Netherlands Enterprise Agency

Geotechnical Report / Investigation Data

Technical Note
SCPT Digital Deliverables
Hollandse Kust (zuid) Wind Farm Sites I & II

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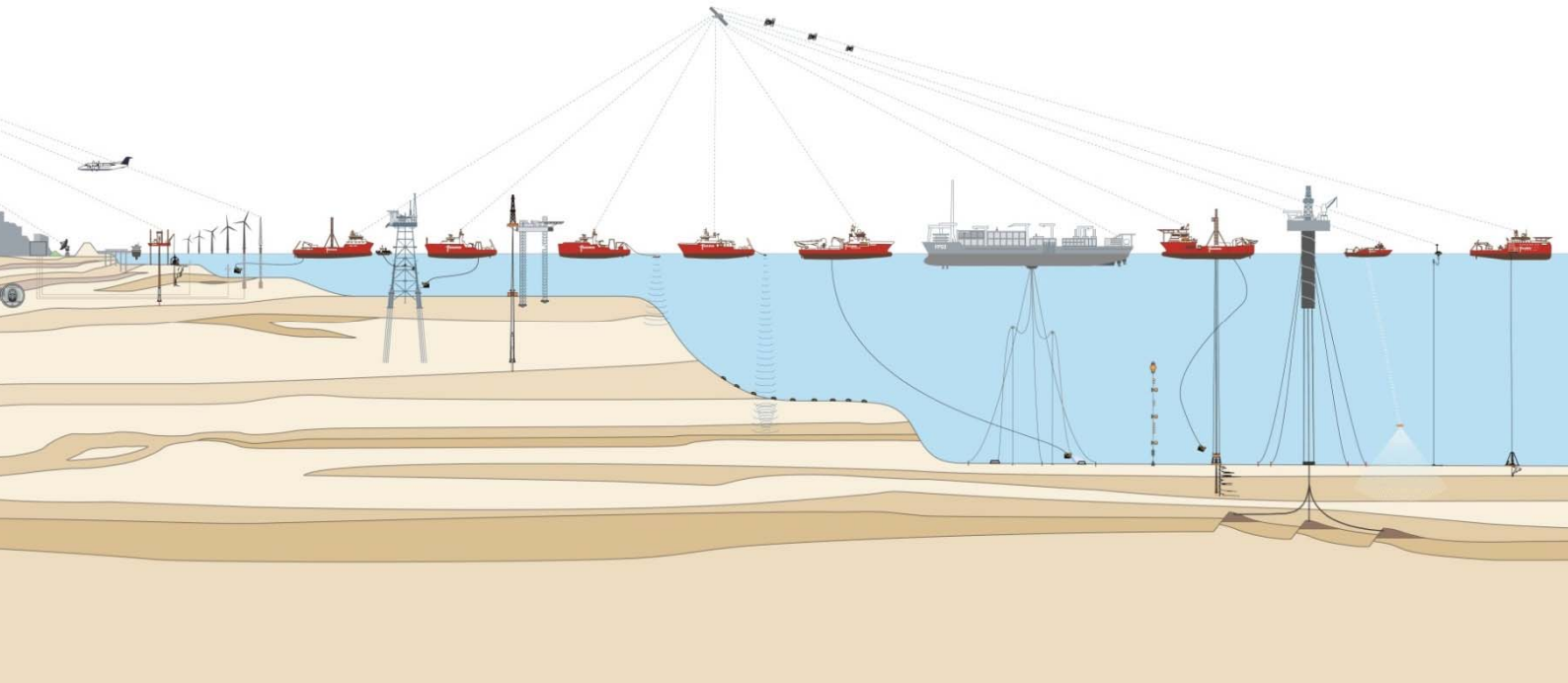
Technical Note
SCPT Digital Deliverables
Hollandse Kust (zuid) Wind Farm Zone
Dutch Sector, North Sea

Client Reference WOZ1600020
Fugro Reference N6196/TN-SCPT (2)

Rijksdienst voor Ondernemend Nederland

Rijksdienst voor Ondernemend Nederland (RVO)



Technical Note
SCPT Digital Deliverables
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Dutch Sector, North Sea

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Date	19 May 2017

1. RESULTS

This technical note provides background information in support of digital deliverables of a geotechnical investigation for Wind Farm Sites (WFS) I and II of the Hollandse Kust (zuid) Wind Farm Zone (WFZ) (Fugro, 2016a and 2016b).

The digital deliverables comprise the following data files:

i. Raw data files (ASCII) containing recorded seismic traces from seismic cone penetration tests (SCPT). The data files are provided for each individual shot and for both geophone depths;
ii. Tabulated values (Excel) of processed (i.e. stacked and band pass-filtered) seismic traces per borehole and per seismic component (x and y only, z is not presented). This information matches (plate) data presented in Fugro (2016a and 2016b).

Data files are embedded in this document and named and numbered as presented in Table 1 below.

