Nord Stream 2 AG

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NORD STREAM 2
NON-TECHNICAL SUMMARY, EIA DENMARK

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This Non-technical summary of the EIA "Nord Stream 2, Environmental impact assessment, Denmark" has been translated from the English original version to a Danish version "Nord Stream 2, Ikke-teknisk resumé, Danmark". In the event that the translated version and the English version conflict, the English version shall prevail.

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1 BACKGROUND AND JUSTIFICATION FOR THE PROJECT

The relevance of gas as a primary energy source is projected to stay stable or even increase over the next decades, given the necessity to reduce coal consumption due to climate reasons and phase-out of nuclear in large parts of the EU. In view of declining domestic production, the EU needs to import additional volumes of gas as early as 2020 to cover gas supply for the next decades.

The Nord Stream 2 Pipeline System (NSP2) is two pipelines through the Baltic Sea planned to deliver natural gas from vast reserves in Russia directly to the EU gas market to fill the growing gas import demand. The twin 1,200 kilometre (km) subsea pipelines will have the capacity to supply 55 billion cubic metres of gas per year in an economic, environmentally safe and reliable way, compensating for the drop in the EU's domestic production. The privately funded €8 billion infrastructure project will ensure long-term access to an important, low-emissions energy source, thereby contributing to the EU's climate protection efforts. Additional supplies will boost competition in the market and support the EU's global industrial competitiveness. Nord Stream 2 follows in the footsteps of the successful experience of construction and operation of the existing Nord Stream Pipeline (NSP), which has been recognised for its high environmental and safety standards, green logistics, open dialogue and public consultation.

Nord Stream 2 AG is a project company established for planning, construction and subsequent operation of the Nord Stream 2 Pipeline. The company is based in Zug, Switzerland and owned by Public Joint Stock Company (PJSC) Gazprom. At its headquarters Nord Stream 2 AG has a strong team of over 200 professionals of over 20 nationalities, covering survey, environment, HSE, engineering, construction, quality control, procurement, project management and administrative roles.

NSP2 will deliver reliable and sustainable transportation capacity of natural gas under sound environmental and economic conditions, closing the upcoming EU import gap and covering imminent security of supply risks.

2 EIA PROCEDURE AND PUBLIC PARTICIPATION

2.1 EIA Procedure

Permits are required for the construction of pipelines for transportation of hydrocarbons produced outside of Denmark and located within Danish territorial waters and on the Danish Continental Shelf. This is pursuant to the Continental Shelf Act, the Danish State's sovereignty over its territorial waters, and Administrative Order on Pipeline Installations. The application for such permits must be submitted to the Danish Energy Agency (DEA), which manages the applications and issues the construction permits on behalf of the Danish State.

Permits for the construction of pipelines for the transportation of gas, oil and chemicals with a diameter exceeding 800 mm and a length of more than 40 km may only be granted on the basis of an Environmental Impact Assessment ("EIA"). The EIA report must contain as a minimum the information listed in the Offshore EIA Administrative Order, including a description of the resources or receptors likely to be significantly affected by the project, both inside and outside of Danish territory. The EIA report must also include a description of the main realistic alternative approaches to the project.

Denmark is a signatory to the Convention on Environmental Impact Assessment in a Transboundary Context ("Espoo Convention"), which promotes international cooperation and public engagement when the environmental impact of a planned activity is expected to cross a border. The NSP2 project is subject to the requirements of the Espoo Convention, as the pipeline will cross the territories of five countries and may cause transboundary impacts to four additional countries. To comply with the Espoo Convention, Nord Stream 2 AG will issue a description of the project and its potential transboundary effects in the form of an ESPOO report to all potentially affected countries.

2.2 Public participation

In accordance with the Offshore EIA Administrative Order, the EU EIA Directive and the Aarhus Convention, the Danish authorities must enable public participation in environmental decision-making.

Furthermore, Nord Stream 2 AG is dedicated to transparent communication and active consultation with relevant stakeholders, including regulatory bodies, non-governmental organisations, experts, affected communities, and other interested and affected parties. The communication strategy incorporates best practices and lessons learnt from the NSP process. Nord Stream 2 AG has already engaged with various stakeholders to inform them about the envisaged project and to understand their views.

3 PIPELINE ROUTE AND ALTERNATIVES

Nord Stream 2 AG investigated several route alternatives through Danish waters. The objective was to find the most effective way of meeting the purpose and need of the project while also avoiding or reducing potentially significant negative impacts.

The route alternatives were identified based on previous planning and experience from NSP, supplemented with new route surveys and seabed investigations, including geophysical and geotechnical investigations. Environmental, socio-economic, and technical criteria were then assessed for each of the route alternatives to determine the preferred route.

Alternative routes, all of which traverse Danish waters, are shown in Figure 3-1.

3.1 Selection of the preferred route

After careful consideration of the relevant environmental, socio-economic and technical criteria, as well as lessons learnt from NSP, the ES route (as shown in Figure 3-1) was selected as the preferred route (hereafter referred to as the 'proposed NSP2 route'). This was based on criteria such as: spatial planning, technical feasibility, existing knowledge from NSP and environmental or socio-economic concerns.

3.2 No-action alternative

According to the Regulations, an EIA should include a no-action (or zero-) alternative which describes a situation in which the planned project is not carried out. In the present case, should NSP2 not be constructed and operated in Danish waters, there would be no environmental or social impact, neither adverse nor positive.

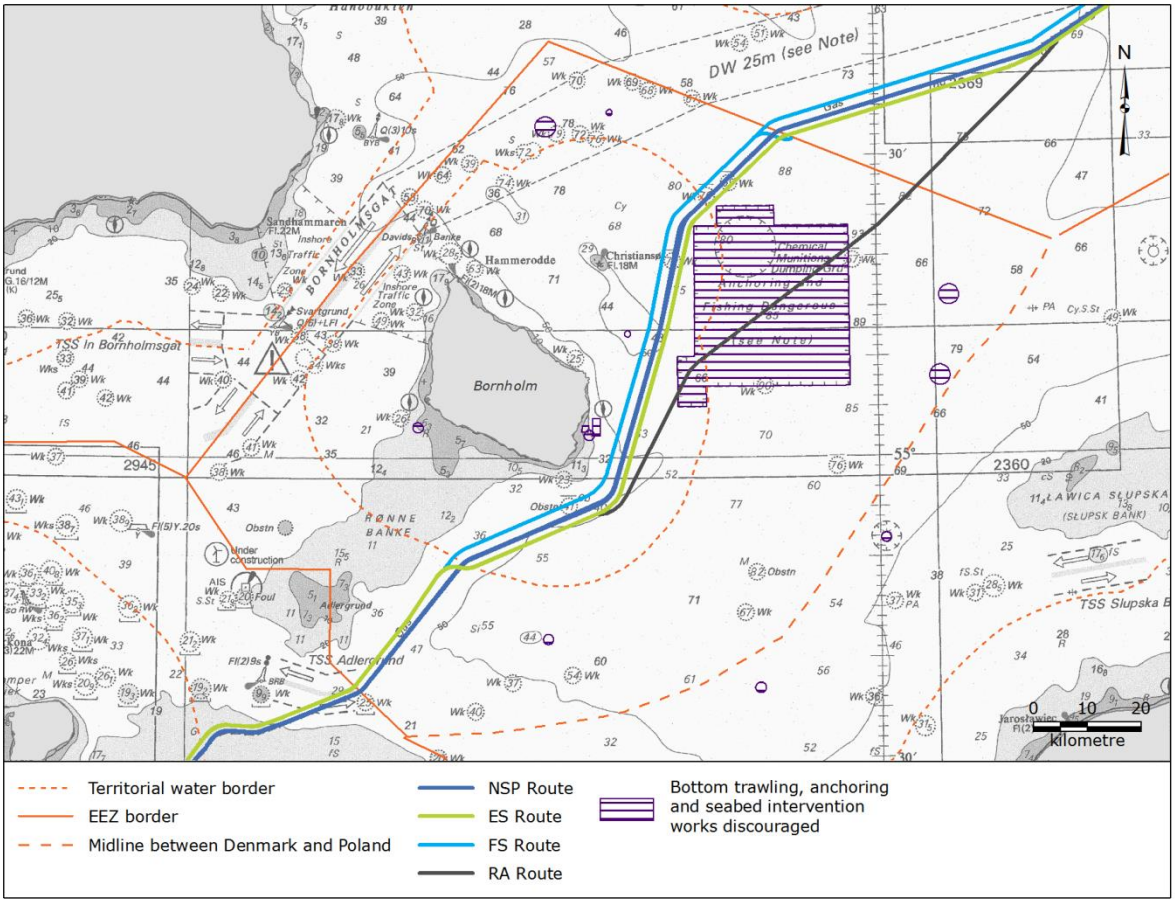

Figure 3-1 Route alternatives considered in the initial route evaluation for NSP2 in Denmark

4 PROJECT DESCRIPTION

4.1 Project schedule

Nord Stream 2 has spent several years conducting research and carrying out technical and environmental surveys to enable the best environmental, technical and socio-economic route alternative. The schedule for NSP2 planning, permitting and construction is outlined in Figure 4-1.

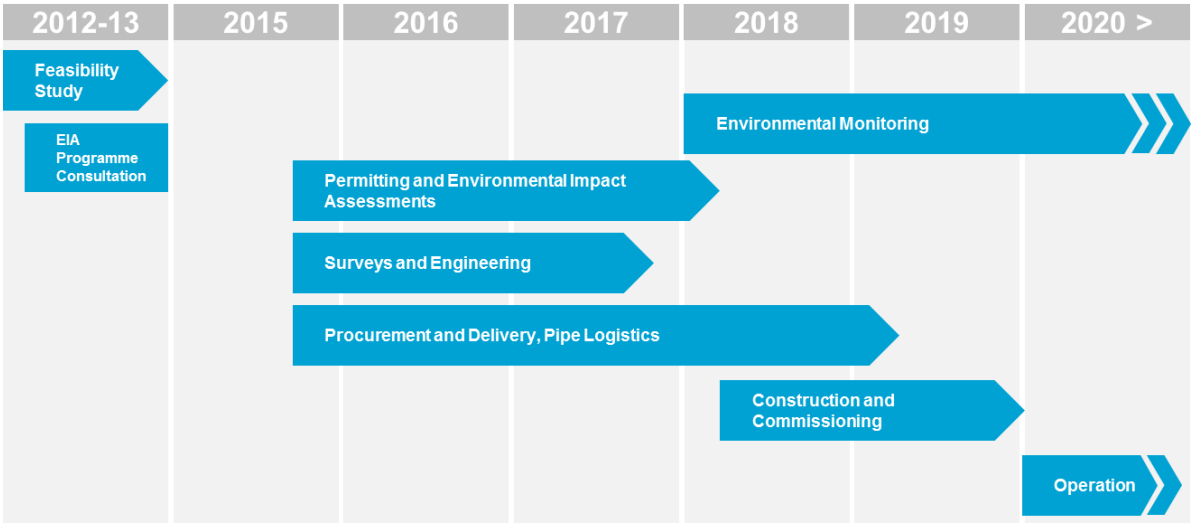

Figure 4-1 NSP2 project schedule

4.2 Proposed NSP2 route

NSP2 is designed to transport natural gas and comprises two 48” diameter subsea pipelines and associated onshore facilities with the capacity to deliver 55 bcm of natural gas per year to the EU market. The pipelines will extend through the Baltic Sea from the southern Russian coast (Narva Bay) in the Gulf of Finland to the German coast (Lubmin area), with no spur lines or intermediate landfalls.

The proposed NSP2 route will cover a distance of approximately 1,200 km, depending on the final optimised route selection. The route crosses the Territorial Waters (TW) of Russia, Denmark and Germany and runs within the Exclusive Economic Zones (EEZ) of Finland, Sweden, Denmark and Germany (see Figure 4-2).

In Danish waters, the proposed NSP2 route runs to the south of NSP, following the same “S-shaped” route to avoid crossing the area where anchoring and trawling are discouraged whilst remaining to the east and south of Bornholm. South-west of Bornholm, the proposed NSP2 route crosses the NSP pipelines and continues in a south-westerly direction before crossing into the German EEZ. The pipelines are generally spatially separated from NSP, but they run in parallel for a substantial length within Danish waters. The length of the proposed NSP2 route in Danish waters is approximately 139 km.

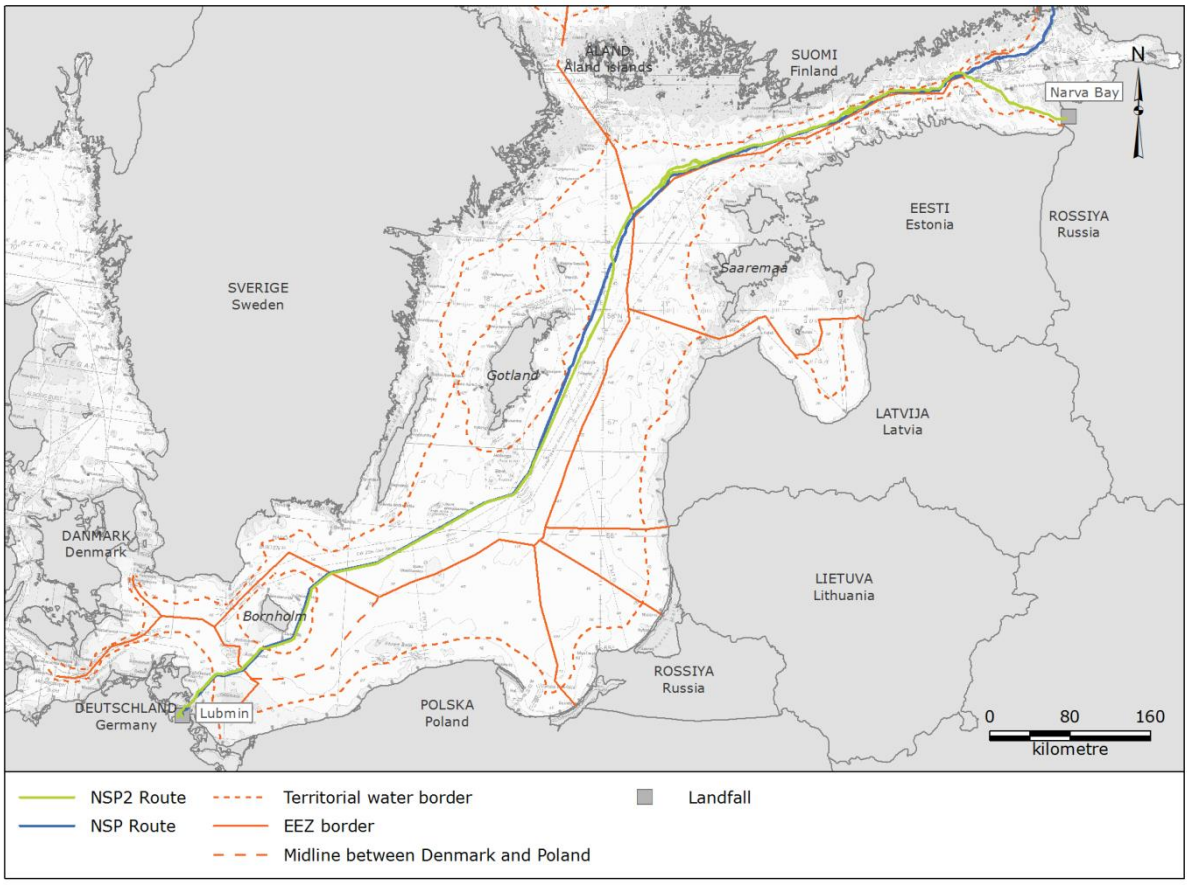

Figure 4-2 Proposed NSP2 route in the Baltic Sea

4.3 Construction Activities

Pipe-lay will be undertaken using specialised vessels handling the entire welding and pipe laying process. Both dynamically positioned (DP) and anchored lay vessels are expected to be employed along the proposed NSP2 route. In the Danish sector, it is expected that a DP lay vessel will be

used for the most part of the route. The pipe-lay activities in Danish waters are expected to last approximately 135 days.

In some areas, the offshore installation of the pipelines (especially in shallow waters) require additional stabilisation and/or protection against hydrodynamic loading (e.g. waves, currents), which can be achieved by either trenching the pipelines into the seabed or rock placement. Trenching can be performed either prior to pipeline installation as a pre-cut trench (pre-lay) or after the pipelines have been laid on the seabed (post-lay). Only post-lay trenching will be carried out in the Danish sector, at an anticipated three sections, spanning a total of 20.5 km. It is conservatively estimated to take 2.6 days in total (62 hours), not including time for relocation.

Rock placement will be the main intervention method for free-span correction to achieve pipeline stabilisation. Rock placement will also be used in the areas where NSP2 pipelines cross NSP pipelines and following an above-water tie-in if it is to be performed in Denmark. For cable crossings, a solution with flexible or rigid separation mattresses is envisaged.

Waste generation (types and amounts) during the construction of the NSP2 pipelines are anticipated to be similar to that generated during NSP construction. Nord Stream 2 AG will develop a Waste Management Plan for the construction and operational phases of the project.

4.4 Operational Activities

Nord Stream 2 AG will be the owner and operator of NSP2. During normal operation, pressurized natural gas will be continuously introduced at Narva Bay, Russia and taken out at an equal rate at Lubmin, Germany.

An operations concept and security system will be developed to ensure the safe operation of the pipelines. The technical expectation of operation of the infrastructure is at least 50 years.

