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ENVIRONMENTAL PERMIT AUTHORITY

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PERMIT DECISION

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ISSUE

Permit application concerning munitions clearance within the Finnish EEZ as part of the natural gas pipeline project from Russia to Germany, and application for starting the construction activities before the decision becomes lawful and binding

PERMIT APPLICANT

Nord Stream AG

APPLICATION

In its application submitted to the Environmental Permit Authority on 2 June 2009, and its application it has later supplemented, Nord Stream AG has requested a permit for clearing munitions in the Finnish EEZ as part of the Russia–Germany natural gas pipeline project, and a permit for starting the work before the decision becomes lawful and binding.

The application concerns the clearance of munitions from the seabed. Besides the munitions specified in more detail in the application, it is possible that other munitions will be found in the installation corridor or its immediate vicinity during the clearance and related surveys. The intention is also to clear such munitions.

BASIS FOR APPLYING FOR THE PERMIT

Chapter 1, Sections 15 and 19 of the Water Act

EXECUTIVE POWERS OF THE PERMIT AUTHORITY

Section 18 of the Act on the Exclusive Economic Zone of Finland

ENVIRONMENTAL IMPACT ASSESSMENT PROCEDURE

An Environmental Impact Assessment Report (completed in February 2009) has been prepared for the entire gas pipeline, and the assessment also includes munitions clearance. The Uusimaa Regional Environment Centre, acting as the co-ordinating authority, issued its statement on the Assessment Report on 2 July 2009.

On 7 August 2009, the applicant provided the Environmental Permit Authority with a response for the views expressed by Estonia regarding the Environmental Impact Assessment procedure concerning munitions clearance. On 13 August 2009, the Environmental Permit Authority sent the aforementioned response to the Ministry of the

Environment to be further delivered to Estonia. On 15 September 2009, Estonia provided the Western Finland Environmental Permit Authority with a statement on the further clarifications.

PLAN

Purpose of the project

The pipeline system of approximately 1,220 kilometres that consists of two pipes will travel from Russia, the Vyborg / St. Petersburg area to Germany. The pipelines will be laid on the continental shelves of Russia, Finland, Sweden, Denmark, and Germany outside territorial waters, and within the territorial waters of Russia, Denmark, and Germany. The project is not connected to the Finnish gas grid. The pipelines will pass through the Finnish continental shelf and EEZ and will not extend to Finnish territorial waters or land areas. It is intended that the pipeline runs for 375 kilometres in the Finnish EEZ.

The intention is to start the pipeline construction works in 2010. The intended lifespan of the pipeline is 50 years. To ensure the safe installation and long-term integrity of the pipeline, clearance of standard munitions will be necessary. This is why the intention is to clear a total of 27 munitions in the installation corridor located in the Finnish EEZ. The corridor extends to a distance of 25 metres from the respective median line of both pipeline routes.

Project benefits

The 27 munitions intended to be cleared from the seabed constitute a risk for the construction and use of the pipeline, and also otherwise for safety and the environment. The munitions may be detonated in connection with anchoring, bottom trawling, extraction of natural resources from the seabed or other means of seabed utilisation. If a munitions object (mine) detonates in an uncontrolled manner in connection with such activities, the munitions object may pose an immediate danger to people nearby. Furthermore, uncontrolled detonation will increase the risk of avoidable environmental impact, such as the risk of death of large fish schools and/or marine mammals, such as seals. Munitions clearance will offer clear benefits for the general public.

The immediate financial benefits to the gas pipeline project will be significant. The applicant will collect approximately EUR 500 million per year in transfer fees.

Europe currently imports natural gas mainly from Russia, Norway and Algeria. The vast Russian sources are situated in geographical proximity to the EU. Thus, it will in principle secure the supply of natural gas to the EU, provided that there is sufficient transfer infrastructure.

The gas market and the need for natural gas is growing in the EU. According to EU estimates, natural gas demand in the EU will increase from 543 bcm in 2005 to approximately 629 bcm in 2025. The share of natural gas in the overall primary energy mix is also expected to increase, in addition to the general increase in the demand for energy. According to the European Commission, it is expected that the natural gas energy share among energy sources will increase by about 25% between 2005 and 2025. This increase in demand cannot only be covered by the EU's own energy sources, and it is estimated that in 2020 approximately 80% of natural gas used in the EU will be imported from elsewhere. The Baltic Sea pipeline can provide a substantial part of this need. In order to fill the looming EU import gap of 195 bcm per year, several projects are planned to secure gas supplies. According to the European Commission, all of these projects are needed to meet the growing demand. The gas pipeline project is particularly pivotal, because it will supply more than a quarter of the import gap: the most of any of the envisaged projects. The gas pipeline project is of importance for Europe's gas supply.

Munitions clearance

General

Historically, the dumping of munitions at sea has been a typical means of destroying munitions that no longer have any military value. The Baltic Sea was used as a dumping ground for conventional and chemical munitions during and subsequent to both World War I (WWI) and World War II (WWII).