Table 1 List of Embedded Data Files

Item	File Name	Contents	Format
1	HKZ_20170519_FEBV_WFS I_BH_SCPT_ACI_V01_F	Raw data files from WFS I SCPT locations containing recorded seismic traces for each individual shot and geophone depth	ACI (ASCII) - zipped
2	HKZ_20170519_FEBV_WFS II_BH_SCPT_ACI_V01_F	Raw data files from WFS II SCPT locations containing recorded seismic traces for each individual shot and geophone depth	ACI (ASCII) - zipped
3	HKZ_20170519_FEBV_WFS I_BH_SCPT_XLS_V02_F	Data files from WFS I SCPT locations containing tabulated x- and y-component seismic traces of the total covered depth range for a SCPT location	XLS (Excel) - zipped

Item	File Name	Contents	Format
4	HKZ_20170519_FEBV_WFS II_BH_SCPT_XLS_V02_F	Data files from WFS II SCPT locations containing tabulated x- and y-component seismic traces of the total covered depth range for a SCPT location	XLS (Excel) - zipped

2. SUPPORTING INFORMATION

ASCII files containing recorded seismic traces (item (i) of Section 1) present the information as shown in the example in Table 2 below.

Table 2 Example Content of ASCII Files

Line	Value	Description[(1)]
1	0.102 ¦ -100.00 ¦ 2.27 ¦ 0.75 ¦ 0	Sample rate [ms] ¦ Time delay [ms] ¦ Geophone depth [m below seafloor] ¦ Source radial offset [m] ¦ Source depth[(2)] [m]
2	16/07/2016	Acquisition date (day/month/year)
3	07:37:41	Acquisition time
4	?[(3)]	Client
5	FUGRO	Company
6	SP10-G0-P1E1M1-V1 S/N:1733-0012	Instrument
7	N6196	Job number
8	RE/HRL	Observer
9	AS ACQUIRED	Trace sort
10	METERS	Distance unit
11	Bucentaur,WFSI,HKZ1-BH01-SC,SCPT_1 (at 0 m below ML),22.9,0,?,?,?,?,None	Optional metadata (Geotechnical vessel used for data acquisition ¦ Wind Farm Site ¦ Borehole ID ¦ Test ID ¦ Water depth (not reduced) ¦ Test depth/drill depth [m below seafloor] ¦ [empty fields][(4)])
12	SHEARWAVE HAMMER	Energy source
13	ASCII	File type
14	5.177441E-003 ¦ 1.506228E-003 ¦ 0.000000E000	Seismic amplitude [m/s^2] for x-, y-, and z-component

Notes:
(1) Description in accordance with BCE (2015)
(2) Fugro systems use a source at seafloor (0 m source depth); radial offset of source is presented in line item 1
(3) Due to operator error Client name has not been entered in the data acquisition system (applicable to all ASCII files)
(4) Fields in line item 11 that are indicated with '?' and 'none' are not in use in the default lay-out of this type of ASCII files

It should be noted that there is no time-domain provided in the ASCII files, i.e. no column presenting time, but only records with seismic amplitudes for the x-, y-, and z-component (z-component was not recorded for this project and hence, values are zero). The first record (for which an example is shown in line item 14 in Table 2) is for t_0 = -100.0 ms (selected time delay T, refer to line item 1 in Table 2). The second record is for t_1 = -99.9 ms (t_0 + sample rate S), the third record for t_2 = -99.8 ms (t_1 + S), record n for $t_{n-1} = t_{n-2} + S$ (for n>0).

SCPT location HKZ1-BH06**A**-SC is erroneously stated as 'HKZ1-BH06-SC**A**' in the file name of the ASCII data files for this location. As this name is also listed in the metadata in the files itself, file naming and contents have not been changed for this location.

SCPT location HKZ2-BH03**A**-SC is erroneously stated as 'HKZ2-BH03-SC**A**' in the file name of the ASCII data files for this location. As this name is also listed in the metadata in the files itself, file naming and contents have not been changed for this location.

Excel data files contain tabulated values (Excel) of processed (i.e. stacked and band pass-filtered) seismic traces per borehole and per seismic component (x and y only, z is not presented) (item (ii) of Section 1):

- A data file containing all x-component seismic traces of the total covered depth range for a SCPT location. Traces are presented for each individual geophone depth and are a visualisation of normalised particle accelerations, represented by an apparent variation (amplitude) in depth. Note that the presented values are relative to the geophone depth value and are not absolute values. This is illustrated with the example in Figure 1: peak particle acceleration (PPA) for the x-component trace at geophone depth 11.26 m is -0.04171 m/s^2. This PPA-value is used to 'normalise' all other particle acceleration (PA) values of this trace for representation on the geophone depth *D*, with a maximum amplitude relative to the geophone depth of *D* + 0.5 m or *D* - 0.5 m. For instance, if the PA value at 120 ms on this trace is -0.03246 m/s^2, then this is represented by a 'normalised' depth of (-0.03246/-0.04171)*0.5 m + *D* = 11.65 m. Column A (yellow cells) in the Excel data file represents the time domain; Column B/Row 2 and further (blue cells) present amplitudes;
- A similar data file as above, but then presenting y-component seismic traces.

