

Nord Stream 2 Natural Gas Pipeline construction and operation in the Finnish EEZ Environmental and Technical Monitoring Quarterly Report Q4 2019

Date	17.3.2020
Project	PO 17-5149
Client	Nord Stream 2 AG
Document ID	W-PE-EMO-PFI-RQU-892-RQU419EN-04

The original report is written in Finnish and has been translated into Swedish and English. If there are conflicting information in the different language versions, the Finnish version prevails.

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 fourth 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 only remaining construction activity in Finnish EEZ during the fourth quarter was post-lay rock placement. By the end of Q4, the total number of finalized berms was 254 and the total volume of rock installed was 903 000 m³. Post-lay rock placement continues in the first quarter of 2020.

Environmental monitoring continued during Q4 and the monitoring equipment was serviced, and data collected at all sites (Control 1, Control 2 and Sandkallan) in December 2019. During the Q4, stormy conditions increased turbidity at the shallower Control 1 and Control 2 stations. The deeper stations at Sandkallan did not experience high turbidities. Instead, the two deeper stations at the Sandkallan site suffered from oxygen deficiency. The shallower Sandkallan station had good oxygen conditions throughout the period.

Monitoring at the Control 1 and 2 stations ended in December 2019. Monitoring will continue in all three Sandkallan stations until the spring 2020.

There were no incidents to be notified to the Finnish authorities during the reporting period.

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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 fourth quarter (Q4) 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 in August 21, 2019 /1/.

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

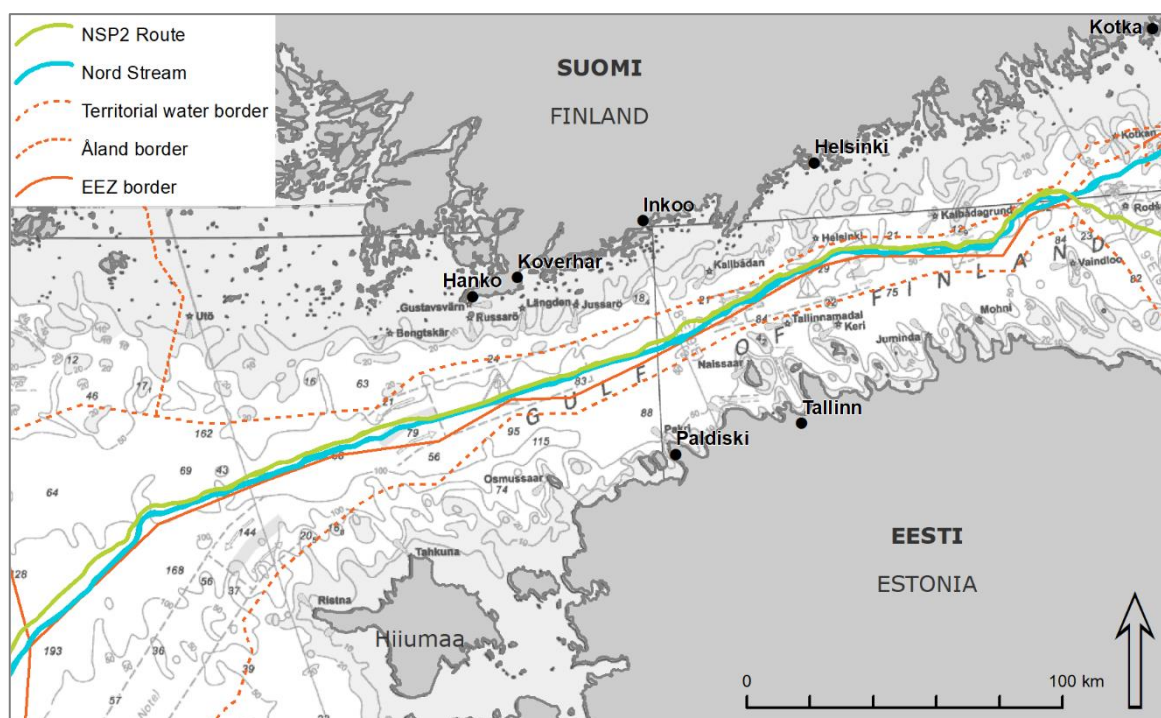


Figure 1. The Nord Stream 2 route passes through the Finnish EEZ. It is situated north of the existing Nord Stream pipelines with an exception of a short section in the east, close to Russian territorial waters.