4.5 Mitigation measures

NSP2 AG is committed to designing, planning and implementing NSP2 with the least impact on the environment as is reasonably practicable. The environmental and social management system (ESMS) for dealing with planned impacts and emergency response is detailed in section 10 of this summary.

A key objective during the planning and designing of NSP2 has been to identify the means of reducing the impact of the project on the receiving environment. To achieve this, mitigation measures have continually been developed and integrated into the various phases of the project according to the mitigation hierarchy. These mitigation measures have been identified through consideration of legal requirements, best practice industry standards, applicable international standards (including World Bank EHS Guidelines and IFC Performance Standards), experiences from NSP and other infrastructure projects, as well as application of expert judgement.

In developing mitigation measures, the primary goal of the process has been to prevent or reduce any identified negative impacts. If it has been impossible to avoid an impact (i.e., there is no other technical or economically feasible alternative), minimisation measures have been planned. In cases where it is not possible to reduce the significance of negative environmental impacts through management actions, restoration or offset measures will be considered.

Mitigation measures during construction and/or operation of NSP2 have been proposed for the following topics: water quality, non-indigenous species, shipping and shipping lanes, commercial fishery, cultural heritage, conventional and chemical munitions, existing and planned installations, military practice areas, environmental monitoring stations and management of hazardous materials and wastes.

5 EIA METHODOLOGY

This section provides a summary of the methodology applied in the EIA. The assessment methodology serves to provide a means of characterising the potential impacts from planned activities and assess their overall significance. Potential impacts from unplanned events are assessed either using a similar methodology or an established risk-based methodology, as appropriate (see section 6).

Resources or receptors which may be impacted by NSP2 are summarised in Table 5-1.

Table 5-1 Receptors susceptible to potential impacts associated with NSP2 in Danish waters

Resource or receptor type		Resource or receptor
Environmental	Physical-chemical	Bathymetry
		Sediment quality
		Hydrography
		Water quality
		Climate and air
	Biological	Plankton
		Benthic flora and fauna
		Fish
		Marine mammals
		Birds
		Protected areas
		Natura 2000
		Biodiversity
Socio-economic	Socio-economic	Shipping and shipping lanes
		Commercial fishery
		Cultural heritage
		People and health
		Tourism and recreational areas
		Existing and planned installations
		Raw material extraction
		Military practice areas
		Environmental monitoring stations

5.1 Identifying potential impacts

A systematic approach was applied in the EIA to identify and evaluate the potential impacts that the NSP2 project may have on the physical/chemical, biological and socio-economic environment and to describe mitigation measures to avoid, minimise or reduce any potentially negative impacts to acceptable levels. Throughout the EIA, where appropriate, a worst case assessment of an impact has been taken into account to ensure that the assessment is conservative.

The temporal scope of the assessment has included impacts during both the construction and operational phase. Potential impacts during pre-commissioning and commissioning will have no impacts on resources or receptors in Danish waters and therefore have not been addressed in the EIA. A high level assessment of decommissioning impacts has been undertaken (and summarised in section 6.25), however a detailed assessment has not been possible because impacts will depend on the decommissioning methodology, which will be developed in the latter stages of the operational phase.

5.2 Assessment of potential impacts

The impact assessment methodology has taken into consideration the nature, type and magnitude of an impact as well as the sensitivity of a resource or receptor to determine an impact ranking. Magnitude of an impact is defined by the spatial extent, duration and intensity. The sensitivity of receptors/resources to each impact was determined by considering their resilience and ecological and/or socio-economic importance, including protection status.

Based on this, an impact ranking was determined, and expressed as a qualitative ranking (See Table 5-2). This took the implementation of inbuilt mitigation measures (designed to avoid and reduce significant adverse impacts) into account.

Table 5-2 Impact ranking categories for planned activities

Negligible	Impacts that are indistinguishable from the background/natural level of environmental and socio-economic change. Impacts are considered 'Not Significant'.
Minor	Impacts of low magnitude, within standards and/or associated with low or medium importance/sensitivity resources/receptors, or impacts of medium magnitude affecting low importance/sensitivity resources/receptors. Impacts are considered 'Not Significant'.
Moderate	Broad category within standards, but impact of a low magnitude affecting high importance/sensitive resources/receptors, or medium magnitude affecting medium or high importance/sensitivity resources/receptors, or of high magnitude affecting low sensitivity resources/receptors. These impacts may or may not be significant, depending on the context, and additional mitigation may thus be required in order to avoid or reduce the impact to non significant levels.
Major	Exceeds acceptable limits and standards and is of high magnitude affecting medium or high importance/sensitivity resources/receptors. Impacts are considered 'Significant'.

For the purposes of this EIA, a 'Significant' impact is one which should be taken into account by the relevant authority when determining the acceptability of a project.

5.3 NSP2 modelling and assumptions

An early task in the EIA process was to determine the propagation characteristics of the physical changes that arise from NSP2 activities. This was informed by a substantial body of empirical data generated by the monitoring programme of Nord Stream, undertaken during both its construction and operation. In the case of sediment release, underwater noise, airborne noise and air emissions, this was supplemented through targeted modelling studies. The release of contaminants, including chemical warfare agents (CWA), and nutrients was evaluated on the basis of the sediment release modelling and levels of contaminants and nutrients identified in the field environmental survey.

6 EXISTING CONDITIONS AND IMPACT ASSESSMENT

This section provides a baseline description of all relevant physical/chemical, biological and socio-economic resources or receptors in Denmark which NSP2 may impact. Furthermore, an assessment of potential cumulative impacts, which may arise as a result of the NSP2 pipeline system in combination with other planned events, is provided.

6.1 Bathymetry

6.1.1 Description of baseline conditions

The Baltic Sea is one of the largest brackish (salinity is between saltwater and freshwater) water bodies in the world. It is located between 53° and 66° Northern latitude and between 10° and 26° Eastern longitude and is bordered by the Scandinavian Peninsula, the mainlands of Northern, Eastern and Central Europe and the Danish islands. It covers an area of 415,000 km2 and has a total volume of approximately 21,700 km3. The average depth is 52 m, the maximum depth is 459 m, and the seabed topography is characterized by several basins separated by sills at various depths.

The water depth along the Danish part of the proposed NSP2 route varies from approximately 28 m to 96 m as illustrated in Figure 6-1.

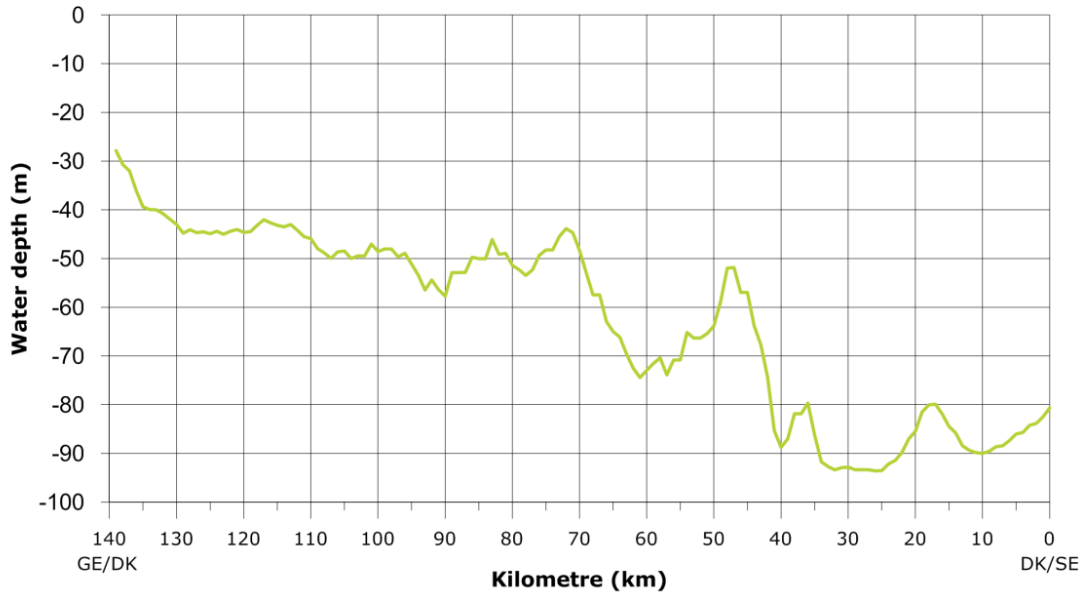

Figure 6-1 Water depth along the proposed NSP2 route in Danish waters

6.1.2 Assessment of potential impacts

Potential sources of impacts on bathymetry from the NSP2 project include physical disturbance of the seabed due to vessel operation and seabed intervention works during construction, subsequent sedimentation and the physical presence of the pipelines and structures on the seabed during operation.

Seabed intervention (i.e., post-lay trenching, rock placement) and pipe-lay activities will physically disturb seabed sediment. No backfilling is planned after post-lay trenching, and the trench will therefore affect the local water depth. The majority of remobilized sediments from trenching and rock placement will settle in the immediate vicinity of the pipelines, on both sides of the trench.

Survey inspections of NSP showed that five years after installation the pipelines have become embedded at least 50% in most locations- depending on the seabed conditions. Natural embedment of the NSP pipeline has in most locations resulted in the water depth reverting back to near baseline conditions.

It is therefore assessed that impacts on bathymetry during construction and operation of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.2 Sediment quality

6.2.1 Description of baseline conditions

The geology of the Baltic Sea comprises Precambrian, Palaeozoic, Mesozoic and Palaeogene bedrock and Quaternary sedimentary cover. Along the proposed NSP2 route in Danish waters, the bedrock consists mainly of crystalline basement, chalk and limestone.

Sediment properties along the proposed NSP2 route were investigated during a geophysical survey carried out in 2015-2016 (Figure 6-2). The survey found that the northern stretch of the proposed NSP2 route, extending from the border of the Swedish EEZ through the Bornholm Deep, is mainly very soft clay. In the shallower parts of the proposed NSP2 route east and south of Bornholm, the seabed is dominated by coarser sediments, sand and boulders, and in the somewhat deeper parts, silt and fine sand.

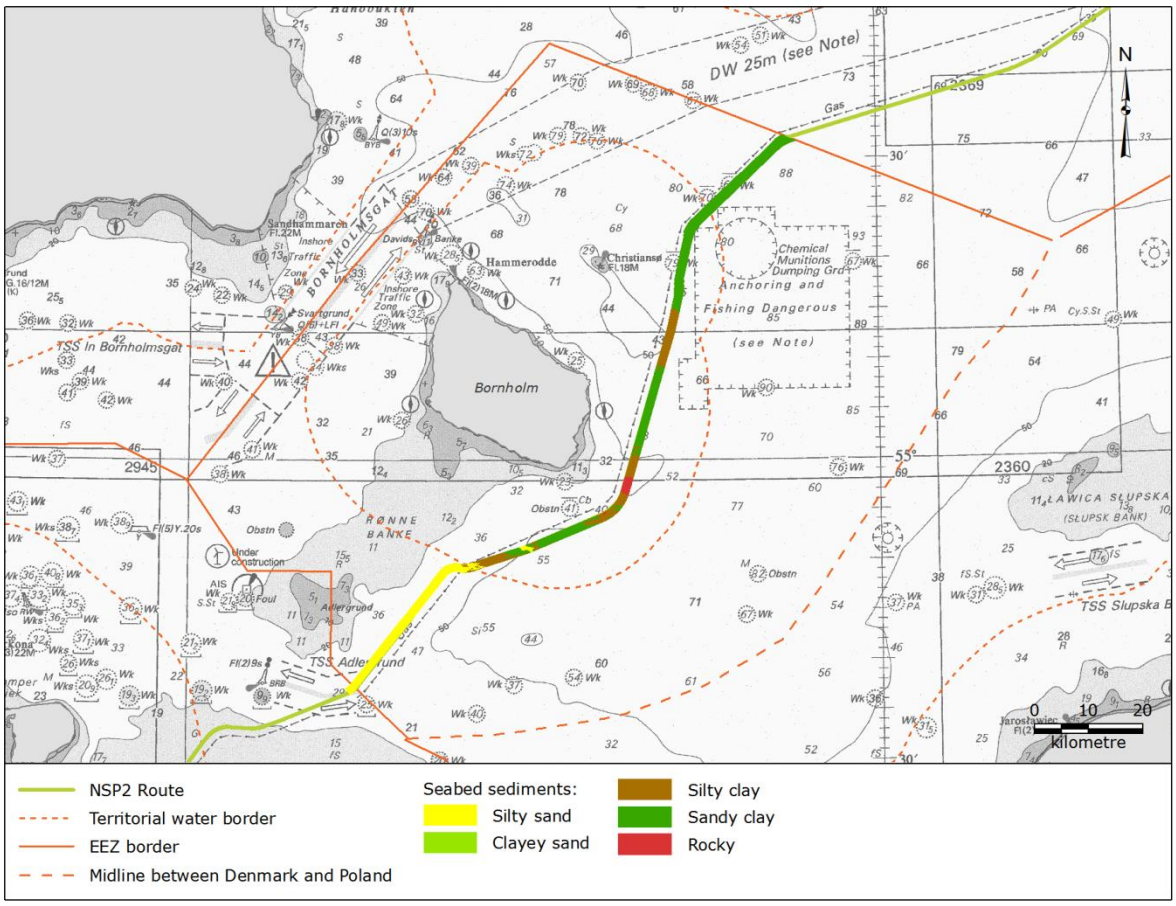

Figure 6-2 Types of seabed sediment along the NSP2 route in Danish waters

6.2.2 Assessment of potential impacts

Potential impacts on sediment quality from the NSP2 project include physical disturbance on the seabed and subsequent sedimentation during the construction phase and the presence of pipelines and structures on the seabed throughout the operational phase.

The predicted sedimentation levels combined with the levels of chemical compounds identified in sediments are not considered sufficient to alter the sediment quality in terms of chemistry, content of contaminants (including metals, organic contaminants and CWA), or the natural processes taking place in the sediment due to microbial activity.

Assessments and monitoring conducted as part of the NSP project confirm these predictions, and showed that they were not sufficient to cause any significant change in sediment quality or levels of erosion or resuspension at or near the pipeline route.

It is therefore assessed that impacts on sediment quality during construction and operation of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.3 Hydrography

6.3.1 Description of baseline conditions

The semi-enclosed Baltic Sea is permanently stratified because it receives freshwater from rivers and saltwater from the North Sea. The inflow of saltwater is sporadic but ecologically important, as it introduces oxygen-enriched seawater into the western Baltic and causes a horizontal salinity gradient from almost oceanic conditions in the northern Kattegat to almost freshwater conditions in the innermost Gulf of Finland. The temperature of the bottom water in the Bornholm Basin is typically within the range of 5-7 °C throughout the year.

The surface waters of the Baltic Sea are aerated by wind-mixing and oxygen is further supplied by photosynthesis. The intermediate waters are also relatively well-oxygenated due to exchange of water from other areas. The deep-water basins in the Baltic Proper (e.g. the Bornholm Basin) suffer severely from long-term oxygen depletion (hypoxia or anoxia), and as such, the benthic environment in these areas are unsuitable for animals and plants.

Salinity, temperature and oxygen were measured in the water column along the proposed NSP2 route at 14 stations. The shallow stations, with water depths less than 50 m, tended to have oxygenated bottom water (approximately 6 mg O2/l) and relatively low salinity (approximately 9 PSU), whereas deep stations tended to have low oxygen levels (ranging from 0.1–1.8 mg O2/l) and higher salinity (approximately 18 PSU). The results were similar to those obtained from surveys for NSP.

6.3.2 Assessment of potential impacts

Potential sources of impacts on hydrography relate to sedimentation following seabed intervention works (i.e. trenching, rock placement) and pipe-lay activities during construction, as well as the presence of the pipelines and structures on seabed during operation, which may alter the direction/magnitude of bottom currents or the vertical mixing of water.

Modelling of sedimentation caused by seabed intervention works shows a very limited impact on seabed morphology, with sedimentation within the range of the yearly natural background and negligible impact on hydrography.

Hydrographic monitoring in the Bornholm Basin undertaken as part of NSP confirmed that the presence of the pipelines did not result in any significant water blocking or mixing effects. Similar results are expected from the presence of the NSP2 pipelines on seabed.

It is therefore assessed that impacts on hydrography during construction and operation of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.4 Water quality

6.4.1 Description of baseline conditions

The water quality of the Baltic Sea is influenced by a number of contaminants introduced from land-, air- and water-based sources. These include metals, organic pollutants, nutrients and particulate matter (suspended sediments).

The main growth-limiting nutrients in the Baltic Sea are nitrogen and phosphorus. When concentrations of these nutrients increase, algal growth is stimulated.

6.4.2 Assessment of potential impacts

During the construction phase, potential sources of impacts on water quality relate to sediment suspension and release of contaminants (including metals, organic contaminants, nutrients, and CWA) into the water column due to seabed interventions and pipe-lay activities, and discharges from vessels. During the operational phase, potential sources of impacts relate to the difference in temperature between the pipelines and the environment, as well as the release of metals from sacrificial anodes.

Modelling of sediment dispersion due to trenching and rock placement indicate that the concentration of spilled suspended sediment in the water column will exceed 2 mg/l (corresponding to a typical background level) at a distance of up to a few kilometres from the construction site. Monitoring of water quality during NSP construction activities showed that these modelling results can be considered conservative, i.e. that the actual sediment spread will probably be less than predicted by the modelling.

