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Client Representatives Geophysical Survey IJmuiden Ver Site V-VI

Annex 8 -

Scope of Work

IJmuiden Ver Wind Farm Zone

Colophon

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1 Introduction

1.1 Scope of this document

This document and its appendices detail the scope of the WORK as part of the CONTRACT that CLIENT has awarded to CONTRACTOR for provision of OFFSHORE CLIENT REPRESENTATIVES during the geophysical investigations at IJmuiden Ver Wind Farm Sites V and VI (IJ56). IJ56 is located within the IJmuiden Ver Wind Farm Zone (IJVWFZ).

1.2 Contract Parties

EXPERT CONTRACTOR	Arcadis Nederland B.V. who has been awarded by CLIENT to perform the technical due diligence related to soil
CLIENT	Netherlands Enterprise Agency
OFFSHORE CLIENT REPRESENTATIVE (OCR)	Person working for CONTRACTOR on the project of CLIENT to monitor daily HSE, QC and progress for CLIENT
CONTRACTOR	Contracting party which supplies the offshore client representatives as part of the WORK
SURVEY CONTRACTOR	Contractor awarded by CLIENT who will provide the survey vessels, equipment and personnel to perform the geophysical site investigation

1.3 Background

The Ministry of Economic Affairs and Climate Policy is responsible for the legislative framework for the development of offshore wind farms in the Netherlands. Within this framework (a) (concession) tender(s) for permit for construction and operation of (a) wind farm(s) will be organized under the current regulation. As part of the tender documentation, the participants will receive an information package in which detailed information on the offshore site is included. Detailed information on the soil conditions at the site will be part of this information package.

Information on the soil conditions at the site is to be developed through a sequence of commissions for geological, geophysical, geotechnical and morphodynamical studies. Information will be presented as factual data, integrated and interpreted data (a Ground Model) and will be comprehensively reported.

The Ground Model is to be of sufficient precision to allow participants to make initial plans and costings for foundation design and cable installation.

This assignment is containing the request for OFFSHORE CLIENT REPRESENTATIVES to monitor the field works of the geophysical investigation.

1.4 Site Description

The IJ56 sites are an extension to the four sites (IJmuiden Ver sites I-IV) that have been investigated for the offshore wind development of the Netherlands. The sites IJ56 will be added to the sites determined in the roadmap 2030 as presented in Figure