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			

On October 9, 2019, Nord Stream 2 AG proposed an amendment of monitoring scope in 2020 to the Uusimaa ELY Centre /10/. The proposed amendment was to reduce the monitoring scope for 2020 from the existing five stations to three stations in Sandkallan due to limited amount of construction work left, and the quality and quantity of data gathered in 2018-2019. With its decision on November 8, 2019, Uusimaa ELY Centre approved the proposed amendment /11/. In accordance, during 2020, water quality and currents will be monitored at three stations at the Sandkallan long term monitoring site, but no longer at the Control sites in eastern and western Gulf of Finland.

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 water permit application and more thorough discussion on the observed impacts.

2 Environmental conditions during the fourth quarter

In October, temperature in the southern coast of Finland was close to the long-term (1981-2010) average. The month was rainier than long-term average in many parts of the country, and the highest precipitation of the month, 137 millimetres, was measured at the Tvärminne observation station in Hanko. /3/

High precipitation continued in November and, in most parts of the country, the total amount of sunshine was only approximately 20 hours. The mean temperature was close to the long-term (1981-2010) average, and by the end of the month there was snow in the whole country, except the southern coast. /4/

The average temperatures were 3–6 degrees above normal in December, and the highest temperature of the month, 8.4 °C, was measured on December 4, 2019 in Parainen. Precipitation in December was above average in most parts of the country. Along the coast it came down as rain, and by the end of the month the southern and western coasts were largely snow-free. /5/

Due to the mild autumn, there was no ice in the Gulf of Finland by the end of the year. Typically (reference conditions 1965-1986), at that time of the year the northern and eastern coastal areas would be covered by 10-20 cm thick ice /6/ (Figure 2).

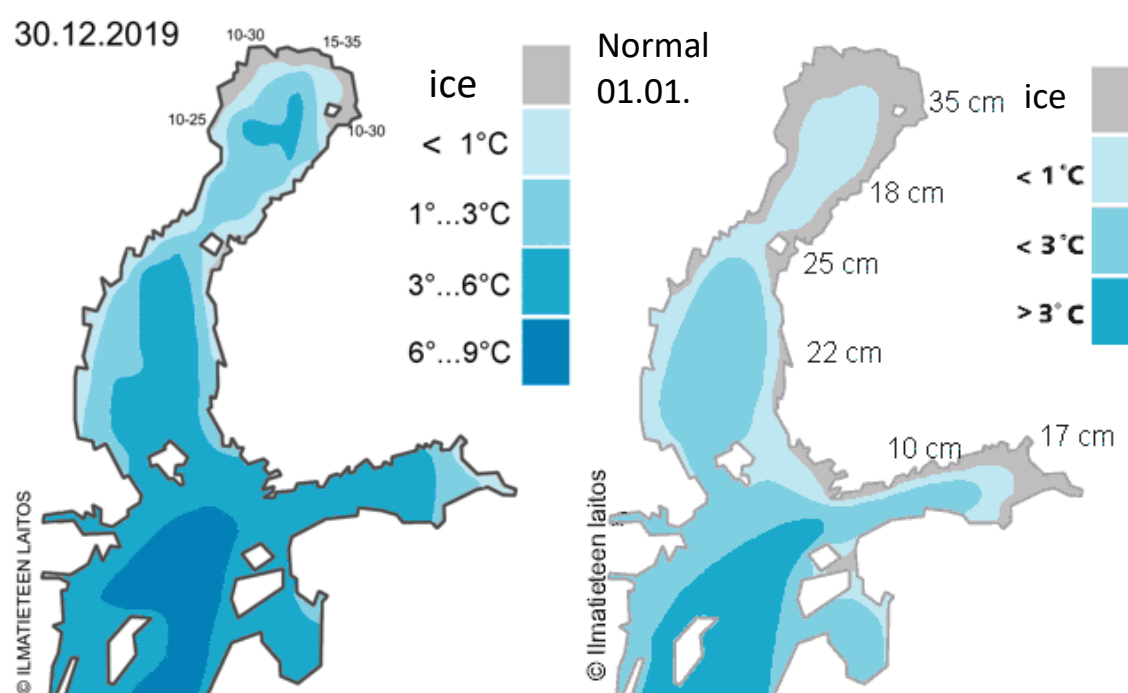


Figure 2. Sea water temperatures and ice cover in the end of the fourth quarter in 2019 and typical conditions during the reference period of 1965-1986 /6/.

