



Fugro Survey BV
Veurse Achterweg 10,
2264 SG,
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The Netherlands,

NOTICE OF MARINE OPERATIONS

Notice is hereby given that Fugro will be conducting a geophysical survey as detailed below.

Fugro Survey B.V in conjunction with Fugro EMU Ltd. will be surveying Norfolk Vanguard offshore wind farm and export cable route located on the east of the United Kingdom, this works will start beginning of August 2016. The project will last for till end of September 2016.

1.1 Survey Area

The following figures show the extents of the survey area and co-ordinates in which the vessels will be operating.

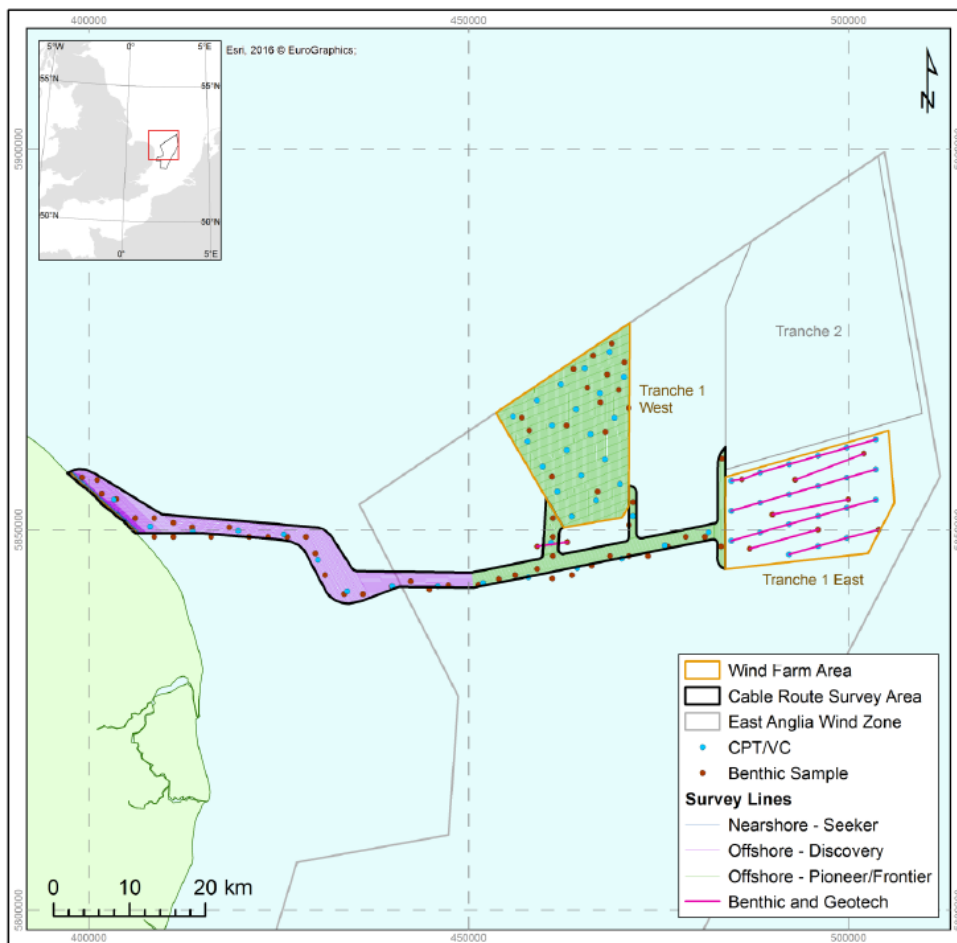


Figure 1.1: Norfolk Vanguard Offshore Windfarm Survey Location

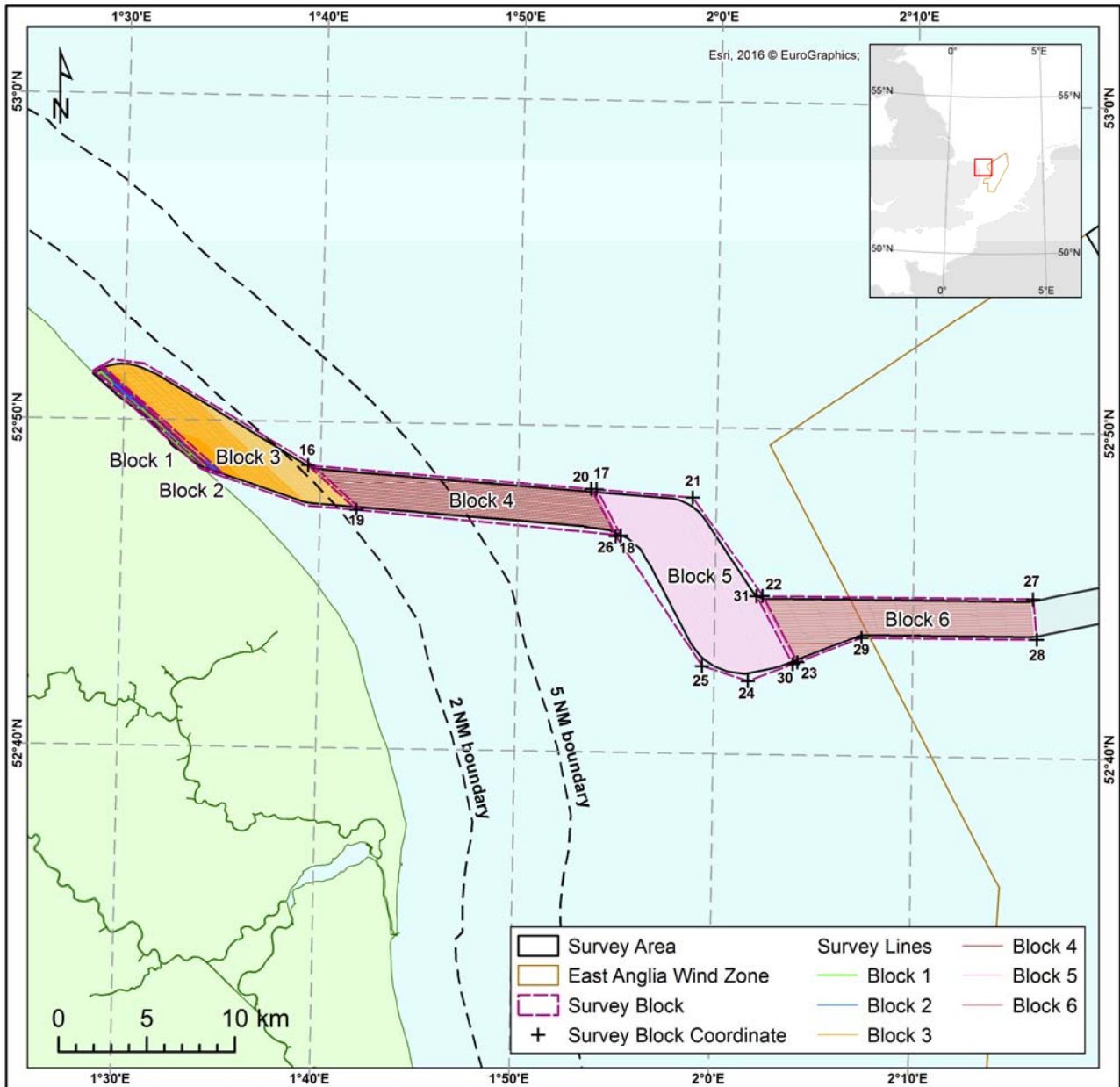


Figure 1.2: Norfolk Vanguard Offshore Windfarm Survey Location

Tranche 1 West Boundary Nodes				
ETRS89			UTM31N	
Nodes	Latitude	Longitude	Easting	Northing
1	52.93586	2.30923	453574	5865359
2	53.04356	2.57120	471252	5877202
3	52.82745	2.57106	471099	5853163
4	52.81319	2.55787	470201	5851581
5	52.80087	2.44373	462497	5850264
Meteorological Mast ZE As-built coordinates				
ETRS89			UTM31N	
ID	Latitude	Longitude	Easting	Northing
ZE	53.17744	2.98505	499001	5892010

Due to complexity of the geometry not all nodes are shown in this figure.
 Do not create vector data from the coordinates in this table.
 GIS data is available upon request from the Vattenfall GIS Team.

Figure 1.3: Norfolk Vanguard Offshore Windfarm Survey coordinates



Map Document: (V:\PROPOSALS\IP160509_EANorth_geophysicalSurvey_Vattenfall3_Plots1_SurveyArray\EAN_SurveyBlocks_v07_InText_ETRS89UTM31_20160713.mxd)
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Figure 1.4: Norfolk Vanguard Offshore Windfarm Survey Location – Cable Route overview

