



# Appendix Fa: Requirements for Submittal of Hydrocarbon related Geoscientific Data

## Introduction

This document is Guidelines for application, execution and reporting of offshore hydrocarbon exploration activities (excluding drilling) in Greenland 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 OGD Guidelines. The approval letter may specify further requirements for reporting than what is mentioned here.

## General Information

All the data mentioned below shall be uploaded to the Greenland National Petroleum Data Repository (GNPDR), which is found at this website: [www.greenpetrodata.gl](http://www.greenpetrodata.gl). Metadata for each dataset will be captured on web forms as part of the upload process.

All datasets shall contain reference to the GNPDR Survey Identification code and the GNPDR dataset ID, either in the data/document/metadata or as part of the filename.

The final report for each project shall be sent to the Oil and Gas Department at the Government of Greenland. The reports shall include licence number, survey name, year, GNPDR Survey Identification code and the GNPDR dataset ID. Reporting of all significant datasets is mandatory.

## Seismic Surveys

The licensee shall submit the following material to the GNPDR as soon as possible and no later than the **1<sup>st</sup> of April** after the year in which the data was collected. Further information on the data requirements for the data to be submitted are in the Seismic data details section.

1. Acquisition report (herein included all acquisition parameters and setup of survey).
2. Field data in SEG-D format (SEG-Y nav-seis merge accepted if SEG-D was not produced in acquisition).
3. Raw and processed field navigation.
4. Source signature.
5. Observers logs.
6. Processed seismic data in SEG-Y format, consisting of:
  - Migrated pre-stack gathers after full pre-stack processing.
  - Migrated stack after full pre-stack processing.
  - Final migrated stack after full pre-stack and post-stack processing.
  - Any Partial stacks (offset and or angle stacks) produced.

The Oil and Gas Department can at any time request a copy of the digital data at a suitable intermediate processing stage.

7. Projected and Geographic coordinate reference systems for processed data.
8. Stacking, migration, anisotropy, water column and time to depth velocity datasets.
9. Processing and if available interpretation reports.

### Seismic data details

- a. All data must be uploaded to the Greenland National Petroleum Data Repository (GNPDR). Tape and disk or any other physical media is not accepted.
- b. Field data SEG-D formats accepted are rev 2.1, rev 3.0, rev 3.1 and newer. Data must be transcribed to disk without encapsulation and may be single or multiple shots per file.
- c. SEG-Y formats accepted are rev 0 using rev 1 trace header locations, rev 1, rev 2 and newer. SEG-Y data must comply with the requirements of the “SEG-Y Data format requirements” section in this document.
- d. Velocities should be supplied in DISKOSV98 format or SEG-Y as detailed in the “Seismic velocity data format requirements” section in this document.

- e. Source signature - recorded or modelled far field (with and without source + receiver ghost) as ASCII files and source details included in acquisition report.
- f. Observers logs accepted file format are, HTML, ASCII or PDF, the PDF must not be made from a scan of a paper report.
- g. Raw navigation must be submitted using UKOOA P2/94 or OGP P2/11 format for marine surveys or SEG-P3 for on-shore surveys.
- h. Processed navigation and bathymetric/topographic data must be submitted using UKOOA P1/90 or OGP P1/11 format for marine surveys or SEG-P3 for on-shore surveys. A GeoJSON format file with all lines in the survey included should be provided.
- i. Projected and Geographic coordinate reference system for processed data must be submitted using UKOOA P6/98 or OGP P6/11 format, as well as being documented in the SEG-Y EBCDIC (Textual) header.
- j. Acquisition report describing the progress and extent of the seismic survey and the acquisition details. The acquisition report must contain information on Licence Number and for Exclusive Licences including a description of the licence commitment under which the described activity has been carried out. Accepted report file format is PDF, the PDF must not be made from a scan of a paper report.
- k. Processing report describing the processes and parameters undertaken on the seismic data. The report must contain information on Licence Number and for Exclusive Licences including a description of the licence commitment under which the described activity has been carried out. Accepted report file format is PDF, the PDF must not be made from a scan of a paper report.
- l. The Oil and Gas Department may determine that different formats for reporting should be used, in that case the department will notify the license holders 3 months in advance by email.

