Porthos FEED Offshore Pipeline

Request for Information - Shore Crossing and Offshore CO2 Pipeline installation

Porthos

24/04/2020

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416010-00212 -TROF-ENG-PEM-INT-TNO-0004

Intecsea
Worley Group

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416010-00212 -TROF-ENG-PEM-INT-TNO-0004 – Porthos FEED Offshore Pipeline: Request for Information - Shore Crossing and Offshore CO2 Pipeline installation

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1.0	For Submission	FvdL	BN/JD/JdP	FvdL	24-04-2020
0.0	For Info	FvdL	OB	FvdL	23-04-2020

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1 Introduction

1.1 Project General

EBN, Gasunie and Port of Rotterdam, united in the Porthos consortium (Port of Rotterdam CO2 Transport Hub & Offshore Storage) have initiated a plan to collect CO2 from the industrial area of the port of Rotterdam and transport it to an abandoned gas field offshore for storage (see Figure 1-1 below).

As part of this CCUS-project (Carbon Capture Utilization and Storage) a concept study was completed in 2018. Porthos now proceeds with the FEED phase in 2019 and 2020, which will include the FEED design for the offshore pipeline section which extends from the last onshore horizontal weld connecting to the trenchless shore crossing up to the bottom flange of the riser at the P18-A platform.

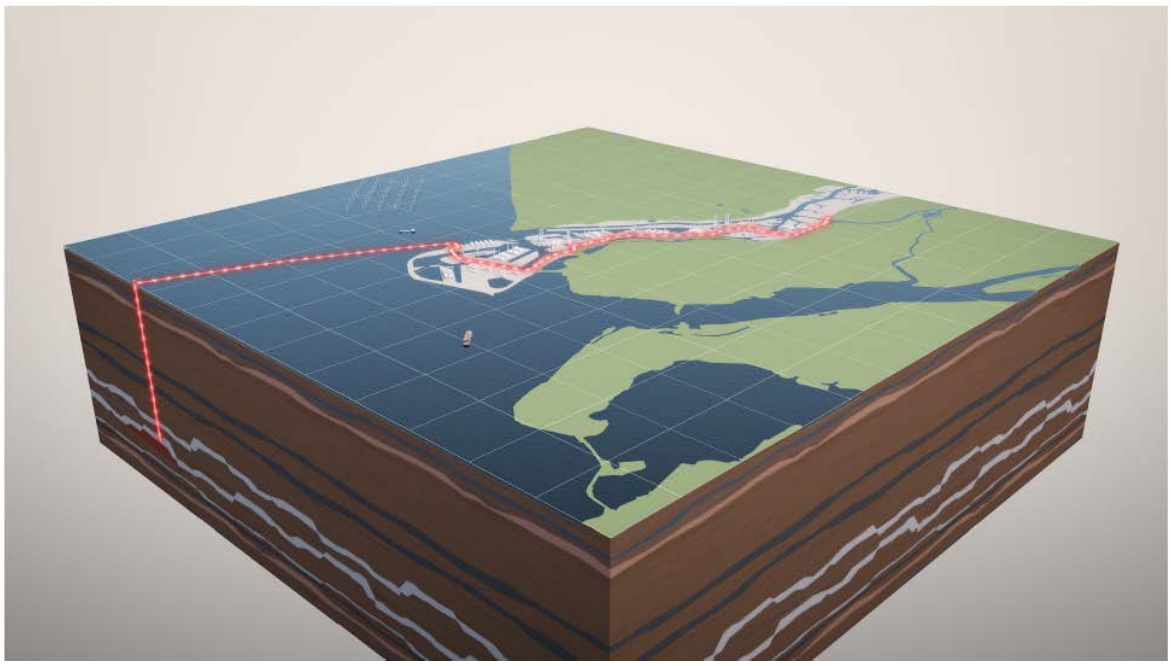


Figure 1-1 Porthos Overview

1.2 Purpose of Document

This questionnaire is part of a market consultation process for the Porthos project. The consultation is formed out of two parts: a questionnaire (1) and a discussion (2). Further explanation on the market consultation process is included in the document "Market Consultation for Shore Crossing and Offshore CO2 Pipeline".

The purpose of the market consultation is to collate information from installation and construction contractors for the different scope elements. This information is both technical, to support the ongoing design activities and preparation of the environmental impact assessment and related to the scope split i.e. to understand which installation packages can be combined.

The information collected during this market consultation will be treated confidential and will not be shared with parties other than the Porthos organization. This will also be applicable for the information given in the discussion. The (general) information provided by Porthos will also be shared as part of an (eventual) tender process.

This document includes general and technical information about the Porthos project and particularly the offshore pipeline and shore crossing section.

1.3 Environmental Requirements

Due to the specific nature of the Porthos project, there exists a strong driver to limit the CO2 and NOx emissions during all phases of the project. Parties are therefore invited to indicate emission reducing measures that can be applied during the construction activities. A good understanding on the potential emission mitigation measures and their pros/cons will benefit the Environmental Impact Assessment process and potential future tendering process.

1.4 Abbreviations

Table 1-1: Abbreviations

AFU	Approved for Use
barg	bar gauge
CCUS	Carbon Capture Utilization and Storage
Degr C	Degree Celcius
EBN	Energie Beheer Nederland
CP	Cathodic Protection
FEED	Front End Engineering Design
FJC	Field Joint Coating
N/A	Not Applicable
NOx	generic term for the nitrogen oxides nitric oxide (NO) and nitrogen dioxide (NO2)
OOR	Out Of Roundness
PP	Polypropylene
RFI	Request For Information
TBC	To be Confirmed
TNO	Technical Note

2 Project Information and Offshore Installation Scope

2.1 Overall Project

Porthos is preparing a project to transport CO2 from industry in the Port of Rotterdam and store this in an empty gas field beneath the North Sea.

The CO2 that will be transported and stored by Porthos, will be captured by various companies. The companies will supply their CO2 to a collective pipeline that runs through the Rotterdam port area. The CO2 will then be pressurized in a compressor station. The CO2 will be transported through an offshore pipeline to a platform in the North Sea, approximately 20 kilometers off the coast. From this platform, the CO2 will be pumped in an empty gas field. The empty gas fields are situated in a sealed reservoir of porous sandstone, more than 3 kilometers beneath the North Sea.

Figure 2-1 Porthos Onshore Key Plan

Porthos has been recognized by the European Union as a Project of Common Interest. For more information, please visit http://ec.europa.eu/energy .

The following main Porthos scope elements are identified:

1. Upstream CO2 collection network (low pressure)
2. Compressor station
3. Onshore high pressure pipeline section
4. Maasvlakte trenchless sea defence crossing
5. Maasgeul Crossing
6. Offshore section
7. Platform expansion spool

8. Platform riser
9. Platform topside modifications

This questionnaire involves the offshore pipeline system which comprises for the purpose of the questionnaire the elements 4,5,6 and 7 of above list. This is schematically shown in Figure 2-2 below.

2.2 Offshore Installation Scope

The offshore scope of work starts at the last onshore horizontal weld connecting to the onshore Maasvlakte section it ends at the bottom flange of the riser at the P18-A platform.

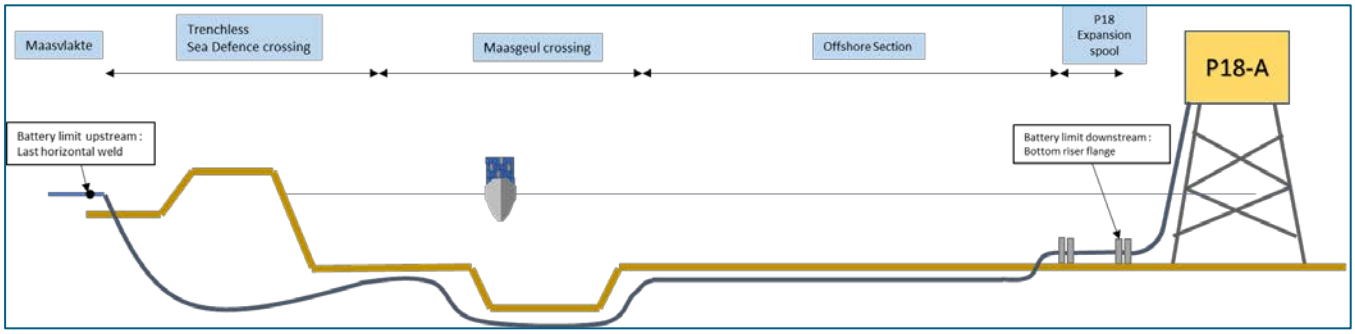


Figure 2-2 Porthos Offshore Scope Elements

2.3 Description Individual Scope Elements

The following installation elements are defined. Please note that for all scope elements the product pipe and insulation are purchased by Porthos and will be made available for installation.

