BMP Stratigraphic Drilling Guidelines, April 2011

1. Introduction

The BMP Stratigraphic Drilling Guidelines constitutes appendix E to "BMP Exploration Drilling Guidelines" (Drilling Guidelines) and outlines BMP's guidelines for application, execution and reporting of offshore stratigraphic drilling within the Greenland EEZ pursuant to § 84 of the Mineral Resources Act.

Whereas these guidelines are not exhausted into details, reference should be made to relevant chapter in the Drilling Guidelines where applicable and relevant for stratigraphic drilling operations

The stratigraphic drilling activity shall be in accordance with NORSOK Standard G-001, Marine Soil Investigations, latest edition. Some of the following sections of these standard terms refer to specific chapters or sections of dated NORSOK standards. If the NORSOK standards have been updated the licensee shall follow the provisions of the latest edition of similar specific chapters or sections.

In these guidelines "Stratigraphic drilling" denotes activity

- carried out by using a suitable Dynamic Positioned Classed light vessel with moonpool equipped with a hoisting rig and drilling equipment designed for standard stratigraphic drilling operations
- carried out with the objective to acquire information on the rock characteristics
- drilled to depths below sea level compatible to meeting the above objective
- which is not drilled to discover or delimit a petroleum deposit or to produce or inject petroleum, water or other medium.

Both the vessel employed and the drilling equipment must be certified by a third party classification society in compliance with relevant North Sea standard.

2. Application Procedure

Application for conducting offshore exploration activities must be submitted to the BMP in one (1) paper copy and one (1) electronic copy at least 40 days before the requested commencement of the exploration activity (but see below).

The application shall be submitted to:
BMP
Imaneq 29
Postbox 930
3900 Nuuk
Greenland
bmp@nanoq.gl

The application must be submitted in its entirety. If the application contains defects and shortcomings, it must be expected that the above indicated timeline of 40 days for the processing is only started when the application is considered complete.

The application must contain the following information:

- Licence number, licensee, Licence operator.
- Contact details of contact person at the licensee (operator).
- Operation Programme
- Documentation of health, safety and emergency systems, including medical emergency systems and safe navigation
- Documentation of insurance
- Environmental Impact Assessment (EIA), including a short (approx. 3 pages) non technical summary

3. Operational requirements and operation programme

3.1 Operational requirements

3.1.1 The licensee shall ensure that the activity is performed in accordance with the approved plans and the specific provisions stipulated in the approval letter.

3.1.2 Modification of the approved activities is contingent upon submission of an application hereof and BMP approval of the modification.

3.1.3 Activities shall to the largest possible extent be coordinated with other activities in the area to ensure that neither the requested exploration activity nor other parties' activity in the exploration area are unnecessarily impeded.

3.1.4 The provisions of NORSOK Standard G-001, Marine Soil Investigations, Rev. 2, October 2004, Chapter 5 "General requirements to execution of work", Chapter 6 "Drilling and logging" and Annex A "Drilling and logging", including A7 "Shallow gas" shall be followed.

3.1.5 The Operator shall identify all hazards associated with the stratigraphic drilling programme and ensure that appropriate measures are in place to manage and control these. To identify any potential hazards on the seabed and in the subsoil the Operator shall perform a site survey for each coring site. The site survey shall as a minimum determine:

a) The possible presence of objects which might affect the drilling operation (boulders, wrecks, other wells, etc.).
b) Possibility of penetrating hydrocarbon bearing zones.
c) Possibility of penetrating particularly weak zones.
e) Possibility of penetrating zones with abnormal pressures (i.e. gas hydrates, permafrost).

To identify hazards and manage them operators shall use systematic methodology and log systems such as HAZID, HAZOP and Risk Assessments, ref. NORSOK Standard Z-013 Risk and Emergency Preparedness Assessment, latest edition.

The site survey shall be performed with means of high resolution seismic, sonar equipment, magnetometric methods for bathymetry and direct visual observations. Execution of site surveys is contingent on separate approval by the BMP. For further guidance in this regard please refer to BMP's "Guidelines for application, execution and reporting of offshore hydrocarbon exploration activities (excluding drilling) in Greenland".