## **Controlled Source Electromagnetic (CSEM) surveys**

The licensee shall submit the following material to the GNPDR as soon as possible and no later than the **1<sup>st</sup> 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 Oil and Gas Department 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.

## **Marine Gravity Surveys (also applicable for Aerogravity Surveys)**

The licensee shall submit the following material to the GNPDR as soon as possible and no later than the **1<sup>st</sup> 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 (ASCII XYZ files or ESRI shape files) of the free-air gravity anomaly maps, supplied as contour maps.
- f.** The Oil and Gas Department may request access to other relevant data.
- g.** Grav/Mag data shall not be reported in the same data file as the seismic navigation.

## **Marine Magnetic Surveys (also applicable for Aeromagnetic Surveys)**

The licensee shall submit the following material to the GNPDR as soon as possible and no later than the **1<sup>st</sup> 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 (GeoTIFF) including residual magnetic intensity map after removal of

IGRF (as contour map [ASCII XYZ files or ESRI shape files]).

- e. The Oil and Gas Department may request access to other relevant data.

## **Other geophysical surveys (including geophysical data acquisition as part of site surveys, as applicable)**

The licensee shall submit the following material to the GNPDR as soon as possible and no later than the **1<sup>st</sup> 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 OGD - Drilling Guidelines).

- a. A copy of any type of sub-bottom profiler data shall be submitted to GNPDR in SEG-Y format. This includes site survey data and data acquired on transit.
- b. High resolution seismic data shall be submitted to GNPDR according to the provisions in this document.
- c. A copy of the processed single or multibeam bathymetric data as x, y, z data in ASCII format.
- d. A copy of sidescan sonar data in a suitable digital format and as digital images (JPEG or PNG).
- e. A copy of still photos (JPEG or PNG) and video (MPEG4) should be included as enclosures to the final report.
- f. Acquisition, processing and interpretation reports (if available) for any type of data acquired shall always be submitted.

## **Shallow cores, associated core samples and seabed sampling**

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

The Oil and Gas Department must receive samples as well as data and reports on results from surface and down-hole measurements as specified below (anything digital shall be submitted to GNPDR):

### **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 Oil and Gas Department Core Storage Facility (see the Supplemental document to the OGD Guidelines February 2016) at a fee determined by the Oil and Gas Department to cover the cost. The fee shall be paid by the licensee. Permission must be obtained from the Oil and Gas Department if samples are to be stored outside the Oil and

Gas Department 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 Oil and Gas Department.
- c.** When the cores/samples are stored in Greenland the Licensee and the Oil and Gas Department may freely inspect the material. The Licensee may - after consulting the Oil and Gas Department - 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 record shall be prepared, see ISO 19901-8:2014 section 9.6.1 (<https://webshop.ds.dk/en-gb/standard/ds-en-iso-19901-82015>) , which normally includes information such as:
  - 1. ID of borehole and sample;
  - 2. date of sampling;
  - 3. location coordinates;
  - 4. water depth;
  - 5. depth below seafloor to the bottom of the sample;
  - 6. type of sampler;
  - 7. dimensions of sampler;
  - 8. length or volume of sample collected;
  - 9. whether the sample is extruded or sealed in tube or liner, etc.
  - 10. The sampling record shall be completed as soon as practicable following sample acquisition.
- b.** An acquisition report must be submitted to the GNPDR and the Oil and Gas Department 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 GNPDR and the Oil and Gas Department.
- d.** Colour digital photos (JPEG or PNG) of all cores/samples shall be submitted. The photos are

to be taken immediately after cutting and should be at a single focal length which should be retained throughout the investigation. Each photo shall show sample site number, sample number, depth, a reference scale, recognized colour chart and a direction (top and bottom) indication. Excess drilling fluids should be wiped off and the sample side facing the camera gently shaved to display structure.

## GNPDR data naming requirements

Each acquisition survey shall have a GNPDR Survey Identification code and that code will be contained in any products delivered from it and any subsequent re-processing.

Every dataset submitted to the GNPDR shall contain reference to at least one GNPDR Survey Identification code and its unique GNPDR dataset ID, either in the data/document/metadata or as part of the filename.

The GNPDR dataset ID will be unique for each dataset submitted to the GNPDR.

