

**UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF OCEAN ENERGY MANAGEMENT
ALASKA REGIONAL OFFICE**

BOEM NTL No. 2022-A01

Effective Date: October 1, 2022

**NOTICE TO LESSEES AND OPERATORS OF FEDERAL OIL AND GAS LEASES IN
THE ALASKA OUTER CONTINENTAL SHELF (OCS) REGION**

**SHALLOW HAZARDS SURVEY AND EVALUATION FOR
OCS EXPLORATION AND DEVELOPMENT DRILLING**

Authority

The Bureau of Ocean Energy Management (BOEM) is issuing this Notice to Lessees and Operators (NTL) pursuant to regulations at 30 CFR 550.207, 30 CFR 550.212, 30 CFR 550.214, 30 CFR 550.242, and 30 CFR 550.244 and to provide guidance about BOEM's shallow hazards program on the Alaska OCS. This NTL supersedes and replaces NTL No. 05-A01, dated July 25, 2005.

In accordance with 30 CFR 550.197, BOEM may release to the public all high-resolution seismic data 60 days after you submit it to us.

Purpose and Need for NTL

This NTL provides guidance for shallow hazards geophysical surveys, evaluations, and reporting procedures for the BOEM Alaska Regional Office. It is issued to clarify and interpret requirements contained in regulations and does not impose additional requirements.

The BOEM regulations at 30 CFR 550.214 and 550.244 require pre-exploratory and pre-development investigations by lessees/operators (you) on leased lands to ensure safe conduct of oil and gas operations on the OCS. Before beginning drilling or construction activities, you must conduct a shallow hazards assessment to evaluate the proposed site for potentially hazardous conditions at or below the sea floor that could affect the safety of OCS operations. Unless you can demonstrate to BOEM (us) that sufficient data is available to evaluate the site, we will require a shallow hazards geophysical survey.

Potentially hazardous shallow conditions, textures, or processes include, but are not limited to, seismicity, subsurface faults, fault scarps, shallow gas, steep-walled canyons and slopes, buried channels, current scour, migrating sedimentary bedforms, ice gouging, permafrost, gas hydrates, unstable soil conditions, pipelines, anchors, ordnance, shipwrecks, and other potentially hazardous natural or man-made features.

Guidance

Pursuant to 30 CFR 550.214(f) and 550.244(f), you must conduct surveys before you submit an Exploration Plan (EP) or a Development and Production Plan (DPP). Your EP or DPP will be considered incomplete without a shallow hazards survey and accompanying analysis and report. BOEM will not allow any sea floor disturbing activities, other than geotechnical investigations, until you analyze the site and BOEM clears the operations to proceed. We recommend that you plan your financial commitments and logistics, including mobilization, accordingly.

You must conduct the activities described in this NTL in accordance with all applicable laws, regulations, rules, and lease stipulations, including the Marine Mammal Protection Act of 1972 (MMPA), as amended, and the Endangered Species Act of 1973 (ESA), as amended.

BOEM may require you to collect shallow hazards surveys even for sites located in State of Alaska waters if the well(s) extends into Federal OCS lands (550.214(e) and 550.214(f)).

In areas where data of adequate coverage and quality are available, we may modify or waive specific shallow hazards survey requirements on a case-by-case basis. We will consider new technologies, acquisition or processing techniques, and alternate survey designs. We strongly recommend that you review your proposed survey strategy with appropriate BOEM personnel before starting any survey operations.

This NTL does not cover other ancillary activities, such as archaeological and biological investigations, or pipeline surveys. Archaeological survey and reporting guidance is contained in BOEM NTL No. 05-A03, Archaeological Survey and Evaluation for Exploration and Development Activities, effective July 25, 2005, and reissued June 24, 2020. However, we may allow the use of select shallow hazards data to satisfy or supplement data requirements of an archaeological or biological survey if we determine that such a survey is necessary, and that the data from the shallow hazards survey satisfy the requirements for an archaeological or biological survey. We encourage you to consult with us about the potential for using shallow hazards data to satisfy these provisions. For all pipeline-related activities, including pre-installation survey design pursuant to 30 CFR 250.1007(a)(5), contact BSEE Alaska.

Qualified and experienced personnel must perform the field survey, process and analyze data, prepare the report, and acknowledge responsibility by signing the appropriate data logs, analysis and reports as per 30 CFR 550.194(a)(2). You are responsible for obtaining the best possible results using the most appropriate survey technology. Poor quality data due to inappropriate acquisition or processing technique(s) are not acceptable and could result in BOEM requiring you to resurvey the site.

