

Appendix F: Requirements for Submittal of Geoscientific Data

Introduction

This appendix F to the MLSA Guidelines for application, execution and reporting of offshore hydrocarbon exploration activities (excluding drilling) in Greenland (MLSA Guidelines) stipulates the standard formats and reporting requirements for specific types of exploration activities. These apply in addition to the general reporting requirements set out in Chapter 10 of the MLSA Guidelines. The approval letter may specify further requirements for reporting than what is mentioned here.

1. General Information

The operator of the Licence under which the data has been acquired, shall submit a completed version of the **Appendix Fb spreadsheet**, containing meta-information for the data submittal.

One copy of the data mentioned below shall be forwarded on CD/DVD or USB3 discs to the MLSA, as stated in chapter 10 in the **MLSA Guidelines**.

The CD/DVD or USB3 discs must be marked with information about sender, licence number, survey name and year. Reports shall include licence number, survey name and year. Reporting of all significant datasets is mandatory.

2. Seismic Surveys

2D-seismic data

The licensee shall submit the following material to the MLSA as soon as possible and no later than the 1st of April after the year in which the data was collected:

a. an acquisition report describing the progress and extent of the seismic survey and the acquisition details. The acquisition report shall be submitted with a cover letter containing information on Licence Number and for Exclusive Licences including a description of the licence commitment under which the described activity has been carried out.

b. digital navigation and bathymetric data in UKOOA P1/90 or OGP P1/11 format, or whatever other format MLSA may determine, including a map of the survey area and a shape file (.shp) with all lines in the survey included.

c. digital seismic data if created are subject to mandatory reporting:

a copy of final migrated stack after full pre-stack processing in SEG-Y format.

a copy of final migrated stack after full pre-stack and post-stack processing in SEG-Y format.

a copy of partial stacks (offset/angle) in SEG-Y format

Information about in what other formats the data are held should also be supplied. Any reprocessing and special processing data shall also be supplied as specified in this paragraph. Stacking and migration velocities should be supplied in ESSO V2 format.

- d. a copy of the field data in SEG-D (rev. 3.0, RODE encapsulation) including documentation (observers logs).
- e. processing and if available interpretation reports.

3D-seismic data

The licensee shall submit the following material to the MLSA as soon as possible and no later than the 1st of April after the year in which the data was collected:

- a. an acquisition report describing the progress and extent of the seismic survey and the acquisition details.
- b. a report on the acquisition and processing of the navigation data (UKOOA P6/98 or OGP P6/11 format) including a map of the survey area and a shape file (.shp) with all lines in the survey included.
- c. digital seismic data: a copy of the final processed migrated data in SEG-Y format. Information about in what other formats the data are held should also be supplied. MLSA can at any time request a copy of the digital data at a suitable intermediate processing stage. Any reprocessing and special processing data should also be supplied as specified above. Stacking and migration velocities should be supplied in ESSO V2 format.
- d. a copy of the field data in SEG-D (rev. 3.0, RODE encapsulation) including documentation (observers logs).
- e. processing and if available interpretation reports.

3. Controlled Source Electromagnetic (CSEM) surveys

The licensee shall submit the following material to the MLSA as soon as possible and no later than the 1st of April after the year in which the data was collected:

- a. the licensee shall submit a digital copy of all CSEM raw and processed data including a description of the data format. Furthermore a complete list of deliverables shall be supplied on the basis of which the MLSA can base further requirements for data delivery.
- b. the licensee shall also submit processing, acquisition and data interpretation reports and any later additional reports produced by the licensee or any sub-contractor to the licensee.

4. Marine Gravity Surveys (also applicable for Aerogravity Surveys)

The licensee shall submit the following material to the MLSA as soon as possible and no later than the 1st of April after the year in which the data was collected:

The naming of separate Gravity surveys shall be in accordance with the naming conventions.