Any acquisition dataset should use the line GNPDR acquisition line naming system described in this document

## GNPDR Survey Identification code

The identification code of a survey will be defined by a 12-character code where the format of the 12 characters is defined as: **CCYYYYTSNNNN** and detailed below:

CC	2 character alphanumeric code for company - See company code list
YYYY	4 character numeric year survey was acquired
TS	2 character code defining the type of survey – e.g. 2D, 3D
NNNN	4 character numeric survey designator, right justified, padded with zeros

The TS 2 character code defining the type of survey is defined as follows:

2D	2D seismic survey
3D	3D seismic survey
4D	4D seismic survey
SS	Site investigation surveys (seismic, shallow boreholes etc)
CS	CSEM surveys
GR	Stand alone gravity surveys
MG	Stand alone magnetic surveys
WB	Stand alone acoustic/sonar/bathymetry surveys



The NNNN 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.

0001	first survey from company GE in year 2007
0002	second survey from company GE in year 2007

### Examples of survey names

GE20202D0001	first 2D survey from company GE in year 2020
GE20202D0002	second 3D survey from company GE in year 2020
GE20203D0001	first 3D survey from company GE in year 2020
GE2020CS0001	first CSEM survey from company GE in year 2020
GE2020SS0002	second Site investigation survey from company GE in year 2020

## GNPDR DATASET ID

Any dataset submitted to the GNPDR must have a dataset ID as well as the survey ID(s) that the data was produced. All datasets from the same project should have the same first 11 characters of the dataset ID (fields, CC, YYYY, TD and SNN).

The dataset ID composition is **CCYYYYTDSNNAAAAAAA\*** as detailed below:

CC	2 character alphanumeric code for company - See company code list
YYYY	4 character numeric year this dataset was created
TD	2 character code defining the type of dataset
SNN	3 character code defining stage + sequential number of the project producing the dataset
AAAA*	Unlimited number of characters to provide unique dataset description and should describe the data type, e.g raw_mig_stack , final_gaths, 10_20_angle_stack , agc_mig_stack, free_air_anomaly , water_depth_grid, for 2d datasets can contain the line number. There must be no spaces in the ID and the acceptable characters are; 0-9, a-z, A-Z and underscore(_)

The TD 2 character code defining the type of dataset is defined as follows:

2D	2D seismic dataset
3D	3D seismic dataset
4D	4D seismic dataset
SS	Site investigation surveys (seismic, shallow boreholes etc)
CS	CSEM dataset
GR	Gravity dataset
MG	Magnetic dataset
WB	Acoustic/sonar/bathymetry dataset

The SNN 3 character alphanumeric describes the stage and sequential number with in the year of the project creating this dataset:

A01	The first data acquisition project of any dataset in a year by a company
A02	The second data acquisition project of any dataset in a year by a company
F01	The first processing of a new acquisition dataset in any year
R01	The first re-processing project of any dataset in a year by a company
R02	The second re-processing project of any dataset in a year by a company
RNN	The N <sup>th</sup> re-processing project of any dataset in a year by a company
M01	The first merge project of any datasets in a year by a company
M14	The fourteenth merge project of any datasets in a year by a company

## Examples of GNPDR DATASET ID

GE2020DA01segd_line_02415	First acquisition project in 2020 by company GE, it is a 2D seismic survey and the dataset is the segd field data from line 02415
GE2020SSA02nav_seis_merge_line_00005	Second acquisition project in 2020 by company GE, it is a Site investigation survey and the dataset is the field nav-seismic merged data from line 5
GE20203DR01raw_mig_stack	First reprocessing project by company GE in 2020, It is a 3d seismic project and this dataset is the raw migrated stack after full pre-stack processing
GE20203DR01final_mig_stack	First reprocessing project by company GE in 2020, It is a 3d seismic project and this dataset is the final migrated stack after full pre-stack and post-stack processing
GE20203DR01final_mig_offset_gaths	First reprocessing project by company GE in 2020, It is a 3d seismic project and this dataset is the final migrated pre-stack offset domain gathers after full pre-stack processing
GE20203DR01angle_stack_10_20_deg	First reprocessing project by company GE in 2020, This dataset is a 3D seismic angle stack volume from that project
GE2020GRR02bouguer_anomaly	Second reprocessing project by company GE in 2020, This dataset is a bouguer anomaly from that project
GE2020WBF01water_vel_line_00014	2020 project by company GE, This dataset is from the first processing of a bathymetry survey, the dataset is water column velocity profile from line 00014 in the project

