Make: Hughes Offshore
Model: HMF
- 21” OD x 211D
- 3¼” ID kill and choke lines, WIP 15,000 psi,
- 4¼” booster line, WIP 3000 psi

Telescopic joint
2 ea Hughes Offshore HMF, telescoping joint, double seats, support ring for tensioning lines and 3½” bore kill and choke lobbies, and booster line with WIP corresponding to BOP.

Hydraulic loading of inner barrel

Buoyancy modules
Make: Eckofloat Type RG 24
Quantity: elements for 15 joints

BOP control System
Valve hydraulic control system with pilot controlled subsea valves electric/magnetic powerpack, 20 x 15 gal bottles, total capacity 2835 litres surface accumulators, 2 remote control stations and complete emergency electric and pneumatic power back-up of all control functions

Acoustic emergency BOP control system
An acoustic emergency control system, type Simrad HPR 30S, with six functions to be used in event the BOP functions are inoperable due to failure of the hydraulic control system. Description of functions: Controls, LMRP, Connector, 3 Pipe Rangs, Shear Rangs.

Choke manifold
WOR choke manifold, rated to 15,000 psi, with two Cameron remote operated chokes and 1 Cameron manually operate choke. The choke manifold is rated for H2S service.
Riser tensioners
One marine riser tensioning system of 8 eight tensioners w/ control panel, air receivers, sheaves and wireline to give a total strike of 15,25 m. The system is independent, having its own electrically powered compressors and chemical or refrigeration air drying unit. 3 each, make Wichman. Capacity each: 45 ft. (100 kips).
Maximum cylinder stroke: 3,01 m. Total wireline travel 15,2 m
Wireline size inch, 1-3/4.

Guideline and Podline system
Guideline tensioning system complete with control panel, air receivers, sheaves and 3/4" wirelines to give a total of 12 m line travel, having a capacity of 6.8 for each with line storage drums behind tensioners.
4 + 2 each, make Wichman. Capacity each KN 71 (16 kips)

Mud pumps
3 each mud pumps of 5000 psi WP. Cont. Ensco F7600 7x12" with 2 x DC motors. Each pump rated to 3472 kW continuous service. The mud pumps are fed by 3 each supercharge pumps, each of 30 kW

Mud storage capacity
2 each active mud tanks, each of 80 m³, total 160 m³ on deck.
4 each reserve mud tanks total of 220 m³ on deck.
2 each mud storage tanks, total of 430 m³ in column.
1 each base oil tanks of 770 m³ in pontoon.
2 each brine tanks, total of 750 m³ in pontoon.

Mud mixing system
STEP Offshore Mud Mixing System
3 each mud mixing pumps, 75 kW each
2 each sump mixing stations with a total of 3 hoppers.
The hoppers are served by 3 surge tanks, two of 23 m³ and one of 14 m³ capacity.

Mud treatment system
5 each Trista VMS 100 Shale Shakers, total flowrate 4.5 m³/min.
16 cone Denver deslimer system, fed by 75 kW supply pump. Cap.
each 1,400 gpm.
1 each Blount degasser. Cap. 3765 m³/h.
1 each Swaco mudgas separator an 8" npt dam vent line to top of
derrick.
2 each mud centrifuges.

Cementing system
Twin Helifluid Electric powered cementing unit for 1035 bar
15,000 psi service.
Twin batch tanks 1.0 m³ each. Recirculation Averaging Mixer with
capacity of 1.27 m³/min (8 BPM) depending on slurry density.

Oil Based Mud arrangement
2 each removable conveyor screw are installed for transportation of
cuttings from shaker into containment tanks. Space available on
deck for installation of 3rd party Cutting Containment System

Radar
2 each Furuno FAR-2127BB
POLAR PIONEER
Hoisting Data

DERRICK HEIGHT INTERFACE REQUIREMENTS

TOP DRIVE (Make): Maritime Hydraulic
TOP DRIVE (Type): DDM 650 HY
All measurements in meters.
### RIG COMPONENT HOISTING CHARACTERISTICS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>STATIC CAPACITY</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Derrick capacity (mt)</td>
<td>Gross</td>
<td>465</td>
</tr>
<tr>
<td></td>
<td>Hook load capacity (mt)</td>
<td>Rated</td>
<td>460</td>
</tr>
<tr>
<td></td>
<td>With max. number of lines</td>
<td>Rated</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Crown block capacity</td>
<td>Rated</td>
<td>580</td>
</tr>
<tr>
<td>3</td>
<td>Traveling block capacity</td>
<td>Rated</td>
<td>560</td>
</tr>
<tr>
<td>4</td>
<td>Hook block</td>
<td>Rated</td>
<td>NA</td>
</tr>
<tr>
<td>5</td>
<td>Swivel head</td>
<td>Rated</td>
<td>NA</td>
</tr>
<tr>
<td>6</td>
<td>Top drive</td>
<td>Rated</td>
<td>580</td>
</tr>
<tr>
<td>7</td>
<td>Anchor platform capacity</td>
<td>Rated (DP DC)</td>
<td>6500 m</td>
</tr>
<tr>
<td>7</td>
<td>Rig floor setback</td>
<td>Rated</td>
<td>265</td>
</tr>
<tr>
<td>8</td>
<td>Rotary casing capacity</td>
<td>Rated</td>
<td>880</td>
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<tr>
<td>9</td>
<td>Drawworks: main drum</td>
<td>Rated</td>
<td>580</td>
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<tr>
<td>10</td>
<td>Drilling line</td>
<td>Rated</td>
<td>97.6</td>
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<tr>
<td>11</td>
<td>Dead line anchor capacity</td>
<td>Rated</td>
<td>44.6</td>
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<tr>
<td></td>
<td>Max. load that rig can handle</td>
<td></td>
<td>463</td>
</tr>
<tr>
<td></td>
<td>Due to the weakest equipment</td>
<td></td>
<td>463</td>
</tr>
<tr>
<td></td>
<td>(to be specified)</td>
<td></td>
<td>Using 12 lines and with Safety factor 2 for drilling.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Online</td>
</tr>
</tbody>
</table>
“Nordica” Specifications

VESEL SPECIFICATION

NORDICA

Our expertise in handling vessels under the Norwegian, Finnish and Nordica – are well-equipped and suited for demanding offshore tasks which requires a high degree of maneuverability and accuracy. All three are excellent vessels for ice management tasks in Arctic areas.