Thousands of sea mines were deployed in the sea during both WWI and WWII as a defence mechanism against attack from naval ships and submarines. The mouth of the Gulf of Finland was of special interest, and therefore the largest quantities of sea mines were deployed there. The mines were laid in barrages to prevent enemy ships from approaching the coasts and entering harbours. The mines were mainly deployed by the German, Finnish and Russian navies.

During WWI and WWII, munitions types such as artillery ammunitions, depth bombs, torpedoes and grenades were also used and dumped. Large amounts of chemical munitions have also been dumped in the Baltic Sea since WWII. It is estimated that approximately 40,000 metric tons of chemical munitions, containing approximately 13,000 metric tons of chemical compounds, have been dumped in the Baltic Sea. Chemical munitions have mainly been dumped in the southern part of the Baltic Sea and therefore they do not affect the gas pipeline in the Finnish EEZ.

Today, systematic munitions clearance is carried out in different parts of the Baltic Sea with the aim of minimising damage and harm due to munitions. In recent decades, the naval forces of the Baltic Sea states have developed safe and effective methods of clearing

mines and other underwater ordnance that contain explosives. The navies of other countries around the world have applied these methods to dispose of ordnance.

According to the German navy, more than 410 mines have been cleared from the Baltic Sea between 1996 and 2006. The largest munitions clearance operations include the Baltic Sweep (1996–1999), including all the Baltic Sea states, as well as the Open Spirit project, which started in 1997 and is still ongoing, including all the Baltic Sea states as well as Belgium, Denmark, Finland, France, Germany, the Netherlands, Norway, Poland, Russia, Sweden and the United Kingdom. Between 1996 and 2008, the Baltic Sweep and Open Spirit operations cleared a total of 501 munitions from the Baltic Sea. In addition to this, several minor munitions clearance operations have been carried out.

After both WWI and WWII, the known mine fields in the Gulf of Finland have been cleared. However, individual mines remain to this day in the sea. The applicant performed a number of munitions surveys in 2006–2008 in co-operation with the Finnish Navy. A total of 27 munitions in 26 different locations must be cleared in the pipeline installation corridor. The estimated duration of the clearance is about two months.

All mines to be cleared are located within the Finnish EEZ, the closest distance being 3.3 kilometres from the Finnish territorial waters boundary. The easternmost munition to be cleared is located near Porvoo, and the westernmost is located near Kemiönsaari.

The largest charge in the munitions to be cleared is 350 kg, and the smallest is 0.8 kg. If the specific charge of a munitions object is unknown, the charge has been estimated as the highest possible charge for the munitions type in question.

The munitions to be cleared, and their location

Munition ID	Munition description	Kilometre post, approximately	Charge (kg)	Distance to municipal boundary (km)
R-06-003	No conclusion reached due to bad visibility on video. Maximum found charge assumed.	181	350	3.8/Porvoo
R-E7B-10466	German burst buoy (Spreng buoy).	206	0.8	3.3/Helsinki
R-07-004	Contact mine, Russian origin.	211	150	4.4/Espoo
R-07-2655	Contact mine, Russian origin.	213	150	4.6/Espoo
R-8AG-W-014	German EMC mine.	223	300	3.9/Kirkkonummi
R-8AG-W-009	German UMA contact mine.	237	30	4.2/Kirkkonummi
R-E8C-10223	German UMA contact mine.	237	30	4.7/Kirkkonummi
R-W8A-10317	German UMA mine.	239	30	3.8/Kirkkonummi
R-8CG-E-004	German UMA mine.	239	30	4.4/Kirkkonummi
R-8CG-E-003	German UMA mine.	239	30	4.2/Kirkkonummi
R-W8A-10312	German UMA mine.	240	30	3.9/Kirkkonummi
R-W8A-10313	German UMA mine.	240	30	3.9/Kirkkonummi
G-08-009	German UMA mine.	240	30	3.9/Kirkkonummi
R-W8A-10005	German UMA mine.	240	30	3.9/Kirkkonummi
R-8CG-E-002	German UMA mine.	240	30	4.2/Kirkkonummi
R-8CG-E-001	German UMA mine.	240	30	4.2/Kirkkonummi
R-08-2805	German EMF mine.	243	350	4.5/Kirkkonummi
R-08-159	Russian contact mine M-08.	245	115	5.0/Kirkkonummi
R-09-27	Russian contact mine M-08.	248	115	5.4/Kirkkonummi
S-09-3135	German EMC mine.	256	300	8.3/Inkoo
R-09-04	German burst buoy (Spreng buoy).	257	0.8	8.8/Inkoo
R-09-192	Russian contact mine M-08.	264	115	10.3/Inkoo
R-11-3395	Finnish S-40 mine.	319	100	11.5/Hanko
R-11-5167	Russian contact mine.	334	250	15.0/Hanko
R-12-008	Possible 2 air dropped bombs. No mine.	361	64	9.3/Kemiönsaari
R-12-3463	German EMC II mine.	366	300	9.2/Kemiönsaari

Carrying out the work

Based on competitive bidding, the applicant has chosen Bactec International Ltd (United Kingdom) to complete the work.

