



Nord Stream 2 Natural Gas Pipeline construction and operation in the Finnish EEZ Environmental and Technical Monitoring Quarterly Report Q3 2019

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Summary

The report presents results and preliminary findings of the environmental and technical monitoring for construction activities of the Nord Stream 2 Gas Pipeline in the Finnish EEZ for the third quarter of 2019. Monitoring is based on the Nord Stream 2 Environmental Monitoring Programme, Finland. The programme was approved on April 12, 2018 within the water permit decision (Nro 53/2018/2, Dnro ESAVI/9101/2017).

Sitowise Oy prepared this report based on data and reports provided by Nord Stream 2 AG and its' monitoring and technical contractors. All findings are preliminary and final conclusions will be reported in the annual report 2019 to be published in May 2020.

The construction activities in Finnish EEZ during the third quarter were rock placement and pipelay of Line B. By the end of Q3, the total number of finalized berms was 264 and the total volume of rock installed was 837,936 m³. Pipelay of Line A was completed on April 30, 2019 and pipelay of Line B on August 21, 2019. Post-lay rock placement continues in the fourth quarter of 2019.

Environmental monitoring continued during Q3 and the monitoring equipment was serviced, and data collected at all sites (Control 1, Control 2 and Sandkallan) in October 2019. Stormy periods with strong currents and high wave action induced elevated levels of water turbidity due to resuspension of sediment on the relatively shallow bottoms. At the deeper monitoring stations of the Sandkallan site in July – August low oxygen concentration caused precipitation of dissolved iron and manganese compounds, increasing turbidity for a month from mid- July to mid-August. The monitoring data indicated no detectable impacts from construction activities at the long-term monitoring sites Control 1, Control 2 and Sandkallan.

The Finnish authorities were notified of two small oil spills, one in July and one August 2019. There were no other incidents to be notified to the Finnish authorities during the reporting period.

On August 9, 2019, the Finnish authorities were invited to visit the pipelay vessel *Pioneering Spirit*. Participants from Traficom, Uusimaa ELY Centre, Traffic Management Finland, The Finnish Boarder Guard and Finnish Transport Infrastructure Agency were given a tour onboard and introduced to the activities performed onboard the pipelay vessel.

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- Annex 1 Nord Stream 2 construction activities during Q3/2019.
- Annex 2 W-PE-EMS-PFI-REP-812-WQCR04EN-03 Long-term water quality and current monitoring in the Gulf of Finland June 2019 – September 2019. Luode Consulting. November 26, 2019.

1 Introduction

The report presents results and preliminary findings of the environmental and technical monitoring for the construction activities of the Nord Stream 2 Gas Pipeline in the Finnish EEZ for the third quarter (Q3) of 2019.

Nord Stream 2 AG is constructing a new offshore natural gas twin-pipeline from Russia to Germany through the Baltic Sea (Figure 1). The length of the corridor is approximately 1,200 km. Parallel pipelines pass through the territorial waters and/or Exclusive Economic Zones (EEZ) of Russia, Finland, Sweden, Denmark and Germany.

In the Finnish EEZ, the route is approximately 374 km and follows the existing Nord Stream pipeline route. Pipelay of Line A in the Finnish EEZ started on September 5, 2018 and was completed on April 30, 2019, and pipelay of Line B started on May 18, 2019 and was completed on August 21, 2019 /1/.

When all construction works are completed the pipelines will to be taken into operation.

