

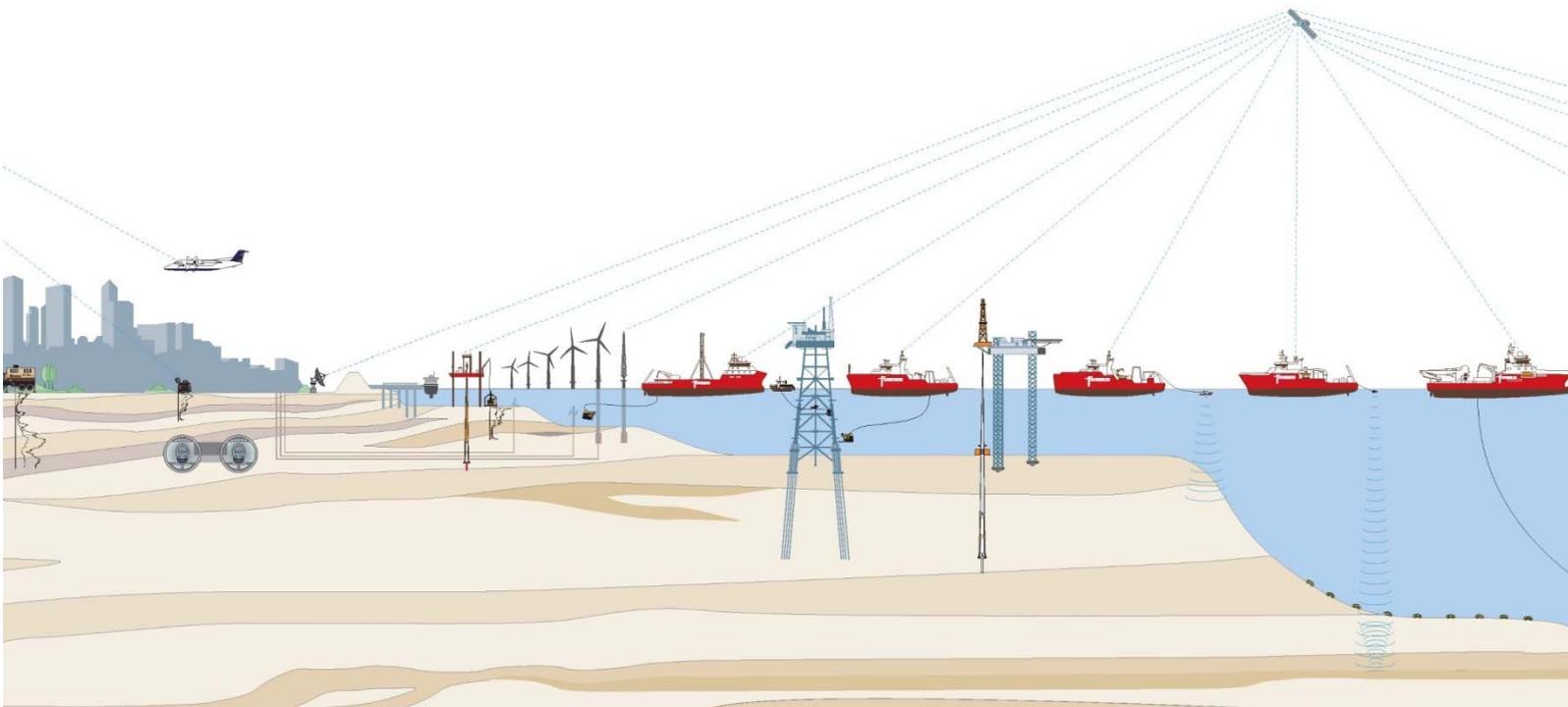
**Hollandse Kust (west) Wind Farm Zone  
Dutch Sector, North Sea  
Technical Note  
Digital Deliverables  
Geological Ground Model**

Client Reference WOZ2190153  
Fugro Document No. P904711/TN14 - GGM Digital Deliverables



Rijksdienst voor Ondernemend  
Nederland

Rijksdienst voor Ondernemend Nederland (RVO)



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**Hollandse Kust (west) Wind Farm Zone  
Dutch Sector, North Sea  
Geological Ground Model – Digital deliverables  
Technical Note**

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<b>Date</b>	25 August 2020

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## **1. PURPOSE AND SCOPE**

This Technical Note presents supporting information on the digital deliverables that were issued in parallel with the geological ground model report for the Hollandse Kust (west) Wind Farm Zone (WFZ), as per Contract WOZ2190153 between Rijksdienst voor Ondernemend Nederland (RVO) and Fugro Netherlands Marine B.V., dated 1 March 2019.

Digital deliverables described in this Technical Note are supplementary to and shall be used in conjunction with the geological ground model report.

Section 2 describes the three digital deliverables, i.e. Kingdom Suite, ArcGIS and 3D ground model (Subsurface Viewer). Appendix A presents Kingdom Suite-specific guidance on how to relink seismic data through Seismic Direct. Appendix B presents guidance on how to use the Subsurface Viewer software.

## **2. DIGITAL DELIVERABLES**

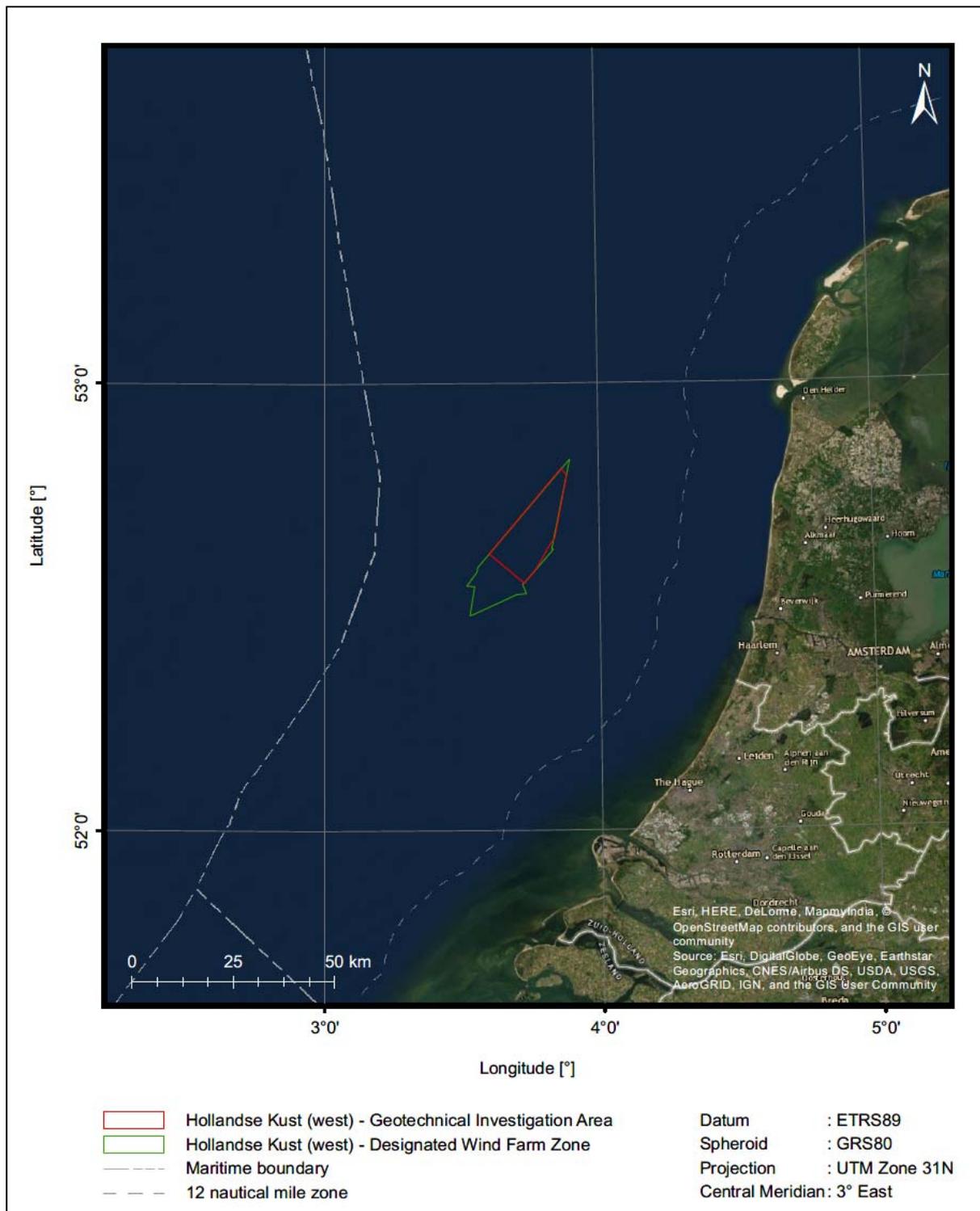
### **2.1 General**

The digital deliverables that were issued in parallel with the geological ground model report are:

- IHS Kingdom project with geological interpretation and separate horizon files
- ArcGIS database including geospatial digital data associated with the ground model
- 3D geological ground model allowing visualisation by open-access application (SubsurfaceViewer Reader), referred to in this document as Sub Surface Viewer (SSV) model.