According to the Finnish Meteorological Institute's open data /7/, during the period of October 1 to December 31, 2019, significant wave height in the open Gulf of Finland varied between 0.1 and 3.4 m (Figure 3) and the wind speed between 0 to 18.7 m/s (Figure 4) /7/. 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).

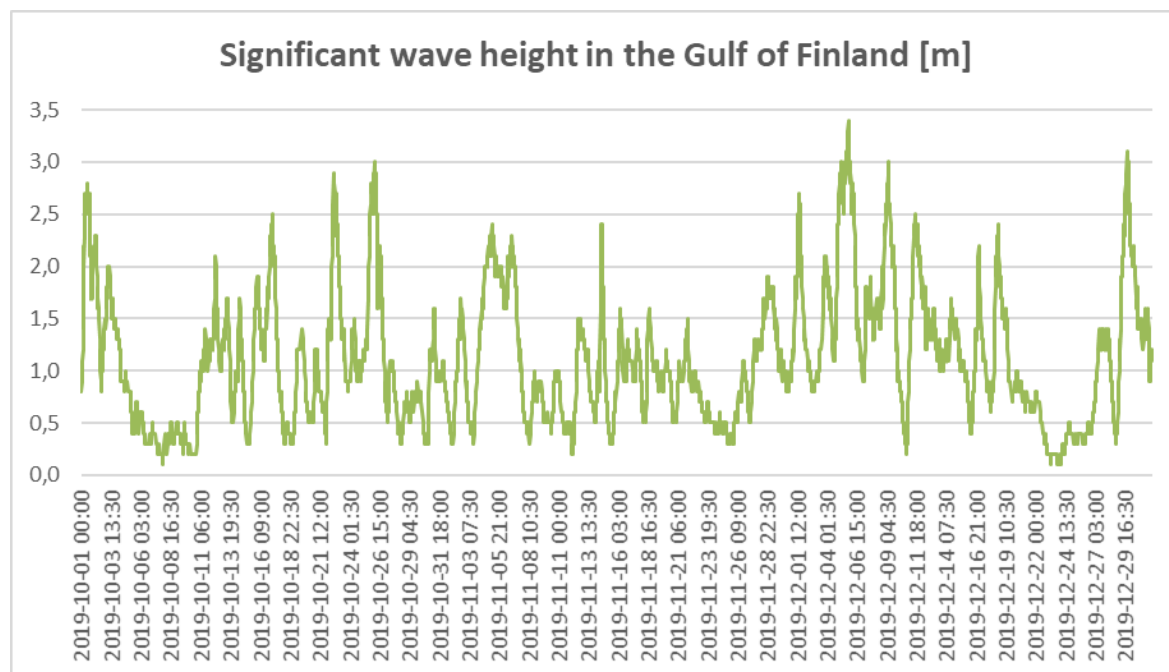


Figure 3. Significant wave height in the Gulf of Finland during the period from October 1 to December 31, 2019 /7/. The data was collected from an open sea wave buoy located in the Gulf of Finland (see Annex 1) and consists of measurements conducted every half an hour.