The concentrations of suspended contaminants in the water column will remain below the levels that might cause adverse effect in the biological environment, except for two organic compounds (benzo[g,h,i]perylene and indenol[1,2,3-cd]pyrene). These compounds may temporarily exceed

the threshold levels for good environmental status (GES) in the water column close to areas of trenching or rock placement, but only in the deep parts of the proposed NSP2 route where benthic and pelagic life is scarce or absent due to low oxygen concentrations.

The amounts of nutrients (N and P) released into the water column during seabed intervention are small compared to existing waterborne inflow to the area, and releases into the bottom water below the halocline will not affect the amount of primary production in the water column.

Concentrations of the CWAs and degradation products released into the water column as a result of intervention works will remain far below the level at which a negative impact on the environment would be expected.

All project vessels will be compliant with the requirements of the Helsinki Convention (Convention on the Protection of the Marine Environment of the Baltic Sea Area) and the prescriptions for the Baltic Sea Area as a MARPOL 73/78 Special Area. Therefore, no impact from discharges from vessels is expected.

Temperature at the surface of an unburied section of pipeline could be up to 0.5 º C greater than the ambient water temperature. However, this effect was not measurable more than 1 m from the pipeline. Elevated levels of anode metal ions in the water column are expected only in the very vicinity of the anodes (within a few metres), and the amounts released from the anodes are insignificant compared to the existing levels of water-borne inflow of metals to the area.

It is therefore assessed that overall impacts on water quality during construction and operation of the NSP2 will be **negligible**, except for impacts associated with release of sediment and contaminants into the water column, which were assessed to be **minor**. None of the impacts, either individually or in combination, are assessed to be significant.

6.5 Climate and air quality

6.5.1 Description of baseline conditions

The Baltic Sea is located in the temperate climate zone, characterised by large seasonal contrasts. Meteorological forces play a significant role in influencing the water temperature, ice conditions, regional river runoff, atmospheric deposition of pollutants and the mixing of water between various sub-regions of the Baltic Sea.

Air quality in the Baltic Sea is influenced by a combination of global, regional and local emissions. Heavy shipping traffic combined with industrialisation of the coast and inshore areas has led to increased levels of air pollution over time. The primary pollutants arise from the combustion of fuel on ships.

6.5.2 Assessment of potential impacts

Potential sources of impacts on air quality and climate relate to vessel emissions associated with onshore and offshore transport/vessel emissions during construction and operation.

Release of nitrogen oxides (NO_X), sulphur oxides (SO_2), carbon dioxide (CO_2) and particulate matter during both the construction and operational phase has been calculated, and corresponds to approximately 2% or less of the annual Danish emissions for each pollutant and less than 1% of the yearly total emissions from vessel activity in the Baltic Sea. As such, air emissions from the NSP2 project are generally assessed to be negligible. Furthermore, all construction and operation activities will occur several kilometres away from inhabited areas, so no local onshore air quality impacts are expected.

It is therefore assessed that impacts on climate and air quality during construction and operation of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.6 Plankton

6.6.1 Description of baseline conditions

Plankton consists of phytoplankton and zooplankton. Phytoplankton is a group of microscopic photosynthetic organisms playing the key role of providing the basis for production of higher levels in the food web, e.g. zooplankton and fish.

Populations of phytoplankton are highly dynamic and vary spatially in response to light conditions, nutrient concentrations, climatic conditions and currents. As such, phytoplankton abundance and distribution can differ from year to year. Phytoplankton also respond cyclically to seasonally driven variations in sunlight and temperature, and generally exhibit three distinct annual "blooms" during spring, summer and autumn (Figure 6-3).

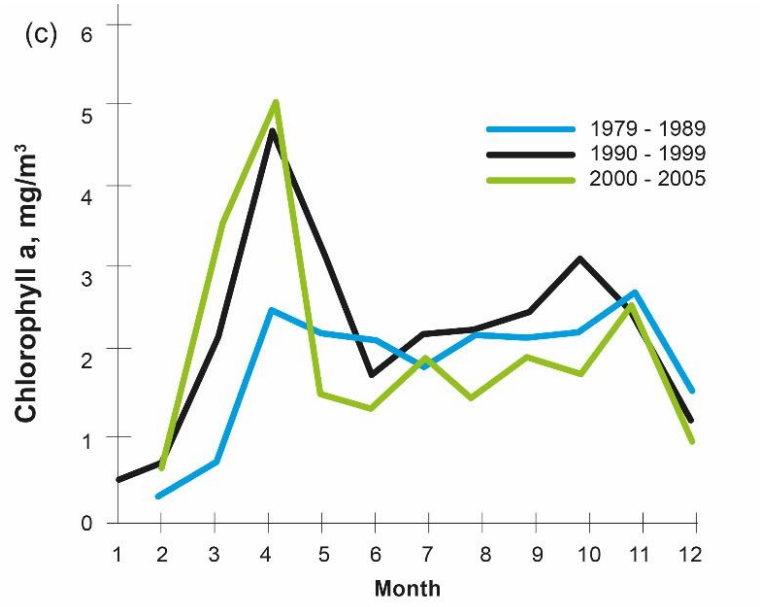

Figure 6-3 Seasonal patterns of chlorophyll-a (mg/m^3, monthly mean) for 1979-1989, 1990-1999 and 2000-2005 at station 213 (east of Bornholm), based on measurements of 0-10 m depth. Chlorophyll-*a* is a pigment that is used to estimate phytoplankton biomass

Zooplankton also forms an important part of the aquatic food web, as they are the primary food source for many small fish (which are subsequently preyed on by larger fish). The zooplankton community in the Baltic Sea consists of freshwater, brackish, and marine species. The populations are distributed vertically and horizontally and fluctuate temporally depending on prevailing physical conditions and food availability.

6.6.2 Assessment of potential impacts

During the construction phase, potential sources of impacts on the pelagic environment relate to construction activities resulting in release of sediment and contaminants (including metals, organic contaminants, nutrients and CWA) into the water column. Impacts during the operational phase relate to the release of metals from sacrificial anodes.

Pipe-lay activities and seabed intervention works will result in the release of sediment and contaminants into the water column. The greatest impact will be in areas where trenching is planned on the seabed which is predominately below the halocline. The halocline is therefore expected to prevent the migration of sediments and contaminants into the upper water layer which is inhabited by plankton.

Even if sediments and contaminants were to reach the photic zone (where plankton reside), plankton communities can generally recover from local, short-lasting disturbances (as they have adapted to the natural variation in suspended sediment concentrations). Furthermore, modelling

results show that most suspended sediments will resettle close to the pipelines, thereby further limiting the spatial and temporal extent of impacts.

During operation, elevated levels of anode metal ions in the water column are expected only in the very vicinity of the anodes (few metres), and the amounts released from the anodes are insignificant compared to the existing levels of water-borne inflow of metals to the area. Therefore, it has been concluded that no impact on the biological environment is expected from release of metals from the anodes.

It is therefore assessed that impacts on plankton during construction and operation of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.7 Benthic flora and fauna

6.7.1 Description of baseline conditions

In the deep parts of Danish waters, the concentration of dissolved oxygen in the bottom water is the most critical factor influencing species abundance and diversity, along with salinity, light, substrate and water movement. Due to periods of little water movement combined with low or no oxygen conditions, benthic "ecological deserts" cover more than half of the seabed along the Danish portion of the proposed NSP2 route. Relating to this, no benthic flora is present along the proposed NSP2 route in Danish waters and therefore has not been discussed further in this section.

A survey along the Danish part of the proposed NSP2 route showed that the benthic fauna differ significantly with depth, both with respect to abundance and numbers of species. In the deeper waters (>60 m depth), zoobenthos are present in very low numbers, and consist mainly of opportunistic and H2S-tolerant species of Polychaetes. In areas of intermediate depth (40 to 60 m), biodiversity is higher and the biomass is dominated by mussels. At shallower depths (<40 m), Annelids were the most abundant group of zoobenthos, although bivalves dominated the biomass.

6.7.2 Assessment of potential impacts

During the construction phase, potential sources of impacts on benthic fauna relate to construction activities resulting in physical disturbance of the seabed; sedimentation on the seabed; release of sediment and contaminants (including metals, organic contaminants and CWA) into the water column. During the operation phase, impacts relate to change of habitat and release of metals from anodes.

Physical disturbance associated with construction activities may result in the mortality or temporary exposure of buried or bottom-dwelling organisms (infauna). The impact would be limited to the footprint of the physical disturbance, which covers a negligible area in comparison with the surrounding habitats which are physically uniform and support similar benthic communities.

During rock placement and trenching, mobilization and re-sedimentation of material from the seabed can change habitat conditions, restrict sunlight penetration and clog the feeding apparatuses of filter feeding animals. Modelling has shown that the rate and amount of sediment resettling on the seabed after rock placement will not exceed thresholds at which benthic life would be permanently impacted.

Calculation of potential release of chemical compounds based on concentrations found in seabed sediments has shown that concentrations in water are below the level that might cause adverse effect in the biological environment.

During operation, the presence of the pipelines and structures on the seabed will appear as solid structures emerging from a quite homogenous looking seabed consisting of sand or mud. This can potentially create a new hard-bottom substrate (a reef effect from pipelines and rocks),

where benthic fauna can settle. Mobile animals may then be attracted to the area in search of food and/or shelter. Overall, any changes to the population structure near the pipelines will be limited, given the spatial extent of the pipelines compared with the total amount of similar habitat in the Baltic Sea.

Also during operation, it has been concluded that no impact on the benthic fauna is expected from release of metals from the sacrificial anodes.

It is therefore assessed that overall impacts on benthic fauna during construction and operation of the NSP2 will be **negligible**, except for the change of habitat which was assessed to have a **minor** impact. None of the impacts, either individually or in combination, are assessed to be significant.

6.8 Fish

6.8.1 Description of baseline conditions

The fish communities in the Baltic Sea are largely dependent on the basic physical settings (i.e. salinity, temperature, oxygen) which constrain biodiversity, fish recruitment and water quality. In particular, the distribution of the fish species inhabiting the Baltic is governed by salinity. Marine species dominate the Baltic Proper and account for approximately two-thirds of the species found in the Baltic Sea, while freshwater species (one-third of the species) occur in the coastal areas and in the innermost parts of the Baltic Sea.

The most commonly occurring fish species in the Bornholm Basin are Baltic cod, sprat, flounder and four-bearded rockling. In addition, plaice and sand goby are frequently found in Danish waters. The proposed NSP2 route goes through the spawning areas/nursery areas of cod, sprat and flounder and feeding areas of herring and salmon. Several species that occur in Danish waters are classified as threatened or near threatened per the HELCOM Red List of Baltic sea species in danger of becoming extinct, and some species are included in Annex II of the EU habitat directive.

6.8.2 Assessment of potential impacts

During the construction phase, potential sources of impact on fish relate to physical disturbance on the seabed; release of sediment and contaminants (including metals, organic contaminants and CWA) into the water column; subsequent sedimentation; and generation of underwater noise. During the operational phase, potential impacts relate to change of habitat and release of metals from sacrificial anodes.

Physical disturbance from construction works would be limited to the footprint of the proposed NSP2 route and will not impact fish populations as a whole. The system is expected to naturally revert to its pre-impact state within a short time span.

Increased water turbidity and oxygen consumption due to suspension of sediment and organic matter during construction works may impact the viability of fish eggs and larvae and cause avoidance reactions in juvenile and adult fish. Modelling of sediment spread has shown that elevated levels of suspended sediments will be restricted to approximately 10 m above the seabed, and increased concentrations will be local and temporary. Therefore, the most severe response from fish is expected to be temporary avoidance behaviour. No significant impact on fish as a result of increased suspended sediment concentration was observed by monitoring undertaken during the NSP construction activities.

Disturbance of the seabed may also cause the release of contaminants into the water column, which fish are at risk of ingesting and accumulating in their tissues. However, calculations have shown that the potential releases of chemical compounds into the water column are below the levels that might cause adverse effect in the biological environment.

Rock placement will cause the highest levels of underwater noise which can potentially impact fish. Modelling of underwater noise from rock placement has shown that underwater noise will be

short-term and localised. Predicted noise levels are likely to trigger an avoidance response in most fish in close proximity to the proposed NSP2 route, however the TTS threshold (causing temporary hearing loss) is only exceeded within a radius up to 100 m from the noise source (Figure 6-4). On this basis, minor impacts to individual fish may occur, but no population-level impacts are expected.

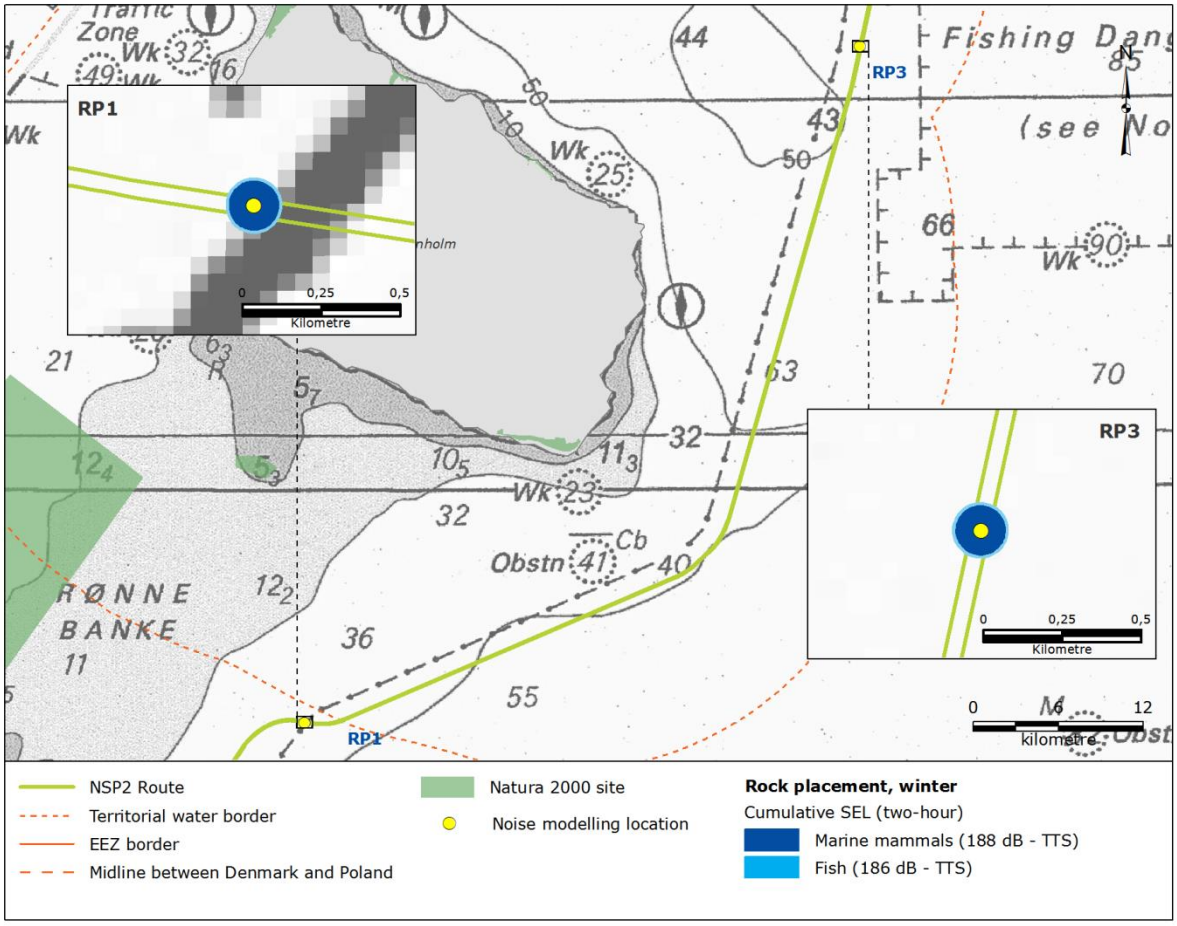

Figure 6-4 Underwater continuous noise level contour plots showing cumulative SEL, dB re. 1µPa., 1 sec (winter) from rock placement activities. The SEL levels are related to the threshold levels used in the assessment for fish and marine mammals

During operation, the amounts released from the sacrificial anodes are insignificant compared to the existing levels of water-borne inflow of metals to the area. Therefore, it has been concluded that negligible impacts on fish are expected from release of metals from the anodes.

It is therefore assessed that overall impacts on fish during construction and operation of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.9 Marine mammals

6.9.1 Description of baseline conditions

Marine mammal species commonly found in Danish waters along the NSP2 route include the harbour porpoise and grey seal. These species are protected under several international treaties, agreements and laws and are considered endangered (in the case of the harbour porpoise, critically endangered) by the International Union for the Conservation of Nature and Natural Resources.

Overall, the Danish part of the Baltic Sea has a relatively low abundance of harbour porpoises. However, harbour porpoises may be present in Danish waters during breeding and lactation,

which lasts from mid-June to August. They are most vulnerable during the breeding period, but the calves may be vulnerable throughout the first year, especially after leaving their mother.

Grey seals may be present in Danish waters during breeding and lactation, which lasts from February to March, as well as during moulting, which lasts from May to June. They are most vulnerable during their moulting, breeding and lactation periods. Furthermore, the proposed NSP2 route will come within 13 km of the Danish haul-out site for grey seals near Christiansø (Figure 6-5).