Notification

You are required to notify all potentially affected OCS lessees of survey actions and schedules prior to survey mobilization.

Lease sale notices may include stipulations or information-to-lessee clauses that require or encourage additional coordination with other parties (e.g., subsistence users, local communities, commercial fishing organizations). You are advised to review these provisions and associated requirements to determine if they apply to your proposed survey. If the survey will include state or foreign waters, you should contact the appropriate agency(ies) to ascertain and comply with all applicable requirements.

You should be aware that seismic surveys have the potential to cause incidental take of marine mammals and are subject to the incidental taking provisions of the MMPA and ESA. Under the MMPA and ESA, you could be required to have a Letter of Authorization (LOA) or Incidental Harassment Authorization (IHA) from the U.S. National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (FWS) before engaging in a seismic survey. You should review your proposed activity with NMFS and FWS.

You must provide the Alaska Regional Supervisor for Leasing and Plans (RS/LP) with a notice of intent to conduct preliminary activities in accordance with 30 CFR 550.208. This notice should be submitted a minimum of 30 calendar days before initiating any field survey operations. The notice should include a description of the type, scope, and timing of the survey in accordance with 30 CFR 550.208. The notice should also include documentation of applicable notifications to other OCS lessees and coordination with other potentially affected parties, and a copy of an IHA or LOA application or approved authorization, if applicable.

In addition, you or your contractor should notify the Alaska RS/LP at least 72 hours before mobilizing for this survey so that BOEM may arrange for an observer to be present.

Shallow Hazards Survey Requirements

You must acquire data to provide information on seafloor conditions that may present hazards to rig set-down, rig anchoring, platform construction, or drilling operations. Your survey must also provide information on sub-seafloor conditions to be taken into consideration during design, construction, and operation to mitigate any potential hazards to drilling operations, production activities, and platform integrity.

The depth of investigation of the shallow hazards survey must be sufficient to reliably cover any portion of a borehole that will be drilled without a Blowout Preventer (BOP) stack, generally down to 1,000 meters (3,280 feet) or 200 meters below potential surface casing depth, whichever is greater.

You may meet shallow hazards survey requirements by using a survey strategy that combines different systems. If you propose to use new technologies or a different type of survey strategy to meet the shallow hazards survey requirements, BOEM will consider the new technologies and survey strategies you propose to determine if they meet the minimum data requirements.

Survey Design

Survey designs are determined by several factors and will vary depending on whether you are drilling from a bottom-founded structure, an artificial island, a floating platform, or a drill ship. These designs also depend on the surveying systems used: high-frequency or low-frequency profiling systems, magnetometer, side-scan sonar, or multi-beam sonar. The optimum survey area and grid-spacing are also affected by the water depth, degree of certainty on where the well will be located, whether the well-bore will be vertical or slanted in open-hole conditions (before you set conductor casing and install the BOP), and on how many and where the wells will be drilled.

The maximum recommended line spacing for each type of survey is 150 meters (492 feet), unless it does not meet the data coverage criteria below. You should provide coverage to a sufficient distance (usually 2,400 meters [1.5 miles]) in all directions from the proposed surface location, and in all directions from the surface projection of a slant well-bore or multiple slant wells that you plan to drill in open-hole conditions. You should extend all lines a sufficient distance beyond intersections to ensure full fold, grid closure, and subsurface ties. You are encouraged to discuss your survey grid strategy with BOEM during your planning stage.

Navigation

A state-of-the-art navigational positioning system, with an accuracy of ± 2 meters (6 feet), is recommended for substantiation and integration of the survey data. For marine surveys, the vessel track should not vary more than ± 15 meters (50 feet) from the pre-plot line, except to avoid obstructions. All geophysical systems should be integrated with ships navigation, including any relevant offset, resulting in accurate posting of data points on survey lines and records. Fix marks should be easily identifiable on post-plot maps. For marine deep-tow systems, an ultra-short baseline system may be required to track the towfish within $\pm 1\%$ error and should be integrated with the ship's navigation. Navigation systems should be calibrated, and both relative and absolute position accuracy verified before the start of the survey and immediately after completion of the survey.

