

Instructions for performing geophysical survey and processing of geophysical data

IGS.004 Calculation of geometry during the work of the HR / UHR systems

GeoEel, Geo-SenseLW_48ch

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List of changes:

05/17/2019 - Appendix 1 and Appendix 2 are added.

1 General overview of the issue

Geometry Calculation” refers to actions aimed at obtaining: a P190 file (required for transfer to the Funds), receiving a file for uploading to the 2D Marine Geometry Spreadsheet 2D Geometry Assignment Module of the ProMax software, obtaining a seismic source deactivation trackplot (via FFID) in AutoCad.

The value to which the point of seismic excitation is linked is the “detonation time” UTC transmitted in a navigation message to a seismic station (see current message formats in IGS.003) and stored in the seismic station log.

In post-processing, navigation issues a file with the coordinates of the source tow point after 1 second and UTC time (see the current file format in IGS.003). Based on Layback, the coordinates of the towed seismic source are calculated after 1 second. For the well-known “blasting time”, the coordinates of the source are calculated at the time of the shot.

If necessary, it is possible to calculate the following coordinates for the moments of undermining:

- 1) Position of the center of the towed seismic source according to the Layback algorithm (the length of the etched cable is used);
- 2) the position of the seismic source according to GSP data (it is necessary to obtain “raw data” from navigation from the GPS cluster positioning system);
- 3) the position of the tail buoy according to GSP data (it is necessary to obtain “raw data” from navigation from the GPS positioning system of the end buoy).

This instruction describes the calculation (1) - “the position of the center of the towed seismic source, for moments of detonation, according to the Layback algorithm”.

2 Calculation of geometry at work GeoEel

Data required to calculate the geometry:

- Log of navigation messages generated by the seismic station (postfix in the name of the .Nav file; example file name: 0148_Seismic_Line_2.Nav.txt);
- Calculated off-line file with the coordinates of the point of towing the seismic source;
- Calculated off-line file with coordinate values and depths based on MBES rays;
- File in sgy format, recorded by the seismic station;
- File with header for P190.

The data obtained in the calculation of geometry:

- File P190, including: coordinates of the point of seismic source detonation; FFID corresponding to the seismograms in the sgy data file (except for the seismograms with noise recording); the depths of the sea below the seismic source;
- A file with the extension ".geom", containing data for loading into the geometry table of the ProMax module "2D Marine Geometry Spreadsheet";
- Script for AutoCad, for drawing the points of detonation of the seismic source (draws the line of movement of the source, the coordinates of the points of detonation, signs the FFID of the points of detonation).

Geometry calculation:

When performing a seismic survey, a string with a time of seismic source detonation is sent to the GeoEel seismic station (see current message formats in IGS.003). A seismic station records incoming lines in a log file with the postfix Nav. Sample file content:

File: **103**, \$GPGGA,20190502,**084731.92**,-9,637334.83,5113283.19,37.1, 19:47:42.97

File: **104**, \$GPGGA,20190502,**084734.47**,-8,637339.03,5113288.90,37.1, 19:47:45.52

File: **105**, \$GPGGA,20190502,**084737.07**,-7,637341.95,5113292.64,37.1, 19:47:48.15

In the example, the FFID of the undermining point (FFID may not coincide with the FIX number from navigation) and the time of undermining in UTC are highlighted in bold.

After performing the seismic profile, navigation prepares a file with the coordinates of the tow point of the seismic source in 1 second (see the current file format in IGS.003). Sample file content:

20190502	084729.000	637331.96	5113279.43	35.79
20190502	084730.000	637333.40	5113281.30	35.79
20190502	084731.000	637334.83	5113283.19	35.78

The procedure for exporting a file from QINSy is described in Appendix 1.

Also, navigation prepares a file with coordinates and depths along the MBES rays (see the current file format in IGS.003). Sample file content:

```
637277.40  5113363.74  -78.06 1    1
637277.92  5113363.33  -78.06 2    1
637278.44  5113362.92  -78.03 3    1
```

The procedure for exporting a file from QINSy is described in Appendix 2.

The operator-geophysicist forms the directory from the seismic data and the files provided by navigation. The body of the file name is common to all files, the correctness of writing postfixes and extensions is required. An example of the contents of a directory (the files used in the calculation of the geometry are highlighted in color):

Seismic Profile Contents	Description
0148_Seismic_Line_2.log	Log recorded by the seismic station.
0148_Seismic_Line_2.Depth.txt	The file with the depth of the spit (according to the repeater depth sensor) recorded by the seismic station.
0148_Seismic_Line_2.Gather1.sgy	Seismic section file for one seismic trace recorded by the seismic station
0148_Seismic_Line_2.Tension.txt	Spit tension log recorded by a seismic station
0148_Seismic_Line_2.sgy	A sgy file recorded by a seismic station (or several files combined).
0148_Seismic_Line_2.Nav.txt	Log messages from navigation for each shot, recorded by the seismic station
0148_Seismic_Line_2_Bathy.txt	File with coordinates and depths along the MBES rays, provided by navigation
0148_Seismic_Line_2_tpSource.txt	The file with the coordinates of the tow point of the seismic source after 1 second, provided by navigation

Geometry calculation is carried out in MatLab software (Commercial license, No. 40779312, ROMONA Ltd). When calculating the script is used "gUhrGeoEel_GeomCreateScript". In this case, the steps described below are consistently performed.

1) Enter additional data:

- The name of the root directory with data files;
- The file name body (example for the table above: 0148_Seismic_Line_2);
- The length of the towing cable seismic source;

- Deepening of a seismic source; - Azimuth on the tail buoy of the seismic spit from the point of towing the seismic spit.

In the absence of data on the position of the tail buoy, the azimuth of the streamer can be approximately estimated as the direction opposite to the direction of the center plane of the vessel. For this, a file is viewed that contains the coordinates of the tow point of the seismic source after 1 second, in the last column of which the course of the vessel is recorded (direction of the center plane); the most frequently occurring value along the profile is selected and 180 degrees are added (subtracted) to it.

2) “Navigation message log for each shot recorded by the seismic station” is being downloaded.

Matlab command: 1; gUhrGeoEel_GeomCreateScript;

3) Emissions are removed in the coordinates of the tow point of a seismic source (produced in the emission removal window). Calculation of coordinates of a towed seismic source using Layback.

Matlab command: 2; gUhrGeoEel_GeomCreateScript;

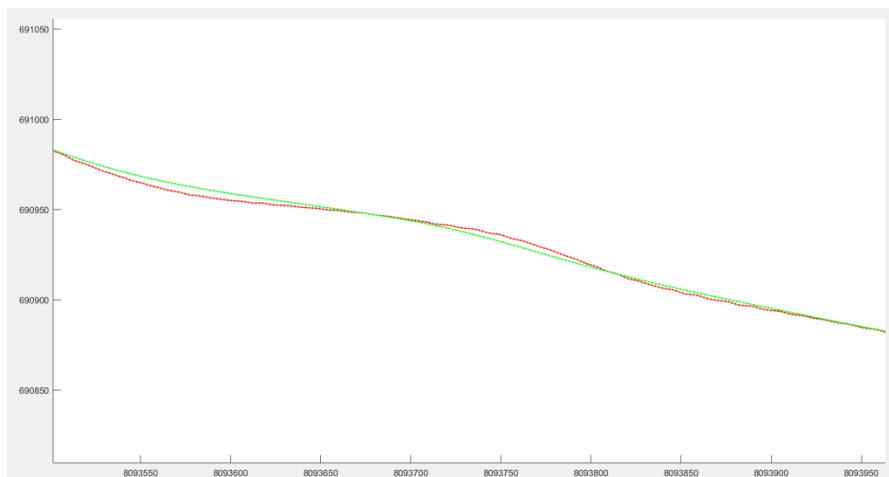


Figure 1 Calculation of the position of a seismic source using a Layback using the dragging model

Red line - tow point position; green - position of the seismic source.

3) FFID compliance check is performed in the sgy file and the “navigation message log” file. Removed from FFID processing that are missing from the sgy file. A script file is created for AutoCad with the position of the seismic source at the moment of shooting and FFID numbers.

Matlab command: 3; gUhrGeoEel_GeomCreateScript;

4) A file is loaded with coordinates and depths along the MBES rays. The calculation of the depths (triangulation) under the seismic source at the moments of shooting is performed.

Matlab command: 4; gUhrGeoEel_GeomCreateScript;

5) A “.geom” file is generated that contains data for loading into the geometry table of the ProMax 2D Marine Geometry Spreadsheet module. Sample file content:

```
103 103 637311.8 5113253.3 78.2 3.0 103 216.0 84732 122 1 0.0
104 104 637315.5 5113258.1 78.2 3.0 104 216.0 84734 122 1 0.0
105 105 637319.2 5113262.9 78.2 3.0 105 216.0 84737 122 1 0.0
106 106 637323.0 5113268.0 78.2 3.0 106 216.0 84740 122 1 0.0
107 107 637326.8 5113272.9 78.2 3.0 107 216.0 84742 122 1 0.0
108 108 637330.6 5113277.9 78.2 3.0 108 216.0 84745 122 1 0.0
109 109 637334.4 5113282.9 78.2 3.0 109 216.0 84748 122 1 0.0
110 110 637338.1 5113287.9 78.2 3.0 110 216.0 84750 122 1 0.0
```

Matlab command: 5; gUhrGeoEel_GeomCreateScript;

6) Data is being downloaded to the P190 file. Example of file contents (part of header lines removed):

```
H0100 Survey area           Testing survey, Aniva Bay
H0102 Vessel details       Ivan Kireev
H0103 Source details       Boomer AA301
H0202 Tape version         UK00A P1/90
H2600 Water depth         Current sea surface by Echo Sounder
H2600....1.....2.....3.....4.....5.....6.....7.....8
S0180_SL5      11      1463112.58N1423051.34E 616148.45152957.3 33.1123112622
S0180_SL5      11      2463112.58N1423051.24E 616146.45152957.3 33.1123112623
S0180_SL5      11      3463112.58N1423051.15E 616144.45152957.2 33.1123112624
S0180_SL5      11      4463112.58N1423051.05E 616142.45152957.2 33.1123112625
S0180_SL5      11      5463112.58N1423050.96E 616140.45152957.1 33.1123112627
```

Matlab command: 6; gUhrGeoEel_GeomCreateScript;

As a result of the calculations, “geometry files” are recorded in the seismic line directory. Below, in the table, an example is given with the names of the files and a description of the purpose of the files.