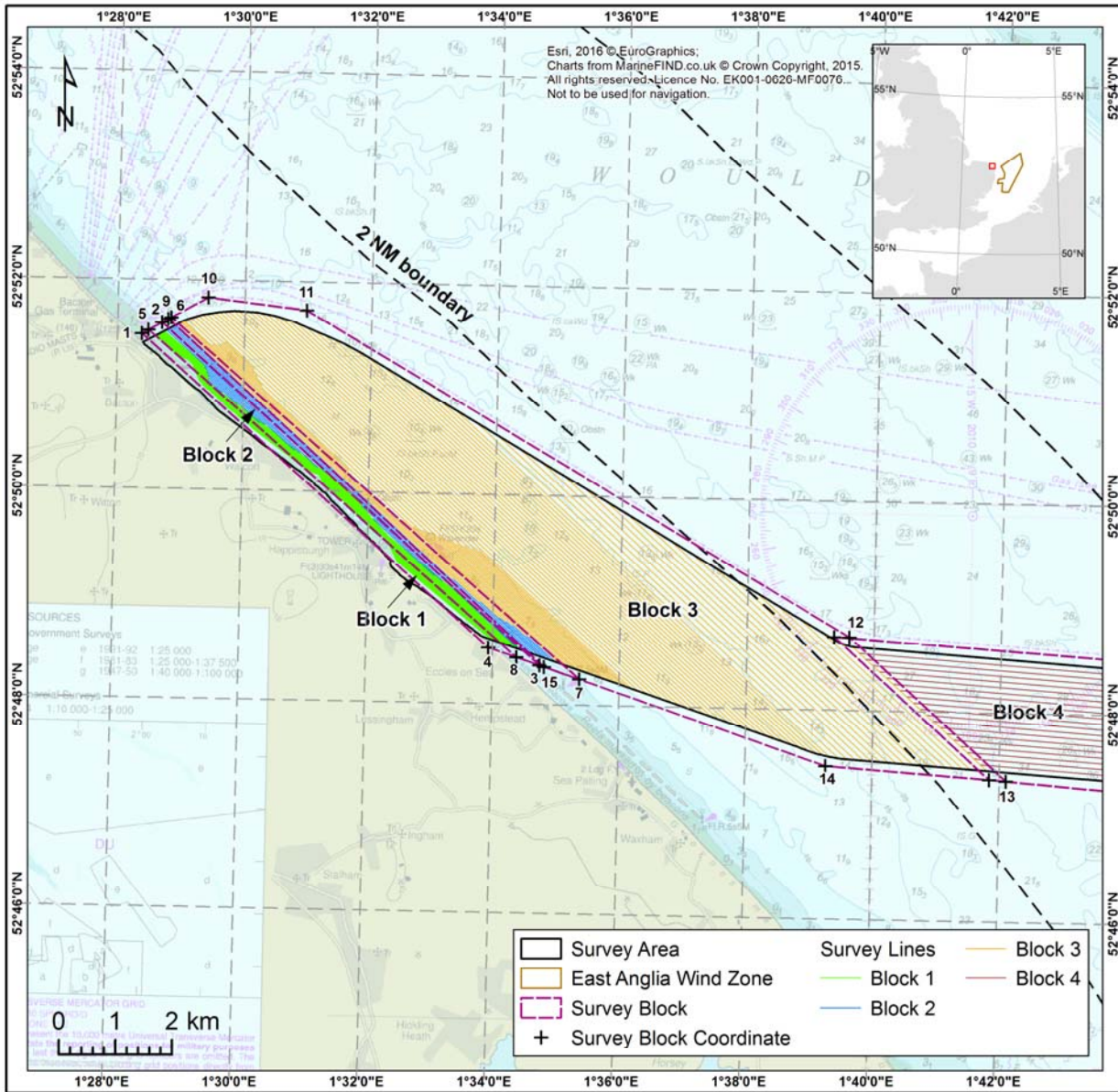


Figure 1.5: Norfolk Vanguard Offshore Windfarm Survey Location – Landfall area overview