The geological ground model and its digital deliverables apply to an area demarcated as Hollandse Kust (west) Geotechnical Investigation Area on the Vicinity Map (Figure 1). This area is located within Hollandse Kust (west) Designated Wind Farm Zone (Figure 1). In this document, the Hollandse Kust (west) Geotechnical Investigation Area is referred to as the Hollandse Kust (west) Wind Farm Zone (HKW WFZ) or 'the site'. The site excludes existing jacket platforms and the related safety zones.

The geological ground model and its digital deliverables apply to approximately 100 m below Lowest Astronomical Tide (LAT). This depth coverage corresponds broadly with the maximum penetration depth of the majority of geotechnical locations (i.e. approximately 60 m to 90 m below seafloor BSF).



**Figure 1 - Hollandse Kust (west) Geotechnical Investigation Area ('Site') or HKW WFZ.**

**2.2 IHS Kingdom Project**

**2.2.1 General**

The geological ground model is based on integrated interpretation of geophysical and geotechnical data (Fugro, 2020e). The interpretation was done in IHS Kingdom Suite software (version 2016.1).

Seismic reflection data (e.g. 2D UHR multichannel seismic, 2D UHR single channel seismic and sub-bottom profiler data) were loaded in the Kingdom Suite Project via Seismic Direct. This functionality uses paths between the project and specific directories (e.g. SEGY folder), which occasionally may need re-linking. Guidance on how to re-link Seismic Direct paths is given in Appendix A.

### **2.2.2 Data & Information**

The IHS Kingdom project includes the following data and information:

- Seismic Reflection Data:
  - Sub-bottom profiler (SBP) data in time domain
  - 2D UHR single channel (SCS) seismic data, Unmigrated in depth domain
  - 2D UHR single channel (SCS) seismic data, Migrated in depth domain
  - 2D UHR multichannel seismic (MCS) data, Migrated in depth domain
  - Interval velocities (from velocity picking) for selected lines covering geotechnical locations with borehole geophysical logging scope.
- Horizon interpretation of geological units
- Interpretation of geological features
- Gridded horizon information (in metres below Lowest Astronomical Tide (LAT)):
  - Depth to base of geological units
  - Geological features
  - Thickness of geological units
- Culture files, amongst others:
  - Background information (e.g. HKW Investigation Area, HKW Designated Wind Farm Zone, safety zones (buffers) on platforms, cables, pipelines, etc.)
  - Outlines of interpreted geological units
  - Contour lines of depth to base and thickness of geological units
  - Outline of interpreted buried channels
  - Outlines of interpreted geological features
- Geotechnical locations (e.g. vibrocores, seabed CPT, boreholes etc.), with following geotechnical information (where applicable):
  - Cone Resistance
  - Sleeve Friction

### **2.2.3 Comments & Assumptions**

- For detailed information on general interpretation and data processing methodology, refer to Plates 2-1 to 2-2, titled 'Study Approach' in report P904711/06 (Geological Ground Model) (Fugro, 2020e)
- The horizon interpretation within the HKW WFZ is the interpretation of the geological ground model phase (Fugro, 2020e), which took into account the acquired geotechnical data and the insights gained during integrated interpretation.
- The horizon interpretation included in the IHS Kingdom project extends beyond the HKW WFZ. The interpretation outside the HKW WFZ is the initial interpretation of the geophysical investigation data (Fugro, 2019) and was not updated in the geological ground model phase (Fugro, 2020e).

- SEGY files are included within the IHS Kingdom project folder structure. These include interval velocity and RMS velocity SEGYS, which are not loaded in the actual project. For more details on velocity SEGYS and time-depth conversion refer to the Geophysical Results Report (Fugro, 2019).

## **2.3 ArcGIS database**

### **2.3.1 General**

The ArcGIS deliverable comprises results of the integrated interpretation of the geological ground model development phase. To avoid duplication, interpretation results from the separate 2019 geophysical survey (Fugro, 2019) are not included in the current GIS deliverable.

The ArcGIS database is a repository of geospatial data derived from integrated data interpretation (i.e. from IHS Kingdom Suite) and task performed with ArcGIS (e.g. contouring). ArcGIS version 10.6/10.8 was used for the compiling ArcGIS deliverables and charts presented in the geological ground model report (Fugro, 2020e). ArcGIS deliverables comprise the following:

- Geodatabase comprising Raster files (i.e. grids)
- Geodatabase comprising Vector features (e.g. Contours, outlines of geological features, geotechnical investigation points)
- Folder with layer files, containing symbology as per Geological Ground Model Report (Fugro, 2020a)
- Mxd files (ArcGIS version 10.2/10.6) with all raster's and features included
- Folder with XML files containing metadata per feature

### **2.3.2 Data & Information**

The ArcGIS Vector geodatabase follows the Seabed Survey Data Model (SSDM) format, whereby features are classified into the following groups:

- Environmental Samples
  - Geotechnical Locations
- Shallow Intermediate Geology
  - Depth to Base of Unit contour lines in m LAT for each Geological Unit [*polylines*]
  - Thickness of Unit contour lines in m for each Geological Unit [*polylines*]
  - Outlines of peat / organic clay level 1, 2B, 2 and 3 [*polygon*] (Level 2A represented as [*points*])
  - Outlines of gravelly layers / boulders [*polygons*]
  - Outlines of identified buried/internal channels [*polygons*]
  - Outlines representing areas where the Units are present and absent [*polygons*]
- Survey Measurements
  - 2D UHR MCS tracklines [*polylines*]
  - Buoyant Waterway markers [*points*]
  - Chart index map [*polygons*]

The ArcGIS Raster geodatabase contains the following gridded data:

- Bathymetry
- Seafloor gradient
- Depth to Base in metres below LAT for each Geological Unit
- Thickness in metres of each Geological Unit
- Depth to top of peat / organic clay levels 1, 2A, 2B, 2C and 3 in metres below LAT
- Depth to top of gravelly layers / boulders in metres below LAT

### **2.3.3 Comments & Assumptions**

- Interpretation results from the 2019 geophysical survey (i.e. magnetometer contacts, sidescan sonar (SSS) contacts etc.) can be found in the GIS deliverables of that earlier data acquisition phase. Details and description of interpretations results that can be found in the Geophysical Results Report (Fugro, 2019)
- Well locations as presented on the charts of the geological ground model reports originate from the Netherlands Oil and Gas website (<https://nlog.nl/en>).
- Outlines of the Hollandse Kust (west) Designated Windfarm Zone and the Geotechnical Investigation area can be found on the Netherlands Enterprise Agency website (<https://offshorewind.rvo.nl/generalw>).
- Information on the SSDM datamodel format can be found on the IOGP website (<https://www.iogp.org/Geomatics/>), including information on data dictionary, its feature classes and attribute descriptions.

## **2.4 3D ground model (Subsurface Viewer)**

### **2.4.1 General**

The 3D ground model provides an interactive visualization of the ground model and a high-level summary of key findings of the investigation and interpretation phased associated with HKW WFZ project and aims to guide the end-user in the complex 3D geological/geotechnical setting.

The 3D ground model is based on results of the integrated interpretation of geophysical and geotechnical data (Fugro, 2020e; see sections 2.2 and 2.3) and is compiled in the SSV file (\*.svp). Geodatabases and grid conversions, were performed with IHS Kingdom Suite software (version 2016.1) and ArcGIS version 10.6/10.8. Conversion of CPT ASCII files were scripted with Excel and Python.

The 3D ground model data, readable with the SubsurfaceViewer and it contains the following objects:

- 8 cross sections through the voxel model and geotechnical boreholes based on cone penetration test (CPT) data using classification methods proposed by Robertson (2009)
- Layer objects
  - CPT and borehole locations as \*bid, associated with CPT data curves generated from LAS files.
  - Geotechnical Investigation Area
  - 2D UHR multi-channel seismic (MCS) tracklines,
  - Magnetometer targets, MBES targets and SSS targets

- Geological units (including outlines showing where geological units are present and absent)
- Geological features (e.g. buried channels, peat / organic clay occurrences)
- 8 Soil provinces
- Oil and gas structures (including 500-m buffer zone), cables, pipelines
- VOXEL model
  - 8 voxel layers for each geological unit (A through G)

Appendix B provides guidance on how to use the SSV software

#### **2.4.2 Data**

- i. Depth to base grids of Unit A to F (xyz-format) as per geological ground model phase (Fugro, 2020e) were used as primary input for defining the voxel layers:
  - a. Depth to base grids were merged, where relevant, to achieve full coverage of surfaces across HKW WFZ (i.e. consistent surfaces without unnecessary data gaps);
  - b. Cell dimension of each grid is 25 m by 25 m;
- ii. Voxel model (subdivided by Unit);
- iii. Shapefiles
  - a. Geological unit outlines (present/absent), geological features as per geological ground model report and accompanying GIS deliverables (Fugro, 2020e);
  - b. 2D UHR multi-channel seismic (MCS) tracklines, magnetometer targets, MBES targets and SSS targets as per geophysical results report and accompanying GIS deliverables (Fugro, 2019)
  - c. Oil and gas structures (including 500-m buffer zone), cables, pipelines derived from NLOG website (see Section 2.2.3; <https://nlog.nl/en>);
  - d. Geotechnical Investigation area derived from Netherlands Enterprise Agency website (See Section 2.2.3; <https://offshorewind.rvo.nl/generalw/>);
- iv. CPT data from ASCII files (Fugro, 2020a; 2020b; 2020c; 2020d) were converted into LAS file format for importing into SubsurfaceViewer using Excel and Python;
- v. CPT interpreted data using classification methods proposed by Robertson (2009);
- vi. Borehole descriptions based on Fugro (2020a; 2020c; 2020d).

