2019/20 Operations Plan

Atlantic Margin Exploration Opportunity
Jameson Land
Onshore East Greenland
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Jameson Land location
Operations planning

- Options for future operations on Jameson Land licences
- Operations Planning Timeline
- Health, Safety, Environmental and Social Impact
- Drilling Plan Overview
  - Key Locations
  - Mobilisation and Support Base
  - Well Site Camps
  - Winter Access Roads
  - Drilling Rig Specifications
  - Data Acquisition
- Operations Summary
GGO has completed an evaluation of the Jameson Land Basin using extensive field observations, 2D seismic and Full Tensor Gravimetric data and identified substantial potential for hydrocarbon accumulations in a variety of play concepts.

### Options for next phase of activity

<table>
<thead>
<tr>
<th>key risks / activity</th>
<th>acquire additional seismic</th>
<th>drilling programme</th>
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<tbody>
<tr>
<td>seismic picks</td>
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<td>✓</td>
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<tr>
<td>reservoir lithology</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>trap integrity</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>optimal well location</td>
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**Costs**

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<th>Estimated</th>
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<tbody>
<tr>
<td></td>
<td>2D – US$ 20 million</td>
<td>2 – 3 wells US$ 75 million</td>
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<tr>
<td></td>
<td>3D – US$ 40 million</td>
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- Unlikely to write off prospectivity
- Will require drilling programme
- Refine targets for future drilling programme

- Potential for discovery
- Test of play components
- Identify need for additional seismic
- Identify further drilling locations
GGO has engaged Canadian Petroleum Engineering (CPE) to advise, plan and manage a drilling programme on Jameson Land, onshore eastern Greenland.

### Planning parameters;
- Single winter season programme
- 2 – 3 wells

### High level timetable to drilling;
- **November 2019** Commitment to drill (GGO)
- **January 2020** Submit applications for drilling and associated documents (GGO)
- **May 2020** Regulatory approval (MIER)
- **June 2020** Mobilisation of equipment from Canada (CPE)
- **September 2020** Commence operations in Jameson Land (CPE)
- **December 2020** Spud first well (CPE)
- **March 2021** End of drilling window (CPE)
- **April 2021** Commence de-mobilization (CPE)
Health, Safety, Environmental and Social Impact

• Operations application to include;
  – Health and Safety
    • Emergency Response Plans
    • Oil Spill Contingency Plans
    • Transportation and Driving Plans and Procedures
    • Safety Studies
    • Waste Management Plan
  – Environmental and Social Impact
    • Environmental Management Plan
    • Social Management Plan
    • Impact Benefits Agreement
Drilling Plan Overview

• Mobilise drilling and associated equipment from Canada (but use local services where available)
• Establish shore base camp for unloading equipment on Jameson Land
• Build winter road to well drilling location #1
• Construct drill site and camp and at drilling location #1
• Drill well #1
• While drilling well #1, construct winter road to drilling location #2
• Construct drill site and camp and at drilling location #2
• Drill well #2
• Evaluate possibility of drilling well #3 in same winter season, drill or de-mob
• De-mobilise drilling equipment, return sites and camps to natural/pre-drill state
Operational Constraints

• The licence area includes a designated Ramsar site (“Internationally Protected Wetland Area”)
  – if drilling activities are within this area, certain operational activities are limited to outside the breeding and moulting season for certain bird species
  – restricted season runs from 15 May to 10 August each year

• Ice conditions within Scoresby Sund
  – sea ice build-up over the winter season
  – mobilisation/demobilization window between
  – obvious uncertainty due to variable seasonal weather conditions
Key Locations

- Possible location for Well #2
- Potential location for supply base
- Well #1
- Possible location for Well #3
- Constable Point airstrip
Mobilisation and Support Base

• The activity associated with this Project will include;
  – the mobilisation of drilling and construction equipment to East Greenland from a marshalling yard in Halifax, Nova Scotia
  – offloading of the equipment onto a secure shore site
  – construct a construction camp and support base
    • set up a support base accommodating about 64 men, prepare bermed and lined fuel farm(s), maintenance shop, cold storage shelters
    • the support base will be constructed by placing about 20 cm of sand harvested from the beach, placing of a filter cloth liner which will be covered with 15 cm more sand and then covered with swamp mats. This will be done to ensure access to the facility in late winter/spring (melt conditions)
  – immediately after freeze up commence the building of a winter access to the initial well sites
    • once the shore base facility is usable, road and location construction which may consist of soil if available or a combination of packed snow / ice pads
  – mobilisation of a drill rig from southern Canada to the location,
  – the drilling of two/tree wells, including initial evaluation and completion activities on the wells
  – demobilization of all equipment back to Canada or to other locations
Potential location for supply base on Scoresby Sund
Well Site Camps