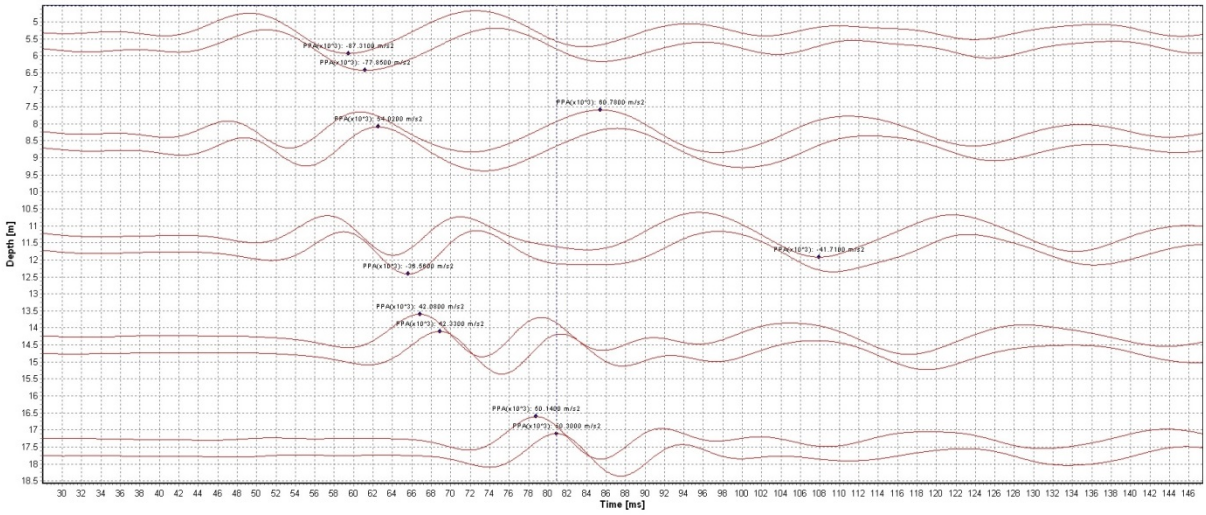

Figure 1 Example of x-component seismic traces with peak particle velocity indicated

The 'true' geophone depth is at the start of data acquisition (at -100 ms). However, processing software SC3-RAV^{TM} (BCE, 2015) does not present data recorded during the (pre-trigger) time delay and therefore, the amplitudes in Row 2 (at 0 ms) do not represent these 'true' geophone depths. As a

consequence, amplitudes at 0 ms are slightly different when the data files with x-component seismic traces and files with y-component traces are compared.

3. REFERENCES

BCE, 2015. *SC3-RAV^{TM} 2015. User's Reference Manual Fugro Engineers B.V. Edition.* Version 15.3.1, October 2015. Vancouver: Baziw Consulting Engineers Ltd.

Fugro, 2016a. *Geotechnical Report – Investigation Data – Geotechnical Borehole Locations – Wind Farm Site I – Hollandse Kust (zuid) Wind Farm Zone – Dutch Sector, North Sea.* Client Reference No. WOZ 1600020/Fugro Report No. N6196/01, Issue 4, 14 November 2016.

Fugro, 2016b. *Geotechnical Report – Investigation Data – Geotechnical Borehole Locations – Wind Farm Site II – Hollandse Kust (zuid) Wind Farm Zone – Dutch Sector, North Sea.* Client Reference No. WOZ 1600020/Fugro Report No. N6196/03, Issue 4, 14 November 2016.

4. USE OF THIS TECHNICAL NOTE

The content of this technical note and embedded data files are secondary to and must be read in conjunction with Fugro reports (2016a and 2016b) listed under the section titled 'References' of this document. The terms and conditions applicable to the referenced documents also apply to this technical note and the content of the data files.

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 contains 6 pages, the definitive version of which is held in Fugro's information system.

Issue No.	Date	Report Status	Approved
2	19-May-2017	Revised Final	MKL
1	02-May-2017	Final	MKL

Document Review and Approval: M. Klein – Principal Geotechnical Engineer

Fugro Project Lead: signed

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ISSUE 07

FEBV/GEO/REP/042

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This investigation was carried out by Fugro Engineers B.V., commissioned by RVO.nl, an agency of the Ministry of Economic Affairs.

The information in this document is valid at the time of publishing (see month/ year). Updates will be published on the website http://offshorewind.rvo.nl/ at the relevant sitemap (Hollandse Kust (zuid)/Hollandse Kust (noord), General Information, submap Revision Log and Q & A. In the Revision Log is indicated which versions are the latest and what the changes are in relation to previous versions. The documents can be found at the relevant sites, indicated in the Revision Log.

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Netherlands Enterprise Agency (RVO.nl) | June 2017