1. With the extension the IJVWFZ will consist of 6 sites with a total capacity of 6,000 MW.

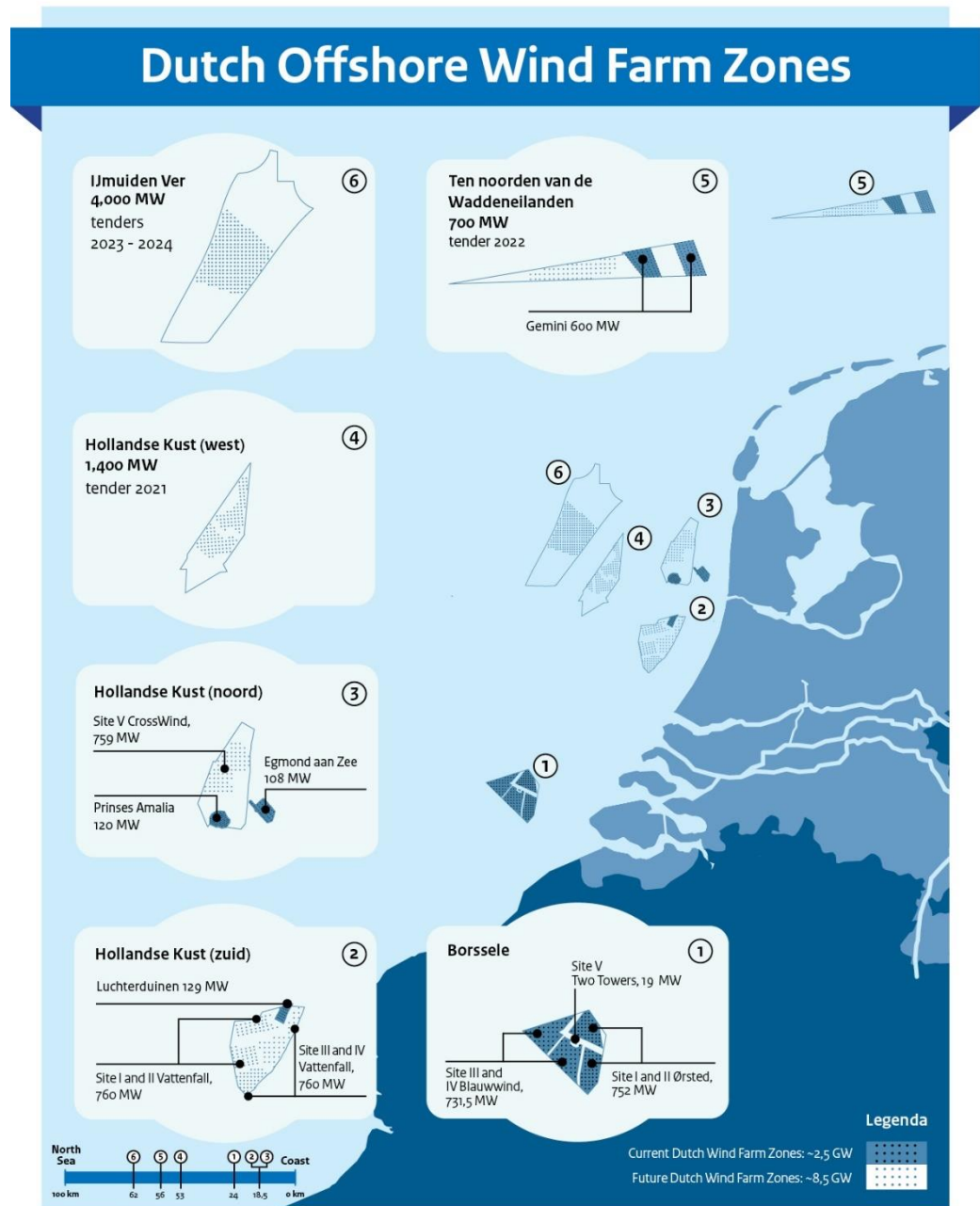


Figure 1. Designated Wind Farm Zones in the Netherlands

1.5 Investigation Area

It is the intention to obtain a single set of geophysical data, reports and drawings for an Investigation Area (IA). The IA covers the area to be occupied by the Wind Farm Sites (WFS), including an additional buffer zone (500 m) around the WFS. The IA is shown in Figure 2.