All of the operations do not, however, take place in the North Sea, Baltic, Barents Sea regions. Vessels sailing under the Arctia flag have also worked in the Gulf of Mexico, West Africa and in the Mediterranean Sea.

ARCTIA OFFSHORE – POWER AT SEA

Our expertise is founded on an experienced staff and specialized vessels. These two are a strong foundation that enables us to offer the best services to our customers.

Arctica Offshore is a part of Arctica Shipping Group, a specialized shipping company offering oil shipping, ice management, offshore service and marine construction services to various oil companies and conventional oilfield majors. We also offer oil spill response and fire services.

Arctica Shipping’s fleet consists of vessels ranging from small tugs to multi-purpose icebreakers:

- 16 tractor icebreakers
- 6 multipurpose icebreakers
- 11 tugs.
### MSV NORDICA SHORT VESSEL DESCRIPTION

The Nordica is a multi-purpose vessel based on a modified icebreaker design with diesel-electric propulsion. The vessel is specially designed for a wide range of offshore-related work.

The vessel is designed to carry out offshore installation tasks and can be equipped for laying pipes, cables, and umbilicals. The optional 1607 m³ crane is well suited for deploying trenching machines and slurry. Its large ballast and strong winches make the Nordica ideal for ploughing operations and towing.

With the main components such as engines and cranes already installed, a change of function can be achieved rapidly. Nordica meets all the stringent rules and regulations for offshore work.

### ICEBREAKING

The Nordica is part of Arctia Offshore’s icebreaker fleet, one of the most powerful in the world. Icebreaking services include ice management, assistance, towing, securing vessels, traffic safety, and traffic control for vessels proceeding in icy conditions.

Nordica’s icebreaking capacity is excellent. The 15 kWe diesel generators produce power for two Astra master stern thrusters to make the vessel easily manoeuvrable. The Nordica is excellent for DP work, all kinds of marine operations and in harsh icy conditions for towing merchant vessels.

### CAPACITIES AND CONSUMABLES

- **Fuel Oil (Diesel Fuel)**: 1650 m³ HFO
- **Lubricating Oil**: 83 m³
- **Fresh Water**: 400 m³
- **Waste Ballast**: 2300 m³
- **FIR Making/Capacity**: 25 T / day
- **Consumables, 84 m³ Draught**: 1100 m³
- **Fuel Consumption, 13 knots**: 3.2 T / day
- **Fuel Consumption, 10 knots**: 2.7 T / day
- **Fuel Consumption, DP**: 1.5 T / day
- **Duration, 10 knots**: 145 hours
- **Duration, 11 knot**: 129 hours
- **Duration at DP depend on distance and speed of transit to location**

### GENERATORS (MAIN)

<table>
<thead>
<tr>
<th>Number</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make</td>
<td>ABB Stromberg Disaster</td>
</tr>
<tr>
<td>Type</td>
<td>2 x 520 kW / 400 V</td>
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<tr>
<td>Rating</td>
<td>634 kVA / 400 V / 50 Hz</td>
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### GENERATORS (HARBOUR SET)

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<thead>
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<tbody>
<tr>
<td>Make</td>
<td>Wartsila</td>
</tr>
<tr>
<td>Type</td>
<td>626 HH / 4416 kW</td>
</tr>
<tr>
<td>Rating</td>
<td>710 kVA / 1000 rpm</td>
</tr>
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### GENERATORS (EMERGENCY)

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<tbody>
<tr>
<td>Make</td>
<td>Caterpillar</td>
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<tr>
<td>Type</td>
<td>3412</td>
</tr>
<tr>
<td>Rating</td>
<td>303 kW / 1300 rpm / 400 V / 50 Hz</td>
</tr>
</tbody>
</table>

### BOLLARD PULL

- **Bollard Pull**: 284 T

### ROLL REDUCTION

- **Roll Reduction Tank**: 720 m³
Drilling Ice Management Plan

Chukchi Sea, Alaska

DYNAMIC POSITIONING

The vessel is equipped with a Norsok X-POS DP-22 dynamic positioning system. This vessel also has an integrated redundant (juliet control system) in addition to the GyRo ANV control class (Dynamic Positioning with Automatic Redundancy). This includes the DP system itself and its power supply, plus the vessel's general auxiliaries and emergency power supply and the mode operation, both in normal and warning / alarm states.

DY NAMIC POSIT IONING

The vessel is equipped with a Kongsberg X-POS DP-22 dynamic positioning system. This vessel also has an integrated redundant (juliet control system) in addition to the GyRo ANV control class (Dynamic Positioning with Automatic Redundancy). This includes the DP system itself and its power supply, plus the vessel's general auxiliaries and emergency power supply and the mode operation, both in normal and warning / alarm states.

BRIDGE EQUIPMENT

The vessel is equipped with a Norsok X-POS DP-22 dynamic positioning system. This vessel also has an integrated redundant (juliet control system) in addition to the GyRo ANV control class (Dynamic Positioning with Automatic Redundancy). This includes the DP system itself and its power supply, plus the vessel's general auxiliaries and emergency power supply and the mode operation, both in normal and warning / alarm states.

INTERNAL COMMUNICATION SYSTEM

The telephone system consists of an automatic exchange and phone sets. In addition to the land lines there are mobile cellular and ships satellite communication system connected to the FAAS. All cabins fitted with telephone.

NET: The following numbers are subject to change depending upon current project and location. 4 pcs satellite telephone lines available for Project / Client Radio / TV cable network, radio / TV cable network, transmits terrestrial radio / TV broadcasts as well as satellite broadcasts, which are further distributed to the ship’s cable network and TV sets.

DATA NET (CLIENT)

The Data Network is a CAT 5, TV 700 TX Ethernet. The network is connected to the Norsat Ku band communication system onboard. May change between projects.

