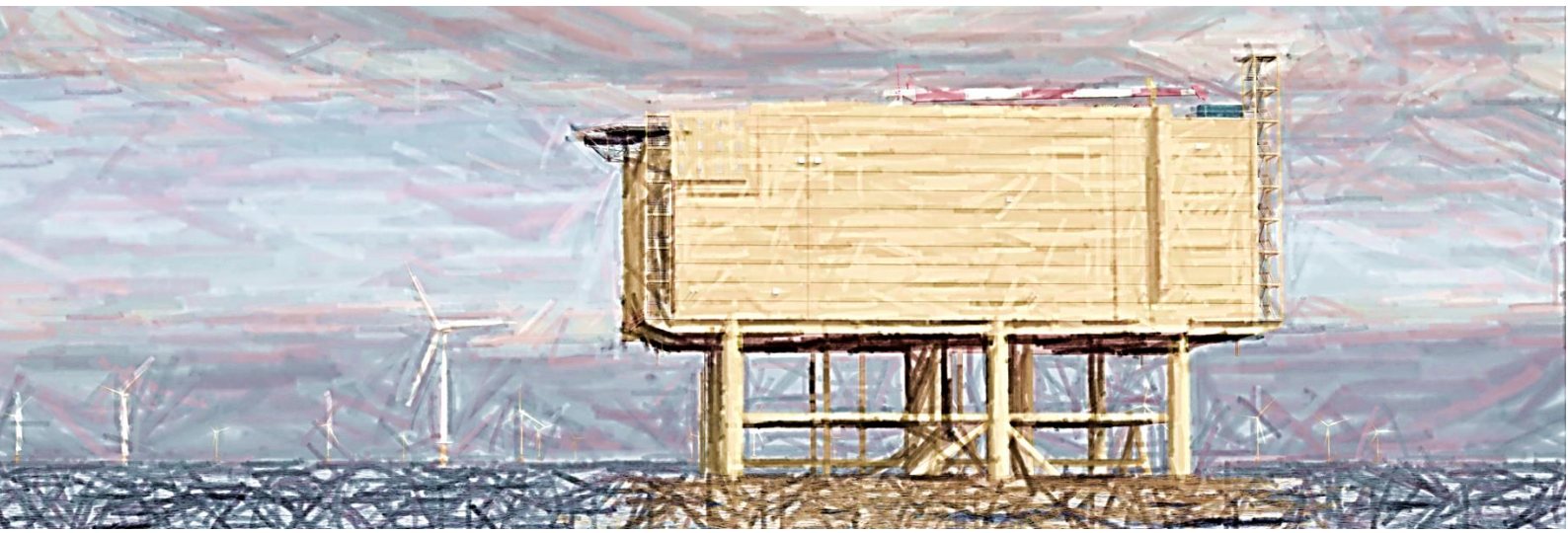
IJmuiden Ver Beta Offshore Grid

Summary of Phase 2 Environmental Impact Assessment



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0 Summary

0.1 Introduction

This is the summary of the Environmental Impact Assessment (EIA) report Phase 2 concerning the IJmuiden Ver Beta Offshore Grid. This is one of three underground connections for the transmission of renewable electricity from the offshore IJmuiden Ver Wind Farm Zone to the mainland.

The other two connections are the IJmuiden Ver Alpha and Gamma Offshore Grids. For these projects separate procedures are followed. The timelines of the procedures for the IJmuiden Ver Alpha and Beta Offshore Grids are the same. The procedure for the IJmuiden Ver Gamma Offshore Grid started in April 2021.[1] Public review of the draft Memorandum on Scope and Level of Detail (dMSLD) for the IJmuiden Ver Gamma Offshore Grid took place in fall 2021. The IJmuiden Ver Gamma Offshore Grid EIA will be drawn up in the first and second quarter of 2022.

This part of the EIA focuses on the preferred alternative of the IJmuiden Ver Beta Offshore Grid, which comprises the platform at sea, the offshore route, the onshore route and the converter station on the Maasvlakte for which permits will be applied for and a zoning plan will be drawn up. The components of the preferred alternative are shown in Figure 0.1.

The IJmuiden Ver Beta Offshore Grid EIA consists of a Phase 1 and a Phase 2. The Phase 1 EIA investigated various environmental aspects of onshore, nearshore and offshore and large water-body cable route alternatives, including the offshore platform search area and the onshore converter station location. The Dutch Minister of Economic Affairs and Climate Policy used information from the Phase 1 EIA and other information to select a preferred alternative from the alternatives examined.[2] The Phase 2 EIA describes the preferred alternative and its environmental impact, and as such is a further elaboration of the Phase 1 EIA. This document provides a summary of the Phase 2 EIA, and briefly discusses the Phase 1 EIA. More information can be found in the Phase 1 EIA or the summary of the Phase 1 EIA.[3]

[1] https://www.rvo.nl/onderwerpen/bureau-energieprojecten/lopende-projecten/hoogspanning/net-op-zee-ijmuiden-ver-gamma

[2] For the Minister's choice, see: https://www.rvo.nl/sites/default/files/2020/11/Keuze-voorkeursalternatief-Net-op-zee-IJmuiden-Ver-Beta_0.pdf

[3] These documents can be found at: https://www.rvo.nl/onderwerpen/bureau-energieprojecten/lopende-projecten/hoogspanning/net-op-zee-ijmuiden-ver-beta/integrale-effectenanalyse

Figure 0.1 IJmuiden Ver Beta Offshore Grid

0.2 Added value and necessity of the IJmuiden Ver Offshore Grid

TenneT has a statutory duty pursuant to the Dutch Electricity Act 1998 (Elektriciteitswet 1998) to manage the offshore grid. These connections transport the electricity generated in current and future wind farm zones to the onshore high-voltage grid. TenneT's responsibilities include permit applications.

The Offshore Wind Energy Roadmap 2030 (Routekaart windenergie op zee 2030)[4]indicates that a total of 4 gigawatt (GW) will be connected from the IJmuiden Ver Wind Farm Zone to the national high-voltage grid. At the end of 2018, the exploratory report 'Verkenning aanlanding netten op zee 2030' was published, which investigated where wind farm zones such as IJmuiden Ver could be connected.[5] On 5 April 2019, a Parliamentary letter was published on the progress of the 2030

[4] https://www.tweedekamer.nl/kamerstukken/brieven_regering/detail?id=2018Z05409&did=2018D21716
[5] See 'Verkenning aanlanding netten op zee' summary: https://www.rvo.nl/sites/default/files/2019/02/2019%20Afwegingsnotitie%20VANOZ%20-%20SAMENVATTING.pdf.

Roadmap.[6] It states that to connect the IJmuiden Ver Wind Farm Zone to the national high-voltage grid:

- an offshore platform will be used;
- two 525 kV underground DC connections with a transmission capacity of 2 GW each will be realized (IJmuiden Ver Alpha and Beta Offshore Grids);
- for IJmuiden Ver Beta, the Maasvlakte and Simonshaven connection points and for IJmuiden Ver Alpha the Geertruidenberg, Rilland and Borssele connection points will be investigated further in Dutch National Coordination Scheme procedures (RCR)[7].

TenneT's connection is compatible with the size of the wind farm zone (sites).

It has become clear that more offshore wind is needed to achieve the climate objectives by 2030. At the end of 2020, the Ministry of Economic Affairs, in cooperation with other ministries, regional authorities, companies and civil society organizations, therefore launched an exploratory project called 'Verkenning Aanlanding Wind Op Zee' (VAWOZ), which looks at possible connections between new offshore wind farms and onshore landing sites. The initial results of this project have shown that the most promising option is to connect 2 GW from the northern part of the IJmuiden Ver Wind Farm Zone to the Maasvlakte: the IJmuiden Ver Gamma Offshore Grid. Independent RCR and Environmental Impact Assessment (EIA) procedures will be conducted for the three projects. The three connections from the IJmuiden Ver Wind Farm Zone are explained below.

The IJmuiden Ver Alpha, Beta and Gamma Offshore Grid projects support the energy transition in the Netherlands by efficiently transporting sustainable electricity generated in the wind farm zone to the Dutch high-voltage grid. A coordinated approach is a more efficient and sustainable solution than each wind farm developer making its own connection. Merging (or combining) the offshore infrastructure investments at TenneT delivers synergy benefits in terms of financing, purchasing, standardization and knowledge development. The chosen approach also leads to lower social costs and a smaller impact on the living environment.

IJmuiden Ver Beta Offshore Grid

In order to achieve the renewable energy objectives and facilitate the timely realization of the wind farms, the IJmuiden Ver Beta Offshore Grid must be in operation by 2029 at the latest. In the Development Framework for Offshore Wind Energy the fourth quarter of 2029 is stated as the indicative completion date.[8]

An outline of the schedule of the IJmuiden Ver Beta Offshore Grid procedure up to the realization is shown below.

[6] Parliamentary letter on progress in implementing the Offshore Wind Energy Roadmap, 5 April 2019, DGETM / 18276832.
[7] In the Dutch National Coordination Scheme (Rijkscoördinatieregeling, RCR), the various decisions (permits and dispensations) required are made simultaneously and in consultation with regional authorities. In addition to permits and dispensations, this usually involves a national zoning plan, which states the zoning of the land and its regulations and use.
[8] Ministry of Economic Affairs and Climate, Ontwikkelkader windenergie op zee, version dated 20 May 2020, see https://www.rvo.nl/sites/default/files/2020/07/Ontwikkelkader%20windenergie%20op%20zee%20voorjaar%202020.pdf

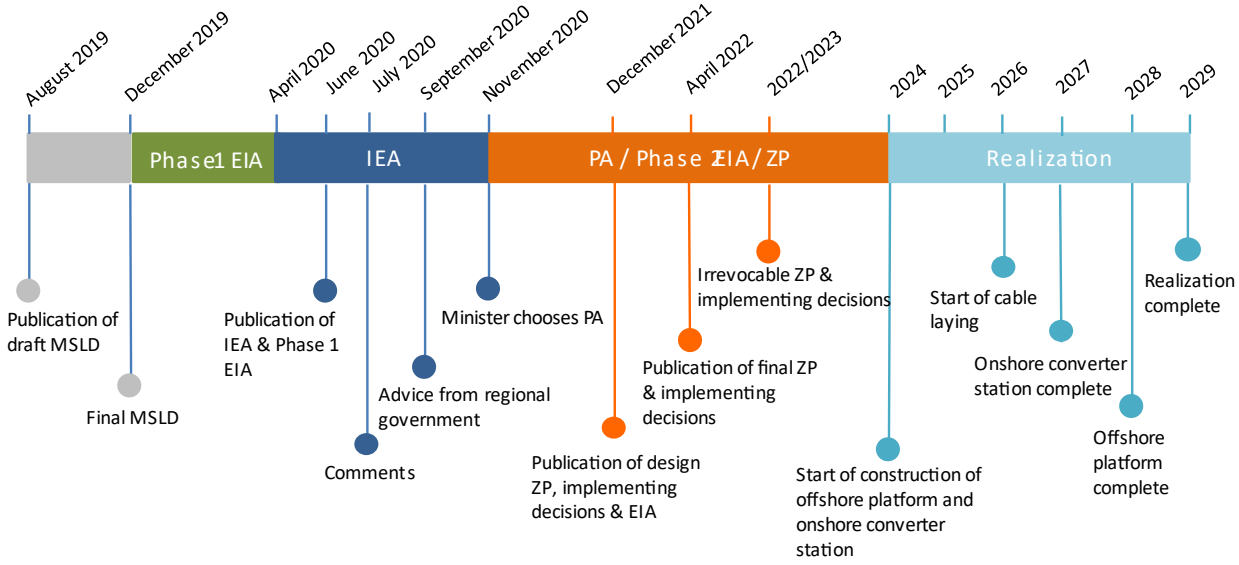

Figure 0.2 Overview of expected schedule

IJmuiden Ver Alpha Offshore Grid

The IJmuiden Ver Alpha Offshore Grid connects 2 GW from the IJmuiden Ver Wind Farm Zone to the national high-voltage grid, see Figure 0.3. This is done via offshore and onshore underground cables and an onshore converter station near an existing 380 kV substation in Borssele. This 380 kV substation will be modified to accommodate the IJmuiden Ver Alpha Offshore Grid connection.

In the Sloe area, a section of an above-ground 150 kV connection will be dismantled for the IJmuiden Ver Alpha Offshore Grid project. The 150 kV connection is an unused customer connection which no longer has a function either now, nor in the future. The dismantling of this section of this above-ground 150 kV connection is part of the zoning plan for the IJmuiden Ver Alpha Offshore Grid.

In order to achieve the renewable energy objectives and facilitate the timely realization of the wind farms, the IJmuiden Ver Alpha Offshore Grid must be in operation by 2028 at the latest. In the Development Framework for Offshore Wind Energy the fourth quarter of 2028 is stated as the indicative completion date.

IJmuiden Ver Gamma Offshore Grid

The IJmuiden Ver Gamma Offshore Grid is the third connection from the IJmuiden Ver Wind Farm Zone. This connection has been identified, via the VAWOZ study, as the most promising option for realization by 2030. One of the main factors for this outcome is that this new connection can run almost entirely parallel to the route of the IJmuiden Ver Beta Offshore Grid project, both offshore and onshore (see Figure 0.3). In addition, adjacent to the IJmuiden Ver Beta Offshore Grid's converter station on the Maasvlakte, space is available for Gamma's converter station.