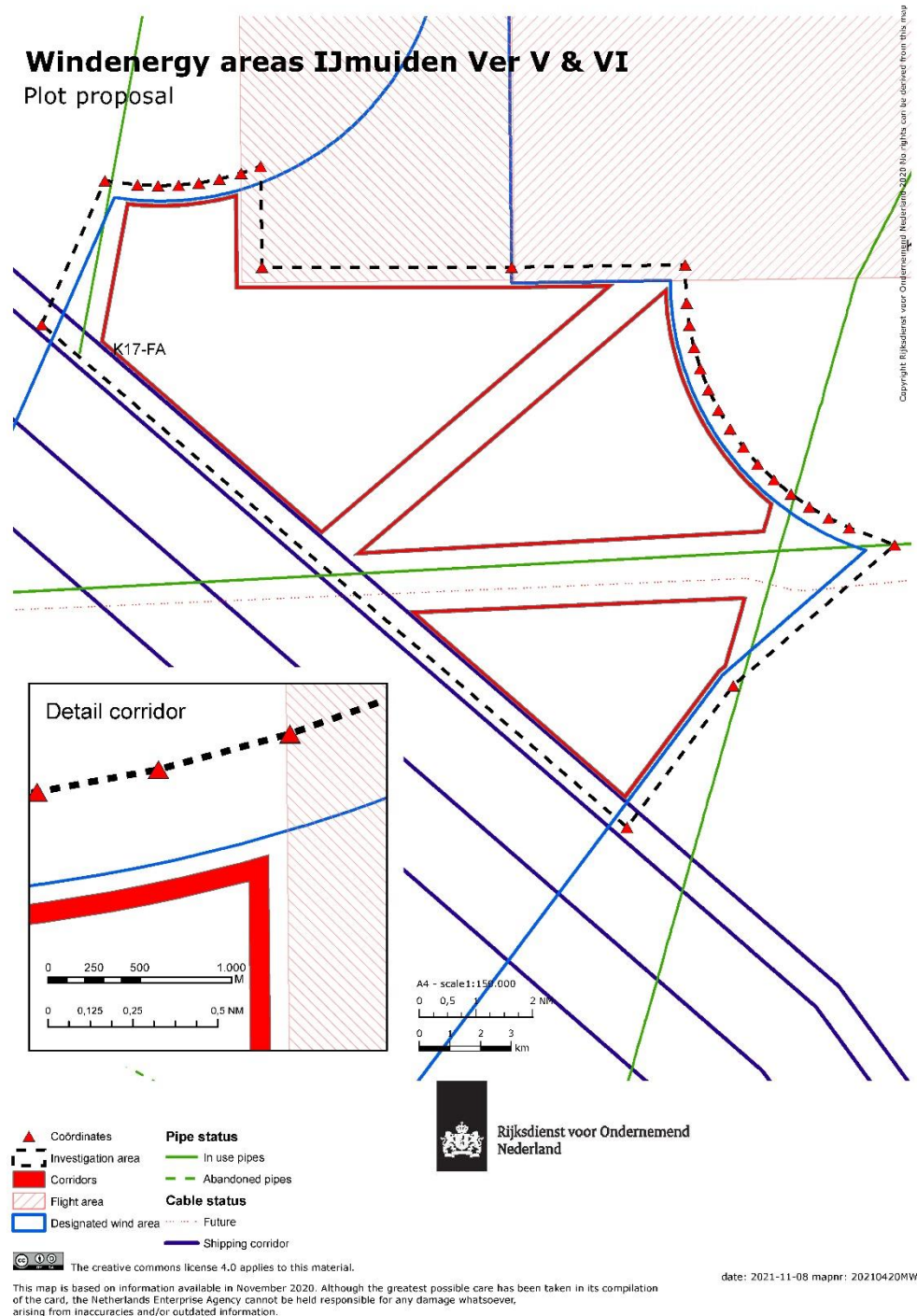


Figure 2. IA to be surveyed during the 2022 geophysical campaign at the IJWVZF

The IA is divided in 2 sections:

1) 2D-UHRS Survey area

This area will consist of the entire area within the Wind Farm Sites V and VI including the 500m zone outside the WFS boundary. The IA overlaps the military zone to the N by 500m.

2) 3D-UHRS Survey area

This area consists of a 110m wide corridor located inboard of each of the WFS boundaries, inset by 100m from the edge of wind farm sites. The detail of the corridor is presented in Figure 2 where the corridor starts at 100 m from the WFS and ends at 210m from the WFS.

1.6 Aims of the geophysical survey

The aim of the geophysical soil investigation is to contribute to the bathymetrical, morphological and geological understanding of IJ56. The investigation is required to obtain seabed and sub-seabed information on this location. The information is required to be suitable for the planning and preparation of geotechnical investigations, and suitable for integration into a ground model of sufficient quality to progress the design and installation requirements for offshore wind farms, including, but not limited to, foundations and cables.

