

Non-technical summary

1.1 Introduction and motivation for the supplementary EIR

Elia Asset NV obtained a construction permit, an operating license and a Natura 2000 permit for the Modular Offshore Grid 2 (MOG2), currently better known as the Princess Elisabeth Island (PEI) project.

For the landing of the export cables, a landing method is currently envisaged that was not discussed in the environmental impact report (EIR) for the MOG2/PEI project and is not included in the permits for the project. This concerns the dredging of canals and basins in the coastal zone to serve as an access channel for the cable-laying vessel. The access channels and basins are necessary to limit installation risks during the installation of the cables by the cable-laying vessel close to the coast and when pulling the cables ashore.

This report supplements the EIR and describes the environmental impact of this new landing technique. This supplementary EIR will only discuss the effects that may differ from those already assessed in the initial EIR.

1.2 Project description

1.2.1 Description of the various activities and methods of implementation

1.2.1.1 New burial technique with access channels

The landing method with access channels consists of dredging wide trenches near the coast to allow the cable-laying vessel to come closer to the coast and to keep the vessel afloat while pulling the cables ashore. This requires a water column of at least 6 m LAT. The access channels must be dredged from approximately KP1.5 to KP10.5 for each individual cable route or for several bundled cable routes. KP1.5 is located at a distance of approximately 800 m from the baseline (~ 0 m LAT).

Depending on the contractor, turning basins will also be dredged. The basins are deeper and have multiple functions: the basin at KP1.5 is designed to allow the cable-laying vessel to turn in the direction of the current while cable installation is already underway. The intermediate basins for LOT2 also provide additional manoeuvrability for the cable-laying vessel during cable laying and also serve as an emergency measure: in the event of unforeseen deterioration in weather conditions, the cable-laying vessel can temporarily retreat to one of these basins (in survival mode) without the cable having to be cut.

After laying and pulling the cable ashore, it will be buried using one of the methods described in the EIR for the MOG2/PEI project.

1.2.1.1.1 Dimensions, footprint, dredging volumes

Table 0-1 provides an overview of the dimensions and characteristics of the access channels per LOT.

- For **LOT1**, three channels will be provided (one per export cable).
- For **LOT2**, a single wider access channel with four turning basins is planned for the installation of three export cables.
- **LOT3**: The landing method for the last two cable trenches is not yet known. Work can be carried out using both variants of the access channels described, or no access channels can be constructed at all. For the purposes of the impact assessment, the worst-case scenario is assumed to be that two access channels will be used for the landing of the last two cables, i.e. the variant with the largest dredging volume.

The method of constructing the access channels therefore depends on the contractor. The contractors for LOT1 and LOT2 were selected after completing an extensive European tender procedure for the design, production, and installation of the export cables. The technical solutions proposed by the selected contractors for LOT1 and LOT2 as a landing method for the cables are part of a complete package, which was assessed favorably for value for money, and are a consequence of the type of vessels in their fleet (or can be contracted) and the type of equipment the contractor in question has for cable burial (and which is suitable for the specific soil conditions in this zone). As a result, there are differences in the exact design of the access channels.

Each access channel has approximately the following dimensions (this varies per LOT and per channel, see Table 0-1):

- Length: 7 to 9 km
- Width: 50-55 m at the bottom of the trench
- Depth: 1 to 2 m
- Trench slope 1V:12H or 1V:3H
- Potentially equipped with four turning basins, measuring 150 m x 150 m and 2 m deep (LOT2)

Maintenance dredging is foreseen to keep the channel open until installation.

Table 0-1: Dimensions and properties of the access channels per lot

	LOT1	LOT2	LOT3 (worst case assumptions)	TOTALS for impact assessment
Access channels				
Required water depth	6 m LAT	6 m LAT	6 m LAT	6 m LAT
Length of the channels (m)	7,000	8,500	7,000	7,000
Between KP's	KP2 – KP9	KP1.5 - KP10	KP2 – KP9	Max. KP1.5 - KP10.5
Width of channels at the bottom (m)	50	55	50	50-55
Depth of channels (m)	Variable between 1 and 2	1	Variable between 1 and 2	Variable between 1 and 2
Slope	1V:3H	1V:12H	1V:3H	1V:3H or 1V:12H
Number of channels	3	1	2	6
Volume to be dredged per channel (m³)	Channel 1: 400,000 m³ Channel 2: 420,000 m³ Channel 3: 445,000 m³	945,000	Channel 1: 445,000 Channel 2: 445,000	Varies between 400,000 and 945,000 per channel
Total volume to be dredged during construction (m³)	1,265,000	945,000	890,000	3,100,000
Maintenance dredging (m³)	270,000	250,000	180,000	
Turn basins				
Required water depth	NA	6.5 m LAT	NA	6.5 m LAT
Dimensions (m)	NA	150 L x 150 W x 2 D	NA	150 L x 150 W x 2 D
Quantity	0	4	0	4
Total volume to be dredged – per channel (m³)	NA	259,000	NA	259,000
TOTAL				
Total volume to be dredged during construction (m³)	1,265,000	1,204,000	890,000	3,359,000
Total volume to be dredged including maintenance dredging (m³)	1,535,000	1,454,000	1,070,000	4.059.000

1.2.1.1.2 Turning basins

For LOT2, four turning basins will be dredged at the access channel, one at the Cable Laying Vessel (CLV) stand-off position at KP1.5 and three others spread over the length of the access channel.

By using this turning basin at KP1.5 and the access channel, the CLV can pull the cable onto the beach without the need for anchors, significantly reducing the risk of damage to already installed subsea cables, including already installed MOG2 subsea power cable system cables, and avoiding the complexity of controlled 'beaching'.

For LOT1, a variant is considered in which turning basins are also constructed instead of access channels.

1.2.1.2 Disposal zones

The volumes to be deposited have been calculated in Table o-2. Due to the coastal location of the access channels and the local soil composition, disposal zones '3' and '4' are considered in this EIR as the most suitable disposal locations (close by and similar soil composition).