Alternatives for eliminating munitions by exploding them onsite have been studied in connection with the project. The alternatives included removing the munitions and eliminating them on land, or transferring the munitions to an open seas location and then eliminating the munitions by detonating them. The alternative of eliminating the munitions by removing them and not detonating them onsite was rejected due to safety concerns. Removing or transferring the munitions is dangerous to people and may result in damage to equipment and vessels since, as time passes, old munitions become more and more sensitive to accidental detonation in comparison to their original state. Furthermore, accidental or unplanned detonation would increase the environmental risks (such as risks to mammals, fish, cultural heritage, external infrastructure and vessels) because harmful-impact-related mitigation measures planned for the intended clearance could not be effectively utilised.

The clearance will be carried out by placing a small charge next to the identified or suspected munitions object on the seabed with a ROV (remote operating vehicle) especially designed for this purpose. The charge will then be detonated at sea level from a safe distance from the munitions object onboard a support vessel.

Special sites of interest will be studied before and after clearance. This will ensure that no harmful impact occurs to cultural heritage sites, cables, barrels and other observed containers.

All munitions clearance works will be performed in a safe and controlled manner following all national and international laws regulating detonation of underwater explosives. The risks related to the methods used in the clearance have been assessed.

Mitigation measures related to harmful impact

In order to minimise the impacts on marine flora and fauna, the works are planned to be carried out during the ice-free period, avoiding fish spawning seasons as well as marine mammals' and birds' migration routes and migratory periods. Furthermore, gradually increasing turbidity is avoided by, for example, avoiding consecutive clearing of munitions objects located close to each other.

Acoustic devices have proven to be an effective means of dislodging marine mammals. However, the dislodgment area around the device may be small, and it may be necessary to place acoustic devices at several distances from the clearing site. The safety area radius (for marine mammals) will be adjusted in accordance with the munitions type. If the charge is 300 kilograms, the marine mammal safety area extends to two kilometres. When using the dislodgment devices, the fact that the dislodgment signal may be associated with dead fish and damaged fish which may lure mammals is taken into account. This may occur when mammals associate the acoustic signal, for example, with dead or damaged fish. In order to minimise the im-

pact, fish that have died during the clearing will be removed whenever possible.

Since the impact prevention measures concerning marine mammals, fish and sea birds mainly consist of visual and acoustic observations and monitoring, the conditions under which the observations are made will be taken into account. The amount of light and the weather will influence the effectiveness of observations, for example. This is why clearing will be performed only when the weather conditions allow safe clearing and effective mitigation of impact, and only during the day when there is enough light (the work will begin an hour after sunrise and end an hour before sunset). Observation will begin at the latest thirty minutes before each detonation. Observation of marine mammals and birds will begin at the earliest 20 minutes after sunrise.

The size of the ammunition affects the ammunition-specific use of the measures. Usually the measures include the following:

1) Observations are carried out to determine, when possible, whether there are any marine mammals, shoals of fish, or sea birds in the safety zone surrounding the detonation site. Observation will begin at least 30 minutes before the intended detonation. The observation methods are as follows:

• Visual observations for the presence of marine mammals and sea birds in the area, carried out by qualified marine mammal observers from a survey vessel. To carry out the observation in an effective way, the measures are taken in daytime when the sea is calm, or the swell of the sea is minor.

• Sound monitoring for identifying sounds made by marine mammals. The sound monitoring buoy has one underwater listening device for low frequencies, and one underwater listening device for high frequencies. The sound monitoring buoy will be placed at a 200-metre distance from the munition before the munition is cleared, and the signals from the device are transmitted to a radio receiver set on a survey vessel.

• Active acoustic fish surveying will be carried out with an echo sounder to identify shoals of fish. Acoustic fish surveying will always be carried out from a support vessel before the munition is detonated.

If sea mammals, sea birds, or shoals of fish are identified within the safety zone, the detonation will be postponed.

2) After carrying out the observing in the safety zone of the detonation site, measures are taken to deter animals. The following methods will be used:

• Sound dislodgment devices ("seal deterrents") for deterring seals and harbour porpoises from the clearance area before the detonation. It is anticipated that the devices will have an effect on seals at a radius of about 300 metres. The number of devices used depends on the size of the munitions. A maximum of four devices will be used for a large munition.

• Sound dislodgment devices for fish, based on small explosive charges (50–500 g). The devices will be placed about 20 metres deep from the support vessel, and detonated 30 seconds before detonating the munition to be cleared.

3) After munitions detonation, any dead or injured fish in the clearance area may lure marine mammals. To minimise this, the contractor will remove fish killed during the clearance by using a surface trawl from a support vessel.

Ecological monitoring will be carried out during the clearance to be able to ensure that the dislodgment measures have duly been carried out.

Clearance work stages

The mine clearance performer will deploy a method pursuant to the aforementioned principles during the clearance works. The clearance work will include the following stages:

1) The vessel will move to the target area, and a TMS (Tether Management System) will be lowered onto the seabed up to a distance of 100 metres from the target. Observers of marine mammals will be on standby during the whole clearance operation.