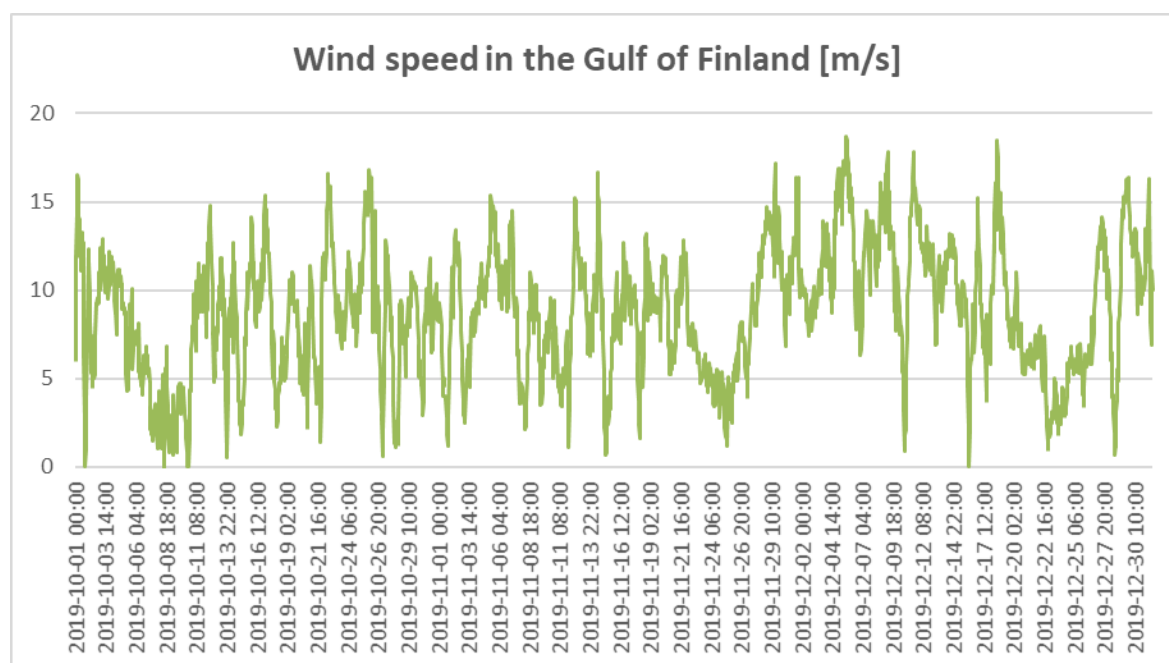


Figure 4. Wind speed in the Gulf of Finland during period from October 1 to December 31, 2019 /7/. The data was collected from a Helsinki lighthouse weather station located in the middle of Gulf of Finland (see Annex 1) and consists of measurements conducted once an hour.

3 Construction activities during the fourth quarter

3.1 Schedule

The only construction activity still continuing in the Finnish EEZ during the fourth quarter was post-lay rock placement (Table 2).

Table 2. Construction activities during Q4 2019.

2019 Q4	October				November					December				
Week	40	41	42	43	44	45	46	47	48	49	50	51	52	1
Rock placement														

3.2 Activities during the period

Rock placement

Rock placement was conducted by the vessel Seahorse from September 30, 2019 to October 3, 2019, after which it departed to the Russian territorial waters. The rock placement vessel Bravenes picked up rock placement in the Finnish EEZ from November 16 to November 17, 2019, after which it, too, departed to the Russian territorial waters. Bravenes returned to the Finnish EEZ on December 2, 2019 and continued rock placement until December 6, 2019, after which it departed to Germany. Rock placement contractors were Boskalis Offshore Contracting B.V. and Van Oord Offshore B.V. (BoVO). Contractors report the proceeding of the rock placement works in an as-built register, which is summarized in the quarterly reports.

The rock placement during Q4 took place between GKP 122 and GKP 213. The locations of the completed berms were at GKP 122 and GKP 174 (Figure 5). During Q4, altogether 2 berms were installed. Both of them were post-lay berms for Line B () to support and cover the pipeline as well as increase its stability.

Many berms are built in several phases (pre-lay, post-lay, possible top-ups¹), and the contractors report them upon completion in the as-built register. Therefore, the total number of berms is not the sum of berms reported as “completed” in the as-built register. Similarly, there is a small difference between the total installed volume calculated from the latest as-built register and the total installed volume calculated as the sum of Q reports. For example, it was earlier reported that during Q3, 33 berms were installed, resulting in a total of 264 berms having been completed by the end of Q3. However, a further analysis revealed that many of the 33 berms were top-ups and the correct number of completed

¹ Top-up: Berms are revisited some time after installing. Additional rock is placed if berms have naturally deformed, due to conditions at the seafloor, to a shape which does not satisfy the minimum design requirements. Top-ups are performed until the design condition is once again reached.

berms by the end of Q3 was 253. Also in Q4, one of the two berms constructed (at GKP 174) was a top-up of an existing berm, which was already recorded as completed in Q3. Therefore, the number of completed berms in the end of Q4 is 254. In addition, construction of two berms was initiated but not completed. As tonnes installed are reported only upon completion of each construction phase, the as-built register is not completely up to date by the end of the year. Such discrepancies will be further explained in the Annual Report 2019, to be published in May 2020.