For one of the conditions of use of the environmental permit for the MOG2 project (Decree dated 26/09/2023), consultations were held with the Maritime Access department regarding the use of zone 4. This consultation recommended splitting the zone, with Elia using only the western portion to distribute the material as evenly as possible. For the current dossier (supplementary application for the construction of access channels), Elia assumes that the same recommendation applies to the use of zone 4, and therefore only the western portion of zone 4 is being considered as a location for the disposal of sediment resulting from the dredging of access channels and basins.

Other alternative disposal locations and strategies considered but not retained are discussed in the alternatives chapter (1.3.1.2).

Table o-2: Deposited volume

	LOT1	LOT2	LOT3 (worst case)	TOTALS
Total volume to be dredged, including maintenance dredging (m³)	1,535,000	1,454,000	1,070,000	4,059,000
Deposited volume (m³)*	1,074,500	1,017,800	749,000	2,841,300

*The deposited volume is equal to the total volume to be dredged, excluding 30% assumed losses during dredging and deposition (by means of valves).

1.2.1.3 Cable installation

The cables will be buried in the access channels. The effects of the cable installation have already been discussed in the initial EIR. Acceptable effects were estimated for all installation techniques.

The cables will be buried in the access channels at LOT1 using a jet trencher. The cable-laying vessel will first lay the cable in the relevant access trench. The ship then returns (or another ship arrives) and positions the jet trencher above the cable. This trencher creates a trench in the seabed by fluidising the bottom material in front of the jetting arm, where nozzles are mounted. The cable sinks into the fluidised trench under its own weight.

LOT2 uses Controlled Flow Excavation (CFE). CFE works by creating a water column, the volume and pressure of which can vary depending on the seabed conditions. The water column excavates the seabed, allowing the export cable to sink under its own weight. The soft seabed and high sediment mobility in this coastal zone result in rapid natural closure and natural filling of the seabed.

Different installation techniques are therefore being considered for LOT1 and LOT2. The differences relate to the vessels and the type of equipment available to the selected contractor, or available for contracting by the contractor, which is also suitable for successfully burying the cables in an area with very soft sediments.

1.2.1.4 Cable joints

In order to allow greater flexibility in the timing of the landing of the various cables on the beach (given the building restrictions in force on the beach during the summer period) and to limit the capacity required from the cable-laying vessel, the cables will be laid in two sections. Both sections will then be connected to each other by means of a joint (connection sleeve). This was already addressed in the initial EIA.

1.2.1.5 Landing on the coast

The cables will be landed by keeping the export cables afloat on air cushions and pulling them directly from the ship onto the beach, where the submarine cables will be connected to the land cables in connection pits.

The landing of the cables has already been discussed in the initial EIR.

1.2.2 Planning and phasing of the project

The three lots will be dredged in separate periods (Table 0-3). The planning for LOT3 is still unknown. It is assumed that this lot can also be completed within a period of 6 months.

The export cables will never be landed during the summer period, given the restriction on carrying out work on the beach in July and August. Dredging activities at sea for the construction of the access channel and basins may continue during this period (the dredging works are at least 800 m from the low-water line).

Table 0-3: Planning and phasing of the project

Lot	Ship	Start date	End date *including WDT P50 and risk buffer	Duration (months)
LOT1	Ship 1	27/10	18/04/2027	6
	Ship 2	13/12/2026	16/03/2027	3
LOT2	Ship 1	27	16/02/2028	6
LOT3	Ship 1			6

1.2.3 Ship movements during the construction phase of the access channels

1.2.3.1 Overview of ships

Dredging and disposal will be carried out using trailing suction hopper dredgers.

1.2.3.2 Ship movements and sailing time at sea

Ships will have to travel approximately 880 times from the dredging location to the disposal zone and back (i.e. number of ship movements). This was calculated based on the volume to be dredged and the bunker volume of the proposed ships (Table 0-4).

Table 0-4: Calculation of number of ship movements and sailing time in continuous working days (24 hours/day)

Lot	Volume to be dredged including maintenance (m³)	Ship's hold volume (m³)*	Number of ship movements (=dredging volume/hold volume)	Sailing time continuous (days)**	Sailing time continuous (hours)
1	1,535,000	5,600	275	69	1,656
2	1,454,000	3,500	416	104	2,496
3	1,070,000	5,600	192	48	1,152
Total	4,059,003		883	221	5,304

*Worst case 3,500 m³ hold; but assumption LOT3 as LOT1, i.e. with 5,600 m³ hold

** Assumption: 4 ship movements at sea per full working day (2x to disposal zone and back)

1.3 Alternatives chapter

1.3.1 Location alternatives

1.3.1.1 Alternative cable route

The Blankenberge/Zeebrugge landing zone was selected for the Ventilux project to receive the export cables from Princess Elisabeth Island. The cable route from the island to Blankenberge/Zeebrugge has not been changed since the initial Environmental Impact Assessment (EIA). Since the landing zone has been established, there are no further location alternatives to consider.

1.3.1.2 Alternative locations for dumping the dredged sediment

This chapter explains alternative landfill zones and strategies that were not retained for further analysis in this supplementary EIR.

1.3.1.2.1 Filling of cable trenches or access channels

Refilling the access channels and cable trenches by dredging back disposed sediment is not planned. It is expected that both the cable trenches and the access channels will fill quickly and naturally due to the soft soil and high sediment mobility in the nearshore zone. For this reason, there is no significant added value in directly disposing dredged material from LOT2 on top of the newly installed LOT1 export cables. Furthermore, the two operations are not compatible in time. Therefore, disposing dredged material from LOT2 to fill LOT1 trenches or channels will not be considered or further investigated.

1.3.1.2.2 Reuse outside the project

In a meeting with Maritime Services and Coast on December 12, 2024, the possibility of reusing the dredged material was discussed. No options were found; most of the dredged material is too soft and silty for beach renourishment. Therefore, reuse of the dredged material is not foreseen.

1.3.1.2.3 Disposal in the direct vicinity of the access chanals

Following informal internal consultations between various advisory bodies, Elia was advised by MUMM in June 2025 to investigate the possibility of dumping the dredged sediment in the vicinity of the access channels (distributed along the channels). However, further practical development of this alternative revealed that it was technically unfeasible due to the limited water depth in the area surrounding the access channels. Due to this technical and economic limitation in water depth and various concerns, this alternative will not be investigated further.