File name	Description
0148_Seismic_Line_2_SrcFfidXY.txt	File with FFID number and coordinates of the seismic source (three columns, tab separator).
0148_Seismic_Line_2_SrcFfidXY.scr	File with script AutoCad.
0148_Seismic_Line_2_Promax.geom	Geometry file for loading into the ProMax 2D Marine Geometry Spreadsheet module.
0148_Seismic_Line_2.190	File P190.

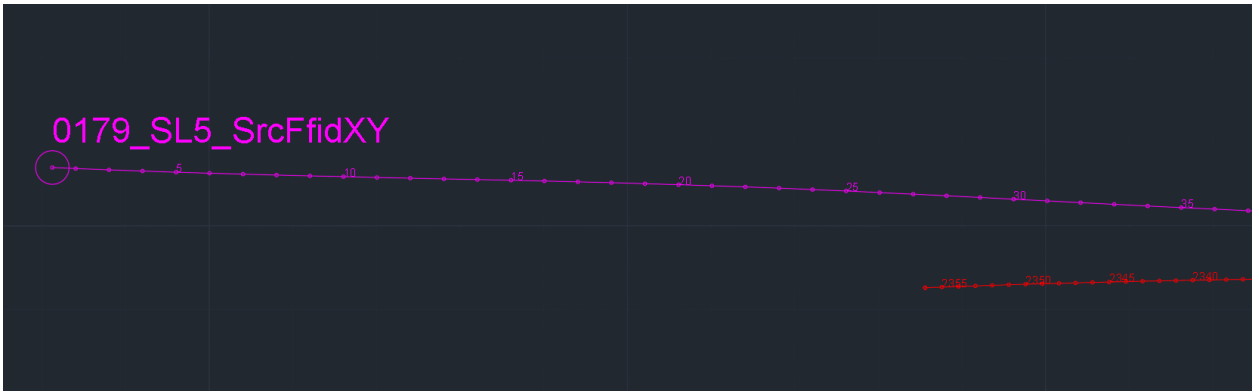


Figure 2 Example of drawing a script in the AutoCad window

3 Calculation of geometry when working with Geo-SenseLW_48ch

“Geometry Calculation” refers to actions aimed at: obtaining a P190 file (required for transfer to the Funds), receiving the file for uploading to ProMax geometry assignment module «2D Marine Geometry Spreadsheet», Acquisition of the seismic shot points trackplot (by FFID) in AutoCad.

Data required to calculate the geometry:

- Log generated by a seismic station (example file name: 18661018.log);
- A computed off-line file with the coordinates of the seismic source tow point;
- Calculated off-line file with coordinate values and depths based on MBES;
- Sgy file recorded by seismic station;
- File with header for P190.

The data obtained in the calculation of geometry:

- A P190 file, including: coordinates of the shot point of seismic source; FFID, corresponding to the seismograms in the sgy data file (with the exception of seismograms with noise recording); sea depths below the seismic source;
- File extension «.geom», containing data to load into the geometry table of the ProMax module «2D Marine Geometry Spreadsheet»;
- Script for AutoCad, for drawing seismic source shot points (draws the line of movement of the source, coordinates of shot points, adds signatures FFID for shot points).

Geometry Calculation:

When performing a seismic survey, a string with a time of seismic source shot is sent to the MultiTrace seismic station. (see current message formats in IGS.003). The seismic station records incoming strings in a log file. Sample file content:

```
FFID,1, SHOTID,1001, LINE,62, SN,18661018, TS,0.0, 01/05/2019 04:27:29.765
UTC, VESSEL_X,637640.960000000, VESSEL_Y,5113657.570000000,
VESSEL_FIX,1219.000000000, VESSEL_HDG,41821.250000000,
VESSEL_AZI,0.000000000, VESSEL_FEA,0.000000000,
VESSEL_SPEED,402460.403504188, VESSEL_GPSTIME,01/05/2019 04:27:27.178 UTC,
FFID,2, SHOTID,1002, LINE,62, SN,18661018, TS,500.0, 01/05/2019 04:27:30.666
UTC, VESSEL_X,637642.420000000, VESSEL_Y,5113667.320000000,
VESSEL_FIX,119.000000000, VESSEL_HDG,41824.460000000, VESSEL_AZI,0.000000000,
VESSEL_FEA,0.000000000, VESSEL_SPEED,1922.980426837,
VESSEL_GPSTIME,01/05/2019 04:27:30.641 UTC,
```


In the example, the FFID of the undermining point (FFID may not coincide with the FIX number from navigation) and the time of undermining in UTC are highlighted in bold.

After completing the seismic profile, navigation prepares a file with coordinates obtained every 1 second for the tow point of the seismic source. (see current message formats in IGS.003).

Sample file content:

```

20190501    041824.000    637645.17    5113671.83    28.38
20190501    041825.000    637646.09    5113673.31    28.39
20190501    041826.000    637646.97    5113674.76    28.46
20190501    041827.000    637647.77    5113676.28    28.61

```

The procedure for exporting a file from QINSy is described in Appendix 1.

Also, navigation prepares a file with coordinates and depths obtained using MBES (see current message formats in IGS.003). Sample file content:

```

637584.27    5113747.20    -78.28 1    1
637584.82    5113746.86    -78.29 2    1
637585.37    5113746.53    -78.31 3    1
637585.91    5113746.20    -78.33 4    1
637586.46    5113745.86    -78.34 5    1
637587.02    5113745.52    -78.35 6    1

```

The procedure for exporting a file from QINSy is described in Appendix 2.

The operator-geophysicist forms the directory from the seismic data and the files provided by navigation. The body of the file name is common to all files., correct spelling of postfixes and extensions is important. Part of the files issued by the station, renamed or deleted. Sample directory content (files used in geometry calculations are highlighted in color):

The contents of the seismic profile folder (original)	The contents of the seismic profile folder (delete and rename)	Description
18661018\		Station log files
18661019\		Station log files
SEG-Y\ 0126_Seismic_line_2.SEGY	SEG-Y\ 0126_Seismic_line_2.sgy	File with seismograms in sgy format
.devorder		streamer segment numbers
18661018.GRIF		Station utility file
18661018.GRLI		Station utility file
18661018.log	0126_Seismic_line_2_LW Streamer.log	Log file of seismic station for the streamer section 18661018
18661019.GRIF		Station utility file
18661019.GRLI		Station utility file

The contents of the seismic profile folder (original)	The contents of the seismic profile folder (delete and rename)	Description
18661019.log	18661019.log	Log file of seismic station for the streamer section 18661019
LAN_TRIGGER_LOG.log	0126_Seismic_line_2_LAN_TRIGGER_LOG.log	Log navigation messages submitted to the station, with station time.
name.txt		Seismic line name.
navigation.p190		File P190, generated by the station (not correct).
RAW_LOG-Input 0.log	0126_Seismic_line_2_RAW_LOG-Input 0.log	Log navigation messages submitted to the station.
	0126_Seismic_line_2_tpSource.txt	File with coordinates and depths obtained with MBES, provided by navigation
	0126_Seismic_line_2_Bath.txt	File with coordinates obtained every 1 second for the tow point of the seismic source, provided by navigation

Geometry calculation is performed in MatLab software (Commercial license, No. 40779312, ROMONA Ltd). When calculating the script is used «gUhrGeoSense_GeomCreateScript». The steps described below are performed in succession.

0) Enter additional data:

- The name of the root directory with data files;
- The body of the file name (example for the table above: 0126_Seismic_line_2);
- towing cable lengths seismic source;
- Deepening seismic source;
- Azimuth from the point of towing the seismic streamer to the tail buoy of the seismic streamer.

If there is no data on the tail buoy position, then azimuth of the can be approximately estimated as the direction opposite to the direction of the center plane of the vessel. For this, a file is viewed that contains the coordinates of the seismic source tow point after 1 second, in the last column of which is recorded the course of the vessel (the direction of the median plane); the most frequently occurring value along the profile is selected and 180 degrees are added (subtracted) to it.

1) A “log of messages from navigation for each shot recorded by a seismic station” is being downloaded.

Matlab command: 1; gUhrGeoSense_GeomCreateScript;

2) The spikes is removed in the coordinates of the point of towing the seismic source (produced in the spike removal window). Calculation of coordinates of a towed seismic source using Layback.

Matlab command: 2; gUhrGeoSense_GeomCreateScript;

- 3) FFID is checked for compliance in the sgy file and the “navigation message log” file. FFIDs that are missing from the sgy file are removed from processing. A script file is created for AutoCad containing the position of the seismic source at the moment of shooting and the FFID number.

Matlab command: 3; gUhrGeoSense_GeomCreateScript;

- 4) The file, with coordinates and depths obtained using MBES, is loaded. The calculation of the depths (triangulation) under the seismic source at the moments of shooting is performed.

Matlab command: 4; gUhrGeoSense_GeomCreateScript;

- 5) file ".geom" is formed, which contains data to load into the geometry table of the ProMax module «2D Marine Geometry Spreadsheet».