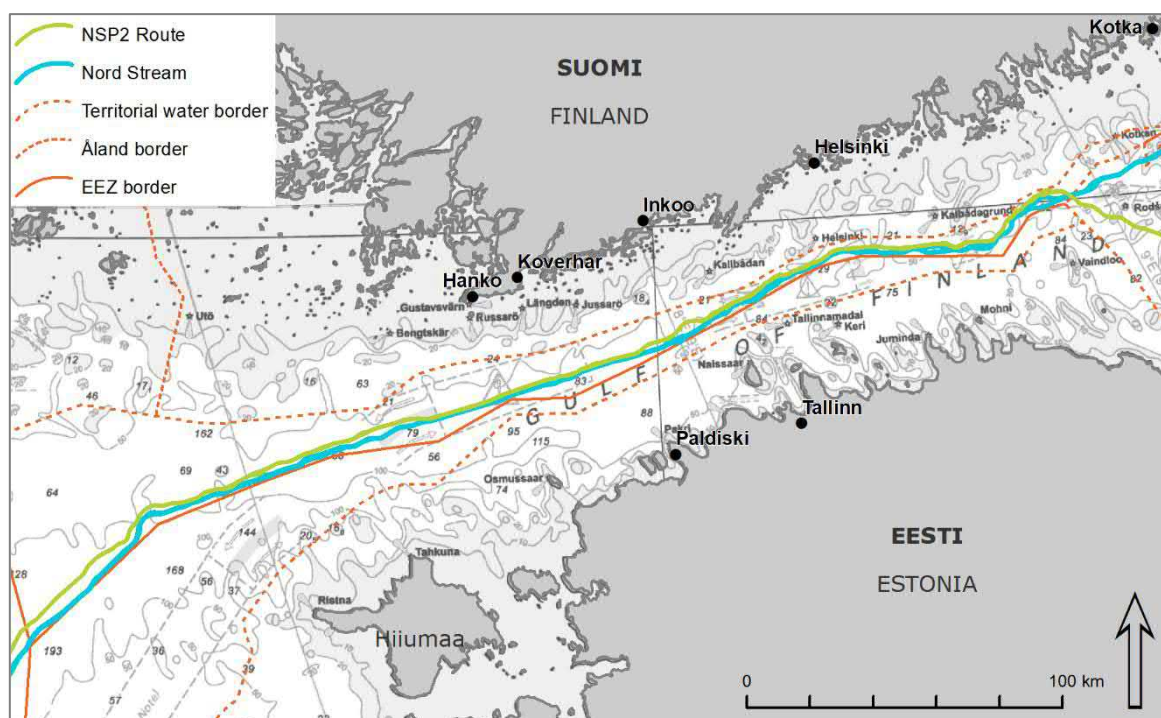


Figure 1. The Nord Stream 2 route passes through the Finnish EEZ. It is situated north of the existing Nord Stream pipelines with an exception of a short section in the east, close to Russian territorial waters.

Nord Stream 2 AG is responsible for environmental monitoring and reporting during construction and operation of the pipelines. The scope of monitoring activities is presented in the Environmental Monitoring Programme, Finland /2/. The programme has been approved within the water permit decision on April 12, 2018 (N:o 53/2018/2, Dnro ESAVI/9101/2017). Monitoring is most intensive during the construction phase (Table 1).

Table 1. General schedule for monitoring activities during 2018–2023 in the Finnish EEZ (based on /2/, modified).

Monitoring target	Construction		Operation			
	2018	2019	2020	2021	2022	2023
Underwater noise	X					
Water quality and currents	X	X				
Commercial fishery					X	
Cultural heritage	X		X			

The supervisory authorities for monitoring of underwater noise, currents and water quality are the Southeast Finland, Uusimaa and Southwest Finland ELY Centres (The Centres for Economic Development, Transport and the Environment). For fishery monitoring, the supervisory authority is the Southwest Finland ELY Centre. For cultural heritage, the supervisory authority is the Finnish Heritage Agency (former National Board of Antiquities).

Quarterly reports will be provided three months after the end of each quarter during the construction period, and annual reports by the end of May of the following year during construction and operation.

Quarterly reporting aims at presenting the main results from technical and environmental monitoring to the authorities. For this reason, they are concise and focused on results. Annual reports will include further data analysis, comparisons to the impact assessments presented in the EIA Report and the permit application and more thorough discussion on the observed impacts.

2 Environmental conditions during the third quarter

The weather fluctuated considerably in July, and many station-specific warm and cold temperature records were broken. In Southern Finland temperatures were low until mid-July but reached record heat measured at the coastal observation stations on the last weekend of July. At Helsinki Kaisaniemi weather station, which is the longest-running observation station in Finland with measurements since 1844, a new record of 33.2 °C was measured, exceeding the previous record from 1945 by 1.6 degrees. At the southern coast the amount of rainfall in July was close to the long-term average. There was one stormy day in July, with the highest average wind speed of 22.1 m/s recorded at the Märket lighthouse, Åland Islands, on July 5. /3/.

The average temperature in August was close to the long-term average (1981–2010). However, similar to July, conditions fluctuated widely. August started with cool weather and many cold nights with frost were recorded even in the southern parts of the country. Towards the end of the month, the temperatures increased again, with peaks above 25 degrees even in Lapland. The precipitation levels were lower than usual in August in most parts of the country. Despite the drought, local heavy rains occurred in August. For example, in Kaisaniemi, Helsinki, it rained 62.5 millimetres within the period of 24 hours on 23 August, causing large material damages. /4/.

September was warmer than long term (1981-2010) average – for the 11th year in a row. Especially the first two weeks were warmer than usual, whereas the end of the month was unusually cold. It rained more than usual in the coastal areas, and northern Finland experienced the first snow on September 29, 2019. /5/.

According to the Finnish Meteorological Institute's open data /6/, during the period from July 1 to September 30, 2019, significant wave height in the open Gulf of Finland varied between 0.1 and 2.9 m (Figure 2) and the wind speed between 0 to 16.5 m/s (Figure 3) /6/. The wave observation data was collected from an open sea wave buoy located in the Gulf of Finland (see Annex 1) approximately six kilometres north of GKP 185, and the wind speed data from a weather station located in the middle of the Gulf of Finland, the Helsinki lighthouse (see Annex 1).