The volume of rock used in the completed berms during the fourth quarter was 21,800 m³, all for post-lay rock placement (). Only Finnish rock material was used. By the end of Q4, the total cumulative volume of rock material used in the Finnish EEZ was 903,000 m³. The rock material installed in the berms under construction is reported in the 2020 statistics.

Table 3. Rock placement (completed berms) during Q4, 2019. Data summarized from /8/.

Berm type	Installed volume m ³ Q4/2019*	Number of berms
In-service buckling mitigation, lateral stability (post-lay)	21,800	2
Total	21,800	2

* Installed volume is notified to Nord Stream 2 by contractors as tonnes (t), which is converted to cubic metres using a factor 1.5625 t/m³

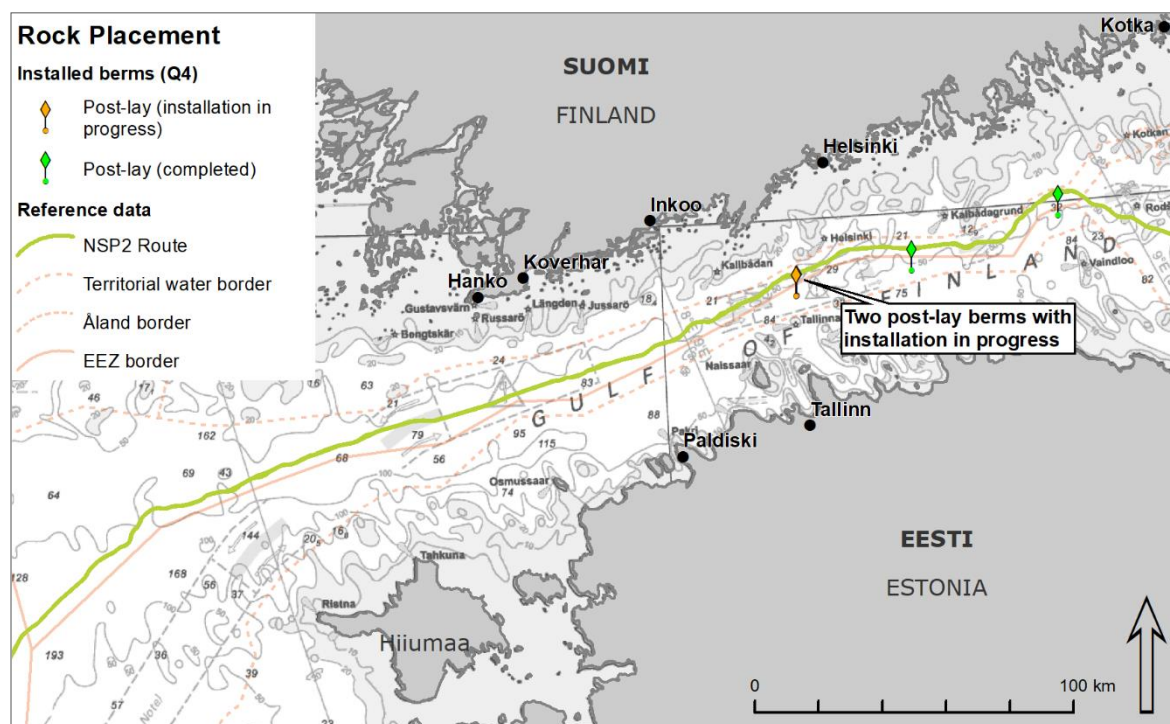


Figure 5. Rock placement during Q4.

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 6).

During Q4 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 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 (ADCP) measuring flow speeds and directions in separate depth layers covering the whole depth range from the bottom to the surface /9/. The Sandkallan stations represent deeper waters than the two control stations. The water depth at the stations varies between 49 and 67 metres.

Monitoring at the Control 1 and 2 stations ended in December 2019, when instruments and data were recovered. Monitoring will continue in all three Sandkallan stations until spring 2020.