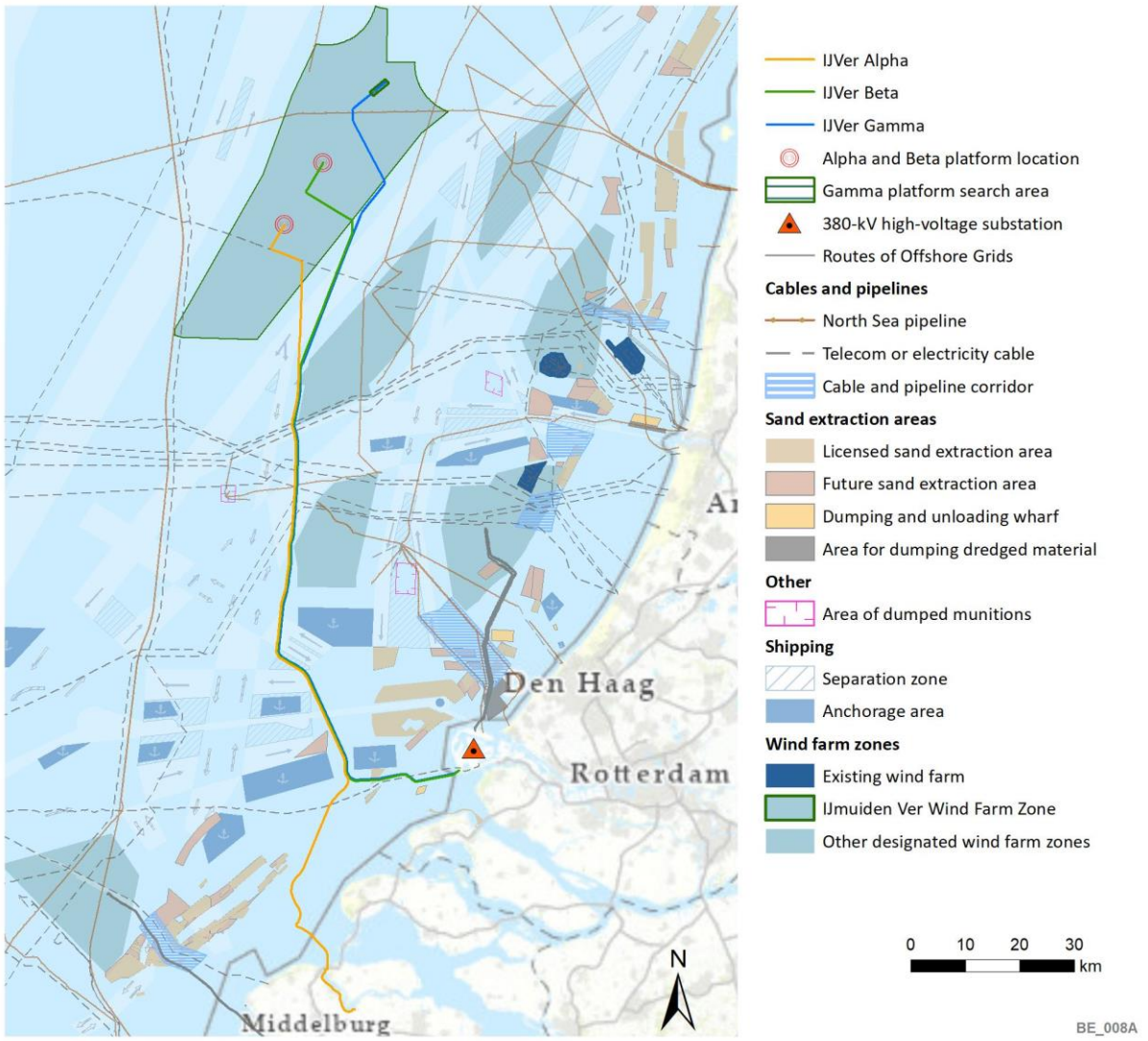

Figure 0.3 IJmuiden Ver Alpha and Beta preferred alternatives and IJmuiden Ver Gamma route option

In order to maximize the synergy benefits with the IJmuiden Ver Beta Offshore Grid, the first (reversible) steps in the IJmuiden Ver Gamma Offshore Grid procedure have been taken. This is relevant because despite the fact that the IJmuiden Ver Wind Farm Zone was designated in 2012, the designation of the northern part of this wind farm zone must be reconfirmed in the North Sea Program (Programma Noordzee), concerning the spatial layout of the North Sea. On 19 March 2021, the draft North Sea Program was submitted to the House of Representatives as part of the National Water Program. This draft was available for public inspection from 22 March to 21 September 2021. In October 2021, the government is expected to publish a supplementary draft North Sea Program 2022-2027 that includes new wind farm zones.

The notification of the project proposal was published together with the participation proposal on 8 April 2021.[9] Public review of the draft Memorandum on Scope and Level of Detail (dMSLD) for the IJmuiden Ver Gamma Offshore Grid took place in the fall of 2021. The IJmuiden Ver Gamma Offshore Grid EIA will be drawn up in the first and second quarter of 2022. Decision-making for the IJmuiden Ver Gamma Offshore Grid is expected to take place after decision-making for the IJmuiden Ver Beta Offshore Grid and the IJmuiden Ver Alpha Offshore Grid.

0.3 The IJmuiden Ver Beta Offshore Grid

The IJmuiden Ver Beta Offshore Grid consists of the following main components (see also Figure 0.4):

- An offshore platform for connecting the wind turbines and converting 66 kV alternating current (AC) (from the wind turbines) to 525 kV direct current (DC)[10] (hereinafter referred to as 'the platform').
- An offshore underground cable system offshore for the transport of 525 kV DC.
- An onshore underground cable system for the onward transport of 525 kV DC to a converter station.
- An onshore converter station at the Maasvlakte (location Maasvlakte Midden) for converting 525 kV DC to 380 kV AC.

The wind turbines in the IJmuiden Ver Wind Farm Zone will be connected directly to the offshore converter platform. The platform is located in the IJmuiden Ver Wind Farm Zone. 525 kV DC cables (offshore and onshore) will connect the platform to an onshore converter station, which will convert DC to AC. The converter station will be connected to the national high-voltage grid via a new 380 kV high-voltage substation to be built on the Maasvlakte (Amaliahaven substation[11]); this new substation will be located immediately adjacent to the converter station. The 380 kV AC cables connecting the converter station of the IJmuiden Ver Beta Offshore Grid to the 380 kV high-voltage Amaliahaven substation run across the converter station site and will not be spatially accommodated separately; in the EIA, the 380 kV AC cables are therefore not considered as a separate component of the preferred alternative.

The new 380 kV high-voltage Amaliahaven substation, the wind turbines and the infield cabling from the wind turbines to TenneT's offshore platform are not part of the IJmuiden Ver Beta Offshore Grid.[12]

[9] https://www.rvo.nl/onderwerpen/bureau-energieprojecten/lopende-projecten/hoogspanning/net-op-zee-ijmuiden-ver-gamma

[10] DC is electrical current in which electrons move in a single direction from the negative pole to the positive pole via the connection. AC is electrical current in which the current periodically changes direction. Almost the entire electricity grid in the Netherlands uses the AC system.

[11] For future developments on the Maasvlakte, TenneT has decided to build a new 380 kV substation on the Maasvlakte: Amaliahaven substation. A separate procedure will be conducted for this substation. The Amaliahaven substation is planned directly adjacent to the converter station for the IJmuiden Ver Beta Offshore Grid. The realization of the 380 kV Amaliahaven substation will take place before the IJmuiden Ver Beta Offshore Grid is taken into operation.

[12] Information about the procedure for the offshore wind farm sites can be found here: https://www.rvo.nl/onderwerpen/bureau-energieprojecten/lopende-projecten/windparken/wind-op-zee-kavels-2024-2030

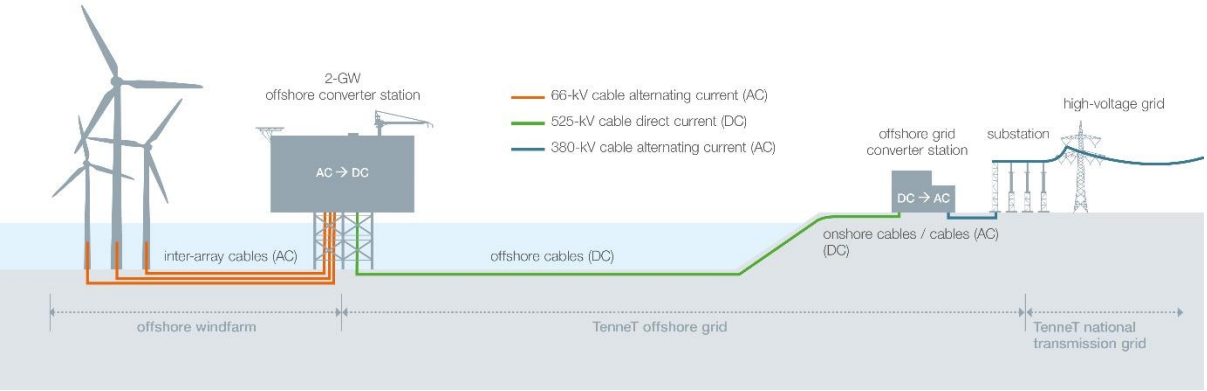

Figure 0.4 Components of the IJmuiden Ver Beta Offshore Grid project from the offshore platform to the connection to the national high-voltage grid

In this EIA, the 'preferred alternative' of the IJmuiden Ver Beta Offshore Grid refers to the above four components mentioned in the bullet list. Section 0.5 describes the various components and the process that has resulted in a preferred alternative.

0.4 EIA procedure

EIA procedure

The aim of the EIA procedure is to allow for environmental and nature interests to be fully considered, alongside other interests, in the decision-making process concerning a plan or activity. The obligation to conduct an EIA procedure for the IJmuiden Ver Beta Offshore Grid was based on the following two reasons:

1. The statutory Environmental Impact Assessment Decree (Besluit milieueffectrapportage) specifies activities for which an EIA duty or EIA evaluation duty is required. It also dictates for which plan or decision an EIA duty or EIA evaluation duty is required.
2. Plans, such as a zoning plan, for which an 'Appropriate Assessment' (Passende Beoordeling) must be drawn up in the context of the Dutch Nature Conservation Act (Wet natuurbescherming) are subject to an EIA procedure. The IJmuiden Ver Beta Offshore Grid crosses Natura 2000 areas, hence potential impact on these areas due to the construction of the IJmuiden Ver Beta Offshore Grid cannot be ruled out in advance. This by itself results in the necessity for an 'Appropriate Assessment' along with the zoning plan.

Phases in the EIA procedure

Figure 0.5 shows the main outlines of the steps and phases in the EIA procedure for the IJmuiden Ver Beta Offshore Grid.

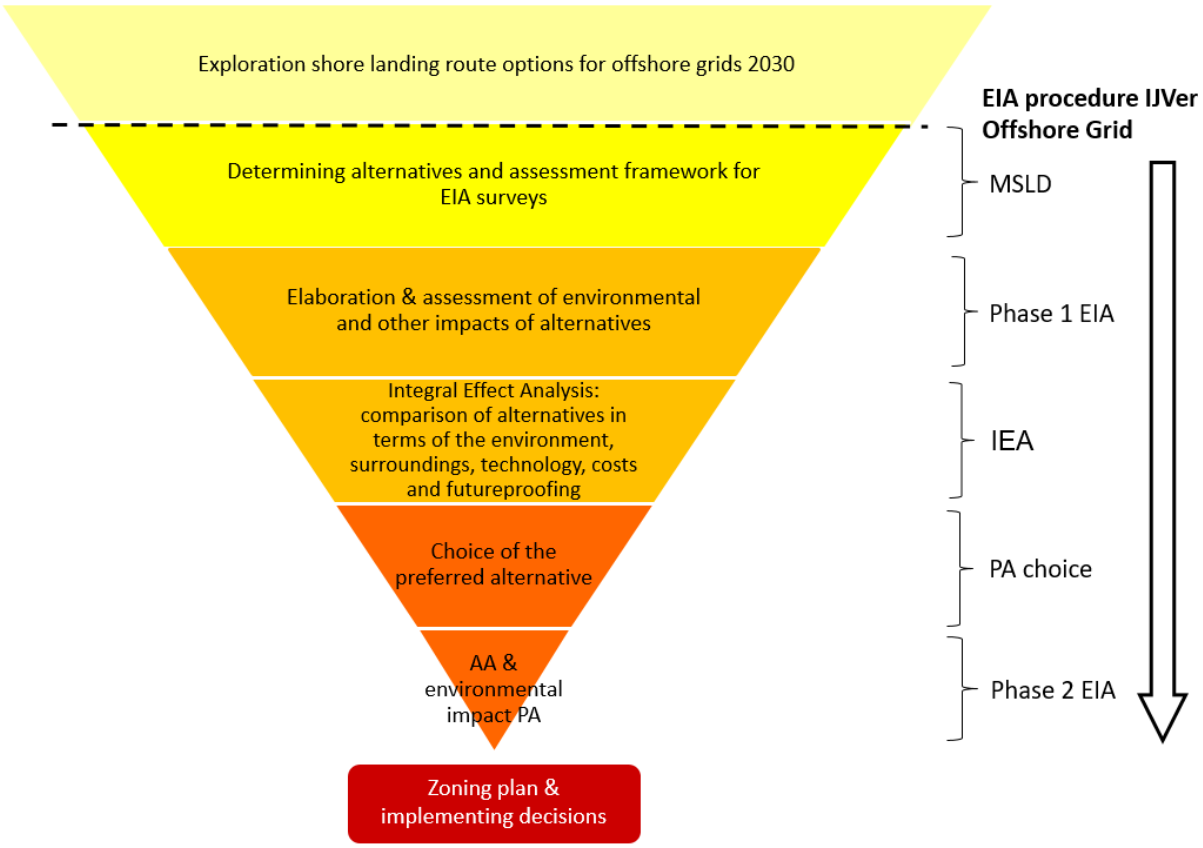

Figure 0.5 EIA procedure phases OG = Offshore grid, MSLD = Memorandum on Scope and Level of Detail, IEA = Integral Effect Analysis, PA = preferred alternative, AA = appropriate assessment

Step-by-step plan for the EIA procedure and participation process

This EIA was drawn up in conjunction with an extensive participation process. Participation took place during the various phases of the project (Memorandum on Scope and Level of Detail, Phase 1 EIA and Integral Effect Analysis), with the aim of retrieving information, knowledge about the project location, points of attention, and suggestions from local parties about alternative routes, the assessment framework, and participation. All the steps and associated studies have been discussed with the relevant authorities at both official and administrative level.

The following steps of the EIA procedure and participation process for this project have been completed:

1. Notification of project proposal and participation proposal, and possibility of submitting reactions.
2. Publishing the draft Memorandum on Scope and Level of Detail (MSLD) and an updated participation plan.
3. Possibility for participation regarding the MSLD and request for advice from the Netherlands Commission for Environmental Assessment (NCEA).
4. Adoption of the final MSLD.
5. Investigation of alternatives (Phase 1 EIA) and preparation of an Integral Effect Analysis (IEA). The IEA was published with an updated participation plan and submitted to local parties for consultation purposes.
6. The Phase 1 EIA was assessed by NCEA.

7. Advice from the regional authorities was received in September 2020.[13]
8. The Integral Effect Analysis of Phase 1 was supplemented to reflect the impacts of an optimized route for the IJmuiden Ver Alpha and Beta Offshore Grids. These routes largely run parallel. The supplementary document was therefore called the IEA Parallel Cables, and was published along with the choice of the preferred alternative and Phase 1 EIA (see below).
9. Choice of the preferred alternative. The Minister of Economic Affairs selected the preferred alternative, taking into account the advice of the regional authorities and the Directorate-General for Public Works and Water Management and based on responses to the IEA. Local parties and the competent authorities were informed about the preferred alternative chosen. An updated participation plan was published.
10. Preferred alternative assessment (Phase 2 EIA; summarized here) and the Appropriate Assessment. At the same time, the draft zoning plan and the permit applications and were drawn up, using the information from the EIA. A preliminary draft of the zoning plan was presented to the preliminary consultation partners.
11. Publication of the draft zoning plan, the draft implementing decisions and associated permit applications with the Phase 1 EIA and Phase 2 EIA, and the Appropriate Assessment as appendices. An updated version of the participation plan and a participation report on the past period were also published.

The following steps of the EIA procedure and participation process are still to be taken for this project[14]:

1. Obtain advice (including that of NCEA) and views on the draft zoning plan, draft implementing decisions, and content of the EIA.
2. Decision on the adoption of the final zoning plan and implementing decisions, with the EIA as an appendix, and their publication.
3. Possibility of appeal against the zoning plan and implementing decisions.
4. Monitoring and evaluation of environmental impacts.

0.5 The preferred alternative

Background

In the Phase 1 EIA, various alternatives for the routes (offshore and onshore) and the converter station location were examined. A search area was defined for the IJmuiden Ver Beta platform in the IJmuiden Ver Wind Farm Zone.

Three realistic alternatives with variants were studied:

- An offshore route to the Maasvlakte via the northern shore landing (MVL-1), with one possible onshore route (MVL-1X);
- An offshore route to the Maasvlakte via the southern shore landing (MVL-2), with two possible onshore routes (MVL-2Y and MVL-2Z); and
- An offshore route to Simonshaven (SMH-1), with two possible onshore routes (SMH-1C and SMH-1D).

[13] The regional advice can be viewed at: https://www.rvo.nl/onderwerpen/bureau-energieprojecten/lopende-projecten/hoogspanning/net-op-zee-ijmuiden-ver-beta

[14] The participation plan can be viewed at: https://www.rvo.nl/onderwerpen/bureau-energieprojecten/lopende-projecten/hoogspanning/net-op-zee-ijmuiden-ver-beta

A general overview of the alternatives and the variants of the routes from the Phase 1 EIA are shown in Figure 0.6. A description of the route alternatives and the points of attention are given in the alternatives document (Appendix VI to the Phase 2 EIA).