Sample file content:

1	1	637608.3	5113612.6	78.6	0.4	1	215.0	41821	121	1	0.0
2	2	637611.3	5113617.3	78.6	0.4	2	215.0	41824	121	1	0.0
3	3	637614.5	5113622.4	78.6	0.4	3	215.0	41828	121	1	0.0
4	4	637617.5	5113627.5	78.6	0.4	4	215.0	41831	121	1	0.0
5	5	637620.8	5113632.8	78.6	0.4	5	215.0	41835	121	1	0.0
6	6	637623.8	5113637.8	78.6	0.4	6	215.0	41838	121	1	0.0

Matlab command: 5; gUhrGeoSense_GeomCreateScript;

- 6) The data is output to the P190 file.

Sample file content (part of header lines removed):

H0100	Survey area		Testing survey, Aniva Bay
H0102	Vessel details		Ivan Kireev
H0103	Source details		Boomer AA301
H0202	Tape version		UK00A P1/90
H26001.....2.....3.....4.....5.....6.....7.....8		
S0126_Seismic	11	1460943.89N1424656.53E	637608.35113612.6 78.6121041821
S0126_Seismic	11	2460944.05N1424656.67E	637611.35113617.3 78.6121041824
S0126_Seismic	11	3460944.21N1424656.83E	637614.55113622.4 78.6121041828

Matlab command: 6; gUhrGeoSense_GeomCreateScript;

As a result of the calculations, “geometry files” are recorded in the seismic line directory. Below, in the table, an example is given with the names of the files and a description of the purpose of the files.

File name	Description
0126_Seismic_line_2_SrcFfidXY.txt	File with FFID number and coordinates of the seismic source (three columns, separator - tabulation).
0126_Seismic_line_2_SrcFfidXY.scr	Script file for AutoCad.
0126_Seismic_line_2_Promax.geom	Geometry file to load into ProMax module «2D Marine Geometry Spreadsheet».
0126_Seismic_line_2.190	File P190.

Prepared by: I. Dmitriev

05/06/2019

Appendix 1: Procedure for exporting a file with the coordinates of the seismic source tow point from QINSy

Exporting a file from QINSy is done as follows:

- 1) Copy the db file (s) of the tack to which you want to export data to the processing project.
- 2) Pass to Replay, select the file (s) we need and click the "Replay" button.

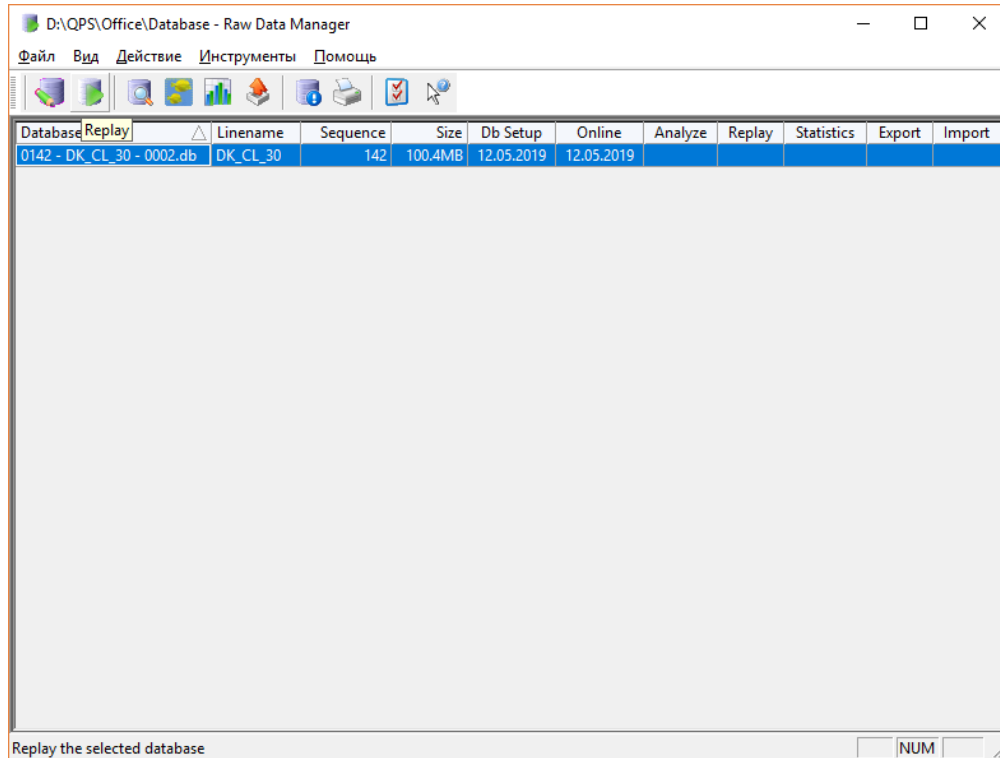


Figure 1.1. Window utility Replay.

- 3) In the controller that opens press the "Session setup" button.

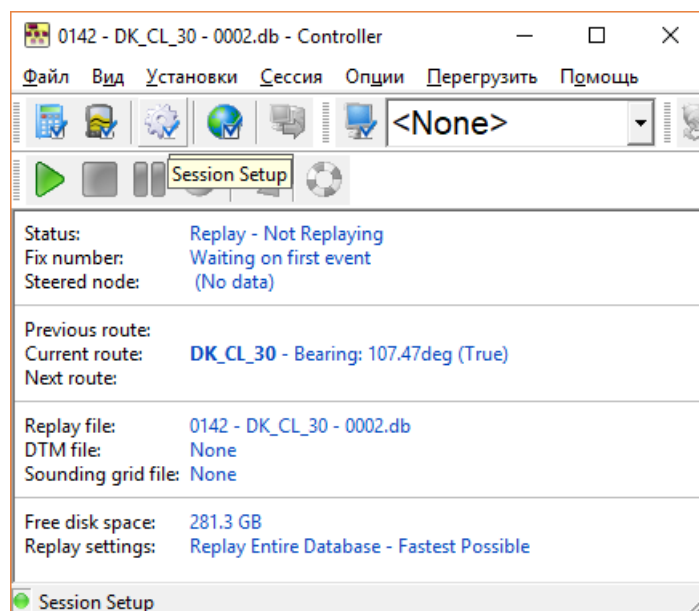


Figure 1.2. Window Replay controller.

In the window that opens (Figure 1.3), go to the “Storage” tab in the left part of the window that opens. In the section "Sounding grid" set "disabled".

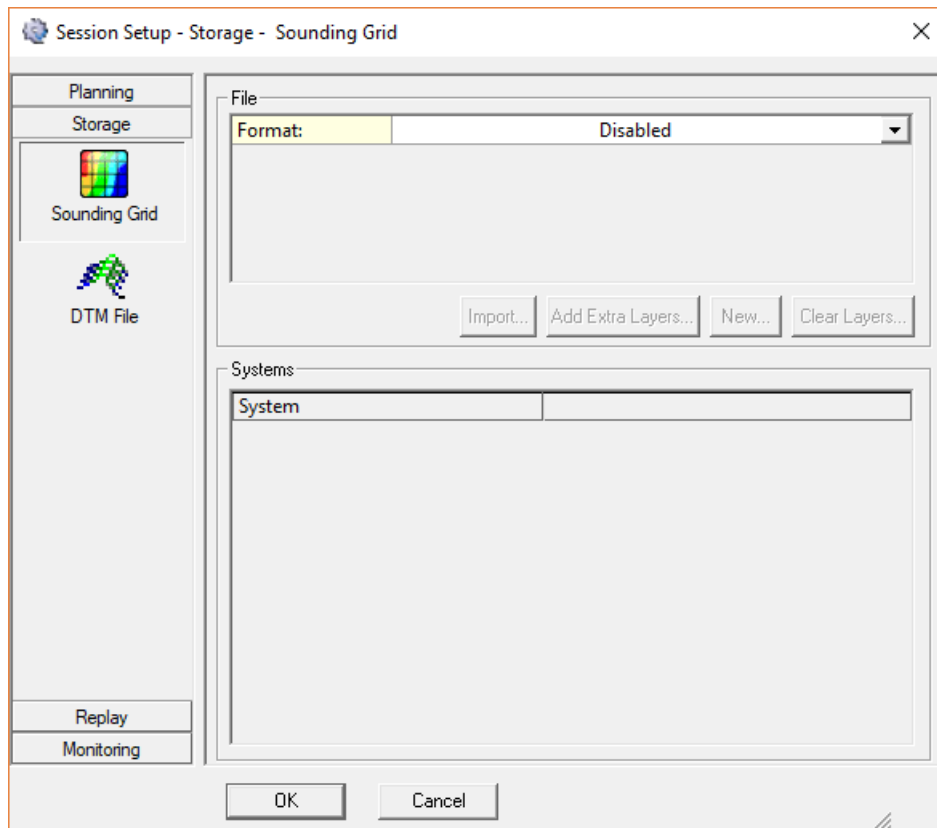


Figure 1.3. Menu Session Setup → Sounding grid of utility Replay.

DTM File - select “* .qpd - QINSy Processing”, tick the multibeam echo sounder. Click "Ok" (see Figure 1.4).