2.3.1 Maasvlakte Sea Defence Crossing

The upstream scope limit for the Maasvlakte Sea Defence crossing is the last horizontal weld on the Maasvlakte. The downstream scope limit is the HDD exit around KP 0.5.

For the Maasvlakte sea defence crossing, three alternative methods are described during FEED:

1. HDD with direct pull-in of (about) 2.5 km length product carrier pipe over 500 meters, directly crossing the Maasgeul (this requires Maasgeul dredging works to be completed prior pull-in) into the HDD
2. HDD with direct pull-in of 0.5 km (+ some overlength for connection) product carrier pipe, requiring a further offshore tie-in with the Maasgeul crossing section.
3. Installation by HDD of a HDPE conduit pipe which is later followed by the pull-in of the product pipestring of 2.5 km length over 500 meters into the conduit pipe.

Obviously, there is a strong relation between the selected method above and the contractual scope split. Some of the above installation methods are only valid when the work is combined with the Maasgeul crossing scope.

Transport

The transport of equipment and all materials to site including storage and protection will be part of the installation contract. A suitable hand-over location for Company supplied items (line pipe) will be made available.

Fabrication

For the HDD section, the fabrication of the pipe string, whether this is the product carrying pipe or a conduit HDPE pipe is the main fabrication item. The stringing will need to be completed close to the installation site while also the timing is of importance. Other fabrication scope for the contractor will be the installation aids, lifting rigging etc.

Installation

The contractor will be responsible for the crossing of the MV sea defence by trenchless technique. This will be by Horizontal Directional drilling technique or an acceptable alternative. The decision whether this involves the installation of the final CO_2 carrier pipe or a conduit pipe will be made after consulting with interested parties.

In case of direct installation of the CO_2 carrier pipe, the Maasvlakte sea defence crossing will be subject to a hydrostatic pressure test for Porthos acceptance. This will not apply for the conduit pipe option and acceptance of the work needs to be addressed (specifically cleanliness, bending radii etc.)

2.3.2 Maasgeul Crossing

As also discussed above, there exists a strong relation between the construction of the Maasgeul crossing and some of the alternative HDD execution methods as described in Section 2.3.1 above. The below scope elements need to be adjusted to the selected execution method.

Transport

Similar to the Maasvlakte sea defence crossing, transport of equipment and all materials to site including storage and protection will be part of the installation contract. A suitable hand-over location for Company supplied items (mainly coted line pipe) will be made available.

Fabrication

To avoid a subsea tie-in between the sea defence crossing and the Maasgeul crossing, the fabrication of the complete pipe string will need to be completed close to the installation site. Timing and schedule of stringing and transport of string to launch location is essential as it relates to the installation activities.

Related fabrication scope for the contractor will be the temporary construction materials such as rigging for pipe pull and towing transport etc.

Installation

The installation activities for the Maasgeul crossing include the dredging scope works (to achieve the pipeline profile provided on Appendix A.3), pipe stringing, preparation of winch site, pull-in support, possibly backfilling and hydrostatic pressure testing.

2.3.3 Offshore Pipeline and Tie-in Spool P18-A

Transport

Transport of all line pipe and field joint coating materials, consumables and supplies to the pipeline installation vessel will be part of the offshore pipelay contract. Personnel transport may have to be organized depending on the duration of the pipelay campaign.

Fabrication

The fabrication scope will be limited to all installation aids required for pipelay (start-up and laydown heads, lifting rigging etc.) and the fabrication of the tie-in spool at P18-A after metrology.

Installation

The offshore pipeline will need to be installed by S-lay technique (due to insulation and concrete weight coating) and post-lay burial with 0.6 m minimum cover. Pre-lay seabed preparation (if any) will likely be included in the offshore pipeline installation scope unless this is included in scope of other project dredging works.

Note that the installation of the flanged tie-in spool can only be part of the offshore pipeline installation scope when the riser installation works at P18-A are completed, alternatively this will be part of riser installation contract.

2.4 Scope Interfaces

The following main scope interfaces are identified based on the above presented scope elements/activities.

The Offshore Section of Porthos has 2 external interfaces, at the start and end with adjacent project Sections and 3 internal interfaces between the defined scope elements.

2.4.1 Porthos offshore pipeline external interfaces

- External upstream interface: connection with the Porthos onshore section at the last horizontal weld. This weld will be included in both scopes and execution dictated by the overall schedule.
- External downstream interface: bottom of riser flange at P18-A. For the purpose of this questionnaire it can be assumed that the riser will be in place when the spool is installed.

2.4.2 Porthos offshore pipeline internal interfaces

Three internal scope interfaces are currently defined:

1. The HDD to Maasgeul crossing is considered as a complex installation interface when these two scope elements are not installed by the same construction party. It is expected that a scope split between parties is only feasible if:

   - the HDD is executed by means of an (HDPE) conduit pipe (mantelbuis)

   or

   - if a tie-in is introduced between HDD and Maasgeul section (around KP 0.5)

   The results of this questionnaire (particularly Appendix B) will be used by the project to have a better definition of the interface particularly for the following stages of the project.

2. The tie-in between Maasgeul crossing to offshore pipeline can be accomplished by leaving a pipeline tail on the seabed (possibly waterfilled for stability reasons) which can be recovered by the layvessel during start-up.

3. Offshore pipeline to platform expansion loop. This is expected to be a flanged connection.

2.5 Schedule

The tentative schedule for the offshore works is provided below. It must be noted that this can be adjusted when this benefits the overall execution schedule.

- Q1 2021 Issue Tender package(s)
- Q2 2021 Receive proposals
- December 2021 Porthos Planned final Investment decision (supported by negotiated bids)
- Q2-Q3 2022 Installation year 1
- Q2-Q3 2023 Installation year2

3 Design Data Offshore Section

3.1 Pressure and Temperature

Pipeline operational data is collected in Table 3-1

Table 3-1: Pipeline Operational Design Data

Parameter	Value
Design pressure	140 barg at +5 m rel to NAP
Maximum operating pressure	131 barg at +5 m rel to NAP
Design temperature - maximum - minimum	 100 °C -45 °C / -20 °C (TBD)
Operating temperature - maximum (compressor outlet) - minimum (requirement shore crossing)	 80 °C 4 °C

3.2 Material Data

3.2.1 Pipeline Material Data

The dimensional data and steel properties for the 16-inch OD pipeline are given in the table below.

Table 3-2: Line pipe dimensional data and steel properties

Parameter	Value
Pipe nominal outside diameter	16-inch / 406.4 mm

Parameter	Value
Wall thickness [1)] -offshore pipeline -HDD	 14.3 mm 17.5 mm
Corrosion allowance [1)]	0 mm
Wall thickness tolerance (LSAW)	- 0.5 mm
Carbon steel grade SMYS @ <50 °C SMYS @ 100 °C	L450 450 MPa 402 MPa
Density	7850 kg/m^3
Young's modulus	2.07*10^5 MPa
Poisson ratio	0.3
Coefficient of thermal expansion	11.6*10^{-6} /°C

3.2.2 Insulation Material Data

The line pipe will be coated with a 5-layer polypropylene anti-corrosion/ insulation coating with the properties shown in table below

Table 3-3: Coating properties

Parameter	Value
Coating type	5LPP [1)]
1st layer; FBE (@ 0.3 W/mK)	0.3 mm @ 1400 kg/m^3

Parameter	Value
2nd layer; adhesive (@ 0.3 W/mK)	0.3 mm @ 960 kg/m^3
3th layer; solid PP (@ 0.3 W/mK)	5 mm @ 960 kg/m^3
4th layer; PP foam (@ 0.3 W/mK)	10 mm @ 860 kg/m^3
5th layer; solid PP (@ 0.3 W/mK)	5 mm @ 960 kg/m^3

This insulation coating does not change in between the HDD exit pit and the spool piece near P18-A. The HDD section does not have the 5-layer coating. A Polypropylene (PP) coating can for instance be used for the HDD section to protect the pipe during installation.