The results of the site survey shall be available to the operator before commencement of the stratigraphic drilling programme and an evaluation of the site survey results shall be forwarded to the BMP for approval before the stratigraphic drilling programme can commence.

3.2 Operation Programme

When submitting an application for conducting stratigraphic drilling the operator shall include an operation programme that shall include the following:

- Information on the operator of the operation (possibly contracted operator). Contact details of the contacts at the contracted operator, including phone number and email address.
- Overview of used vessels and ship owner/shipping company. Vessels' IMO numbers, call sign and ship's email / MMSI number..
- Support and logistical services including listing of contractors
- Purpose of the drilling operation, including:
    - acquisition methodology
    - description of employed equipment
    - use of materials and their application
        - Use of degradable materials to be left at sea is conditioned on approval by the BMP. The application must be accompanied by a description of the used material and documentation of its degradability. A description of the impact of the dissolved material on the surrounding environment must be included in the EIA.
- Plan for the data acquisition and expected quantity of data collected.
    - Positions of the expected coring sites. The position shall be given in geographical and UTM co-ordinates
    - A shape file for each coring site. Water depth for each coring site

- Estimated total coring depth for each coring site
- Depth to and age of the anticipated geological horizons:
    - Representative, interpreted seismic sections near the planned coring site (normally 2 intersecting lines)
    - The velocity functions used in the area
- Logging programme, containing information on types of logs to be run (if applicable)
- Description of any planned analytical programme to be performed on the core material onboard the drilling vessel and/or support vessel
- Description of any later analytical programme

- Operation period, including timing of planned entry into Greenland waters and planned completion of the operation
- Stratigraphic Drilling Operation
    - The description shall include the items listed in section A2, “Drilling spread” of NORSOK Standard G-001, Marine Soil Investigations, Rev. 2, October 2004
    - The operator must outline the mud programme.
    - The operator must outline the well control measures in place. Depending on target depth(s) for the drilling, consideration should be given as to the need for having cementing capabilities in addition to mud pump system.
    - The operator must outline the intended use of chemicals
        - All chemicals planned to be used or discharged must have been tested and evaluated for their eco-toxicological properties according to OSPAR Harmonized Offshore Chemical Notification Format (HOCNF). Chemicals that will pose the lowest risk on the environment shall be selected, in particular those on OSPARs PLONOR list and the chemicals shall also be included in the Danish Product Register PROBAS (see also BMP EIA drilling guidelines).
    - The operator must outline the intended cement programme, if applicable.

3.3 Continuous Reporting

3.3.1 Reporting of significant events

The licensee shall notify the BMP promptly at the BMP emergency telephone (+45) 30 34 07 90 of any significant situation or event, including loss of life, missing person, serious injury, fire, imminent threat to personnel or vessel safety. The above list is not exhaustive.

As soon as practicable after the immediate notification, the licensee shall make a complete written report to the BMP on the occurred situation or incident.

3.3.2 Daily Reports

From the time when the drilling vessel arrives at the coring site and until the coring site is left again, the Bureau of Minerals and Petroleum shall daily, before 11:00 a.m., by e-mail, receive reports on operations and results during the last 24 hours. The reports shall at least cover the activities till 06-00 a.m. on the reporting day.

The daily reports must at least contain the following information:

- Reporting date
- The number and name of the coring site
- Drilling vessel and operator
- Total time on the coring site
- Present operation
- Present coring depth
- Progress during the last 24 hours
- Detailed description of operations during the last 24 hours, covering essential results as well as a description of operational problems (based on drillers log)
- Bit diameter and type
- Description of drill string assembly
- Ice conditions
- Wave height and direction
- Wind force and direction
- Barometric pressure and air temperature
- Description of the geological formations penetrated during the reporting period, indicating depth, lithology, colour, grain size, porosity and - when possible - expected geological age, including detailed results from the preliminary core descriptions
- Drilling speed in the penetrated layers