- a. acquisition, processing and if available interpretation reports, including information on land gravity tie points.
- b. digital processed line and grid data in a standard format used by the industry (e.g. ASCII or GEOSOFT format), including raw data (ASCII). Data should include latitude, longitude (WGS84), free-air anomaly, gravity (if available), height above sea-level and/or height above ellipsoid, and Bouguer anomaly (if computed).

- c. information on reference systems and normal gravity formula used. Information on geoid model used, if sea-level heights are derived from GPS. Information on bathymetry used if Bouguer anomalies are computed.
- d. documented free-air anomaly or gravity line data in digital form, before application of any cross-over adjustment or other cross-track smoothing techniques, or before any analytical downward continuation.
- e. a digital copy (format to be agreed with the MLSA) of the free-air gravity anomaly maps, supplied as contour maps.
- f. the MLSA may request access to other relevant data.
- g. Grav/Mag data shall not be reported in the same data file as the seismic navigation.

5. Marine Magnetic Surveys (also applicable for Aeromagnetic Surveys)

The licensee shall submit the following material to the MLSA as soon as possible and no later than the 1st of April after the year in which the data was collected:

The naming of separate Magnetic surveys shall be in accordance with the naming conventions.

- a. acquisition, processing and interpretation reports.
- b. digital raw data (ASCII) and processed line and grid data in a standard format used by the industry (e.g. Geosoft formats or ASCII format).
- c. documented raw data in digital form.
- d. maps in digital format (to be agreed with the MLSA) including residual magnetic intensity map after removal of IGRF (as contour map).
- e. the MLSA may request access to other relevant data.

6. Other geophysical surveys (including geophysical data acquisition as part of site surveys, as applicable)

The licensee shall submit the following material to the MLSA as soon as possible and no later than the 1st of April after the year in which the data was collected:

It should be noted that for site surveys, the deadline for submission of reports and data will vary according to the approval procedure for the specific subsequent drilling application (also see MLSA - Drilling Guidelines).

- a. a copy of any type of sub-bottom profiler data shall be submitted to MLSA in SEG-Y format. This includes site survey data and data acquired on transit.
- b. high resolution seismic data shall be submitted to MLSA according to the provisions in Appendix F.
- c. a copy of the processed single or multibeam bathymetric data as x, y, z data in ASCII format shall be submitted to the MLSA.
- d. a copy of sidescan sonar data in a suitable digital format and as digital images.
- e. a copy of still photos and video should be included as enclosure to the final report.
- f. acquisition, processing and interpretation reports (if available) for any type of data acquired shall always be submitted.

7. Shallow cores, associated core samples and seabed sampling

This section concerns sea bottom samples. Reporting regarding shallow coring programs are set out in the MLSA - Drilling Guidelines.

The MLSA must receive samples as well as data and reports on results from surface and down-hole measurements as specified below:

Storage and submission of material

- a.** all types of cores/samples shall be stored as soon as practicable and at the latest 1 year after acquisition at the MLSA Core Storage Facility (see chapter 10 in the MLSA guidelines) at a fee determined by MLSA to cover the cost. The fee shall be paid by the licensee. Permission must be obtained from the MLSA if samples are to be stored outside the MLSA Core Storage Facility. The samples must be accompanied by a cover letter that includes information of sample number, type and coordinates.
- b.** for cores: a complete longitudinal section of the core comprising at least one half of the core (lengthwise) shall be submitted to the MLSA.
- c.** when the cores/samples are stored in Greenland the Licensee and the MLSA may freely inspect the material. The Licensee may - after consulting the MLSA - take samples for further analysis.
- d.** the licensee has to submit the remaining material of the grab samples and other types of bottom samples after completion of analytical testing.
- e.** marking: All cores/samples collected by the Licensee shall bear a label stating name of the core site, up and down, and depth (depth interval) from which the sample is taken. The label must be made in a way that ensures permanent sample identification.
- f.** packing: The cores/samples must be packed so that the possibility of long-term identification and storage is ensured.