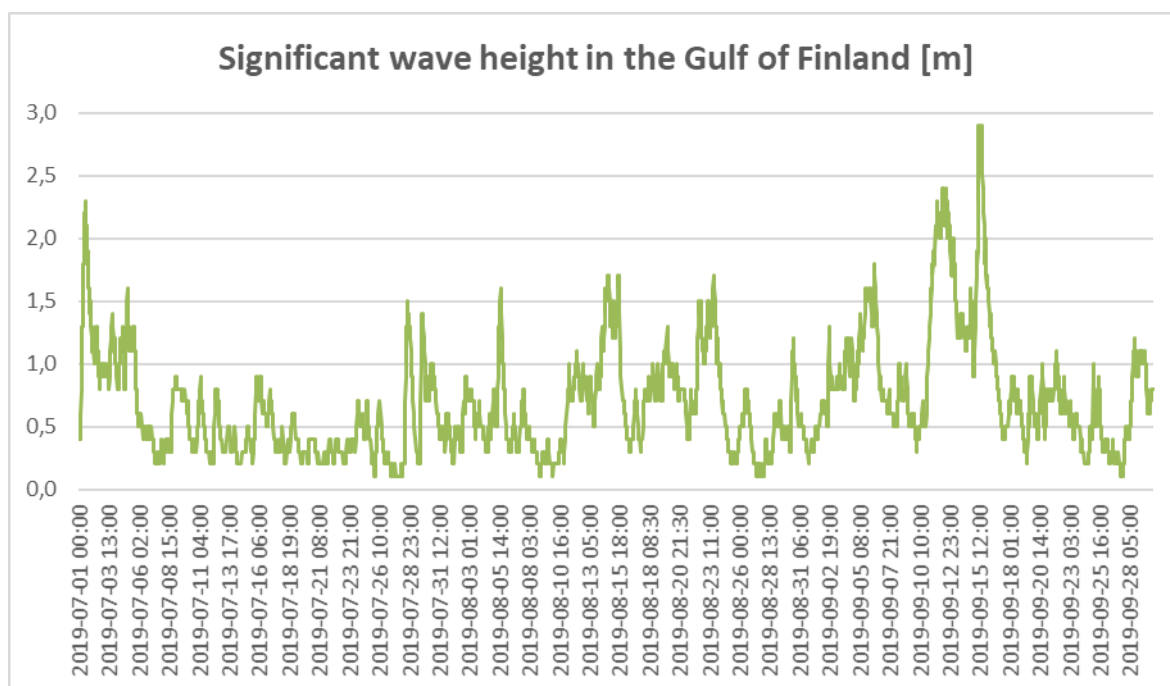


Figure 2. Wave height in the Gulf of Finland during the period from July 1 to September 30, 2019 /6/. The data was collected from an open sea wave buoy located in the Gulf of Finland (see Annex 1) and consists of measurements conducted every half an hour.

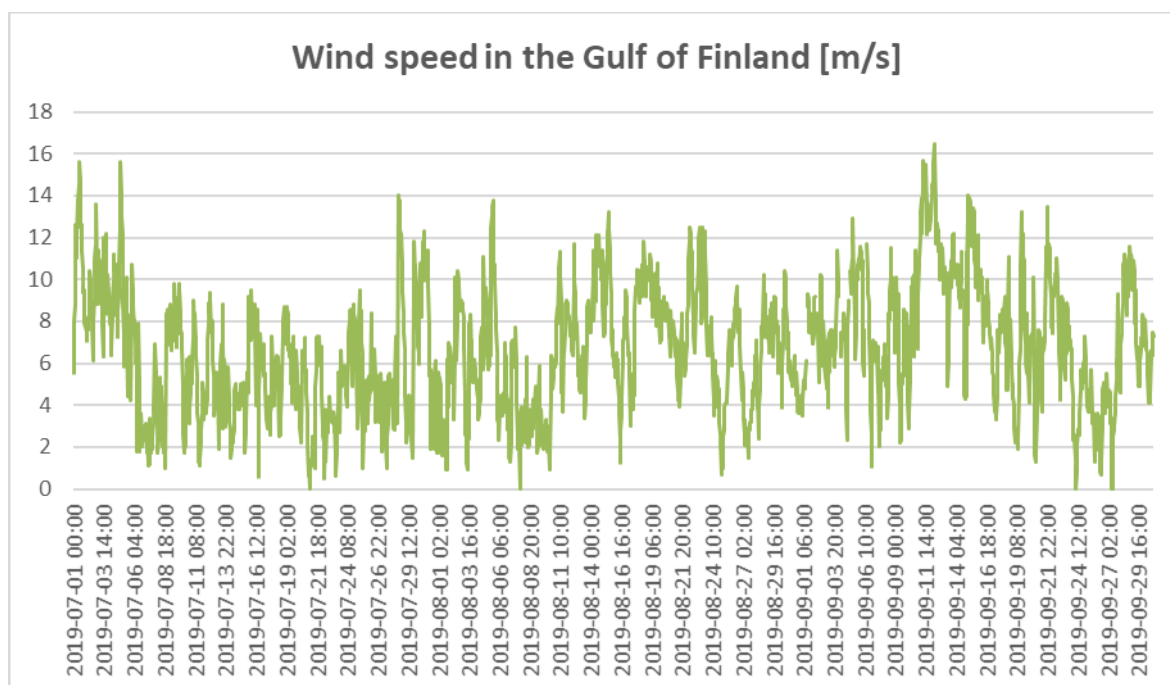


Figure 3. Wind speed in the Gulf of Finland during period from July 1 to September 30, 2019 /6/. The data was collected from a Helsinki lighthouse weather station located in the middle of Gulf of Finland (see Annex 1) and consists of measurements conducted once an hour.

3 Construction activities during the third quarter

3.1 Schedule

The construction activities in the Finnish EEZ during the third quarter were pipelay of Line B and rock placement on Line B (Table 2).

Table 2. Construction activities during Q3 2019.

2019 Q3		July					August					September		
Week		27	28	29	30	31	32	33	34	35	36	37	38	39
Rock placement							Continues							
Pipelay Line B		Completed												

3.2 Activities during the period

Rock placement

Rock placement was conducted by the vessel Bravenes from August 2, 2019 until September 8, 2019. Rock placement contractors were Boskalis Offshore Contracting B.V. and Van Oord Offshore B.V. (BoVO). Contractors report the proceedings of the rock placement works in an as-built register /7/, which is summarized in the quarterly reports.