Locations for a converter station and for a connection to a 380 kV substation were sought at the Maasvlakte and near Simonshaven. Four potential converter station locations were examined. One location in Simonshaven (Biertsedijk) and 3 locations on the Maasvlakte (Noord, Midden and Zuid).

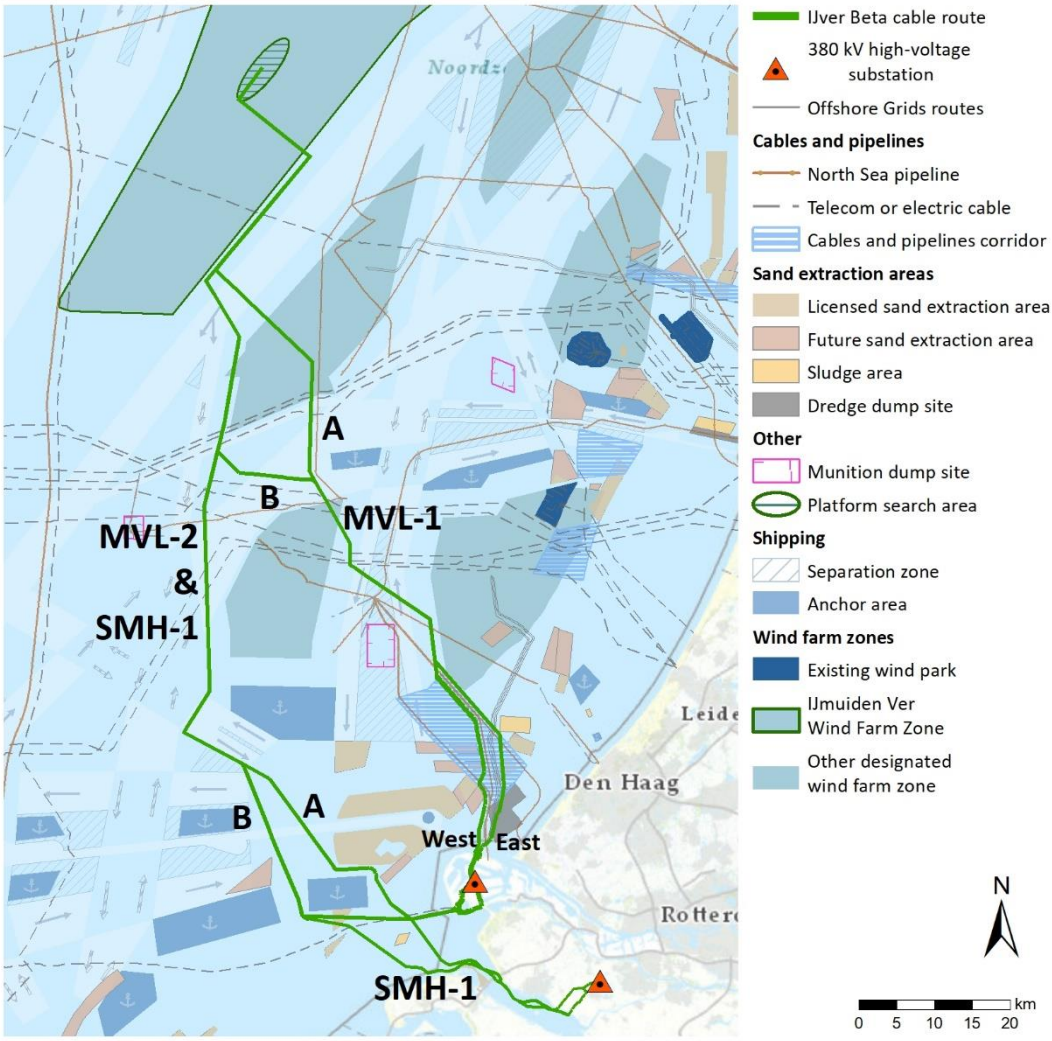

Figure 0.6 Route alternatives for the IJmuiden Ver Beta Offshore Grid

The Phase 1 EIA examined both connection locations as full alternatives. Due to the fact that a connection on the Maasvlakte was a realistic option, in combination with the more substantial environmental impact and the higher cost of a connection on the Simonshaven compared to the Maasvlakte, it was jointly decided by the competent authority and the initiator not to consider a connection on the Simonshaven in more detail in the IEA. As a result, the Simonshaven location was no longer an option for the preferred alternative.

A more extensive summary of the components studied and the assessment can be found in the digital summary of the Phase 1 EIA.[15] This is also where the complete documents can be found.

In November 2020, the Minister of Economic Affairs and Climate Policy subsequently selected a preferred alternative for the IJmuiden Ver Alpha and IJmuiden Ver Beta Offshore Grids.[16] For the IJmuiden Ver Alpha Offshore Grid, a connection to the national high-voltage grid in Borssele via the Veerse Meer was selected. For the IJmuiden Ver Beta Offshore Grid, a connection on the Maasvlakte was selected with alternative MVL-2B as the offshore preferred alternative. MVL-2Y was selected for the onshore route to the existing high-voltage substation on the Maasvlakte. After the Minister's choice, the route has been further optimized. The optimized route of the preferred alternative was assessed in the Phase 2 EIA, and included in the zoning plan and permits. For future developments on the Maasvlakte, TenneT has decided to build a new 380 kV substation on the Maasvlakte: Amaliahaven substation. The IJmuiden Ver Beta Offshore Grid will be connected to this substation.

The offshore route was slightly modified so that the route of the preferred alternative of the IJmuiden Ver Beta Offshore Grid (MVL-2B) is parallel to the route of the preferred alternative of the IJmuiden Ver Alpha Offshore Grid (BSL-2B). A parallel route for the preferred alternatives of the IJmuiden Ver Alpha Offshore Grid and the IJmuiden Ver Beta Offshore Grid results in more efficient use of the space in the North Sea, and leaves more room for connecting any future wind farms or other facilities. It also means both routes of the preferred alternatives are located outside the Bruine Bank Natura 2000 area, which reflects the stewardship expressed in Article 1.11 second paragraph of the Nature Conservation Act.

The optimized route of the preferred alternative of the IJmuiden Ver Beta Offshore Grid is explained below. The optimized route of the preferred alternative will hereinafter be referred to as the planned route.

Description of the planned route

This section gives a brief description of the IJmuiden Ver Beta Offshore Grid's planned route.

Platform location

The IJmuiden Ver Beta Offshore Grid's planned route and the platform location are shown in Figure 0.8. The Phase 1 EIA still indicated a search area for the platform. The exact location of the platform has been determined based on surveys[17], taking into account the possible presence of unexploded ordnance (UXO). The 500 meter safety zone around the platform does not overlap with the current sites for the wind farm zone, so this will not affect the placement of wind turbines within the sites.

Offshore planned route

The cable route consists of an assembly of four cables. Two of these are high-voltage DC cables, one of which acts as the positive (+) pole and the second as the negative (-) pole. These two cables are adjacent to each other. The third cable is the metallic return, which transports the residual current created by voltage imbalance. In addition, the metallic return can be used as a back-up cable during

[15] The digital summary of the Phase 1 EIA can be found at: https://www.arcgis.com/apps/MapSeries/index.html?appid=dc43b4ab5e374a158ce24b735b8d4c49&forcedesktop

[16] Letter regarding selection of preferred alternative https://www.rvo.nl/sites/default/files/2020/11/Keuze-voorkeursalternatief-Net-op-zee-IJmuiden-Ver-Beta_0.pdf

[17] A survey that takes place at sea using a ship and equipment such as sonars (a technique that uses sound waves). This can be used to capture underwater data that can provide information on aspects such as soil science and archeology.

maintenance, so that electricity can be transmitted between one of the poles and the metallic return at half power (1 GW). The fourth cable in the bundle is the fiber-optic cable that is included for communication between the platform and the onshore substation. All these cables are single-core cables with separate mechanical protection.

Two cable configurations are possible:

- a (1x4)-cable configuration in which the metallic return and the fiber-optic cable are located directly against the positive and negative poles;
- a (2x2)-cable configuration in which the metallic return and the fiber-optic cable are located a few meters (maximum 5 meters) from the positive and negative poles.

Figure 0.7 shows the two configurations. The planned route and the corridor width are the same for both cable configurations. However, the cable configuration selected does affect the cable laying method. The (2x2)-cable configuration will require more dredging and an additional cable ship. Another difference concerns the magnetic field. Section 0.7.2 discusses the implications of this.

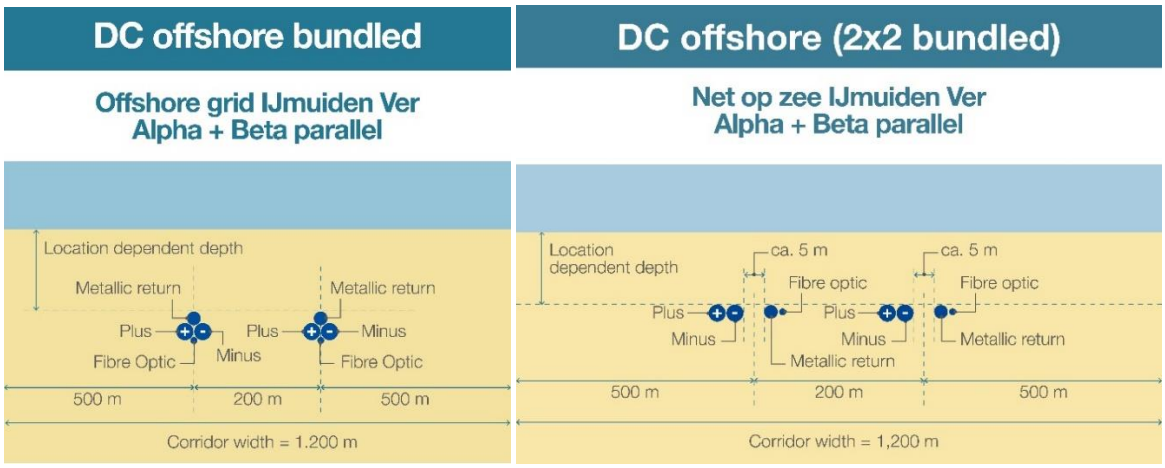

Figure 0.7 (1x4)-offshore cable configuration (left) and (2x2)-offshore cable configuration (right)

After leaving the IJmuiden Ver Wind Farm Zone, the planned route crosses the shipping route. Northwest of the Hollandse Kust (west) Wind Farm Zone, the route of the IJmuiden Ver Alpha Offshore Grid joins the planned route of the IJmuiden Ver Beta Offshore Grid. From this point onwards both routes run parallel over a length of approximately 78 km (see Figure 0.8). The two routes run between the Bruine Bank Natura 2000 area and the Hollandse Kust (west) Wind Farm Zone.

Going south, the two routes run along the Goeree light platform on the east side. The minimum distance of the planned route to the anchorage area is 1,000 meters, to the light platform it is 500 meters and the mutual distance between the cables of the IJmuiden Ver Alpha and Beta Offshore Grids is 200 meters. The planned routes cross the Eurogeul. This is being coordinated with the Directorate-General for Public Works and Water Management and the Pilotage Service and the National Harbor Master are also involved. After passing the anchorage areas, the routes of the IJmuiden Ver Alpha and Beta Offshore Grids separate. The planned route of the IJmuiden Ver Alpha Offshore Grid heads south to Borssele, while the planned route of the IJmuiden Ver Beta Offshore Grid continues east towards the Maasvlakte.

The planned route then crosses the Voordelta Natura 2000 area towards the Maasvlakte. The connection comes ashore southwest of the Slufter via the shore landing zone for the construction of cables and (pipe)lines.

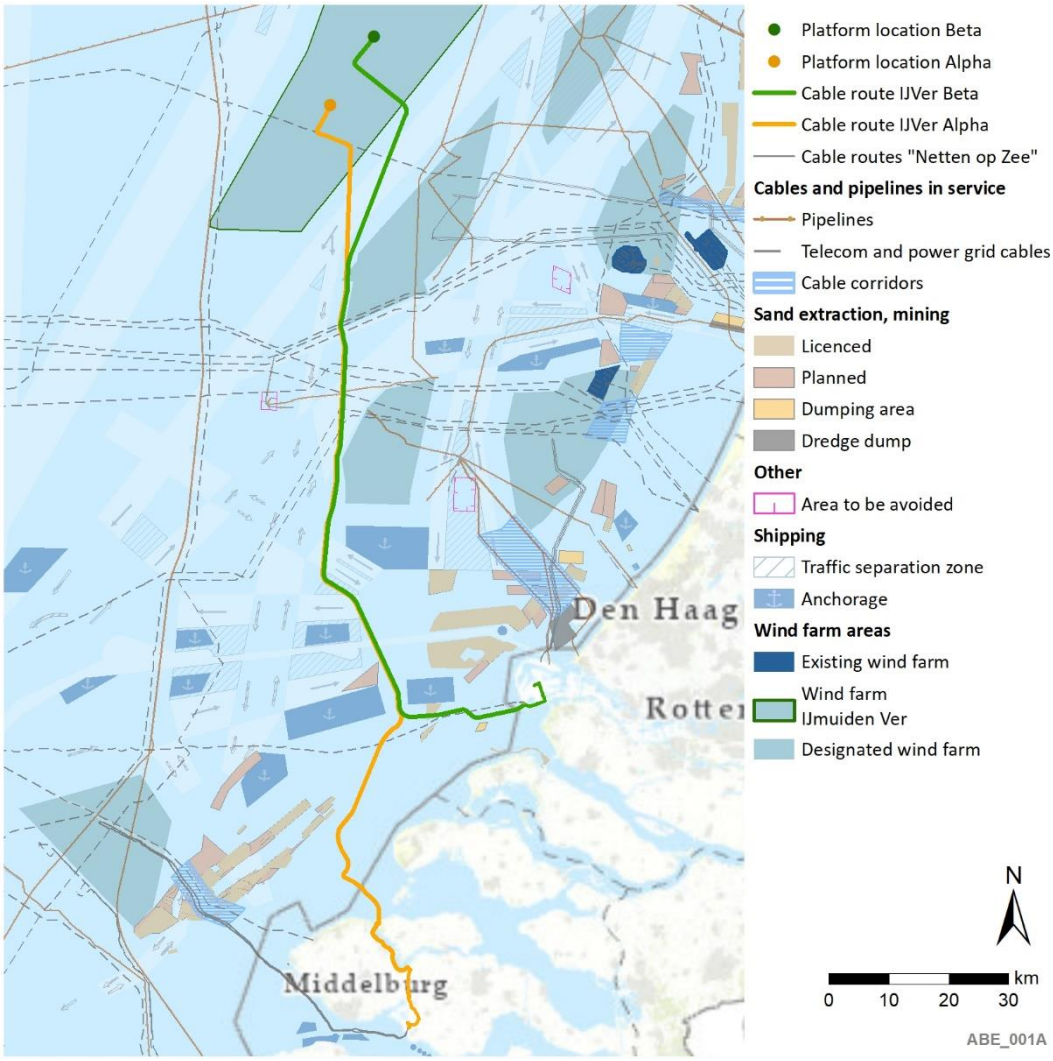

Figure 0.8 Planned routes of the IJmuiden Ver Beta Offshore Grid and the IJmuiden Ver Alpha Offshore Grid (not shown in full)

Shore landing on the Maasvlakte, onshore planned route and converter station site

The IJmuiden Ver Beta Offshore Grid comes ashore via the shore landing zone on the south side of the Maasvlakte (Figure 0.9) and continues to the Maasvlakteboulevard. A borehole will be used to cross the coastal defense. After the borehole, the planned route runs north of the Maasvlakteboulevard and crosses the road to then run south of the Noordzeeboulevard over a length of approximately 240 meters within protected nature reserves (Voordelta Natura 2000 area and National Ecological Network (Natuurnetwerk Nederland (NNN)). Due to the presence of wind turbines and associated cables, there is insufficient space to locate the planned route entirely on the north side of the Noordzeeboulevard and stay outside these protected areas. The planned route crosses the road and continues on the north side of the Noordzeeboulevard with open excavation. Where the planned route runs east of the N15 and under the existing high-voltage lines, the N15 and railroads are crossed via boreholes. Subsequently, boreholes are also used to cross the roads and railroads in the north-east corner to reach the converter station site.