2) The vessel will withdraw to a distance of one kilometre from the site.

3) The Remote Operated Vehicle (ROV) will withdraw from the TMS and will check the target. The video material based on the check will be delivered to the vessel crew to identify the munitions object and verify its condition. The ROV will also check the other objects on the seabed that have been identified in the previous studies (up to a distance of one kilometre). After this, the ROV will withdraw into the TMS.

4) The TMS will be lifted to the surface. After this, PAM (Passive Acoustic Monitoring System), a target marker and deterrent devices for fish and seals will be deployed.

5) The vessel will withdraw to its position. The clearance plan will be finished off, and the calculations regarding the detonation will be verified. The equipment required for the clearance work will be prepared for use. The local authorities will be informed of the schedules, and the clearance work to be carried out will be verified.

6) When all equipment and plans are finished, and the finishing works have been verified, the vessel will move to the target. The TMS will be positioned up to a distance of 100 metres from the target. When the TMS is laid on the seabed, the vessel will withdraw to its position. As the vessel retreats, it will lay the blasting cable on the seabed. The ROV will collect the explosives and the frames to which the explosives are attached from the TMS, and will move them to their final destination for the clearance work.

7) The ROV will withdraw into the TMS. After this, there will be a waiting period of 30 minutes. The vessel will move to the target area and lift the TMS to the surface. After this, the vessel will return to its point of origin.

8) After the vessel has returned, the authorities will be informed of the verified schedules. After this, a Rigid Inflatable Boat (RIB) will be deployed to observe fish and to remove marine mammals from the target area. After this, the RIB will move to a safe distance which has been defined in advance.

9)The clearance stage will be initiated after the clearance director has been ensured that all procedures have been followed and has checked with the vessel captain, the head observer of marine mammals and the clients' representatives that there are no obstacles to continuing the clearance. All vessels will be warned as agreed with the authorities. After this, the fish deterrent device will be detonated. The main charge will be exploded no later than 30 seconds after exploding the deterrent device. The area will then be checked with the RIB based on a visual inspection.

10) When the clearance director has ensured that there is no immediate danger, the vessel will move to the target area. The TMS will be lowered into the water and the vessel will withdraw. After this, the ROV will check the target area and ensure that the mine has been destroyed. Possible leftovers resulting from the explosion will be lifted from the seabed, and the crater will be checked. The vessel will move to the target area and lift the TMS to the surface.

These measures will be repeated with every mine that is to be cleared.

PROJECT AREA

General

The Baltic Sea water is brackish water, which is the result of freshwater mixing with sporadic saltwater inflows through the very narrow Danish Straits. In addition, temperature differences that cause stratification of the water masses contribute to the creation of brackish water by isolating the bottom water layers from the upper layers.

The water turnover in the Baltic Sea is very slow. It might take up to 30 years for the entire water volume to be changed. Because the Baltic Sea is also almost totally surrounded by land, considerable amounts of contaminants and nutrients have accumulated on the seabed, especially in areas with soft sediments rich in organic matter. Furthermore, stratification together with eutrophication due to human activity have resulted in extensive depletion of oxygen in the deep waters. At present, large seabed areas in the Baltic Sea are without living organisms. Eutrophication has also increased cyanobacterial blooms in recent decades, particularly in the Gulf of Finland.

In the Finnish EEZ, the pipeline route runs through the central and deep areas of the Gulf of Finland and the northern Baltic Proper. The water depth along the surveyed pipeline corridor varies from about 40 to 200 metres.

Seabed

According to the information based on the geotechnical surveys, the morphology of the seabed of the eastern Gulf of Finland is very rugged and uneven. In several areas, 1–2% of the seabed consists of slopes. This alternating and undulating seabed of drowned glacial and pre-glacial landscapes has caused a rather complex pattern of zones of recent sedimentation. The dominant classes of sedimentation are: 1) a zone of sedimentation dominated by very soft clay, 2) a mixed zone of sedimentation and non-sedimentation consisting of clay with coarse sediments, and 3) a zone of non-sedimentation with crystalline bedrock, diamicton and coarse sediments and scattered local sedimentation—very soft clay, silt and fine sand, sand and gravel.

The seabed geology in the eastern Gulf of Finland is dominated by outcrops of glacial and pre-glacial origin. The outcrops are dominated by coarse sediments, till and crystalline bedrock. Recent sediments are deposited in numerous depressions between highs and banks and in a few larger depressions. These sediments are dominated by very soft clay, silt and fine sand. There are no very coarse recent sediments in the eastern Gulf of Finland. Clay deposits in the east change to more silty and sandy deposits further to the west. In the westernmost end of the eastern Gulf of Finland, the recent sediments are dominated by very soft clay.