3.3.3 3-day activity reports

3 times a week the licensee shall submit a 3-day activity report. The 3-day activity report is used to inform stakeholders of ongoing exploration activities in order to allow for the planning and coordination of various offshore activities. The content and format for such 3-day activity reports shall follow the template in Appendix C to BMP's "Guidelines for application, execution and reporting of offshore hydrocarbon exploration activities (excluding drilling) in Greenland"

3.3.4 Weekly reports

Every Monday, the licensee shall submit a weekly report to the BMP to bmp@nanoq.gl. The report must follow the format and contain the information shown in Appendix D to BMP's "Guidelines for application, execution and reporting of offshore hydrocarbon exploration activities (excluding drilling) in Greenland".

3.8.4 Completion Report

Immediately after the end of the operation the licensee shall submit a summary completion report. The report must follow the format and contain the information shown in Appendix E to BMP's "Guidelines for application, execution and reporting of offshore hydrocarbon exploration activities (excluding drilling) in Greenland"

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4. Health, Safety and Contingency Planning

4.1 The licensee shall demonstrate they have a Safety Management System and describe how safety management, including the co-ordination of the safety management programs of the major contractors, fits within the overall management of the programme. The licensee must demonstrate evidence of the links between the health and safety management systems including emergency response of the different vessels taking part in the operation and the licensee (bridging documents) for approval by the BMP.

4.2 The licensee shall ensure that all employees are instructed in health-, safety- and contingency plans relevant to their respective work areas.

4.3 Both the vessel employed and the drilling equipment must be certified by a third party classification society in compliance with relevant North Sea standard.

4.4 For other requirements regarding health, safety and contingency planning reference is made to Drilling Guidelines' section on HSE Assessment.

4.5 For requirements regarding safety of navigation for vessels, reference is made to BMP's "Guidelines for application, execution and reporting of offshore hydrocarbon exploration activities (excluding drilling) in Greenland"

5. Insurance

5.1 The licensee's activities shall be covered by insurance which at all times comply with the provisions of the Licence and standards laid down by the BMP.

5.2 Upon submission of an application for offshore exploration activities, the licensee shall notify the BMP on existing insurance policies and their main terms. The licensee shall submit all insurance policies and terms to the BMP regarding the activity upon BMP's request.

5.3 At the request of the BMP, the licensee shall establish and maintain additional insurance. The licensee shall furthermore follow provisions on insurance given by BMP, and decisions on insurance made by the BMP.

6. Support operations

6.1 Health Systems/ Medical Emergency Preparedness

6.1.1 During the operation, a person with medical training with specific prerequisites for handling and stabilizing patients with acute conditions shall be onboard the vessel.

6.1.2 The licensee shall take measures by which

a) a qualified doctor at all times is available for consultation (eg. through Radio Medical, or similar) or to be brought aboard the vessel, and
b) an injured person can be transported from the vessel to a hospital

6.1.3 In the application the licensee shall include an account/statement of the health systems / medical emergency preparedness resources available during the operation.

6.2 Vessel Reporting Systems

6.2.1 The vessel shall use the Greenland VMS (Vessel Monitoring System) and have a monitoring device installed for this purpose. Vessels must further be equipped with LRIT (Long Range Identification and Tracking System).

6.2.2 If the VMS or LRIT is not operative, and on voyage to and from Greenland waters before VMS is installed, the reporting system GREENPOS shall be used.

6.3 Notification

6.3.1 After approval has been granted by the BMP, the licensee must notify the authorities listed section 3.7 of BMP's "Guidelines for application, execution and reporting of offshore hydrocarbon exploration activities (excluding drilling) in Greenland". The notification must occur before the activity begins. The authorities must also be informed upon termination of the activities.

The notification shall contain a list of used vessels with specification of vessels' IMO number, call sign and email / MMSI number, which they will operate during the period.

7. Environmental Impact Assessment and environmental regulation

7.1 Environmental Impact Assessment

7.1.1 The licensee shall ensure that stratigraphic drilling activities are planned and executed so that environmental risks are identified, assessed and reduced as much as is reasonable practicable. Best Available Technology (BAT) and Best Environmental Practice (BEP) shall be applied and used in order to minimize environmental impacts, c.f. Mineral Resources Act § 53.