The converter station site is located approx. 1 km from the existing 380 kV substation west of the N15 near the Dardanellenstraat. A new 380 kV high-voltage substation (Amaliahaven substation) will be built directly adjacent to the IJmuiden Ver Beta Offshore Grid's converter station. This substation is needed because of anticipated developments on the Maasvlakte. The IJmuiden Ver Beta Offshore Grid connects to this new 380 kV high-voltage substation.

Figure 0.9 Onshore planned route and the converter station site

0.6 Assessment framework

0.6.1 Introduction

The environmental impacts as a result of the IJmuiden Ver Beta Offshore Grid can be divided into the impacts during construction, during operation (use, maintenance, repairs) and during the removal phase. The impacts during the removal phase following expiry of the technical lifespan are not larger than or different from those during the construction and operation phases.[18] Therefore, they were not assessed separately. Any requirements for the removal phase will be included in permits. More information about the construction method, exploitation phase and removal of the IJmuiden Ver Beta Offshore Grid can be found in the Part B EIA, Chapter 1.

Several surveys will be carried out for the construction of the platform and laying the cables in the seabed, including, for example, surveys into the condition of the soil, the presence of archeological objects and unexploded ordnance (UXO). A couple of these surveys have already been carried out. The parties carrying out the surveys are responsible for applying for the work permits they need. The environmental impacts of the surveys are very limited (e.g. vessel sailing and seabed scanning, boreholes) and occur so dispersed in time and location that they blend in with regular shipping and activities on the North Sea. Therefore, these impacts were not assessed separately. An exception to this is the seismic survey for the construction of the platform and cables; the underwater noise and its impact were assessed in the EIA.

The assessment framework for the Phase 2 EIA is the same as the one used for the Phase 1 EIA. Substantively, the assessment framework is the same, adjustments are editorial in nature. The assessment framework is explained below.

Reference situation
The reference situation is the current situation without (realization of) the IJmuiden Ver Beta Offshore Grid but including the developments that will very likely[19] take place in the near future. These developments will take place independently of the planned route of the IJmuiden Ver Beta Offshore Grid and are called autonomous developments.

A development that is highly relevant to the IJmuiden Ver Beta Offshore Grid is the realization of the IJmuiden Ver Alpha Offshore Grid. The planned offshore routes of the IJmuiden Ver Alpha Offshore Grid and the IJmuiden Ver Beta Offshore Grid partially run parallel to each other. This was taken into account in the choice of the planned routes for both projects as well as in the Phase 2 EIA. In the planned onshore and offshore routes of the IJmuiden Ver Beta Offshore Grid, space has also been reserved for the connection of future wind farm zones (including the IJmuiden Ver Gamma Offshore Grid). The decision-making on the IJmuiden Ver Alpha Offshore Grid and the IJmuiden Ver Beta Offshore Grid is conducted through separate and autonomous procedures.

Decision-making on the IJmuiden Ver Gamma Offshore Grid is expected to take place after decision-making on the IJmuiden Ver Beta Offshore Grid and the IJmuiden Ver Alpha Offshore Grid. Therefore

[18] For example, laying the cable offshore will require dredging, while removing the cable will not.
[19] Autonomous developments include developments for which planning decisions have already been made or for which there is sufficient certainty that they will be realized. The environmental impacts of the latter category of developments can only be included in the EIA if they are sufficiently clear. An overview of the autonomous developments can be found in Chapter 1 of Part B.

the IJmuiden Ver Gamma Offshore Grid does not constitute an autonomous development for the IJmuiden Ver Beta (and Alpha) Offshore Grid(s).

Assessment scale

The impacts of the platform, the offshore and onshore planned route and the converter station location are assessed using a plus and minus scale for each environmental aspect in relation to the reference situation. The assessment scale used is shown in Table 0.1.

Table 0.1 Assessment scale

Assessment	Impact	Assessment in relation to the reference situation
++	Very positive	The planned route leads to a very noticeable positive change
+	Positive	The planned route leads to a noticeable positive change
0/+	Slightly positive	The planned route leads to a very small positive change
0	Neutral	The planned route does not differ from the reference situation
0/-	Slightly negative	The planned route leads to a very small negative change
-	Negative	The planned route leads to a noticeable negative change
--	Very negative	The planned route leads to a very noticeable negative change

0.6.2 Offshore assessment framework

Table 0.2 contains the assessment framework used in assessing the platform and the offshore planned route. The assessment framework consists of the following aspects:

- Soil and water
- Nature
- Archeology
- Spatial functions and other uses

Each aspect has various sub-aspects. An explanation is given for each sub-aspect. This indicates what is being investigated, and whether this concerns temporary impacts (during the construction phase) or permanent impacts (during the operation phase). It also indicates whether this concerns impacts of the cable on the environment, impacts from the environment on the cable, or a combination of the two.

Table 0.2 Explanation of environmental aspects of the offshore assessment framework

	Offshore sub-aspect	Environmental impacts
Soil and water – offshore	Length of seabed route (km)	The length gives an indication of the area of seabed that will be temporarily disturbed by laying the cable.
	Seabed dynamics	Consideration is given to where seabed formations are present in parts of the route, which could lead to cables being buried at a greater depth. Burying at a greater depth means that the seabed is disturbed more. This is a temporary impact during the construction phase (impacts can last longer than this phase) and during maintenance (operation phase).
	Presence of silty deposits and peat	If there are very silty deposits and peat in the seabed, the probability of turbidity occurring in the water column is greater. This impacts nature. Silty deposits and peat also mean that the cables cannot dissipate enough heat into the immediate vicinity. In large bodies of water, these deposits can be replaced with sand before the cable is laid. This can lead to more exchange of saltwater with groundwater. For the same reason, silty deposits and peat can play a role in salinization around the shore landing points. This is a temporary impact during the construction phase (impacts can last longer than this phase) and during maintenance (operation phase).
	Voordelta dynamics	This aspect considers whether the Voordelta is expanding in a seaward direction, or whether erosion is taking place and the Voordelta is moving inland. In principle, the cables will be laid at such a dept that they will not become exposed or require other maintenance. However, if the cables nevertheless become fully or partially exposed due to erosion, they will have to be buried again. This means the seabed will be disturbed again. If the cables become more covered over time, any repair work will result in more localized disturbance to the seabed. This will cause turbidity and impact nature. This is a temporary impact during the construction phase (impacts can last longer than this phase) and during repair work (operation phase).
Nature – offshore	Areas protected by the Nature Conservation Act	This aspect considers whether the construction and operation phases cause temporary or permanent impacts on protected habitats, such as Natura 2000 areas. Impacts may occur due to habitat degradation, disturbance (above water and underwater), turbidity, sedimentation and electromagnetic fields.
	Species protected by the Nature Conservation Act	This aspect considers whether there are temporary or permanent impacts on protected animal and plant species in the construction and operation phases. Impacts may occur due to disturbance (above water and underwater), turbidity, sedimentation and electromagnetic fields.
	Marine Strategy Framework Directive (MSFD)	This aspect considers whether the construction and operation phases result in temporary or permanent impacts on protected habitats, pursuant to the Marine Strategy Framework Directive (Kaderrichtlijn Mariene Strategie). Impacts may occur due to habitat degradation, underwater disturbance, turbidity, sedimentation and electromagnetic fields.
	Water Framework Directive (WFD)	This aspect considers whether the construction and operation phases cause temporary or permanent impacts on protected habitats, pursuant to the Water Framework Directive (Kaderrichtlijn Water). Impacts may occur due to habitat degradation, underwater disturbance, turbidity, sedimentation and electromagnetic fields.
Archeology	Known archeological value	Known offshore archeological values include shipwrecks, aircraft wrecks and obstructions (potential wrecks). If these lie on the route, the route must be diverted. If this is not possible, known archeological values must be removed (permanent impact on archeology). This is mainly an issue in the construction phase.
	Expected archeological value	In the context of this aspect, an estimate has been made of the probability that the intervention will reach archeologically relevant layers (Pleistocene landscape). It indicates the possibility of permanent impacts on archeologically relevant layers. This is mainly an issue in the construction phase.
Spatial functions and other uses – offshore	Areas of dumped munitions and military activities	The laying, maintenance and removal of the cables in zones where military activities occur (such as training areas for target practice) can temporarily impact this usage because work vessels will be deployed in these zones. In addition, the cable itself may be affected if it is laid in or close to an area of dumped munitions as there is a risk of ammunition exploding. This is mainly an issue in the construction phase and during maintenance (operation phase).
	Dumping of dredged material	The laying, maintenance (any repair work) and removal of the cables in zones where dredged material is dumped may temporarily impact this usage because work vessels will be deployed in these zones. During work on the cable, dumping is not possible. The dumping of dredged material may also have a temporary and/or permanent impact on the cable, because it may be inaccessible or less accessible if material is being or has just been dumped on it. This is a disadvantage in case of any repairs. Permanent erosion holes can also arise, exposing the cable and requiring maintenance. The dumping of dredged material may also affect the thermal properties of the cable. Impacts of the dumping of dredged material on the cable are mainly an issue in the exploitation phase and when work is being done on the cable (operation phase).
	Minerals (geothermal energy, oil and gas extraction)	There may be temporary impacts if cables are laid near operational or abandoned mining platforms. Ships can cause damage to the platform, and an abandoned pit may be damaged. There are safety zones around existing platforms. If the cable route were to lie within the safety zone of a platform, this could mean a permanent impact. In addition, it may limit the area in which new platforms can be located. There can also be an impact on the cable from mining activities, or because the remains of abandoned pits damage equipment. This is mainly an issue in the construction phase and during maintenance (operation phase).
	Fishing and	The area of fishing grounds may be temporarily reduced due to the safety zones around the offshore

	Offshore sub-aspect	Environmental impacts
	aquaculture	cable ships during the construction phase. Fishing and aquaculture (such as fish farming, mussel farming and seaweed cultivation) may be obstructed both during construction (disturbance of the seabed, turbidity) and operation (disturbance of the seabed, turbidity due to maintenance) of a nearby cable system. This is mainly an issue in the construction phase and during maintenance (operation phase).
	Sand and shell extraction	No sand may be extracted at a distance of less than 500 meters from the cable. The cable thus permanently imposes spatial restrictions within areas and zones intended for sand extraction. This applies in particular to the operation phase.
	Shipping	During the laying and maintenance (operation phase) of the cables, there will be a temporary increase in ship traffic. This extra traffic mainly consists of slow-moving ships with limited maneuverability. This ship traffic may temporarily or permanently hinder normal shipping traffic. This is also a permanent impact, because ships are not allowed to anchor above a cable.
	Unexploded ordnance	The cable may be affected if its route crosses unexploded ordnance (UXO). UXO have to be examined and removed, which has a major impact on cable laying and costs.
	Cables, pipelines, and rail and road infrastructure	There are temporary impacts when crossing other cables and pipelines, because additional measures have to be taken (e.g. dumping stones). In addition, the assets (property) of third parties are impacted because any maintenance and removal of cables and pipes is made more complex due to the presence of (additional) crossings. Permanent impacts on other cables and pipes can also arise due to electrical and magnetic influences.
	Wind farm zones	The space required by a route can result in less space for future wind farm zones, and/or cause the fragmentation of wind farm zones. This is a permanent impact.
	Recreation and tourism	There may be temporary impacts on recreational boating, because a safety zone must be maintained around cable ships. This is a temporary impact during the construction phase.

0.6.3 Onshore assessment framework

The assessment framework for the onshore planned route and the converter station location consists of the following aspects:

- Soil and water
- Nature
- Landscape and cultural history
- Archeology
- Living environment, spatial functions and other uses

Each aspect has various sub-aspects. Table 0.3 gives an explanation for each sub-aspect, indicating what was studied, whether this concerns temporary impacts (during the construction phase) or permanent impacts (during the operation phase), and whether this concerns impacts from the cable on the environment or impacts from the environment on the cable.

Table 0.3 Explanation of environmental aspects of the onshore assessment framework

	Onshore sub-aspect	Environmental impacts
Soil and water	Change in soil composition	Disrupting the soil structure during excavation changes the soil composition, which potentially has an impact on how land is used. This impact may occur during the construction and operation phases. This temporary impact may also be permanent in some soil compositions, such as peat.
	Change in soil quality	During the construction phase, contaminants might be found in the soil. These pose risks for the people involved in the work and also lead to environmental hygiene risks in the area. In addition, the spread of contamination would lead to a deterioration of soil quality in the area. The impact is temporary, because measures must always be taken if the impact occurs (remediation).
	Settlement	In this sub-aspect, the possibility of settlement occurring due to drainage in the construction phase is considered. The degree of settlement is determined by the amount of reduction in the pore pressure and the settlement sensitivity of the soil. Impacts due to settlement can be permanent (surface subsidence and building subsidence)
	Change in groundwater quality	In this sub-aspect, the possibility of crossing layers with low hydraulic conductivity is considered. Excavations in layers with low hydraulic conductivity affect the quality and flow rate of groundwater. This can lead to temporary and permanent impacts (salinization). The impacts occur in the construction phase and the operation phase.
	Change in groundwater level	In this sub-aspect, the possibility of groundwater levels and flows being affected by drainage in the construction phase is considered. This impact can be temporary (decrease in growth/development of vegetation) or permanent (dehydration/death of vegetation).
	Change in surface water quality	In this sub-aspect, the relationship between the discharge of groundwater (released during drainage) and the sensitivity of the water system and activities that depend on it (e.g. usage in agriculture, such as irrigation) are studied. It is a temporary impact during the construction phase (when drainage is necessary). However, the impact can also be permanent if, for example, ecological functions are affected by changes in water quality.
Nature	Natura 2000 areas, excluding fertilization/acidification	In this sub-aspect, the possibility of temporary and permanent impacts on protected habitats or Natura 2000 areas in the construction and operation phases is studied. Impacts may occur due to disturbance (noise, light, visual), mechanical impacts, dehydration, surface loss and electromagnetic fields. Most of the impacts are temporary and take place during the construction phase. However, permanent impacts (disturbance and electromagnetic fields) can also still occur during the operation phase.
	Natura 2000 areas, incl. fertilization/acidification	In this sub-aspect, the impacts of fertilization and acidification are considered. This impact occurs as a result of emissions of substances such as nitrogen during the construction phase. These emissions are temporary and take place during the construction phase. The impacts from emissions and deposition of nitrogen can be permanent
	National Ecological Network	In this sub-aspect, the possibility of temporary or permanent impacts on the National Ecological Network (Natuurnetwerk Nederland - NNN) is considered. This includes examining whether there is a temporary or permanent impact on the values that qualify an area as an NNN management type.
	Protected species	In this sub-aspect, the possibility of temporary or permanent impacts on species protected by the Nature Conservation Act is considered.