Recommended Data Acquisition Instrumentation

BOEM recommends that you record all data digitally at a sampling rate of at least one sample per second and that all data recorders to the navigation system be interfaced to ensure proper integration of information. Acquisition of certain data types may need more frequent sampling to be useful.

Bathymetry

Bathymetry data may be acquired using a multi-beam echo-sounder bathymetry system that provides high quality 150% coverage over the survey area. Single-beam echo-sounder data may be used to verify the results.

Water-Column Anomaly Detection

Use a system and recording parameters capable of detecting gas in the water-column.

Magnetometer

In water depths of less than 200 meters (656 feet), BOEM recommends that you use a total field intensity magnetometer to determine the presence of shipwrecks, pipelines or other magnetically susceptible objects. Under this approach, you should consider towing the magnetometer sensor as close as possible to the seafloor (no more than 6 meters (20 feet) altitude), or in accordance with industry standards for the water depth. BOEM recommends that you use a magnetometer with a sensitivity of 1 gamma or less and a background noise level that does not exceed a total of 3 gammas peak-to-peak. A gradiometer system is recommended for more precise results.

Side-scan Sonar

BOEM recommends that you acquire side-scan sonar data to record continuous non-contoured planimetric images of the seafloor that provides for the detection and evaluation of seafloor objects and features 1 meter (3.3 feet) in size at maximum range within the survey area. A mosaic may be constructed with a digital map format described in [Appendix 3](#). This survey should provide at least 150% overlap of the seafloor between any two adjacent survey lines

Shallow Penetration Sub-Bottom Profiler

An acoustic sub-bottom profiler system is recommended to determine the character of near-surface geological features. Such a system should be capable of achieving resolution of vertical bed separation of at least 0.3 meter (1 foot) in the upper-most 15 meters (50 feet) or greater. BOEM recommends that you run the shallow penetration sub-bottom profiler with a deep tow system or use un-crewed underwater vehicles.

2-D Multi-Channel High Resolution Seismic

A multi-channel high resolution seismic survey is recommended to determine the character of deeper geological features. BOEM recommends that the profiler system be capable of penetrating at least 1,000 meters (3,280 feet) or 200 meters below potential surface casing depth, whichever is greater, and that the vertical resolution be less than 6 meters (20 feet). Per industry best practices, this involves using 24 or more channels at group intervals of 12.5 meters or less and processing the data via migration to enhance interpretation.

3-D Seismic Reflection Surveys

For areas in water depths greater than 200 meters (655 feet), BOEM recommends that you consult a 3-D seismic reflection survey for subsurface hazards over 100 percent of the area. These data should be processed in a manner to preserve a frequency of 60 hertz or more for the shallow interval. The minimum expected coverage area for 3-D data is the same as that for high-resolution surveys.

Shallow Core Data

If bottom-founded structures, including gravel or ice islands, will be used, you will need to collect shallow core data for analysis of shallow hazards, engineering, and geotechnical evaluations, and/or archaeological resources.

Original Shallow Hazards Survey Data and Information Retention

Pursuant to 30 CFR 550.210(b), if you conduct ancillary activities, you must retain copies of all original shallow hazards survey data and information, including navigation data, and make it available to BOEM upon request at any time prior to lease termination.

Shallow Hazards Report

Pursuant to 30 CFR 550.214(e), and 550.244(e), you must include in your EP or DPP a shallow hazards report (or a reference to a previously submitted report by contractor name and date) based on the information obtained from a shallow hazards survey.

Overview

In the shallow hazards report, you should include an evaluation and synthesis of the data you gathered during the shallow hazards survey and integrate it with other available geological, geotechnical, and geophysical information. Your report should be prepared, signed, and dated by a geophysicist or geologist specializing in shallow hazards interpretation.

The report should discuss surface and buried geologic and anthropogenic features; discuss the potential for shallow hazard occurrence, and engineering considerations, and provide two interpreted structural cross-sections passing at right angles through all proposed well-bore location(s).

The report should include a short summary table of potential engineering considerations or drilling hazards in the shallow subsurface that describes the general sediment type, possible nature of the identified anomaly or feature, and its depth. This table should include potential hazards or engineering considerations to both set-down, rig emplacement or bottom-founded structure construction, and to drilling operations. An example of a short summary table is attached ([Table 1: Example Shallow Hazards Summary Table](#)). Submission of other analyses and reports of the results of all geological, geotechnical, and geochemical analyses is strongly suggested.