THE NETWORK HAS OUTLETS ON THE FOLLOWING LOCATIONS ONBOARD

Bridge
Operation Center 4th Bridge deck
Conference Room 2nd Bridge deck
Owners cabins
Rt Deck
Hospital 2nd Bridge deck

MSV NORDICA

DP AND AUTOMATION HARDWARE

Type (DP)
Kongsberg X-POS DP-22 (installed 2009)
Operator stations (OD): 2 pcs
Dual redundant controller: 1 pc (one cabinet with a separate controller)
Integrated juliet (JUL) 1 pc (two independent control - controllers)
Process & well stations (FS): 8 pcs (for thrusters and power propulsion plant)
Network Distribution Units: 6 pcs
Type (Automation): Kongsberg X-Channel (installed 2009)
Operator stations: 5 pcs
Automation / X-Channel stations are part of the K-POS system

REFERENCE SYSTEMS / EQUIPMENTS

The DP system is supported by the following reference systems:
Hydroacoustic: 1 pc Kongsberg Hyper 500
Satellite: 1 pc Kongsberg ITRK M15/50
Satellite positioning: 3 pcs Kongsberg DSS-type receivers
4.5 Differential signal: EALA, Innvarinat (SIP, Otzono) high precision connection possible upon separate agreement
Arteks: 1 pc NVR 4 (oil explosion proof type)
Fathometer: 1 pc Fathometer optional
Vertical Reference: 3 pcs Kongsberg MRU-2 and MRU-3 types
Gyro: 3 pcs NTS (Delfin Elos, Optilux Gyros)
Ais: 2 pcs GILL Ultrasonic wind sensors

MAIN OPERATING MODES

Juxtapose: Mode
Mixed Juxtapose / Auto Mode
Manual Positioning using the three-axis joystick: Mode
Selecting any of the three degrees of vessel movement, as normal and / or auto
Auto Heading Mode
Selecting vessel heading at auto control
Auto Reception Mode
Station keeping at selected heading and position
Follow Target Mode
Automatic following of icing target
Auto Track: low speed: Mode
Track keeping in low speed
Auto Track: high speed: Mode
Track keeping in medium or high speed
Alongsips: external Force
Manual input of force in horizons by the joystick
Compensation by joystick

COMPUTING

GNSS - A3 radio station
Telifon 34492 on Deck
Inmarsat Fleet 77
Aeronaut VHF (fixed + portable)
Additional VHF / UHF radios
SEARCHLIGHT
The following Mariner remote controlled searchlights are provided:
2 x 500,000 W (25m - dp)
3 x 100,000 W (50m - dp)

July, 2014
Drilling Ice Management Plan

Shell Gulf of Mexico Inc.

July, 2014

Drilling Ice Management Plan

Chukchi Sea, Alaska

MSV NORDICA

WINCHING CAPACITIES

DECK LOADING

Deck Area

approx. 7100 m² (Deck loading area)

Capacity

1075 m³ (Deflated loading area)

ANCHOR HANDLING DRUM

First Layer

Outmost Layer

Nákup

Approx. 7100 m²

1075 m³

Type

TAW 10000 / 3000E

Drive

Babbie, 2 DC motors

(1250 kN)

Pay-out/m.speed

Steps from 0 to max speed

Cable-layers

2, for 84 mm Ø and link chain

1 ex. work winch

a) At low gear starting pull 2 min.

3750 kN

1750 kN

Nominal load 11

1000 kN

1400 kN

At speed

0-5 m/min

0-17 m/min

Maximum Speed

16 m/min

20 m/min

At break

1325 kN

625 kN

Safety Clutch

68 m/min

140 m/min

Max speed

2.1 knots

4.5 knots

b) At high gear starting pull 2 min.

9075 kN

7750 kN

Nominal load 11

1325 kN

625 kN

At speed

0.15 m/min

0.38 m/min

Maximum Speed

40 m/min

85 m/min

At break

1325 kN

7750 kN

Safety Clutch

144 m/min

314 m/min

Max speed

4.7 knots

10 knots

c) Bend Brake static holding load

4500 kN

2118 kN

TOWING

TOWING DRUM

First Layer

Outmost Layer

3150 mm

2577 mm

a) At low gear starting pull

2750 kN

1800 kN

Nominal load 11

3000 kN

1400 kN

At speed

0.6 m/min

0.17 m/min

Maximum Speed

18 m/min

36 m/min

At load

1025 kN

660 kN

Safety Clutch

65 m/min

113 m/min

Max speed

2.1 knots

4.3 knots

b) At high gear starting pull

9075 kN

2150 kN

Nominal load 11

1325 kN

625 kN

At speed

0.15 m/min

0.38 m/min

Maximum Speed

40 m/min

85 m/min

At load

1325 kN

500 kN

Safety Clutch

144 m/min

296 m/min

Max speed

4.7 knots

3.6 knots

c) Bend Brake static holding load

4500 kN

2118 kN

ACCOMMODATION

Total Accommodation: 77 Persons incl. crew

Day Room / Mess for crew:

Day Room: 5th Bridge-deck

Meeting and coffee shop: Upper deck

Laundry Room: 2nd deck

2 laundry centers on different decks

Gymnasium: 5th Bridge-deck

Sauna: 2nd deck

Eating: Upper deck

Operation Center: 4th Bridge-deck

Silicoe Stor: 5th Bridge-deck

Client Office / Conference Room: 1st / 2nd Office

Reception (deck office): Upper deck

Hospital: 2nd Bridge-deck

ARCTIA OFFSHORE

NORDICA
**MSV NORDICA**

**SURVEY FACILITIES**
The MSV NORDICA has no permanent ROV system on board, but it does have the capability for an ROV system should the project require it.

**MANNING**

<table>
<thead>
<tr>
<th>Role</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master</td>
<td>1</td>
</tr>
<tr>
<td>Chief Officer / CAPT</td>
<td>1</td>
</tr>
<tr>
<td>First Officer / OIC p</td>
<td>1</td>
</tr>
<tr>
<td>Second Officer / OIC p</td>
<td>2</td>
</tr>
<tr>
<td>3rd Engineer</td>
<td>1</td>
</tr>
<tr>
<td>4th Engineer</td>
<td>2</td>
</tr>
<tr>
<td>Electrical Engineer</td>
<td>1</td>
</tr>
<tr>
<td>Electrician</td>
<td>1</td>
</tr>
<tr>
<td>Boatswain</td>
<td>1</td>
</tr>
<tr>
<td>Deck Steward</td>
<td>2</td>
</tr>
<tr>
<td>Engine Revisor</td>
<td>2</td>
</tr>
<tr>
<td>Motorioin</td>
<td>1</td>
</tr>
<tr>
<td>Cook</td>
<td>1</td>
</tr>
<tr>
<td>2nd Cook</td>
<td>2</td>
</tr>
<tr>
<td>Catering &amp; trimmers</td>
<td>3</td>
</tr>
<tr>
<td>Crane Tech.</td>
<td>1</td>
</tr>
<tr>
<td>Crane ops.</td>
<td>2</td>
</tr>
</tbody>
</table>

Total Marine Crew about 27 persons, however this may change between projects.