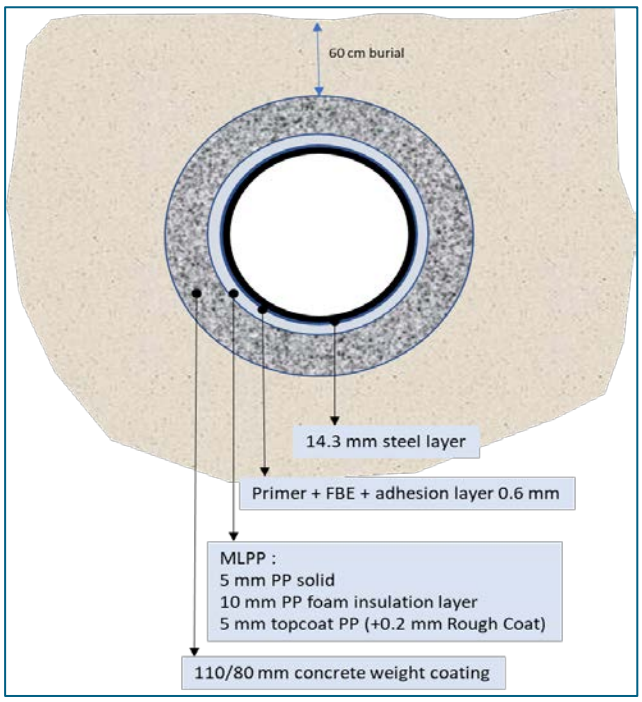


Figure 3-1 PORTHOS base-case external coating configuration

3.2.3 Concrete Weight Coating

The concrete weight coating has the following properties

Table 3-4: Concrete Coating density

Parameter	Value
Concrete weight coating	3040 kg/m^3

The section in between KP 0.5 and KP 8 shall be equipped with 110 mm CWC, the remaining section up to the spool piece near P18-A will have 80 mm CWC.

3.2.4 Cathodic Protection

The outer flowline surface will be protected by a high-quality FBE/PP based coating, supplemented by a standard CP design with aluminum half shelf bracelet anodes placed at regular intervals along the pipeline.

3.3 Design Data relevant for HDD Sea Defence Crossing

An indication of the soil condition the area near the HDD is included in Appendix A.5.

From the figure above, it can be concluded that soil conditions applicable to the HDD are mainly governed by sand, varying from moderately fine, loosely packed to moderately coarse, tightly packed and sand with clay layers.

The FEED HDD trajectory drawing is presented in Appendix A.2. It is currently envisaged that the HDD section will have a 10mm Polypropylene coating.

3.4 Design Data relevant for Maasgeul Crossing

The indicative depths of the exit pit and the trenches can be obtained from the FEED HDD trajectory drawing (Appendix A.2) and the FEED Maasgeul crossing drawing (Appendix A.3).

Surface soil conditions at both the south side of the Maasgeul and within the Maasgeul are characterized by CLAY. Areas with silty SAND have been found towards the northern slope of Maasgeul. The slope itself is characterized by SAND at the bottom of the slope and (stiff) CLAY and silty SAND more at the top of the slope.

The southern side of the navigation channel is characterized by dredging scars. The northern side on the other hand is characterized by scour holes and trenches.

Just north of the trench, the area is characterized by muddy SAND and CLAY. Further north, up to platform P18-A the area is characterized by silty SAND with varying packing density.

The seabed elevation from HDD exit up to north side of Maasgeul, (KP0.25 up to KP 3.0) is presented in Appendix A.6

3.5 Design Data relevant for Pipe Laying

The PORTHOS FEED offshore pipeline route can be obtained via the Key Plan Drawing in Appendix A.1.

The seabed elevation up to north side of Maasgeul, (up to P18-A) is presented in Appendix A.7.

There are no crossings of the PORTHOS pipeline with other cables or pipelines.

3.6 Nautical conditions in Maasmond Area

Appendix A.4 summarizes the nautical conditions which apply for TenneT HKZ project, for laying four electricity cables in the Maasmond. It is expected that the nautical conditions will be similar for Porthos.

4 Questionnaire

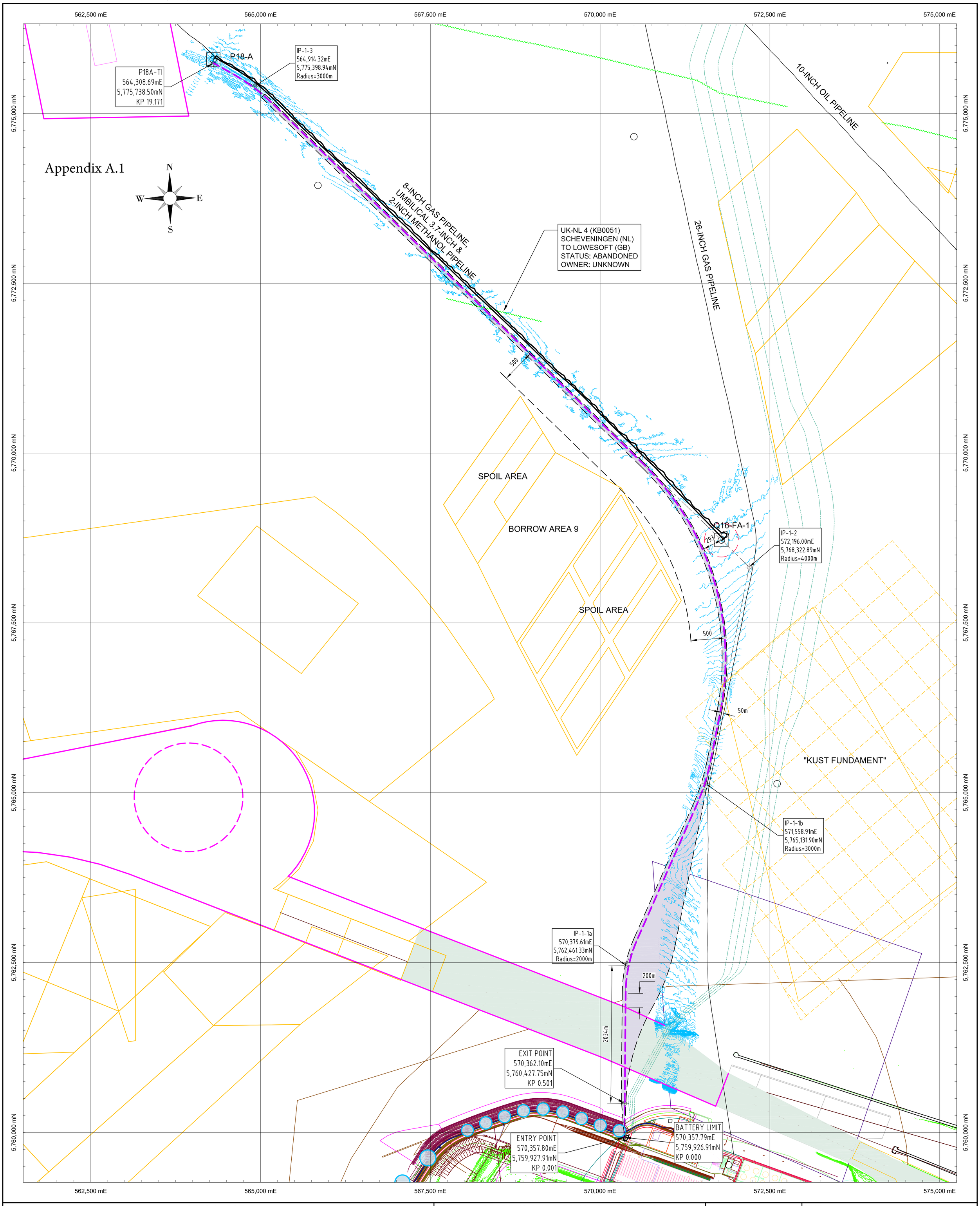
Please find the scope questionnaire in Appendix B.

Please find the technical questionnaire in Appendix C.