1.3.1.2.4 Disposal in designated disposal sites and other search zones in the Marine Spatial Plan

The designated disposal zones or other search zones for dredged material disposal, as defined in the Marine Spatial Plan 2020-2026 or the Draft Marine Spatial Plan 2026-3034, could be selected as the location for disposing dredged material from the access channels and basins.

Nearly all disposal zones and search zones have a depth of less than 10 m LAT. Disposal zone S1 does have sufficient depth. However, using this zone results in an additional shipping distance. Moreover, this is an intensively used zone where sediment from maintenance dredging works is disposed from shipping routes to ports. Therefore, disposing sediment from the access channels in S1 is considered undesirable.

For these reasons, disposing dredged sediment from the access channels in the dumping zones and other search zones of the Marine Spatial Plan is considered unfeasible and will not be investigated further.

1.3.2 Technical alternatives

1.3.2.1 Cable burial technique

In the initial EIR, the pre-trenching technique was discussed in detail in the impact assessment (largest volumes) as a worst-case technique, but advanced cable ploughing was also considered as a second option. The new alternative is a new worst-case alternative with an increase in dredged volumes and disturbed surface area.

1.3.2.2 LOT3 configuration

For LOT3, the worst-case scenario is assumed, whereby two cable trenches are dredged for two separate cables.

1.3.2.3 Reduced variant for LOT1

For LOT1, this supplementary environmental impact assessment (EIA) considers three access channels (one per export cable). This represents the worst-case scenario for LOT1. The LOT1 contractor is also considering a variant in which no access channels are dredged, but only a turning basin at KP1.0-2.0 for each access channel. The total dredging works for this variant are estimated at approximately 500,000 m³ and a disturbed surface area of 36,000 m² (3 x 200 m² x 60 m²). This represents a significant reduction compared to the worst-case assumption with the construction of three access channels (total volume of 1,265,000 m³ and disturbed surface area of 1,619,230 m²). Therefore, this EIA only describes and assesses the worst-case scenario for LOT1, namely the construction of three access channels. Only limited effects are expected for the reduced variant.

1.4 Impact assessment

This chapter describes and evaluates the potential environmental effects per discipline using the same methodology as the initial EIR. Where relevant, the effect of the project on achieving the good environmental status (GES) of the Marine Strategy Framework Directive (MSFD) is also assessed. The GES is an ecological standard that ensures that marine ecosystems are healthy, clean and productive (Belgian State, 2025).

The method and reference situation have not changed; please refer to the initial EIR for this. For gaps in knowledge, mitigating measures and how the effects can be monitored, please also refer to the initial EIR, as no relevant changes are expected for the alternative landing technique (unless otherwise stated for specific effects).

Finally, it should be noted that this supplementary EIR only describes the environmental effects during the construction phase. The new alternative involving the dredging of access channels and basins has no impact on the operational and decommissioning phases.

A scoping exercise was carried out for each discipline to determine whether there are any reasons to expect different effects that would require the assessment to be supplemented in relation to the initial EIR.

1.4.1 Soil

1.4.1.1 Dredged volumes

A total of **approx. 4 million m³** of sediment will be dredged and then permanently deposited in disposal zone 3 or 4. Based on previous experience, losses during dredging and disposal of sandy material are estimated at approx. 30%. For this alternative landing technique, this amounts to approx. 2.8 million m³ that will effectively end up permanently on the seabed. No backfill is foreseen of the access channels.

The total dredged volumes of the alternative landing technique means more than a doubling (x 2.63) of the initially discussed worst-case scenario with trenching.

1.4.1.2 Disturbed area

In order to evaluate Descriptor D6 for achieving the GES, the area within which the integrity of the seabed will be disturbed at the access channels and disposal zones is calculated below.

The dredging of the access channels (including basins) will disturb a total area of **approximately 3,637,000 m²**.

The surface area of disposal zone 3 (21,457,000 m²) is significantly larger than that of disposal zone 4 (5,095,000 m²), which means that the height of the deposits is considerably lower (0.13 m vs. 0.56 m). In reality, the deposited material will not have exactly the same thickness everywhere.

The total disturbed area in **the worst-case scenario** is therefore **3,637,000 m² + 21,457,000 m²**. For the use of the disposal zone, the worst-case disturbed area remains the same as in the initial EIR. However, it is important to note that the initial EIR referred to temporary storage, whereas this EIR refers to permanent disposal.

In the worst-case scenario of this EIR, the alternative landing method would entail a threefold increase (x3.01) compared to the worst-case scenario in the initial EIR for the section of the access channels.

1.4.1.3 Impact on geology

The geology will be disturbed to a depth of 1 to 2 m below the seabed, comparable to what was previously discussed in the initial EIR. As no Palaeogene (formerly known as Tertiary) layers will be cut through, the continuity of the geological layers will not be lost. The effect of the access channels on the disturbance of the Quaternary layers is considered to be **non-existent (o)**.

1.4.1.4 Impact on morphology and bathymetry

During the dredging of the access channels, the morphological structures will be removed and the medium and small sand dunes will disappear completely. However, in the relatively short term, natural filling of the access channels and thus restoration of the seabed profile will take place.

Due to the shallow dredging depth and the expected natural recovery of the access channels in the short term, the effect on the morphology and bathymetry in and around the access channels is estimated to be **minor negative (o/-)**.

As mentioned earlier, approximately 2.8 million m³ of dredged material will be permanently deposited on the seabed. If spread evenly over the entire surface area of disposal zones 3 or 4, this would lead to an increase in thickness of 0.13 and 0.56 m in disposal zones 3 and 4, respectively. In reality, it is unlikely that the material will be deposited so evenly across the entire disposal zone, and the thicknesses will therefore vary across the disposal zone.

Disposal zone 3 is located almost entirely at the Akkaertbank and has a water depth of between approx. -10 and -20 m LAT. Disposal zone 4 is located further east near the coast with a water depth varying between approx. -8 and -17 m LAT. At disposal zone 3, dunes

occur up to approx. 2-3 m high and in disposal zone 4 up to approx. 4-5 m high. If it were decided to match the natural variation in sand dune height in the relevant disposal zone, and therefore to stockpile up to the dune heights mentioned above, 5.30% or 12.39% of the disposal zone would be used. In the long term, the sediment will spread further.