**LIFE SAVING, FIRE ALARM AND RESCUE EQUIPMENT**

<table>
<thead>
<tr>
<th>Lifeboat</th>
<th>Type</th>
<th>Dimensions</th>
<th>Weight excluding equipment</th>
<th>Engine</th>
<th>Speed</th>
<th>Regulation</th>
<th>Dimensions</th>
<th>Weight excluding equipment</th>
<th>Engine</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 pcs</td>
<td>80 persons each</td>
<td>7.9 x 3.7 m / draught 1.22 m</td>
<td>4700 kg</td>
<td>525 hp</td>
<td>21 knots</td>
<td>UL-SO</td>
<td>5.7 x 2.72 m / draught 1.20 m</td>
<td>2300 kg</td>
<td>36 hp</td>
<td></td>
</tr>
</tbody>
</table>

Details believed to be correct but not guaranteed.

---

**“Fennica” Specifications**

**VESSEL SPECIFICATION**

[Image of the Fennica vessel]

*Arctia Offshore*
ARCTIA OFFSHORE - POWER AT SEA

Shell Gulf of Mexico Inc.

Drilling Ice Management Plan
Chukchi Sea, Alaska

July, 2014

ARCTIA OFFSHORE - POWER AT SEA

Global system multipurpose icebreakers - Fennica, Fennica and Tonsa - are well-equipped and suited for demanding work which requires a high degree of manoeuvrability and accuracy. All three are seawater vessels for ice management tasks in arctic areas.

All of the operations do not, however, take place in the North Sea, Baltic Sea or arctic regions. Vessels sailing under the Arctica flag have also worked in the Gulf of Mexico, West Africa and in the Mediterranean Sea.

MSV FENNICA

MSV Fennica is a multifunctional vessel based on a modified icebreaker design with diesel-electric propulsion. The vessel is specially designed for a wide range of offshore related work.

The vessel is designed to carry out offshore installation tasks and can be equipped for laying pipes, cables and umbilicals. The platform 120 T SWL, a feature well suited for deploying three-man teams and equipment. The large ballast holds and strong winches make the Fennica ideal for ploughing operations and towing.

With the main components such as winches, cranes and 2 Winch already installed, a charge of functions can be achieved rapidly. Fennica meets all the stringent rules and regulations for offshore work.

ICEREAKING

The Fennica is a part of Arctica’s offshore icebreaker fleet, one of the most powerful in the world. Icebreaking services include ice management, assistance, towing, securing vessel traffic safety, and traffic control for vessels proceeding in icy conditions.

Fennica's icebreaking capability is excellent. The 15 MW diesel-generators produce power for two 50kW motor driven thrusters to make the vessel easily manoeuvrable. The Fennica is excellent for DP work, all kinds of marine operations and in harsh ice conditions for towing merchant vessels.

VESSLE DETAILS

IMO No: 9643615
Call Sign: OAGD
Type of Vessel: Icebreaker & Multipurpose Support
Flag State: Finland
Port of Registry: Helsinki
Owners: Arctica offshore
Built: 1990
Lightweight: 7,055 T
Draught (Approach) 4.800 T
Displacement: 12,900 T
LWL: 116.9 m
LBP: 56.7 m
Breadth Moulded: 24.0 m
Depth Moulded: 12.5 m
Draught (Stadning): 8.4 m

CLASSIFICATION

DIN: 141 POLARIC Icebreaker Top Supply Vessel
Hullcode: ST HEIKK ERIK ED SYMPHONI

CAPACITIES AND CONSUMABLES

Fuel Oil (Diesel Fuel) approx. 1500 mt HFO approx 817 mt UO
Lubricating Oil approx. 80 mt
Fresh Water approx. 400 m³
Water Ballast approx. 2100 m³
Ice Making Capacity approx. 15 T/ day
Consumables / 34 Kt Draught:
Type of Fuel (Bunker Fuel) HFO / DO
Fuel Consumption / 34 knots: 10 T / day
Fuel Consumption / 11 knots: 30 T / day
Fuel Consumption / 9 T: 15 T / day
Duration / 34 knots: 42 days
Duration / 11 knots: 57 days
Duration / 3 knots: 67 days
Duration times may depend on distance and speed of transit, to location.
Propulsion

Power: 15 V/32 / 6000 kW Wartsila Vasa x 2
12 V/32 / 4000kW Wartsila Vasa x 2

Propeller Type: Fixed pitch, variable rpm

B Prop Motor: 2

Type: 2 pcs ARB Stromberg Drives

Bow Thrusters

Number: 3
Make: Donaldson
Type: FU-40UTC-225D
Power: 150 kW
Propeller Type: Variable Pitch

Switchboards

Make: ARB distribution
Type: 6.3 kV proof GDRPC 2004
Transformers: 2 x 2000kVA 6000 / 400 V 50 Hz

Generator (Main)

Number: 4
Make: ARB Stromberg Drives
Type: 2 x 950 1200 hp
2 x 950 900 hp
Rating: 6 233 kW / 6 362 kW / 750 rpm

Generator (Harbour Set)

Number: 1
Make: Wartsila
Type: VA-SA 4K22
Rating: 780 kW / 1000 rpm

Generator (Emergency)

Number: 1
Make: Canpelle
Type: 3400
Rating: 3600kW / 3600 rpm / 400 x 50 Hz

Bollard Pull

Bollard pull / Aquamarine: About 230 tonnes

Roll Reduction

Inter-Act: 720 m³

Dynamic Positioning

The vessel is equipped with a Kongsberg K-POS DP-22 dynamic positioning system.

The vessel also has an integrated redundant joystick control system. Classification’s 3DAR under the Dynamic Positioning with automatic (drifting). This includes the DP system itself and its peripheral supply plus the vessel’s general switchboard and emergency power supply and the mode operation, both in normal and emergency / standby.