The rock placement during Q3 took place between GKP 114 and GKP 320 (Figure 4). During the Q3 period altogether 33 berms were finalized: all of them post-lay berms for Line B (Table 3). Post-lay berms were installed on the pipeline in order to support and cover the pipeline as well as increase its stability. In total 29 of the 33 berms were constructed to increase the pipeline stability on rough seafloor (Table 3) and four berms were constructed to support crossings with other pipelines. The total number of finalized berms at the end of Q3 was 264.

The volume of rock used during the third quarter was 75,636 m³, all for post-lay rock placement. Only Finnish rock material was used. By the end of Q3, the total cumulative volume of rock used in the Finnish EEZ was 837,936 m³.

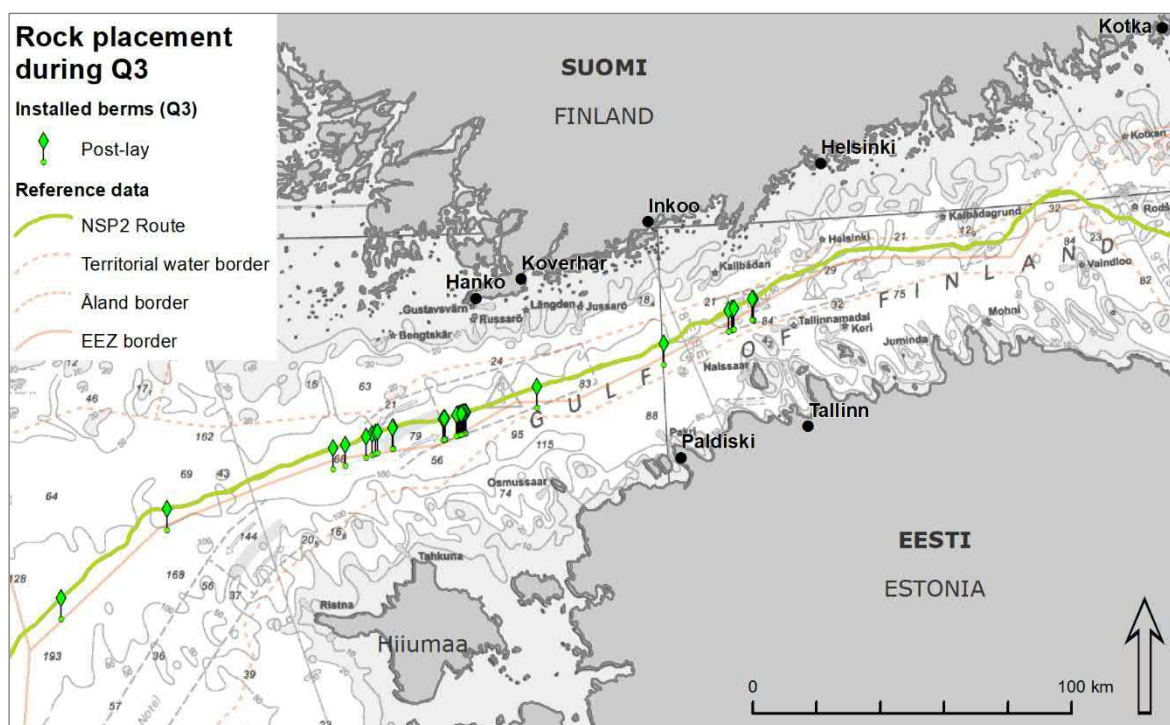


Figure 4. Rock placement activities during Q3.

Table 3. Rock placement during Q3, 2019. Data summarized from /7/.

Berm type	Installed volume* m ³	Number of berms
Stress/freespan correction (post-lay)	-	-
Lateral stability (post-lay)	49,364	29
Crossings	26,271	4
Pre-lay	-	-
Post-lay	26,271	4
Total	75,636	33
* Installed volume is notified to Nord Stream 2 by contractors as tonnes (t), which is converted to cubic metres using factor 1.5625 m ³ /t		

Pipelay

During the third quarter 2019 pipelay of Line B was conducted in the Finnish EEZ by the pipelay vessel *Pioneering Spirit*. The OCV *Fortitude* and PLSV *Calamity Jane*, together with the CSV *Normand Poseidon*, a new vessel in the survey team (Figure 5), provided ROV survey support to the pipelay vessel. /8-20/.



Figure 5. The survey support vessel CSV Normand Poseidon and the guard duty intervention tug Thor. Sources: www.solstad.com and /21/.

The pipelay vessel *Pioneering Spirit* continued the pipelay of Line B eastwards from GKP 320 through July and August until the pipelay of Line B in the Finnish EEZ was completed on August 21, 2019 at GKP 114 (Figure 6) /8-20/. An intervention tug, as agreed with authorities during the permitting procedure, was stationed at the Kalbådagrund shallow area in the vicinity of Kalbådagrund Traffic Separation Scheme (TSS) during pipelay at the TSS area /21, 22/. The pipelay proceeded without incidents past the TSS area, and no support from the tug was needed /22/.

There were no interruptions to pipelay due to weather conditions during Q3 2019.