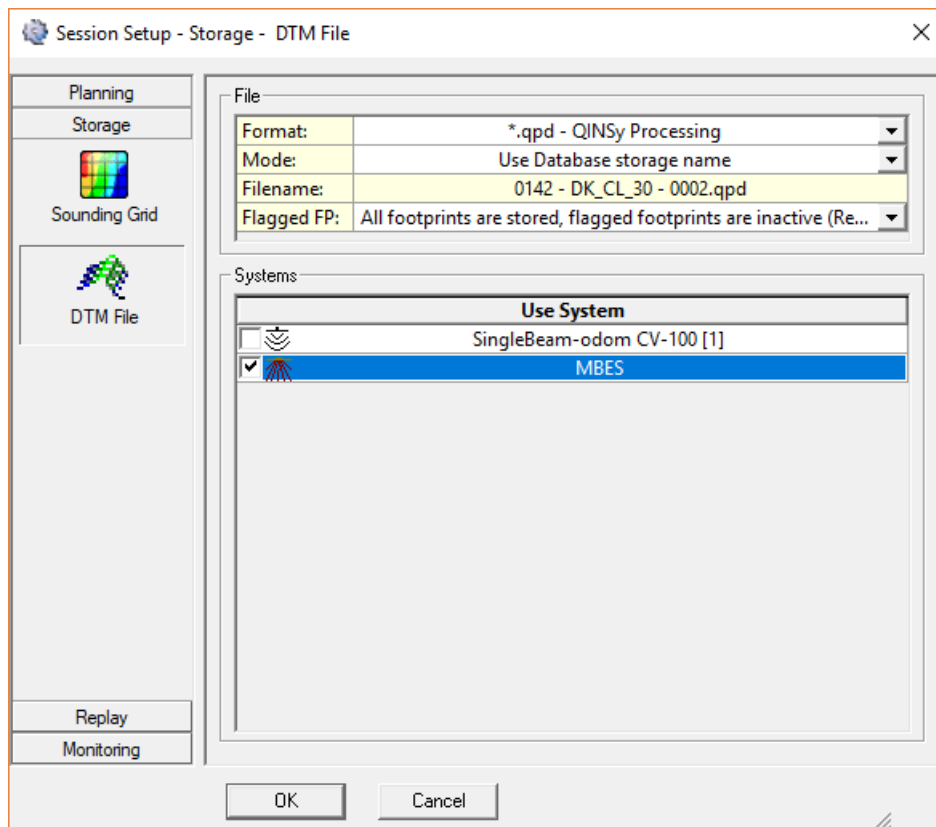


Figure 1.4. Menu Session Setup → DTM File utility Replay.

4) In the controller press the "Computation Setup" button

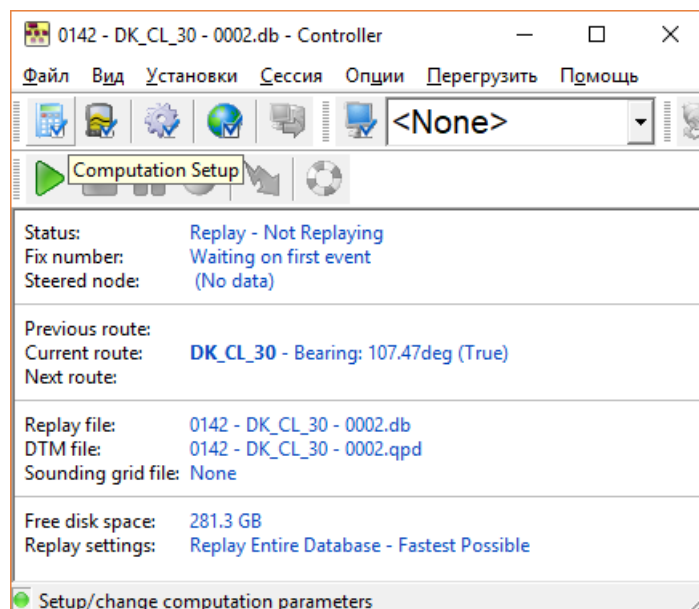


Figure 1.5. Window Replay controller.

Window will open similar to Figure 1.6:

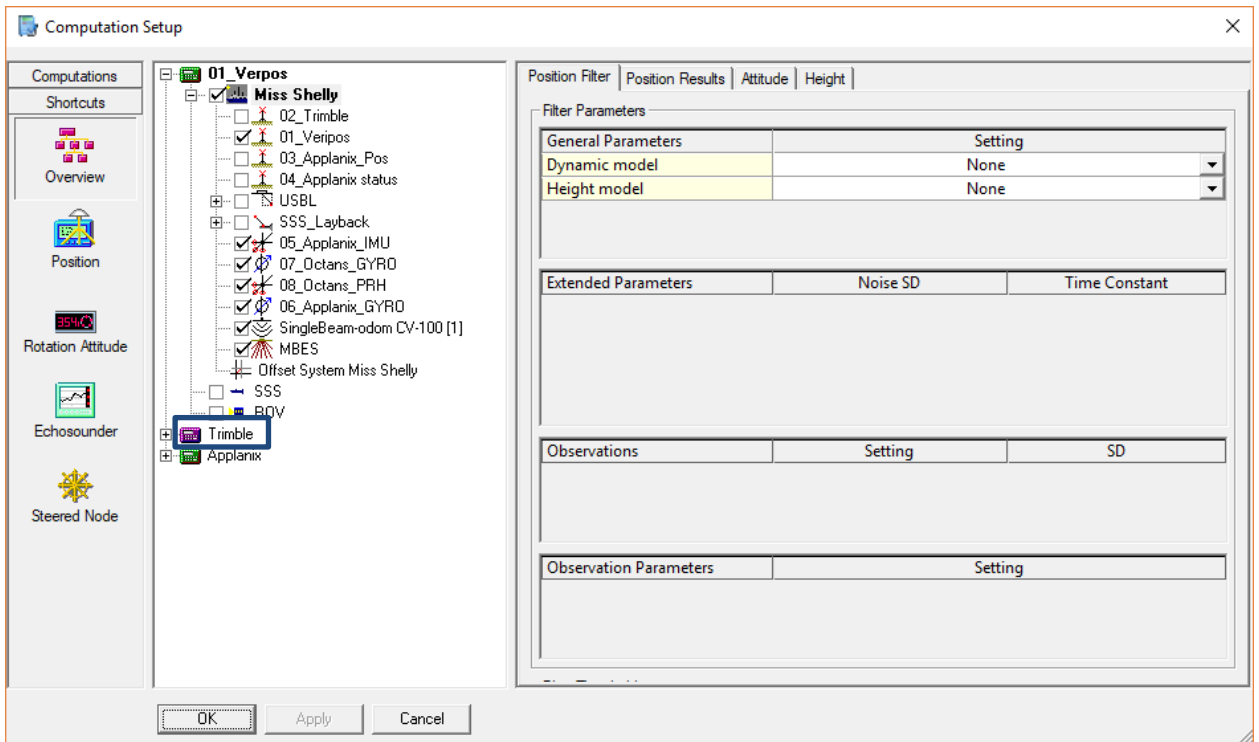


Figure 1.6. Window Computation Setup.

Here, the counting system in which this line was recorded is highlighted in red. We open all the “+” in it and click on the activated positioning system.

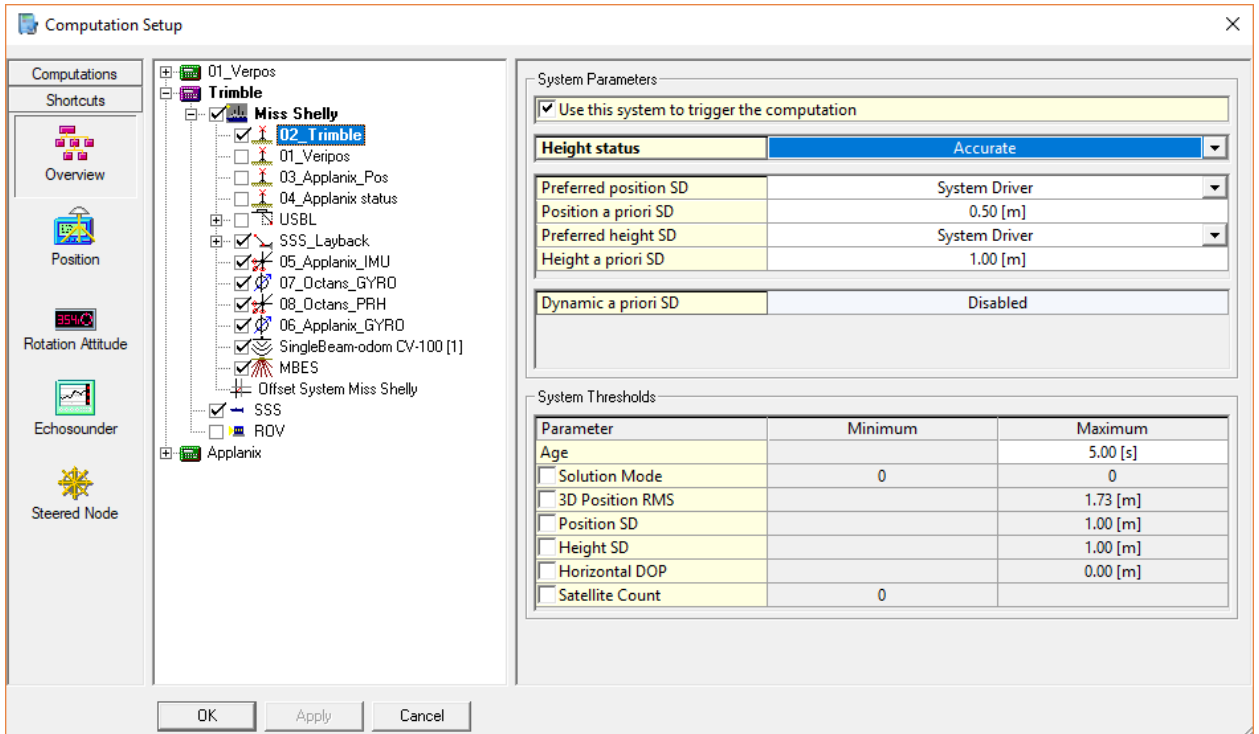


Figure 1.7. Positioning system of window Computation Setup.