The effect on bathymetry and morphology as a result of permanent disposal in the disposal zones is considered to be **moderately negative (-)**.

1.4.1.5 Impact on sediment transport, sedimentation and erosion

During both the dredging of the access channels and the disposal of the sediment at the disposal zone, sediment transport will occur from the associated sediment losses. This excess sediment transport resulting from the sediment losses will mainly consist of a high percentage of fine material.

Part of the sediment loss occurs during dredging and disposal in the form of turbidity plumes. In order to estimate this effect, a 3D numerical plume modelling study was previously carried out (IMDC, 2022), the results of which were already discussed in the initial EIR. Various scenarios were simulated at three typical sections along the entire cable route.

The results are being reviewed in the context of this EIR. When dredging a 1 km long silty section near the coast, no deposition thicknesses of more than 1 cm of fines occur at the access channels. When disposing approx. 96,000 m³ in disposal zone 3, the plume deposits extend up to 2 km in the dominant flow direction. These deposits are max. 1 to 10 mm thick.

However, the dredged volumes required to create the access channels are approximately 40 times greater than the volume simulated here. In other words, when the effects on sedimentation are scaled up to the actual dredged volumes, the deposition thicknesses will also increase. However, the increase in deposition thicknesses depends on the distribution of the disposal. In reality, the disposal will be spread over the entire disposal zone, resulting in smaller deposition thicknesses. In addition, resuspension of the material (i.e. not included in the simulation) will contribute to smaller permanent deposition thicknesses of fines.

Because the expansion of the footprint of the fine deposits is determined by the prevailing currents and the fall velocity of the sediment type and not by the amount of sediment, a larger disposal volume will lead to greater deposition thicknesses, not to a larger footprint of the deposits.

The Flemish Banks Habitat Directive area is located more than 4 km from disposal zone 3 and more than 9 km from disposal zone 4, which rules out sedimentation in this area. However, the gravel bed to the north-west of disposal zone 3 is located within a radius of 2 km from the outer boundary of the disposal zone, but not in the dominant flow direction. There is a possibility that the gravel bed will be impacted by the deposition of fines during disposal, but the likelihood is low. There are no gravel beds in the vicinity of disposal zone 4 that could be impacted.

Given the excessive sediment transport, the impact of the alternative landing method on sedimentation and erosion processes during the construction phase is assessed as

moderately negative (-). With regard to the sedimentation of fines, no significant differences are expected between the various disposal zones in terms of the extent of the deposits.

1.4.1.6 Impact on grain size distribution

Since no backfilling will take place, the access channels can naturally refill after the cable has been laid with neighbouring sediment of the same composition, possibly with slightly coarser material. The effect on seabed integrity (Descriptor D.6) is assessed as **minor negative (o/-)**.

The grain size distribution may be affected in the disposal zones. Depending on the disposal zone, the disposal of dredged material will have a greater or lesser impact on the original grain size distribution of the disposal zone. For example, the silt-rich material from the coastal zone will cause a greater change in disposal zone 3 than in disposal zone 4.

According to plume modelling, the settling of plumes during disposal within the disposal zones would cause deposits of fines that could reach up to 2 km from the disposal point.

The gravel bed located near disposal zone 3 is within a radius of 2 km and therefore there is a chance that it could still be impacted by the losses and deposits of fines that occur during disposal. There are no gravel beds located near disposal zone 4 that would be impacted.

The impact on grain size (and Descriptor D6: seabed integrity) in the disposal zones has a permanent effect. However, as this concerns a limited area within a single disposal zone that is also designated for disposal, the effect is assessed as **moderately negative (-)**.

1.4.2 Water

1.4.2.1 Impact on hydrodynamics

Since the access channels are only 50 m wide and are oriented at an angle of approximately 45 degrees to the dominant flow direction, only a direct effect on the flow around the access channels is expected here. The impact on waves will also be minor, as shoaling will not be significantly affected. In the event of extreme wave heights, the position of wave breaking may change slightly.

No significant effect on coastal protection is expected due to the position of the access channels to be dredged (i.e. at least 500 m from the low-water line) in combination with their temporary nature (i.e. natural filling). If deemed necessary on the basis of bathymetric surveys, the access channels can still be filled with the stockpiled material from the disposal zone.

The effect on hydrodynamics is considered to be **minor negative (o/-)**.

1.4.2.2 Impact on water quality: turbidity

During the dredging and disposal activities, sediment plumes will form in the water column, temporarily increasing turbidity. To assess the effects, numerical modelling was carried out in the initial EIR (IMDC, 2022).

Dredging causes an increase in turbidity of up to 50 mg/l, reaching several hundred metres from the works for 3 to 6 days (i.e. for a 1 km scenario in the initial EIR). The turbidity plumes caused during the dredging works along the access channels will therefore not reach the nearby Natura 2000 area Vlaamse Banken.

The effect of disposal the dredged silty sediment at disposal zone 3 causes an increase in turbidity to 50 mg/l. These sediment concentrations can occur up to five kilometres from the disposal zone. Increased sediment concentrations of up to 10 mg/l may occur, which could reach the Vlaamse Banken area. The sediment concentrations will fall back to almost 0 within an hour after disposal and will therefore not accumulate (IMDC, 2022). The turbid period will last longer as the works take longer, but the plumes will not be more extensive or have a higher concentration.

As no long-term effects are expected, the impact of the alternative landing method on turbidity can be considered **moderate negative (-)** in line with the initial EIR.

1.4.3 Climate and atmosphere

1.4.3.1 Atmosphere and air quality (ship emissions)

Transport emissions are calculated based on the duration of the activity, ship characteristics such as installed power and speed, and emission coefficients. The emission coefficients used here are the same as for the initial EIR, except for NOx.

This results in 10 kt CO₂, 0.2 kt NO_x, 0.007 kt PM₁₀ and 0.06 kt SO₂. These additional emissions for the dredging of the access channels are limited to the total emissions of the already approved project with the island and the export cables.