Efficiency of pipelay during Q3 is presented below:

- approximately 206 kilometres of pipelay
- 52 effective days of pipelay
- pipelay at 22 cable crossings, Balticconnector natural gas pipeline crossing and at two Nord Stream natural gas pipeline crossings
- highest daily speed in Q3 was approximately 5.0 km/day
- average daily speed in Q3 was approximately 4.0 km/day (effective days)

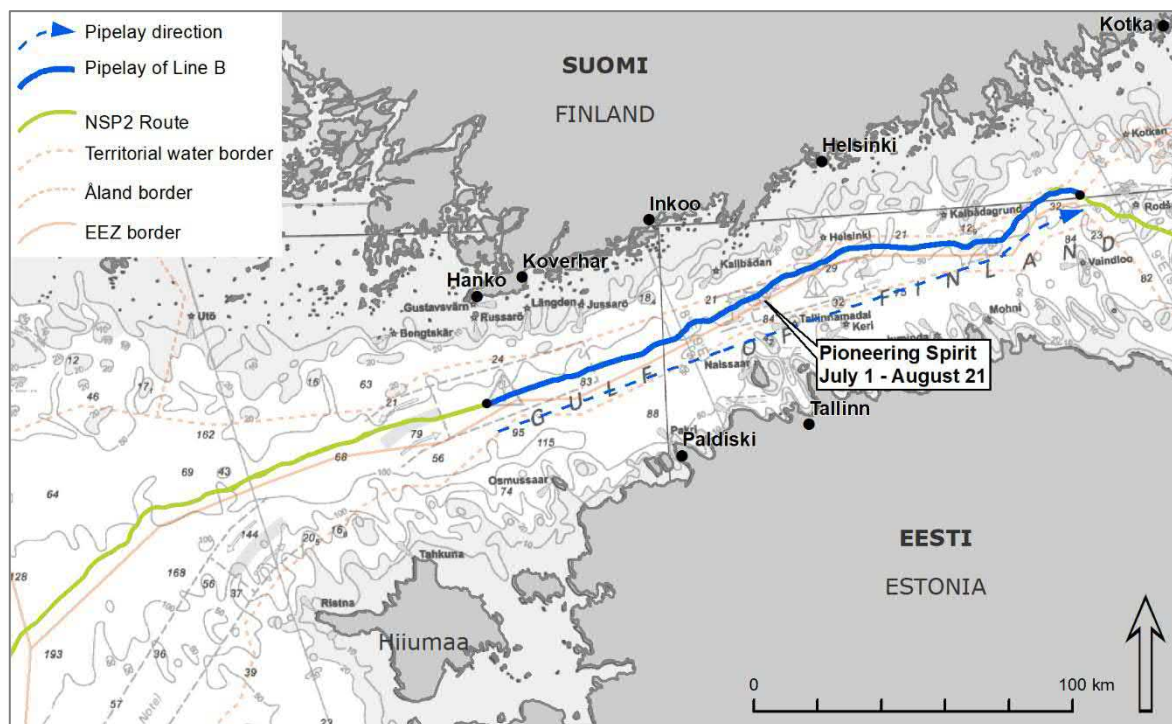


Figure 6. Pipelay during Q3 2019.

3.3 Authority visit to the pipelay vessel Pioneering Spirit

On August 9, 2019, Nord Stream 2 AG invited the authorities to visit the pipelay vessel Pioneering Spirit. Participants from Traficom, Uusimaa ELY Centre, Traffic Management Finland, The Finnish Border Guard and Finnish Transport Infrastructure Agency were given a tour onboard and introduced to the activities performed onboard the pipelay vessel.

4 Water quality and currents

4.1 Monitoring activities

Water quality and current velocity is monitored at three sites by Luode Consulting, according to the approved Environmental Monitoring Programme Finland /2/ (Table 4 and Figure 7).

During Q3 2019, water quality measurements continued at control stations located in the Western (Control 1) and Eastern Gulf of Finland (Control 2). The same two control stations were used during the Nord Stream project. They represent relatively shallow coastal waters. The water depth at both stations is between 40–50 metres. Water quality monitoring includes turbidity, oxygen concentration, salinity and temperature measurements in three depth layers near the seabed.

In addition, water quality was also measured at Sandkallan long term monitoring site. Sandkallan site consists of three separate water quality stations. One of them is equipped with profiling current meter measuring flow speeds and directions in separate depth layers covering the whole depth range from the bottom to the surface /23/. The Sandkallan stations represent deeper waters than the two control stations. The water depth at the stations varies between 49 and 67 metres.

Table 4. Installation, last service and data recovery of water quality and current monitoring sites.

	Installed	Last service	Next service
Control 1	17.4.2018	7.10.2019	Q4
Control 2	18.4.2018	21.10.2019	Q4
Sandkallan	18.4.2018	8.10.2019	Q4