7.1.2 In the application for approval of stratigraphic drilling the licensee shall include an a environmental impact assessment (EIA). The EIA shall state how the exploration activity will be conducted, so they are in accordance with section 4.1.1. The EIA shall include an Environmental Management Plan describing measures to be taken in order to mitigate impacts to the environment. The EIA shall be accompanied by a short non-technical summary of the EIA (approx. 3 pages)

7.1.2.1 The licensee shall use the "BMP Guidelines for preparing en Environmental Impact Assessment (EIA) report related to stratigraphic drilling offshore Greenland, April 2011" when preparing an EIA

7.1.2.2. BMP may, in accordance with § 20 (Licences for exploration and exploitation) / § 11 (standard terms for prospecting licences) publish the completed EIA report on www.bmp.gl or elsewhere after informing the licensee.

7.3 Emissions

7.3.1 When evaluating and approving specific stratigraphic drilling activities, the BMP will stipulate requirements regarding emissions (including exhausts, discharge water, drilling cuttings and drilling additives) in accordance with the "BMP Guidelines for preparing and Environmental Impact Assessment (EIA) report for activities related to hydrocarbon exploration and exploitation offshore Greenland" of January 2011.

7.3.1 BMP may require video/photo documentation of the benthic population of the exploration area, if the applied operations programme includes generation of cuttings, to an extent that is assessed to may have environmental impact for possible occurrences of habitats particularly sensitive to sedimentation.

7.4 Important Areas for Wildlife

7.4.1 The licensee must acquaint themselves to the relevant strategic environmental impact assessments for the area of operation and other relevant studies on wildlife etc. in the area.

7.4.2 The licensee shall, in organizing and carrying out the stratigraphic drilling programme take into consideration the designated protection zones for wildlife, which are set out by the BMP rules for fieldwork and map of important areas to wildlife in Greenland (http://dmugisweb.dmu.dk/rdimportantareas/) and observe the associated protective measures.

7.4.3 BMP may when approving specific exploration activities require the licensee to perform further impact studies and / or limit the operation to certain periods or from certain areas.

7.5 Other Environmental Regulation

7.5.1 All non-degradable materials and structures shall be removed upon termination of the operation, unless BMP approves otherwise.

7.5.2 Discharge of waste water and kitchen waste shall be in compliance with the provisions of Annex IV and Annex V of the MARPOL Convention

7.5.3 Vessels engaged and machinery used in the exploration activities should only use diesel and gasoil with a sulphur content less than 1.5 % (weight). Heavy fuel oil and oil with a sulphur content >1.5 % should not be used.

8. Reporting of data

8.1 All material and data shall be submitted to the BMP within 14 days of it being available, but no later than April 1st, the year after the data was acquired. Dispensation from this deadline must be applied for at, and approved by, the BMP.

Data, including processed data and reports shall be submitted to:

Råstofdirektoratet (Bureau of Minerals and Petroleum)
Imaneq 29
Postboks 930
3900 Nuuk
Grønland

Cores and samples shall be submitted to the BMP Core Storage facility at the following address:

Greenland Services Partners A/S
3910 Kangerlussuaq
Greenland

8.2 All data and reports specified below must be submitted in two (2) separate copies, which allows for onward forwarding of one copy without media copying.

8.3 All reports must be submitted in digital format. All digital data shall be submitted on cd/dvd or another media readable by the BMP.

8.4 BMP may at any time request the licensee to submit information as to whom any data including reports have been sold.

8.5 BMP may in the approval letter specify further requirements for reporting or deviate from the requirements listed mentioned here.

8.6 The BMP may at any time request further information and reporting as available to the licensee.

8.7 Further requirements regarding reporting, submission of data and samples and storing of samples:

8.7.1 Samples

All samples (cores, fluids, and all other types of samples) shall be stored at the BMP Core Storage Facility as soon as practicable and at the latest l year after completion of the well.