Reports

- a.** a sample log shall be prepared, see NORSOK standard G-001, Rev. 2, October 2004, Annex B "Sampling", section B.6 "Sample log"
- b.** an acquisition report must be submitted to the MLSA after finalisation of the survey.
- c.** reports on all types of analyses, including a summary of geological results, copies of sample/core descriptions, listing of the coring sites principal data, name/number, position in geographical and Universal Transverse Mercator (UTM) co-ordinates, vessel, water depth, reference level, operator, contractor, shall be forwarded to the MLSA.
- d.** colour photos of all cores/samples shall be submitted. The photos are to be taken immediately after cutting. Each photo shall show sample site number, sample number, depth, and scale as well as top and bottom indication (for photos of cores).

Naming conventions

The following requirements follow with some exceptions the Common Data Access Limited (CDA) CS-9 standard for seismic surveys.

Survey Name

The name of the seismic survey will be defined by a 12 character code where the format of the 12 characters is defined as:

CCYYYYSSXXXX

CC	is a 2 character alphanumeric code for a company or contractor - See Note A (below)
YYYY	is a 4 numeric year designator
SS	is a 2 character code defining the type of survey – e.g. 2D, 3D
XXXX	is a 4 character numeric survey designator with leading blanks padded with zeros

The 2 character code defining the type of survey will be applied as follows:

2D	Used for 2D navigation data
3D	Generic name for all datasets held for a 3D acquisition survey – implies that there are more than one data type loaded to the https://greenpetrodata.gl for the survey
3F	Used for the outline polygon
3B	Used for the bin grid (OIL & GAS UK P6/98 format)
3S	Used for the 3D sail line data (OIL & GAS UK P1/90 format)
CS	Used for CSEM surveys
GR	Used for gravity surveys, when gravity measurements are <u>not</u> made along with a seismic acquisition
MG	Used for magnetic surveys
SS	Used for Site Surveys

e.g. AB20073D0001 generic name for the acquisition survey
AB20073F0001 outline polygon of the extent of the acquisition survey
AB20073B0001 bin grid (P6/98) for the processed data from the acquisition survey
AB20073S0001 sail line data (P1/90) providing the shot and receiver group records for the acquisition survey.

Where there are other datasets associated with the survey, such as the processed data sets, then the two character codes will be used to define to these different products derived from the initial acquisition data.

The 4 character number will be a sequence number as each survey from the same company in the same year for the same survey type is loaded.

- e.g. AB20072D0001 first 2D survey from company AB in year 2007
- AB20072D0002 second 2D survey from company AB in year 2007
- AB20073D0001 first 3D survey from company AB in year 2007
- AB2007CS0001 first CSEM survey from company AB in year 2007

Line Name

The seismic line name will be 18 characters to conform to the OIL & GAS UK P1/90 format.

The composition of these 18 characters will be as below
CCYYYYSSSSSSLLLLLV

CC	is a 2 character alphanumeric code for a company or contractor - See Note A (below).
YYYY	is a 4 numeric year designator
SSSSSS	is a 6 character alphanumeric survey designator with leading blanks padded with zeros - See Note B (below).
LLLLL	is a 5 character line number and must include leading zeroes - See Note C (below).
V	is 1 character that has one of the following values R for reprocessed or 0 if not reprocessed.

- e.g. AB200700000000010 2D line acquired by company AB in 2007.
- e.g. AB200767540300010 2D line acquired in by company AB in Quad 6754 / block 3.
Please do not use Quad/Block if lines crosses block boundaries.
- e.g. AB20140000000001R 2D line reprocessed in 2014 by company AB. Information about the original survey name/ line number must be retained in the textual file header (EBCDIC).

Note A.

Company and contractor codes are designated by the MLSA. If codes are missing or new codes are needed, please contact the MLSA (mlsa@nanoq.gl). Only lines and surveys with correct company codes will be accepted by the MLSA.