The dominant classes of sedimentation in the western Gulf of Finland are 1) zone of sedimentation dominated by very soft clay, and 2) mixed zone of sedimentation and non-sedimentation consisting of clay with coarse sediments. The area can be divided into two subareas: eastern part, with a smooth seabed forming a gentle trough, and the western part, with a rough seabed with many hills and outcrops of glacial and pre-glacial deposits. The eastern part is mainly comprised of recent sediments dominated by very soft clay and a

few ridges consisting of sand, gravely sand, gravel and crystalline bedrock (of glacial and pre-glacial origin). There are minor channels between the glacial outcrops. The infilling in the channels is comprised of very soft clay.

The seabed of the western part of the western Gulf of Finland is altering and undulating, with many hills with glacial or pre-glacial outcrops and intervening depressions with recent sedimentation. Very soft clay is the dominant sediment, with patches of coarser sediments, silt and fine sand. Few large topographic elements are found in this part of the western Gulf of Finland. These elements are dominated by crystalline bedrock and gravely sand.

The predominant classes of sedimentation in the Finnish part of the Baltic Proper are 1) zone of sedimentation dominated by very soft clay, 2) mixed zone of sedimentation and non-sedimentation consisting of clay with coarse sediments, and 3) zone of non-sedimentation consisting of coarser sediments, till and bedrock with thin, scattered local surface layers of recent very soft clay. The area is dominated by several hills and depressions, which create a rough and strongly undulating seabed. Generally, the seabed in this section dips against the centre of the Baltic Sea. The entire section is dominated by deep, narrow valleys that cross the pipeline route. The slope gradient of the hills and outcrops exceeds 15 degrees in several locations. The glacial landscape elements in part of the section are very large. Gravely sand and coarse sediments comprise the surface in the highs in this part. The surface sediments in the valleys and depressions are dominated by very soft clay.

Currents

The currents in the Baltic Sea are weak. Surface current velocities strongly correlate with wind speed. Together with inflows, large amounts of water flow towards the east near the coast of Estonia. A compensating strong westward outflow occurs in the northern parts of the Gulf of Finland approximately 20–30 km offshore. The Finnish coast is shallow and rich with islands. The currents are slowed down by these factors, and the westward outflow occurs in the offshore areas.

About 95% of the pipeline in the Finnish project area is located at a water depth of more than 60 m. The estimated average flow velocity at this depth of 60 m is 0.01–0.02 m/s. The pipeline route is located in the proximity of the main outflow area of the Gulf of Finland, to the north of the central axis of the Gulf of Finland. In this zone, the outflow is quite homogenous from the uppermost layers down to depths of 30 m. The width of this outflow is approximately 10 km and the typical speed is 2–5 cm/sec. Near the bottom, the effects of bathymetric topography create more eddies than are found in the upper layers.

Salinity

The salinity in the Baltic Sea and Finnish project area is variable. These variations are due to the inflow of high-saline and oxygen-enriched water from the North Sea via the Danish Straits.

The inflow causes a vertical gradient in salinity because the saline water does not easily mix with less saline, less dense water. This is why the more saline water flows to the seabed. A boundary, known as the 'halocline' (a thermocline of salinity), is formed between these two water masses, resulting in a strong vertical salinity gradient. In the western and central Gulf of Finland, the halocline is weak and seasonal and lies at a depth of approximately 60–70 m. In the northern Baltic Proper, the halocline is permanent at a depth of approximately 80 m. In areas with a weak halocline and rather shallow bathymetry, waters may mix vertically every year in late autumn or winter. This is especially the case in the eastern Gulf of Finland. In the northern Baltic Proper, as well as the central and the western Gulf of Finland, this phenomenon is constrained by greater depths and a stronger halocline.

Water temperature

Annual and seasonal temperature variation is an essential physical feature of the Gulf of Finland. In winter, the mean temperature of the surface waters varies between approximately 5°C and 7°C. In spring, the surface waters start to warm up. The annual mean maximum surface temperature of 16.5°C to 17.5°C is reached in July/August. The surface layer is mixed by the wind, due to which the water temperature remains the same at all depths of the layer, but beneath this layer a boundary (a thermocline) develops between the cool, dense bottom water and the less dense surface water. The upper edge of the thermocline is typically at a depth of 30–40 m in the Gulf of Finland.

During summer, the layer between the thermocline and the halocline is usually colder and denser than the water layers over and below it, ranging between 2°C and 4°C. Under the halocline, temperature variations are small and the temperature usually ranges between 4°C and 6°C. The temperature in near-bottom waters, however, shows stronger horizontal variations due to the widely varying bathymetry.

Water quality

Water transparency in the Gulf of Finland is considerably low. During summer, water transparency is lowest, and varies between about 3 and 5 metres. Water transparency usually decreases towards the eastern Gulf of Finland. Over the last 100 years, the decrease in summertime water transparency has been most pronounced in the northern Baltic Proper and in the Gulf of Finland. The primary cause of decreased transparency, especially in the Gulf of Finland, is the increase in phytoplankton biomass, which is a result of increased nu-

trient concentrations and is a sign of continuous eutrophication in the Baltic Sea.

The Gulf of Finland is the most eutrophised sub-basin of the Baltic Sea. The nutrient concentrations in the Gulf of Finland are the highest in the east. The high nutrient levels in the Gulf of Finland are a result of both external and internal loads.