We look in the section “Height status” on the right side of the window: there are 2 possible options - Accurate or Unreliable. What does it mean?

- A. Accurate means that the file recorded in RTK mode. Without going into details, we can say that the depths recorded in the file are automatically brought to a given sea surface (MSL, LAT, B-77, etc.). These are the depths for mapping. We need the actual sea depth at the time of measurement to export files. Therefore, here we change the value to “Unreliable”.
- B. Unreliable means that the depths reduced to the actual sea level by recalculating the values of the depth of the echo sounder and Z offsets. As a rule, we set the depth of the echo sounder and the HADR value (Height above draft reference) in the settings to be 0. In this case, the ship’s COG taken as the sea surface. Here we leave Unreliable.

Click on the name of the vessel and check in the tab "Height": **Tide method = disabled, Manual draft = 0.** Click Apply and Ok. Close the controller.

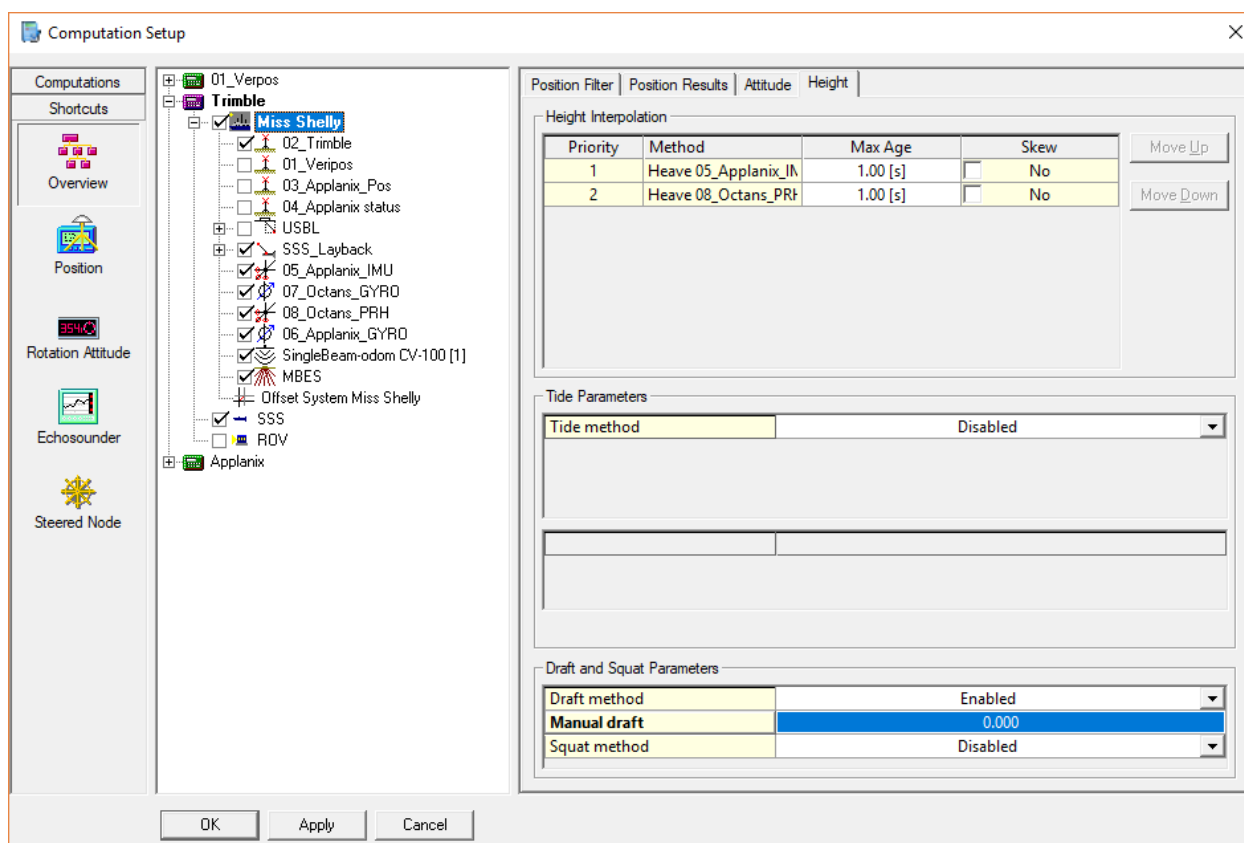




Figure 1.8. Window Computation Setup, tab Height.

5) In the Replay window, select the file that we edited and click Tools → Clone settings. This command will copy the settings we entered into the remaining files, which we will specify when executing the command.

6) We select all files with the same settings and press the button . The controller opens. In the Replay controller, press the "Play" button and wait until our files overwritten with the new settings.

7) In the Replay controller, select the desired file for export. It happens that the exported tack consists of several files (the body of the name is one, and the postfix has a sequence number from 1 to n), in this case we select all the files related to this tack. Click the button "Export"  → All data - Generic Export.

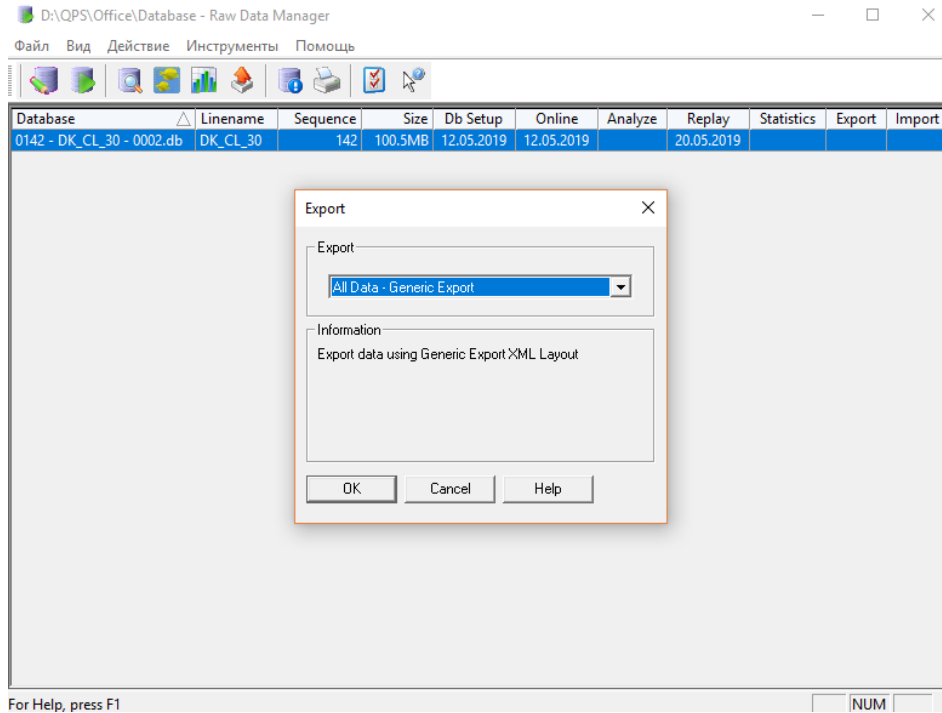


Figure 1.9. Window export data of utility Replay.

In the next window (Figure 1.10) we check that there is a Results file and click next.

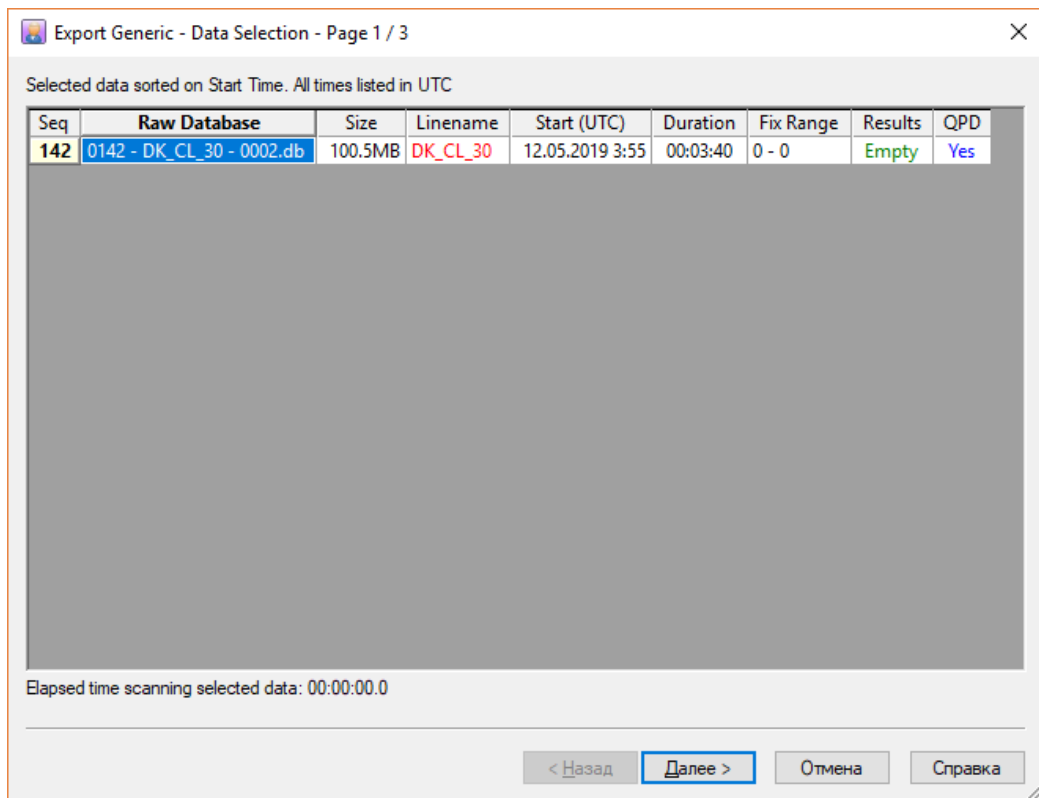


Figure 1.10. Window for checking the presence of errors in the files for export.