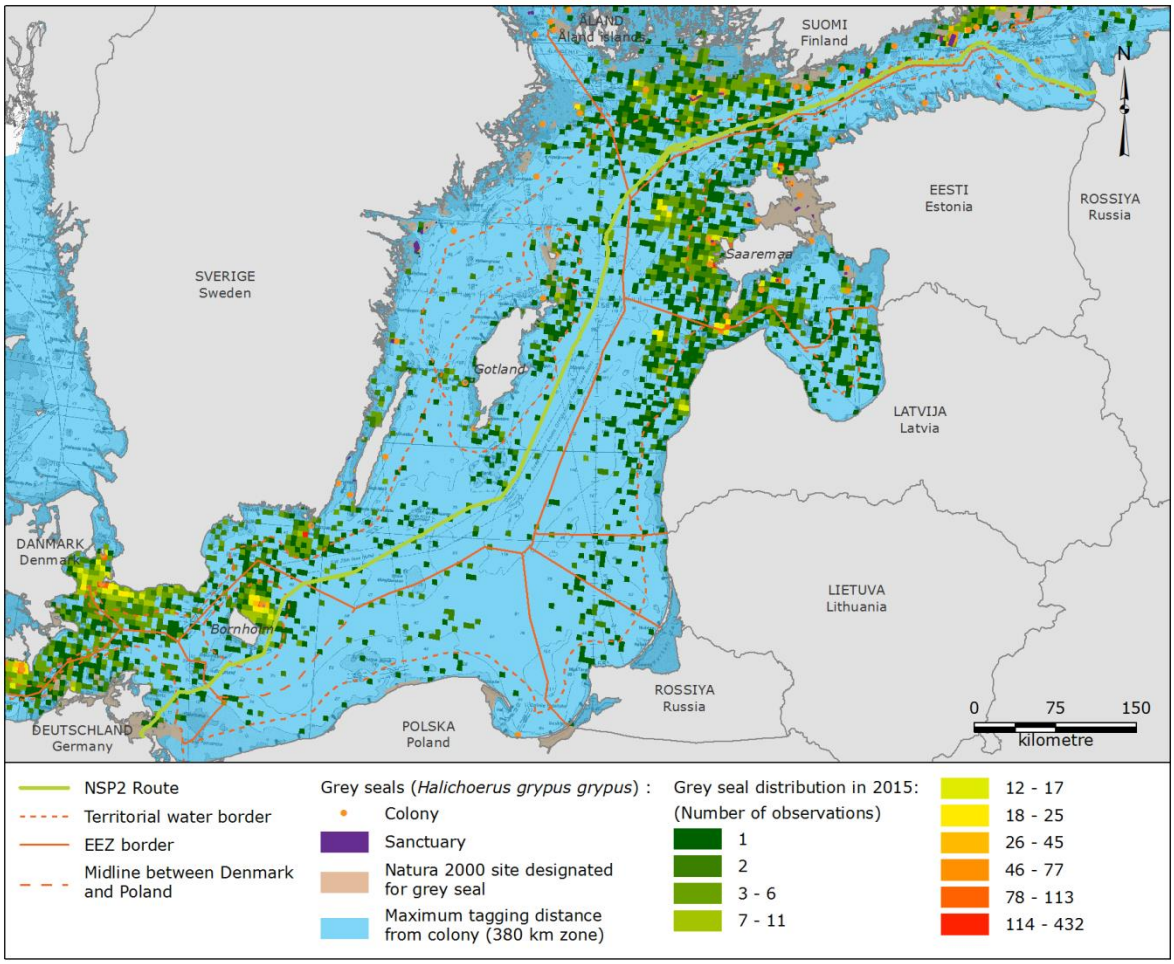

Figure 6-5 Haul-out sites (colonies) used by grey seals for resting, breeding and moulting. Global positioning system (GPS) tracking of grey seals is indicated by blue dots

6.9.2 Assessment of potential impacts

During the construction phase, potential sources of impacts on marine mammals relate to release of sediment and contaminants (including metals, organic contaminants and CWA) into the water column; and generation of underwater noise. During the operational phase, potential impacts relate to change of habitat.

Suspended sediment in the water column may directly affect marine mammals by affecting their vision or causing injury to visual organs. Modelling of sediment spill has shown that sedimentation will only occur in relative proximity to the pipelines (as well as be limited to the bottom 10 m of the water column) and will be short-term. Therefore, suspended sediment in the water column are not expected to have a noticeable impact on marine mammal vision.

Contaminants, such as organic pollutants, heavy metals and CWA, can impact marine mammals either directly, or through the food chain, causing bioaccumulation in the tissues and resulting in potentially toxic effects. However, given the low concentrations and limited spatial extent and

duration of sediment spill during construction activities, combined with the highly mobile nature of marine mammals, no impacts are anticipated.

Underwater noise has the potential to result in physical injury and hearing loss, behavioural disturbance or masking effects on marine mammals. Modelling of rock placement, which will result in the highest underwater noise levels, has shown that noise levels will not exceed the threshold for permanent hearing loss, though there is a risk of temporary hearing loss in close proximity to the noise source (within 80 m, see Figure 6-4) i.e. rock placement activities.

During operation, the presence of the pipelines and support structures on the seabed may alter the existing habitat, increasing local benthic diversity and consequently fish diversity and abundance. However, given the limited spatial extent of the pipelines compared with the overall foraging area for Baltic marine mammals, the impact resulting from a change in prey abundance will be negligible.

It is therefore assessed that overall impacts on marine mammals during construction and operation of the NSP2 will be **negligible**, except for the behavioural impacts of underwater noise during construction which is assessed as **minor**. None of the impacts, either individually or in combination, are assessed to be significant.

6.10 Birds

6.10.1 Description of baseline conditions

The Baltic Sea is an important area for numerous seabird species, including gulls, auks, dabbling ducks, sea ducks, mergansers and coots. The majority of the species are associated with relatively shallow water (<30 m) including lower sub-littoral areas, offshore banks and lagoons. A reduced number of birds forage in the more open and deeper parts of the Baltic Sea.

Two important Bird and Biodiversity Areas (IBAs) are located within Danish waters: DK079 Ertholmene, east of Bornholm, and DK120 Rønne Banke, south of Bornholm. These areas are shown in Figure 6-6.

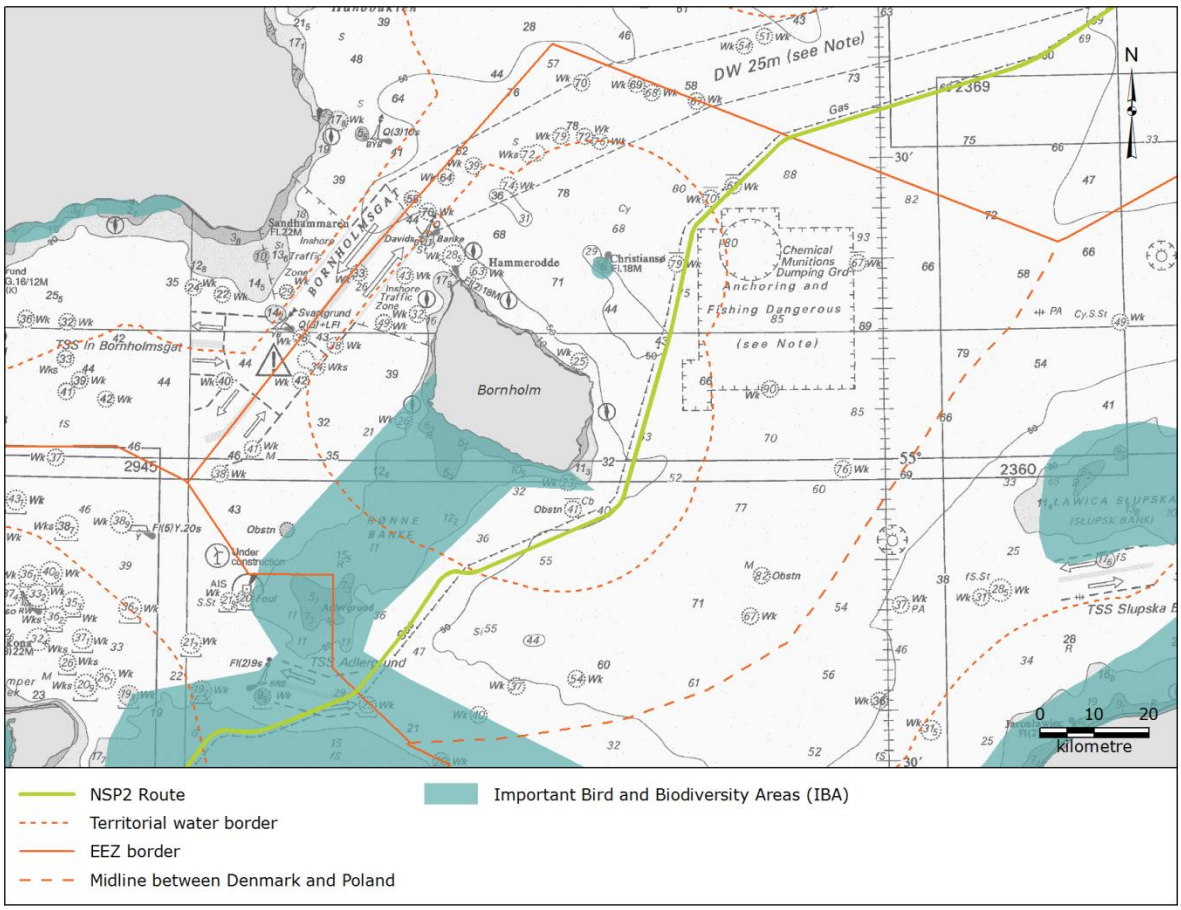

Figure 6-6 IBAs in Danish waters

NSP baseline surveys conducted in 2007-2009 found a total of 14 species within Danish waters, although all represented less than 1 % of their total Baltic Sea populations. The results identified a foraging area used by razorbill and guillemot (Natura 2000 bird species, see section 6.12) approximately 20 km north-east of their colonies on the island of Ertholmene. Summer and winter surveys between Rønne Bank and Oder Bank, areas commonly visited by overwintering waterbirds, found only two species present at low abundances during the summer surveys and six bird species or species groups present in higher abundances during the winter. The most commonly observed species was the long-tailed duck, observed in the shallow parts of Rønne Banke at <20 m water depth.

6.10.2 Assessment of potential impacts

During the construction phase, potential sources of impacts on birds relate to the release of sediment and contaminants (including metals, organic contaminants and CWA) into the water column and physical disturbance above water during construction. Particular consideration has been given the Important Bird and Biodiversity Areas (IBAs) DK079 Ertholmene and DK120 Rønne Banke. No impacts are anticipated during the operational phase.

An increase in suspended sediments in the water column has the potential to impact foraging efficiency of birds (depending on foraging method) as a result of decreased water transparency or reduced food availability due to prey avoidance. However, modelling has shown that elevated levels of suspended sediment will be limited in scale, duration and spatial extent, and does not have potential to impact the nearby IBAs.

Sedimentation on the seabed has the potential to cause burial of food resources (infauna and epifauna species), which may affect the availability of prey species for benthic feeders (e.g. mergansers and coots). However, the area that may be impacted is small (0.65 km2 may be covered

by up to approximately 1 mm of sediment), and it was concluded that sedimentation on the seabed is unlikely to affect foraging of benthos-feeding birds.

Calculation of potential release of chemical compounds has shown that concentrations in the water column are expected to be below the level that might cause adverse effect in the biological environment.

The physical presence of construction vessels (visual presence and noise) has the potential to disturb birds and cause them to temporarily abandon their resting and/or foraging areas. Based on empirical data, bird flight distances vary by species, but in general impacts are expected to be limited to a 1-2 km radius around the vessels. Given the nature of the construction works, birds within the impact radius will only be disturbed for a short amount of time (less than 24 hours).

It is therefore assessed that overall impacts on birds during construction of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.11 Protected areas

6.11.1 Description of baseline conditions

Protected areas in the Baltic Sea include marine and coastal habitats and species. Some areas are under strict legal protection, such as Natura 2000 sites, and others are designations or recommendations, such as Ramsar sites[1] and HELCOM Marine Protected Areas[2]. The locations of protected areas in Danish waters are shown in Figure 6-7. Natura 2000 sites are discussed separately in section 6.12.

[1] The Convention on Wetlands of International Importance (the Ramsar Convention) is the international treaty that provides the framework for national action and international cooperation for the designation and conservation of wetlands.

[2] The Helsinki Commission, or HELCOM, is the governing body of the international Convention on the Protection of the Marine Environment of the Baltic Sea, and works to protect the marine environment of the Baltic Sea from all sources of pollution through intergovernmental cooperation. Each HELCOM Marine Protected Area has been selected for its unique set of nature values and is under a site-specific management plan.

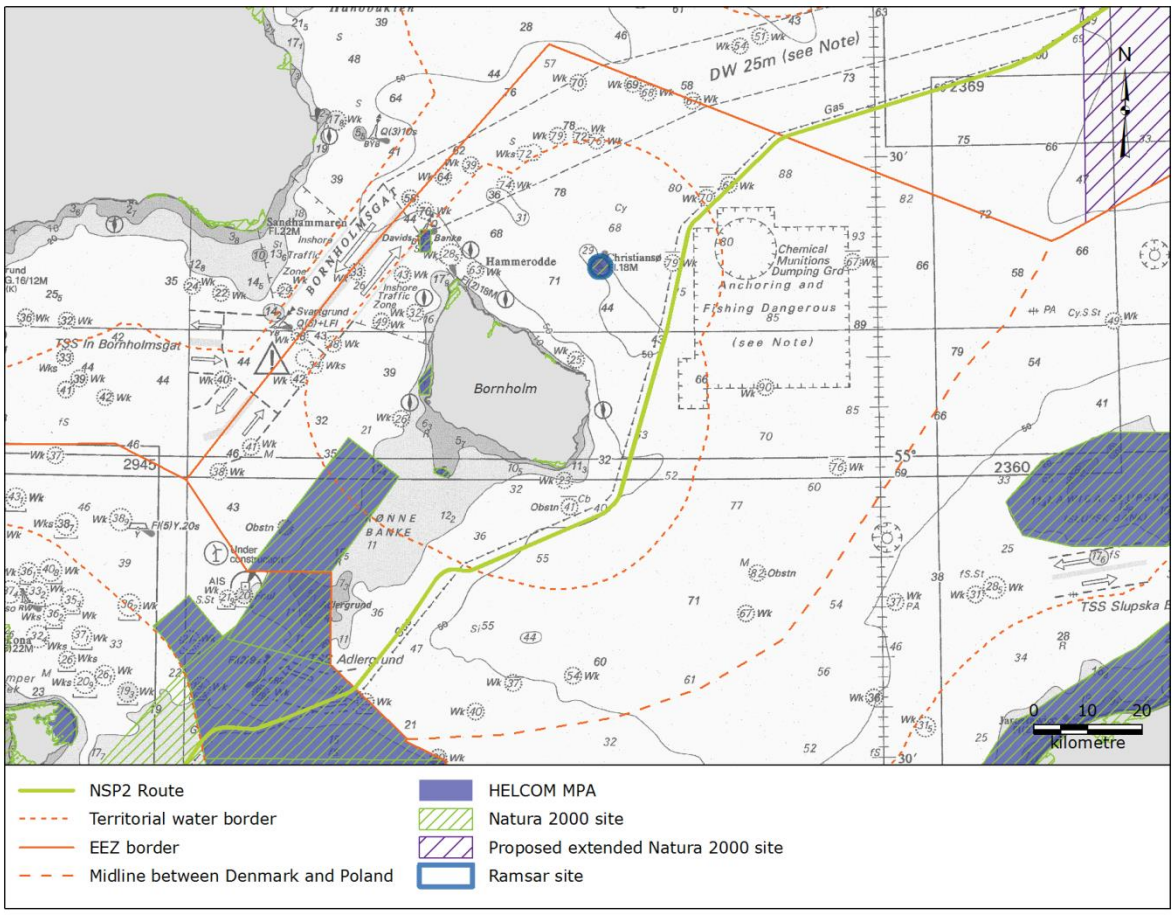

Figure 6-7 Protected areas along the pipeline route within Danish waters

6.11.2 Assessment of potential impacts

During the construction phase, potential sources of impacts on protected areas are related to release of sediment and contaminants (including metals, organic contaminants, and CWA) into the water column, sedimentation on the seabed, introduction of non-indigenous species, and physical disturbance above water. During the operation phase, potential impacts are related to introduction of non-indigenous species, physical disturbance above water, presence of pipelines and structures on the seabed, and release of metals from anodes.

The protected areas in Danish waters are situated at least 13 km from the proposed NSP2 route. Modelling results show that no impacts on water quality, fish, marine mammals, or birds can be expected within the protected areas due to sediment/contaminant spread in the water, sedimentation, or noise generation associated with NSP2 construction and/or operational phase.

Metals released from anodes are expected only to affect water quality in the very vicinity of the anodes (within a few metres), and hence no impacts are anticipated within the protected areas.

It is therefore assessed that there will be **no** impacts on protected areas during construction and operation of the NSP2.

6.12 Natura 2000 sites

6.12.1 Description of baseline conditions

Natura 2000 is an ecological network of protected areas, set up to ensure the survival of Europe's most valuable species and habitats. The network is comprised of three types of sites: Special Protection Areas (SPAs), which are designated under the European Commission Birds Directive; Special Areas of Conservation (SACs), which are designated under the European Commission

Habitat Directive (adopted by the European Commission and formally designated by the government of each country in whose territory the site lies); and Sites of Community Importance (SCIs), designated under the European Commission Habitat Directive (adopted by the European Commission but not yet formally designated by the government of each country). Natura 2000 sites are shown in Figure 6-8.