#### **2.4.3 Comments & Assumptions**

- SSV file (\*.svp) is an archive comparable to a zip file, in which all data included in the 3D model are stored. This file can be opened with zip-file manager software (e.g. 7-zip) and the data can be extracted from there;
- The base of the 3D model was defined at 105 m below LAT;
- The 3D voxel model was created by using the depth to base rasters as a starting point. These various rasters serve as the top, as well as bottom of the voxels. A voxel has the same cell size as the rasters that were used (25 m by 25 m). The voxels were created by extracting the z-value from the raster on top (i.e. Depth to base unit A) and the z-value from the underlying raster (i.e. Depth to base unit B). An extrusion is then done by connecting the (top) left corner of the A cell to the (bottom) right corner of the B cell and filling this space with a 3D volume. A voxel will then be allocated with classification of the bottom unit, in this example unit B. To extract this information for the voxels of unit A, the top unit, the bathymetry raster was used as upper surface. All voxels that extend beyond the base of the 3D model are cut off at 105 m below LAT;

- Soil Provinces are provided in the subsurface viewer model as polygons. The identified soil provinces are further described in report P904711/07 (Geotechnical Parameters) (Fugro, 2020f). As such the soil provinces contained in the SSV model shall be used in conjunction with this report (Fugro, 2020f);
- Default cross sections are provided in the 3D model which have the same orientation and reference (e.g. cross section 1, cross section 2, etc.) as those presented in report P904711/06 (Geological Ground Model) (Fugro, 2020e);
- The geological features peat / organic clay levels are included as outlines where these specific features occur (i.e. polygons). An exception is peat / organic level 2A, for which representation of this peat / organic clay level by outlines was deemed not suitable, due to its limited lateral extent. Peat / organic clay level 2a is represented as points which is consisted with the geological features charts in report P904711/06 (Geological Ground Model) (Fugro, 2020e);
- CPT data at 126 locations (including TenneT locations for Apha and Beta substation locations);
- Downhole CPT data was appended to the seabed CPT, where applicable. The coordinates and water depth presented in the LAS files and the SSV model corresponds to the seabed CPT.
- Seabed CPT is presented for the sections where seabed CPT and downhole CPT data overlaps;
- Strata descriptions presented in the graphical logs, are based on CPT data using classification methods proposed by Robertson (2009). The classification methods allow for a standardized and uniform approach of CPT data interpretation and are based on relationships between Normalized Cone Resistance ( $Q_{tn}$ ) versus Normalized Friction Ratio ( $F_r$ ) and  $Q_{tn}$  versus Pore Pressure Ration ( $B_q$ );
- Data gaps from downhole CPT data is shown as 'Empty' and displayed transparent in the graphical logs. Data gaps in downhole CPT data occurs due to the acquisition process.;
- Colour scheme of the graphical logs (refer to Table 2) are associated to Robertson classification (2009);
- Principal soil type and relative density or undrained shear strength (e.g. dense to very dense SAND) from borehole descriptions were extracted from the geotechnical logs (Fugro, 2020a; 2020c; 2020d) to create the 'Boreholes' layer in the SSV model;

### **3. REFERENCES**

Fugro, 2019. *Geophysical Results Report – Hollandse Kust (West) Wind Farm Zone Survey 2018*, Report No. P904162, Vol. 3, Revision 4 (Final). Issued 19 August 2019 to RVO, Nootdorp, Fugro.

Fugro, 2020a. *TenneT Alpha Platform, Hollandse Kust (west) Wind Farm Zone Dutch Sector, North Sea*. Fugro Report No. P904645/01 (4), issued 16 October 2019 to TenneT TSO B.V., Nootdorp, Fugro.

Fugro, 2020b. *Seafloor In Situ Test Location, Hollandse Kust (west) Wind Farm Zone Dutch Sector, North Sea*. Fugro Report No. P904711/01 (5), issued 10 February 2020 to RVO, Nootdorp, Fugro.

Fugro, 2020c. *Geotechnical Borehole Locations, Hollandse Kust (west) Wind Farm Zone Dutch Sector, North Sea*. Fugro Report No. P904711/03 (4), issued 09 April 2020 to RVO, Nootdorp, Fugro.

Fugro, 2020d. *TenneT Beta Platform, Hollandse Kust (west) Wind Farm Zone Dutch Sector, North Sea*. Fugro Report No. P904711/05 (4), issued 22 November 2019 to RVO, Nootdorp, Fugro.

Fugro, 2020e. *Geological Ground Model, Hollandse Kust (west) Wind Farm Zone Dutch Sector, North Sea*. Fugro Report No. P904711/06 (3), issued 12 May 2020 to RVO, Nootdorp, Fugro.

Fugro, 2020f. *Geotechnical Parameters, Hollandse Kust (west) Wind Farm Zone Dutch Sector, North Sea*. Fugro Report No. P904711/07 (3), issued 31 July 2020 to RVO, Nootdorp, Fugro.

Robertson, P.K. 2009. Performance Based Earthquake Design Using the CPT. In Kokusho, T., Tsukamoto, Y. and Yoshimine, M. Eds. *Performance-Based Design in Earthquake Geotechnical Engineering – from Case History to Practice: Proceedings of the International Conference on Performance-Based Design in Earthquake Geotechnical Engineering IS-Tokyo 2009*, 15-18 June 2009, Boca Raton: CRC Press, pp. 3-20.

**4. USE OF THIS TECHNICAL NOTE**

This technical note was prepared according to a project specification determined by the client.

Fugro understands that the presented information will be used for the purpose described above. That purpose was a significant factor in determining the scope and level of the services. If the purpose for which the presented information is used or the client's proposed development or activity changes, this Technical Note may no longer be valid.

Document distribution is restricted to project participants approved by the client.

This document has 22 pages (including appendices), the definitive versions of which are held in Fugro's information system.

Document Check and Review: M. Klein

Fugro Project Lead: P. de Graaf  
Senior Project Engineer

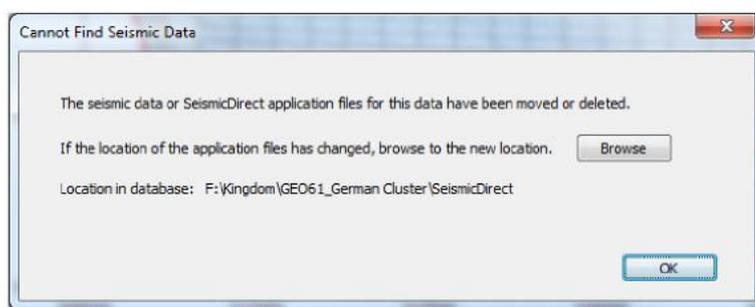
### A. KINGDOM SUITE – SEISMIC DIRECT RE-LINKING OF DATA

#### A.1 Introduction

This appendix serves as an aid to reconnect IHS Kingdom projects created utilising SeismicDirect.

Projects created with use of SeismicDirect rely on links to specific folders in the project structure which are lost upon physically copying the project to a different network location. In addition when a project on an external HDD is plugged in a different computer the assigned drive letter may be different than when first created, resulting in the need for re-linking a few folders.

You know when you need to re-link the folders when you get the following message upon attempting to open a seismic section:



Browsing to the correct folder location does have the desired effect; relinking should be done within SeismicDirect (i.e. click on 'OK').

#### A.2 Re-linking folders

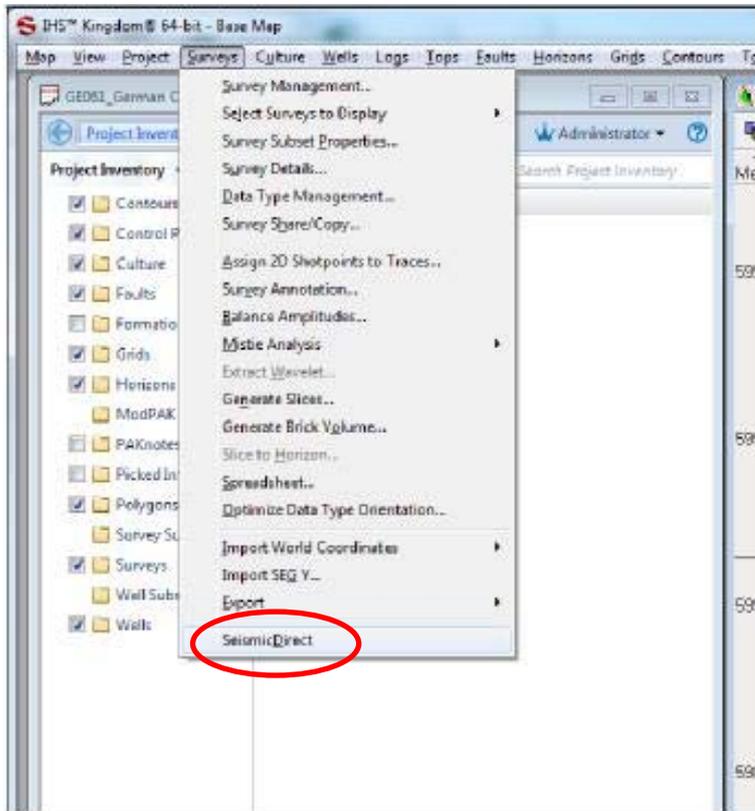
The following folders will need to be reconnected:

- SeismicDirect application files;
- SeismicDirect log files;
- Folders containing the segy files.