Appendix A
Technical Information

#	Subject/Topic	Refers to Scope Element
A.1	Porthos Offshore Key Plan	All
A.2	HDD trajectory	HDD
A.3	Maasgeul Crossing	HDD/Maasgeul Crossing
A.4	Nautical Requirements For Construction activities in Maasgeul (TenneT criteria)	HDD/Maasgeul Crossing
A.5	Indicative Soil Conditions HDD	HDD
A.6	Seabed elevation Maasgeul Crossing KP 0.25 to 3.00	HDD/Maasgeul Crossing
A.7	Seabed Elevation KP 2.75 to End (near Platform P18-A)	Offshore Pipeline
A.8	P18-A Platform approach	Offshore Pipeline/tie-in

FILE NAME: Y:\INTECSEA WP\41601000212 PORTHOS\CAD\SU\DWG\TROF-ENG-PIP-INT-DWG-0001\TROF-ENG-PIP-INT-DWG-0001.DWG
PLOT DATE: 27 Feb 2020 8:19 AM BY: VAN KUIJK, FRANK (DELFT)



NOTES & LEGEND

1. Confirmation heading of pipeline awaiting Porthos-TenneT influence study.
2. Porthos Route ID: Porthos_04_20200221
3. Route coordinates: see TROF-ENG-PEN-INT-REP-0001
4. Pipeline route still pending agreement with third parties, e.g. Rijkswaterstaat
5. Minimum distance to existing offhore infrastructure: 50m
6. Pipeline approach to platform P18A may be further optimized.

- Proposed Pipeline Route
- ONE-DYAS assets
- Submarine Cable
- TenneT Power Cable
- Existing Pipeline
- Proposed Pipelines (TBC)
- Boundary of Clearway
- Area of Sand Winning
- Kustfundament
- Dredging Maintenance Area
- Indicative Routing Optimization Envelope
- Planned Wind Turbine Location
  Radius represents safety zone

0 250 1,250 2,500
METERS

GEODETIC & PROJECTION PARAMETERS

DATUM NAME	:	European Datum 1950
REFERENCE SPHEROID	:	International 1924
PROJECTION		
Projection System	:	Universal Transverse Mercator (UTM)
Zone	:	31 North
Latitude of origin	:	0° (Equator)
Central meridian (CM)	:	3° E
False Easting at origin	:	500 000 m
False Northing at origin	:	0 m
Scale factor at CM	:	0.9996

REV	DATE	DESCRIPTION	DRWN	DSGN	ENGR	APPR
01	27 FEB 2020	RE-ISSUED FOR CLIENT REVIEW	FAK	FAK	OB	FvdL
00	17 DEC 2019	ISSUED FOR CLIENT REVIEW	FAK	FAK	OB	FvdL
B	16 DEC 2019	ISSUED FOR INTERNAL REVIEW	FAK	FAK	OB	
A	09 DEC 2019	ISSUED FOR INFORMATION	FAK	FAK	OB	

Intecsea
Worley Group

PROJECT: Porthos CO2 Pipeline FEED

CLIENT: Port of Rotterdam · gasunie crossing borders in energy · ebn

TITLE: ROUTE OVERVIEW

DRAWN BY:	DATE:	CHECKED BY:	DATE:	APPROVED BY:	DATE:	SHEET	OF
FAK	26 NOV 2019	OB	25 FEB 2020	FvdL	27 FEB 2020	1	1

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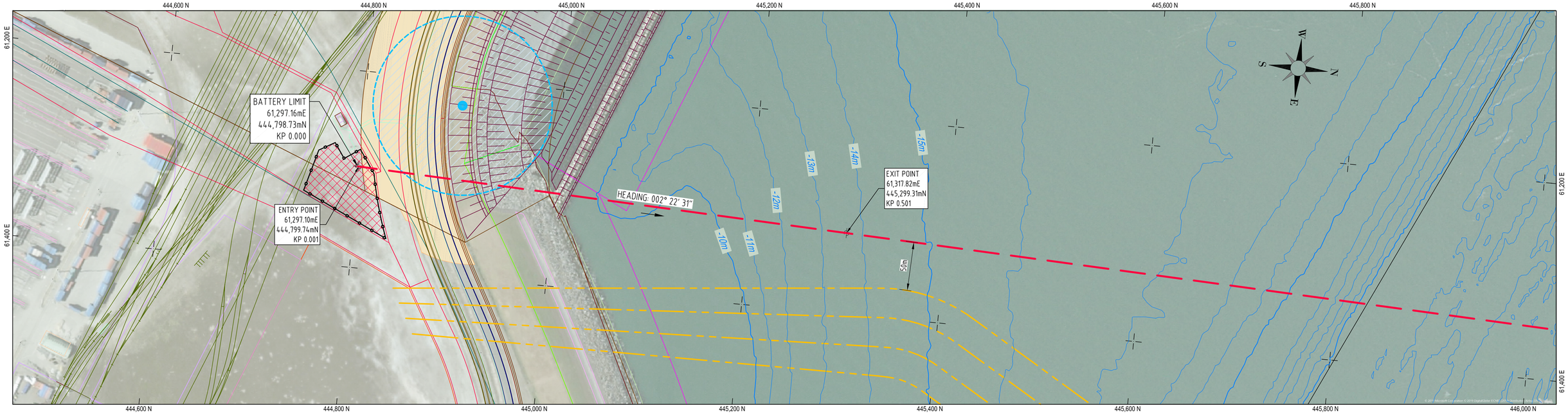
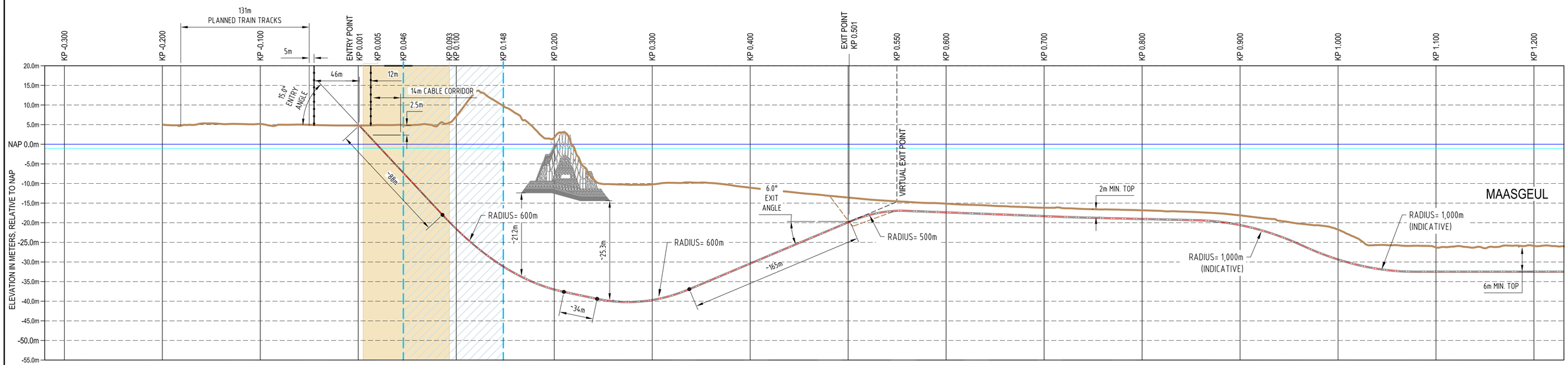
DRAWING NUMBER: TROF-ENG-PIP-INT-DWG-0001
REV: 01

Appendix A.2





HORIZONTAL SCALE	1:2,000
VERTICAL SCALE	1:400
VERTICAL EXAGGERATION	5

0 20 100 200
METERS

NOTES

1. Elevations are in meters, relative to NAP (Normaal Amsterdams Peil)
2. LAT= -1.03m NAP
3. Total length of HDD Trajectory= 630m
4. Ground/Seabed profile is indicative only.
5. Confirmation heading of pipeline awaiting Porthos-TenneT influence study.
6. Porthos Route ID: Porthos_04_20200221
7. Route coordinates: see TROF-ENG-PEN-INT-REP-0001
8. The feasibility of the entry and exit locations and the trajectory of the trenchless sea defence crossing has yet to be confirmed from the FEED safety study.
9. Top of pipe cover to be confirmed based on safety study.
10. High Impact Zone wind turbines, reference: Port of Rotterdam, document number 2018-306a_00

LEGEND

- Ground/Seabed Elevation
- Center Line of HDD Trajectory
- NAP Level
- LAT Level
- TenneT Power Cable
- Planned Train Tracks
- Onshore Pipeline and Cable Corridor
- Planned Wind Turbine Location
  Radius represents safety zone
- High Impact Zone Wind Turbines

COORDINATES OF KEY POINTS

POINT ID	RD GRID		UTM31N - ED50	
	Easting (m)	Northing (m)	Easting (m)	Northing (m)
Battery Limit	61,297.16	444,798.73	570,357.79	5,759,926.91
Entry Point	61,297.10	444,799.74	570,357.80	5,759,927.91
Exit Point	61,317.82	445,299.31	570,362.10	5,760,427.75