In the following window (Figure 1.11) we create a Layout. In other words, a template according to which we can export the data we need in the future. Press the "New" button. A window appears, as in the image below.

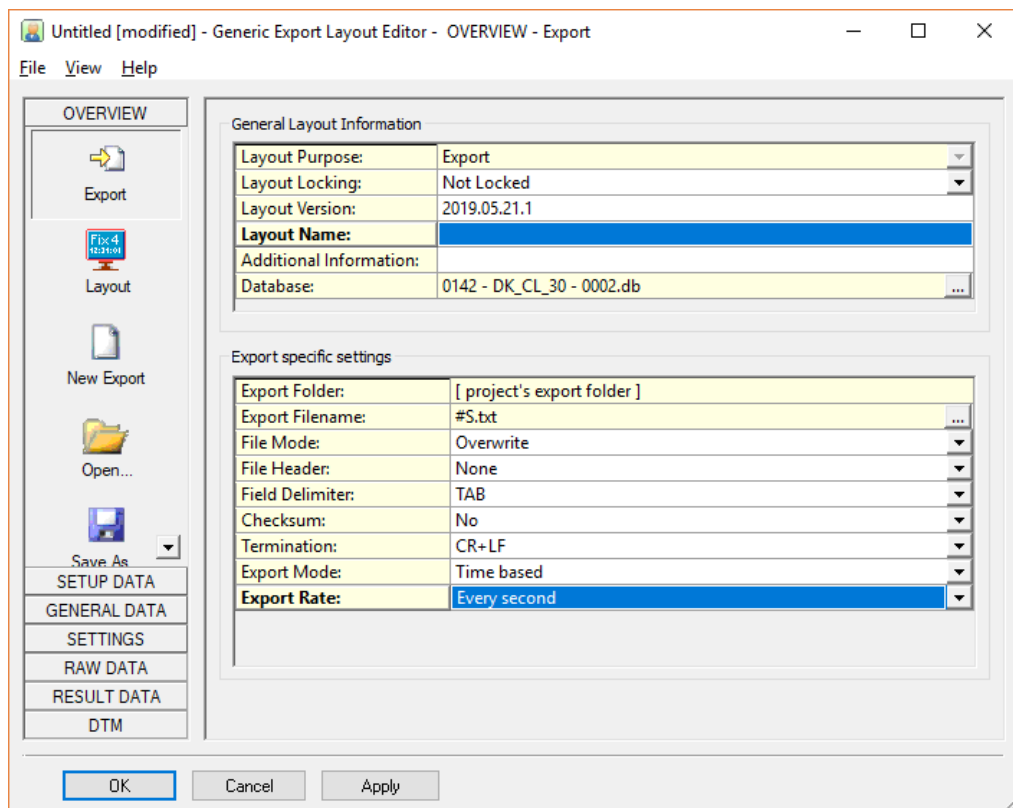



Figure 1.11. Window Overview → export.

Here we can give a name to our template in the field Layout name.

Export Filename: you can give the original name for the exported file or use the name of the db file.

The remaining settings should be as shown to Figure 1.11.

8) Переходим во вкладку GENERAL DATA.

Click 2 times on the date. The date reduced to the form in accordance with the example line: YYYYMMDD. To do this, in the Time Format field, select User Defined; in the User Defined field, press the button  and in the opened window type the characters in the Time Format Specifier line in accordance with the description given in this window below.

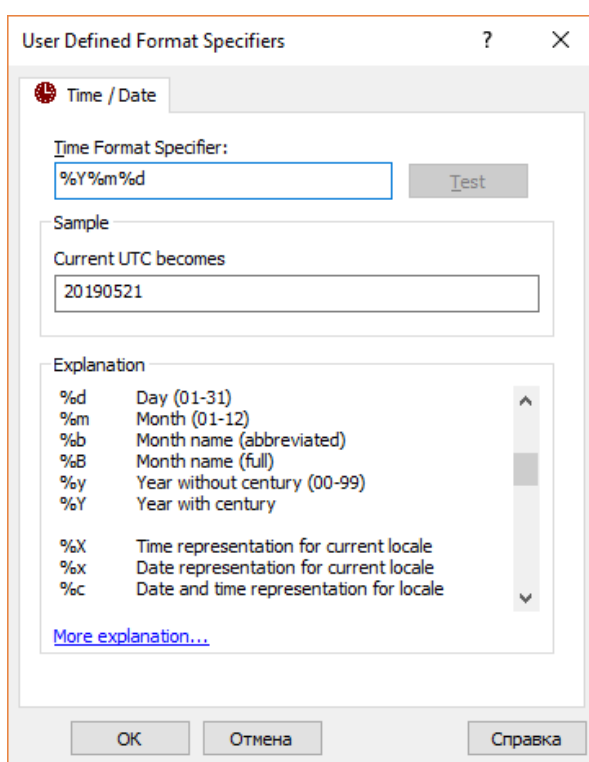


Figure 1.12. Window settings of format date..

Time Zone: 0hr UTC.


9) Pass to the RESULT DATA tab.

Choose "Nodes". Click the "Add" button and add the towing point of the equipment for which we export data. The point of towing equipment should be checked with the geophysicist.

Computation choose the one in which the file was recorded (we defined this in Section 4).

On the right side of the screen, select everything that we need to export to txt:

- A. Time. The time format must be converted to the form specified in the data export example: hhmmss.sss. To do this, in the Time Format field, select User Defined; in the User Defined

field, press the button  and in the window that opens, type the characters in the Time Format Specifier line in accordance with the description given in this window below.

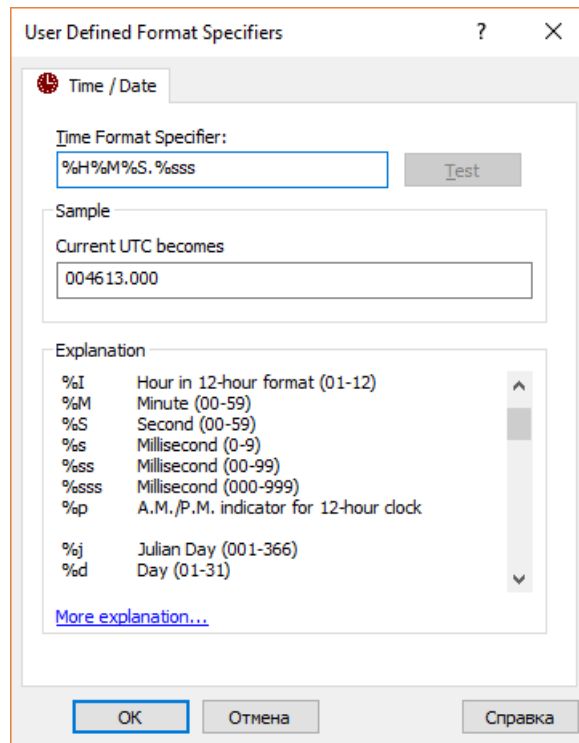


Figure 1.13. Window settings of format time.

Time Zone: 0hr UTC.

- B. Easting. Check to Nr Format = x.xx
 - C. Northing. Check to Nr Format = x.xx
 - D. Heading. Check to Nr Format = x.xx
- Click to Apply.

10) Pass to the tab Overview → layout. We check that the sequence of lines corresponds to Figure 1.14.

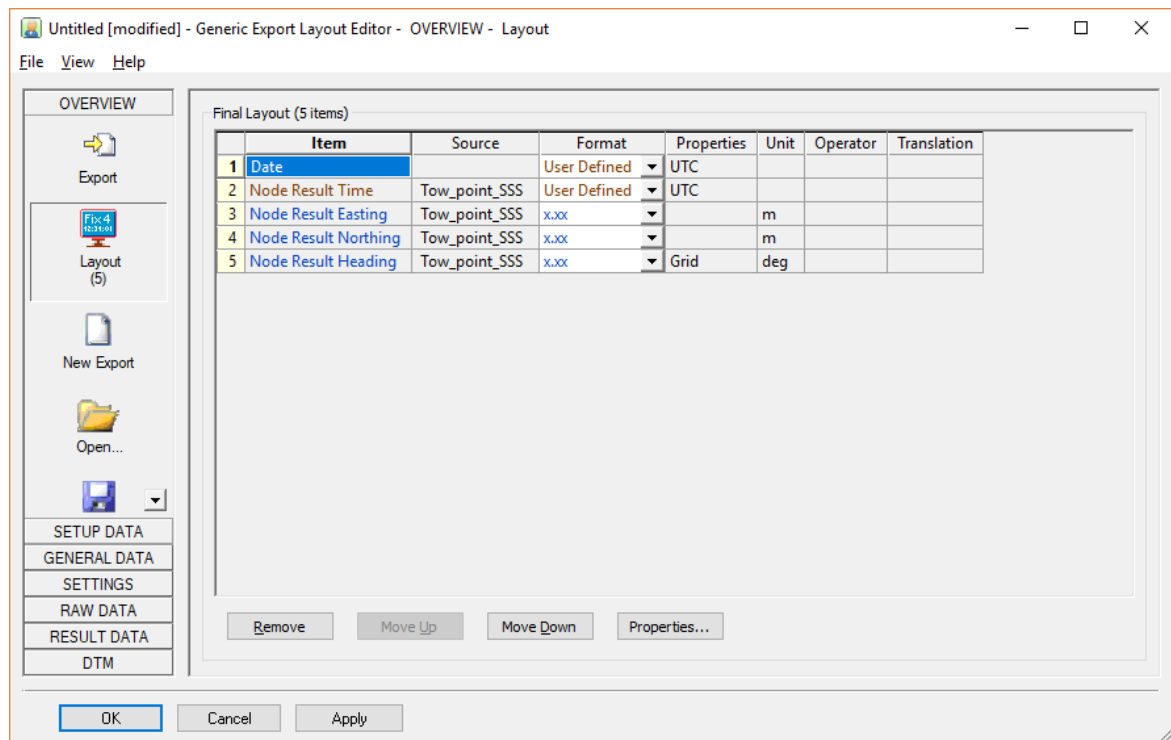


Figure 1.14. Window Overview → Layout.