The investigation is expected to provide:

- An accurate bathymetric dataset
- Information describing all seabed features of significance to the construction of wind farm facilities including but not limited to:
 - Sea floor materials, their variation and morphology
 - any natural features such as boulders, scour hollows, pock-marks;
 - any non-natural features such as wrecks and debris (both known and previously unmapped), pipelines, cables and infrastructure;
- Soil and water samples for a T0 (baseline) ecological campaign to serve as a reference for changes in species composition of (mainly) soft substrate fauna that occur after the installation of a wind farm.
- Sub-Seabed datasets of sufficient quality to support construction of a ground model to at least 100 m below seabed, with resolution and signal-to-noise ratio optimised for production of an Integrated Ground Model.
- A Preliminary Ground Model (PGM) of the site, including as a minimum;
 - Estimated elevation and depth below seabed of the base of mobile sediments if detectable.
 - Estimated elevation and depth below seabed for a set of interfaces between principal geological formations or other horizons of interest;
 - The locations of structural features or geohazards within the shallow geological succession including but not limited to faulting, accumulations of shallow gas, peat, buried/infilled channels, structures associated with sub-glacial processes or glaciotectonism;
 - Correlation with existing geophysical and geotechnical interpretation at IJV I-IV and elsewhere as available.
- The current position of existing (in service & out of service) cables and pipelines.
- A comprehensive interpretative report on the survey results obtained, describing the PGM; and
- A preliminary zonation of the site for input into the specification and scope for a geotechnical sampling and testing programme to follow the completion of the geophysical survey.

The output of the investigation shall be delivered in formats defined in this scope of work including digital data, Seismic Workstation and Geographic Information System project filesystems, chart data and reports.

The Geophysical Survey follows and receives information from the Geological, Archaeological and UXO Desk Studies, and it is expected to precede and supply

information to a geotechnical investigation, an Integrated Ground Model (IGM, integrating the results of Geological, Geophysical and Geotechnical investigations) and a morphodynamical investigation.

It is expected that the IGM (to be developed under a separate, later commission following geotechnical data acquisition) will be a revision and significant enhancement of the PGM. It is expected to include refinement to data processing of sub-seabed data, ground-truth calibration of geophysically estimated depths, rationalisation of geotechnical and geophysical observations, refinement of the preliminary litho-stratigraphic model to include geotechnically relevant structures and the development of a 3D distribution of geotechnical parameters.

1.7 Timing of the Investigations

The data acquisition for the geophysical survey shall be carried out in Q1-Q3 2022.

1.8 Available Information

1.8.1 *WFZ specific information*

CLIENT has carried out desk studies on the entire IJWVFZ including IJ56. The following desk studies are available on <https://offshorewind.rvo.nl/>;

- Geological desk study;
- Archaeological desk study;
- UXO desk study.

Additional to above a geophysical survey within the IJWVFZ is completed for sites I-IV. Results from this survey are available at <https://offshorewind.rvo.nl/>.

1.8.2 *Other information*

Further, for information, the results of the geophysical and geotechnical surveys carried out for Borssele, HKZ, HKN, HKW, TNW WFZ are available at <https://offshorewind.rvo.nl/>. It should be noted that this scope of work deviates from those of previous investigations *and may introduce additional requirements*.

1.8.3 *Geophysical Survey Tender*

CLIENT has published a tender to select a SURVEY CONTRACTOR. Information regarding the requirements set for the SURVEY CONTRACTOR can be found in the tender documents by link below.

<https://www.tenderned.nl/tenderned-tap/aankondigingen/242646>.

2 Scope of Work

This section describes the Scope of WORK for the OCR. Details of the Survey works are presented in section 3.

2.1 Monitoring of Survey Activities

The OCR will monitor the field works performed by the SURVEY CONTRACTOR during the execution of the works. The OCR will have the task to monitor safety, Quality and progress of the data acquisition. The geophysical survey works will consist of the following:

- High resolution bathymetric and backscatter survey
- High resolution side scan sonar survey
- Magnetometer survey
- Shallow Penetration Sub-Bottom Profiler (SBP) survey
- 2D Multi-Channel Ultra High-Resolution Seismic (2D-UHRS) profiling survey
- 3D Multi-Channel Ultra High-Resolution Seismic (3D-UHRS) profiling survey
- Seabed Sampling (ecological, box corer)
- Seabed Sampling (geoscience, box corer or grab sampler)
- Water sampling (ecological)
- Vibrocore Sampling

2.2 Health Safety Environmental and Quality monitoring

The OCR will monitor daily the Health, Safety, Environmental and Quality (HSEQ) of the works performed by the SURVEY CONTRACTOR. The OCR will assess if the SURVEY CONTRACTOR is working according their own HSEQ procedures and as per the requirements as set by CLIENT. Reference is made to the HSE and Quality requirements as set in the tender for the SURVEY CONTRACTOR (Ref. 1.8.3).