GEODETIC & PROJECTION PARAMETERS

DATUM NAME	:	Dutch (RD)
REFERENCE SPHEROID	:	Bessel 1841
PROJECTION		
Projection System	:	Oblique Stereographic
Latitude of origin	:	52.15616056° N
Central meridian (CM)	:	5.38763889° E
False Easting at origin	:	155 000 m
False Northing at origin	:	463 000 m
Scale factor at CM	:	0.999907900
VERTICAL DATUM	:	NAP

REV	DATE	DESCRIPTION	DRWN	DSGN	ENGR	APPR
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00	17 DEC 2019	ISSUED FOR CLIENT REVIEW	FAK	OB	OB	FvdL
B	16 DEC 2019	ISSUED FOR INTERNAL REVIEW	FAK	OB	OB	
A	09 DEC 2019	PRELIMINARY FOR INFORMATION ONLY	FAK	OB	OB	

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PROJECT: Porthos Offshore Pipeline FEED

CLIENT: Port of Rotterdam, gasunie crossing borders in energy, ebn

TITLE: HDD SEA DEFENCE CROSSING

DRAWN BY:	DATE:	CHECKED BY:	DATE:	APPROVED BY:	DATE:	SHEET	OF
FAK	04 DEC 2019	OB	05 MAR 2020	----	----	1	1

SCALE AT 'A1' SIZE	DRAWING NUMBER	REV
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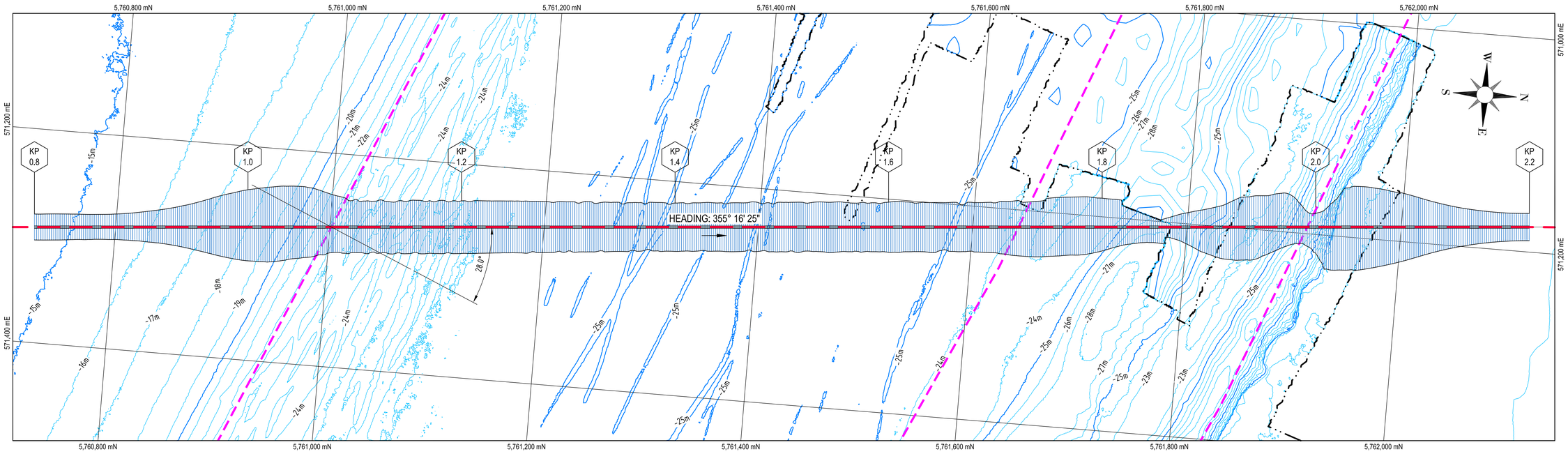
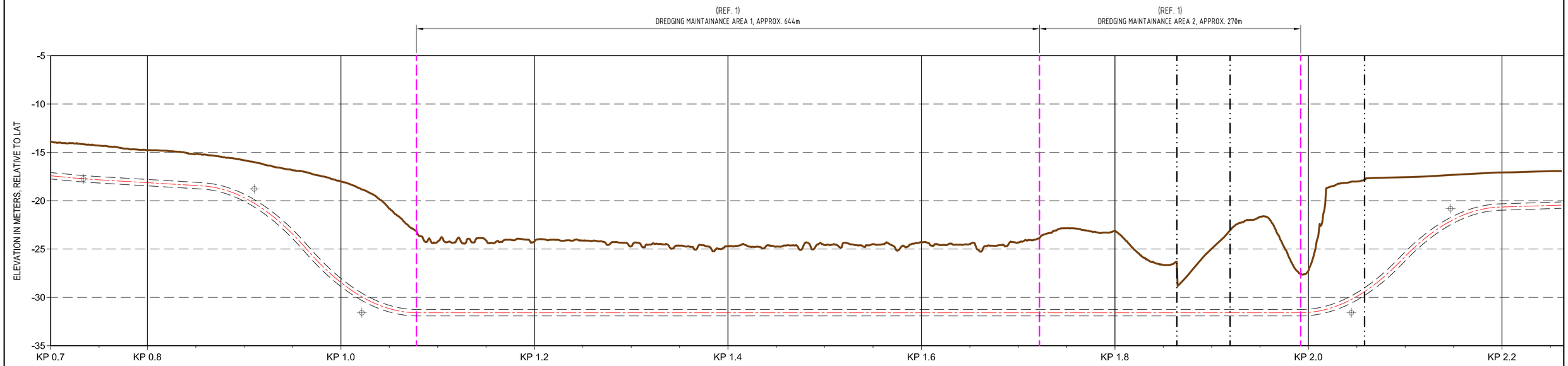
PLOT DATE: 23 Mar 2020 12:42 PM BY: VAN KUIJK, FRANK (DELFT)

Appendix A.3

PLAN VIEW & BATHYMETRY



LONGITUDINAL PROFILE ALONG PIPELINE CENTER LINE (VERTICAL SCALE 1:200)



HORIZONTAL SCALE	1:2,000
VERTICAL SCALE	1:200
VERTICAL EXAGGERATION	10

0 20 100 200
METERS

NOTES

1. Elevations are in meters, relative to LAT (Lowest Astronomical Tide)
2. LAT= -1.03m NAP
3. Seabed profile is indicative only.
4. Vertical elastic bending radius is assumed to be 1,000m.
5. Confirmation heading of pipeline awaiting Porthos-TenneT influence study.
6. Porthos Route ID: Porthos_03_20191209
7. Route coordinates: see TROF-ENG-PEN-INT-REP-0001
8. TenneT bathymetry data as in document TT_HKZ_BAT_nu5k_001 (0.3m grid size)
9. RWS data as in file: 20110620182000-Hollandse kust (Kustzone, NCP) (20m grid size)
10. Side slopes trench 3:1 (Run:Rise) (Preliminary)
11. Bottom width trench is 2m (Preliminary)
12. Dredging volume KP 0.800 to KP 2.200 = 270,000m³ (Indicative)

LEGEND

- Seabed Elevation
- Pipeline Centerline
- Top/Bottom of Pipe
- Change of Elevation Data Source

REFERENCES

REF. 1 Design Basis Report TROF-ENG-PEN-ING-REP-0002

GEODETIC & PROJECTION PARAMETERS

DATUM NAME	:	European Datum 1950
REFERENCE SPHEROID	:	International 1924
PROJECTION		
Projection System	:	Universal Transverse Mercator (UTM)
Zone	:	31 North
Latitude of origin	:	0° (Equator)
Central meridian (CM)	:	3° E
False Easting at origin	:	500 000 m
False Northing at origin	:	0 m
Scale factor at CM	:	0.9996
VERTICAL DATUM	:	LAT

REV	DATE	DESCRIPTION	DRWN	DSGN	ENGR	APPR
00	16 JAN 2020	ISSUED FOR CLIENT REVIEW	FAK	OB	OB	FVDL
B	15 JAN 2020	ISSUED FOR INTERNAL REVIEW	FAK	OB	OB	
A	09 JAN 2020	PRELIMINARY FOR INFORMATION ONLY	FAK	OB	OB	

Intecsea (Worley Group)