To minimize possible delays in the review of your EP or DPP, you may submit a shallow hazards report to BOEM's Alaska Region Plans Section (reports for lease surveys or site-specific surveys) before you submit the related EP or DPP. Please provide one digital copy (archival quality DVD, archival quality CD, or mutually acceptable digital storage media) labeled with your company(ies) name, the lease number(s), the text "Shallow Hazard Report," and the date.

Recommended Report Contents

BOEM recommends including the following information in the written shallow hazards report:

Area Description

A description of the surveyed area that includes the:

- OCS lease number(s), block number(s), and lease area(s)
- Minimum and maximum water depths of the survey area

Personnel List

A list of the individuals involved in survey planning, fieldwork, and report preparation, and their corresponding position titles.

Survey Description

A discussion of the shallow hazards survey that includes:

- a description of the navigation system
- a description of survey instrumentation
- a description or diagram of the survey vessel, including its size, sensor configuration, and sensor location and offset(s)
- a description of survey procedures
- vessel speed and course changes
- sea state and weather conditions
- a copy of the daily survey operations log

Assessment or Analysis

An assessment or analysis of the potential for shallow hazards within the surveyed area, including, but not limited to, discussions of:

- the general geological background
- oil and gas activity, including wells, platforms, and pipelines
- bathymetry
- seafloor features and deep-water benthic communities, including side-scan sonar contacts or uncrewed vehicle video documentation
- geological features, including faults, channels, scours, and karsts areas
- shallow gas, gas hydrate, and shallow-water flows
- magnetic anomalies
- proximity to any significant OCS sediment resources
- unstable seafloor areas

Embedded maps

See [Appendix 1](#) and [Appendix 2](#) for GIS Layer, Digital Map Format, and coordinate reference system (CRS) information. Maps should be embedded in order to communicate relevant information and context with regard to the written report, as suggested below, but presented in a way not to impair legibility of the maps. These maps may be reproduced at a larger scale, and additionally presented as [Attached Maps](#). Page-sized maps embedded in the textual report should include:

- A geographic index map illustrating survey area(s) relative to geography, sale area, and indicating lease and block numbers;
- Survey track line map(s) illustrating lease block boundaries, track lines, fix points, existing well location(s), and proposed well location(s) with proposed metric UTM X-Y coordinates;
- Bathymetry contoured in intervals of 2 meters (or 5 feet) or less;
- Thickness and distribution of unconsolidated sediments, when present, contoured in intervals of 5 meters (or 15 feet) or less. The location, datum, soil classification, and graphic soil logs, to an appropriate scale, should also be shown;
- Shallow structure contoured at intervals of 20 meters (or 50 feet) or less; and
- Anomalies or potential hazards must be indicated on a base map with subsea depth to event posted.

Additional Information to Provide

In addition to the written report, BOEM recommends submitting the following additional information, as described in this subsection. [Side-scan Sonar Contacts](#) and [Magnetic Anomalies](#) should be provided as “comma delimited” (ASCII) text files. The text file should include projection information and the column/field names. BOEM recommends that you also provide the contact and anomaly information in a tabular format within the report.

Attached Maps

Submit digital maps at a scale of 1:12,000 (or 1:24,000 if the survey report involves multiple OCS blocks) and oriented to true north (see [Appendix 1](#) and [Appendix 2](#)).

Include on the maps:

- a navigation post-plot of the surveyed area, showing lease block lines, latitude-longitude reference coordinates, survey lines and directions, and navigational shot points at intervals of no more than 150 meters (or 500 feet);
- bathymetry (at contour intervals of 0.3 meters (1 foot) to 15 meters (50 feet) depending on seafloor morphology);
- multi-beam seafloor rendering;
- side-scan sonar mosaic;
- seafloor and shallow geologic features;
- deep geologic structures (from medium penetration profiler data);
- side-scan sonar contacts;
- magnetic anomalies;
- areas of shallow gas;
- sites of proposed and former oil and gas operations; and
- location of significant sediment resources in water depths less than 30 meters (100 feet).

See [Appendix 1](#) for GIS Format suggestions and [Appendix 2](#) for map presentation suggestions.

Magnetic Anomalies

A list of all magnetic anomalies of unknown source in both a text file and ESRI compatible shapefile file using the following format:

- Anomaly Number, Area, Block Number, Line Number, Shot Point, Tow Height, Signature, Intensity, Duration, NAD 83 Latitude, NAD 83 Longitude, Avoidance Distance, NAD 83 X Coordinate, NAD 83 Y Coordinate, Coordinate System Name
- Latitude/longitude may be provided to six decimal places.