Furthermore, the OCR will monitor if the SURVEY CONTRACTOR respects the criteria, which will be provided as part of the exemption for underwater noise, which are likely to include;

- a. Use of Acoustic Deterrent Device (ADD) for porpoises, before sub-bottom profilers will be turned on.
- b. Soft start procedure of the sub-bottom equipment with description of duration and power settings of the equipment to allow porpoise mammals to leave site.

2.3 Number of Client representatives

CLIENT expects the SURVEY CONTRACTOR will work with two (2) vessels, but the SURVEY CONTRACTOR has the possibility to utilize 1 or up to 3 vessels simultaneous. For each vessel one (1) OCR shall be available on the vessel and will work in a 12 hour shift. Sufficient back-up personnel should be available to allow for crew changes.

The duration of rotations between crew changes is to be determined by the SURVEY CONTRACTOR. The OCR rotation schedule shall be based on the SURVEY CONTRACTOR's rotation plan. CLIENT expects a possibility to change OCR each 3-4 weeks.

CLIENT requests to submit four (4) main OCRs in case the SURVEY CONTRACTOR deploys two (2) vessels, and four (4) back up OCRs in case three (3) vessels are deployed or one of the main OCRs is unavailable.

2.4 Requirements to Offshore Client representatives

Required knowhow

- a. Experience with the execution of geophysical soil investigations within the offshore wind field
- b. Proven in-depth knowledge on technical and contractual items related to the scope.
- c. Knowledge of data acquisition and its equipment related to hydrographical surveying, high resolution seismic surveying and seabed sampling by means of;
 - (i) DPGS positioning systems
 - (ii) USBL positioning systems
 - (iii) multibeam echosounders,
 - (iv) magnetometers,
 - (v) shallow sub-bottom profilers
 - (vi) ultra-high resolution Boomer/Sparker acquisition
 - (vii) Vibrocore Sampling
 - (viii) Seabed sampling by means of grab/box sampling
 - (ix) (Preferred) 3D UHRS surveying
- d. Experience in similar roles in offshore wind projects
- e. (Valid) Certification for offshore work with as minimum;
 - o BOSIET or similar
 - o Medical

Activities and responsibilities (amongst other)

- Monitor execution of offshore works
- Report progress offshore works
- Participating in vessel meetings, Risk assessments and kick off meetings
- Audit day to day safety in operations
- Audit quality of works
- Audit the agreements as set in the exemption for underwater noise and permits

2.5 Schedule of the WORK

Duration of the WORK will be depending on the workability, the amount and efficiency of the vessels as provided by the SURVEY CONTRACTOR.

The Survey will start in Q1 2022 and will continue until Q2/Q3 2022. CLIENT expects starting date of the mobilization in March 2022 at the earliest.

For the purpose of this SOW a number of 100 vessel days is expected, the 100 days can be divided over 1,2 or 3 vessels.

The narrowing window, specifying the starting date of the offshore works for which the OCR need to be made available, will be defined as follows:

- *One month before the intended start of the offshore works, Client will provide a best estimation of the mobilisation date and location.*
- *One week before the intended start of the offshore works, Client will provide an update with best estimation of the mobilisation date and location.*

After the start of the WORK notifications on the exact crew change date will be provided by CLIENT as follows:

- *One week before crew change, the crew change date can be specified with a precision of 2 days;*

- 48 hours before crew change, the exact crew change date shall be specified;

2.6 Mobilization / demobilization

CONTRACTOR shall arrange all travel arrangements from and towards the mobilization port set by the SURVEY CONTRACTOR.

Travel arrangements include:

- Flight / train or other travel costs
- Hotel and foods
- Mandatory vaccinations if applicable / test to be able to travel

CLIENT expects the mobilization port of the SURVEY CONTRACTOR to be within the Netherlands.