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	8.12.2019	-
Control 2	18.4.2018	10.12.2019	-
Sandkallan	18.4.2018	10.12.2019	Q2/2020

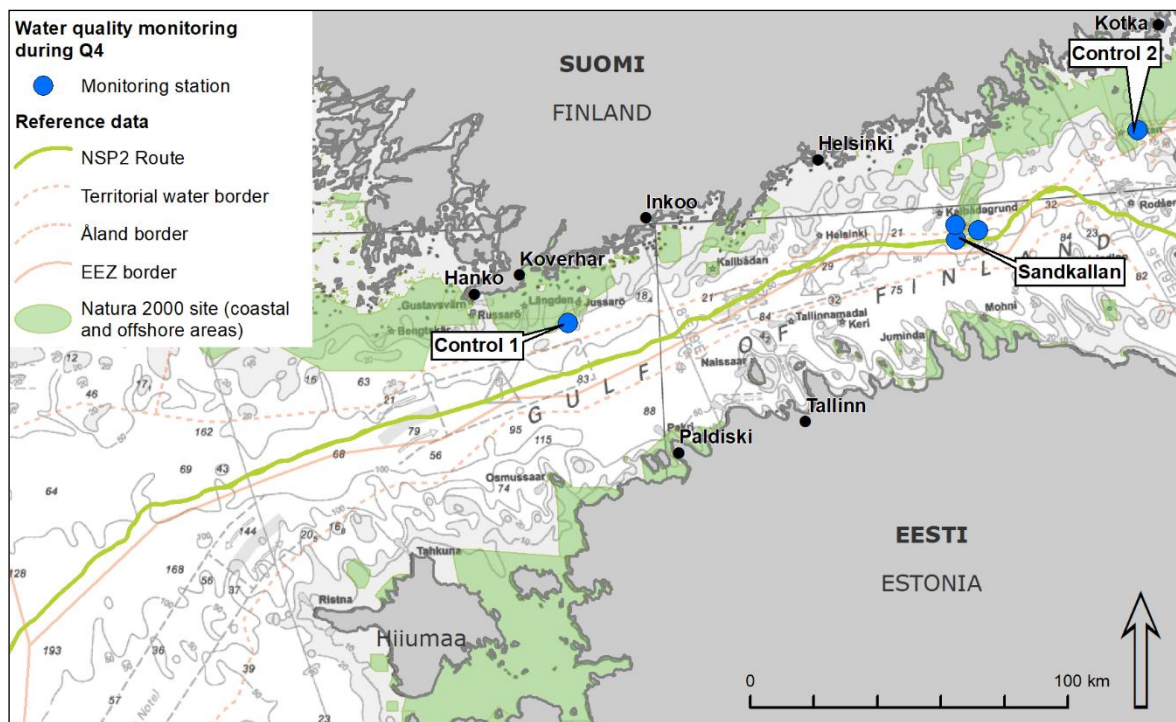


Figure 6. Water quality and current monitoring sites during Q4 2019.

4.2 Results

The results cover the period between December 2018 and December 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 /12/.

During the Q4 2019, stormy periods with strong currents and high wave action induced elevated levels of water turbidity with peak values up to 15 turbidity units [FNU] (Figure 7). The reason for the phenomenon was resuspension of sediment from the relatively shallow bottoms. It was observed most clearly at the relatively shallow site of Control 1. At the monitoring site Control 2, highest values were slightly lower, 10 FNU. The effects of stormy periods were hardly detectable at the three deeper Sandkallan monitoring stations where highest turbidity values remained below 5 FNU.

Oxygen concentrations increased at all stations towards the end of the year but remained slightly lower compared to the previous year. Especially in Control 2, oxygen concentration measured by the sensors close by the bottom was only 3–4 mg/l (Figure 7). Weakening thermal stratification and stormy periods improved mixing of the water layers, leading to an increase of oxygen concentration in the deeper water layers.