• Temporary camp(s) will be established in addition to the support base camp;
  – camps at the support base and one at each rig site
  – combined they will accommodate up to 100 plus personnel

• The camp(s) will be equipped with;
  – heated water storage
  – heated wastewater storage system capable of handling all of the wastes created in the camp
    • all wastewater will be treated on site and disposed of as agreed to by the Regulatory agencies
    • all solid wastes will be gathered, treated and disposed of as agreed with the regulatory agencies
    • the intent is to leave no waste on site and no sumps will be constructed
    • agreement from the regulators on where and how to dispose of the well cuttings is required
Well Site Camps

- well site camps will be located on an area approximately 160 m by 160 m (about 2 hectares)
  - to be constructed by building a 20 cm ice pad surrounded by an ice containment berm
  - the rig and camp will be placed on rig and swamp matting on top of the ice pad
  - an impermeable liner will be placed on the ice pad prior to spotting the rig matting that is required to support the drilling rig (to protect the pad from melting or shifting during the drilling program and from contamination)
  - no sumps will be excavated, all waste will be collected in aboveground tanks and disposed of as agreed to with the regulators
  - stationary fuel tanks on the drilling location will be double walled or will be located within a self-bermed skid - refuelling of vehicles will be conducted following a strict refuelling procedure and using approved conventional fuel transfer equipment
  - sanitary wastes will be stored and treated for disposal in an approved manner
Winter Access Roads

- winter access will be designed to reach the well locations, well #1 and well #2
  - final routing will be surveyed during the summer of 2020 at which time it will be necessary to identify any obstacles and identify and mark them
  - the construction methods for the winter access roads need to be confirmed with the Greenland regulatory agencies but will likely incorporate a mixture of transit on the land on packed snow/ice roads with some areas such as crossing gullies or valleys where snow/ice bridges may be required
  - a major controlling factor for constructing the access roads will be when the ground is frozen and an ample amount of snow is available for efficient construction activities to be undertaken
  - in each case, the access roads will follow the coast as much as possible, and then cut inland to the respective well site
  - winter access to well #1 should begin as soon the supply base is established and all equipment and consumables are available. This site is anticipated to be 3 km inland from the supply base
  - access to well #2 will be constructed while drilling the first well. The site will be 15 km along the coast to the north of the supply base and 20 km inland
  - well #3 will be 25 km to the south of the Supply Base and 7 km inland
Drilling Rig Specifications

• diesel electric driven rig is preferable (mechanical rigs may be considered dependent upon condition)
  – rig will be fully winterized for arctic drilling conditions
  – depth capacity +/- 3,500 m
  – 250 HP, hydraulic driven top drive
  – minimum of two 1,000 HP, triplex mud pumps
  – 100 m³ active surface drilling fluid tanks plus 60 m³ premix tank
  – 2 x 100 psi WP boilers
  – a 244.5 mm (9 5/8”) 35,000 kPa (5,000 psi WP) triple ram BOP system
    • consideration being given to the possible need for a 178 mm (7”) 70,000 kPa (10,000 psi WP) BOP system rigged with power tongs able to handle 339.7 mm (13 3/8” through to 177.8 mm (7”) casing sizes
  – tubular inventory for drilling these wells will be at 200% of projected well depths
  – basic fishing tools for all contractor tubulars to be provided by the drilling rig
Data Acquisition

- Mudlogging while drilling below [surface casing]
- Drill cuttings
- Directional surveys
- Wireline logging
  - Basic gamma, density/neutron and electrical/sonic suite
  - Sidewall cores
  - Vertical seismic profiler
- Testing ??
  - Wireline RFT
  - Open hole?
Operations Summary

• Construction;
  – supply base
  – winter roads for access
  – 2-3 well sites and associated camps

• Operating philosophy;
  – winter operations to avoid bird moulting/breeding season and minimise permanent operational footprint
  – single mobilization of equipment and consumables at start of season
  – utilisation of local goods and services where possible, crew change through Constable Point/Iceland
  – zero waste emission on location
  – site restoration to pre-drill condition
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