The following step-by-step guide will allow you to relink these folders and have the Kingdom Project working as intended within a couple of minutes.

## APPENDIX A – KINGDOM SUITE – SEISMIC DIRECT RE-LINKING OF DATA

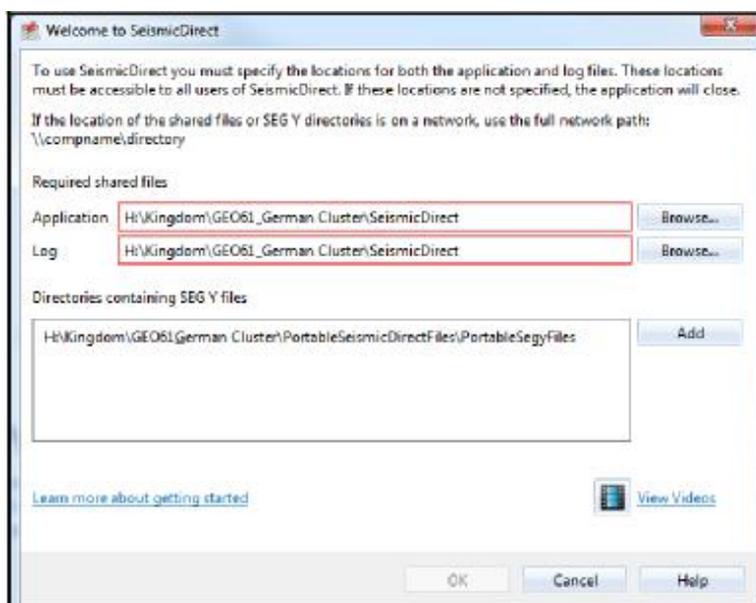
### Step 1 – Open SeismicDirect from within the Kingdom Project



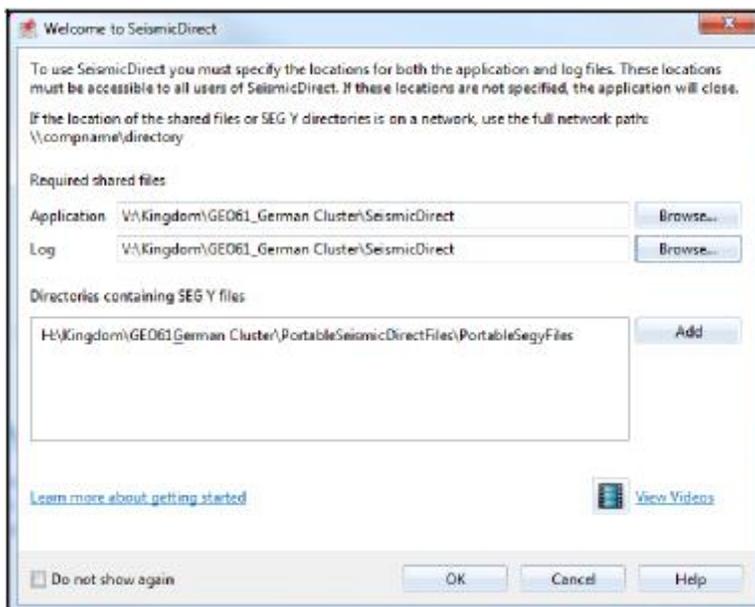
On menu bar: Surveys >>SeismicDirect)

### Step 2 – Re-link 'application' and 'Log' folders and 'segy' folder:

The initial screen in seismic direct shows the paths to the 'application' and 'log' folders. When project is not correctly linked they have a red outline:



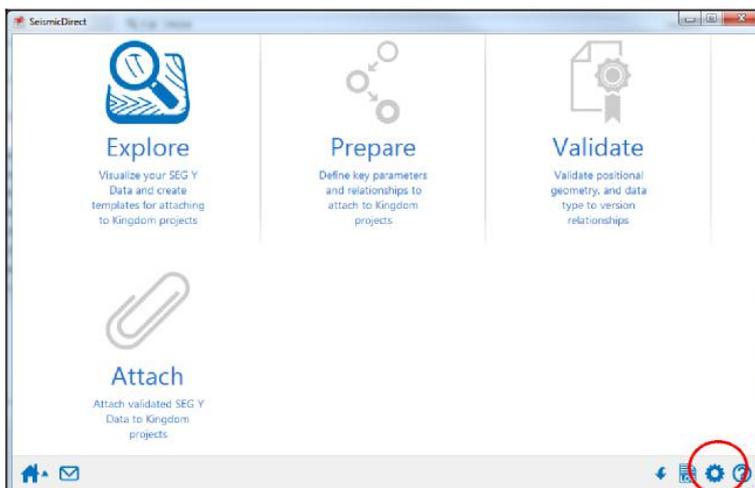
Browse to the correct folder locations. They should be in the Kingdom Project structure. Normally you can link to the SeismicDirect folder in that specific structure.



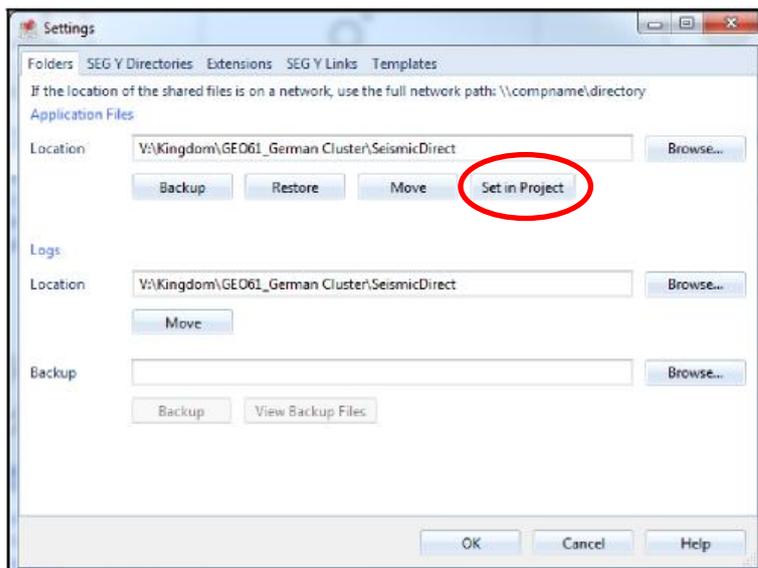
Also link to the correct directory containing the segy files

**Step 3 – Update settings in SeismicDirect**

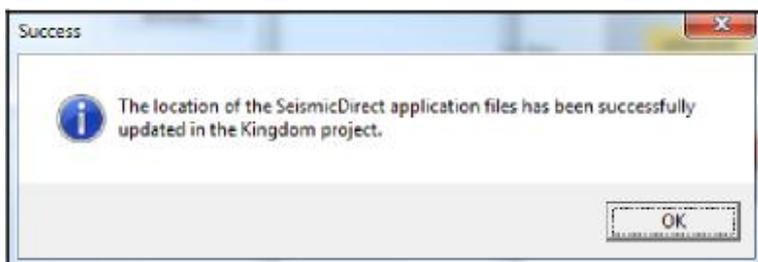
Next, click on the settings wheel in the lower right hand corner of the main SeismicDirect window:



## APPENDIX A – KINGDOM SUITE – SEISMIC DIRECT RE-LINKING OF DATA

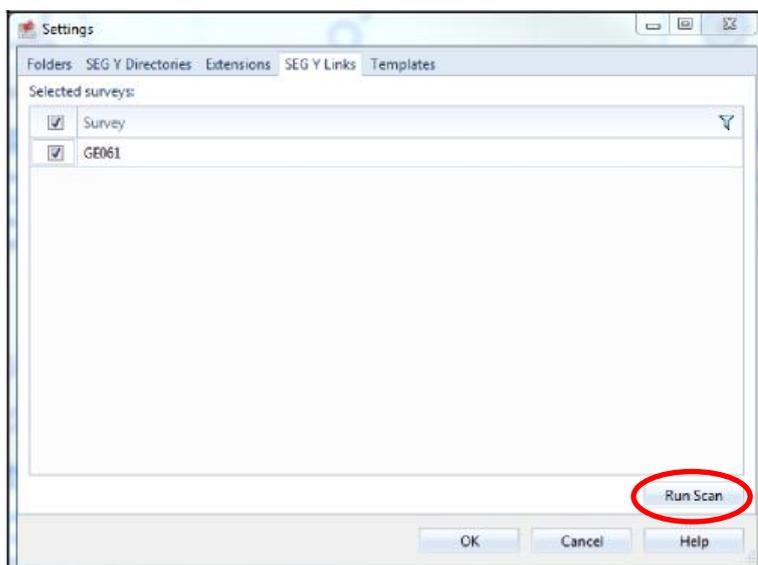


The locations of the 'application' and 'log' folders are updated. Click on the 'Set in Project' button to save these locations in the Kingdom Project.