2.7 Team set-up

The CLIENT has organized the project set-up within the IJ56 investigation by splitting the works of Wind & Water investigations and Soil investigations. The Geophysical survey is part of the Soil site investigation.

The Soil site investigation for IJ56 is managed by RVO project managers together with a team of contracted experts. The package is set up under supervision of a package manager from RVO overseeing all the studies related to soil for IJ56. The RVO package manager is supported by a lead expert who is involved as well in all studies. Both the Package manager as the lead expert will manage all interfaces between the studies.

The Geophysical survey will be managed by an RVO project manager who is supported by a team of contracted experts with in-depth knowledge related to the study.

Organogram of the project set-up is presented in figure 3. The position of the OCR in the organogram is highlighted red.

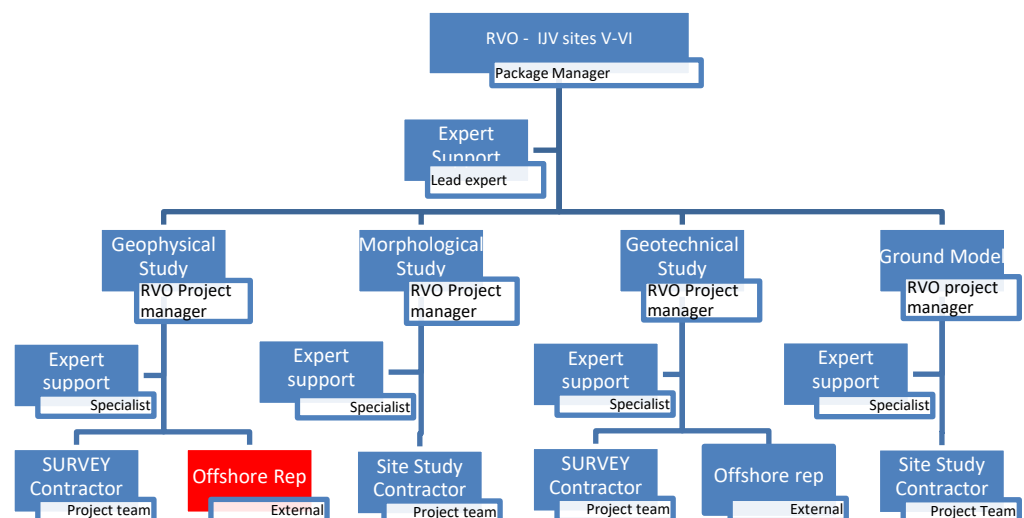


Figure 3. Organogram soil package IJ56

2.8 Communication

The communication lines are based on the team organization as presented in section 2.7. The communication from the OCR shall always include the RVO project manager

and related expert(s). The expert team will advise together with the RVO project manager on any queries from the OCR regarding to contract, HSEQ and or progress.

The OCR shall discuss queries during the WORK with CLIENTs on-shore team, consisting of the RVO project manager and the EXPERT CONTRACTOR. For the OCR first point of communications is presented as below:

- 1) CONTRACTOR; Travel arrangements
- 2) RVO project manager; for planning, contractual items and approval of travel arrangements
- 3) Lead Expert; for technical questions and data acquisition

Figure 4 is presenting the communication lines within the IJ56 Geophysical investigation with the position of the OCR indicated in red.