Msv Fennica

EN-300 AUTOMATION HARDWARE

Type (DP): Kongsberg K-POS DP-22 (Installed 2009)
Operator stations (OS): 2 pcs
Dual redundant controller (DRC): 1 pc (with own independent relay controller)
Redundant joystick (JIC): 1 pc (with own independent relay controller)
Network Distribution Units (NDU): 8 pcs (for thruster and power/propulsion plant)
Type (Automation): Kongsberg K-2 (Installed 2009)
Operator Stations: 5 pcs
Automation / E-Chief stations are part of the K-POS system

REFERENCE SYSTEMS / EQUIPMENTS

The DP system is supported by the following reference systems:

Hydro Acoustic: 1 pc Kongsberg UA 7200
Towframe: 1 pc Kongsberg UWA 3700
Seaweed positioning: 3 pcs Kongsberg DMS (type receivers)
4.5 Differential signals: HHA, Intermeccanica, SPIT, OKIhara
High-precision connections possible: upon separate agreement
Antennas: 1 pc MR-4, 1 pc M-5, 1 pc M-5 (support而不 specifically)
Microphones: 1 pc far Iman, 1 pc micros
Kongsberg MRU2 and MRU5 types:
Gyro: 3 pcs class0 Gyro (Gyro Optic Gyro)
Anemometers: 2 pcs (LV) 0-20 m/s wind sensors

MAIN OPERATING MODES

Joystick Mode: Manual Positioning using the three-axis joystick
Auto Mode: Selecting any of the three degrees of vessel movement, as manual and/or auto
Auto Heading Mode: Automatic following of heading target
Auto Position Mode: Station keeping at selected heading and position
Follow Target Mode: Selecting vessel heading at auto control
Auto Track (low speed) Mode: Track keeping in medium or high speed
Auto Track (high speed) Mode: Track keeping in medium or high speed
Alingmats: External Force: Manual input of force to the joystick
Compensation: by joystick
Drilling Ice Management Plan

Chukchi Sea, Alaska

BRIDGE EQUIPMENT

The vessel is installed with a navigation system equipped with
Multi-Sensor radar and positioning system.
Type approved Dual ECDIS system, ECDIS planning station.

SYSTEM PRODUCES:
Flexible course planning, steering and monitoring.
Continuous calculations of own position and display on ECDIS
Continuous target tracking by radar and AIS
Continuous target presentation by ECDIS

EXTERNAL COMMUNICATION SYSTEM

Emergency Position Indicating Radio Beacons (EPIRB)
3 pcs + VHF portable 1 pc.
Helicopter Communication, fixed
2 pcs aviation VHF
Helicopter control Portable VHF ACR
2 pcs
Distress Transponders
4 pcs 9 GHz
2 on the bridge
2 on the helicopter
EMR
3 pcs

COMPRESSORS:
GMDSS - 64 radio stations
Telex/TELNET - 2 on Dual board
Infrared Ring - 77
Aviation VHF (fixed + portable)
Additional VHF/VHF radios

SEARCHLIGHTS:
The following Xenon remote controlled search lights are provided:
3 x 1000 W (365,000)
3 x 1000 W (365,000)
3 x 1000 W (365,000)

INTERNAL COMMUNICATION SYSTEM

AUTOMATIC TELEPHONE SYSTEM

The telephone system consists of an automatic exchange and phone sets.
In addition to the land lines there are intercom audible and visual communication systems connected to the radio. All cabins fitted with telephones.

+11 123 456 789
TOD/TOC
GSM: +356 401 123 456
GSM: +356 401 123 456
VSAT: +356 30 602 7301
VSAT: +356 30 602 7301
SAT 3: +356 30 602 4511
SAT 3: +356 30 602 4511

DATA NET (CLIENT)

The Data Network is a cat. 5/1000TB Ethernet.
The network is connected to the VSAT Satellite communication system onboard.
(May change between projects)

THE NETWORK HAS OUTLETS ON THE FOLLOWING LOCATIONS ONBOARD:

Bridge
Operation Center
Conference Room
2nd deck

Owner’s cabins
4th deck

Aft Deck
1st deck

Hospital
2nd deck

MSV FENNICA

HEL DECK

Deckcock, ‘O’ Valve
19 in. H.P.T.
Rated
Super Rance 11, or similar

MPS
1 pcs, American MPS 100

DECK LAYOUT

Sheaf, lav.
2 pcs

batches (30 mm 60 mm 95 mm)

Air on Deck
19 connecting points
300 m³/hr, 7 bar

Air Receiver
1000 L

Sea and Fresh Water
4 connecting points
40°C/7.56 Bar

M13 Panel Outlets
2 pcs 50 A
4 pcs 25 A
8 pcs 15 A
6 pcs 10 A
2 pcs 20 A

ELECTRICITY ON DECK

Power Outlets 400 V (3x100 V) 50 Hz, rated at 1100 kW
2 pcs 10 A
7 pcs 125 A
2 pcs 32 A
4 pcs 63 A
2 pcs 320 A
(Additional NA-set available, output 440 V, 60 Hz 72 x 1000 A, rated at 320 VA)

Power Outlets 230 V (3x100 V) 50 Hz, rated at 40 kW
6 pcs 10 A (2 ph)
2 pcs 32 A (3 ph)
Drilling Ice Management Plan

Chukchi Sea, Alaska

DECK CRANES

MAIN CRANE
Manufacturer: HYDRAULIT AGA
Main hook: 30 T Double fall / 11 m radius
Wire Length: 310 m
Working depth: approx. 350 m / Single fall
Approx. 180 m / Double fall
Main Size: 32 m

SECONDARY CRANE
Manufacturer: Maag Cranes
Main hook: 5,7 T / 15 m
Wire Length: 100 m
Wire Size: 22 mm
Drum Capacity: 100 m

A FRAME (OPTIONAL)
Safe Working Load: 120 T
Clearance between legs: 12 m
Height: 15 m
Working Depth: approx. 300 m

WINCHING CAPACITIES

DECK LOADING

Deck Area: approx. 1100 m²
Capacity: 10 T / m² (defined loading area)

ANCHOR HANGING DRUM

Maker: Aquanor Living
Type: TAIK 3000 / 2000E
Drive: Electric, 2 DC motors each 225 kW
Reel Out Speed: Steps from 0 to max speed
Cable武数: 2, for 64 mm Ø stud link chain:
1 on each drum