Marking: All samples collected by the Licensee shall bear a label stating name of the core site and depth (depth interval) from which the sample is taken. The label must be made in a way that ensures permanent sample identification.

Packing: The samples must be packed so that the possibility of long-term identification and storage is ensured. Fluid samples of drilling mud shall be packed so that quality and quantity are not affected during transportation.

- Sample (1 litre) of the drilling fluid from the inlet side taken after each qualitative change of additives. Samples of other fluids used on board the drilling vessel shall also be submitted.

- Cores: All cores shall be stored at the BMP Core Storage Facility not later than one year after completion of the well. This time period may upon request be prolonged by the BMP.

    - When the cores are stored in Greenland, the Licensee and the Bureau of Minerals and Petroleum may freely inspect the material and may - after consulting the Bureau of Minerals and Petroleum - take samples for further analysis.

      The core material shall from it is taken till it is stored at the BMP Core Storage Facility be stored in such a way that representatives from the supervising authority at the Licensee's expense have unimpeded access to inspect the material in so far as it is reasonable and to take samples for additional analysis.

      Cores will be used to obtain information concerning the specific layers penetrated and in the long-term establishment of general information on the Greenland subsoil. It is therefore important that core material be kept as intact as possible. Samples should be sawed or drilled out. The Bureau of Minerals and Petroleum can at any time require special procedures to be followed in connection with handling of and sample taking from cores.

- Overburden material insofar the drilling technique applied affords such material to be retrieved

- Core chips: To avoid unnecessary damage of the core material only essential chips should be taken. Chips, which are not immediately needed, shall be taken by sawing

or drilling (e.g. reference samples). If it is necessary to take chips at the coring site (e.g. for quick paleontological dating) this shall be done with care and the chips shall whenever possible be taken where the core already is broken.

- Gases and hydrocarbon seepages: Gases and or liquid hydrocarbons escaping from cores must be sampled and kept in appropriate, tight containers. Sampling should be carried out *in duplo*, and one duplicate sample must be forwarded to the BMP Core Storage Facility as soon as possible.

- Non destructive logging of the core shall be undertaken (i.e. spectral gamma ray, susceptibility, density, velocity etc.) either onboard the drilling vessel/the support vessel or later when the core is taken onshore.

- Drilling of plugs: Horizontal or vertical plugs shall be taken for specific investigations after accept from the Bureau of Minerals and Petroleum.

- Slabbing of cores: For each 1 m core a 15 cm long, undisturbed section shall be stored. For the remaining part of the core a complete longitudinal section comprising of at least one half of the core shall be submitted to BMP as soon as possible.

8.7.2 Copy of the processed multibeam bathymetric data in a suitable format (data acquired on transit between the coring sites) shall be submitted to the BMP as soon as data are available however not later than 1st April the year after the data was acquired.

8.7.3 Reports on analyses of samples from the borehole: Copies of descriptions and reports shall be forwarded to the Bureau of Minerals and Petroleum, including the following information:

- Reports on stratigraphical, sedimentological and paleontological analyses

- Core descriptions

- Colour photos of all cores shall be submitted. The photos are to be taken immediately after cutting. Each photo shall show coring site number, core number, depth, and scale as well as top and bottom data. Furthermore, a copy of all other photos from the handling of core material (e.g. taking of plugs) must be forwarded.

- Conventional core analyses

- Special core analyses

- Petrophysical measurements of core material

- Reports on source rock analyses

8.7.4 Final reporting: Not later than 1 April the following year a summary technical/geological report shall be forwarded to the BMP, including the following

information:

- Listing of the coring sites principal data, name/number, position in geographical and Universal Transverse Mercator (UTM) co-ordinates, drilling vessel and rig, water depth, reference level, operator, contractor, dates of the included operations, total time spent, and total depth of the well indicating geological age at TD.

- Summary of the progress of drilling operation, stating technical problems, if any, and discussion hereof.

- Summary of the physical and environmental conditions encountered while coring including weather, ice conditions and ice management

- Summary of geological information obtained during the drilling operation.