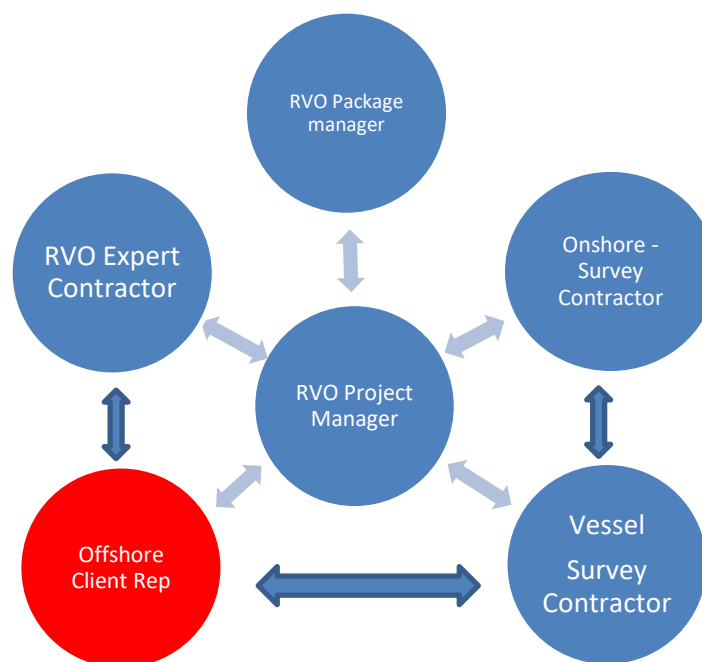


Figure 4. Communication lines

2.9 Reporting

The reporting requirements for the geophysical survey work are as follows:

Daily & Weekly reporting

The SURVEY CONTRACTOR is to submit daily reports throughout the period of the fieldwork, providing full details of previous 24 hours' work and results.

The SURVEY CONTRACTOR may be requested by the CLIENT to provide Data Quality Reports ("DQR") when appropriate. The DQR will not have to be provided on a daily basis but the SURVEY CONTRACTOR must be prepared to compile and provide these reports under the supervision of the OCR. Content of standardised elements of DQRs is to be established at the TKOM.

The OCR will issue a daily update to the CLIENT including:

- Summary of works completed last 24 hours
- Planning upcoming 24 hours
- HSE items of last 24 hours
- Quality items of last 24 hours
- Any observations and/or notes

Furthermore, the OCR will participate in short progress meetings with CLIENT and SURVEY CONTRACTOR, three (3) times a week (vessel progress calls).

3 Survey Requirements

The OCR shall monitor the field works as performed by the SURVEY CONTRACTOR. This section describes the main requirements of the survey components. Detailed information can be found in the Scope of Work for the SURVEY CONTRACTOR (Ref.1.8.3)

3.1 Requirements of the Survey Layout and Configuration

It is anticipated that the acquisition of geophysical, hydrographic and environmental datasets may involve one or more passes across the IA. The SURVEY CONTRACTOR shall select their optimum survey layout and acquisition configuration (e.g. single or multiple passes, single- or multi-vessel solution) to achieve the survey objectives and data quality requirements.

The following criteria, covering the entire IA:

- Multi-Beam Echo Sounder (MBES) bathymetry, Side-Scan Sonar (SSS), magnetometry (MAG), shallow penetration, high resolution Sub Bottom Profiler (SBP¹) and 2D Multi-Channel Ultra High Resolution Seismic (2D-UHRS) are to be acquired with parallel primary lines at not greater than 70 m line spacing.
- The primary line orientation for 2D data shall be oriented at CONTRACTOR's discretion taking into account technical and quality considerations for all sensors, survey efficiency, representative tidal current speed and direction, and interfaces at the survey boundaries.
- Secondary lines (tie or cross lines) are to be within 10° of the orthogonal to the primary lines.
- Secondary lines are to be acquired at a maximum spacing of 420 m for the MBES, SSS, MAG, SBP and 2D-UHRS surveys.
- The maximum separation of the 2D-UHRS near-channel mid-point track and the SBP track on all lines is anticipated to be 15 m.
- Minimum length of any line or line segment shall be 500 m.
- Every line or line segment shall have at least two intersections, with intersections within 420 m of each line end.
- At least 30 box-corer seabed sediment samples are to be acquired, to adequately characterise the ecology of the seafloor. These must be conserved for onshore analysis.
- At least 25 Vibrocore samples are to be acquired, to adequately sample the geological and morphological variation of the seabed.
- At least 30 water samples are to be acquired with a water sampler (e.g. Niskin Bottle, minimum 1 litre volume), filtered and stored frozen at or below -15°C for onshore eDNA analysis.
- At least 12 sediment grab samples (Box corer, Van Veen grab or similar) for seabed soil classification independent of the ecological samples.
- At least 300 km are to be surveyed outside of IJ56 with regards to nearby (within 90 km from IJ56) investigation areas with MBES, SBP and 2D-UHRS systems active. The exact locations of the link lines are to be determined after contract award.
- Two line segments totalling a maximum of 20 km are to be re-occupied up to three times over the survey duration to record bathymetry data, providing information on seabed mobility analysis.