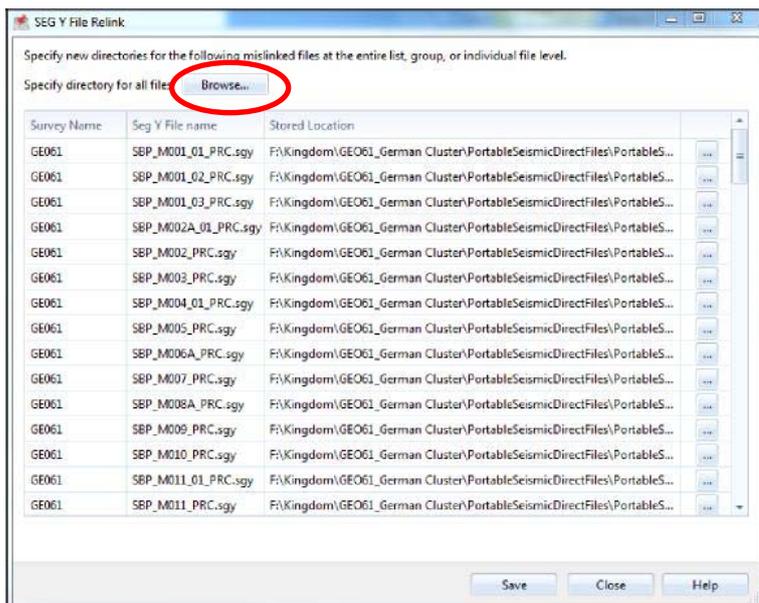
### Step 3 – Scanning and updating 'segy' links

Go to the 'segy links' tab



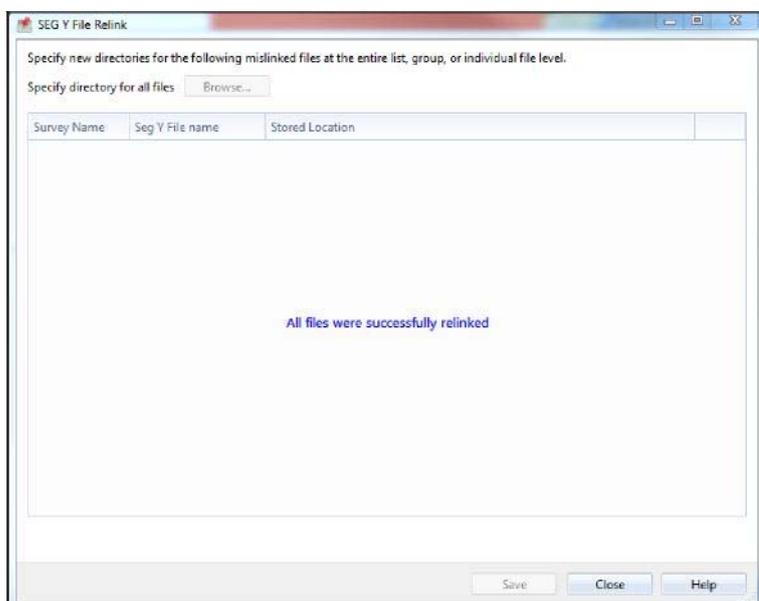
Click on 'Run Scan'. The next window will show all the segy file which are mis linked:

## APPENDIX A – KINGDOM SUITE – SEISMIC DIRECT RE-LINKING OF DATA



Click on browse and select the correct folder containing the segy files. The program will assess correctness of the new links. This may take a couple of minutes.

You will get the following message, indicating that all segy's are successfully relinked



Click on 'Close' and exit Seismic Direct.

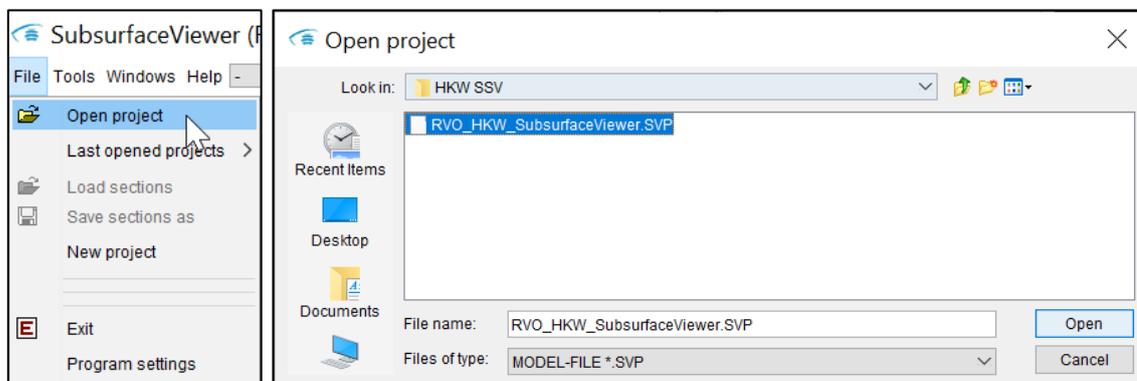
In the Kingdom Suite project environment you should now be able to open a seismic line.

## APPENDIX B – SUBSURFACE VIEWER: HOW TO...

### B. 3D MODEL - SUBSURFACEVIEWER

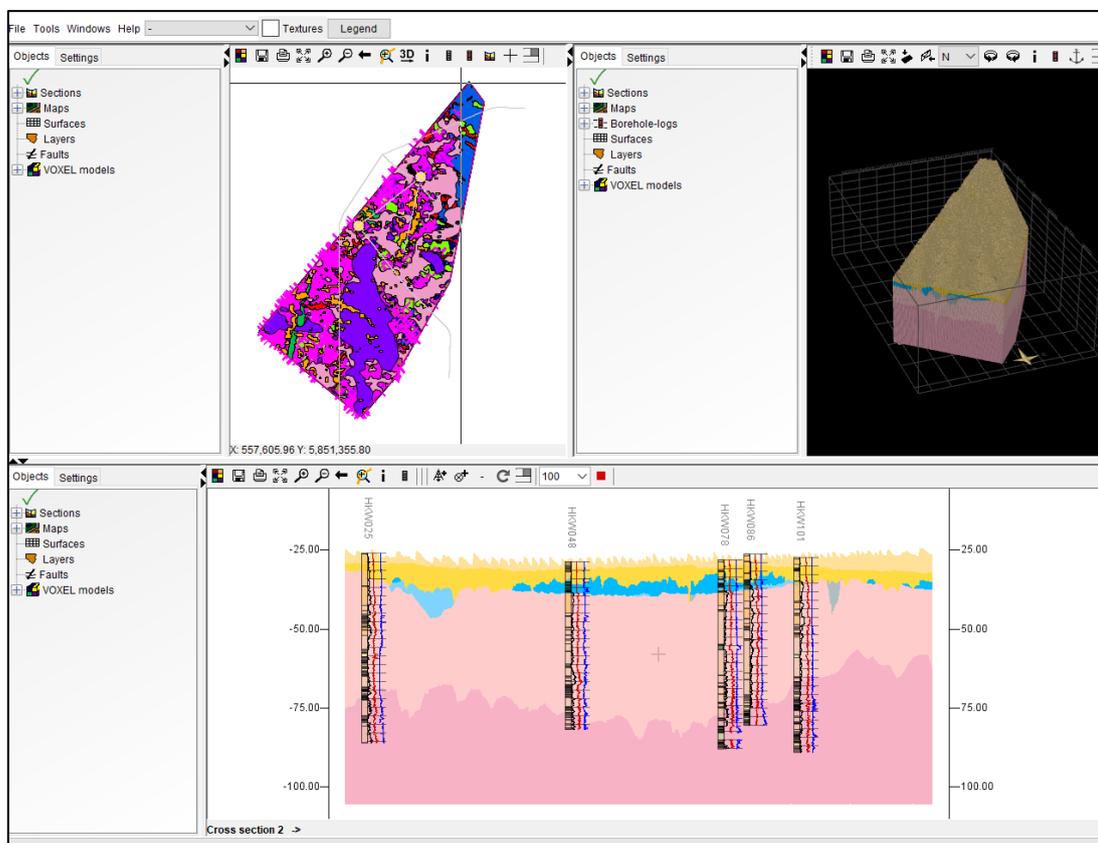
#### B.1 General

The 3D model can be loaded by clicking File > Open project and selecting the \*.SVP file (Figure 2).