Inorganic and organic contaminants

The Baltic Sea receives inorganic and organic contaminants from several different sources. The origin of the organic contaminants is anthropogenic, while the main sources of metals in the Baltic Sea are forest and agricultural soils, and industrial and municipal waste, which are either discharged directly into the sea or transported via rivers and atmospheric deposition. Hazardous substances from industry are emitted at all stages of the product chain. A significant part of the waterborne metal input into the Baltic Sea is transported via rivers from the catchment area.

Total phosphorus concentrations in the sediments along the pipeline route in 2007 and 2008 were between 410 and 5,400 mg/kg. Concentrations of nitrogen were 350–13,000 mg/kg. In the surveys carried out in 2009, the concentrations of nitrogen and phosphorus were at the same level as in the surveys conducted in 2007 and 2008.

Metal surveys related to the gas pipeline project have been conducted in the Finnish project area in 2005–2007. In 2008, environmental field investigations were carried out in the Kalbådagrund area. The Instructions for dredged sediments (Ympäristöopas 117, 2004) by the Ministry of the Environment classify two concentration limits. Concentrations of harmful substances below the lower level (limit 1) indicate background concentrations of the aquatic environment. Concentrations above the lower level indicate contaminated sediments. Concentrations above the upper level (level 2) indicate slightly contaminated sediments.

According to the concentration limits for dredged sediments applicable in Finland, the metal concentrations in recent sediments (0–2 cm) for arsenic, cadmium, chromium, copper and zinc were in excess of the lower level (limit 1). The upper limit values (limit 2) of the investigated metals were not observed to be exceeded. These concentrations represent average concentrations of recent sediments along Finnish coastal areas. However, the effect of the munitions clearance cannot be compared to the effects of dredging and dumping, because the re-suspended sediments settle down practically in the same area where they originate.

According to the OSPAR ecotoxicological assessment criteria (EAC), the mean concentrations of all studied metals except mercury, nickel and lead exceed the threshold value. Metal concentrations are in line with previous studies of metals in the sediments. Concentrations of metals in the sediment in the Finnish project area are in the mid-range compared with the overall concentrations along the pipeline route.

The concentrations of metals in surface sediments (0–2 cm) on the basis of surveys conducted in the Finnish project area, and the limit values set out in the dredging and depositing manual by the Ministry of the Environment are as follows:

Metal	Number of samples with concentration above limits of quantification (total number of samples)	Mean concentration mg/kg, mean (Min.–Max.)	Limit value/ dredging manual (Level 1–Level 2)
Arsenic	25 (25)	11.8 (3.9–32.4)	15–60
Cadmium	25 (25)	1.2 (0.5–2.0)	0.5–2.5
Chromium	238 (238)	68 (16.5–116)	65–270
Copper	25 (25)	27.6 (6.1–50.9)	50–90
Mercury	21 (25)	0.1 (0–0.1)	0.1–1
Nickel	25 (25)	24.0 (6.1–42.8)	45–60
Lead	25 (25)	25.7 (6.2–44.7)	40–200
Zinc	25 (25)	124.4 (38.1–213.8)	170–500

The concentrations have been normalised as organic carbon content (10% of regular sediment) and clay content (25% of standard sediment).

The normalised mean concentrations, minimum and maximum concentrations between the surveys of 2007, 2008 and 2009 do not vary to a significant extent. They are practically at the same level when comparing the surveys of 2007 and 2009. Mercury and cadmium were the only difference in the results. The mean concentration in the surveys of 2009 was 0.1 mg/kg, which is more than two times higher than in the surveys or 2007 (0.04 mg/kg). The mean concentrations for cadmium were also clearly higher in the surveys of 2009 (2009: 0.82 mg/kg in comparison to 2007: 0.52 mg/kg). The concentrations of cadmium and mercury are clearly below level 2 set out in

the dredging and depositing manual. This also applies to other metals.

There have been substantial inputs of organic contaminants in the Baltic Sea from numerous sources over the past 50 years. Organic pollutants reach the sea via river runoff, atmospheric deposition and direct discharge of effluents. Sources include industrial discharges, such as the organochlorines in effluent from pulp and paper mills, runoff from farmland, dumped waste and paints used on the hulls of ships and boats. Inputs of several organic pollutants, notably certain organochlorine pesticides, such as DDT and technical-grade hexachlorocyclohexanes (HCH isomers), have decreased because these substances have been banned since the 1980s. The main sources of dioxins are combustion processes, such as waste incineration and metal smelting and refining. Polychlorinated dibenzo-p-dioxins (PCDDs) and furans and dioxin-like PCBs, which are often called "dioxins" as a group, are common contaminants. The total concentration of dioxins is usually presented as a toxicity equivalent (TEQ), which is comparable to the most toxic dioxin compound, 2,3,7,8-TCDD.