If the line is not in its place, it can be lift or lower using the “Move Up” and “Move Down” keys.

The data export template setup completed. Click to Apply and Ok.

11) After saving the Layout, the program returns us to the Layout selection window. Put a tick in front of our Layout and click Next → Finish (see Figure 1.15).

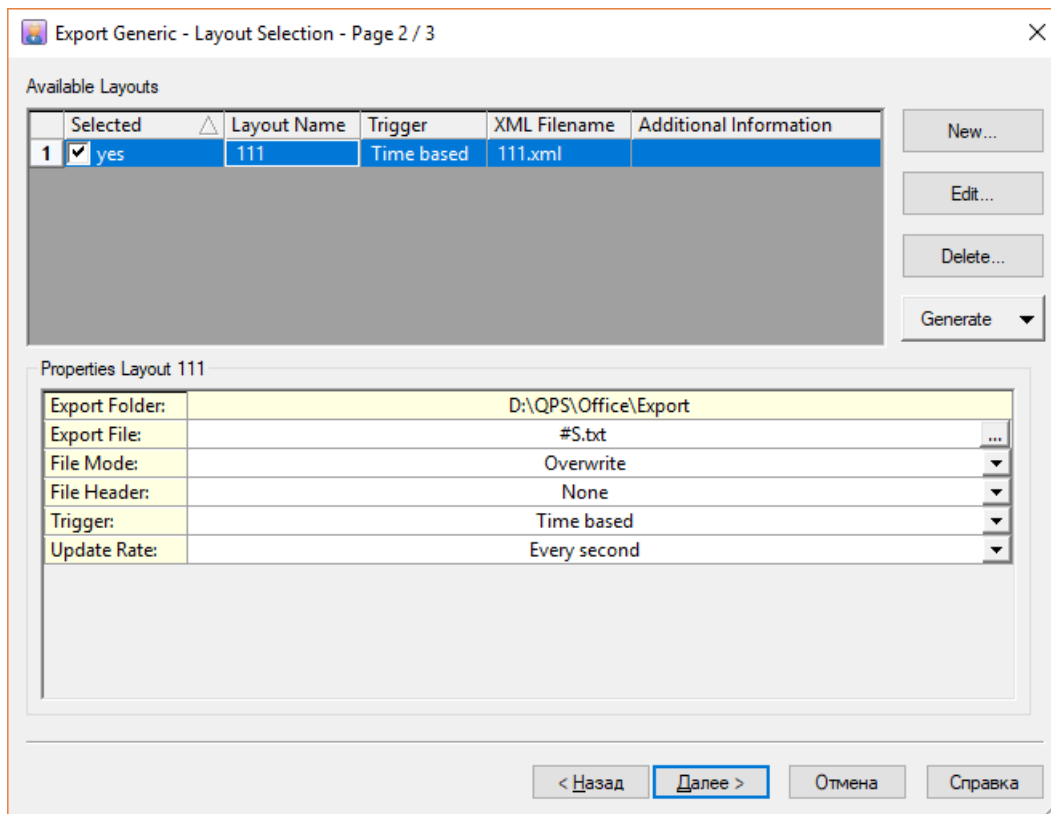


Figure 1.15. Window verification of export data.

The file export completed. The exported file must be found in the Export folder of the QINSy project and handed over to the geophysicist-processor.

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Appendix 2: The procedure for exporting a file with coordinates and depths along the MBES rays from QINSy

To export a file, do the following:

1) Pass to the Processing Manager. When you enter it, a dialog box appears with a choice of the type of project (Figure 2.1). Choose "Empty Session".

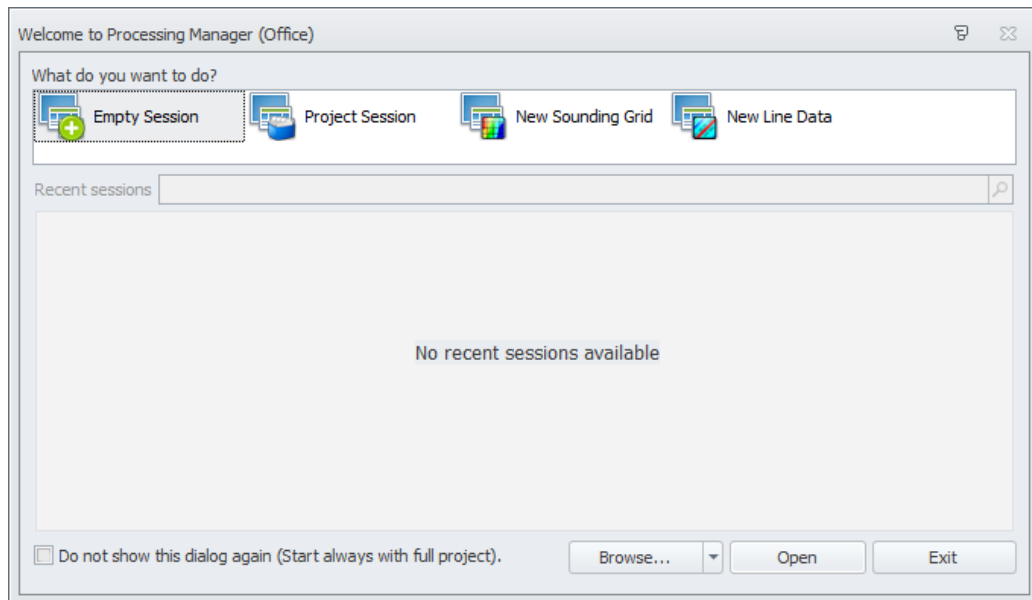


Figure 2.1 Choosing a way to open Processing Manager

We import here our overwritten qpd files. To do this, right-click on the "Survey files" → Import → Survey (Figure 2.2). In the window that opens, select the qpd files we need.

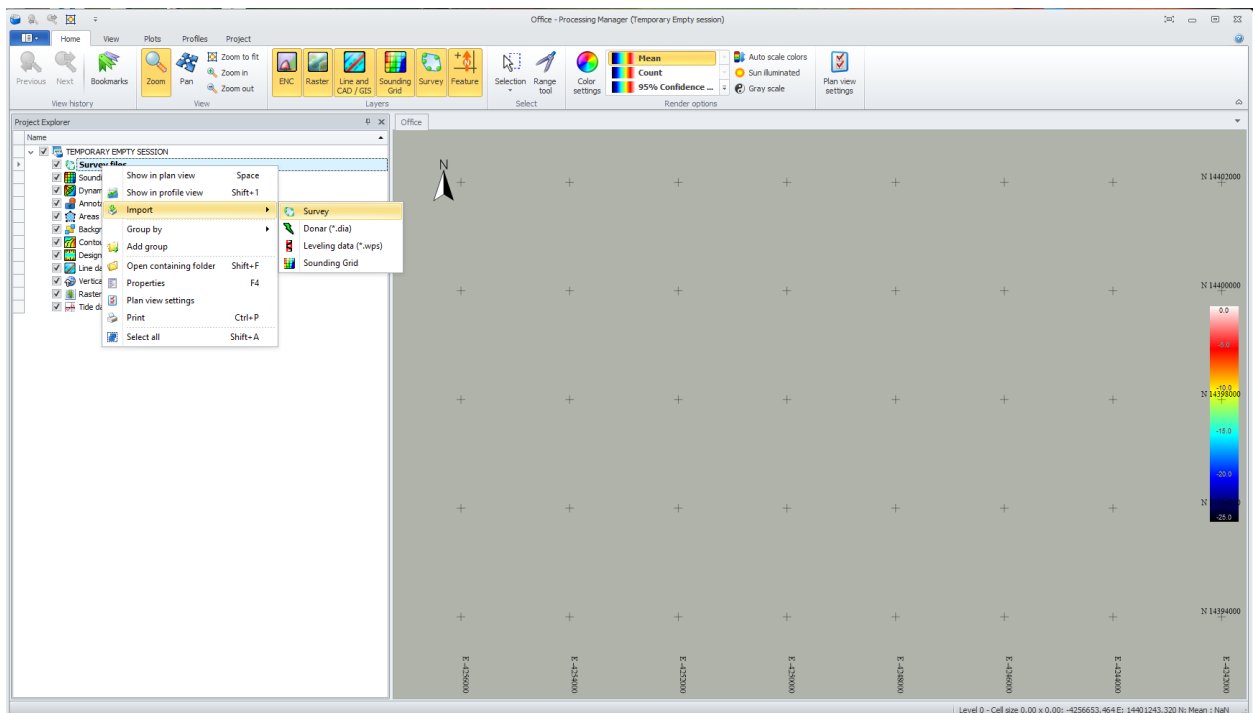


Figure 2.2 Import QPD files

2) Earlier it was said that in the Unreliable mode, the depths were recorded with the condition that the vessel's COG we adopted is on the surface of the water. In fact, the ship's COG is not always on the surface. In order to determine the correction to bring the depth to the actual sea level, we need to export the vessel's draft sensor data for the entire tack recording period and calculate the average value. Further, using the formula, determine the depth correction and apply it in the Validator by encrypting the depth points to a constant value.