Company Code	Company Name
AM	Amoco Greenland Oil Company
AQ	Société National des Pétroles d'Aquitaine
AR	ARCO Greenland Inc
BP	BP Exploration Operating Company Limited
CN	ConocoPhillips
CQ	Cairn Energy Plc (Capricorn Exploration)
CV	Chevron Greenland Exploration A/S
DN	Dong E&P Grønland A/S
EK	EnCana Corp
EI	ENI Denmark BV
EM	EMGS ASA
ES	Esso Exploration Greenland
GF	Fugro-Geoteam AS
GA	grønArctic energy Inc
GD	GDF SUEZ E&P Greenland AS
GE	GEUS
GG	Greenland Gas & Oil PLC
GP	Greenland Petroleum Exploration Co. Ltd.
GX	ION Geophysical GX Technology
HB	Halliburton Geophysical Services, Inc.
KA	KANUMAS
HO	Husky Oil Operations Limited
MB	Mobil Exploration Greenland Inc.
MR	Maersk Oil Kalaallit Nunaat AS
NU	Nunaoil A/S
PH	TGS-NOPEC Geophysical Company ASA
NP	Phillips Petroleum Sisimiut A/S
SH	Shell Greenland A/S
ST	Statoil Greenland AS
SW	Spectrum Geo Ltd
TT	Total Greenland A/S
UT	Ultramar Greenland Ltd.
XP	PA Resources AB

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Note B.

Each company can use this component in whatever way is most suitable for the specific survey; using for example quadrant/block, asset name or tranche number.e.g.

SSSSSS

e.g. 675403

Quad 6754 and block 3

e.g. 0000T6

Area Tranche 6

For further information about the use of **Quad** and **Blocks**, see Exploration Drilling Guidelines on www.govmin.gl.

Note C.

5 characters have been allocated for line number to allow for 3D shoots where the first line number is very often greater than 0, e.g. where companies are shooting a combined survey and they agree line numbers amongst themselves. In this instance the first line number may be 7000.

SEG-Y HEADER STANDARDS

Textual header (EBCDIC Header)

Client = Name of survey operator

Survey Name

Acquisition information:

date of acquisition

airgun vol

gun depth

interval

Identification of processing contractor, place and time of processing

Processing history as agreed with client and contractor

SP/CDP relation for 2D data at a given point on the line or Byte position for inline/crossline information in trace header for 3D data

Identification of survey and line by names. Line name should be complete including any prefix (e.g. AB2007000000000010).

If this is a reprocessing see naming conventions for lines.

Identification of geogedetic datum, projection, central meridian and spheroid for coordinates in seismic.

For 2D data, the EBCDIC Header, should CLEARLY give the relationship CDP to shot-point numbering, at one tiepoint or as a formula.

For 3D data EBCDIC header should CLEARLY give byte position for inline/ crossline information in trace header.

For 3D data EBCDIC header should CLEARLY give coordinates of grid origin.

For 3D data EBCDIC header should CLEARLY give grid rotation in seconds related to grid North and clockwise in inline direction