First Layer Outmost Layer

a) At low gear stalling pull 2 min: 3700 kN 1751 kN
Nominal load 1T: 3000 kN 1405 kN
At speed: 0.8 m / min 0.17 m / min
Maximum Speed: 18 m / min 38 m / min
At load: 1525 kN 620 kN
Safety Clutch: 66 m / min 540 m / min
Max Speed: 2.1 knots 4.5 knots

b) At high gear stalling pull 2 min: 1656 kN 779 kN
Nominal load 1T: 1575 kN 629 kN
At speed: 0.16 m / min 0.38 m / min
Maximum Speed: 40 m / min 88 m / min
At load: 585 kN 275 kN
Safety Clutch: 148 m / min 314 m / min
Max Speed: 4.7 knots 10 knots

TOWING

Towing in astern tension mode or with brake engaged
Interfaced to DP

TOWING DRUM

First Layer Outmost Layer

TOWING DRUM: 1283 mm 2010 mm

a) At low gear stalling pull: 3700 kN 1751 kN
Nominal load 1T: 3000 kN 1405 kN
At speed: 0.8 m / min 0.17 m / min
Maximum Speed: 18 m / min 38 m / min
At load: 1525 kN 620 kN
Safety Clutch: 66 m / min 540 m / min
Max speed: 2.1 knots 4.5 knots

b) At high gear stalling pull: 1656 kN 779 kN
Nominal load 1T: 1575 kN 629 kN
At speed: 0.16 m / min 0.38 m / min
Maximum Speed: 40 m / min 88 m / min
At load: 585 kN 275 kN
Safety Clutch: 148 m / min 314 m / min
Max Speed: 4.7 knots 10 knots

c) Band brake static holding load: 45000 kN 2294 kN
Drilling
Ice Management Plan
Chukchi Sea, Alaska

ACCOMMODATION

<table>
<thead>
<tr>
<th>Total Accommodation</th>
<th>77 persons incl. crew (normally 42 client beds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day Room / Mess for client</td>
<td>5th Bridge deck</td>
</tr>
<tr>
<td>Day Room</td>
<td>5th Bridge deck</td>
</tr>
<tr>
<td>Messroom and coffee corner</td>
<td>Upper deck</td>
</tr>
<tr>
<td>Laundry Room</td>
<td>2nd deck</td>
</tr>
<tr>
<td>Grocery</td>
<td>1st Bridge deck</td>
</tr>
<tr>
<td>Gymnasium</td>
<td>Upper deck</td>
</tr>
<tr>
<td>Sauna</td>
<td>2nd deck</td>
</tr>
<tr>
<td>Salle</td>
<td>Upper deck</td>
</tr>
<tr>
<td>Operation Center</td>
<td>4th Bridge deck</td>
</tr>
<tr>
<td>Salon Room</td>
<td>5th Bridge deck</td>
</tr>
<tr>
<td>Client Office / Conference Room</td>
<td>1 x 30 m² Office, 24 m² Lab</td>
</tr>
<tr>
<td>Reception (desk, office)</td>
<td>Upper deck</td>
</tr>
<tr>
<td>Hospital</td>
<td>2nd Bridge deck</td>
</tr>
</tbody>
</table>

SURVEY FACILITIES

The MSV Fennica has no permanent ROV system on board. Let it does have the capability for an ROV system should the project require it.

MANNING

<table>
<thead>
<tr>
<th>Rank</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master</td>
<td>1</td>
</tr>
<tr>
<td>Chief Officer / EPO</td>
<td>1</td>
</tr>
<tr>
<td>First Officer / EPO</td>
<td>1</td>
</tr>
<tr>
<td>Second Officer / EPO</td>
<td>2</td>
</tr>
<tr>
<td>Chief Engineer</td>
<td>1</td>
</tr>
<tr>
<td>&quot; Engineer</td>
<td>2</td>
</tr>
<tr>
<td>Electrical Engineer</td>
<td>1</td>
</tr>
<tr>
<td>Radio Officer</td>
<td>1</td>
</tr>
<tr>
<td>Deck Rep</td>
<td>2</td>
</tr>
<tr>
<td>Bosun Rep</td>
<td>2</td>
</tr>
<tr>
<td>Motorman</td>
<td>1</td>
</tr>
<tr>
<td>Cook Steward</td>
<td>1</td>
</tr>
<tr>
<td>&quot; Cook</td>
<td>2</td>
</tr>
<tr>
<td>2nd Cook</td>
<td>2</td>
</tr>
<tr>
<td>Caving Assistant</td>
<td>3</td>
</tr>
<tr>
<td>Crane ops.</td>
<td>2</td>
</tr>
</tbody>
</table>

The MSV Fennica has 26 persons, however this may change between projects.

LIFE SAVING, FIRE ALARM AND RESCUE EQUIPMENT

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Dimensions</th>
<th>Weight including Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifeboats</td>
<td>2 pc. 82 persons each</td>
<td>Waterman 375</td>
<td>4750 kg</td>
</tr>
<tr>
<td>Engines</td>
<td>Sabby 44.295</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulation</td>
<td>NND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifeboat Davit</td>
<td>Davit for type O-18120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOB Boat</td>
<td>1 pc. Manxman, 9 mde</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Waterman 372</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>L 1700 mm / B 2200 mm / draught 1000 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine</td>
<td>Sabby 44.295</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed</td>
<td>21 knots</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulation</td>
<td>NND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOB Boat Davit</td>
<td>Davit O-115-40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life Rafts</td>
<td>6 x 25 and 2 x 20 persons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Viking Life-saving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life Raft Davit</td>
<td>2 pcs. Daed O-115-21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Alarm system</td>
<td>1 pc. Automa F &amp; 844</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire detection system</td>
<td>The vessel is equipped with an automatic fire detection system</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DETAILS BELIEVED TO BE CORRECT BUT NOT GUARANTEED.
“Tor Viking II” Specifications

AHTS/Icebreaker Tor Viking II - Main Characteristics

**Design:** KMAR 808 AHTS/ICEBREAKER (Now; MOSSMAR)

**Classification:** DnV,+1A1, SUPPLY, SF, TUG ICEBREAKER ICE-10, DK(+) EO HELDK-SH DYNPOS-AUTR HL(2,8) W1-OC

**Built / Delivered:** Havyard Leirvik, Norway - 03/2000

**Registered / Flag:** Skärhamn, Sweden

**Dimensions**
- Length Over All (LOA): 83.70 metres
- Length between p.p.: 75.20 metres
- Breadth, moulded: 18.00 metres
- Depth, moulded: 8.50 metres
- Draught (scantling): 7.20 metres
- Draught (design): 6.00 metres
- Freeboard (design): 2.50 metres
- Dead Weight: 2,528 tonnes
- Light Ship: 4,289 tonnes
- Gross: 3,382 tonnes
- Net: 1,145 tonnes