See [Appendix 3](#) for magnetic data submission recommendations.

Side-scan Sonar Contacts

A list of all side-scan sonar contacts of unknown source in both a text file and ESRI compatible shapefile file using the following format:

- Sonar Contact Number, Area, Block Number, Line Number, Shot Point, Length, Width, Height, Shape, NAD 83 Latitude, NAD 83 Longitude, Avoidance Distance, NAD 83 X Coordinate, NAD 83 Y Coordinate, Coordinate System Name

- Latitude/longitude may be provided to six decimal places. See [Appendix 3](#) for data submission recommendations.

3-D Seismic Reflection Data

If you are using 3-D seismic reflection data to prepare your report in lieu of 2-D high resolution data for the evaluation of subsurface hazards, BOEM recommends that you provide the following additional information to assist BOEM in its review:

- a discussion of the acquisition and processing (or reprocessing) of the 3-D seismic data used
- a seafloor “rendering” or shaded seafloor features
- seafloor amplitude using a scale with red as the greatest amplitude and blue as the lowest amplitude
- a time to depth conversion table
- tophole prognoses table summarizing potential geohazards with portions of seismic sections (inline and cross line) passing through the proposed well at least one thousand feet along both sides
- normalized power spectrum for the upper one second from the seafloor at each well location

See [Appendix 3](#) for data submission recommendations.

Intersection of Deep Penetration Seismic Profiles Over Proposed Well Location(s)

For exploration wells or first production wells, BOEM recommends that you provide at least two un-interpreted migrated common depth point seismic lines intersecting at the primary well locations and annotated with the surface and bottom hole locations of the well(s). These profiles may come from the prospect’s seismic exploration survey and should cover the full depth of the proposed drilling interval. You should also supply a survey grid map to allow accurate placement of the deep seismic lines in relation to other surveys and the proposed location. The map should clearly show navigation fixes, shot points, and line identifications for the submitted lines. You may use common depth point seismic lines furnished with an exploration plan, according to 30 CFR 550.214(c), to satisfy this requirement. Refer to 30 CFR 550.197(b) for information about timelines for the BOEM-initiated public release of data and information that you submit.

Data Preparation and Submission

When submitting your shallow hazards report and data, you should make sure that it is a complete package (including all text, maps, sample seismic lines, geohazard shapefiles, and other graphics). You should submit the report with required maps and seismic cross-sections as a digital file in a secured portable document format (.PDF) with printing and copying of text, images and other content enabled. In addition, you should submit digital copies of all spatial data used in the survey maps as shapefiles (.SHP) for each individual layer group as described in [Appendix 1](#). You should submit all raster files used in the survey maps (e.g. side scan sonar imagery and amplitude/seafloor renderings) as high resolution GEOTIFF files. All raster and spatial data should be submitted as ArcGIS 10.0 compatible map packages (.MPK) with the coordinate reference system (CRS) defined (see [Appendix 2](#)). You should submit a copy of sub-bottom profiler and processed 2-D or 3-D seismic data formatted in SEG-Y format as described in [Appendix 3](#).

For each data type delivered, the following metadata should be provided:

- Survey name
- Dates of acquisition, and, if appropriate, date of processing
- Start/Stop dates and times
- Names of operating and responsible personnel
- Vessel location and speed
- Sea state (Beaufort Scale)
- Ice conditions, if applicable
- System parameters for data collection equipment, such as manufacturer, model, frequency range, power, filter settings, physical characteristics and deployment configuration, including water depth of towed sound source, or other necessary information.
- Record scale parameters including any changes during recording
- Vertical exaggeration
- Acquisition reports, if available
- Processing information, if applicable

Mitigation of Potential Hazards

Pursuant to 30 CFR 550.202, EPs or DPPs must demonstrate that an operator has planned and is prepared to conduct the proposed activities in a manner that conforms to all applicable laws, implementing regulations, and lease terms and stipulations, and is safe; conforms to sound conservation practices and protects the rights of the lessor; does not unreasonably interfere with other uses of the OCS, including those involved with National Security or Defense; and does not cause undue or serious harm or damage to the human, marine or coastal environment. You must exercise one of the following procedures for mitigation of potential shallow hazards identified through shallow hazards surveys and reports and/or shallow hazards assessments, or where BOEM's review of your analysis indicates a potential hazard within the Immediate Area (see below for description of "Immediate Area") of your proposed operations:

1. Amend your EP or DPP to locate the site of the operations to avoid the potential shallow hazard;
2. Submit information to BOEM that demonstrates that the use of special protective measures will minimize the risk to safe operations or to the shallow hazard; or
3. Submit information to BOEM that establishes that such operations will not be adversely affected by the shallow hazard and the shallow hazard will not be affected by the proposed activity.