PROJECT: Porthos Offshore Pipeline FEED

CLIENT: Port of Rotterdam, gasunie (crossing borders in energy), ebn

TITLE: MAASGEUL CROSSING

DRAWN BY:	DATE:	CHECKED BY:	DATE:	APPROVED BY:	DATE:	SHEET	OF
FAK	07 JAN 2020	OB	15 JAN 2020	FVDL	16 JAN 2020	1	1

SCALE AT 'A1' SIZE: 1:2,000

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REV: 00

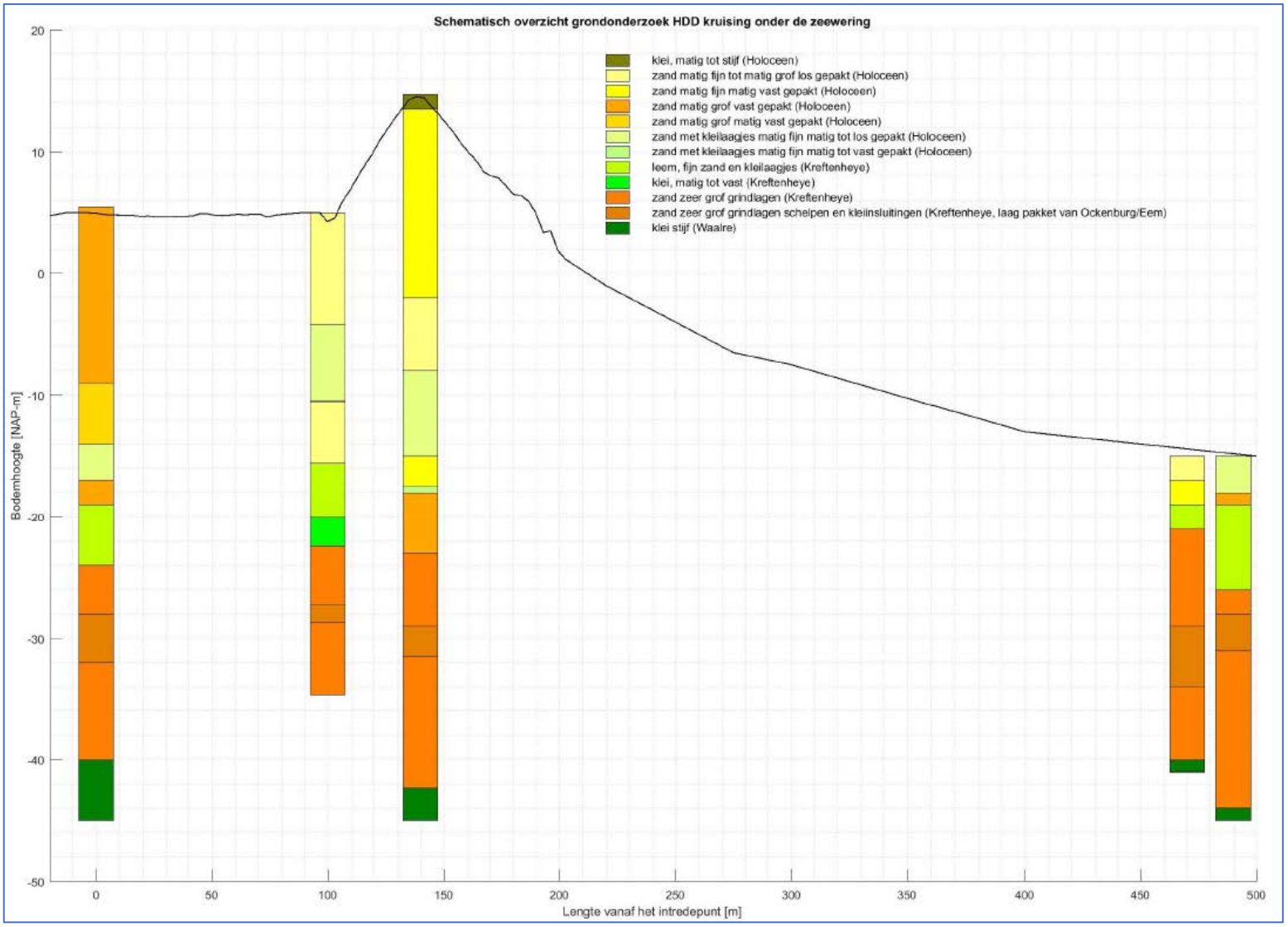
FILE NAME: Y:\INTECSEA WP\41601000212 PORTHOS\CAD\SU\DWG\TROF-ENG-PIP-INT-DWG-0013\TROF-ENG-PIP-INT-DWG-0013.DWG
PLOT DATE: 16 Jan 2020 2:08 PM BY: VAN KUIJK, FRANK (DELFT)

Appendix A.4

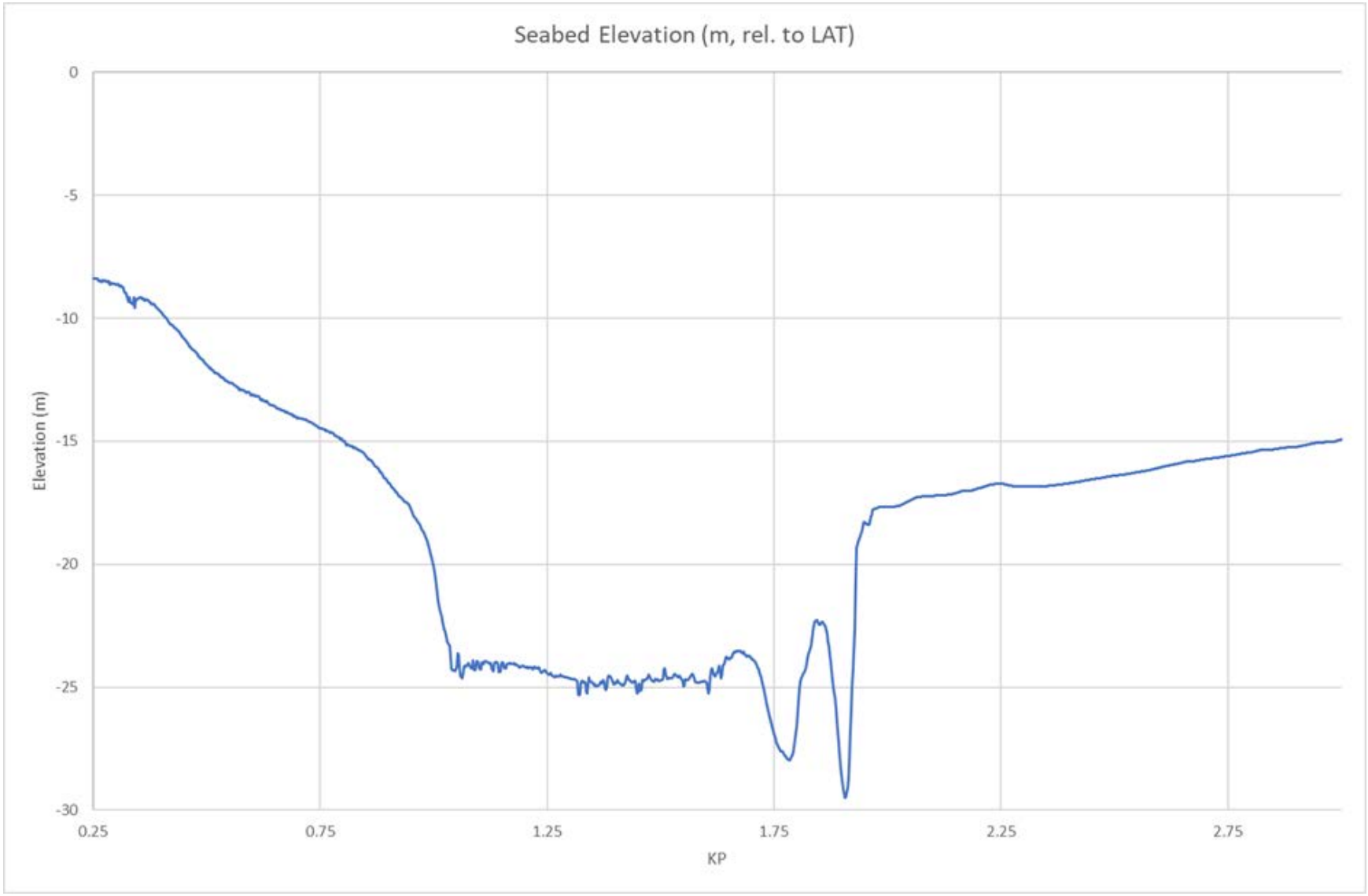
The main Nautical requirements when working in the Rotterdam Port access channel (Maasmond)) that were recently imposed for the construction of 4 electricity cables are listed below. These may be different for the installation of the pipeline and will be subject to further discussions during the selection of the installation method.