The effect on the atmosphere is assessed as **minor negative (o/-)**.

1.4.4 Noise and vibrations

1.4.4.1 Above-water noise at the coastline

Above-water noise will be noticeable during the dredging of the access channels close to the coast and when ships enter and leave ports. Dredging and disposal cause relatively low noise levels above water, and the noise decreases rapidly with distance from the dredgers.

At distances of several kilometres from the source, the noise contribution from the dredger will be masked by ambient noise. The access channels end approximately 800 metres from the beach, which means that the noise from work vessels may be audible on the coast for part of the project. Work on LOT2 will start at the end of August. It is recommended not to start near the beach. By avoiding the tourist season, the limited

duration of the work (3 x 4 to 6 months) and the high number of existing ship movements in the BPNS, the additional noise nuisance at the coastline will be limited. The effect is considered to be **minor negative (o/-)**.

1.4.4.2 Underwater noise

The dredging of the access channels and the intensification of shipping traffic will increase underwater noise during the construction phase. The increase in underwater noise will occur outside shipping routes or sand extraction zones, in areas where the level of anthropogenic noise is currently still relatively limited (BMM, 2023).

In the vicinity of the project zone, noise levels will be increased for 4 to 6 months per year for 3 years (approx. 200 days in total) at a location where anthropogenic noise is currently limited as it is located outside shipping routes. In addition, the noise impact of a dredger is greater than that of a passing ship because it is a continuous source of noise over a longer period of time. The effect is therefore considered **moderately negative (-)** as it cannot be ruled out that disturbance will affect marine animal populations, resulting in the environmental objective D11C2 for anthropogenic continuous low-frequency noise not being achieved and the GES not being attained (Belgian State, 2025). However, no impulse noises are produced.

1.4.5 Fauna, Flora & Biodiversity

1.4.5.1 Macrobenthos

1.4.5.1.1 Habitat disturbance

The access channels are located in a zone mainly characterised by the presence of *Macoma balthica* communities, with very low species richness, biomass and density, typically found in silty sediments (Breine *et al.*, 2016, 2018). The *Nephtys cirrosa* community found in disposal zone 3 is also characterised by low density and species richness. Finally, disposal zone 4 is predominantly characterised by the *Abra alba* community, which has the highest density, biomass and species richness.

It is likely that the entire biotic zone at the access channels and disposal zones is destroyed. Since the loss of benthic organisms is directly related to habitat loss, this loss at the access channels is estimated on the basis of the average biomass of the benthic communities according to Breine *et al.* (2018). For the total disturbed area, this results in a maximum estimated loss of approximately 145 tonnes of benthic biomass for all access channels. However, the greatest habitat disturbance and loss of organisms occurs at the disposal zone. Although habitat disturbance is much greater in disposal zone 3, the loss of organisms is greater in disposal zone 4, as it is located in the rich *A. alba* community, where the average biomass is much greater and the total loss of organisms amounts to approximately 3,400 tonnes.

The access channels are not located in areas that are potentially suitable for *Lanice conchilega* aggregations. Disposal zone 4 and the northern half of disposal zone 3 are moderately suitable for the occurrence of *L. conchilega* aggregations. The disposal of silt-rich material may render these areas unsuitable for the occurrence of aggregations.

According to the biological value map by Pecceu *et al.* (2021), the access channels are located in areas with low to very low biological value, while disposal zones 3 and 4 are located in zones with very high biological value. However, it should be noted that the assessment is partly based on older versions of the (modelled) occurrence of gravel beds, which are characterised by a very high biological value (see below). For disposal zone 3, it can therefore be assumed that the biological value is probably lower, given that no gravel is expected here based on more recent mapping.

According to Van Lancker *et al.* (2023), there are no potential gravel beds near the access channels or disposal zones 3 and 4. Direct habitat disturbance is therefore ruled out. However, there is a gravel bed within a radius of 2 km northwest of disposal zone 3, where fines may be deposited during disposal.

Despite the relatively large loss of organisms and the disturbance of the habitat, the scale of the intervention remains limited. None of the benthic communities are disturbed for more than 2.2% of their total area. Moreover, research shows that benthic communities in soft sediments can recover quickly, provided that the grain size of the sediment is sufficiently similar.

Overall, the effect of habitat disturbance and loss of organisms is assessed as **moderately negative (-)**.

As a **mitigating measure**, it is proposed to draw up a **dredging and disposal plan**, in which disposal zones are tailored to the nature of the dredged material. In addition, it is important to select disposal zones that are as far away as possible from the existing gravel beds.

1.4.5.1.2 Disturbance due to turbidity

Dredging and disposal of sediments leads to increased turbidity, which in turn can have an inhibitory effect on the primary production of phytoplankton and possibly affect the local food chain. In addition, organisms in the water column or on the seabed may be harmed by an excess of fine sediment particles.

In the chapter Water, it was concluded that the results of the plume modelling from the initial EIR are still applicable and that the turbid period will last longer as the works take longer, but the plumes will not be more extensive and will not accumulate. Since the benthos of the subtidal sandbanks of the BPNS is well adapted to naturally elevated sediment concentrations, the impact of this is considered acceptable.

The increase in turbidity as a result of the dredging works is therefore characterised as potentially significant, mainly in the vicinity of the disposal areas and given the relatively long disturbance period (3 x 4 to 6 months). Although the benthic communities in the BPNS are resilient to these natural fluctuations, the impact of increased turbidity when applying the new landing technique is assessed as **moderately negative (-)**.

1.4.5.1.3 Sedimentation

The stirred-up silt in the water column settles over a wide area and can form a thin deposit on the bottom. This additional sedimentation can affect bottom-dwelling animals. If the sedimentation occurs too quickly or in too thick a layer, it can lead to

suffocation of fauna in the bottom. This has consequences for the composition of the benthos and the availability of food for higher trophic levels. In the recovery phase, r-strategists (pioneer species with rapid growth and high reproduction rates) will initially dominate.

In the Soil chapter, it was concluded that although the actual dredging volumes will be much greater than the simulated deposits, the deposition thicknesses will not increase proportionally because the deposits will be spread over the disposal area and resuspension of the material will occur, contributing to smaller deposition thicknesses of fines. A larger footprint of the deposits is not expected, which means that no sedimentation will occur within the Flemish Banks.