**Figure 2** – Steps to open a project: File > Open project > Select the \*.SVP file

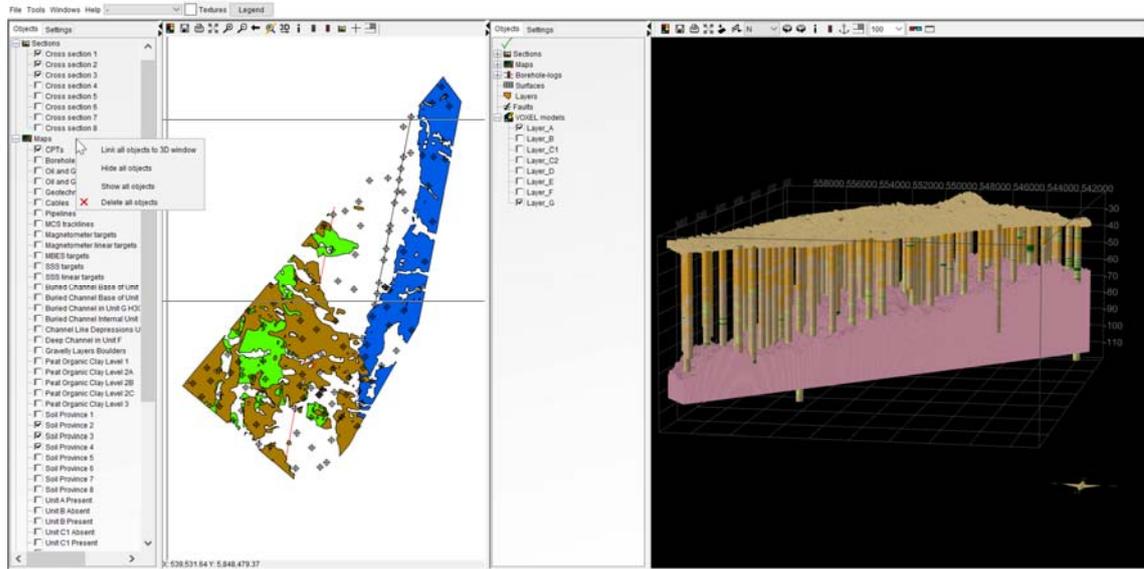
The model is displayed in three views (**Figure 3**): 1) Top view at the top left of the window, 2) 3D view at the top right of the window and a cross-section view at the bottom of the window. Zooming can be done by clicking the magnifier buttons or using the mouse wheel. The model can be horizontally or vertically displaced by holding the left click button and moving the mouse; in the 3D view this will rotate the model, where the pivot point is located at the location where the user clicked.



**Figure 3** – Top left: top view of model. Top right: 3D view of model. Bottom: cross-section view

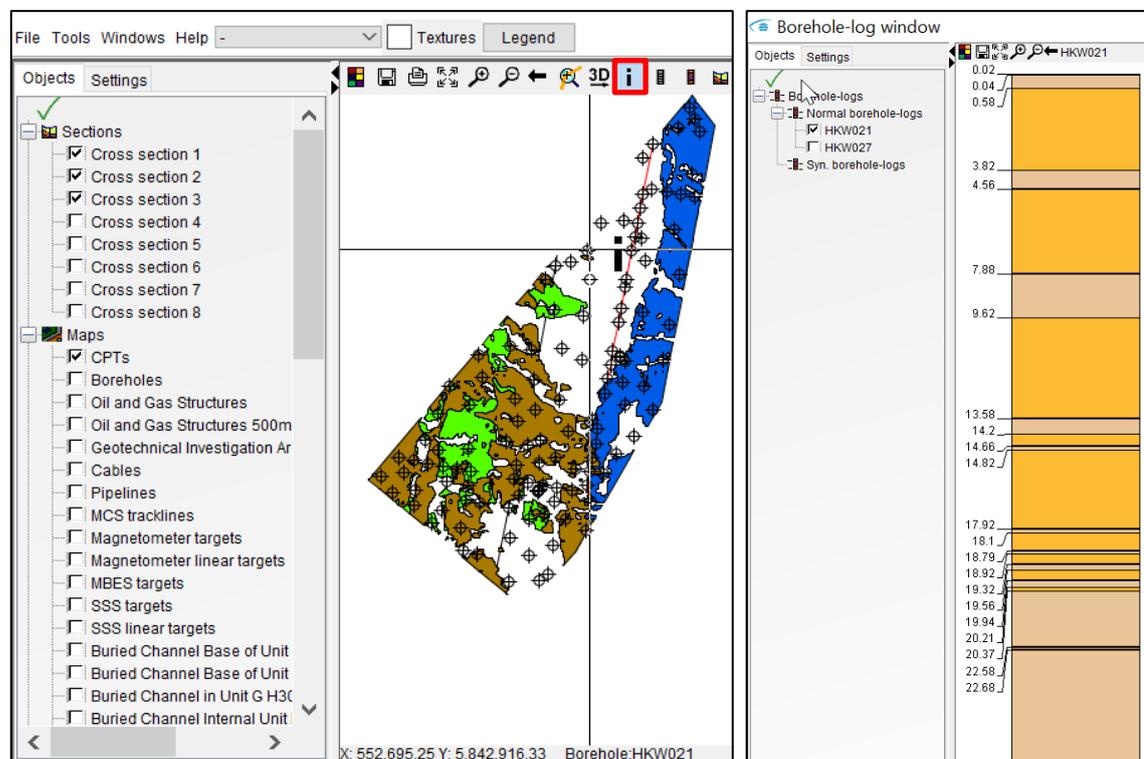
## APPENDIX B – SUBSURFACE VIEWER: HOW TO...

Maps, cross sections and the voxel model can be turned off or on by ticking the boxes. All objects can be hidden or shown by right-clicking 'Sections', 'Maps' or 'VOXEL models' and selecting 'Hide all objects' or 'Show all objects' (**Figure 4**).



**Figure 4** – Selecting objects for data visualization

With the **info** bottom boreholes and CPTs are selected and displayed in the borehole-log window.

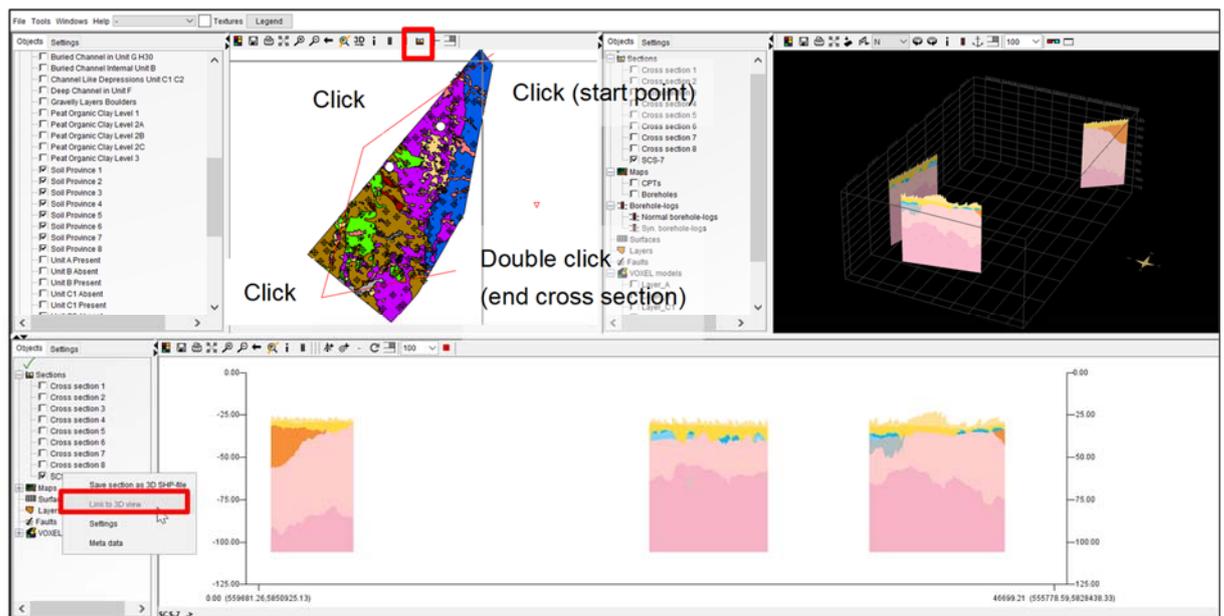


**Figure 5** – Selection of boreholes and CPT locations with the info button for visualization in the borehole-log window

## APPENDIX B – SUBSURFACE VIEWER: HOW TO...

### B.2 Cross sections

To create a new cross section, click the cross section icon in the top view, then left click the start point of your cross section and add sections by single left clicking at the desired coordinate. To end the cross section double left click at the end coordinate (Figure 6). The cross section will be displayed in the cross-section viewer (bottom view). To link the cross section to the 3D view, right click the cross section name in the cross-section viewer, and select 'link to 3D view'.



**Figure 6** – Create a new cross section

### B.3 Borehole logs and CPT data

The graphical logs of the CPTs and sampling locations are filled using the information compiled in a \*.blg file. The colour convention for the graphical logs is summarized in Table 2.

The LAS files contains the parameters shown in Table 1. These parameters can be plotted in the borehole-log view or cross sections, by right-clicking the cross section name or the borehole name, then clicking Settings>Settings borehole>Logs and typing the desired parameter in the text box after 'Measurement' (see Figure 7). Note that the parameter should be exactly the same as the LAS column headers; use consistently the upper and lower case of the parameters in Table 1. A maximum of 7 parameters can be plotted simultaneously (Figure 7). The headers of the parameters cannot be presented in the viewer due to software limitations. The user can choose a colour convention for the parameters. The predefined cross sections shows cone resistance ( $q_c$ ) as black, sleeve friction ( $F_s$ ) as red and pore pressure ( $u_2$ ) as blue.

The relative depth, absolute depth, layers depth and descriptions can be activated in the borehole-log settings of the cross section viewer (Figure 7) or the borehole-log window (Figure 8).