Many organic contaminants are resistant to biological degradation or are only very slowly degradable, but they have a high potential for bioaccumulation in organic material. Based on these properties, the organic compounds tend to accumulate in the food chain. Hexachlorocyclohexanes (HCHs) deviate from this general observation, as they do not tend to bioaccumulate and tend to persist in the water phase rather than in sediment. In addition, polyaromatic hydrocarbons (PAHs) do not bioaccumulate due to the metabolism of the compounds in the organisms of biota. PAHs have a low water solubility and high affinity for organic matter.

Normalised concentrations of organic pollutants in young sediments along the pipeline route in a survey conducted in the Finnish project area in 2007 and 2008, and the limit values pursuant to the dredging and depositing manual by the Ministry of the Environment, are as follows:

	Number of samples with concentration above limits of quantification (total number of samples)	Mean concentration mg/kg, mean (Min.–Max.)	Limit value/ dredging manual mg/kg, mean		Number of samples exceeding level 1	Number of samples exceeding level 2
			Level 1	Level 2		
Anthracene	4 (26)	0.01 (0.005–0.02)	0.01	0.1	2	0
Benz(a)anthracene	21 (26)	0.02 (0.005–0.05)	0.03	0.4	4	0
Benz(a)pyrene	21 (26)	0.02 (0.006–0.08)	0.3	3	0	0
Benzo(g,h,i)pyrelene	22 (26)	0.04 (0.006–0.19)	0.8	8	0	0
Benzo(k)fluoranthene	21 (26)	0.02 (0.006–0.06)	0.2	2	0	0
Phenanthrene	20 (26)	0.02 (0.005–0.09)	0.05	0.5	2	0
Fluoranthene	24 (26)	0.05 (0.01–0.14)	0.3	3	0	0
Indeno(1,2,3-cd)pyrenene	24 (26)	0.04 (0.006–0.20)	0.6	6	0	0
Chrysene	21 (26)	0.02 (0.006–0.04)	1.1	11	0	0
Naphthalene	17 (26)	0.01 (0.005–0.03)	0.01	0.1	16	0
PCB 28 *)	26 (26)	1 (0.45–5)	1	30	0	0
PCB 52 *)	1 (26)	2 (0.455–8)	1	30	0	0
PCB 101 *)	3 (26)	4 (0.45–75)	4	30	2	0
PCB 118 *)	2 (26)	2 (0.45–18)	4	30	2	0
PCB 138 *)	2 (26)	6 (0.45–123)	4	30	2	0
PCB 153 *)	2 (26)	7 (0.45–158)	4	30	2	0
PCB 180 *)	1 (26)	6 (0.45–123)	4	30	1	0
Tributyltin (TBT) *)	26 (26)	106 (12–893)	3	200	26	3
DDT total	17 (26)	0.002 (0.0005–0.008)	0.01	0.03	0	0

*) µg/kg, mean

The concentrations have been normalised as organic carbon content (10% of standard sediment). The normalised concentrations have been compared to guideline values implemented to sediment dredged in Finland (DDTs and tributyltin). In all calculations, the val-

ues of the limit of quantification (LOQ) have been used when the analysed concentration was below the LOQ.

Dioxin concentrations in sediment range between 2.8 and 38 pg/g. The concentration is mainly below the Finnish concentration limit (level 1) for dredged sediment. According to the Finnish criteria, a concentration below 20 pg/g represents uncontaminated sediment, whereas 500 pg/g or higher represents contaminated sediment.

In June 2009, sediment samples were taken in a total of 33 sampling locations, of which eight positions have three sampling locations near each other (one on the centre line and two at a distance of 250 metres on each side). Four of the triple stations were located near the munitions locations. The preliminary analysis of the samples confirmed the initial assumption of the dioxin concentrations along the route of the pipelines. In the samples taken from the mine detonation sites, the highest dioxin concentration in the surface sample (0–2 cm) was 22 pg/g, and for the 0–30 cm layer, 1.2 pg/g.

Birds and mammals

The Baltic Sea is an important migrating route and breeding and resting area for birds. The northern parts of the Baltic Sea, i.e. the Gulf of Finland, the Archipelago Sea and the Gulf of Bothnia, are very important breeding areas for ducks, gulls, terns and waders. The breeding season begins in March/April and continues until early August. Some 200 bird species (migrants and breeders) can be frequently observed along the shores of the Gulf of Finland. There are about 30–40 species of seabirds (ducks, geese, waders, gulls and divers) that are common breeders or migrants. Most species nest on rocky and stony islands and islets in the outer and middle archipelago (12–20 km from the pipeline route).

Twice a year, large numbers of Arctic birds cross the Baltic Sea on their way to breeding or wintering areas. The Gulf of Finland is one of the most important migration routes for birds. Especially during the spring migrations in May, hundreds of thousands of migrating birds can be observed in a single day. Autumn migration occurs over a longer period from the end of June to the end of October.