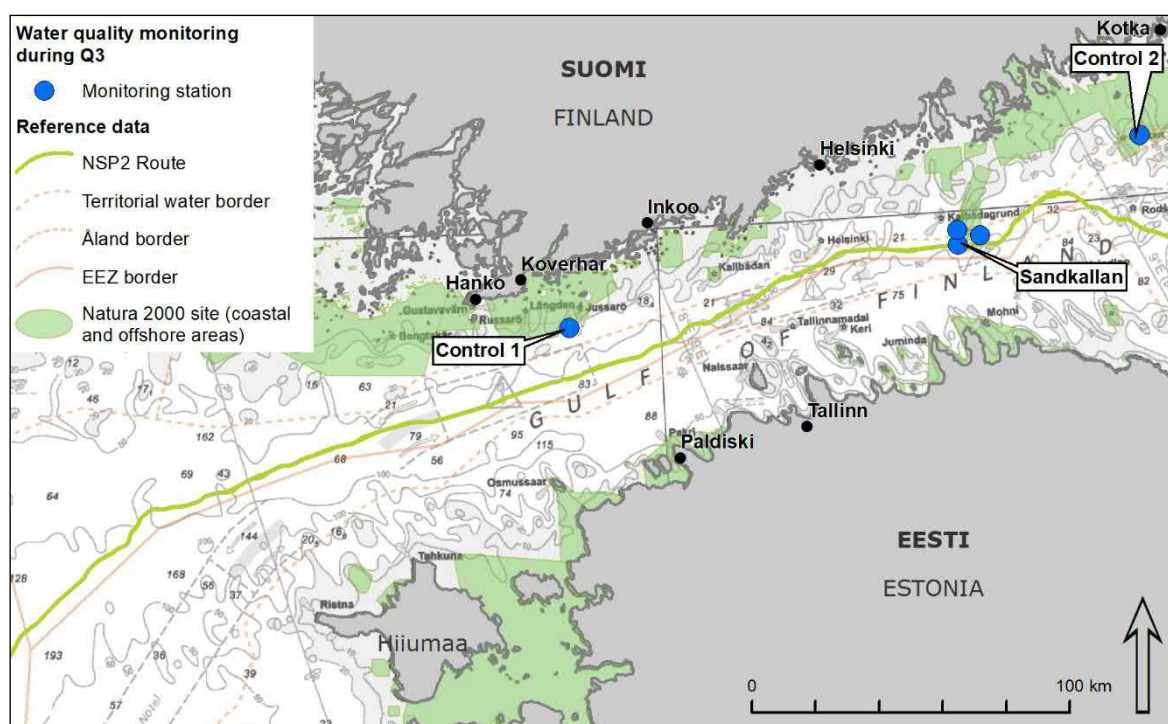


Figure 7. Water quality and current monitoring sites during Q3 2019.

4.2 Results

The results cover the period between December 2018 and October 2019. No impacts from construction activities were detected in water quality at long-term monitoring sites Control 1, Control 2 and Sandkallan during the monitoring period /28/.

During the Q3 period, stormy periods with strong currents and high wave action induced elevated levels of water turbidity with peak values up to 26 turbidity units [FNU] (Figure 9). The reason for the phenomenon was resuspension of sediment on the relatively shallow bottoms. It was observed most clearly at the relatively shallow site of Control 1. Slightly increased turbidity up to 10 turbidity units [FNU] was also observed at the deeper monitoring stations of the Sandkallan site in July - August. It was caused by precipitation of dissolved iron and manganese compounds at low oxygen concentrations and unrelated to construction work (Figure 8).

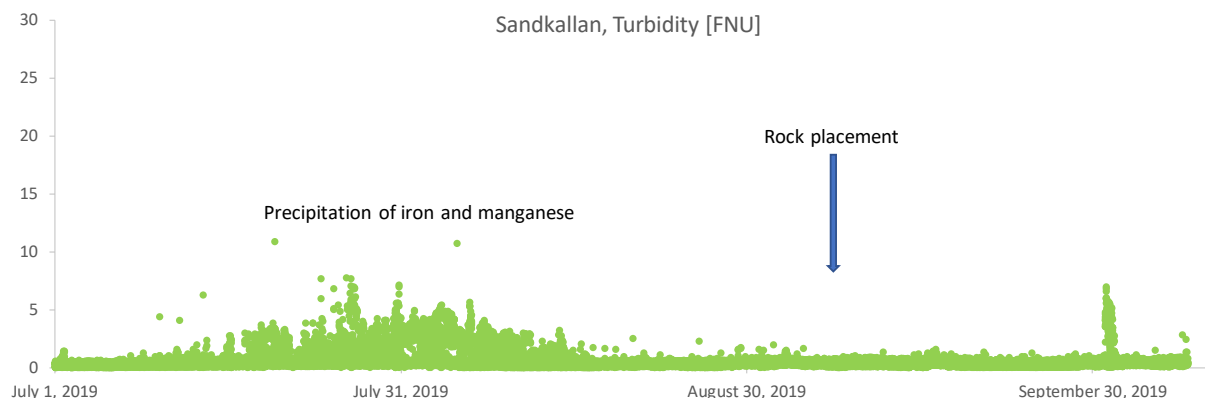


Figure 8. Turbidity measured at the three Sandkallan stations during Q3 2019. The only construction activity, installation of the rock berm FI-B1009, is indicated by blue arrow.

There was high variation in the oxygen concentration at the monitoring sites (Figure 9). At Control 1, Western Gulf of Finland, oxygen concentration was high, above 8 mg/L most of the time. At Control 2, Eastern Gulf of Finland, oxygen concentration remained around 8 mg/L over the winter period, but relatively low concentrations, down to 1 mg/L, were measured in summer and autumn close to the bottom. At Sandkallan site, the deepest measurement stations suffered regular oxygen deficiency. On the contrary, the shallowest station of Sandkallan showed good oxygen conditions throughout the whole reporting period.