NOTICE TO MARINERS

GE050 – VATTENFALL NORFOLK VANGUARD OFFSHORE WINDFARM REV 3



UID	BlockID	Lon_dD	Lat_dD	Lon_DdM	Lat_DdM	Easting	Northing
1	1	1.473056	52.858027	1° 28.383' E	52° 51.482' N	397193.692	5857569.557
2	1	1.478347	52.859835	1° 28.701' E	52° 51.590' N	397554.1408	5857763.073
3	1	1.579119	52.806345	1° 34.747' E	52° 48.381' N	404220.7012	5851674.491
4	1	1.565615	52.809049	1° 33.937' E	52° 48.543' N	403316.4317	5851993.276
5	2	1.474837	52.858636	1° 28.490' E	52° 51.518' N	397315.0436	5857634.708
6	2	1.480768	52.860662	1° 28.846' E	52° 51.640' N	397719.0775	5857851.624
7	2	1.589586	52.804248	1° 35.375' E	52° 48.255' N	404921.6577	5851427.38
8	2	1.573052	52.80756	1° 34.383' E	52° 48.454' N	403814.4245	5851817.717
9	3	1.480028	52.860409	1° 28.802' E	52° 51.625' N	397668.6692	5857824.561
10	3	1.490398	52.863949	1° 29.424' E	52° 51.837' N	398375.0425	5858203.536
11	3	1.51635	52.862195	1° 30.981' E	52° 51.732' N	400117.9887	5857972.025
12	3	1.660256	52.811772	1° 39.615' E	52° 48.706' N	409700.97	5852173.205
13	3	1.701858	52.789196	1° 42.111' E	52° 47.352' N	412459.503	5849610.646
14	3	1.654537	52.791134	1° 39.272' E	52° 47.468' N	409272.5904	5849884.755
15	3	1.5803	52.806097	1° 34.818' E	52° 48.366' N	404299.7367	5851645.296
16	4	1.656279	52.811779	1° 39.377' E	52° 48.707' N	409432.9528	5852178.973
17	4	1.899238	52.801808	1° 53.954' E	52° 48.109' N	425790.875	5850791.571
18	4	1.920184	52.778495	1° 55.211' E	52° 46.710' N	427163.941	5848176.978
19	4	1.69747	52.789377	1° 41.848' E	52° 47.363' N	412163.9715	5849636.065
20	5	1.894862	52.801992	1° 53.692' E	52° 48.120' N	425496.1416	5850816.566
21	5	1.980314	52.798342	1° 58.819' E	52° 47.901' N	431251.0843	5850325.379
22	5	2.040191	52.748496	2° 2.411' E	52° 44.910' N	435213.9664	5844725.362
23	5	2.070034	52.714699	2° 4.202' E	52° 42.882' N	437179.7495	5840939.54
24	5	2.028822	52.704834	2° 1.729' E	52° 42.290' N	434381.1114	5839878.947
25	5	1.990119	52.712193	1° 59.407' E	52° 42.732' N	431777.6062	5840733.553
26	5	1.916058	52.778007	1° 54.963' E	52° 46.680' N	426884.8286	5848126.898
27	6	2.26762	52.748232	2° 16.057' E	52° 44.894' N	450564.6423	5844515.503
28	6	2.271099	52.727702	2° 16.266' E	52° 43.662' N	450776.3094	5842229.499
29	6	2.123636	52.727683	2° 7.418' E	52° 43.661' N	440818.102	5842338.388
30	6	2.066087	52.713755	2° 3.965' E	52° 42.825' N	436911.7697	5840837.984
31	6	2.035066	52.748257	2° 2.104' E	52° 44.895' N	434867.7107	5844703.358

Figure 1.6: Norfolk Vanguard Offshore Block Survey coordinates

Scheduled vessels for blocks:

Block 1 – 0m-2m	RHIB
Block 2 – 2m-5m	Valkyrie
Block 3 – 2m-10m	Discovery
Block 4 – 10m +	Discovery
Block 5 – 10m +	Discovery
Block 6 – 10m +	Discovery
Windfarm Area	Fugro Pioneer

1.2 Vessels

Fugro Pioneer

MV Fugro Pioneer (call sign C6BH3), a 53 m purpose build survey vessel delivered in 2014.

The Pioneer will be conducting a geophysical survey with towed equipment up to 200 m behind the vessel. The vessel will be operating on a 24 hour basis. Throughout survey operations, the vessel will be displaying the appropriate lights and shapes as required under the COLREGS Rule 27 (b) and will require other vessels to maintain a wide berth of at least 200 m.



Figure 1.7: Fugro Pioneer

Task Name	Duration	Start	Finish
Offshore Section (Pioneer)	46.6 days	Wed 10/08/16	Mon 26/09/16
Transit	0.5 days	Wed 10/08/16	Wed 10/08/16
NV Tranche 1 West	33 days	Wed 10/08/16	Mon 12/09/16
NV Offshore Section Cable Route	9.8 days	Mon 12/09/16	Thu 22/09/16
NV Optional Seabed Mobility Survey	1.7 days	Thu 22/09/16	Sat 24/09/16
NV Optional Met Mast Survey	0.1 days	Sat 24/09/16	Sat 24/09/16
Demobilisation	1.5 days	Sat 24/09/16	Mon 26/09/16

Figure 1.8: Fugro Pioneer schedule

RV Discovery

The RV Discovery (Call Sign: 2AEL8) is owned by Fugro since 2006 and converted to a bespoke survey vessel. The vessel is a twin screw, 24 m monohull with accommodation for 12 people.