Binary Header

400-byte Binary File Header – Entries listed below are mandatory

Byte	Description
3213-3214	Number of data traces per ensemble.
3215-3216	Number of auxiliary traces per ensemble.
3217-3218	Sample interval in microseconds (μ s). Normally the same as in trace header
3221-3222	Number of samples per data trace. Normally the same as in trace header
3225-3226	Data sample format code. <u>Mandatory for all data.</u> 1 = 4-byte IBM floating-point 2 = 4-byte, two's complement integer 3 = 2-byte, two's complement integer 4 = 4-byte fixed-point with gain (obsolete) 5 = 4-byte IEEE floating-point 6 = Not currently used 7 = Not currently used 8 = 1-byte, two's complement integer
3229-3230	Trace sorting code (i.e. type of ensemble) : -1 = Other (should be explained in user Extended Textual File Header stanza 0 = Unknown 1 = As recorded (no sorting) 2 = CDP ensemble 3 = Single fold continuous profile 4 = Horizontally stacked 5 = Common source point 6 = Common receiver point 7 = Common offset point 8 = Common mid-point 9 = Common conversion point
3255-3256	Measurement system: 1=metres 2=feet
3501-3502	SEG-Y Format Revision Number. A value of zero indicates "traditional" SEG-Y conforming to the 1975 standard.
3503-3504	Fixed length trace flag. A value of one indicates that all traces in this SEG-Y file are guaranteed to have the same sample interval and number of samples, as specified in Textual File Header bytes 3217-3218 and 3221-3222. A value of zero indicates that the length of the traces in the file may vary and the number of samples in bytes 115-116 of the Trace Header must be examined to determine the actual length of each trace. This field is mandatory for all versions of SEG Y, although a value of zero indicates "traditional" SEG-Y conforming to the 1975 standard.
3505-3506	Number of 3200-byte, Extended Textual File Header records following the Binary Header. A value of zero indicates there are no Extended Textual File Header records (i.e. this file has no Extended Textual File Header(s)). A value of -1 indicates that there are a variable number of Extended Textual File Header records and the end of the Extended Textual File Header is denoted by an (SEG: EndText) stanza in the final record. A positive value indicates that there are exactly that many Extended Textual File Header records. Note that, although the exact number of Extended Textual File Header records may be a useful piece of information, it will not always be known at the time the Binary Header is written and it is not mandatory that a positive value be recorded here. <u>This field is mandatory for all versions of SEG Y, although a value of zero indicates "traditional" SEG-Y conforming to the 1975 standard.</u>

Trace Header – 2D file

240-byte trace header – Entries listed below are mandatory (but not necessarily in the byte positions specified)

Byte	Format	Description
1 -4	4 byte INT	Trace sequence number within line.
5 - 8	4 byte INT	Trace sequence number within SEG-Y file — Each file starts with trace sequence one.
17-20	4 byte IBM FLT	Shotpoint number; Not mandatory -as long as SP-CDP relationship provided
21-24	4 byte INT	Ensemble number (i.e. CDP, CMP, CRP, etc)
29-30	2 byte INT	Trace identification code: -1=Other 0=Unknown 1=Seismic data 2=Dead 3=Dummy
71-72	2 byte INT	Scalar to be applied to all coordinates specified in Trace Header bytes 73-88. Positive = multiplier; Negative = divisor
73-76	4 byte INT	Source coordinate - X; For 2D the coordinate of ensemble (CDP) of this trace; Not mandatory, as long as nav available
77-80	4 byte INT	Source coordinate-Y; For 2D the coordinate of ensemble (CDP) of this trace; Not mandatory as long as nav available.
89-90	2 byte INT	Coordinate units: 1 = Length (meters or feet) 2 = Seconds of arc 3 = Decimal degrees 4 = Degrees, min, secs (DMS)
103-104	2 byte INT	Total static applied in milliseconds. (Zero if no static has been applied,)

Trace Header – 3D file

240-byte trace header – Entries listed below are mandatory (but not necessarily in the byte positions specified)

Byte	Format	Description
1 - 4	4 byte INT	Trace sequence number within line.
5 - 8	4 byte INT	Trace sequence number within SEG-Y file — Each file starts with trace sequence one.
29-30	2 byte INT	Trace identification code: 3=Dummy
29-30	2 byte INT	Trace identification code: 3=Dummy
73-76	4 byte INT	Source coordinate - X; Not required if corner points are provided
77-80	4 byte INT	Source coordinate-Y; Not required if corner points are provided.
89-90	2 byte INT	Coordinate units: 1 = Length (meters or feet) 2 = Seconds of arc 3 = Decimal degrees 4 = Degrees, min, secs (DMS)
103-104	2 byte INT	Total static applied in milliseconds. (Zero if no static has been applied,)
189-192	4 byte INT	3D Inline number. Does not have to be in this position
193-196	4 byte INT	3D Crossline number. Does not have to be in this position

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