However, the gravel bed to the north-west of deposition zone 3 is located within a radius of 2 km from the deposition zone, and there is therefore a chance that the gravel bed could still be impacted by the deposition of fines that occurs during deposition. As sedimentation of fine material can permanently disrupt the gravel beds, the necessary precautions must be taken. However, given that the gravel bed runs parallel to the dominant flow direction, the risk of sedimentation from the disposal is greatly reduced.

Given the potential permanent consequences for seabed functions and ecosystem efficiency, the effect of sedimentation from the turbidity plume is assessed as **moderately negative (-)**.

1.4.5.1.4 Sediment composition

As mentioned in the chapter on soil, depending on the disposal zone, disposal will have a greater or lesser impact on the original grain size distribution of the disposal zone. For example, the silt-rich material from the coastal zone will cause a greater change in disposal zone 3 than in disposal zone 4.

When the sediment composition changes, the suitability for the benthic communities present will also change permanently. According to Descriptor D6 of the MSFD (Belgian State, 2025), the GES is achieved when the integrity of the seabed is at a level that guarantees that the structure and functions of ecosystems are preserved and that benthic ecosystems in particular are not adversely affected. Relevant pressures are physical loss (due to permanent alteration of seabed substrate or seabed morphology and extraction of seabed substrate) and physical disturbance of the seabed (temporary and reversible).

Due to the proximity of gravel beds to disposal zone 3 and the potentially permanent changes to benthic communities, the impact is assessed as **moderately negative (-)**. However, the impact on the achievement of the GES is negligible because the impact remains local in scale compared to the distribution of benthic communities throughout the BPNS.

For the cable trenches, the effect is considered **immeasurable (o)**, as there is no backfilling of the trenches, which means that the suitability for the existing benthic communities will not change.

1.4.5.2 Epibenthos and fish

1.4.5.2.1 Disturbance

The habitat disturbance for epibenthos and fish communities covers the same areas as described for macrobenthos. However, the direct loss of organisms is considered to be more limited, precisely because of the higher mobility of these species. The phased implementation of the works means that the seabed will quickly become available for recolonisation, which, in combination with the relatively rapid recovery of the benthos, will also support the recovery of the food base for higher trophic levels.

Habitat disturbance can lead to increased concentrations of fines, which make the habitat of the sand eel, an important source of food for higher trophic levels, less suitable. This is particularly the case for disposal activities in disposal zone 3, where sandy sediments are more prevalent.

Fish are exposed to ship noise in different ways, depending on their life cycle stage. Eggs and larvae have no means of avoiding an approaching ship and may receive a lethal dose of noise. For adult fish, the effect of a passing ship will affect their condition and survival (Stage *et al.*, 2018). In addition, shipping can cause significant nearby background noise at levels comparable to or higher than the vocalisations of fish and in the same critical bandwidths (Neenan *et al.*, 2016). Any disturbance of sound detection and recognition can have consequences for fish survival.

D11 of the KRMS refers not only to impulse noise but also to anthropogenic continuous low-frequency noise in water (Belgian State, 2025). However, there is a knowledge gap regarding what noise level can be considered safe for fish.

Due to the relatively large area over which the noise disturbance is spread and the long installation period (3 x 4 to 6 months), the effect is assessed as **moderately negative (-)**, as it cannot be ruled out that the disturbance will have an impact on fish populations and that the GES D11 (continuous underwater noise) and D1 (biodiversity) will not be achieved.

1.4.5.2.2 Turbidity

The dredging activities for the access channels cross fishing grounds in the coastal zone that are considered relatively rich in terms of species diversity and fish density.

Despite the possibility of avoidance, fish may experience local disturbance due to reduced visibility, disturbance of migration routes or changes in hunting and foraging behaviour. However, such disturbances are temporary in nature. Plume modelling has shown that the dredging and disposal plumes generally remain in the water column for less than one hour, after which concentrations fall back to below the natural background levels. Cumulative effects are therefore not expected. Given the temporary nature of the turbidity and the avoidance capacity of fish species, the effect of increased turbidity on fish and epibenthos is assessed as **minor negative (o/-)**.

1.4.5.3 Birds

1.4.5.3.1 Disturbance

The planned works may cause disturbance to seabirds that use the area to feed or rest. This area is important for disturbance-sensitive species such as grebes and sea ducks, and to a lesser extent for divers, especially in the winter months.

In the period from December to March, when the densities of the disturbance-sensitive red-throated diver and black scoter are at their highest, it is strongly recommended to avoid work within 10 km of the coast as much as possible (cf. Royal Decree 21/12/2001 on species protection). However, according to the current schedule, the work for LOT1 and LOT2 will largely take place during the winter months.

The mobility of seabirds does allow them to move to nearby areas, but in densely populated areas they may have difficulty finding suitable alternatives, which can lead to increased energy consumption and disturbance of foraging behaviour.

Given the high risk of disturbance to seabirds in the 10 km zone during the winter months, the relatively long construction phase and the negative impact on the achievement of the environmental objectives for the GES, the effect is assessed as **moderately negative (-)**.

1.4.5.3.2 Turbidity

The increased sediment concentrations may temporarily reduce visibility for birds that feed on fish, such as terns, divers and sea ducks. This may force them to move further away from the work, exposing them to other disturbances.

In the Soil chapter, it was concluded that in the silty coastal areas, the increase in turbidity above the background value of 4 mg/l is limited to a distance of several hundred metres around the access channels. The effect of disposal in disposal zone 3 causes an increase in turbidity to 50 mg/l up to five kilometres from the centre of the disposal zone. The dredging and disposal plumes remain in the water column for less than one hour before concentrations fall below the natural background concentration.

For the dredging of the access channels, an implementation period of four to six months is expected per lot, with little accumulation of turbidity plumes along the access channels. The immediate vicinity of the dredging works is expected to become temporarily unsuitable as a foraging area for sight-hunting birds. Work will be carried out progressively at the access channels, and the turbidity will quickly return to background levels. However, a much larger turbidity plume will be generated at the disposal areas, which will be used for a longer period. The loss of foraging grounds will therefore be greater at these locations.