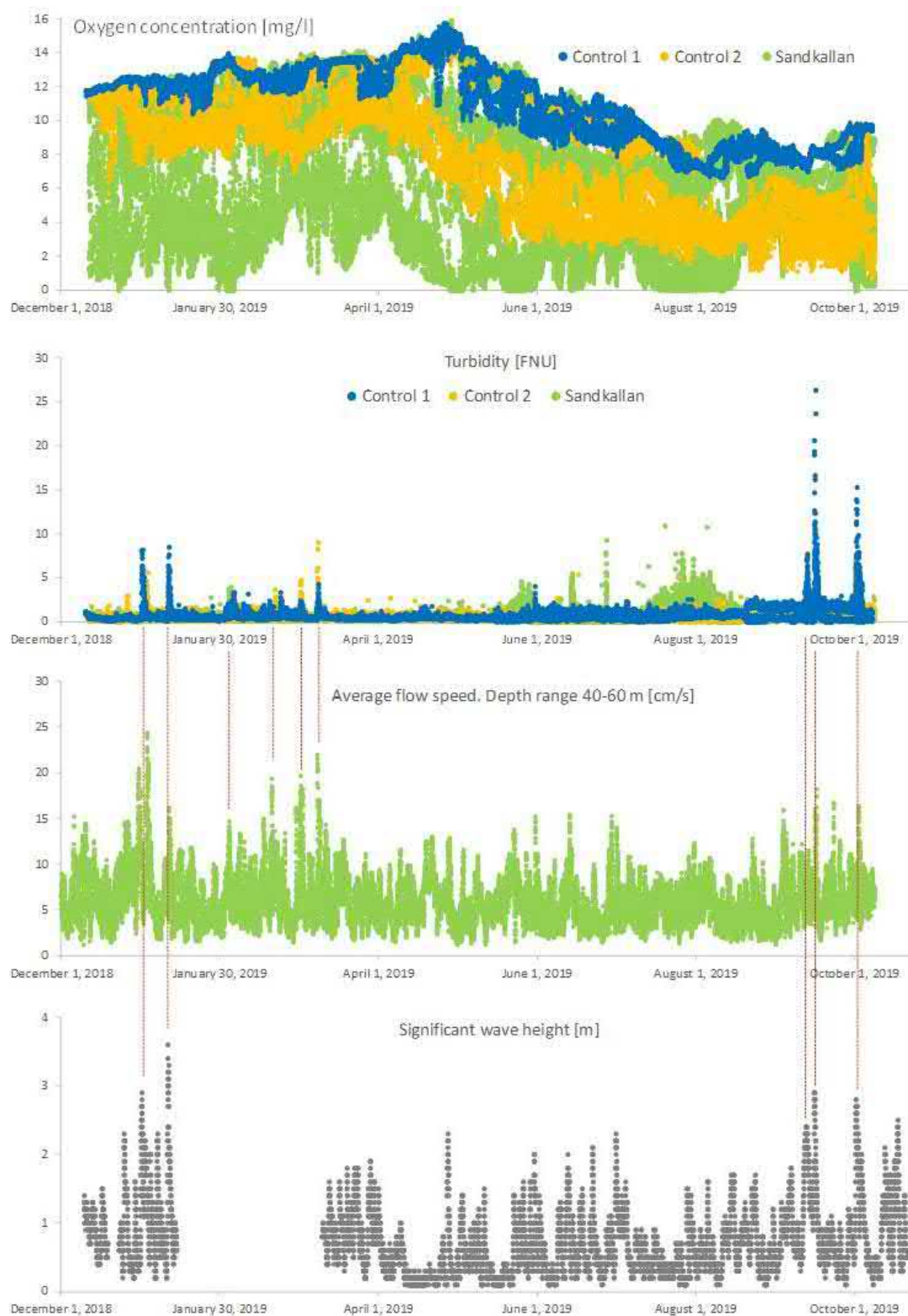


Figure 9. Oxygen concentration, turbidity and flow speed at the monitoring sites Control 1, Control 2 and Sandkallan, and the significant wave height measured by the Finnish Meteorological Institute /6/. Wave data are not available for the winter months due to occasional presence of ice. Wind induced high wave and flow episodes and their connection to increased turbidity are indicated by red hairlines. The images are combinations of all measurements carried out at the monitoring sites.

5 Notifications

On July 26, a small oil leak occurred on the survey support vessel OCV Fortitude. A cylinder in the main boom of a crane used onboard leaked about 20 L of oil on deck. Of the total spill, about 10 L could be banded on the deck, but 10 L were lost in the sea /24/. The Border Guard was informed immediately, and the Finnish authorities were provided a notification the same day /24/. The oil lost in the sea was Castrol Hyspin AWH-M 46, which is biodegradable, non-bioaccumulable hydraulic fluid /25/.

On August 12, the rock placement vessel Bravenes lost 40 L of oil from one of its azimuth thrusters to the sea. The Border Guard was informed immediately, and the Finnish authorities were notified on the same day /26/. The oil lost to the sea was Shell Omala S2 G 68 gear lubricant. Its major constituents are inherently biodegradable, although it contains components that may persist in the environment. According to the Product Safety Sheet, it is practically non-toxic to marine life /27/.

6 Conclusions

Construction activities in the third quarter of 2019 consisted of pipelay of Line B, which was completed on August 21, and post-lay rock placement on Line B, which continues during the fourth quarter.