Immediate Area Definition

For magnetic anomalies with an intensity of 50 gammas or greater and side-scan sonar contacts, the Immediate Area is the area inside a circle centered on the feature with a radius of 30 meters (100 feet). You may change this avoidance distance depending upon the signature, intensity, ambient magnetic field, and duration of any individual anomaly or contact. For geologic

features, the Immediate Area includes any site located within a radius of 75 meters (245 feet) of the feature.

Guidance Document Statement

BOEM issues NTLs as guidance documents in accordance with 30 CFR 550.103 to clarify and provide more detail about certain BOEM regulatory requirements, and to outline the recommended information to be provided in various submittals.

This NTL is intended to provide clarity to the public regarding existing requirements under the law and applicable regulations. To the extent that provisions of this NTL derive from requirements established by statute, regulation, or by a provision in the lease, they should be considered as BOEM's description of the specific requirements of those statutes, regulations, and leases, and are, therefore, enforceable as legal requirements. The provisions of this NTL may also be made mandatory in whole or part through stipulations or conditions of approval from BOEM in leases, plans, permits, or other authorizations. To the extent any provision is not derived from requirements established by statute, regulation, or a provision in a lease or condition of approval, it serves as a recommendation as to best practice and not an independent mandate.

Paperwork Reduction Act of 1995 (PRA) Statement

An agency may not conduct or sponsor a collection of information unless it displays a currently valid OMB Control Number. OMB has approved the information collection requirements in 30 CFR 550, subpart B, under OMB control numbers 1010-0114 and 1010-0151. This guidance document does not impose any additional information collection requirements subject to the Paperwork Reduction Act of 1995.

Contacts

Please contact the Alaska Regional Office's Regional Supervisors listed below if you have any questions concerning shallow hazards surveys, plan evaluation, or other questions.

Titles	Contact	Phone
Regional Supervisor: Leasing and Plans	Main Office	(907) 334-5200
Regional Supervisor: Resource Evaluation	Main Office	(907) 334-5200

Mailing Address:

Bureau of Ocean Energy Management
Alaska OCS Region Office of [Leasing and Plans] or [Resource Evaluation]
Attention: Regional Supervisor of [Leasing and Plans] or [Resource Evaluation]
3801 Centerpoint Dr. Suite 500
Anchorage, AK 99503

**JAMES
KENDALL** Digitally signed by
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09/07/2022

James J. Kendall
Regional Director, Alaska Regional Office
Bureau of Ocean Energy Management
Department of Interior Region 11

Date

Table 1: Example Shallow Hazards Summary Table (non-exhaustive list)

Depth	Drilling Activity and Safety System	Geology (Depth and Lithology)	Possible Hazards and Conditions (EXAMPLES)	Mitigation
0-400'	<ul style="list-style-type: none"> - Drive 30" Conductor - Spud Well 	0-400' Seafloor Characteristics (mud, sand, boulders), shallow sediment (peat)	High velocity bottom currents, unstable sediment, boulder or soft sediment bottoms, shallow biogenic gas, permafrost, etc.	Divertor installed
400' – 1000'	Drill and set 20" conductor casing with Divertor	Sands with thin coals, Permafrost layers	Shallow coal seam gas, shallow faults, permafrost	Divertor installed, gas detector in mud tank
1000' – 3000'	Drill and set 13.375" Surface casing, install BOP system	Unconsolidated to consolidated sands and silts	Shallow gas, faulting, abnormal pressures,	BOP installed @ 3000', well bore cased
3000' – 9500'	Drill and set 9.625" intermediate casing	Consolidated sand and silt	Faults, unconformities, abnormal formation pressures	BOP, mud weights
9500' - TD	Drill and set 7" Production casing liner	Sands and gravels, shales	Lost circulation, faults, abnormal pressures	BOP, mud weights, casing

Appendix 1 - Recommended Format for GIS Layers

BOEM recommends that you use the following grouping format for GIS data (ArcGIS). Please ensure that [Federal Geographic Data Committee](#) (FGDC) compliant metadata are present in all shapefiles or feature classes; please use fully developed attributes within the tables to accurately and completely describe the presented data elements. These should be provided in a single ESRI Map Package (.MPK).