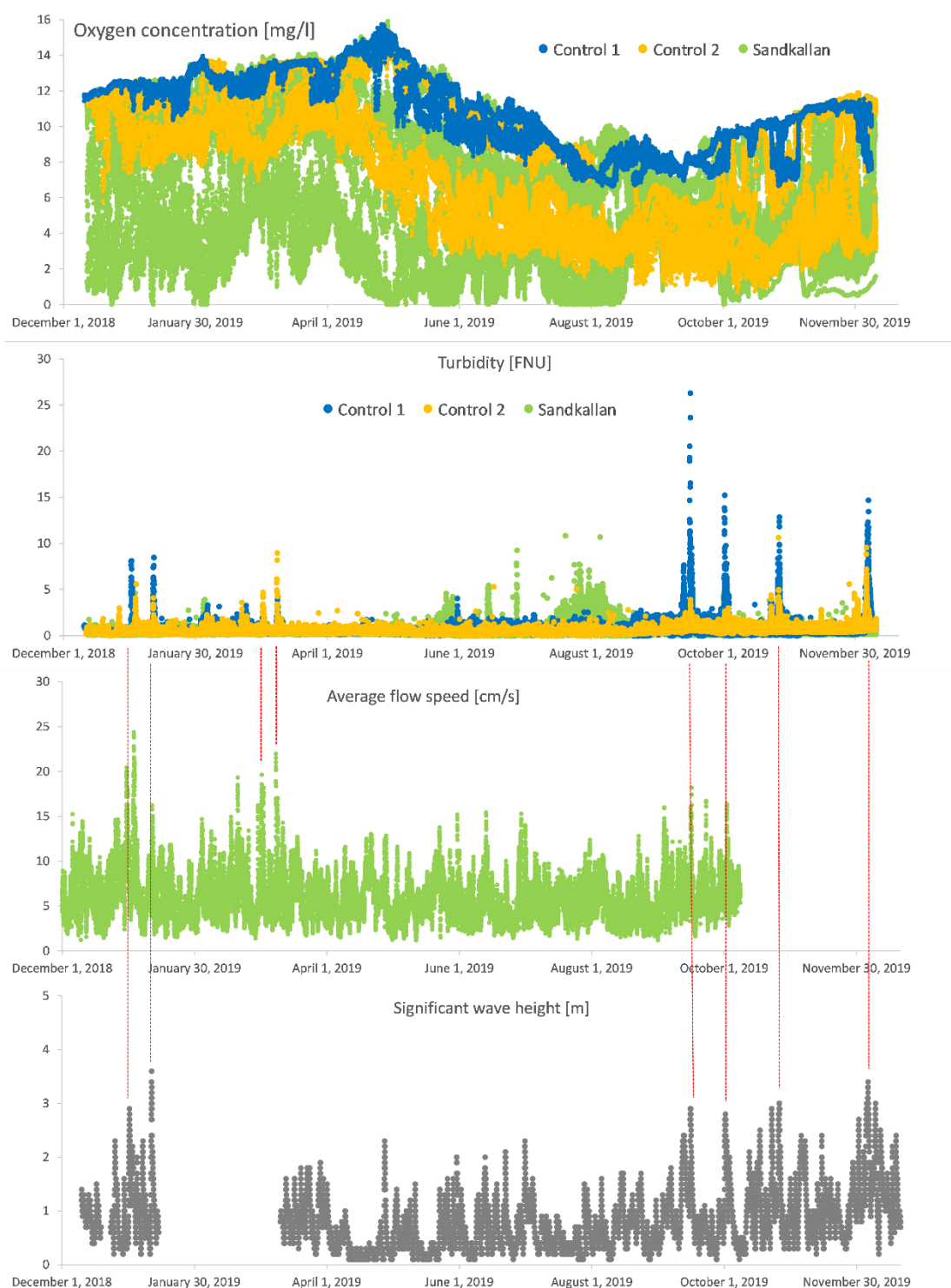


Figure 7. Oxygen concentration, turbidity and flow speed at the monitoring sites Control 1, Control 2 and Sandkallan, and the significant wave height measured by the Finnish Meteorological Institute. /7/. Wave data are not available for the winter months due to occasional presence of ice. Due to weather limitations flow speed sensor (ADCP) was not serviced in December 2019 and therefore no new data is presented in this report. Wind induced high wave and flow episodes caused turbidity peaks that are indicated by red hairlines. The images are combinations of all measurements carried out at the monitoring sites. They represent the depth range of 2-15 m above the seabed.

5 Notifications

No notifications related to the construction activities were provided during Q4.

6 Conclusions

Construction activities in the fourth quarter of 2019 in the Finnish EEZ consisted solely of post-lay rock placement, which continues in the first quarter of 2020.