Seabirds that occur on the BPNS are accustomed to foraging in turbid water, and most species feed in the upper metres of the water surface. The birds do not dive to the bottom of the sea, where the increase in turbidity will be highest. Although the increase in turbidity is always temporary, the effect is assessed as **moderately negative (-)** given

the scale of the works, the negative impact on the achievement of the GES and the ecological importance of the coastal zone for seabirds.

1.4.5.4 Marine mammals

1.4.5.4.1 General disturbance

Marine mammals are particularly sensitive to underwater noise. The works for LOT1 will also take place during the spring, when the highest densities of harbour porpoises occur in the BPNS. For LOT2, there is also a partial overlap, and for LOT3, a worst-case scenario is assumed. Harbour porpoises mainly occur in more offshore areas. Seals are present in the coastal zone throughout the year and may experience more disturbance from the works.

The most common and dominant contributors to anthropogenic noise in water are ships that continuously emit noise at high levels. Until now, it was assumed that these effects were negligible given the poor (low sensitivity) hearing of porpoises at low frequencies, precisely the frequency range in which large ships emit their highest noise intensity. Direct hearing damage to porpoises is therefore unlikely. However, research has shown that porpoises do systematically avoid ships within a considerable range, suggesting that they are in fact able to respond to low levels of ship noise at a distance of at least 1 km from the source (Dyndo *et al.*, 2015; Oakley *et al.*, 2017; Roberts *et al.*, 2019). Habituation effects do not appear to occur. There is also general concern about the effects of increasing exposure to underwater noise from shipping on grey and common seals (Jones *et al.*, 2017). Behavioural changes in response to ship noise may be short-lived, but they do represent an energy cost.

Porpoises mainly forage using echolocation and are therefore not expected to be very sensitive to changes in turbidity. Furthermore, porpoises naturally occur in areas with poor visibility (Todd *et al.*, 2015). Any avoidance responses due to increased turbidity are likely to coincide with and be smaller than avoidance responses due to increased underwater noise levels (Rumes and Degraer, 2022a).

However, for foraging seals, sight is the most important source of information (Levenson and Schusterman, 1999). For animals that naturally live in fairly turbid water, such as the coastal zone of the BPNS, this does not necessarily translate into reduced foraging efficiency, as other senses are also used (Dehnhardt *et al.*, 2001).

Finally, food sources for marine mammals may be disrupted directly (food availability) or indirectly (changes in the food chain) during dredging operations. However, as already mentioned in the discussion of the effects on benthos, most benthic and fish species in the BPNS are reasonably resistant to a certain degree of anthropogenic pressure. In this respect, it is expected that disturbed seabeds will be quickly recolonised by resilient and opportunistic species. However, forced displacement of harbour porpoises to areas that are less suitable in terms of food supply could be harmful, as they cannot survive for long without food (Ransijn *et al.*, 2019).

It can be concluded that the environment within a radius of several kilometres of the dredging and disposal works will become less suitable or unsuitable for foraging marine mammals. Although the work will take a relatively long time (3 x 4 to 6 months) and the

noise from the dredging work will be audible over a large distance, no long-term negative effects on porpoise and seal populations are expected as a result of the construction of the access channels. Thanks to their high mobility, marine mammals will temporarily leave the immediate vicinity of the works, but given that the BPNS covers only a fraction of the distribution area of the species concerned, the disturbance effect is assessed as **moderately negative (-)**. No effects are expected on environmental objectives for achieving the GES for marine mammals (Belgian State, 2025), as these relate to bycatch and impulsive underwater noise, which are not relevant here.

1.4.6 Sea view

1.4.6.1 Installation works near the coastal zone

The part of the access channels closest to the coast is located approximately 500 m from the beach at Blankenberge, while the other end is approximately 5 km from the beach at De Haan. The construction of the access channels will be clearly visible from the coast at Blankenberge and to a lesser extent towards De Haan.

This disturbance will not be perceived as negative by every visitor to the coast. However, it may be advisable to set up an information campaign to inform the population about the nature and purpose of the works.

Given that there is only a small overlap with the tourist high season and the number of ships is very limited, the effect on the sea view is considered to be **minor negative (o/-)**.

1.4.7 Interaction with other human activities

1.4.7.1 Fishing

The access channels are located entirely within the 6 nautical mile (nm) zone. Fishing activities in the project zone within the 6 nm zone have already been analysed by ILVO in the Fisheries Impact Report (ILVO, 2022) in the initial EIR.

For the 6 nm zone, it is expected that the impact on fishing in the project zone itself will be **minor negative (o/-)** when the access channels are dredged, given the limited number of hours that fishing takes place and the fact that not the entire route will be continuously blocked to fishing and that the works will only cause local disturbance to the fish population.

The work will also be announced and communicated in advance (e.g. Notices to Mariners) so that fishing vessels are aware of the planned work.

1.4.7.2 Tourism and recreation

The installation near the coast may temporarily disrupt water recreation, especially if this period overlaps with the tourist high season (LOT2 and possibly LOT3). A (limited) part of the coastal zone near the landing zone will be temporarily unavailable for recreational activities. On the other hand, the works may also attract tourists.

Good communication with, among others, the Shipping Assistance Service, local water sports clubs, the Coastal Department and the coastal municipalities in preparation for and during the execution of the works is necessary here.

The effect of the construction of access channels on tourism and recreation is temporary (max. 6 months in the coastal zone per year/per lot) and seasonal, and is considered to be **minor negative (0/-)**.

1.4.8 Risks and safety

1.4.8.1 Additional shipping

For the dredging of the access channels, a total number of 800 ship movements at sea over a period of three years (for the three lots, each lasting 4 to 6 working months) is assumed. Compared to the large number of existing shipping movements from the coast, the project will result in a limited increase in the number of ship movements.