- All activities in the port access channel will be subject to approval by the Rotterdam port authorities. This requires timely submission of relevant documentation such as method statements, procedures, risk assessments etc.. For complete obstruction of the port access channel, the approval process is expected to take 7 - 9 months.
- The maximum duration for partly obstruction of the port access channel is 8 hours. During this period a minimum of 300 meters wide passage zone should be available
- Complete obstruction of the access channel should be avoided as much as possible. If this cannot be avoided, the duration should be limited to 2 hours.
- The amount and durations of traffic obstructions (partly and complete) will require prior approval by port authorities and the need for these obstructions shall be clearly demonstrated. (risk mitigation, installation efficiency etc.)
- There must be a minimum of 48 hours between obstruction periods.
- All equipment that will be operating in the port access channel will have DP (Dynamic Positioning). No anchoring and spuds will be allowed unless it is clearly demonstrated that performing the activity on DP is not possible.
- The use of cables during the pipeline installation will be subject to Rotterdam port authorities approval and requirements.
- Construction activities will need to be abandoned when visibility is reduced to 2000 meters or less or wind velocity is higher than 10,7 m/s.

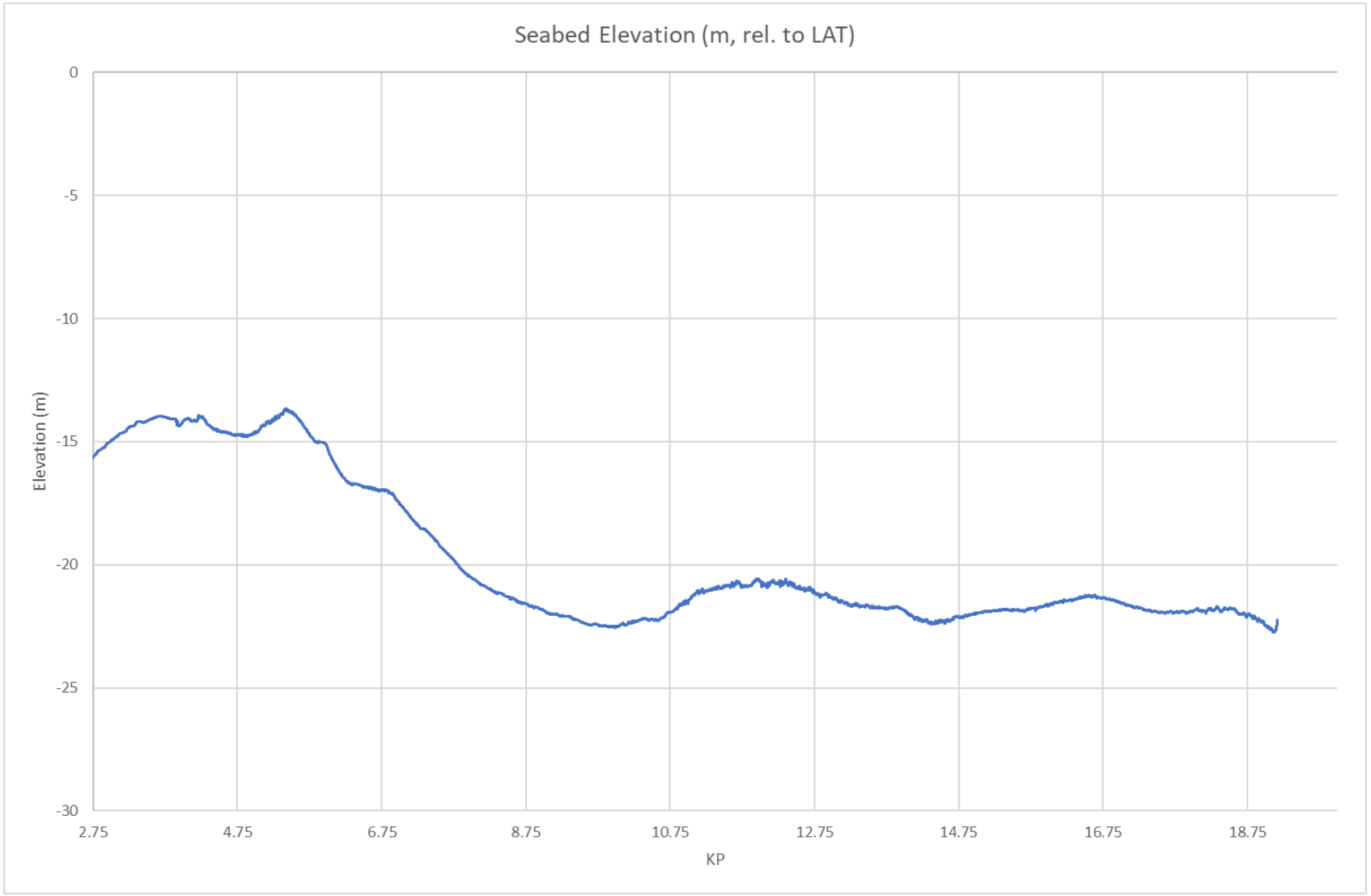
Appendix A.5 Indicative Soil Conditions HDD



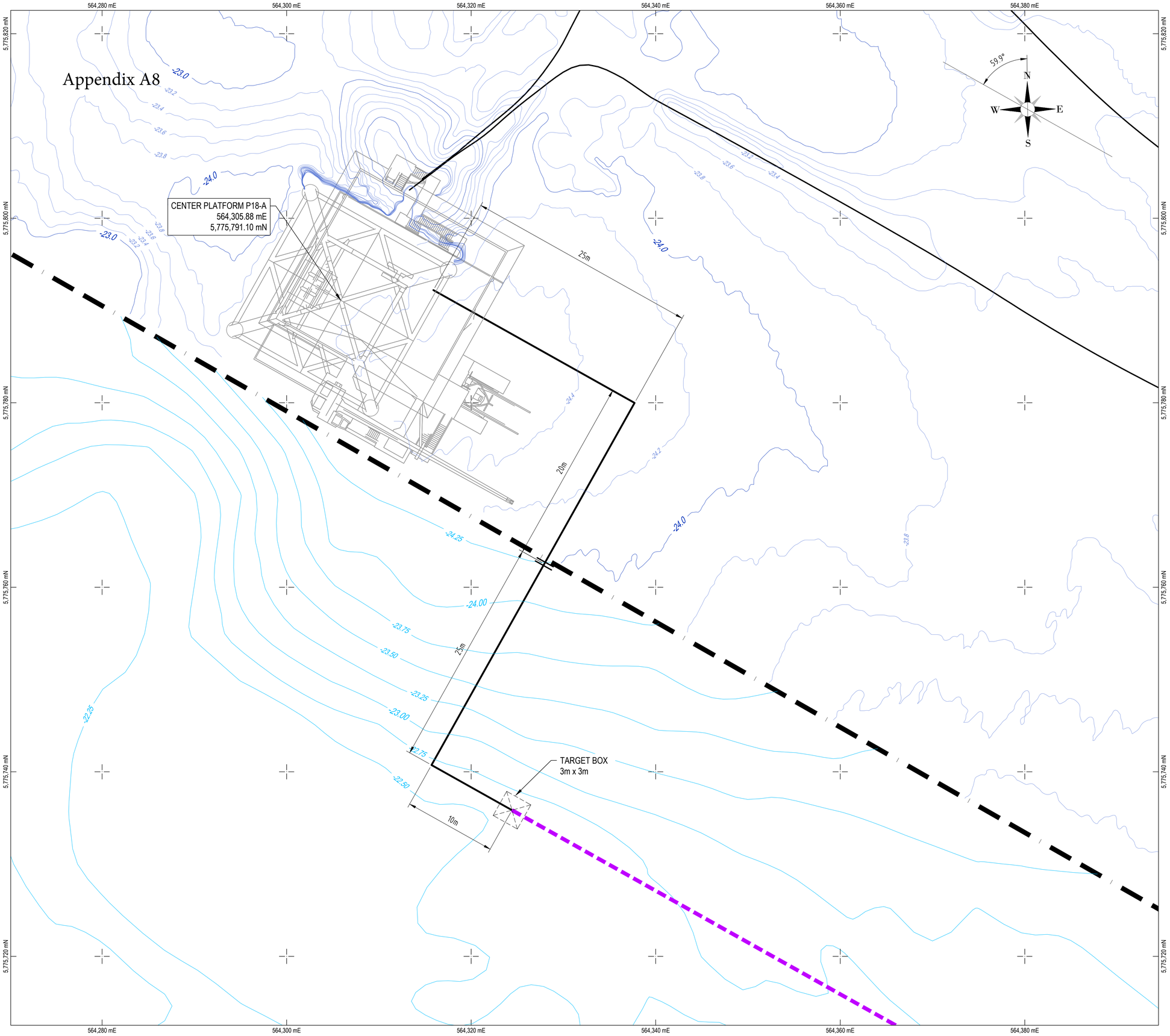
Appendix A.6 Seabed elevation Maasgeul Crossing KP 0.25 to 3.00



Appendix A.7 Seabed Elevation KP 2.75 to End (near Platform P18-A)



Appendix A8



FILE NAME: C:\USERS\FRANK\DOCUMENTS\WORK FOLDER INTECSEA\416010-00212 PORTHOS\DWG\TROF-ENG-PIP-INT-DWG-0012\TROF-ENG-PIP-INT-DWG-0012.DWG
PLOT DATE: 25 Mar 2020 2:47 PM BY: FRANK VAN KUIJK

NOTES

1. ..