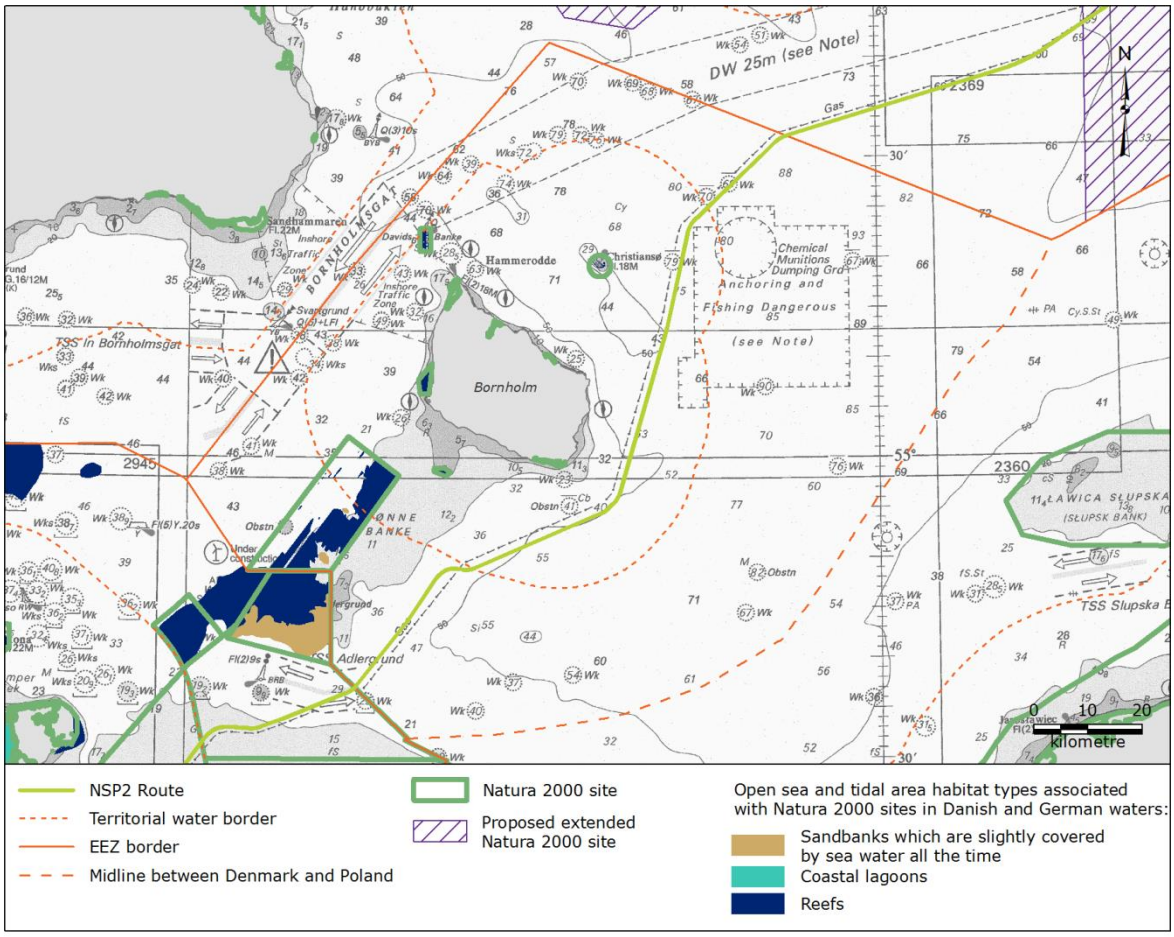

Figure 6-8 Natura 2000 sites in the Danish section of the NSP2 project area

6.12.2 Assessment of potential impacts

During the construction phase, potential sources of impacts to Natura 2000 sites are related to release of sediment and contaminants (including metals, organic contaminants and CWA) into the water column, sedimentation on the seabed, generation of underwater noise, and physical disturbance above water. During the operation phase, potential impacts are related to physical disturbance above water and physical presence of pipelines and structures on the seabed.

No activities associated with the NSP2 project in the Danish sector will occur within Natura 2000 sites. As described above, the closest Natura 2000 site is 13 km from the proposed NSP2 route.

Modelling results show that no impacts on qualifying species or habitat of the Natura 2000 sites can be expected due to sediment/contaminant spread in the water, sedimentation on the seabed, above/underwater noise generation, or emissions associated with NSP2 construction and/or operational phase.

It is therefore assessed that there will be **no** risk of significant impacts to Natura 2000 sites from the NSP2 project.

6.13 Biodiversity

6.13.1 Description of baseline conditions

The Baltic Sea is generally considered to have a low biodiversity[3], due in part to the young geological age of its current physiological and chemical conditions. This means that many species have not fully adapted to the brackish conditions, and both true marine and freshwater species inhabiting the Baltic Sea are living at their physiological limits and are geographically limited. As discussed in section 6.3 and 6.7, the hydrological conditions in the Baltic Sea also results in poor ventilation of the deep bottom waters which severely restricts the biodiversity in these areas.

In the Danish sector, HELCOM has assessed the area to range from "Bad" to "Moderate", reflecting an impaired biodiversity status (Figure 6-9). The "Bad" areas generally correspond to the deeper parts of the Bornholm Basin, where low oxygen levels restrict life, and the "Moderate" areas correspond to the Arkona Basin, where seasonal inflows of oxygenated marine water keep the bottom layers of the shallow basins relatively mixed and oxygenated throughout the year.

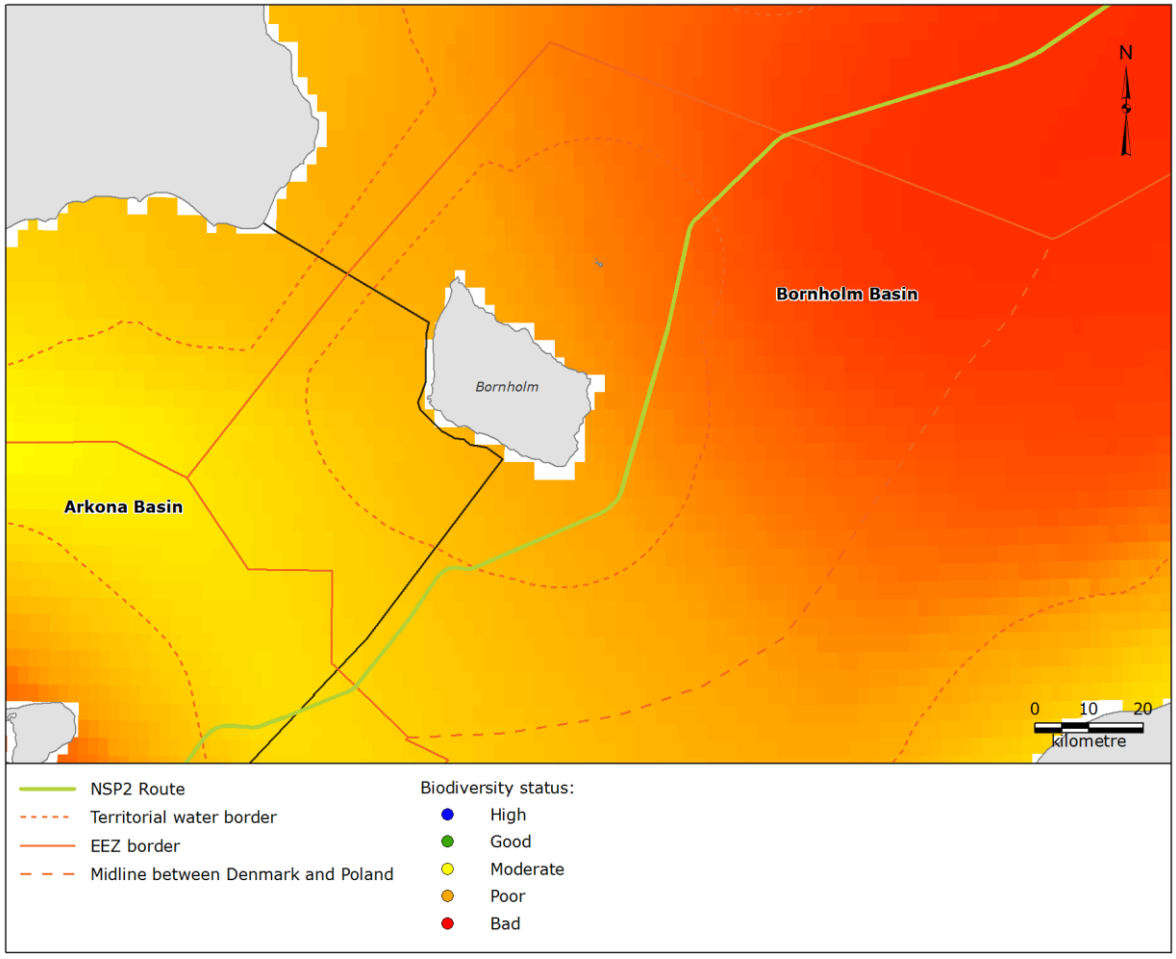

Figure 6-9 Biodiversity status in Danish waters

The main pressures on the biodiversity in the Baltic Sea ecosystem are considered to be eutrophication, introduction of non-indigenous species, and other anthropogenic disturbances of important areas.

6.13.2 Assessment of potential impacts

Impacts on biodiversity are consistent with impacts identified for species and habitats discussed above. Additionally, there is potential for impact on species and habitats to combine. Based on a

[3] Biodiversity is typically referred to as the "health" of the ecosystem.

review of the potential for in-combination impacts it is considered that NSP2 will not impact the overall integrity and functioning of the habitat, nor the trophic interactions between species. Furthermore, the potential to introduce non-indigenous species is limited by the fact that ballast water will be taken in from the Baltic Sea rather than released, and by the unfavourable (hypoxic/anoxic) conditions in the deep parts of the proposed NSP2 route which will prevent spread of hard-bottom organisms along the exposed surface of the pipeline.

The construction and operation of NSP2 will not result in a significant impact on the fundamental abiotic conditions that controls the biodiversity in the system (e.g. salinity and low oxygen content in bottom waters) or the main pressures on biodiversity (i.e. eutrophication, non-indigenous species and other anthropogenic disturbances.

It is therefore assessed that impacts on biodiversity during construction and operation of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.14 Shipping and shipping lanes

6.14.1 Description of baseline conditions

The Baltic Sea is one of the most intensely trafficked seas in the world and accounts for 15% of the world's cargo transportation. The majority of ships in the Baltic Sea follow predesignated routes that are static and in accordance with existing traffic separation schemes (TSSs).

Four ship traffic routes have been identified in the vicinity of the proposed NSP2 route in Danish waters (Figure 6-10).

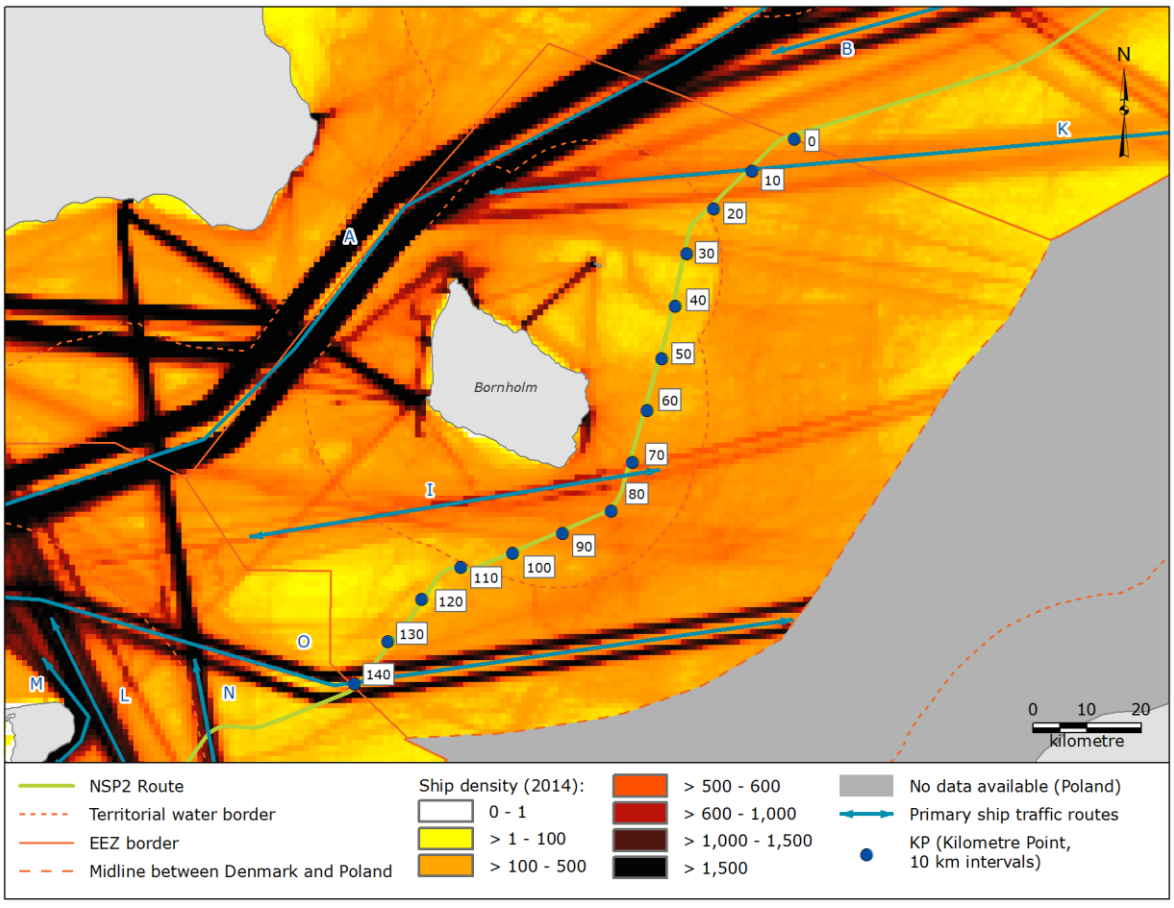

Figure 6-10 Ship traffic density in Danish waters

The annual number of ships crossing the proposed NSP2 route has been estimated for each kilometre point (KP) along the whole route (see Figure 5-12). The area with the highest number of crossings (approximately 1,200) in Danish waters is associated with the westbound traffic at the TSS Adlergrund (KP 138) before entering German waters.

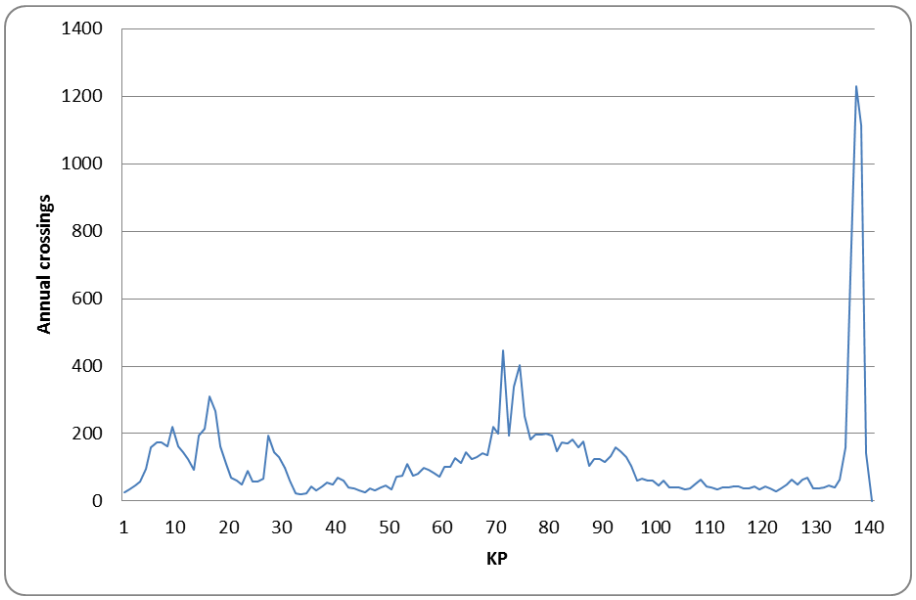

Figure 6-11 Predicted annual crossings per KP along the proposed NSP2 route in Danish waters

6.14.2 Assessment of potential impacts

Potential sources of impacts on shipping and shipping lanes relate to the imposition of safety zones around stationary or slow moving vessels (i.e. pipe-lay or survey vessels) during both the construction and operation phases.

During construction, safety zones will be established around each vessel, the radius of which will depend on the vessel type: 3,000 m for the anchor lay barge, 2,000 m for the DP pipe-lay vessel, and 500 m radius for other vessels that are restricted in their manoeuvrability (to be agreed with the authorities). In the temporary safety zone unauthorized navigation, diving, anchoring, fishery or work on the seabed will be prohibited; therefore all vessels not involved in construction activities will be required to plan their journey around the safety zone. However, the imposition of the safety zone will be temporary at any given location as the construction area is continuously moving with a rate of approximately 2.5 km per day.

During the operations phase, no project-related vessels will be present along the proposed NSP2 route during normal pipeline operations. However, external surveys of the pipelines are expected to be carried out at one- or two-year intervals in the beginning of the operational phase. Later in the operational phase, there may be longer intervals between these surveys depending on the survey results.