**Capacities**
- Dry Bulk: 283 m³ in 4 tanks - totaling 10,000 ft³
- Pot Water: 724 m³
- Drill Water / Ballast: 1,205 m³
- Brine: 400 m³ – SG 2.5
- Oil Based Mud: 612 m³ – SG 2.8
Base Oil: 242 m³
Fuel Oil: 1,190 m³ Marine Gas Oil (Diesel)
Urea: 94 m³
Diesel Overflow: 21 m³ with alarm
Diesel Service / Settling: 2 x 20 m³
Deck Load: Abt 1,350 ts
Deck Area: 603 m² / 40.20 m x 15.0 m
All products in dedicated tanks – no dual purpose tanks

**Propulsion**
Main Engine: MAK 18,300 BHP - 4 eng (father/son) 2 x 3,840 kW + 2 x 2,880 kW = 13,440 kW
Thrusters: Bow 1,200 BHP in tunnel (Electr) + 1,200 BHP 360 deg retractable = 2,400 BHP:
Stern 1,200 BHP in tunnel
Bollard Pull: Bollard Pull: 202 continuous (DnV certified) / Abt. 210 max pull
Speed/Consumption: 16 knots – Abt. 42.7 MT / 24 hrs at 6.0 metres draught , 12 knots – Abt. 25.0 MT

**Towing & Anchor Handling Equipment**
AHT Winch: Brattvaag towing/anchor handling winch 400 ts pull / 550 ts brake holding caps
AHT Drum: One of 1,400 mm dia. x 3,750 dia. x (1,250 mm + 1,250 mm) length
Wire Capacity: 2 x 1,900 metres of 77 mm wire or 2 x 1,650 metres of 83 mm wire
AH Drum: One of 1,400 mm dia. x 3,750 mm dia. x 3,000 mm length
Wire Capacity: 4,100 metres of 83 mm wire
Winch Control: TOWCON 2000 Automatic Control with printer
Pennant Reels: One off 2 x 1,500 m of 77 mm wire or 2 x 1,300 m of 83 mm wire capacity: One
off 3,400 m of 77 mm wire or 1 x 3,100 m of 83 mm wire capacity
Large Reel Inner Core: 1,500 mm dia.
Cable Lifters: 2 x 76 mm and 2 x 84 mm onboard
Chain Lockers: 2 x 129 m 3 / giving abt 2 x 6,000 ft of 3 inch chain
Shark Jaws: 2 pairs of Karm Forks arranged for chain up to 165 mm dia. / 750 ts SWL
Inserts for handling of 65, 75, 85, 100, and 120 mm dia. wire/chain
Stern Roller: One of 3,5 metres dia. x 6.0 metres length – SWL 500 ts
Guide Pins: 2 pairs Karm Fork Hydraulic pins – SWL 170 ts

**Deck Equipment**
Capstans: 2 x 15 ts pull
Tugger Winches: 2 x 15 ts pull
Smit Brackets: One bracket on B Deck Forward – SWL 250 ts
Crane: 1 hydraulic crane on fore cargo deck giving 6 / 12 ts at 20/10 m arm (360 deg)
: 1 telescopic crane on aft cargo deck giving 1.5 / 3 ts at 15/10 m arm (360 degr)
: 1 hydraulic crane on for-castle deck for stores etc.
Windlass: 1 hydraulic windlass / mooring winch. 2 declutch-able drums 46 mm K3 chain

**Accommodation:** Accommodation of a total of 23 persons, including crew.
All accommodation equipped with air-condition and humidification facilities.

**Dynamic Positioning**
The vessel is equipped with Kongsberg Simrad SDP 21 Redundant DP System – Green DP.
“Aiviq” Specifications

REGISTRATION: Hull #247
Year Built: 2012, La Ship and North American Shipbuilding

Vessel Type: Ice Class A3 Anchor Handling Towing Supply Vessel

<table>
<thead>
<tr>
<th>U.S. MEASUREMENTS</th>
<th>METRIC EQUIVALENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIMENSIONS</td>
<td>360’8” X 80’ X 34’</td>
</tr>
<tr>
<td>Draft (Loadline):</td>
<td>28’1.6875”</td>
</tr>
<tr>
<td>Draft (Normal):</td>
<td>26’</td>
</tr>
<tr>
<td>Draft (Max. Ice):</td>
<td>25’</td>
</tr>
<tr>
<td>Draft (Min. Ice):</td>
<td>21’</td>
</tr>
<tr>
<td>Free Deck Space:</td>
<td>150’ x 61’</td>
</tr>
<tr>
<td>Clear Deck Area (Total):</td>
<td>9,150 sq. ft.</td>
</tr>
<tr>
<td>Clear Deck Area (Cargo):</td>
<td>4,880 sq. ft.</td>
</tr>
<tr>
<td>Deck Strength (Cargo):</td>
<td>1,024 lbs/sq. ft.</td>
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<tr>
<td>Deadweight Tonnage:</td>
<td>5,113 LT</td>
</tr>
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CAPACITIES

<table>
<thead>
<tr>
<th></th>
<th>U.S. Measurement(s)</th>
<th>Metric Measurement(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Oil</td>
<td>528,155 gals.</td>
<td>1,999 m³</td>
</tr>
<tr>
<td>Liquid Mud/Brine/Rec. Oil</td>
<td>10,160 barrels</td>
<td>1,615 m³</td>
</tr>
<tr>
<td>Ballast/Rig Water</td>
<td>562,684 gals.</td>
<td>2,130 m³</td>
</tr>
<tr>
<td>Rig Water (Dedicated)</td>
<td>421,667 gals.</td>
<td>1,596 m³</td>
</tr>
<tr>
<td>Glycol</td>
<td>8,677 gals.</td>
<td>32.85 m³</td>
</tr>
<tr>
<td>13 Service Tanks</td>
<td>30,019 gals.</td>
<td>113.63 m³</td>
</tr>
<tr>
<td>Dry Bulk</td>
<td>8,840 cu. ft. @ 80 psi</td>
<td>250.4 m³ @ 5.5 bars</td>
</tr>
</tbody>
</table>
# Drilling Ice Management Plan