The RV Discovery will be conducting a geophysical survey with towed equipment up to 200 m behind the vessel. The vessel will be operating on a 24 hour basis and will require other vessels to maintain a wide berth of at least 200 m.



Figure 1.9: RV Discovery

Task Name	Duration	Start	Finish
Cable Route Section (Discovery)	37.9 days	Fri 05/08/16	Tue 06/09/16
Transit	0.5 days	Fr 05/08/16	Fr 05/08/16
NV Discovery Section Cable Route	23.4 days	Fri 05/08/16	Sun 28/08/16
Demobilisation/Mobilisation Benthic	0.5 days	Sun 28/08/16	Mon 29/08/16
NV Benthic on route	8 days	Mon 29/08/16	Tue 06/09/16
Transit	0.5 days	Tue 06/09/16	Tue 06/09/16

Figure 1.10: RV Discovery schedule

Valkyrie

For the nearshore work, Fugro proposes the use of the Valkyrie (call sign: 2HCS2) owned by Fugro. The Valkyrie is a brand new, purpose built hydrographic and geophysical nearshore survey vessel, commissioned, owned and operated by Fugro.

The Valkyrie will be conducting a geophysical survey with towed equipment up to 200 m behind the vessel. The vessel will be operating on a 12 hour basis and will require other vessels to maintain a wide berth of at least 200 m.



Figure 1.11: Valkyrie

Task Name	Duration	Start	Finish
Nearshore Section (Valkyrie)	10 days	Mon 29/08/16	Thu 08/09/16
Transit	1 day	Mon 29/08/16	Tue 30/08/16
NV Valkyrie Section Cable Route (until -2m LAT)	8 days	Tue 30/08/16	Wed 07/09/16
Demobilisation	1 day	Wed 07/09/16	Thu 08/09/16

Figure 1.12: Valkyrie schedule

Nearshore RHIB

Fugro Propose to perform the nearshore aspect of this survey with a smaller inflatable craft.

This will operate 12 hours per day. In the areas close to the coast as defined as Block 1 in figure 1.5

1.3 Purpose of survey

The purpose of the geophysical survey is to provide adequate quality and quantity of geophysical data to inform the existing ground model for the site and export cable corridor. The geophysical investigation needs to provide detailed information in the area which will serve as a basis to inform the site selection process and to enable preliminary foundation design.



Table 1.1: Overview Scope

Survey area(s)	Description	Comments
FIRM		
<ul style="list-style-type: none"> Export cable route 	<ul style="list-style-type: none"> MBES & SSS: Full coverage of site MAG & SBP: Data acquired on all lines 	Roughly a 2km corridor
OPTIONAL		
<ul style="list-style-type: none"> Tranche 1 West 	<ul style="list-style-type: none"> MBES & SSS: Full coverage of site MAG & SBP: Data acquired on all lines UHS: Data acquired on all lines or alternative on every second line. 	The geophysical survey lines shall coincide with as many turbine locations as is reasonably possible
<ul style="list-style-type: none"> Met Mast ZE in Tranche 2 area 	<ul style="list-style-type: none"> SBES, MBES & SSS 	Survey area in 50m radius + 2km transect
<ul style="list-style-type: none"> Tranche 1 East Tranche 2 	<ul style="list-style-type: none"> SBES & MBES 	Seabed mobility survey (120 km est.)
<ul style="list-style-type: none"> Tranche 1 West Tranche 1 East Export cable route 	<ul style="list-style-type: none"> Grab Sampling 	<u>Number of grab samples:</u> Tranche 1 West: 15 Tranche 1 East: 8 Cable route: 46 TOTAL: 69 grab samples
<ul style="list-style-type: none"> Tranche 1 West Export cable route 	<ul style="list-style-type: none"> CPTU & Vibrocores (VC) to 6m <p>It is noted that the minimum required water depth for performing CPTU's & Vibrocores is 10m.</p>	<u>Number of CPTU:</u> Tranche 1 West: 20 Tranche 1 East: 20 Cable route: 18 TOTAL: 58 CPTU <u>Number of VC:</u> Tranche 1 West: 20 Tranche 1 East: 20 Cable route: 18 TOTAL: 58 VC

1.4 Geotechnical Campaign

There will be a geotechnical works as well scheduled for mid September. More details to follow in the next update of this Notice to Mariners.



1.5 Contacts

The contents of this notice are based upon our current understanding of the project requirements and upon Fugro's planning at the time of submission. It should be noted that Fugro will endeavour to update this notice as required.

Enquiries regarding the contents of this Notice to Mariners or any other matters should be directed to Fugro (survey contractor):

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