FOR INFORMATION ONLY

GEODETIC & PROJECTION PARAMETERS

DATUM NAME	:	European Datum 1950
REFERENCE SPHEROID	:	International 1924
PROJECTION		
Projection System	:	Universal Transverse Mercator (UTM)
Zone	:	31 North
Latitude of origin	:	0° (Equator)
Central meridian (CM)	:	3° E
False Easting at origin	:	500 000 m
False Northing at origin	:	0 m
Scale factor at CM	:	0.9996

REV	DATE	DESCRIPTION	DRWN	DSGN	ENGR	APPR
A1		ISSUED FOR INTERNAL REVIEW	FAK	FAK	EK	

IntecSea Worley Group

PROJECT: Porthos CO2 Pipeline FEED

CLIENT: Port of Rotterdam · gasunie crossing borders in energy · ebn

TITLE: APPROACH AT PLATFORM P18-A

DRAWN BY:	DATE:	CHECKED BY:	DATE:	APPROVED BY:	DATE:	SHEET	OF
FAK	23 MAR 2020	EK	-	-	-	1	1

SCALE AT 'A1' SIZE	DRAWING NUMBER	REV
1:200	TROF-ENG-PIP-INT-DWG-0012	A

Appendix B
Questionnaire - Scope

Appendix B Questionnaire Scope

Reply Date	
Company	
Contact details	

	Question Porthos/Intecsea	Reply
1	Please advise which offshore scope elements your Company is interested to execute and /or whether you are interested in a partnership to cover the whole scope.	
2	Please provide a high-level method statement for installation of your selected scope elements. What do you consider as your unique selling points? Please advise opportunities where and how CO2 and NOx emissions can be reduced.	

	Question Porthos/Intecsea	Reply
3	Are you familiar with FIDIC conditions of contract (Yellow Book) and/or LOGIC General Conditions? Do you have a preference between LOGIC or FIDIC and would you accept a contract based on these conditions?	
4	What do you see as the main risks for the Porthos project and your intended scope?	
5	Do you have any comments on the concept execution Schedule? Specifically related to the preparation time after contract award?	
6	Do you see additional scope interfaces that Porthos/Intecsea should be aware of? What scope change would you suggest Porthos to consider and why?	
7	Suppose the current measures regarding the covid-19 virus (f.i. required distance, meeting and travel restrictions) will be in place at the time of execution of the works. Do you foresee any (negative) impact of these measures on time and costs of the scope? If possible could you give an indication of this impact?	

<table>
<tr><th></th><th>Question Porthos/Intecsea</th><th>Reply</th></tr>
<tr><td>8</td><td>Are you willing and able to give a presentation about your response on one of the following time slots on 2nd and/or 4th June?</td><td>
<table>
<tr><th>Date</th><th>Time slot
(CEST = UTC +2)</th><th>Possibility? (Yes/No)</th><th>Presentation form (web/skype/in person at WTC Utrecht)</th></tr>
<tr><td>2nd June 2020</td><td>8.45 – 10.30</td><td></td><td></td></tr>
<tr><td></td><td>10.45 – 12.30</td><td></td><td></td></tr>
<tr><td></td><td>13.00 – 14.45</td><td></td><td></td></tr>
<tr><td></td><td>15.00 – 16.30</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>4th June 2020</td><td>8.45 – 10.30</td><td></td><td></td></tr>
<tr><td></td><td>10.45 – 12.30</td><td></td><td></td></tr>
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<tr><td></td><td>15.00 – 16.30</td><td></td><td></td></tr>
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<tr><td>(other time slot tbd responder)</td><td></td><td></td><td></td></tr>
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Appendix C
Questionnaire - Technical

Technical Questions (It is only requested to complete the Sections for the intended Scope of Work)

Reply Date	
Company	
Contact details	

Part A : Maasvlakte sea defence Crossing by Trenchless Installation (HDD or alternative)

Part B : Maasgeul Crossing

Part C : Offshore Section

Part D : Platform approach

Part A : Maasvlakte sea defence Crossing by Trenchless Installation (HDD or alternative)		
	Question Porthos/Intecsea	**Reply**
A.1	Which installation method outlined in 2.3.1 of the RFI document has your preference? Please motivate/comment or provide alternative.	
A.2	What are the requirements with respect to coating of pipe (type and thickness). Is in your opinion 10mm 3LPP sufficient for this HDD?	
A.3	Can you include in your Method description or indicate here: a) the space requirements for your equipment (entry and exit); b) how it is intended to perform the activities at the exit (dredging and handling) and how the marine activity is envisaged; c) Description of procedure and time frame for transition from HDD near complete to the first section of pipe being pulled in. d) Preferred drilling direction and expected spills at the seabed; e) Preference for pull back pipe or push or both; f) envisaged weather mitigation during the HDD drill.	

Part A : Maasvlakte sea defence Crossing by Trenchless Installation (HDD or alternative)		
	Question Porthos/Intecsea	**Reply**
A.4	In case a pipe pull-in methodology is applied for Porthos, could you give an indication for the pull-in rate?	
A.5	Does the currently chosen HDD exit location provide enough navigational space (water depth, clearance to sea defence) for your operations? If not, please explain which exit location you would consider to be optimal for HDD / marine operations.	

Part B : Maasgeul Crossing		
	Question Porthos/Intecsea	**Reply**
B.1	Please describe the intended installation methodology for the pull-in (see section 2.3.2).	
B.2	Please advise for your intended installation methodology the feasibility to install the Maasgeul crossing in the dredged trench in a long radius bend across the Maasgeul. This will allow the route length to be reduced.	
B.3	Could you provide an indicative list containing the main equipment your company would mobilize to dredge and backfill the southern side of the Maasgeul (incl HDD exit pit), the Maasgeul navigation channel and transition to the northern side of the Maasgeul?	
B.4	Does the currently chosen HDD exit location provide sufficient navigational space (water depth, clearance to sea defence) for your operations? If not, please explain which exit location you would consider to be optimal for HDD / marine operations.	
B.5	Please advise how your intended installation methodology mitigates (partial) obstruction / blockage of the shipping lanes refer to Appendix A.4.	

Part C : Offshore Section		
	Question Porthos/Intecsea	**Reply**
C.1	Do you have experience with the installation of an offshore pipeline where a concrete coating (80-100 mm) is applied over a 5LPP (about 25 mm thickness). If so, was additional qualification/testing performed (slippage).	
C.2	What is the lowest temperature you have qualified a welding procedure to for SAWL 450 grade steel.	
C.3	Do you have a production/HSE/quality preference for the field joint infill system for a thermal insulated pipeline?	
C.4	What is the most likely trenching method, does it allow for/ require a separate backfilling pass, and what tools are required for that. Considering the PORTHOS pipe specifications and a typical North Sea sandy soil condition, what is maximum depth that can be achieved with the preferred trench / pipe burial method (1 pass/2 passes)? Which burial depths have you been able to achieve with comparable North Sea projects?	

Part D : Platform Approach		
	Question Porthos/Intecsea	**Reply**
D.1	Can you advise, considering your intended installation vessel width, safety distance from platform side and possible side walking on A&R cable, what the minimum offset spool distance could safely be? Refer to appendix A8 where 20m + 25m = 45m is shown. Can this be reduced?	
D.2	In addition to the question above Porthos would like to avoid the additional flange set as shown in Appendix A8. What size of spool can be safely installed in one section considering deck space, lifting etc.) or what feasible alternatives do you see?	