## GNPDR acquisition line naming

An acquisition line name will be defined by a 18-character The composition of these 18 characters will be: **CCYYYYSSSSSSLLLLLV** and detailed below:

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CC	2 character alphanumeric code for company - See company code list
YYYY	4 character numeric year line was acquired
SSSSSS	6 character alphanumeric survey designator, right justified, padded with zeros
LLLLLL	5 character line number, right justified, padded with zeros
V	1 character, version number, 0 by default

The SSSSSS 6 character alphanumeric survey designator can be used in whatever way is most suitable for the specific survey; using for example quadrant/block, asset name or tranche number. Please do not use Quad / Block if lines cross block boundaries. Examples are:

675403	Quad 6754 and block 3
0000T6	Area Tranche 6

### Examples of acquisition line names

GE200700000000010	2D line acquired by company GE in 2007
GE2007675403000010	2D line acquired by company GE in 2007 in Quad 6754 / block 3

## Company code list - (CC part of survey/line/dataset names)

Company codes are designated by the Oil and Gas Department. If codes are missing or new codes are needed, please contact the Oil and Gas Department (NAP@nanoq.gl). Only lines and surveys with correct company codes will be accepted by the GNPDR.

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

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<b>MB</b>	Mobil Exploration Greenland Inc.
<b>MR</b>	Maersk Oil Kalaallit Nunaat AS
<b>NU</b>	Nunaoil A/S
<b>PH</b>	TGS-NOPEC Geophysical Company ASA
<b>NP</b>	Phillips Petroleum Sisimiut A/S
<b>SH</b>	Shell Greenland A/S
<b>ST</b>	Statoil Greenland AS
<b>SW</b>	Spectrum Geo Ltd
<b>TT</b>	Total Greenland A/S
<b>UT</b>	Ultramar Greenland Ltd.
<b>XP</b>	PA Resources AB

## SEG-Y Data format requirements

SEG-Y formats accepted are rev 0 using rev 1 trace header locations, rev 1, rev 2 and newer (<https://seg.org/Publications/SEG-Technical-Standards>).

1. 2D and 3D Post-stack datasets must have CDP/CMP projected XY coordinates (map projection) for each trace.
2. 2D and 3D Pre-stack datasets pre-binning (un-regularized) must have source and receiver projected XY coordinates (map projection) for each trace.
3. 2D and 3D Pre-stack datasets post-binning (regularized) must have CDP/CMP Projected XY coordinates (map projection) for each trace.
4. All SEG-Y must be of fixed length traces, i.e all traces in a file must be the same number of samples and the sample rate must remain constant.
5. The preferred data sample type is 4-byte IEEE floating-point (SEG format code 5).
6. All SEG-Y rev 0 and rev 1 datasets must be written as Big Endian ordered data.
7. The EBCDIC (Textual) header must contain the coordinate reference system used for the trace XY headers, either as EPSG codes or a CRS description. This CRS system must be the same as the one detailed in the processed navigation data.

Minimum requirements for the Textural, Binary and Trace headers are detailed in the following sections.