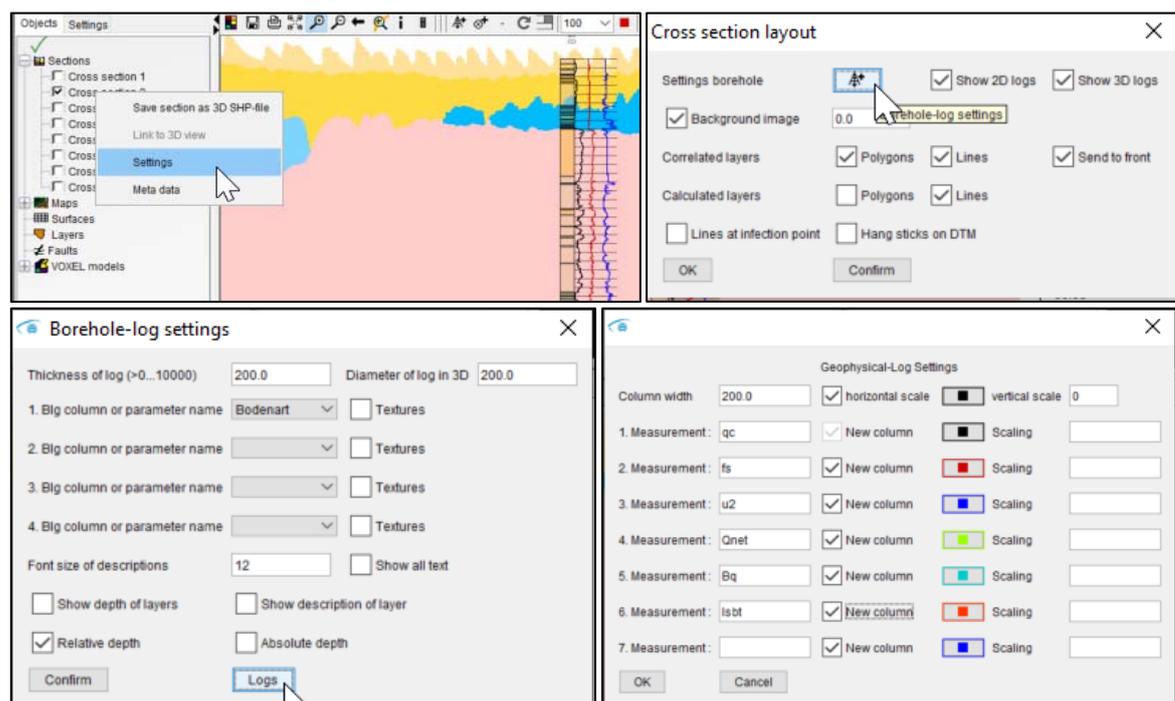
## APPENDIX B – SUBSURFACE VIEWER: HOW TO...

Parameter	Unit	Description
Depth	[m]	Depth below seafloor
Time	[s]	Logging time
qc	[MPa]	Cone resistance
fs	[MPa]	Sleeve friction
Fr	[-]	Friction ratio
u2	[kPa]	Pore pressure
Qnet	[MPa]	Net cone resistance
qt	[MPa]	Total cone resistance
Bq	[-]	Pore pressure ratio
Qt	[-]	Normalised cone resistance
Fr_norm	[-]	Normalised friction ratio
lc	[-]	Soil behaviour type index
lsbt	[-]	Soil behaviour type index
Robertson Qt	[-]	Robertson Qt: Robertson (2009) Qtn classification
Robertson Bq	[-]	Robertson Bq: Robertson (2009) Bq classification

**Table 1.** parameters provided in the LAS files and loaded in the SSV model

Robertson Class	Colour	Short description
1	Red	Sensitive, fine grained
2	Orange	Organic soils
3	Green	Clay
4	Light Green	Silt mixtures
5	Yellow	Sand mixtures
6	Light Orange	Sand
7	Orange	Gravelly sand
8	Grey	very stiff sand to clayey sand
9	Light Blue	very stiff, fine grained

**Table 2.** Robertson classification and colour convention



**Figure 7 –** Steps to select the CPT curves in cross section window

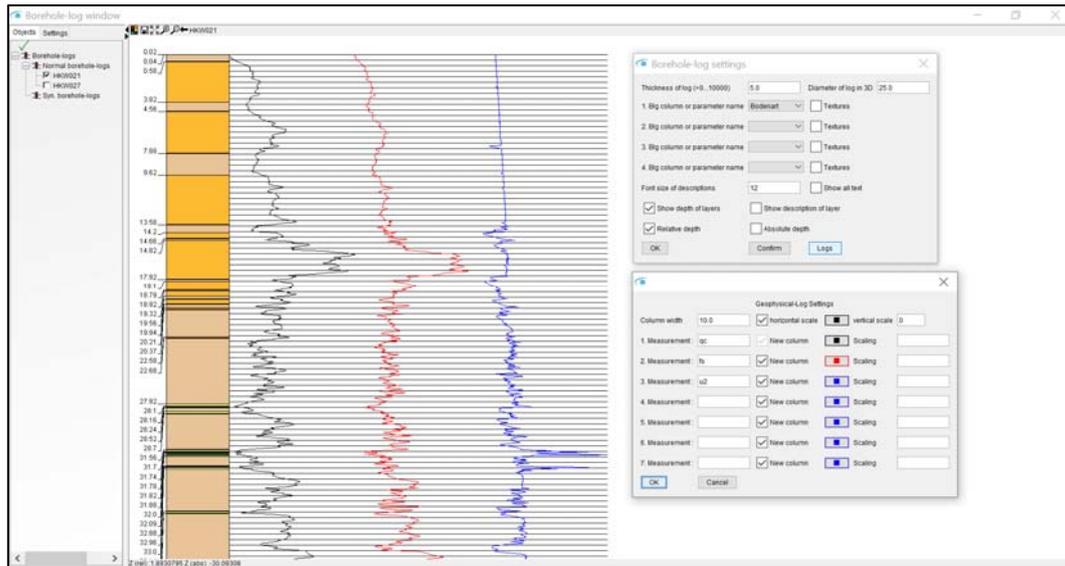


Figure 8 – Steps to select the CPT curves in borehole-log window

### B.3.1 3D view

Soil description information of geotechnical sampling boreholes and Robertson classification of CPT data is graphically shown in the 3D view while the maps 'Boreholes' and/or 'CPTs' (Figure 9) are activated. The main soil type or relative density and undrained shear strength can be visualized for the downhole sampling locations (Figure 9).

The geographical log diameter is predefined as 200 m to each location to have a better visualization. This can be changed by right clicking 'CPTs' or 'Boreholes'>Settings>Borehole-log settings>Diameter of log in 3D (Figure 10). The downhole CPTs performed for the Alpha and Beta TenneT platforms are in close proximity, hence the 3D cylinders overlap (Figure 10).

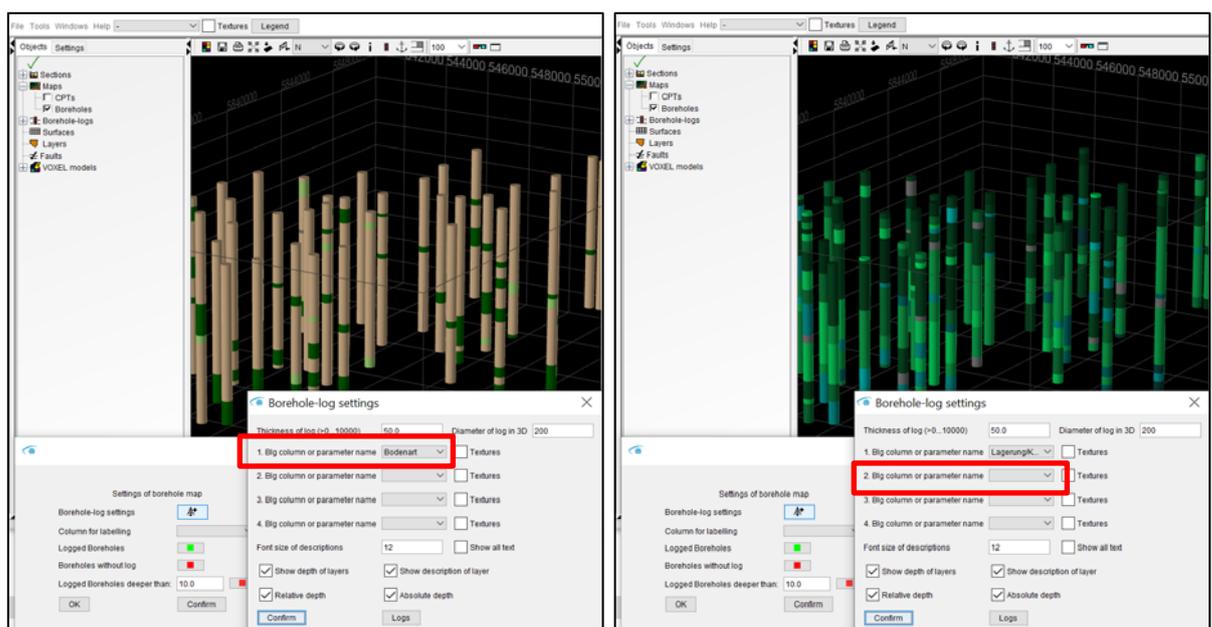


Figure 9 – Soil description information of geotechnical sampling boreholes in 3D window