General Information Group

The General Information Group contains all pertinent culture information found on the map. BOEM recommends that you include at least the following layers in this group:

- coastlines;
- lease blocks;
- protraction areas;
- federal/state boundaries;
- exclusion areas;
- villages, towns, and cities; and
- other appropriate culture data.

Infrastructure Group

The Infrastructure Group contains all industry infrastructure. BOEM recommends that you include at least the following layers in this group:

- pipelines;
- boreholes;
- all wells;
- proposed activities;
- fairways and anchorage areas;
- removed structures (e.g. abandoned wells, gravel islands or anchors); and
- other, as appropriate.

Navigation Data and Bathymetry Group

The [Navigation Data and Bathymetry Group](#) contains the post-plot of the navigation data as well as all bathymetric data. BOEM recommends that you include at least the following layers in this group:

- survey lines and shot points; and
- bathymetry data.

Seafloor Features Group

The Seafloor Features Group contains the geological features and unidentified side-scan sonar contacts and magnetic anomalies located by the shallow hazards survey. BOEM recommends that you include at least the following layers in this group:

- unidentified side-scan sonar contacts;
- unidentified magnetic anomalies;
- artificial reefs and artificial reef planning areas;
- seafloor fluid expulsion features and gas vents;
- brine seeps and brine pools;
- seafloor scarps with height;
- mounds and pinnacles;
- organic reefs and relict reefs;
- deepwater coral locations;
- outcrops and hard bottoms;
- live bottoms;
- named topographic features and their protection zones (e.g., the Hanna Shoal in the Chukchi Sea);
- seafloor faults;
- areas of seafloor slumping, debris flows, mud slides, and collapse depressions;
- seafloor hydrate mounds;
- scour and furrows;
- ice features;
- for ice gouges, include in the attribute table: year, orientation, width, ridge height, depth, location;
- for drain cracks, include in the attribute table: year, associated river, strudel zone (primary, secondary, etc.), length, location;
- for strudel scours, include in the attribute table: year, associated river, strudel zone (primary, secondary, etc.), water depth, scour depth and maximum horizontal extent;
- natural and dredged channels; and
- other seafloor features and anomalies (e.g., shipwrecks, pockmarks, can holes, etc.).

Subsurface Features Group

The Subsurface Features Group contains all subsurface features located by the shallow hazards survey. BOEM recommends that you include at least the following layers in this group:

- buried faults with depth labels;
- shallow gas as seen on shallow penetration sub-bottom profiler (acoustic voids);
- shallow gas as seen on medium penetration seismic profiler or conventional seismic reflection data (2-D or 3-D) (high amplitudes, bright spots) with depth labels;

- buried slumping;
- buried hydrates (e.g., bottom simulating reflector (BSR), seismic blanking);
- shallow water flow zones;
- salt;
- significant geologic features;
- karst features;
- buried channel features.

Appendix 2 – Recommended GIS CRSs, Data and Maps

For digital maps, BOEM recommends that your map include a legend, a scale, title, north arrow, CRS used, and lat/long and/or x/y grid graticule ticks in a georeferenced PDF with layers. These maps may be letter sized, or larger, as required to adequately show recommended information.

Recommended CRSs:

- Lat/Long – WGS84
- Beaufort – Alaska Albers NAD83 or UTM4N NAD83/UTM5N NAD83/ UTM6N NAD83 as appropriate
- Chukchi – UTM3N NAD83
- Cook Inlet – UTM5N NAD83
- Other areas please use appropriate UTM zones

CRS Information and Graticules

BOEM recommends that the CRS be included on the map, either in the legend or as text on the map. Also, please include graticule information showing lat/long and/or x/y ticks along the border of the map, with internal tick marks as appropriate.