Sensor draft data is also exported via Export.  → All data – Generic Export of utility Replay. Create a new Layout, find the Draft Sensor in the Raw Data → Observation Systems tab and select Value for export. We make export for all files in the tack.

Because The vessel's draft sensor is located near a multipath echo sounder, the sea level rise relative to the vessel's COG can be calculated using the following formula

$$\Delta D = Z_{\text{draft}} + \text{Draft}_{\text{cp}}, \text{ where:}$$

ΔD - excess of actual sea level over calculated in QINSy. The “+” sign means that the actual sea level is higher than calculated; “-” means that the actual sea level is lower than the calculated QINSy.

Z_{draft} is the offset of the vessel's draft sensor along the Z axis in the ship's coordinate system. It taken from the db settings.

Draft_{cp} is the average value of the vessel draft sensor for the entire tack. Calculated from the export of vessel draft sensor data.

When using the formula, the signs do not change. Z offset vessel, as a rule, a negative value; the “Draft” value of the vessel draft sensor always gives a positive.

3) The calculated amendment must be enter into the data. To do this, select the necessary files in the Survey files section in the Processing Manager, go to the Edit tab, click the “Validator”




button . In the left part of the window, activate all the lines (put a checkmark in front of all files). After that, press the button , behind button  → All footprint (all spots of illumination). A window will appear as Figure 2.3.



Figure 2.3 Window for adding commands editing points

Click to Add, select to "Shift [Z]" from the drop-down list - a window will appear as Figure 2.4.

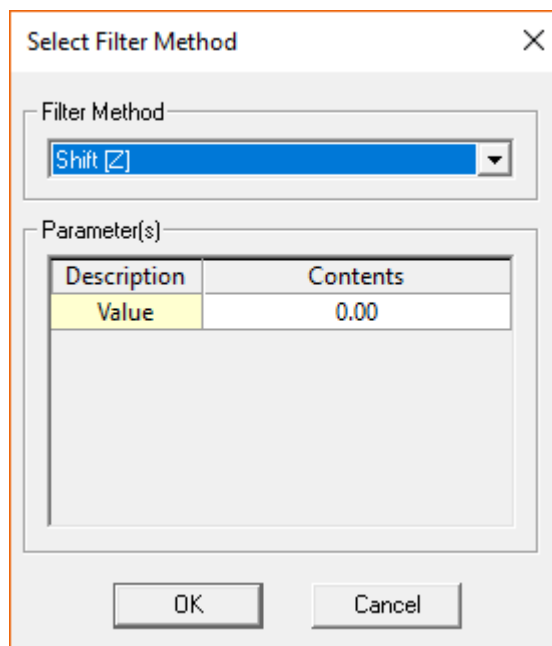


Figure 2.4. Window settings command «Shift [Z]»

Here we enter the value of the calculated correction and click Ok. The program will begin to recalculate the depths.

4) Now we need to clean qpd from gross errors (depth departures). You can do this here, in Validator. The principle of data clearing by the Validator program can be found in the “Help” section of QINSy.

5) After cleaning the data, save and close the Validator. Select the necessary files in the Survey files section in the Processing Manager (here you can upload files for several tacks, select only files corresponding to one tack), right-click on the selected files and click Export → User defined ASCII (Figure 2.5).

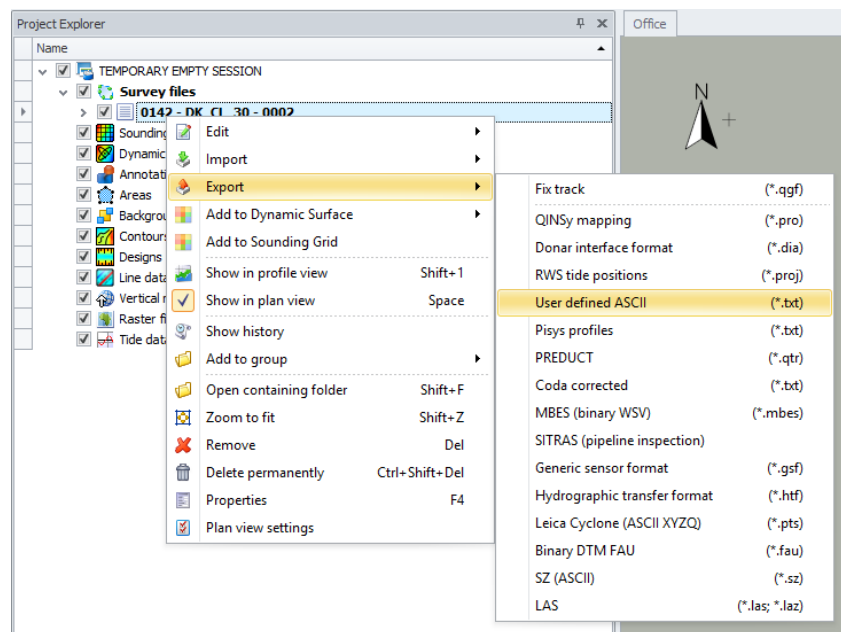


Figure 2.5 Export data from QPD files

Window will open as Figure 2.6:

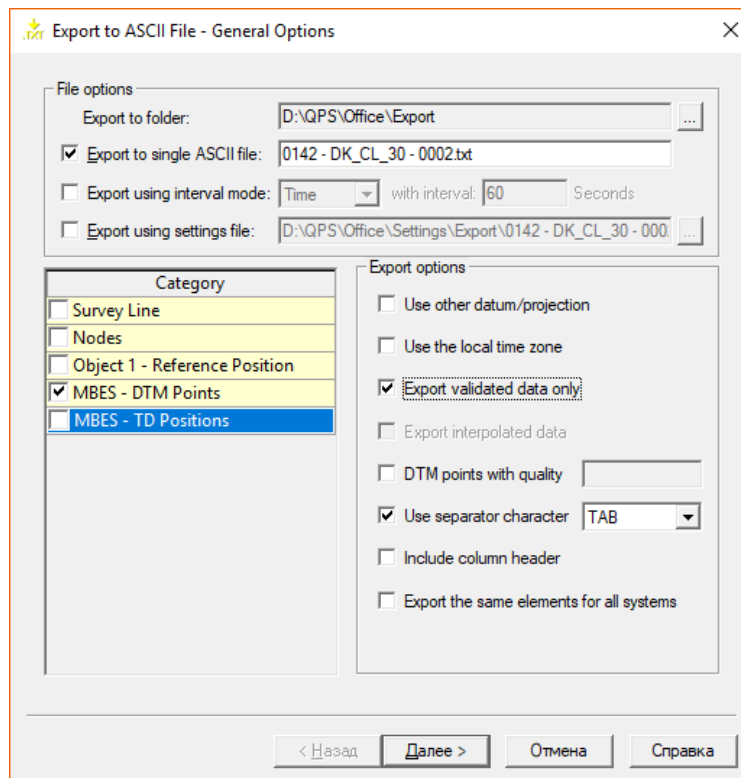


Figure 2.6 Window settings of export data from QPD files

In the field “Export to single ASCII file” enter the name of our future exported file. **ATTENTION: This name does not automatically change when changing files from which we export data! Do not forget to enter the current file name each time to avoid confusion in case of large export volumes.**

The remaining fields are customizable as shown in Figure 2.6.

Click to Next (further). Adjust the window in accordance with Figure 2.7.

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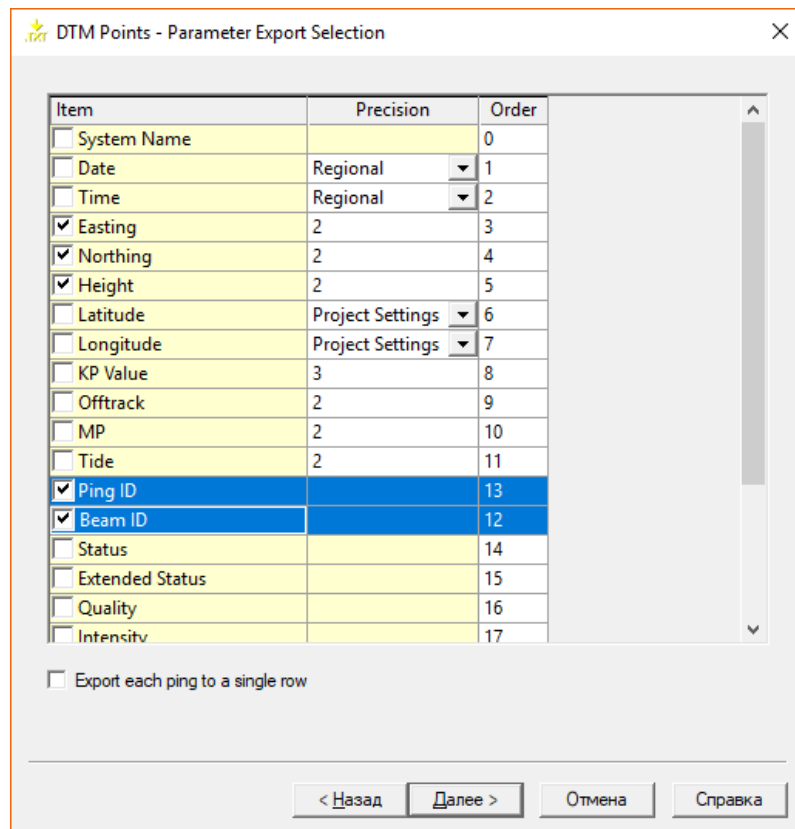


Figure 2.7 Window settings fields of export data from QPD files

Note that in the “Order” column, the Ping ID field corresponds to 13, and the Beam ID field corresponds to 12. This is done intentionally, since in the exported file, the Beam ID column is in front of the Ping ID column.

Click to Next and the file exported to the Export folder of the QINSy project. The file transferred to the geophysic-processor.