It is therefore assessed that overall impacts on shipping and shipping lanes during construction and operation of the NSP2 will be **negligible**, except for the impacts of imposition of safety zones around vessels in the construction phase, which are assessed to be **minor**; none of the impacts, either individually or in combination, are assessed to be significant.

6.15 Commercial fishery

6.15.1 Description of baseline conditions

Fishery is an important part of the Danish economy, with fishery vessels from Denmark and other parts of the EU periodically fishing in Danish waters.

The number of registered fishing vessels based on Bornholm, including Christiansø, decreased from 94 to 79 between 2010 and 2014. In 2014, there were 12 harbours on Bornholm with registered fishing vessels; Nexø on the eastern side of the island had the greatest number. The gear types most commonly used by Bornholm-based vessels were trawls and gill nets. The bottom trawl fishery is particularly intense to the west of Bornholm and in a larger area extending from just south of Bornholm all the way to the east/northeast of the island (see Figure 6-12).

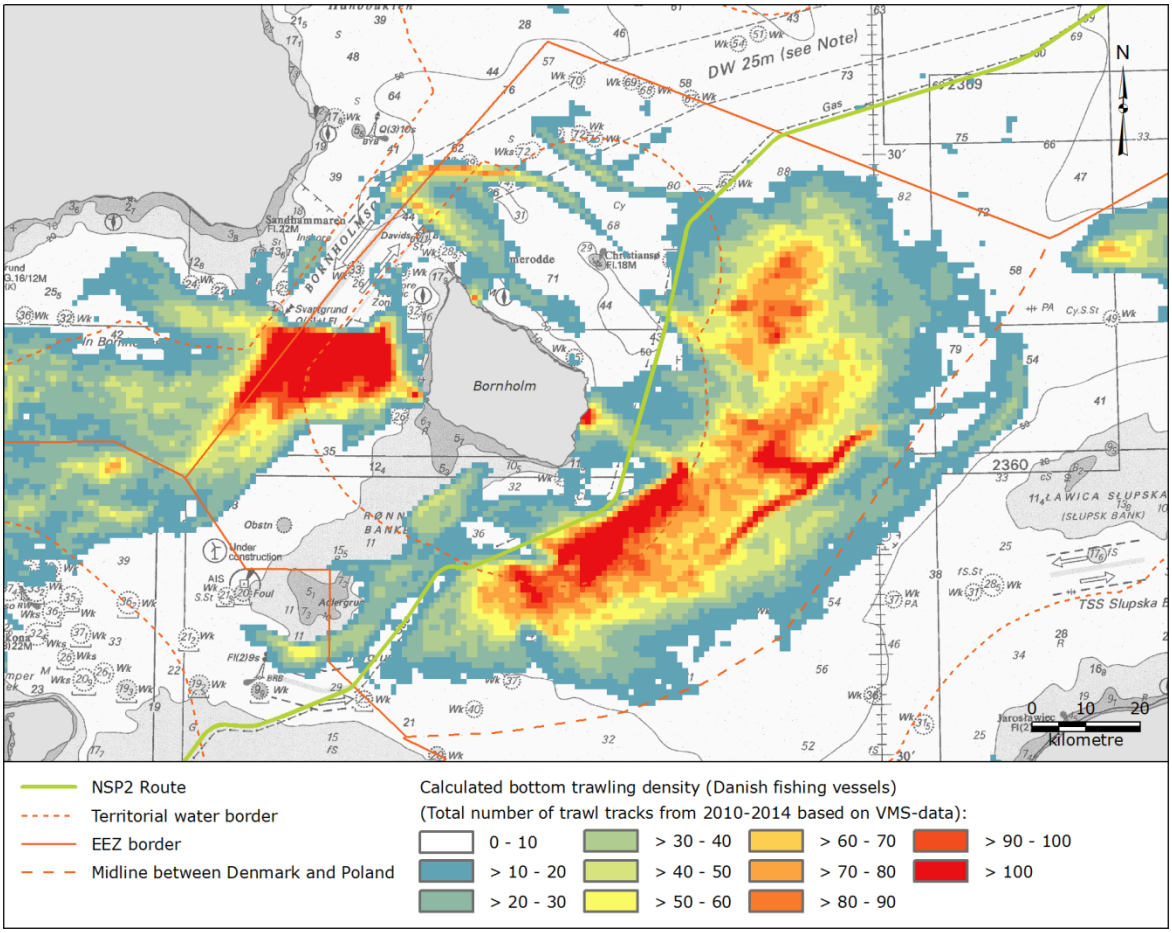

Figure 6-12 Distribution of fishery by bottom trawling in Danish waters. Data source: Danish AgriFish Agency

Several other countries also fish within Danish waters. Between 2010 and 2014, the mean annual catch and mean annual value of the catch of all fishing vessels near the proposed pipeline route in Danish waters amounted to 279,245 tonnes and 107 million euros, respectively. Danish vessels comprised approximately 13.5% (37,578 tonnes) of the mean annual catch by weight and 20% (21.3 million euros) of the mean annual catch by value.

6.15.2 Assessment of potential impacts

During the construction phase, potential sources of impacts on fishery relate to safety zones around vessels and physical disturbance above water (from increased vessel movements). During the operation phase, the potential impacts are related to the presence of the pipelines and structures on seabed.

During construction, supply vessels will bring pipes and other supplies to the pipe-lay vessel. The increased traffic in the area has the potential to damage fishing gear, particularly longlines at the surface of the water column. Approximately 20 vessels from Bornholm periodically use this type of equipment (some of which are fishing for cod close to the seabed, and therefore the lines are not disturbed by traversing vessels) and as such the impacts would be limited.

During operation the physical presence of pipelines and structures on the seabed has the potential to impact on bottom trawling activities through either protection zones or through damage or loss of gear.

Analysis of the embedment of the existing NSP pipelines in Danish waters show that five years after installation, the pipelines are embedded at least 50% in many locations. A similar level of embedment is expected for the NSP2 pipelines, reducing the actual height above the seabed.

It is therefore assessed that overall impacts on commercial fishery during construction and operation of the NSP2 will be negligible, with the exception of the presence of the pipeline on the seabed, which is assessed to have a minor impact; none of the impacts, either individually or in combination, are assessed to be significant.

6.16 Cultural heritage

6.16.1 Description of baseline conditions

The maritime cultural heritage in the Baltic Sea primarily consists of two broad categories of underwater cultural heritage objects (CHOs): submerged Stone Age settlements and manmade objects including shipwrecks, aircrafts and other artefacts. Both are of great historical importance and are therefore protected under Danish and international law. The proposed NSP2 route will not pass through areas identified or suspected of containing Stone Age settlements; as such, these are not discussed further.

A geophysical reconnaissance survey of the proposed NSP2 route corridor performed between November 2015 and March 2016 identified seven potential wreck sites, two of which were previously found during surveys for NSP and five of which were new findings. The shipwrecks identified during the NSP and NSP2 project investigations are shown in Figure 6-13. Further assessment of the CHO in cooperation with recognized marine archaeologist is ongoing.

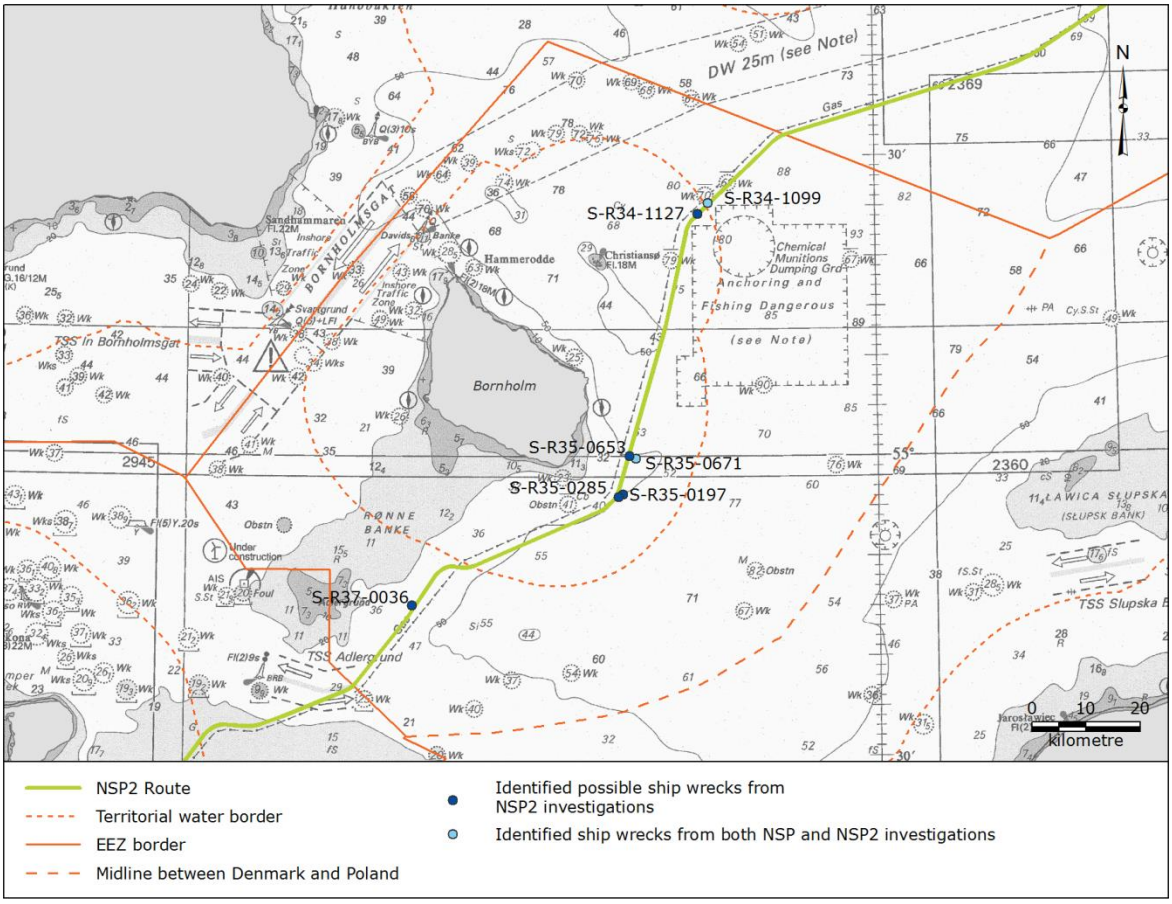

Figure 6-13 Identified possible wrecks during the NSP and NSP2 investigations

6.16.2 Assessment of potential impacts

Potential sources of impacts on CHOs relate to physical disturbance of the seabed during the construction phase and the presence of the pipelines and structures on the seabed during the operation phase.

Pipe-lay, anchor-handling, trenching and rock placement could damage CHOs or make them inaccessible for archaeological investigation. To ensure the integrity of CHOs during the construction and operation of NSP2, all targets found during route surveys will be visually inspected. Mitigation measures, as necessary, will be elaborated together with the relevant Danish authorities. Safety zones will be defined around identified CHOs. This approach proved effective during NSP construction, with post-lay wreck monitoring surveys showing no impacts in Danish waters.

Findings of unexpected items during construction works are to be managed according to the chance finds procedure prepared by Nord Stream 2 AG. The procedure includes notification of the national cultural heritage agencies, in accordance with national laws and international conventions.

Long-term presence of pipelines and structures on the seabed has the potential to alter sedimentation patterns and/or cause erosion around protected wrecks due to local changes in currents. However, NSP2 has been routed to avoid potential CHOs, and where required, a separation distance will be established, so negligible impacts from erosion around CHOs is anticipated. Following the implementation of similar precautions, the monitoring programme for cultural heritage developed for NSP showed no disturbance of known wrecks.

It is therefore assessed that overall impacts on cultural heritage during construction and operation of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.17 People and health

6.17.1 Description of baseline conditions

Although no NSP2 activities are proposed close to the mainland of Denmark, the proposed NSP2 route passes to the east and south of Bornholm and Ertholmene in Danish waters. Bornholm is located approximately 10 km from the proposed NSP2 route, has a population of approximately 39,830 residents and is part of the Capital Region of Denmark. Ertholmene is located approximately 15 km from the proposed NSP2 route, has a permanent population of approximately 90 residents and is not part of any municipality or region of Denmark.

6.17.2 Assessment of potential impacts

Potential sources of impacts on people and health relate to the physical disturbance above water (comprising airborne noise and light from vessels) during both the construction and operation phase.

Bornholm and Ertholmene which are located approximately 10 km away from the proposed NSP2 pipeline route are the closest populated areas. As such, only impacts with a large spatial extent could potentially affect residents of these islands.

However, as shown in Figure 6-14, the noise levels from the pipe-lay activities (considered worst-case for airborne noise) are not expected to exceed the World Health Organisation (WHO) maximum onshore threshold guideline of 40 decibels (dB). In fact, it is unlikely that the noise will be heard above ambient levels.

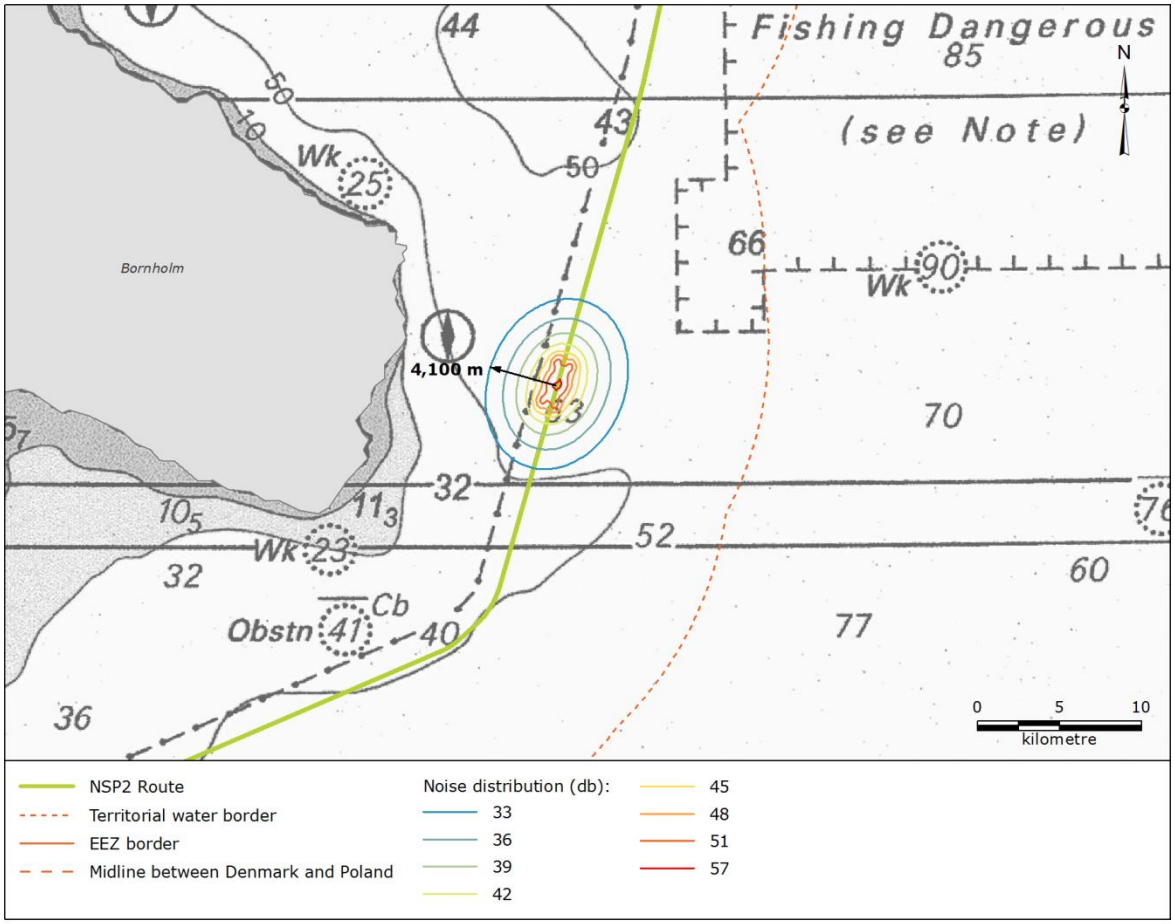

Figure 6-14 Distribution of airborne noise from the pipe-lay vessel

Pipe-lay will be conducted on a 24-hour basis, and during the dark periods at night, the pipe-lay vessel will use spotlights. The visibility of the light from land will depend on the weather conditions and the position of the pipe-lay vessel. When visibility is good, it is possible to see 19 km or more across the Baltic Sea, and therefore the spotlight would likely be visible from both Born-

holm and Ertholmene. However, as the light source will be at least 10 km from land (where NSP2 runs closest to the Bornholm coast), and the light intensity will decrease with increasing distance the spotlight is unlikely to cause a nuisance to the people living close to the southern or eastern coast of Bornholm or Ertholmene.

During operation, there is the potential for the same airborne noise and light impacts during periodic, vessel-based inspection and maintenance activities. However, given that inspection activities will only occur every one to two years (at their most frequent), impacts are expected to be similar to or more likely, less than what is expected during construction.

It is therefore assessed that overall impacts on people and health during construction and operation of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.18 Tourism and recreational areas

6.18.1 Description of baseline conditions

Tourism and recreation are important parts of the Danish economy, and influences people's amenity. The number of tourists visiting Bornholm has been increasing over the last several years, with 650,000 visitors in 2007. Ertholmene hosts approximately 40,000 visitors annually. The majority of tourists visit the islands during the summer and arrive by ferry.