Legend

All map symbols should match the International Association of Oil & Gas Producers (IOGP) Seabed Survey Data Model (SSDM) when applicable

(<http://www.iogp.org/Geomatics#2521682-seabed-survey-data-model>). Include all symbols used for depiction of:

- project area outline;
- infrastructure such as pipelines and wellheads;
- biological features including live bottoms, topographic features, and chemosynthetic communities;
- geophysical characteristics such as acoustic voids or faults;
- other features such as unidentified magnetic anomalies and side-scan sonar contacts (with avoidance radii), buried channels, and shipwrecks;
- table of unidentified sonar contacts depicted on the map (when appropriate);
- table of unidentified magnetic anomalies (when appropriate);
- OCS area name(s) and block number(s);
- lease numbers;
- Federal/State boundaries.

Title Block

In addition to a legend, other items should be included in a Title Block, including

- map title, date, and scale (verbal and graphic);
- company name(s);
- lease block numbers;
- personnel names, dates, file and job numbers, and map numbers (e.g., map 1 of 2)

Layer Groups

It is recommended that layers be grouped into Layer Groups as described in [Appendix 1](#), including:

- General Information
- Infrastructure
- Navigation Data and Bathymetry
- Seafloor Features
- Subsurface Features

Appendix 3 – Digital Survey Data Delivery

BOEM Recommended standard SEG-Y, digital data, and Associated Information submittal package.

Recommended deliverable CRSs:

- Lat/Long – WGS84
- Beaufort – Alaska Albers NAD83 or UTM4N NAD83/UTM5N NAD83/ UTM6N NAD83 as appropriate
- Chukchi – UTM3N NAD83
- Cook Inlet – UTM5N NAD83
- Other areas please use appropriate UTM zones

Digital Vessel Navigation Data

Digital vessel navigation data should be delivered in ESRI compatible point shapefile. Shapefile points should include attributes for X, Y, Lat, Long, Time, Speed, and Direction.

Magnetometer Data

Magnetometer data should be supplied as an ASCII CSV pointset including receiver location (in X/Y and Lat/Long), date, time, magnetometer bottom standoff distance, and field intensity. In addition, please provide magnetic intensity with the International Geomagnetic Reference Field (IGRF) removed. Column names should be listed in the ASCII file, and location of any reference sensors should be provided. ESRI compatible point shapefiles should be delivered, as well as the CRS used.

Side-scan Sonar Data

Side scan sonar data should also be delivered as GEOTIFFs or as Mean Sea Level (MSL) referenced point-cloud data, including backscatter intensity. ESRI compatible point shapefiles, as described above in this NTL should be delivered, as well as the CRS used. In addition to the data, please provide any acquisition and processing reports available.

Shallow Penetration Sub-Bottom Profiler

See 2-D Seismic Data or 3D Seismic Data.

2-D Seismic Data

All items that should be included on an external USB drive to ensure proper loading of the data:

- Project or seismic program name, protraction area, block number, lease number, and acquisition method or acquisition report
- Final processed seismic data in SEG-Y standard exchange format

- A digital ACSII text copy of SEG-Y EBCDIC header inclusive of byte position description
- A final edited ASCII navigation file formatted in standard SEG-P1 or UKOOA P1-90 format. Identify line name and locations for the first, last, and every tenth SP including latitude/longitude, and projected XY locations. Identify the datum of the data and the associated projection system used. This information should be provided in a single file
- A digital copy of the processing sequences that were applied to the data or the processing report
- A digital image plot of the survey, including culture data, as a PDF.

3-D Seismic Data

All items that should be included on external USB drive to ensure proper loading of the data:

- Project or seismic program name, protraction area, block number, lease number, and acquisition method or acquisition report
- Original 3D survey name, date of acquisition, and the company that acquired the original survey
- Permit number under which the original seismic survey was acquired, if relevant
- Three-dimensional final processed seismic volume in SEG-Y standard exchange format
- A digital ACSII text copy of SEG-Y EBCDIC header inclusive of byte position description for the data, or digital ACSII text copy of workstations loading parameters for the data set, including survey azimuth, in-line spacing, trace or CDP spacing, sample rate, record length, latitude, longitude, line number, trace number for each corner position, (upper left, lower left, upper right, and lower right). Identify the datum of the data and the associated projection system used.
- A digital copy of the processing sequences that were applied to the data or the processing report
- Digital bin-centered location of final locations associated with the survey (first, last, and every tenth bin-centered point for each line) in SEG-P1 or UKOOA P1-90 format. Identify datum of the data and the associated projection system used; and
- A digital image plot of the survey, including culture data, as a PDF.