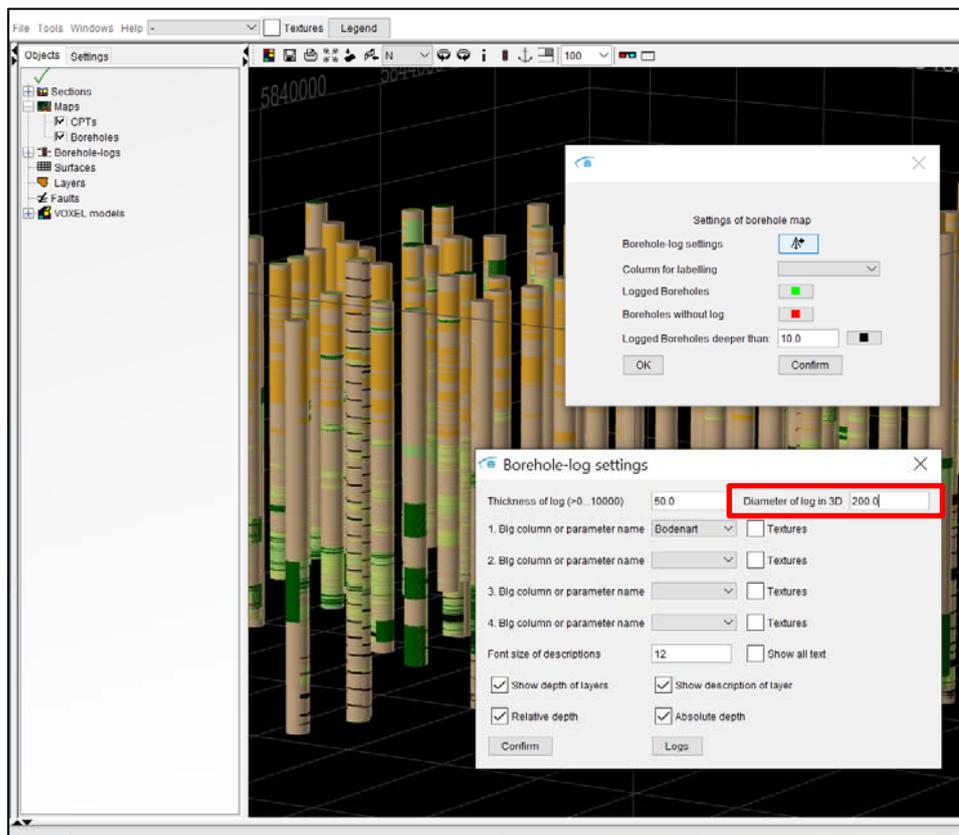


Figure 10 – CPTs and in 3D view

### B.3.2 Borehole-log window

In the top view, boreholes and CPTs can be selected with the info button as explained in section B.1. The selected locations will be displayed at the left of the window.

- For CPT data, the Robertson classification, depth of layers and CPT data can be displayed by right clicking the location name>settings>Logs (Figure 11);
- For borehole data, the soil type (Bodenart), relative density and undrained shear strength descriptions (Lagerung/Konsistenz) can be displayed (Figure 11)

## APPENDIX B – SUBSURFACE VIEWER: HOW TO...

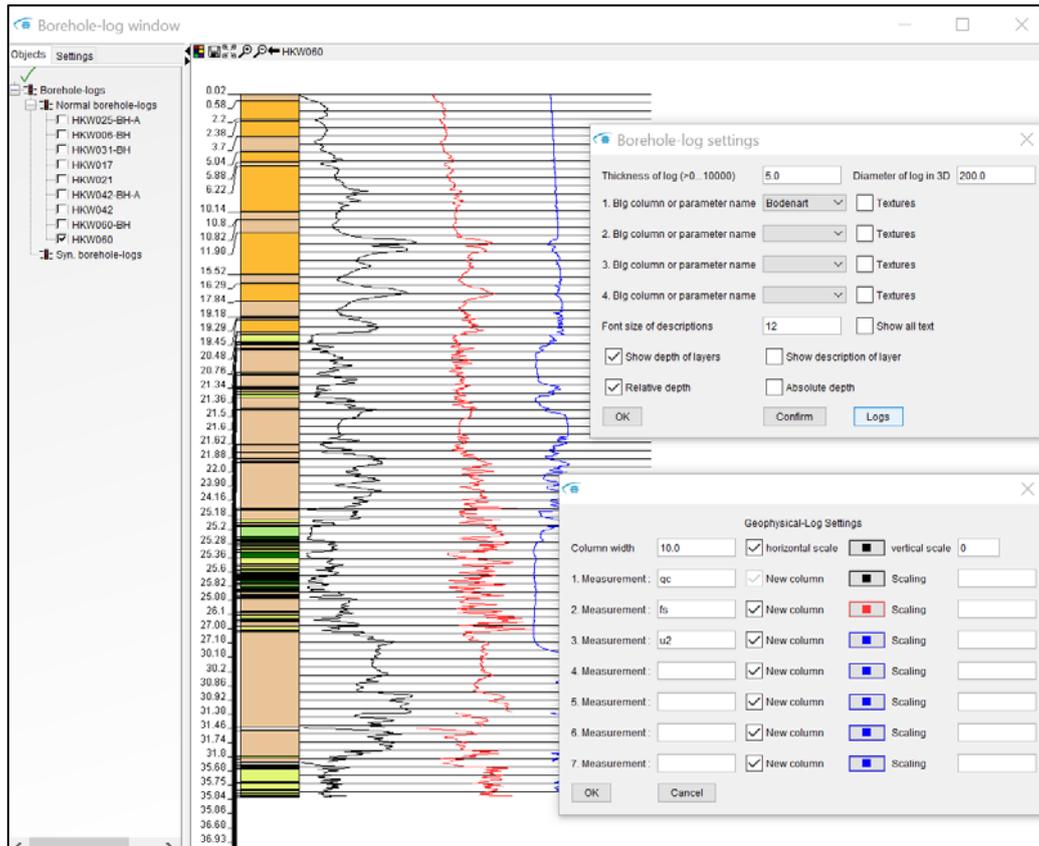


Figure 11 – CPTs in Borehole-log window

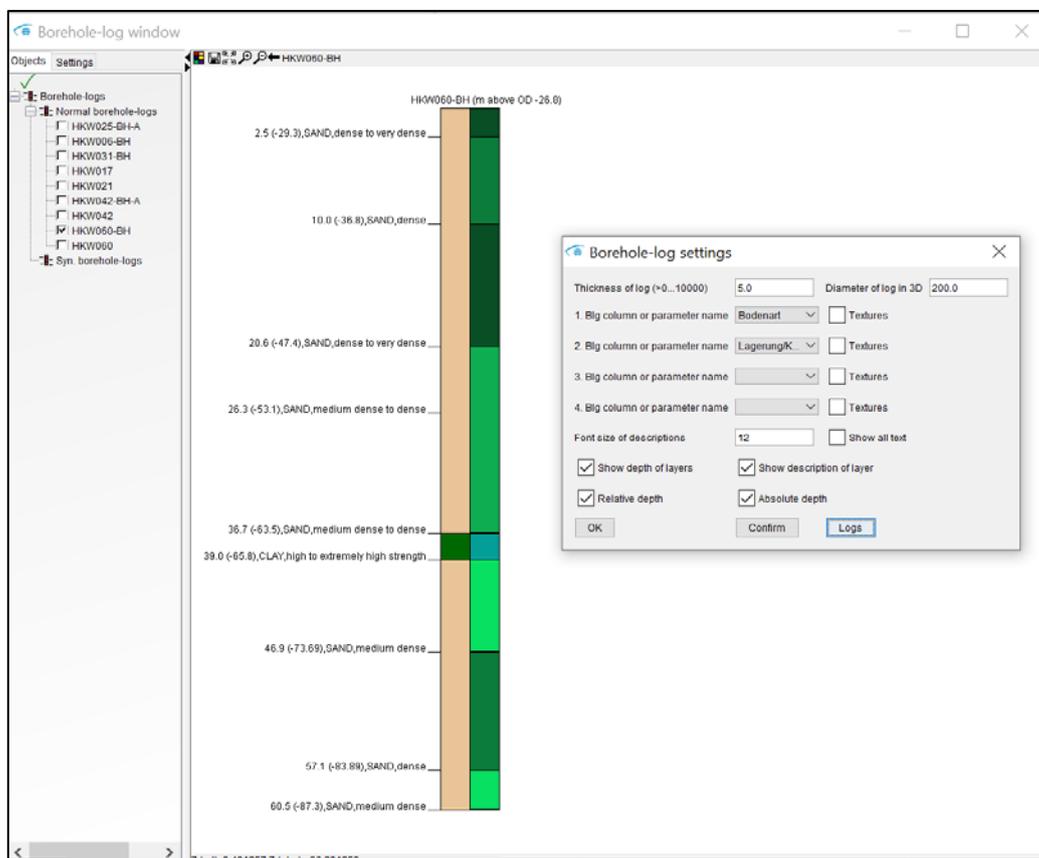


Figure 12 – Soil description information of geotechnical sampling boreholes in Borehole-log window