	Onshore sub-aspect	Environmental impacts
Landscape and cultural history	Impact on coherence between specific elements and their context	In this sub-aspect, the possibility that elements of historical and/or landscape value are affected is considered. It concerns an impact that arises in the construction phase, but which has a permanent character.
	Impact on the characteristics of the area	In this sub-aspect, the possibility of a major contrast between the converter station and the character of the landscape is considered. The characteristics of an area are determined by the nature, appearance and significance of an area. It concerns a permanent impact in the operation phase.
	Impact on visibility and experience	This sub-aspect describes the impact on the visible features of the landscape, as experienced by the user in the environment. It concerns a permanent impact in the operation phase.
Archeology	Known archeological value	Known onshore archeological values are sites on the Archeological Monuments Map (Archeologische Monumentenkaart - AMK). If these lie on the route of the cable, the route must be diverted, or if this is not possible, they will be removed (permanent impact on archeology). This is mainly an issue in the construction phase.
	Expected archeological value	In this aspect, an estimate was made of the probability that the intervention will affect archeological values. It indicates the possibility of permanent impacts on archeologically relevant layers. This is mainly an issue in the construction phase.
Living environment, spatial functions and other uses	Oil, gas extraction and geothermal energy	There may be temporary impacts during construction if this takes place near an operational or abandoned production location. Excavation can cause damage to a production site and abandoned wells. There may be permanent impacts, because the cable limits the area in which new production locations can be located. There can also be an impact on the cable from mining activities, or because the remains of abandoned pits damage equipment. This is mainly an issue in the construction phase and during maintenance (operation phase).
	Primary flood defense	In this sub-aspect, the number of primary flood defenses that must be crossed, and the complexity of these crossings, are considered. The location within protection zones is also considered. The crossings and the location can result in permanent impacts. This concerns both temporary impacts on the cable (more complex and therefore more expensive to lay), and permanent impacts on the flood defenses.
	Unexploded ordnance	The cable may be affected if its route crosses unexploded ordnance (UXO). UXO have to be examined and removed, which has a major impact on cable laying and costs.
	Cables and pipelines	In this sub-aspect, the quantity and nature of the cables and pipelines that have to be crossed, and the degree of influence on other cables and pipelines, are considered. The crossings have no impact on these cables and pipelines, but mainly impact technology, cable-laying techniques, costs and maintenance. Fewer crossings means lower costs and risk of damage to other cables and pipelines, and that less coordination with owners of the cables and pipelines is required. Other cables and pipelines may well be affected. This impact will be permanent in the operation phase.
	Impact on spatial functions	In this sub-aspect, the crossings of spatial functions, the crossing of infrastructure and secondary flood defenses, the influence on railways and secondary flood defenses, the crossing of agricultural areas, and the impact on the cable caused by high-risk establishments and flooding are considered. Most sub-criteria within this sub-aspect concern permanent impacts of the cable on spatial functions in the operation phase. The sub-criteria for high-risk establishments and flood risk relate to permanent impacts on the cable itself.
	Impact on the living environment	In this sub-aspect, noise nuisance, magnetic fields, vibrations and traffic are considered. Noise nuisance plays a role in the construction and operation phases. Vibrations and traffic are temporary and only relevant during the construction phase. Magnetic fields are present in the operation phase.
	Recreation and tourism	In this sub-aspect, the impact on recreational and touristic functions is considered. These impacts can be temporary (noise and view of work in the construction phase) or permanent (noise, view of converter station).

0.7 Conclusions on environmental impacts

0.7.1 Introduction

The following sections contain the conclusion table and the key environmental impacts and mitigating measures of the platform (Section 0.7.2), the offshore planned route (Section 0.7.3), the onshore planned route (Section 0) and the converter station (Section 0.7.5). The conclusion tables contain an assessment with and without mitigating measures. The aspects and sub-aspects for which no mitigating measures are possible or for which the impact of measures is not reflected in the impact assessment are indicated by a gray color and N/A (not applicable).

0.7.2 Conclusions regarding the platform

This section explains the impact assessment of the offshore platform. It begins with a summary table, which is followed by an explanation of the slightly negative (0/-), negative (-) and very negative assessments (--) and mitigating measures.

Two different foundation methods were studied for the platform:

- a jacket for which piles are driven approximately 60 meters into the seabed;
- suction buckets that anchor the platform to the seabed without piling (more information can be found in Chapter 1 of Part B of the Phase 2 EIA).

Table 0.4 Platform assessment

Aspect	**Assessment without mitigating measures**		**Assessment with mitigating measures***	
Variant	Platform – Jacket	Platform – Suction buckets	Platform – Jacket	Platform – Suction buckets
Soil and water – offshore				
Area of the North Sea seabed (hectares)	1.5 hectares	1.5 hectares	1.5 hectares	1.5 hectares
Local disturbance and change of the seabed	0/-	0/-	N/A	N/A
Nature – offshore				
Areas protected by the Nature Conservation Act				
Habitat degradation	0	0	N/A	N/A
Disturbance – above water	0	0	N/A	N/A
Disturbance – underwater	-	0	0/-	N/A
Species protected by the Nature Conservation Act				
Habitat degradation	0	0	N/A	N/A
Disturbance – above water	0/-	0/-	N/A	N/A
Disturbance – underwater	-	0/-	0/-	N/A
MSFD (Marine Strategy Framework Directive)				
Habitat degradation	0/-	0/-	N/A	N/A
Disturbance – above water	0/-	0/-	N/A	N/A
Disturbance – underwater	-	0/-	0/-	N/A
WFD (Water Framework Directive)				
Habitat degradation	0	0	N/A	N/A
Disturbance – underwater	0	0	N/A	N/A
Archeology				
Known archeological value	0	0	N/A	N/A
Expected archeological value	0	0	N/A	N/A
Spatial functions and other uses				
Oil and gas extraction	0	0	N/A	N/A
Shipping	0	0	N/A	N/A
Unexploded ordnance (UXO)	0	0	N/A	N/A
Cables and pipelines	0	0	N/A	N/A

*an assessment is only included if mitigating measures are possible and the impact of these measures is reflected in the assessment

Soil and water – offshore

The above-water surface of the IJmuiden Ver Beta Offshore Grid platform is approximately 80 m x 110 m. Soil protective measures will be taken around the platform, disturbing a (seabed) area of approximately 15,000 m^2 (1.5 ha). The foundations for the platform, including the installation of scour protection, will permanently disturb the seabed. A location with few sand waves was selected

for the platform. The area disturbed is approximately 1.5 ha for both foundation methods, jacket and suction buckets. Because the foundation protrudes above the seabed, this is a permanent disturbance.

Due to the location of the platform and the limited size of the disturbed surface (1.5 ha of the North Sea), the assessment of the impact of both foundation methods is slightly negative (0/-).

Mitigating measures
No mitigating measures are possible to further limit the impact of the platform on the seabed.

Nature – offshore
During the construction of the platform, habitat may be damaged, and there could be underwater and above-water disturbance. During the operation phase, there could also be underwater and above-water disturbance. The impacts on nature are described below for Natura 2000 areas (areas protected by the Nature Conservation Act), protected species (species protected by the Nature Conservation Act), the Marine Strategy Framework Directive (MSFD) and the Water Framework Directive (WFD).

The platform construction will cause very limited, local **habitat degradation** where the platform is anchored to the seabed and the scour protection is installed. This will change the habitat from a sandy flat seabed to a stony reef structure. Habitat degradation affects Marine Strategy Framework Directive (MSFD) descriptors such as 'biodiversity', 'food chains', 'hydrographical conditions' and 'sea-floor integrity'. However, the area is so small that for the MSFD it only represents a slightly negative (0/-) change. In this aspect, there is no difference between a jacket foundation and a suction bucket foundation.

The impact of the platform is assessed as slightly negative (0/-) for the aspect of **above-water disturbance**, both for the MSFD and species protected by the Nature Conservation Act, because there is some degree of disturbance during construction. The possibility of long-lasting or permanent barriers as a result of surface disturbance is excluded. There is no difference between a jacket foundation and a suction bucket foundation.

The impact of the platform is assessed as negative (-) for the aspect of **underwater disturbance** to areas and species protected by the Nature Conservation Act and underwater disturbance in the context of the MSFD. The disturbance contour of impulse noise caused by pile-driving does not reach into the Bruine Bank Natura 2000 area. During the construction of the platform, the number of days that harbor porpoises are disturbed will remain within the limits allocated in the Ecology and Cumulation Framework (Kader Ecologie en Cumulatie - KEC)[20], but it cannot be ruled out that the noise standard will be exceeded. As a result, the impact of underwater disturbance for areas protected by the Nature Conservation Act is assessed as negative (-). In terms of species protected by the Nature Conservation Act and the MSFD, the impact assessment for underwater disturbance is also negative (-), because it cannot be guaranteed that the noise remains below the threshold value.

[20] The Ecology and Cumulation Framework focuses on possible cumulative impacts on the populations of species that have to be protected during the construction and operation of the offshore wind farms until 2030. The pile-driving and surveys for laying the offshore grid projects are also part of the Ecology and Cumulation Framework. More information about the Ecology and Cumulation Framework can be found at: https://www.noordzeeloket.nl/functions-use/windenergie/ecologie/cumulation/kader-ecologie/

The suction bucket foundation method precludes the need for pile-driving, so there will be no impact of impulse noise on marine mammals and fish. The assessment of underwater disturbance for suction buckets is therefore only based on the continuous noise, which disturbs a relatively small area of the Dutch Continental Shelf. It is possible that marine mammals or migratory fish will avoid the cable ships and/or the platform during the construction phase. The impact of a platform with a suction bucket foundation has therefore been assessed as slightly negative (0/-) for the MSFD and species protected by the Nature Conservation Act.

Mitigating measures
To ensure that harbor porpoises and seals can flee the piling noise, an ADD (acoustic deterrent device) must be used during pile-driving. In addition, piling must use a slow start (increasing frequency of hammering) and soft start (increasing force of hammering. When it is decided which platform builders and design will be used, the underwater noise must be calculated more specifically for the project and evaluated against the maximum noise standard. Based on the results, additional mitigating measures may be required. During construction, the actual noise exposure will be measured and monitored. The calculations and measures taken will be recorded in an ecological working protocol.

In addition, the lighting plan must include that the illuminance from 150 meters from the lighting source remains below 0.1 lux and lighting is directed inward and shielded outward.

The application of these mitigating measures changes the impact assessment of the underwater noise of a platform with a pile foundation from negative (-) to slightly negative (0/-) for the aspects of areas and species protected by the Nature Conservation Act and the MSFD.

Archeology – offshore
The platform is not expected to have any negative impact on archeology.

Spatial functions and other uses – offshore
The platform is not expected to have any negative impact on spatial functions and other uses offshore.

0.7.3 Conclusions regarding the offshore planned route

This section explains the impact assessment of the offshore 525 kV DC cables. It begins with a table, which is followed by an explanation of the slightly negative (0/-), negative (-) and very negative assessments (--) and mitigating measures.

For the planned route, both the (1x4)-cable configuration and the (2x2)-cable configuration were assessed. The planned route and the corridor width are the same for both cable configurations.

Table 0.5 Assessment of planned route

Aspect	Offshore 525 kV DC cables			
	without mitigating measures		with mitigating measures*	
	(1x4)-cable configuration	(2x2)-cable configuration	(1x4)-cable configuration	(2x2)-cable configuration
Soil and water – offshore				
Length of the planned route on the seabed (km)	146 km	146 km	146 km	146 km
Seabed dynamics	--	--	N/A	N/A
Presence of silty deposits and peat	- (km 0-75)	- (km 0-75)	0/- (km 0-75)	0/- (km 0-75)
	Knowledge gap (km 75-146)		Knowledge gap (km 75-146)	
Voordelta dynamics	-	-	N/A	N/A
Nature – offshore				
Areas protected by the Nature Conservation Act				
Habitat degradation	0/-	0/-	N/A	N/A
Disturbance – above water	--	--	0/-	0/-
Disturbance – underwater	0/-	0/-	N/A	N/A
Turbidity	0/-	0/-	N/A	N/A
Sedimentation	0/-	0/-	N/A	N/A
Electromagnetic fields	0/-	0/-	N/A	N/A
Species protected by the Nature Conservation Act				
Habitat degradation	-	-	0/-	0/-
Disturbance – above water	--	--	0/-	0/-
Disturbance – underwater	-	-	0/-	0/-
Turbidity	0/-	0/-	N/A	N/A
Sedimentation	0/-	0/-	N/A	N/A
Electromagnetic fields	0/-	0/-	N/A	N/A
MSFD (Marine Strategy Framework Directive)				
Habitat degradation	0/-	0/-	N/A	N/A
Disturbance – above water	-	-	0/-	0/-
Disturbance – underwater	0/-	0/-	N/A	N/A
Turbidity	0/-	0/-	N/A	N/A
Sedimentation	0/-	0/-	N/A	N/A
Electromagnetic fields	0/-	-	N/A	N/A
WFD (Water Framework Directive)				
Habitat degradation	0/-	0/-	N/A	N/A
Disturbance – underwater	0	0	N/A	N/A
Turbidity	0/-	0/-	N/A	N/A
Sedimentation	0/-	0/-	N/A	N/A
Electromagnetic fields	0/-	-	N/A	N/A
Archeology – offshore				
Known archeological value	0	0	N/A	N/A
Expected archeological value	0/-	0/-	N/A	N/A
Spatial functions and other uses				
Areas of dumped munitions and military activities	0/-	0/-	N/A	N/A
Dumping of dredged material	0	0	N/A	N/A
Oil and gas extraction	0	0	N/A	N/A
Fishing and aquaculture	0	0	N/A	N/A
Sand and shell extraction	0/-	0/-	N/A	N/A
Shipping	-	-	N/A	N/A
Unexploded Ordnance	-	-	N/A	N/A
Cables and pipelines	-	-	N/A	N/A
Offshore wind farm zones	0	0	N/A	N/A
Recreation and tourism	0	0	N/A	N/A

*an assessment is only included if mitigating measures are possible and the impact of these measures is reflected in the assessment

Soil and water – offshore

The length of the offshore planned route is 146 km, of which 133 km is offshore and 13 km is nearshore.[21] Seabed dynamics is the local variation that occurs as seabed formations – such as ridges and sand waves – move across the seabed. Prior to cable laying, sand waves and mega ridges are flattened. Therefore, the construction of a cable route in an area with a dynamic seabed leads to a greater disturbance of the seabed compared to an area without a dynamic seabed. Approximately 50% of the offshore planned route is located in an area with dynamic soil formations. This has been assessed as very negative (--). It is not possible to locate the planned route entirely outside the area with a dynamic seabed.

The presence of very silty deposits or peat in the seabed (also known as disturbance layers) increases the likelihood of the occurrence of turbidity in the water column and, consequently, sedimentation on the seabed. From the available data, the total length where such disturbance layers are located is limited to a range of 10 to 20 km, concentrated in the area between 20 and 50 km from the coast. The sub-aspect of presence of silty deposits and peat has been assessed as negative (-). There is less data available about the offshore seabed, and seabed surveys will be carried out to close this knowledge gap.

The planned route for the IJmuiden Ver Beta Offshore Grid runs via the Voordelta to the Maasvlakte. The Voordelta is roughly the area along the coast from the Westerschelde estuary to the Nieuwe-Waterweg. The area is characterized by the presence of a varied and dynamic environment of coastal waters, intertidal area (sand flats and mudflats) and beaches, which form a relatively sheltered transition zone between the (former) estuaries (i.e. the large bodies of water) and the high seas. The bed of the Voordelta is still changing. Near the Maasvlakte, the seabed elevation increases close to the shore landing. The dam in the Haringvliet has reduced the size of the Haringvliet's outer delta. Because as a result of the decision to leave the sluices in the Haringvliet open ajar at high tide (Kierbesluit) as of 2018 (how far they are opened varies, depending on the river discharge), the dynamics can increase to a limited extent. The sub-aspect of Voordelta dynamics has been assessed as negative (-).