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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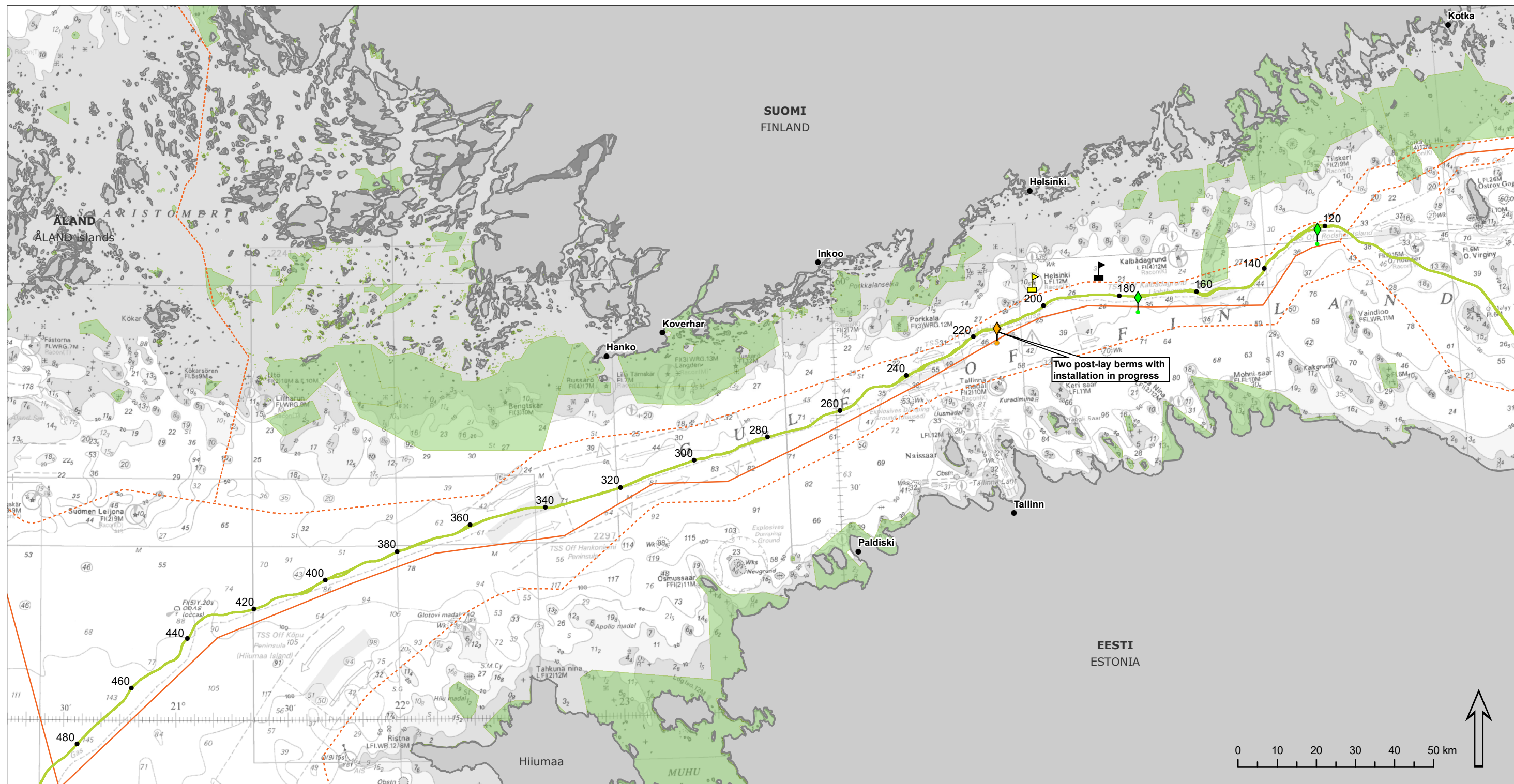
Maps and GIS data

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European Environmental Agency (EEA) 2018. Natura 2000 sites. © Directorate-General for the Environment (DG ENV).

Finnish Environmental Institute (SYKE) 2018. Natura 2000 sites. International Boundaries Research Unit (IBRU) 2010. Borders of the Exclusive Economic Zones and Territorial Waters.



Nord Stream 2 Construction activities during Q4/2019

Installed berms (Q4)

- Post-lay (installation in progress)
- Post-lay (completed)

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
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 - Natura 2000 sites. EEA and SYKE 2018.

Annex 1

Version: Q4 report EN ver4
 Code: W-PE-EMO-PFI-RQU-892-RQU419EN-04
 Date: 6.2.2020
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Construction activities during Q4/2019

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