The most popular land-based attractions on Bornholm are primarily located on the western and northern sides of the island (Figure 6-15). Outdoor activities such as hiking and birdwatching are popular on both islands, whilst the coastal waters are well-suited for recreational activities such as bathing, recreational fishing and diving. The latter of which is possible either from the shore or from boats with some diving excursions visiting shipwrecks located 5-10 km or even further from the coast.

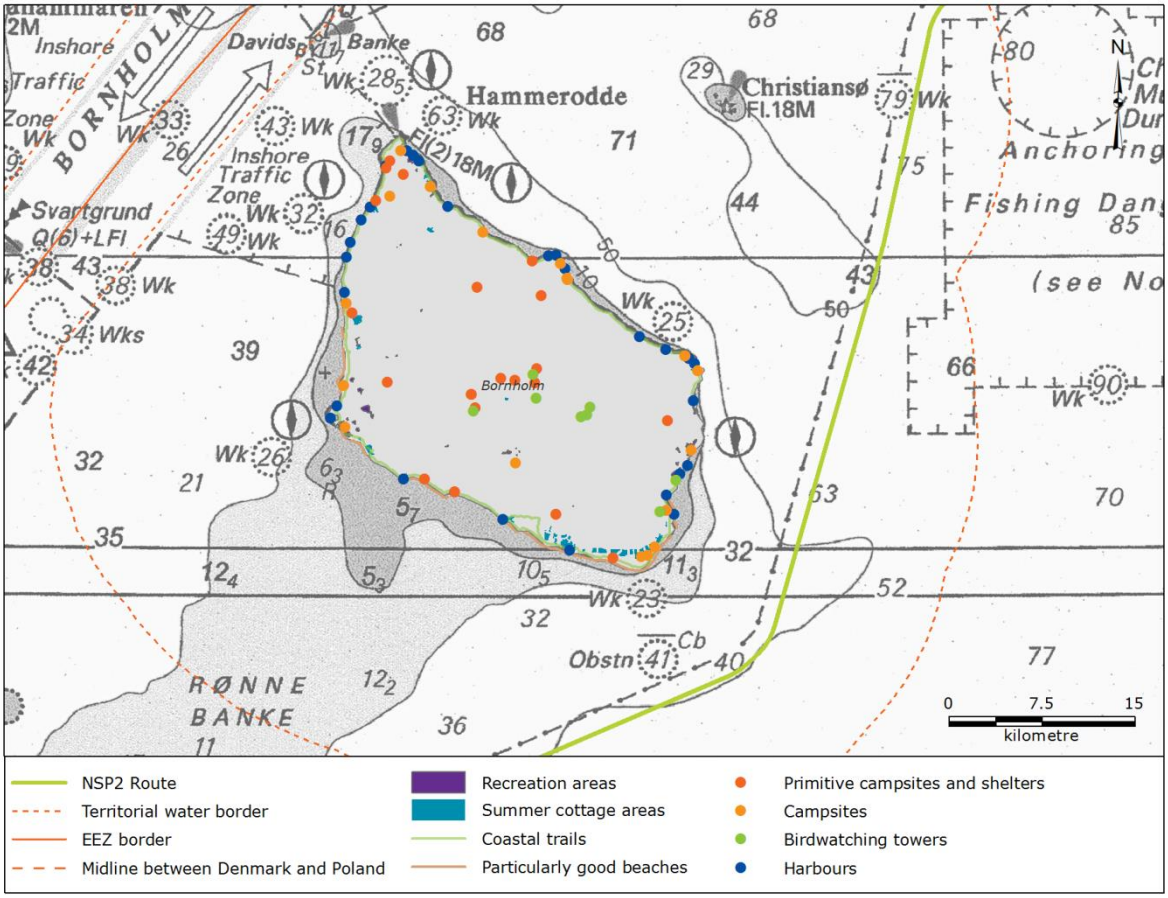

Figure 6-15 Recreational interests and areas of interest in relation to tourism on Bornholm

6.18.2 Assessment of potential impacts

During the construction phase, potential sources of impacts on tourism and recreational areas may relate to safety zones around vessels and disturbance and noise above the water from vessels, and release of suspended sediment into the water column. During the operation phase, potential impacts are related to safety zones around vessels.

Recreational vessels, e.g. used for diving or fishing, will not be permitted to enter the safety zone. However, as the pipe-lay vessel will move forward with a speed of approximately 2.5 km per day, depending on weather conditions, the duration of the impact from the imposition of safety zones around vessels (with the maximum radius of 3000 m) will be temporary at any given location.

Construction activities have the potential to increase airborne noise which may impact recreational or tourist activities which are reliant on a quiet and relaxing environment. However, given the distance between the islands and the proposed NSP2 route, noise is not expected to reach nuisance levels on Bornholm or Ertholmene at any time.

The turbidity (cloudiness) of the water around the proposed NSP2 route may be increased during construction due to suspension of sediment in the water column. However, given the imposition of the safety zone around the project-related vessels, no recreational activities including those susceptible to these impacts (i.e. recreational diving) will occur in the areas where turbidity will be at its highest. Suspended sediment outside of the safety zone will be of much lower concentration and within natural variation.

During operation, the imposition of safety zones around inspection and/or maintenance vessels may impact tourism or recreational activities. However, the impact will be the same as or more likely, lower than the impact during construction due to the limited frequency of surveys.

It is therefore assessed that overall impacts on tourism and recreational areas during construction and operation of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.19 Existing and planned installations

6.19.1 Description of baseline conditions

There are several existing and planned installations in close proximity to the proposed NSP2 route in Danish waters (Figure 6-16). Specifically, the proposed NSP2 route would cross two active and two inactive telecom cables as well as the operating NSP pipelines. The DEA is currently planning the tender process for an offshore wind farm immediately southwest of Bornholm, and has additionally reserved a large part of the area known as Rønne Banke, further southwest of Bornholm, as the potential location for another offshore wind farm. The NSP2 pipeline will not cross either of these wind farm areas.

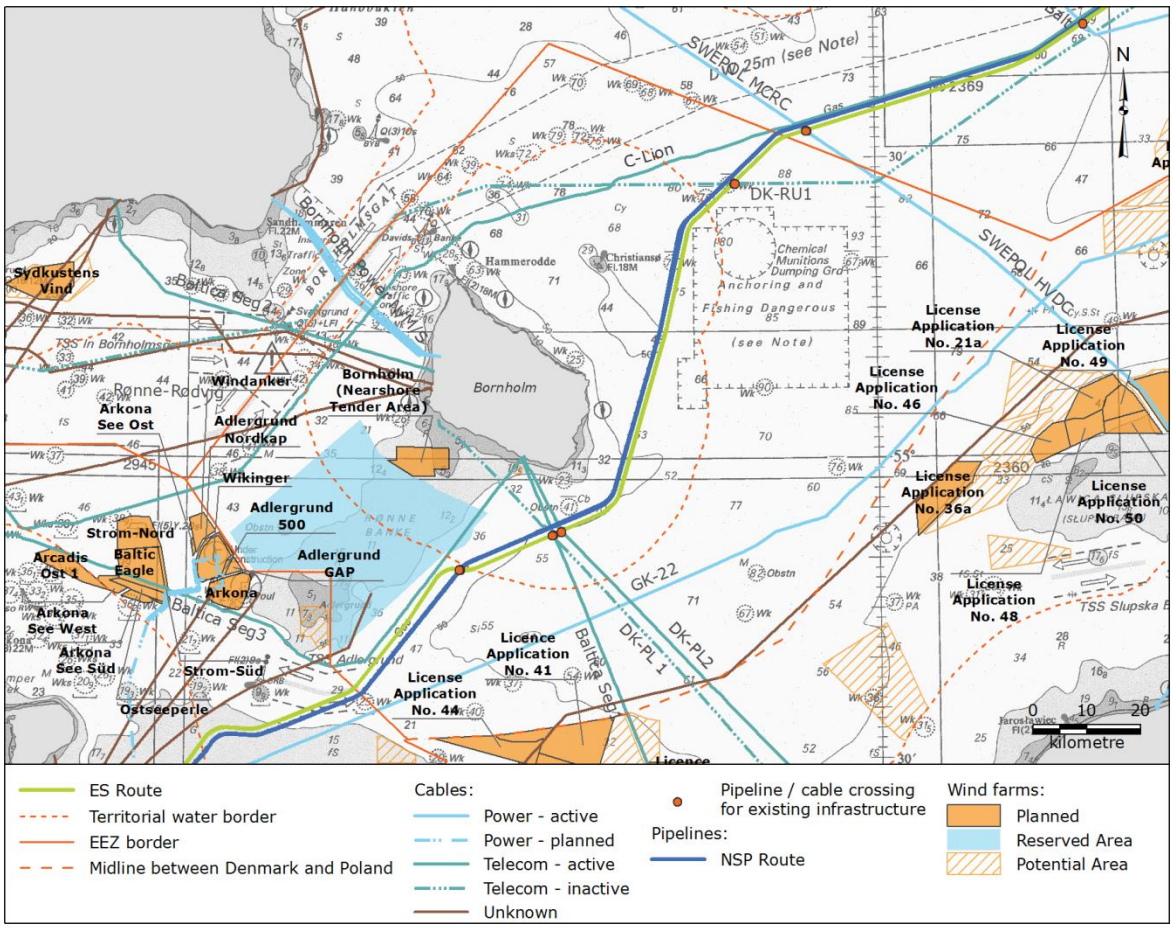

Figure 6-16 Existing and planned installations in Danish waters

6.19.2 Assessment of potential impacts

During the construction phase, potential sources of impacts on existing and planned installations may relate to physical disturbance on the seabed. During the operation phase, sources of potential impacts are related to the physical presence of pipelines and structures on the seabed.

NSP2 will occupy a 139-km corridor within which the seabed will be of limited availability to existing and planned installations. However, standard industry practice will be implemented in the process of crossing any existing installations and crossings will be agreed with the owners of each installation.

As the NSP2 pipeline would not cross either of the planned wind farm areas, the construction and operation of the NSP2 project will not preclude wind farms from coming forward in the future.

It is therefore assessed that overall impacts on existing and planned installations during construction and operation of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.20 Raw material extraction areas

6.20.1 Description of baseline conditions

There are nine areas designated for extraction of raw materials in the vicinity of the proposed NSP2 route in Danish waters, primarily south-west of Bornholm at Rønne Banke (Figure 6-17). Although the Danish authorities require transportation of all extracted marine sediments to Bornholm, permits for extraction specify that these activities should seek to minimise negative impacts to marine traffic.

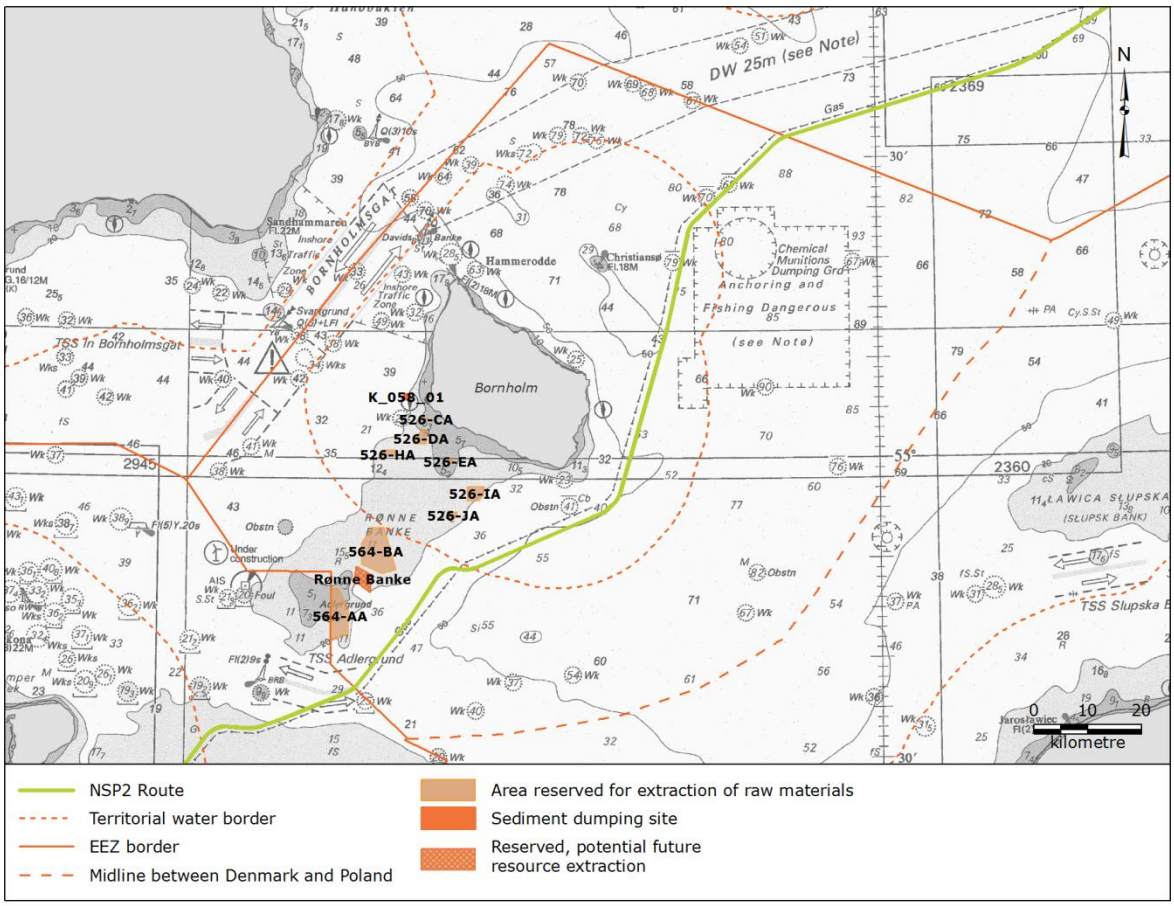

Figure 6-17 Designated areas for raw material extraction in Danish waters

6.20.2 Assessment of potential impacts

Potential sources of impacts from NSP2 on raw material extraction sites may relate to the physical presence of pipelines and structures on the seabed.

The pipeline will occupy a 139-km corridor within which the seabed will be of limited availability for raw material extraction. All presently designated raw material extraction areas are located outside the proposed NSP2 route and as such the construction and operation of the NSP2 project will not preclude further extraction from occurring within these areas.

It is therefore assessed that overall impacts on raw material extraction sites during operation of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.21 Military practice areas

6.21.1 Description of baseline conditions

Three military practice areas are situated in close proximity to the proposed NSP2 route within Danish waters (Figure 6-18). Two of these areas are crossed by the proposed NSP2 route (ES D 138 and ES D 139); they are located directly east of Bornholm and are managed together with Sweden for naval shooting exercises. The third area, which is not crossed by the proposed NSP2 route, is located directly south of Bornholm and is actively used for live fire practice from the island. During exercises, ships are strictly forbidden from entering these areas. The Danish Navy informs the public of upcoming military exercises.

Submarine practice areas, used by the German Navy as submarine exercise areas, are located to the east of Bornholm but are not crossed by the proposed NSP2 route.

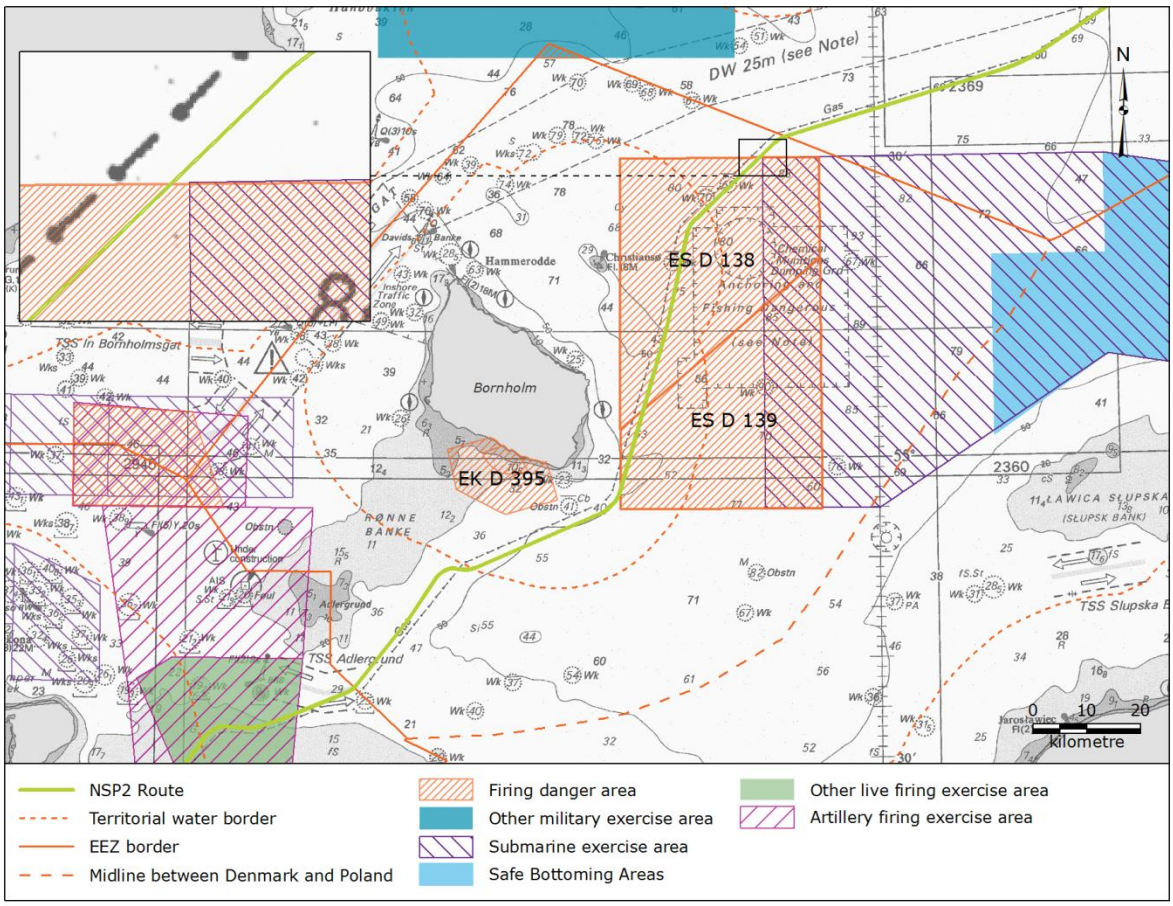

Figure 6-18 Military practice areas in Danish waters

6.21.2 Assessment of potential impacts

During the construction phase, potential sources of impacts on military practise areas may relate to physical disturbance above water caused by the presence of vessels. NSP2 intends to contact and coordinate with the appropriate authorities to ensure no conflict between military activities and pipeline construction and operation activities.