**Chukchi Sea, Alaska**

## MACHINERY
- **Main Engines:** Four (4) CAT C280-12 diesels (5,444 BHP each)
- **Propulsion:** Two (2) 4,600 mm dia. CP propellers in nozzles
- **Bow Thrusters:** Two (2) Brunvoll FU100 2,450 mm 1,500 kW
  - One (1) Rolls-Royce 2,000 kW fold down
- **Stern Thruster:** Two (2) Brunvoll FU80 LTA 2,000 mm 1,050 kW
- **Speed:** 15 knots in SSJ open water
  - 8 knots in 1.0 m ice thickness
- **Bollard Pull:** 200 MT
- **Generators:**
  - Four (4) CAT 3512C 1,700 kW
  - Two (2) 2,000 kW shaft generators
  - Two (2) CAT C32 910 kW emergency generators

## CLASSIFICATION
- **ABS:**
  - Maltese Cross A1 (Hull)
  - Ice Class A3 (Icebreaker)
  - Maltese Cross A1 (Towing)
  - Maltese Cross AMS (Machinery)
  - Maltese Cross ACCU (Automation)
  - Maltese Cross FF 2 (Firefighting)
  - Maltese Cross DPS-2 (Dynamic Positioning)
  - Oil Recovery Capability Class 1
  - Safety Standby Vessel (300 Survivors)
  - HELIDK (SRF)
  - Protected Oil Tanks (POT)
  - CCO Polar (-40°C, -50°C) (HR 36)
  - AH Offshore Support Vessel
  - Subchapter I (Cargo)
  - SOLAS, MARPOL

## ACCOMMODATIONS:
- 36 client, 28 crew

## ADDITIONAL FEATURES/EQUIPMENT
- **Firefighting:**
  - Four (4) 1,800 m³/hr fire monitors
- **Helideck:**
  - Suitable for Sikorsky S92 (12.8 MT/21 m dia.)
- **Client/Crew Features:**
  - Conference room, two (2) client lounges, crew lounge, client office, ship's office, exercise room, and three (3) laundry rooms
  - Standby/Rescue:
    - Rescue zones, decontamination area, change room, treatment room, recovery room, morgue, and medical medical storage

## LIFESAVING EQUIPMENT
- Two (2) 64-Man Arctic Class Enclosed Lifeboats with davits
- Six (6) 25-Man Inflatable Life Rafts
- One (1) 10-Man Fast Rescue Craft with davit
- One (1) 15-Man Daughter Craft with davit
- One Rescue Platform

Other gear as required by USCG and SOLAS
Attachment 3 – Shell Ice and Weather Advisory Center

Operational Support Overview

Safe and efficient offshore operations in the Arctic are contingent upon quality and timely ice and weather forecasts. Using state of the art satellite technology, large areas of the Beaufort and Chukchi Seas are monitored remotely by the SIWAC to track movement of ice and make estimates of its type and concentration.

Synthetic Aperture Radar (SAR) instruments on board the RADARSAT 2 satellite are contracted to acquire necessary images of sea ice over areas of interest several times per week. These images are transmitted to ground stations, processed, and made available for analysis within hours of acquisition. Interpretation of the ice edge and features are performed by experienced specialists using powerful mapping software to produce ice charts that are considerably more detailed than those available from national ice centers. These charts are then distributed to operational personnel and planning managers and can be validated or ground-truthed using actual ice regime assessments from the IMV fleet.

Knowing the location and composition of the ice at any given moment is a valuable tool; however, it is not enough. It is important to forecast how the ice may change over time. A complementary component of ice forecasting is quality weather information. Weather conditions in the Arctic are among the most severe on the planet and change dramatically in a short time. National weather services do not provide measurements and forecasts that sufficiently resolve the conditions over small areas or short time spans in the Arctic offshore. Therefore, dedicated meteorologists with Arctic forecasting experience are employed full time to produce accurate snapshots of the current conditions and reliable forecasts of weather conditions into the future.

Using global weather models, such as ECMWF and GFS numerical weather model as a starting point, the meteorologists produce a high resolution grid in proprietary modeling software of weather parameters, such as atmospheric pressure, wind speed, and wave height, that have been corrected based on local observations from Shell’s vessels at sea, meteorological buoys, and coastal weather stations. The result is a model that accurately reflects current and forecast weather conditions over short distances in the Beaufort and Chukchi Seas, making marine operations and vessel transits safer and more responsible. Without this innovative forecast effort, weather products from other sources tend to describe the average or general conditions that one could expect over large areas, such as the entire U.S. Beaufort Sea, which results in local conditions rarely matching what is forecast.

The wind vectors, which are a set of points indicating the speed and direction of the wind distributed over the Beaufort and Chukchi Seas, and other output from the weather model are applied to the ice charts in the mapping software. This allows the ice analyst to assess the effect of wind and weather systems on the future movement and development of the ice.
Attachment 4 – Ice Alert Logs
Ice Alert Level Log

<table>
<thead>
<tr>
<th>ICE ALERT LEVEL LOG</th>
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<tbody>
<tr>
<td>DRILLING UNIT</td>
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<td>Date</td>
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**Ice Alert Level Notification**

**Notice of Ice Alert Status Change**

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<th>Drilling Unit</th>
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<tr>
<td>Date</td>
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<tr>
<td>Time</td>
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<tr>
<th>Previous Ice Alert Level</th>
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**Ice Alert Arguments**

<table>
<thead>
<tr>
<th>Hazard Time (HT)</th>
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<tr>
<td>Secure Time (ST)</td>
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<tr>
<td>Move Time (MT)</td>
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<td>Alert Time (AT)</td>
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**New Ice Alert**

**Present Ice and Weather Conditions**

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**Forecast Ice and Weather Conditions**

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**Comments**

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**Approved By Master/OIM**

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<tr>
<th>Signature</th>
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<td>Date &amp; Time</td>
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## Well Secure Time Log

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Well Secure Time (ST)</th>
<th>Initials</th>
<th>Rig Manager / OIM</th>
<th>Remarks</th>
<th>Initials</th>
<th>Shell Drilling Supervisor</th>
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