Difference in assessment between the (1x4)-cable configuration and the (2x2)-cable configuration

There are no differences between the impacts on soil and water of the (1x4)-cable configuration and the (2x2)-cable configuration; the assessment is the same.

Mitigating measures

Mitigating measures to reduce impacts are limited to making transition joints[22] as much as possible in areas that are not dynamic; this also applies to the Voordelta. However, this does not lead to a change in the impact assessment for the sub-aspects of seabed dynamics and Voordelta dynamics.

[21] Offshore is the designation for the area with water depths greater than 10 to 20 meters. The sea section with a water depth of less than 10 meters is referred to as nearshore.

[22] The offshore cable is too long to transport in one piece, so the route will be constructed in sections. The places where the cables are connected are called transition joints. Every 40 to 60 km of the route there will be such a joint. The exact location of these joints is not yet known, so they can still be moved around.

Avoiding silty deposits or peat in the seabed leads to an impact reduction; this applies to the planned route and the transition joints. This may be possible at a later stage when more is known about the exact location of the disturbance layers. Applying these measures changes the impact assessment for the sub-aspect of presence of silty deposits and peat from negative (-) to slightly negative (0/-).

Nature – offshore

The impacts of the offshore planned route occur mainly due to work during the construction phase; habitat may be damaged, and there could be underwater and above-water disturbance, turbidity and sedimentation. The magnetic field is only relevant for the operation phase. The impacts on nature are described below for Natura 2000 areas (areas protected by the Nature Conservation Act), protected species (species protected by the Nature Conservation Act), the Marine Strategy Framework Directive (MSFD) and the Water Framework Directive (WFD).

The impact of the 525 kV DC cables on **habitat degradation** for the sub-aspect of areas protected by the Nature Conservation Act is assessed as slightly negative (0/-). The planned route runs through the Voordelta Natura 2000 area, where a limited area of two types of habitat is affected. In addition, the route crosses part of a soil conservation area. The impact on the sub-aspect of species protected by the Nature Conservation Act is assessed as negative (-), because it cannot be ruled out that the planned route is located, at least partially, in an area suitable for honeycomb (Sabellaria alveolate) worm reefs. The impact on the sub-aspect of WFD is assessed as slightly negative (0/-), due to local, temporary habitat degradation. The planned route runs through the WFD body of water Noordelijke Deltakust, where degradation of <0.2% of the area is possible. The impact on the sub-aspect of WFD is therefore assessed as slightly negative (0/-).

The impact of **above-water disturbance** by the offshore 525 kV DC cables is assessed as negative (-) for the MSFD, as very negative (--) for areas protected by the Nature Conservation Act and as negative for species protected by the Nature Conservation Act. This is because disturbance to nursing seals and molting shelducks during the construction phase of the planned route near Hinderplaat and the shore landing location (Voordelta Natura 2000 area) cannot be ruled out in the event of construction in certain periods. For seals, these periods are the nursing and molting seasons and for shelducks the molting period.

During the work for the offshore 525 kV DC cables, disturbance can be caused by **continuous underwater noise** and impulse noise from the detailed geophysical surveys. The impact on areas protected by the Nature Conservation Act is assessed as slightly negative (0/-). Geophysical surveys during the laying of the cables must be carried out in the area recorded in the Ecology and Cumulation Framework. With regard to species protected by the Nature Conservation Act, the disturbance of an individual during geophysical surveys cannot be excluded. The impact has therefore been assessed as negative (-). With regard to the MSFD, the continuous disturbance is temporary in nature, occurs on a small part of the Dutch Continental Shelf, and not at a level or location that would adversely affect marine mammals, migratory fish or other organisms. As a result, there are no impacts on the Good Environmental Status (GES). Due to deviation from the reference situation, the impacts have been assessed as slightly negative (0/-).

The impacts of **turbidity** on the MSFD, the WFD, areas protected by the Nature Conservation Act and species protected by the Nature Conservation Act have been assessed as slightly negative (0/-). The

impacts caused by the work occur in the Voordelta and Bruine Bank Natura 2000 areas. There is a limited impact on primary production, fish and birds that rely on sight to find food. In addition, there is also sufficient alternative foraging habitat available, so negative impacts have been ruled out. With regard to species protected by the Nature Conservation Act, there is a temporary impact on fish species that rely on sight to find food. However, there is sufficient undisturbed area available. With regard to the MSFD, the disturbance is not at a level or location that would adversely affect migratory fish, birds, benthos (all organisms living on the seabed) or primary production. As a result, there are no impacts on the Good Environmental Status (GES) of MSFD descriptors. Turbidity occurs in the WFD bodies of water Noordelijke Deltakust, Zeeuwse Kust and Hollandse Kust. In addition, there are possible radiation impacts on the biological quality element 'vis' of the WFD body of water Haringvliet-west. However, impacts on migratory fish can be ruled out as a result of blocking migration.

With regard to areas protected by the Nature Conservation Act, **sedimentation** above the limit does not reach into the Bruine Bank. In the Voordelta, this limit is only exceeded in an area of 3 hectares very close to the coastline, but in the very small area affected ecological impacts can be ruled out. This results in a slightly negative (0/-) assessment for the sub-aspect of areas protected by the Nature Conservation Act. With regard to the MSFD, the negative impacts of sedimentation on the Dutch Continental Shelf largely disappear against those of habitat degradation and will not be noticeable at the system level (slightly negative assessment, 0/-). Exceedance of the sedimentation limit occurs only in the WFD body of water Noordelijke Deltakust. The negative impacts of sedimentation are not noticeable at the system level. The impact on the sub-aspect of the MSFD is therefore slightly negative (0/-).

With regard to areas protected by the Nature Conservation Act, harbor porpoises in the Voordelta and migratory fish that can perceive **electromagnetic fields** do not experience a barrier effect. The electromagnetic field does not reach into the Bruine Bank Natura 2000 site. This results in a slightly negative (0/-) assessment. With regard to species protected by the Nature Conservation Act, there is also no barrier effect, which results in a slightly negative (0/-) assessment. With regard to the MSFD, the descriptors 'biodiversity' and 'supply of energy' can be adversely affected by barrier effects, which results in a slightly negative (0/-) assessment.

Difference in assessment between the (1x4)-cable configuration and the (2x2)-cable configuration
More turbidity occurs during the construction of the (2x2)-cable configuration compared to the (1x4)-cable configuration. However, this does not lead to different impacts. Based on the modeled data, it is estimated that the sediment cloud will dissipate in just over 4 months.

In the event of a failure in the positive or negative pole, the magnetic field of the (2x2)-cable configuration is higher than that of the (1x4)-cable configuration. If the positive or negative pole fails, the metallic return (MR) temporarily takes over the function of this pole.[23] Such a failure is expected to occur a maximum of three times in a period of 40 years, during which the MR will function as a positive or negative pole for approximately one month per occurrence. In a failure situation of the (2x2)-cable configuration, the magnetic field of the metallic return (MR) can be 10 to 40 times higher compared to the operation phase of the (1x4)-cable configuration. These values can change the behavior of various invertebrates, sharks and rays. In the short term, this will not impact

[23] This reduces the capacity of the connection to 1 GW.

the MSFD descriptors D1 biodiversity and D3 food webs, or WFD target Macrofauna. If, following a cable failure, the period in which the MR functions as a positive or negative pole lasts longer than one month, it is recommended to switch off the MR after two months as a precaution to exclude a negative impact at the species and ecosystem levels. Due to the possible impacts on benthos, the assessment of the (2x2)-cable configuration is negative (-) for the MSFD and the WFD.

Mitigating measures
The Slikken van Voorne and Hinderplaat are designated resting areas. Disturbance of nursing seals can be ruled out by working outside the pupping and nursing season, or when working in this season, by temporarily stopping work when nursing seals are present within the disturbance contour. Disturbance of molting shelducks can be avoided by working outside the molting period, or by stopping work when molting shelducks are present within the disturbance contour.

Even though it is not the case, here it was assumed that honeycomb worm reefs are a protected species. In order to guarantee the protection of honeycomb worm reefs in the context of species protected by the Nature Conservation Act, surveys can be carried out to determine the presence of honeycomb worm reefs. If necessary and if possible, the planned route can then be optimized with more certainty within the designated corridor. This allows, as far as technically possible, parts of the reef to be spared, so that they are not damaged and can recover more quickly.

Applying these mitigating measures changes the impact assessment for areas protected by the Nature Conservation Act from very negative (--) to slightly negative (0/-), and for the MSFD and species protected by the Nature Conservation Act the impact assessment of above-water noise changes from negative (-) to slightly negative (0-/).

Archeology – offshore
The impact on expected archeological values is slightly negative (0/-). The planned route covers an area of 269 ha in the zone with a medium expected archeological value and an area of 2,657 ha in the zone with a low expected archeological value. The planned route covers no area in the zone with a high expected archeological value. Within the area covered by the planned route, there are 3 known shipwrecks.[24] The assumption is that with small adjustments to the planned route these wrecks can be spared. The impact on known archeological values has therefore been assessed as neutral (0/-).

Table 0.6 Area covered by the planned route in zones with a low, medium or high expected archeological value and number of known archeological values

Expected archeological values				Known archeological values
Yes (high)	**Possible (medium)**	**No (low)**	**Total**	**Shipwrecks**
0.0 ha	269.2 ha	2,656.5 ha	2,925.7 ha	3

Difference between the assessment of the (1x4)-cable configuration and the (2x2)-cable configuration
There are no differences between the impacts of the (1x4)-cable configuration and the (2x2)-cable configuration; the assessment is the same.

[24] A buffer of 100 meters is respected around shipwrecks. If a buffer is partly or fully within the space requirement, it is included in the assessment.

Mitigating measures

Impacts on known archeological values can be mitigated by making small adjustments to the planned route at the sites of know archeological values; this has already been assumed in the impact assessment. The impact on expected archeological values cannot be mitigated in advance, because there is no certainty beforehand if anything is actually present in the zones expected to be of archeological value. These zones will be further studied during the execution of archeological surveys (these will be conducted in the period up to and including early 2022), which may result in an expected archeological value being redefined as a known archeological value.

If it is not possible to change the plan (allowing, for example, a wreck to be spared[25]), the only option is to document the archeological values that will be destroyed (preservation ex situ). However, this does not qualify as a mitigating measure. If a site is considered worthy of conservation, it must be documented by excavating it.

Spatial functions and other uses – offshore

The planned route crosses the Hollandse Kust (west) Wind Farm Zone, which is a small 'bulge' on the southwest side of the wind farm zone (see also Figure 0.10). For various reasons, this has been assessed as having no impact:

- The bulge of the wind farm zone that is crossed by the planned route falls outside the sites included in the draft decision for the Hollandse Kust (west) sites (February 2021).[26]
- The bulge does not seem suitable for wind turbines in the future, because it is not in line with the rest of the wind farm zone and may thus pose a hazard to shipping.
- In the draft North Sea Program, the boundary of this area has been adjusted so that the bulge no longer exists.

[25] Archeological values can be protected by leaving the ground in which the values are located undisturbed (preservation in situ).

[26] The draft decisions for Sites VI and VII Hollandse Kust (west) were available for review from 5 February to 18 March 2021. See also https://zoek.officielebekendmakingen.nl/stcrt-2021-5137.html

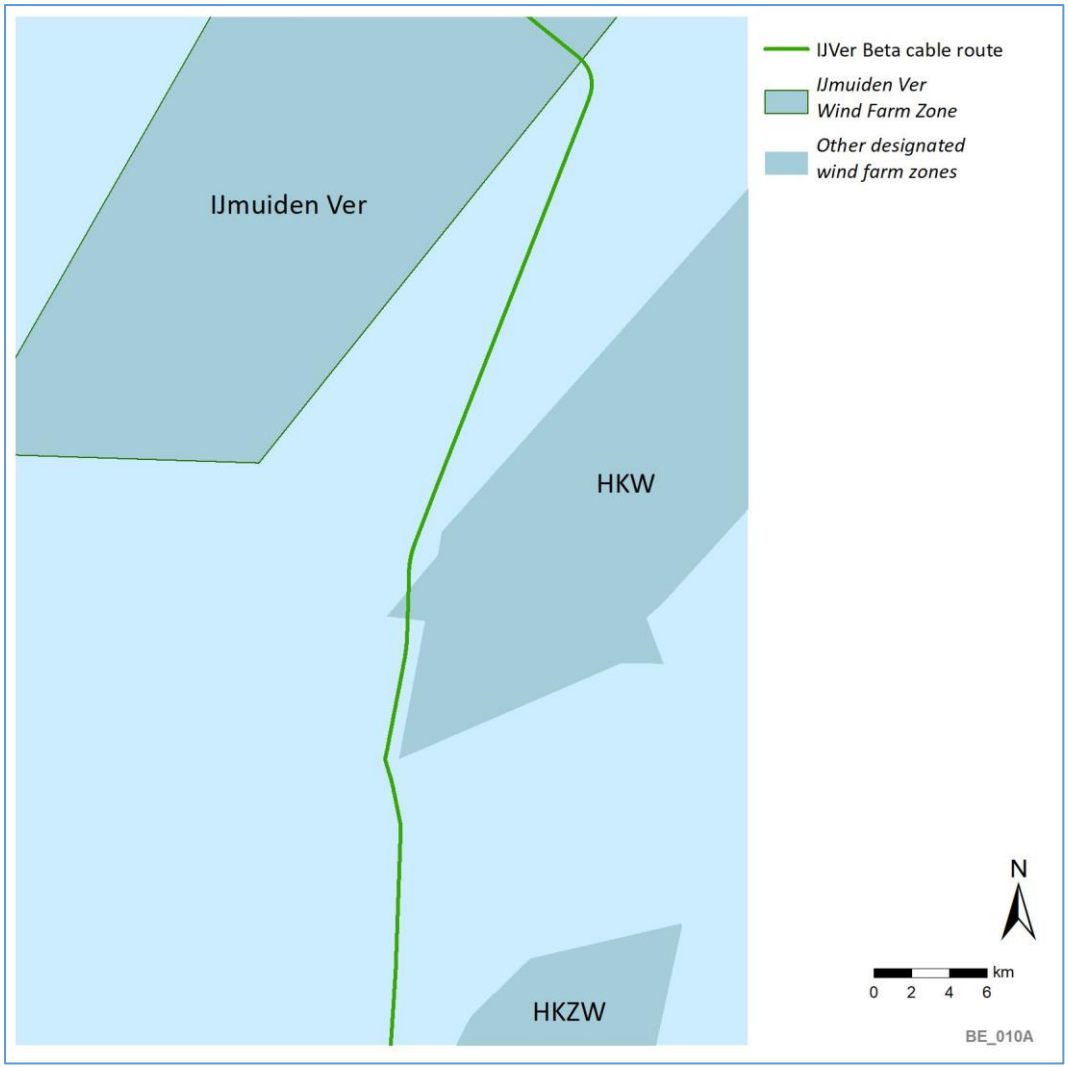

Figure 0.10 The planned route and the designated wind farm zones, crossing Hollandse Kust (west)

The planned route has a slightly negative (0/-) impact for the sub-aspect of sand and shell extraction. The planned route is not located in a priority sand extraction area, but consists largely of a sand layer with a thickness of 6-12 m within the zone reserved for sand extraction. A large part of this layer cannot be extracted due to other spatial functions present in the immediate vicinity such as an anchorage area. As a result, the planned route is not part of a larger continuous area that can be used for sand extraction. The planned route is located in a shell extraction area, but there is plenty of other space in the North Sea to extract shells.

The sub-aspect of areas of dumped munitions and military activities has also been assessed as slightly negative (0/-), because the planned route crosses the Goeree military training area.