No pipelay interruptions occurred due to weather conditions.

There were two small oil spills during the period from the support vessels, one from a survey support vessel Fortitude (20 L, of which 10 L contained on deck) and another from a rock placement vessel Bravenes (40 L). These were reported to the authorities without delay.

Construction work progressed according to plans.

The monitoring data indicated no detectable impacts from construction activities at the long-term monitoring sites Control 1, Control 2 and Sandkallan. The increased turbidity values in the bottom layers of these stations are explained by natural phenomena such as strong currents, high wave action and chemical reactions at low oxygen concentrations.

Environmental and technical monitoring has been carried out according to the monitoring programme. The results in this report are preliminary. The final results for the year 2019 will be presented in the annual report 2019.

7 List of references

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Maps and GIS data

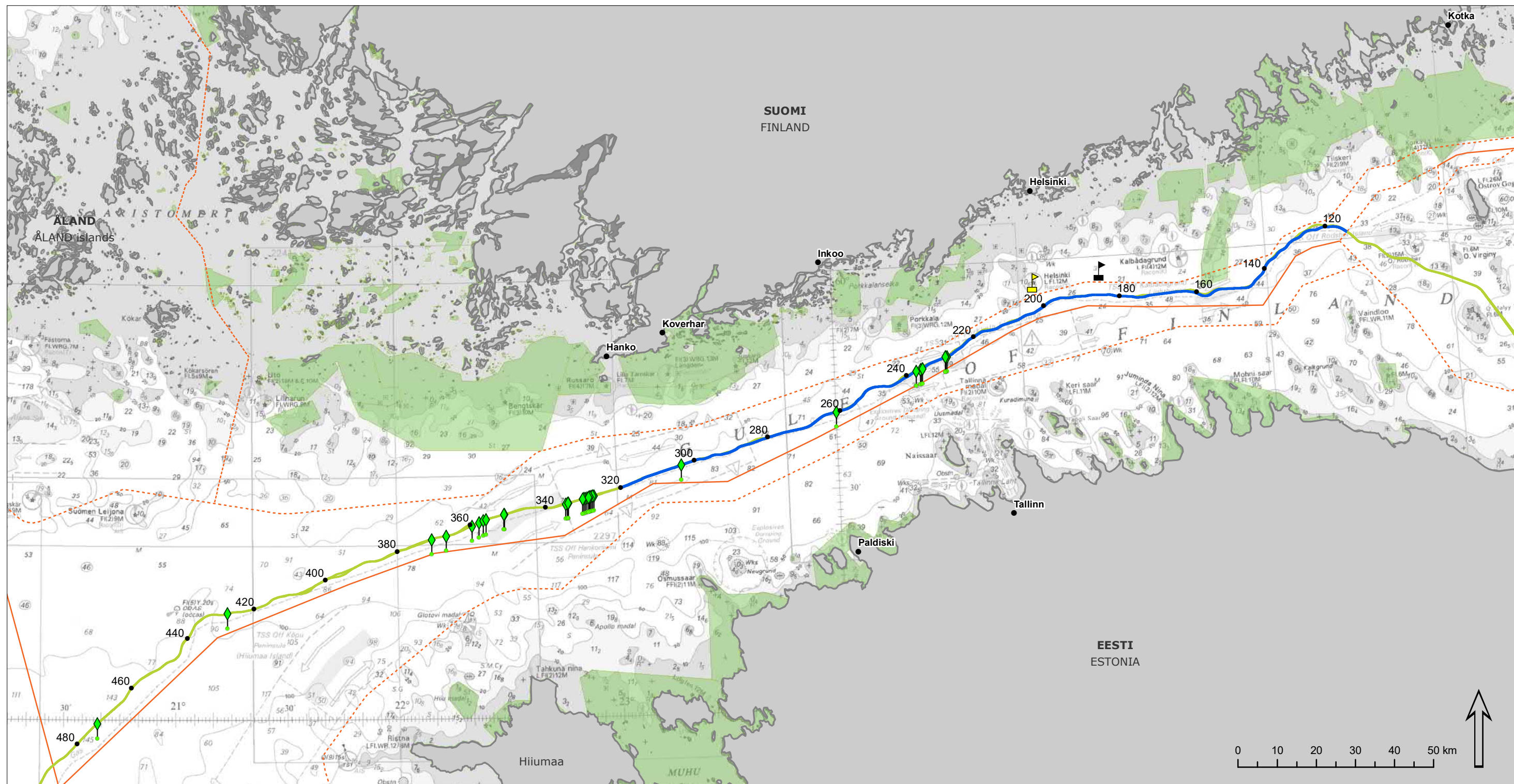
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Nord Stream 2 Construction activities during Q3/2019

Pipelay

— Pipelay of Line B

Rock Placement

◆ Post-lay

Reference data

- NSP2 Route
- Global Kilometre Point (GKP)
- 🚩 Wave data
- 🚩 Wind data

■ Natura 2000 site (coastal and offshore areas)

--- Territorial water border

--- Åland border

— EEZ border

References:

- Limits of Exclusive Economic Zones and Territorial Waters: IBRU May 2010
- Background sea charts are "Not to be used for navigation"
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- Natura 2000 sites. EEA and SYKE 2018.

Annex 1

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Controlled: Sanna Vaalgamaa

Construction activities during Q3/2019

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