The risk of shipping accidents will increase due to these additional ship movements and the limited maneuverability of the dredgers during their operations. However, the potential disruption during dredging of the access channels is limited in space and time. These movements will take place outside the established shipping lanes. No shipping lanes will be crossed within the project zone, but they will be crossed during transport to and from the disposal zones. On the other hand, commercial vessels using these crossed shipping lanes will always operate under pilotage, and the vessels involved in the operations will be clearly identified in accordance with COLREG regulations (e.g., as having limited maneuverability). Any additional required measures will be coordinated in advance with the MRCC (and, by extension, the Pilotage Service). The effect is therefore assessed as **minor negative (0/-)**.

1.4.8.2 Deepening of shipping routes

The disposal areas are surrounded by various shipping routes. The dispersion of deposited material leads to deposits in the surrounding area and could therefore also result in the deepening of shipping routes.

Given the size of the surrounding areas and the duration of the activities (i.e. spread over three different periods over three years), these effects are expected to be comparable to the natural sediment mobility in the region. No significant deepening is therefore expected as a result of these permanent disposal operations.

In addition, there will also be excessive sediment transport as a result of sediment losses. In the chapter on soil, it was decided that the deposition thicknesses will remain limited, so that they will only contribute minimally to a possible deepening of the shipping routes. The effect is therefore assessed as a **minor negative (0/-)** effect.

1.5 Cumulative effects

The potential effects of dredging the access channels, combined with other activities at sea, could lead to cumulative effects (Table 0-5). In the coastal zone, cumulative effects are possible with shipping, fishing and water-based recreation.

Table 0-5: Cumulative effects for the various disciplines; S: cumulative effect = sum of the effects; >S: cumulative effect is greater than the sum of the effects; <S: cumulative effect is less than the sum of the effects; not applicable (n/a)

	Effect	Explanation
SOIL		
Seabed disturbance	N/A	The cumulative effect is zero, as no other works are known to be taking place in the vicinity and during the same period as the works for the access channels. The cumulative effect would be equal to the sum of the effects.
Dredged volumes and deposition	N/A	There is no cumulative effect as no other works are known to be taking place in the vicinity and during the same period as the works for the access channels.
WATER		
Impact on turbidity	N/A	Cumulation during the construction phase is possible with projects that cause turbidity in the same environment and take place at the same time (>S). No other specific works are known to be taking place in the vicinity during the same period.
Climate and atmosphere		
Impact on transport emissions	>S	The additional ship movements and associated emissions accumulate with other shipping activities on the sea (fishing, wind farm construction, sand extraction and disposal activities). The cumulative effect is greater than the sum of the effects (>S) as emissions accumulate in the atmosphere. However, this project contributes to the overall project of Princess Elisabeth Island, which contributes to the development of renewable energy.
NOISE AND VIBRATIONS		
Above-water noise on the coastline	N/A	No other offshore projects are expected to be audible on the beach at the coastline. If there is any overlap with other activities that lead to an increase in background noise at the coastline, the cumulative effect is estimated as the sum of the effects (S).
Impact on underwater ambient noise	>S	There will be a cumulative effect with the underwater noise caused by existing activities taking place in the vicinity at the same time (shipping, fishing, sand extraction, etc.). The effect on noise from shipping and dredging may be greater than the sum of the individual effects due to possible overlap and in the event of prolonged periods of increased noise levels (>S). The increase in ship movements may have a negative impact on the

	Effect	Explanation
		achievement of the GES D11 – continuous underwater noise.
Fauna, flora and biodiversity		
<i>Impact on macrobenthos, epibenthos and fish communities</i>		
Habitat disturbance	S	Given that disturbed habitats recover relatively quickly, the cumulative effect is considered to be the sum of the effects (S).
Turbidity and sedimentation	S	Various activities in the BPNS lead to sedimentation or a temporary increase in turbidity. However, little or no spatial overlap is expected between these activities, which means that deposits or turbidity plumes will not accumulate. The cumulative effect is therefore equal to the sum of the effects (S).
<i>Impact on birds</i>		
Disturbance	>S	In terms of cumulative effects, disturbances in the 10 km coastal zone should be taken into account in particular. Given that the zone in which disturbance-sensitive species occur is limited, the effect is considered to be greater than the sum of the effects (>S).
Turbidity	S	The increased turbidity may hamper the foraging of visually hunting birds, although this effect is local and temporary. The effect is equal to the sum of the effects (S).
<i>Impact on marine mammals</i>		
General disturbance	>S	Overlap is possible with the construction phase of the PEI, the export cables for PEI, and the wind farms in the PEZ, in addition to ongoing activities such as sand extraction, fishing and shipping, which will disturb marine mammals over a large area and for a period of several years. The cumulative effect is expected to be greater than the sum of the effects (>S) due to the longer duration of exposure to high noise levels and disturbance, and the extensive area within which these effects occur. In addition, the loss of habitat over a large area may hinder the migration of marine mammals.
Sea view		
Impact on ship movements to and from ports	S	Cumulative effects on sea views are possible with an increase in other shipping activities in front of the PEI and PEZ. The cumulative effects are equal to the sum of the individual effects (S).
Interaction with other human activities		
Fishing	S	The construction of the access channels will accumulate with all other activities in the coastal zone during the same period. The cumulative effect is equal to the sum of individual effects (S).
Tourism and recreation	S	The cumulative effect is considered to be the sum of the individual effects (S). After all, the effect on tourism and recreation is also partly subjective for each recreational user.
Risks and safety		

	Effect	Explanation
Additional shipping	S	The potential hindrance during the dredging of the access channels will occur outside the established shipping routes. The cumulative effect is considered to be the sum of the individual effects (S).
Deepening of shipping routes	S	If the deposits coincide with other deposits in these disposal areas, the effect may accumulate. The cumulative effect is then considered to be the sum of the individual effects (S).

1.6 Transboundary effects

Given the position and distance of the access channels from neighbouring countries, no transboundary effects are expected in France, the Netherlands and the UK. Effects of the project in these waters can therefore be ruled out.

1.7 Conclusion

No unacceptable effects are expected during the construction of the access channels and basins, provided that the necessary mitigation measures specified in the conditions of the environmental permit for PEI¹ are complied with.

¹ Ministerial Decree of 26 September 2023 granting Elia Asset NV authorisation for the construction, an operating licence and Natura 2000 approval for the Modular Offshore Grid 2 in the maritime areas under Belgian jurisdiction.