The sub-aspects of shipping, UXO and cables and pipelines have been assessed as negative (-). For shipping, this is due to the fact that the planned route crosses of 5 (busy) shipping routes and the temporary disturbance this causes for shipping. One of these routes is the Eurogeul, the access route for major ships to the Port of Rotterdam. The National Harbor Master stipulates the nautical conditions for crossing this shipping lane. And the conditions for the depth at which the cable is buried in the seabed are determined by the managing party, the Directorate-General for Public Works and Water Management. The planned route also crosses the Rijnveld precautionary area

(where several shipping routes converge) and the Maas Noord West Traffic Separation Scheme (TSS[27]).

With regard to the sub-aspect of UXO, areas suspected to contain UXO scattered along the planned route on the North Sea are crossed. The risk of UXO increases, when the planned route runs closer to the coast. This constitutes a medium risk and has been assessed as negative (-). With regard to the sub-aspect of cables and pipelines, the number of cable crossings (18 telecom cables and the BritNed electricity cable) and pipeline crossing (2 pipelines) on the North Sea determines the negative (-) assessment.

Difference between the assessment of the (1x4)-cable configuration and the (2x2)-cable configuration
There are no differences between the impacts on spatial functions and other uses of the (1x4)-cable configuration and the (2x2)-cable configuration; the assessment is the same.

Mitigating measures
Limited mitigating measures are only possible for the sub-aspects of shipping and UXO, but they do not lead to a different impact assessment. With regard to shipping, the risks during the construction phase of the IJmuiden Ver Beta Offshore Grid are limited as much as possible by communicating with ships and, if necessary, the decision can be made to deploy a second guard vessel in busy shipping areas to provide additional protection. The cables will be laid in the planned route in accordance with a safety protocol for UXO. If UXO are found, the possibility of re-routing the cable within the cable corridor will be examined. If this is not possible, the UXO will be cleared.

[27] A traffic separation scheme (TSS) is a routing system to channel shipping traffic in order to reduce the risk of collisions. The places where oncoming traffic must keep a certain distance are indicated.

0.7.4 Conclusions regarding the onshore planned route

This section explains the impact assessment of the onshore 525 kV DC cables. It begins with a table, which is followed by an explanation of the slightly negative (0/-), negative (-) and very negative assessments (--) and mitigating measures.

Table 0.7 Impact assessment IJmuiden Ver Beta Offshore Grid for the onshore planned route

	Planned route	
	Without mitigating measures	With mitigating measures*
Soil and water – onshore		
Change in soil composition	0	N/A
Change in soil quality	0/-	0
Settlement	0	N/A
Change in groundwater quality	0	N/A
Change in groundwater level	0/-	0
Change in surface water quality	0	N/A
Nature – onshore		
Natura 2000 areas		
Disturbance (noise, light, visual)	-	0/-
Mechanical impacts	0/-	N/A
Dehydration	0	N/A
Fertilization and acidification (nitrogen deposition)	0/-	N/A
National Ecological Network (NNN)		
Disturbance (noise, light, visual)	-	0/-
Mechanical impacts	0/-	N/A
Dehydration	0	N/A
Protected species		
Protected species	-	0/-
Landscape and cultural history		
Impact on coherence between specific elements and their context	0	N/A
Impact on geological values	0	N/A
Archeology		
Known archeological value	0	N/A
Expected archeological value	0	N/A
Living environment, spatial functions and other uses		
Oil, gas extraction and geothermal energy	0/-	N/A
Primary flood defense	-	N/A
Unexploded ordnance (UXO)	0	N/A
Cables and pipelines	-	N/A
Impact on spatial functions	0/-	N/A
Impact on the living environment	0	N/A
Recreation and tourism	0/-	N/A

*an assessment is only included if mitigating measures are possible and the impact of these measures is reflected in the assessment

Soil and water – onshore

The onshore planned route only has a slightly negative (0/-) impact on soil quality; there is no impact on the other sub-aspects (0). The Maasvlakte consists mainly of raised soil (sand) that is not very susceptible to settlement and can be restored well. Due to the presence of (slight) contaminations, the planned route can lead to a very small negative change (displacement or further spread) for the sub-aspect of change in soil quality.

Mitigating measures
Mitigating measures for the planned route on the Maasvlakte consist of a remediation requirement if contamination is found during excavation, and returning the pumped groundwater water back into the ground and/or sheet piling at locations where drainage is required. As a result, there is no more impact on the sub-aspects of change in soil quality and change in groundwater level; the assessment for both sub-aspects changes from slightly negative (0/-) to neutral (0).

Nature – onshore
Impacts on nature onshore can be caused by disturbance (noise, light and visual), destruction of habitat or the disturbance or killing of plant and animal species. Impacts on nature are described below for Natura 2000 areas, the National Ecological Network and protected species.

Natura 2000 areas
A small part of the planned route on the Maasvlakte – the southernmost part, parallel to the bend in the Noordzeeboulevard – is located just inside the boundary of the Voordelta Natura 2000 area. The total area involved is approximately 0.15 ha (a strip of approximately 240 meters by 6 meters). Furthermore, there may be an impact on Natura 2000 areas due to external effects via disturbance during the construction phase and/or fertilization and acidification caused by nitrogen emissions during the construction phase.

The disturbance contours overlap with a narrow strip of the Slikken van Voorne in the Voordelta Natura 2000 area and with a small corner of the Voornes Duin Natura 2000 area. The work takes place in an area that is already subject to disturbance in the current situation (caused by for instance traffic, wind turbines and recreation) and the disturbance caused by construction of the planned route is temporary. However, some of the designated non-breeding birds have an unfavorable conservation status and/or have a negative trend (e.g. wigeon, oystercatcher, redshank), as a result of which any disturbance may have a negative impact on the conservation status; this has been assessed as negative (-). The Voornes Duin has conservation targets for four breeding birds; their breeding sites are located outside the area that is disturbed, so there is no impact.

Mechanical impacts occur due to excavation. This concerns a narrow strip parallel to the Noordzeeboulevard where there is no qualifying habitat type. This strip consists of the road verge with strong encroachment of sea buckthorn, and also has no long-term potential for any of the designated habitat types. There is also no habitat for birds with a conservation target. Because the impacts are temporary and there are no qualifying natural values of the Voordelta and any development of these values in the long term will not be compromised, the impacts are assessed as slightly negative (0/-).

The construction of the planned route will require drainage at a few locations. There are no dehydration-sensitive habitat or foraging areas on and along the planned route. Negative impacts due to dehydration are therefore ruled out; the assessment is neutral (0).

Natura 2000 areas – acidification and fertilization caused by nitrogen deposition
During the construction of the IJmuiden Ver Beta Offshore Grid, nitrogen is released due to the use of work vessels and other machinery. Using the emission dispersion model AERIUS, the deposition of nitrogen on nitrogen-sensitive habitat types was calculated. This was done for the entire project, so no breakdown was made for the various project components.

The impacts of acidification and fertilization have been assessed as slightly negative (0/-). The AERIUS calculation shows there is deposition on all nitrogen-sensitive Natura 2000 areas. However, a significant negative impact is ruled out, because the deposition is temporary and so small that it has no ecological impact. This is clear from assessments of specific types of habitat and a general consideration of nitrogen depositions on vegetation.

Difference between the (1x4)-cable configuration and the (2x2)-cable configuration
There are no differences between the assessment of the (1x4)-cable configuration and the (2x2)-cable configuration for acidification and fertilization. The offshore cable configuration is not relevant to the other aspects of nature onshore.

National Ecological Network
The boundaries of the National Ecological Network (NNN) are the same as those of the Natura 2000 area. Only the first part of the planned route, the part in the bend of the Noordzeeboulevard, is located within the boundaries of the National Ecological Network. The area involved is approximately 0.15 hectares. In addition, approximately 1,750 meters of the planned route run directly parallel to the NNN, the Slikken van Voorne.

Where the planned route runs through or directly along the NNN, temporary disturbance (approximately 10 weeks) caused by noise, light or visual aspects will occur due to work during the construction phase. As a result, any birds present may temporarily leave the area. This has been assessed as negative (-).
Due to the construction of the planned route in the NNN (approx. 240 m), the management type present there (open dune) will disappear. After the work has been completed, the area will be available again for nature and open dune can recover. No degradation of the dune forest management type will occur, making the mechanical impacts temporary. The impacts are assessed as slightly negative (0/-). The nature management types and habitats located within the planned route are not sensitive to dehydration. Impacts due to dehydration are therefore ruled out; the assessment is neutral (0).

Protected species
The planned route is mainly located on unused land with vegetation of pioneer conditions.[28] Such pioneer vegetation with open sand is suitable for various protected plant and animal species. The work site for the purpose of cable-laying is part of the habitat of these species. As a result, damage to this habitat or individuals may occur during the work.

The vulnerable, rare root vole is known to occur in the Slikken van Voorne. However, the work will take place outside this habitat (namely in the dry, higher verge north of the Noordzeeboulevard) (Bekker, 2020), as a result of which there will be no degradation of the salt marshes and salt marsh edge zone. Therefore, degradation of habitat is not an issue.

The gull colony does not fall into the category of bird species that are protected all year. A fauna management plan for gulls has been drawn up for the port area, in which parts of the Maasvlakte are reserved as breeding sites for various gull species. The work site for the cable route falls outside

[28] Pioneer vegetation refers to the first plants that grow in a bare and empty area. They generally have a short life cycle and are usually outcompeted by other species over time.

the designated sites, so the planned route does not affect the existing population or the objectives set.

Because the area will be available again to the species after the work has been completed, the impacts that occur are temporary in nature and are assessed as negative (-).

Mitigating measures
To largely avoid the impact of disturbance (caused by noise, light and visual aspects) on animal species, work must be carried out outside specific seasons and periods. This means that work in areas suitable as breeding/reproduction habitat for bird species and/or the natterjack toad and/or the sand lizard must be carried out outside the breeding or active season of these species. If some or all of the work nevertheless has to be carried out during the breeding and/or active season, for example due to well-founded reasons relating to work safety, dispensation is required. Depending on the area and the animal species present, mitigating measures are also needed that will ensure that 1) breeding birds do not breed in certain areas and/or 2) natterjack toads and/or sand lizards cannot reach the work site. This can be done by making suitable (breeding) habitat unsuitable prior to the start of the breeding season or active season (and of the work). If smooth cat's-ear grows on the work site, individual plants must be moved to an alternative growth site. After the work has been completed, the smooth cat's-ear will be replanted on the cable route.

No measures can be taken to prevent mechanical impacts caused by the construction of the planned route in Natura 2000 and NNN areas. Due to lack of space north of the Noordzeeboulevard, a route on the north side of this boulevard is not possible, and there is also insufficient space for construction using boreholes instead of open excavation.

Landscape and cultural history
The onshore planned route has no impact on landscape and cultural history.

Archeology – onshore
The onshore planned route has no impact on known archeological values and expected archeological values.

Living environment, spatial functions and other uses – onshore
The sub-aspects of oil, gas extraction and geothermal energy, recreation and tourism, and impact on spatial functions have all been assessed as slightly negative (0/-). The planned route results in a very slight restriction on the exploration permit for geothermal energy on the Maasvlakte. At the Maasvlakte beach there is beach tourism in the form of bathing and kitesurfing. The locations of the entry and exit points of the boreholes, transition joints and the work sites around them will be closed to recreation for several weeks. There is also a temporary restriction on parking and accessibility of the beach during cable-laying. During the operation phase, there is no impact on beach tourism, as the cables are buried below the surface, they are not visible and are not an obstacle. However, due to the temporary impediments to beach recreation, there is a slight negative impact (0/-) on recreation and tourism.

Overall, the sub-aspect of impact on other spatial functions has been assessed as slightly negative (0/-). With regard to this sub-aspect, infrastructure crossings, high-risk establishments and possible impacts on and from wind turbines were examined among other things. The slightly negative

assessment is due to the high density of hazardous materials sites and pipelines in the vicinity of the planned route and the location of the planned route within part of the wind farm search area of the municipality of Westvoorne. The locations of future wind turbines within this search area are not known, but it is possible that the planned route constitutes an additional constraint to the layout of the wind farm search area. TenneT has deemed the risk from the existing wind turbines along the Noordzeeboulevard for the planned route acceptable.[29]
The sub-aspect of impact on spatial functions includes impact on railroads. There are several railroads for the transport of goods. The planned route runs parallel within 700 meters for about 3 km. In coordination with all stakeholders, it is ensured that the planned route will cause no unacceptable disturbance to railroads.

The sub-aspects of primary flood defense and cables and pipelines have been assessed as negative (-). The planned route crosses the sea defense around the Maasvlakte and near the Oostvoornse Meer it runs for a limited length in the protection zone of the primary flood defense of the Hollandse Delta Water Board. The sea defense around the Maasvlakte is not officially a primary flood defense, but is treated as such by the West Nederland Zuid Directorate-General for Public Works and Water Management. The starting point is that the requirements of the party managing the flood defense are met. Because crossing the flood defense is complex and the location in the protection zone of a primary flood defense entails specific requirements, the sub-aspect of primary flood defense has been assessed as negative (-). A negative impact (-) is also expected for the sub-aspect of cables and pipelines. The limited space available when crossing cables and pipelines is the reason for this assessment. These cables and pipelines also include the above-ground 380 kV high-voltage connections Maasvlakte-Simonshaven and Westerlee-Maasvlakte; part of the planned route will be constructed underneath these high-voltage connections. Working safely is not part of the assessment in the EIA, but it is a point of attention for the execution phase.

Mitigating measures
The route already takes into account all the spatial functions on the Maasvlakte as much as possible. Further optimization of the planned route is not possible. Impermissible disturbance of cables and pipelines and impact on railroads is ruled out through detailed engineering and if necessary by mitigating measures in order to resolve impermissible impact (electrical, thermal), and is part of the planned route. The impact assessment does not change for all these sub-aspects.

[29] This is not considered a safety risk but a consideration of the likelihood of damage to the electricity grid and security of supply.

0.7.5 Conclusions regarding the converter station

This section explains the impact assessment for the converter station. It begins with a table, which is followed by an explanation of the slightly negative (0/-), negative (-) and very negative assessments (--) and mitigating measures.

Table 0.8 Impact assessment for the converter station

	Converter station	
	Without mitigating measures	With mitigating measures*
Soil and water – onshore		
Change in soil composition	0	N/A
Change in soil quality	0	N/A
Settlement	0	N/A
Change in groundwater quality	0	N/A
Change in groundwater level	0/-	0
Impact on surface water quality	0	N/A
Nature – onshore		
Natura 2000 areas		
Disturbance (noise, light, visual)	0	N/A
Dehydration	0	N/A
NNN		
Disturbance (noise, light, visual)	0	N/A
Dehydration	0	N/A
Protected species		
Protected species	-	N/A
Landscape and cultural history		
Impact on the characteristics of the area	+	N/A
Impact on the coordination between specific elements and their context	0	N/A
Impact on visibility and experience	+	N/A
Impact on geological values	0	N/A
Archeology		
Known archeological value	0	N/A
Expected archeological value	0	N/A
Living environment, spatial functions and other uses		
Unexploded ordnance (UXO)	0	N/A
Cables and pipelines	0	N/A
Impact on spatial functions	0	N/A
Impact on the living environment	0/-	0
Recreation and tourism	0	N/A

*an assessment is only included if mitigating measures are possible and the impact of these measures is reflected in the assessment

Soil and water – onshore

For the construction of the converter station, drainage is required, which will cause a (temporary) change in the groundwater level. This impact is slightly negative (0/-).

Mitigating measures

By returning the pumped groundwater water back into the ground and/or sheet piling, if necessary, impacts on the groundwater level can be limited, so that no impacts occur.