## Textural header (EBCDIC Header)

The minimum information contained in the SEG-Y Textural header must be as shown below, additional information such as processing flow details can be included within spare rows. Merged datasets can have multiple GNPDR Survey IDs of the various inputs listed in the textural header.

```

C01 CLIENT: NAME OF OPERATOR                ; PROCESSED BY:
C02 DATA TYPE: FINAL GATHERS                ;DOMAIN: TIME OR DEPTH ;DATE: JUNE 2014
C03 GNPDR DATASET ID: CCYYYYTDSNNAAAAAA*
C04 GNPDR SURVEY ID: CCYYYYTSNNNN           ;SURVEY NAME:
C05
C06 ACQ BY:                                ;VESSEL:                                ;YEAR: 2012
C07 NUM SOURCES:                            ;VOL:                CU; DEPTH: M; SP INT: M
C08 NUM CABLES:                             ;LENGTH:            M;DEPTH:    M; CHANS/CABLE:        ;CHAN SEP:    M
C09 SOURCE SEPARATION:                      M;CABLE SEPARATION:        M
C10 TRACES/RECORD:                          ;SAMP INT:    MS;SAMP/TRACE:
C11
C12 PROCESSING DATE: 2014;
C13 PROCESSING: SEGD READ; NAV SEIS MERGE; .....;
C14
C15
C16
C17
C18
C19
C20
C21
C22
C23
C24
C25 HDR BYTE POSITIONS: NAME BYTE POS LEN; INLINE 189 4; XLINE 193 4
C26 CDPLBL 21 4; CDP-X 181 4; CDP-Y 185 4;
C27
C28 PROJ EPSG CODE: 3182
C29 ELLIPSOID:GRS 1980; DATUM: GREENLAND 1996; PROJ: UTM; ZONE: 22N
C30
C31 INLINE BIN: 12.5 M ;INCR: 1 ; XLINE BIN: 12.5 M ;INCR: 1
C32 INLINE AXIS: 15.415 ;DEG (CLOCKWISE FROM NORTH)
C33 CROSSLINE AXIS: 105.415 ; DEG (CLOCKWISE FROM NORTH)
C34 ORIGIN IL,XL:      ,      ; X:                UNIT ;Y:                UNIT
C35 DATA CORNER COORDINATES:
C36 IL      XL      X      Y
C37 IL      XL      X      Y
C38 IL      XL      X      Y
C39 IL      XL      X      Y
C40 POLARITY:

```



### SEG-Y Binary Header – Entries listed below are GNPDR Mandatory

Byte location	Description
3213-3214	Number of data traces per ensemble, (1 for post stack)
3215-3216	Number of auxiliary traces per ensemble (0 for post stack)
3217-3218	Sample interval. Microseconds for time data, meters/feet for depth data
3221-3222	Number of samples per data trace
3225-3226	Data sample format code
3227-3228	Ensemble fold , (1 for post stack)
3229-3230	Trace sorting code (type of ensemble)
3255-3256	Measurement system (1 = Meters, 2 = Feet)
3501-3502	SEG-Y Format Revision Number

### SEG-Y Trace Header – Entries listed below are GNPDR Mandatory

Byte location	Description
1-4	Trace sequence number within line.
5-8	Trace sequence number within SEG-Y file
13-16	Channel/Receiver number (if applicable)
17-20	Source point number (if applicable)
21-24	Unique ensemble number (CDP, CMP, CRP, CDPLBL etc.) (if applicable)
29-30	Trace identification code (1 = Time domain, 25 = Depth domain)
37-40	Offset/Angle header (Pre-stack only)
71-72	Scalar to be applied to all coordinates (negative = divisor)
73-76	Source X projected coordinate relating to this trace (if applicable)
77-80	Source Y projected coordinate relating to this trace (if applicable)
81-84	Receiver X projected coordinate relating to this trace (if applicable)

85-88	Receiver Y projected coordinate relating to this trace (if applicable)
89-90	XY Coordinate units (1 as should be in metres or feet)
103-104	Total static applied in milliseconds (Zero if none applied)
181-184	X projected coordinate of this trace
185-188	Y projected coordinate of this trace
189-192	Inline number (if applicable)
193-196	Crossline number (if applicable)

## Seismic velocity data format requirements

Velocities should be submitted in the form that they were used in processing the data. Gridded velocity models are to be provided in SEG-Y format. Non regularly sampled velocities are to be provided in DiskosV98 format, as defined in the NPD Yellow book ( <https://www.npd.no/globalassets/1-npd/regelverk/forskrifter/en/geophysical-guidelines.pdf> )

Velocity data type	Accepted formats
RMS Stacking	DiskosV98 or SEG-Y - depending on sampling
RMS migration	DiskosV98 or SEG-Y - depending on sampling
Interval migration - Time	SEG-Y
Interval migration - Depth	SEG-Y
Anisotropy components	SEG-Y
Time to depth	DiskosV98 or SEG-Y - depending on sampling
Other velocity datasets	DiskosV98 or SEG-Y - depending on sampling