It is therefore assessed that overall impacts on military practise areas during construction of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.22 Environmental monitoring stations

6.22.1 Description of baseline conditions

Long-term trends in physical, chemical and biological variables are being monitored at selected environmental monitoring stations throughout the Baltic Sea. The monitoring stations in the Danish waters around Bornholm are shown in Figure 6-19 and are located at distances of more than 7 km from the proposed NSP2 route.

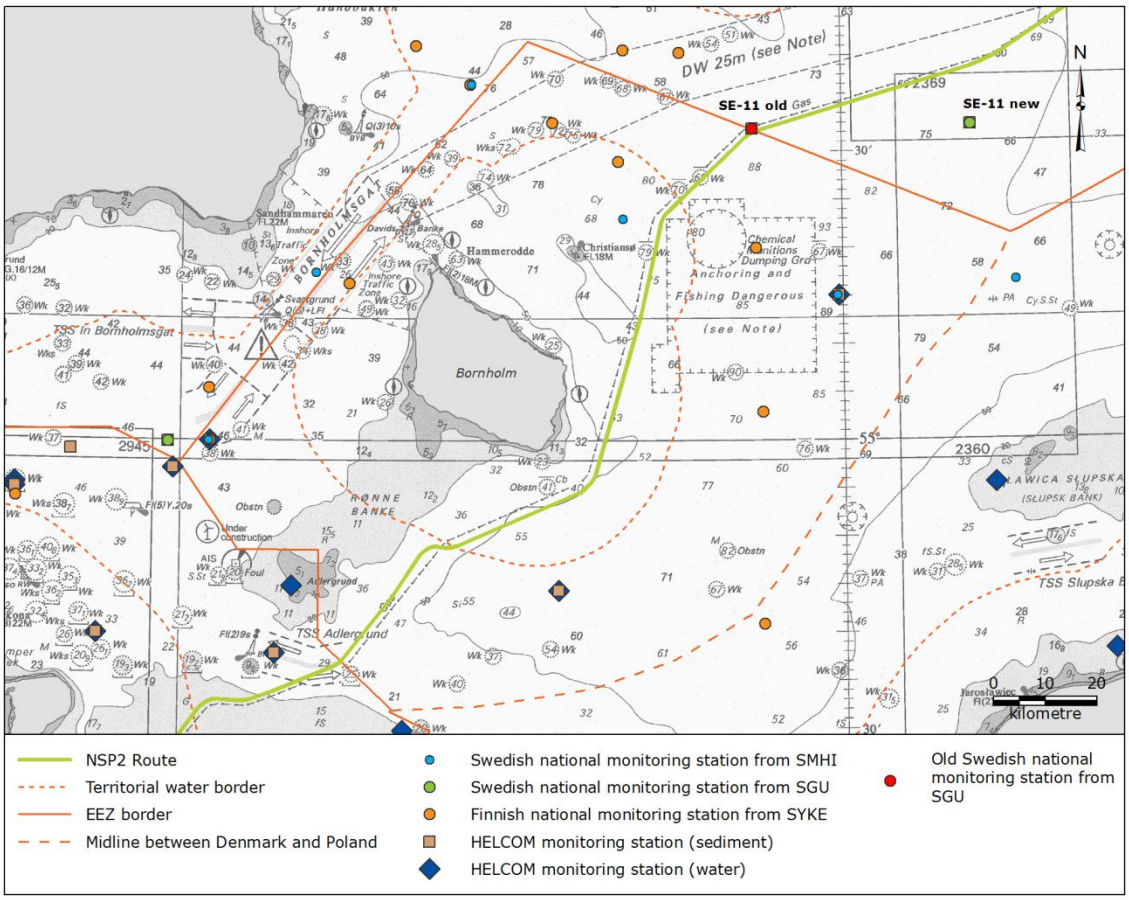

Figure 6-19 Offshore monitoring stations around Bornholm. The old Swedish monitoring station is out of service

6.22.2 Assessment of potential impacts

During the construction phase, potential sources of impacts on environmental monitoring stations may relate to suspended sediments and contaminants in the water column and sedimentation on the seabed.

However, since the impacts associated with increased suspended sediment and contaminants, as well as sedimentation, are localised and likely to be limited to the area in the vicinity of the pipeline, it is unlikely that the stations, which are located a minimum of 7 km from the proposed NSP2 route, will be impacted.

It is therefore assessed that overall impacts on environmental monitoring stations during construction of the NSP2 will be **negligible**; none of the impacts, either individually or in combination, are assessed to be significant.

6.23 Marine strategic planning

A number of EU directives and programmes have been developed with the aim to improve the quality of European waters and create a common framework for marine spatial planning. This includes the Marine Strategy Framework Directive (MSFD), Water Framework Directive (WFD) and Baltic Sea Action Plan (BSAP).

An assessment has been undertaken to determine the compliance of NSP2 with these directives and programmes, and shows that NSP2 will not prevent achievement of the long-term goals, or be contrary to the objectives and initiatives set out in the MSFD, WFD and/or BSAP.

6.24 Cumulative impacts

While the impacts of the NSP2 project on individual receptors or resources have been assessed in sections 6.1 to 6.22, it is also necessary to consider the potential for impacts to interact with impacts from other projects. These other projects may generate their own individually insignificant impacts, but when considered in combination with the impacts from NSP2, a significant cumulative impact could result, e.g. combined sediment impacts from two or more (planned) projects.

6.24.1 Planned projects

Only two planned projects were identified to have potential to combine with NSP2 and generate cumulative impacts. These comprise Bornholm Wind Farm and Extraction Areas south of Bornholm, located 18 km and >6 km from the proposed NSP2 route corridor, respectively.

Given the highly localised and temporary nature of the potential impacts from both projects, no potential for cumulative impacts with NSP2 was identified, with the exception of underwater noise in respect to Bornholm Wind Farm.

However further analysis of the noise modelling results from both NSP2 and Bornholm Wind Farm confirmed that, given the distance between the two projects (18 km), there was no potential for overlap of the impacts of increased noise associated with construction activities of the two projects. Therefore it was assessed that there will be **negligible** cumulative impacts.

6.24.2 Existing projects

In response to a request during the consultation process, consideration was also given to the potential for cumulative impacts as a result of existing projects i.e. the existing Nord Stream pipeline system and existing telecommunication cables, in combination with Nord Stream 2. The assessment concludes that there is the potential for **negligible** cumulative impacts from these existing projects in combination with NSP2 for all receptors.

6.25 Decommissioning

Technical expectations for NSP2 operation are at least 50 years. The proposed decommissioning programme will be developed during the latter years of the operation phase of NSP2 to allow consideration to be given to any new or updated legislation and guidance available at the time, as well as to utilise good international industry practice and technical knowledge gained over the lifetime of NSP2. The condition of NSP2 infrastructure may also influence the preferred decommissioning method and relevant mitigation measures.

Leaving *in situ* is likely to be the preferred option for offshore structures of NSP2. Management and mitigation methods for decommissioning of NSP2 will be developed in agreement with the relevant national authorities, in accordance with the legislative requirements at the time of decommissioning, and with due consideration of the knowledge and technology available at the time of decommissioning.

7 UNPLANNED EVENTS AND RISK ASSESSMENT

Comprehensive risk assessments have been carried out to understand, mitigate or prepare for possible risks. The identified risks to the environment and public during construction and/or operation of NSP2 assessed in this section relate to the following unplanned events:

- Vessel collisions and subsequent oil spill;
- Gas release;
- Unplanned munitions encounter;
- Unplanned maintenance works; and
- Unplanned above-water tie-in.

To prevent or mitigate potential impacts from accidents and unplanned events during construction and operation, Nord Stream 2 has developed a mitigation strategy which ensures compliance with international requirements and follows best practise. Furthermore, a chance finds procedure will be prepared by Nord Stream 2 to set out a protocol should an unexpected risks or impacts arise during the construction phase (e.g. identification of un-mapped munition). Nord Stream 2 will additionally develop and implement an emergency response plan for the operational phase of Nord Stream 2. Nord Stream 2 will only undertake activities for which the associated risk is assessed as acceptable.

8 TRANSBOUNDARY IMPACTS

The Espoo Convention (Article 1 vii) defines a transboundary impact as:

"*…any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another Party.*"

The Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may result in transboundary impacts. NSP2 crosses the jurisdiction of several countries and is being constructed in a marine environment, where an impact may propagate some distance from its source. Therefore, whilst the impacts arising from construction, operation and decommissioning of NSP2 in the Danish sector will generally be experienced in Danish waters, they may in some instances extend into neighbouring countries, i.e. transboundary impacts.

8.1 Transboundary impacts from planned events within Danish waters

In line with the above, the potential for the planned activities in Danish waters to impact resources or receptors in Sweden, Germany and Poland was assessed within the EIA. The potential sources of transboundary impacts included:

- Altered hydrography due to the presence of pipelines on the seabed;
- Emissions of air pollutants and GHGs from vessels;
- Dispersal of sediment and contaminants into the water during seabed intervention;
- Underwater noise generated during rock placement; and
- Interference with fishing vessels due to the presence of lay barge, supporting vessels, and associated safety zones.

Generally, the nature and magnitude of environmental and socioeconomic impacts caused by activities within the Danish waters on Sweden and Germany will be similar to but significantly less than the impacts caused by the planned activities within the Swedish and German waters.

There is a designated German Natura 2000 sites where the proposed NSP2 route enters the German EEZ. There are no planned seabed intervention works near the German Natura 2000 site, and any potential impact is expected to be temporary and correlated to the pipe-lay itself and the presence of vessels. No significant impacts to German Natura 2000 sites are expected in association with activities in the Danish sector.

A designated Swedish Natura 2000 site is also present near the Danish section of the proposed NSP2 route, but due to its distance from the construction site, no significant impacts on this site are expected in association with activities in the Danish sector.

Based on the NSP2 modelling and NSP monitoring results it is concluded that none of the impacts are expected to extend to the Polish waters. Therefore, no significant transboundary impacts from the planned activities within Danish waters were identified.

Given that the inflow of oxygenated deep water to the inner parts of the Baltic Sea is critical to the functioning of the marine environment, the potential for NSP2 to cause transboundary impacts to the Baltic Sea as a result of impacts to hydrography was also assessed. Since the NSP pipelines as well as the proposed NSP2 route do not pass through the Bornholm Strait or the Stolpe Channel, the main gateways for inflowing seawater to the Baltic Proper, there will be no hydraulic effect on the bulk flow.

8.2 Transboundary impacts from unplanned events within Danish waters

Potential unplanned events which may have a transboundary impact comprise oil spill following a ship collision, leakage of gas from the NSP2 pipelines (depending on size of event and location). However, as discussed in section 7, the probability of such events occurring is low.

HELCOM recommends that governments of the contracting parties to the convention should aim to develop collaborative oil spill response services., It is therefore assumed that countries around the Baltic Sea are capable of controlling a major oil spill within two days of release, and thereby impacts on the environment, both regional and transboundary, will be minimised. In the case of a gas release in Danish waters, it is assessed that it may be a safety issue for the ship traffic, but will not pose a threat to the safety of coastal inhabitants in Denmark or other countries. The impact will depend on the type of leak, its magnitude and the type of repair required. Any transboundary impacts to the environment will be local and of a relatively short duration, while impacts on sea traffic (changing shipping routes) will be of longer duration, owing to repair activities at the location. The transboundary impacts of a gas release would primarily be related to the emission of methane to the air, as methane is a greenhouse gas which is present across all countries and contributes to climate change. It is assessed that there is no risk of impacts to the environment from munitions in Danish waters.

9 PROPOSED ENVIRONMENTAL MONITORING

The purpose of an environmental and socio-economic monitoring programme is to confirm assumptions used in the EIA and to verify the environmental impacts as described and evaluated in the EIA. Furthermore, data from a monitoring programme may identify the need for environmental mitigation measures if, contrary to expectations, data indicate unwanted environmental impacts.

Evaluating environmental impacts caused by construction and operation of the NSP2 pipelines inside Danish waters will include monitoring activities before, during and/or after construction, depending on the respective objective. Monitoring prior to construction will aim to establish baseline conditions; during construction will aim to verify the input parameters used for e.g. the modelling of sediment dispersion and underwater noise and to confirm the modelling results; and after construction will aim to verify the EIA findings.

The proposed monitoring programme inside Danish waters draws to a large extent on the great knowledge and experience acquired during the NSP monitoring programme which concluded that the impacts to the marine environment were negligible to minor to not significant, limited to the immediate vicinity of the pipelines.

It is anticipated that environmental and socio-economic monitoring will be undertaken in regards to the following parameters: water quality, cultural heritage, munitions, CWA, commercial fishery, and maritime traffic. The precise approach to the final monitoring programme will be established in consultation with the Danish authorities. All environmental and socio-economic monitoring results will be made publicly available.

10 HEALTH, SAFETY, ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM (HSES MS)

In the planning phase Nord Stream 2 has adopted a health, safety, environmental and social (HSES) policy, implemented through a management system (HSES MS), which is aligned to international standards. The HSES MS enables Nord Stream 2 to identify and systematically control all relevant HSES risks arising during project planning and construction. It also covers the management of security where it may impact the safety of personnel and project-affected communities, the integrity of project assets and the reputation of Nord Stream 2. Once Nord Stream 2 is commissioned, the HSES MS will be adjusted to manage HSES issues for the operational phase.

As part of the management system, Nord Stream 2 is developing environmental and social management plans to ensure compliance with the HSES policy throughout construction and operation. ESMPs will apply to both Nord Stream 2's own staff and its contractors, and Nord Stream 2 will ensure that contractors adhere to the standards and requirements in the HSES MS and applicable ESMPs. HSES information will be proactively communicated internally and externally.

11 SUMMARY

In summary, the construction and operation of NSP2 has the potential to result in **negligible** to **minor** impacts on the environment; no impacts either individually or in combination, are assessed to be significant.

A summary of the potential impacts on all receptors assessed in this EIA is provided in Table 11-1 and Table 11-2.

Table 11-1 Summary of the overall impacts caused by the NSP2 project on physical-chemical and biological resources or receptors

Potential impact		Physical-chemical					Biological							
		Bathymetry	Sediment quality	Hydrography	Water quality	Climate and air quality	Plankton	Benthic flora and fauna	Fish	Marine mammals	Birds	Protected areas***	Natura 2000***	Biodiversity
Construction phase	Physical disturbance on seabed													
	Release of sediments into the water column													
	Release of contaminants into the water column													
	Release of CWA into the water column													
	Sedimentation on the seabed													
	Generation of underwater noise									**				
	Physical disturbance above water*													
	Emissions of air pollutants and GHGs													
	Introduction of non-indigenous species													
Operation phase	Presence of pipelines and structures on the seabed													
	Changes of habitat													
	Physical disturbance above water*													
	Emissions of air pollutants and GHGs													
	Generation of heat from gas flow through the pipelines													
	Release of metals from anodes													
	Introduction of non-indigenous species													

* E.g. from presence of vessels, airborne noise and light
** Impact on Marine mammals from underwater noise is assessed to be "Negligible" for PTS/TTS and "Minor" for behavioral response

Negligible impact

Minor impact

It has been assessed that there will be no impact on protected areas.

For Natura 2000 sites, a Natura 2000 screening has been performed and it is assessed that there will be no risk of significant impact.

Table 11-2 Summary of the overall impacts caused by the NSP2 project on socio-economic resources or receptors

Potential impact		Socio-economic								
		Shipping and shipping lanes	Commercial fishery	Cultural heritage	Environmental monitoring stations	People and health	Tourism and recreational areas	Existing and planned installations	Raw material extraction sites	Military practice areas
Construction phase	Physical disturbance on seabed									
	Release of sediments into the water column									
	Release of contaminants in the water column									
	Physical disturbance above water*									
	Imposition of safety zones around vessels									
	Sedimentation on the seabed									
Operation phase	Presence of pipelines and structures on the seabed									
	Physical disturbance above water*									
	Imposition of safety zones around vessels									

* E.g. from presence of vessels, noise and light

Negligible impact

Minor impact