The following criteria represent layout requirements for the *3D-UHRS*, covering a subset of the IA.

- 3D Multi-Channel Ultra High Resolution Seismic (3D-UHRS) data are to be acquired within a set of corridors supplied in table 2, nominally 110m wide, parallel to, and inboard of, the boundary of the IJ56 WFS. 3D-UHRS data are to be acquired on sub-parallel sail lines to deliver a minimum of 12-fold data with a bin size of $\leq 1.0\text{m}$ (inline) and $\leq 2.0\text{m}$ (cross line). For the avoidance of doubt, a 30m halo of data is included in the 110m corridor boundary, this is to be acquired to provide a target 50m wide central corridor of fully migrated data to $\sim 60\text{m}$ depth.

It is preferred that primary MBES/SSS/MAG/SBP data are collected from the same vessel.

It is required that MBES data are acquired, processed and delivered with both the 2D-UHRS and 3D-UHRS survey to support source and receiver height compensation in UHRS (re)processing.

In case the SURVEY CONTRACTOR uses two pass or two vessel operations the SURVEY CONTRACTOR must deliver the results as a single, coherent body of data. All data must be referenced to a common vertical datum. Final time-domain seismic data must be corrected to a time-pseudo-datum corresponding to the vertical datum(s), all non-dipping water bottom reflections must tie within ≤ 0.2 ms. Vessel specification sheets including instrumentation, settings and appropriate procedures are required to be produced, maintained and followed where multiple vessels and/or multiple personnel rosters contribute to the same measurement type.

Equipment interference must be minimised in all cases, shall be proactively monitored and reported, and shall not impact the data quality. The mitigation measures for potential sources of interference should be described in the proposal.

3.2 Mobilization and demobilization

Mobilization of the vessel(s) to the site will be considered completed when all necessary survey and Project Documentation, equipment, critical spares and personnel are accepted as operational to the specification agreed by the CLIENT and approved by the CLIENT. Verification of performance shall be made according to an agreed plan with all required testing and calibration of vessel and equipment (defined during TKOM) documented and signed off (this is regarded as part of the mobilisation).

The harbour to be used for mobilization of survey vessel(s), equipment and personnel is chosen by the SURVEY CONTRACTOR with approval of the CLIENT.

Demobilization of the vessel will be authorised when all the data required have been acquired and have passed field QA/QC criteria to the satisfaction of the OCR.

3.3 Lost Equipment

SURVEY CONTRACTOR shall be responsible at his own cost for the marking the location and recovery of equipment dropped or lost during the execution of the project. SURVEY CONTRACTOR shall mark the positions of equipment on or below the seabed with marker buoys if necessary and recover the equipment at the earliest possible opportunity. All equipment shall be removed to a reference level which is the trough of mobile sand waves in the area.

3.4 Testing

Following mobilization, a testing phase shall be implemented to establish the appropriate configuration and parameterisation of data acquisition equipment and finalisation of the survey QA parameters. Where data processing operations are critical to either in-field QA/QC or evaluation of the suitability of the data acquisition

configuration, design and parameterisation of these operations shall be part of the testing phase. A testing programme shall be agreed as part of the planning phase, and should include the collection of data properly representative of the range of ground conditions at the site. Provision shall be made for tests to be evaluated by both OCR and onshore client personnel.

Acceptance by CLIENT of data acquisition configuration is expected to take place as soon as possible after mobilization and testing. Production data acquired prior to acceptance of the data acquisition configuration is acquired at the SURVEY CONTRACTOR'S risk, shall be subject to rigorous QC and may be rejected by the OCR.

During the Testing phase and first data acquisition CLIENT will have the option to send one of the experts to join the vessel for the first one – two weeks to assist the OCR with the set-up and first data collection.