Nature – onshore

The converter station site is located outside the boundaries of Natura 2000 areas and the NNN; immediate negative impacts can therefore be ruled out in advance. The Voordelta Natura 2000 area is at least 2,500 meters away from the construction site. Due to its location on the industrial estate and behind the flood defense, disturbing impacts (noise, light and optical disturbance, and dehydration) on Natura 2000 values are not an issue.

The only factor relevant to Natura 2000 areas is the impact of nitrogen deposition. This applies to Natura 2000 areas close to and further away from the converter station location. No separate calculation and impact assessment have been carried out for the location of the converter station. Please refer to the section about the onshore planned route.

The site for the converter station on the Maasvlakte is unused land with vegetation of pioneer conditions. Such pioneer vegetation with open sand is suitable for various protected plant and animal species. Only smooth cat's-ear grows near the construction site, so construction may result in a decrease in available growth sites. For the aspect of protected species, the realization of the converter station is therefore assessed as negative (-). It should be noted that smooth cat's-ear is a species of pioneer conditions, for which even under natural conditions growth sites disappear quickly and recolonization takes place elsewhere. Ample alternative growth sites remain on the Maasvlakte.

Mitigating measures

To avoid disturbance or destruction of nests, work must be done outside the breeding season. Alternatively, it must be ensured prior to the breeding season that suitable nesting habitat is not present where work is carried out. For the natterjack toad, it must be ensured that no animals are present on the work site and that animals can also no longer reach the site during the work causing the disturbance. If smooth cat's-ear is present when work starts, individual plants must be moved to an alternative growth site.

Landscape and cultural history

The converter station is not expected to have any adverse impact on landscape and cultural history.

The Maasvlakte is visible from the coast of Voorne and Hoek van Holland from a great distance due to high elements such as container cranes, chimneys and wind turbines. The converter station is located in an area designated for distribution. Around the site, container terminals dominate the horizon. In terms of visibility and perception from the surrounding area, the converter station blends into the industrial landscape. Up close, the converter station is perceived to fit in with the association of Maasvlakte 2 as an industrial landscape and the energy supply of the wind turbines already present.

Archeology – onshore

The converter station has no impact on archeological values; mitigating measures are not an issue. It is possible that accidental finds may be discovered, in which case they should be reported to the competent authority. If it is not possible to change the plan (i.e. if preservation in situ is not possible), the only option is to document the archeological values that will be destroyed (preservation ex situ). This does not qualify as a mitigating measure.

Living environment, spatial functions and other uses – onshore
The impact on the living environment is slightly negative (0/-). This is due to noise and the magnetic field of the AC part of the converter station. Calculations show that the 0.4 microTesla (µT) magnetic field contour extends up to 50 meters beyond the converter station site. No sensitive objects are located within this contour.[30]

During the exploitation phase, the converter station produces noise, which comes from various noise sources that are present (transformers, the converter coolers, the converter hall, the DC hall and the transformer coolers).[31] It follows from the noise calculations that the converter station will not fit within the noise zone without additional measures. No noise-sensitive objects are located within the 40 dB(A) per 24-hour period noise contour of the converter station.

Mitigating measures
With sound-insulating enclosures, the noise impact of the converter station can be limited and the converter station fits within the noise zone. With this measure, the impact for the sub-aspect of impact on the living environment is assessed as neutral (0).

0.7.6 Cumulation

IJmuiden Ver Alpha and Beta Offshore Grids
The IJmuiden Ver Alpha Offshore Grid is an important development for the IJmuiden Ver Beta Offshore Grid. The impact of these projects may be cumulative, but this partly depends on when the grids are constructed and the time between construction of each grid. The IJmuiden Ver Alpha Offshore Grid is expected to be constructed between 2024 and 2027, and the IJmuiden Ver Beta Offshore Grid between 2024 and 2028. Alpha is therefore expected to be constructed first. Three scenarios have been described for assessing cumulative impacts:

1. Construction of the IJmuiden Ver Alpha and Beta Offshore Grids in **the same season**. The work may take place with a period in between or be carried out simultaneously;
2. construction of the IJmuiden Ver Beta Offshore Grid **one year after** the IJmuiden Ver Alpha Offshore Grid;
3. construction of the IJmuiden Ver Beta Offshore Grid **two years after** the IJmuiden Ver Alpha Offshore Grid;

Below is a general description of whether and for which environmental aspects cumulation can occur for the IJmuiden Ver Alpha and Beta Offshore Grids. The cumulation is the same for the (1x4)-cable configuration and the (2x2)-cable configuration, except for the nature aspect where a difference arises in the cumulation of turbidity. This difference is explained under 'Nature'.

IJmuiden Ver Alpha, Beta and Gamma Offshore Grids
Decision-making on the IJmuiden Ver Gamma Offshore Grid is expected to take place after decision-making on the IJmuiden Ver Beta Offshore Grid and the IJmuiden Ver Alpha Offshore Grid. Therefore the IJmuiden Ver Gamma Offshore Grid does not constitute an autonomous development for the IJmuiden Ver Beta (and Alpha) Offshore Grid(s). The yet-to-be-drafted IJmuiden Ver Gamma Offshore Grid EIA will address cumulative impacts of the IJmuiden Ver Alpha, Beta and Gamma Offshore Grids.

[30] More information about the magnetic field can be found in Appendix XII-C of Part B.
[31] More information on noise, including noise impacts on fire stations and low-frequency noise, can be found in Chapter 9 (for instance in Section 9.5.2) of Part B.

Soil and water – offshore

If the IJmuiden Ver Alpha and Beta Offshore Grids are constructed simultaneously, the seabed will only be disturbed once, which is favorable compared to the other scenarios. Because the disturbed surface of the seabed recovers quickly, there is no cumulation if one connection is constructed one or two years after the other. With simultaneous construction, seabed recovery may take a little longer.

Nature – offshore and onshore

Platform

- **Habitat degradation**
  By constructing the Alpha and Beta platforms, the habitat of a slightly larger area of seabed changes permanently. This area is not relevant compared to the total area of seabed available. The construction of both platforms takes place outside areas protected by the Habitat Directive. There is therefore no cumulation.
- **Disturbance – above water**
  The impacts of disturbance are usually either very temporary (in which case animals are not additionally affected by a recurrence), or of such consequence that animals do not make it to the next season. The realistic probability of the same organism experiencing disturbance twice from consecutive activities is difficult to determine, mainly due to the mobile nature of many species. The disturbance from the platforms is not located within the Bruine Bank Natura 2000 site and will not have an impact there. In addition, the platforms are far enough apart that there will be no overlap in above-water noise. There is therefore no cumulation.
- **Disturbance – underwater**
  For underwater disturbance from continuous noise the same applies as for above-water disturbance. Both platforms were included in the Ecology and Cumulation Framework, and assessed there in cumulation. By following this framework, the reinforcing effect of simultaneous pile-driving can be ruled out. Cumulative impacts due to impulse noise from the two platforms, if they are constructed one after the other is thus not ruled out, but assessed as ecologically acceptable through the Ecology and Cumulation Framework.

Planned route

Northwest of the Hollandse Kust (west) Wind Farm Zone, the planned routes of the IJmuiden Ver Alpha and Beta Offshore Grids come together to run parallel over a length of approximately 79 km, until they reach the Goeree light platform. The various assessment criteria are described below:

- **Habitat degradation**
  Habitat degradation occurs at the cable routes of the IJmuiden Ver Alpha and Beta Offshore Grids. Given the distance between the cables, habitat degradation does not overlap. The habitat will recover on both routes. Given the limited size and area of the impact, the impacts are not noticeable at the ecosystem level, even if construction occurs in the same season. There is no cumulation of impacts.
- **Underwater disturbance**
  Underwater disturbance in the form of underwater noise may occur during sailing. This underwater noise is continuous, and temporary in nature. Underwater noise will reach into the Bruine Bank. This area is designated for six bird species, which experience little or no impact from underwater noise. Fish and marine mammals have adequate fallback options. Thus, there is no demonstrable difference between the various scenarios for disturbance from underwater noise.

- **Above-water disturbance**
  The planned routes run near the Bruine Bank Natura 2000 area, where there are high volumes of molting and foraging birds. These birds will also be present along the planned route. In scenario 1a, this above-water disturbance will occur twice within a season. In scenario 1b, disturbance will be a one-off event, but over a larger area. For scenarios 2 and 3, there is at least a year in between. The parallel section of the route is located at least 16 km from the coast, so there will be no difference between the scenarios in terms of impact of above-water disturbance on shorebirds or seals resting on sandbanks. Disturbance affects the behavior of birds, e.g. increased alertness and fleeing from the source of the disturbance. In theory, disturbance twice in a short period, as would be the case in scenario 1a, could be more burdensome than if this disturbance was spread out more over time, given the energy reserves of molting/diving birds. In practice, large parts of the parallel part of the planned routes are already disturbed by normal shipping activity. As a result, a limited but not demonstrable difference is foreseen between the different scenarios in terms of above-water disturbance.
- **Turbidity and sedimentation**
  The sediment clouds that are released and the sediment that is deposited during the laying of the 525 kV DC cables of the IJmuiden Ver Alpha and Beta Offshore Grids are small in size and are only present for a short period of time. If construction takes place in the same season with or without simultaneous construction, there are no impacts of cumulation between the IJmuiden Ver Alpha and Beta Offshore Grids (for a detailed analysis, see the Appropriate Assessment for the IJmuiden Ver Beta Offshore Grid).
  Compared to the (1x4)-cable configuration, simultaneous construction of the routes of the IJmuiden Ver Alpha and Beta Offshore Grids in the (2x2)-cable configuration changes the cumulative impact of turbidity. The increase in the scope of turbidity during the laying of the (2x2)-cable configuration affects the ability of the little tern and common tern to capture their prey and their flight options on Maasvlakte 2, which could jeopardize their conservation status. Based on the modeled data, it is estimated that the sediment cloud will dissipate in just over 4 months. If the other cable is laid after this time period, there is little or no cumulation, so laying cables also has no impact on the little tern and common tern.
- **Electromagnetic fields**
  The electromagnetic fields around the 525 kV DC cables of the IJmuiden Ver Alpha and Beta Offshore Grids will extend up to 20 m horizontally. As the cables will be located at a distance of 200 m from each other, there will be no cumulation between them. There will be no demonstrable difference between the three scenarios.

Archeology

Possible cumulation occurs between the offshore planned routes of the IJmuiden Ver Alpha and Beta Offshore Grids. Due to the parallel laying of the cables over a length of approximately 78 km offshore, there is a lot of disturbance of the seabed. If this results in less space to spare archeological values, the impacts on archeology may increase. It should be noted though that the parallel position of the cables takes up less space compared to positioning the cables separately. This is regardless of whether the projects are constructed in the same season or whether the IJmuiden Ver Beta Offshore Grid is constructed 1 year (or more) after the IJmuiden Ver Alpha Offshore Grid.

Spatial functions and other uses

If the IJmuiden Ver Alpha and Beta Offshore Grids are laid in the same season, temporary impacts can arise twice in succession, especially where the planned routes for Alpha and Beta run parallel to

each other (in the North Sea). There is also more marine traffic during the construction phase. This means a certain surface area that will be temporarily unavailable for fishing, water sports and recreational boating. This area of the North Sea can relatively easily be avoided by other users of the space. This also applies at the transition joints, where cable ships will be present for 7 to 10 days to connect the cables while they are being laid. Shipping will encounter two hindrances at the crossing of the Eurogeul and Rijnveld. This does not change the impact assessment.

Cumulation with other projects
The only aspect for which there may be cumulation with other projects is nature offshore. For this aspect, there are two sub-aspects that have no impact on their own, but may have an impact in combination with other projects.

Underwater impulse noise
Due to the spatial overlap, the impact of the construction of the IJmuiden Ver wind farm could cumulate with the impact of laying the IJmuiden Ver Alpha and Beta Offshore Grids. Simultaneous construction and cable laying can amplify the impact of underwater and above-water disturbance. However, the Ecology and Cumulation Framework already takes this into account, so if the conditions outlined in this framework are met, cumulative impacts of the IJmuiden Ver Alpha and Beta Offshore Grids and the IJmuiden Ver wind farm can be ruled out.

EM fields
Electromagnetic fields must overlap for them to have cumulative effects. The cables of the IJmuiden Ver Alpha and Beta Offshore Grids are located 200 meters apart in the parallel part of the planned routes, which means that the magnetic fields do not overlap. The BritNed cable also runs parallel in part to the IJmuiden Ver Beta Offshore Grid, in the last part of the planned route up to the shore landing at the Maasvlakte. The BritNed cable is located at least 500 meters away from the IJmuiden Ver Beta Offshore Grid. As a result, there is no (ac)cumulation between these fields.

0.7.7 Key knowledge gaps

For the aspect of **Soil and water – offshore**, the most important knowledge gap concerns the structure of the subsoil of the seabed. The presence of silty deposits and peat is particularly relevant. Before cable-laying in the planned route, a soil survey into the structure of the subsoil will be carried out, and the results will be made available prior to the start of this phase.

For the onshore planned route and the converter station on the Maasvlakte, the available monitoring wells provide limited insight into groundwater levels. The environmental impacts for the sub-aspect of change in groundwater level are based on data from monitoring wells that are part of drainage advice for the Maasvlakte (Deltares, 2019; Tauw, 2016) and snapshots of groundwater levels when making boreholes (Antea Group, 2020). This monitoring data provides very limited insight into the fluctuation of the groundwater system on the Maasvlakte. Locally, there may still be a higher or lower groundwater level. This can lead to other impacts such as a change in groundwater level and spread of contaminations due to drainage. By returning the pumped groundwater water back into the ground, the area of influence of drainage can be greatly reduced and dispersion of contamination minimized, reducing impacts. At the time of writing this summary, Antea is working on a measurement grid to monitor groundwater levels and get a good picture of the soil structure. For the indicative drainage advice, the most recent information was used (Antea, May 2021).

There are some knowledge gaps for the aspect of **Nature – offshore**. The gaps are already known to the competent authority and play a role in all similar projects. The impacts of electromagnetic fields around cable systems are not fully known. The impact of these cable systems on the foraging and migration of marine mammals and fish is unclear. The magnetic field may have a negative impact on the orientation of whales and dolphins. For birds, there are knowledge gaps about collision risks and disturbance due to the presence of the platforms and activities on them. With regard to marine mammals and fish, there is a knowledge gap in the relationship between the degree of disturbance to individual animals and population effects. There are also still knowledge gaps about the impact of turbidity on the relationship between water transparency and the foraging success of birds that rely on sight to find food. Finally, based on the available literature, no definitive answer can be given about the exact impact of continuous underwater noise produced by ships on birds, fish and marine mammals.

For the aspect of **Nature – onshore**, there is a knowledge gap about the potential negative impact of electromagnetic fields on natural values. It is currently assumed that electromagnetic fields from underground cables have no negative impact on protected natural values. There are no practical indications of a negative impact based on existing cables in the soil. However, knowledge about this is limited, so it can be viewed as a knowledge gap. However, it only concerns impacts directly around the cables. The magnetic field rapidly loses strength and is local, so any impact at a greater distance, such as on the navigation of migratory birds during migration, can certainly be ruled out.

For the aspect of **Archeology – offshore**, the knowledge gap partly consists of verifying the expected archeological value on the seabed and underneath it. Surveys are still being conducted for this purpose; these results will be available prior to the decision-making.

For the aspect of **Spatial functions and other uses – offshore**, there is a knowledge gap in terms of UXO. UXO may be present on the planned route, but the exact locations and types of UXO involved are unknown. This knowledge gap can be closed by following the safety protocol for UXO in the form of an on-site survey, which can provide a definitive answer.

COLOPHON

IJmuiden Ver Beta Offshore Grid
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