Four sea mammal species – the harbour porpoise, the harbour seal, the grey seal, and the ringed seal are native to the Baltic Sea. Harbour porpoises and harbour seals are found primarily in the southernmost parts of the Baltic Sea, within the Danish, German and Swedish EEZs. Grey seals are found throughout the Baltic Sea, but only in small numbers in the southern region. Ringed seals are found in areas that typically have ice cover during winter, mostly in the Gulf of Bothnia and the Gulf of Riga; small populations have also been observed in the Archipelago Sea and the Eastern (Russian) parts of the Gulf of Finland. Grey seals and ringed seals are the only mammal species that have permanent populations in the Finnish project area. The harbour seal and the harbour porpoise are rarely spotted

along the Finnish coastline. During ice-free periods, grey seals haul out in groups on small islands, islets and rocks in the outermost archipelago. In winter, they haul out on drift ice close to open water. Grey seals seem to migrate between haul-outs throughout the Baltic Sea Proper between the sea areas of Finland, Sweden and the Baltic states. The density of grey seals is highest close to haul-outs but varies seasonally.

Fish and fish stocks

The environmental conditions in the Gulf of Finland are unfavourable to many fish species. The Baltic Sea is host to around 70 saltwater fish species and around 30–40 brackish or freshwater species. The number of marine fish species is higher in the more saline parts, whereas in the Gulf of Finland, freshwater species are dominant. Many fish species live in the Gulf of Finland close to their ecological limits. The low oxygen content or total lack of oxygen in deeper areas limits the amount of suitable habitats for demersal fish species.

Marine fish species that are not found in inland waters but are found in the Finnish EEZ in the Gulf of Finland and in the northern Baltic Proper are: herring, sprat, straight-nosed pipefish, small sandeel, eelpout, flounder, sand goby, bullrout, lumpfish, cod, broad-nosed pipefish, great sandeel, snake blenny, sea snail, common goby, turbot, garfish, black goby, two-spotted goby, long-spined bullhead, fifteen-spined stickleback and butterfish. The open seas are dominated by sprat and herring. Migratory fish in the Finnish project area include salmon, sea trout, and whitefish. The commercially exploited fish species in the Finnish project area are mainly sprat and herring.

Plankton and benthos

The species composition of the Baltic Sea phytoplankton (plant plankton) is influenced by salinity. As the salinity decreases from the south-west towards the north-east, essential variations in the phytoplankton species composition can be observed as halophilic species, which prefer saline water, are gradually replaced by brackish and freshwater species. According to the results of long-term monitoring, the biomass of phytoplankton concentration in the northern Baltic Proper and the Gulf of Finland has increased steadily since the 1970s. The increase has been most distinct in the Gulf of Finland, where the mean biomass has more than doubled since the early 1970s.

The zooplankton (animal plankton) community in the Baltic Sea consists of freshwater, brackish, and marine species. The extent of the distribution of the various zooplankton species depends on their ecophysiological tolerances and the availability of food resources, i.e. phytoplankton and microzooplankton. Moreover, both the species composition and the abundance of the zooplankton community and the phytoplankton in the Baltic Sea vary with the seasons. No

significant trends in the overall biomass of zooplankton were observed in 1979–2005, but recent variations in the abundance of certain larger species have been observed. Salinity is the most important factor regulating zooplankton species composition and abundance in the Gulf of Finland. Other direct and indirect regulating factors are predation by certain fish species and human-induced eutrophication.

Macrophytes are aquatic vascular plants and algae growing on the sea floor that are large enough to be seen with the naked eye. The boundary for macrophytes in most areas of the Baltic Sea is between depths of approximately 18–20 m up to about 30 m. At greater depths, macrophytobenthos is absent. At the mouth of the Gulf of Finland, algae are present down to 27 m. In the central Gulf of Finland, the maximum depth for flora is 10–15 m, but in the easternmost parts only approximately 6 m.

In the Gulf of Finland, 93 different macroalgae species have been recorded. Filamentous algae grow from the surface to a depth of 1 m. In this zone, the seasonal succession of the composition of algae species is remarkable. Below the filamentous algae zone, there is a bladder wrack community down to a depth of about 5 m.

The deep, open areas in the Gulf of Finland have been devoid of macrofauna for most of the monitoring prgramme (established in 1964) due to hydrographical conditions and prevailing oxygen depletion. Salinity stratification disappeared and oxygen conditions improved temporarily during the prolonged stagnation during 1977–1993. However, hypoxia was re-established in the middle of the 1990s. As a result, the abundant macrobenthic communities that were recorded in the early 1990s in the deep central parts of the Gulf were almost completely absent in 1996–1997, and they have not recovered to any great extent due to continued oxygen depletion below the permanent halocline. In favourable oxygen conditions, deep bottoms can be colonised by abundant communities of amphipods and bivalves. Greater numbers of benthic fauna have been absent from the deepest parts (60–80m) of the Gulf of Finland for at least ten years. During the summers of 2006 and 2007, the situation in the deep waters of the Gulf was the worst since the beginning of the entire regular monitoring programme.

Hard-bottom habitats (bedrock, boulders, stones and gravel) below the photic zone are typically occupied by non-mobile, filter-feeding invertebrates attached directly to the substratum. These communities extend to a depth of approximately 20–40 m in the Gulf of Finland. The largest biomasses are formed by mussels and barnacles. Other groups include hydroids, bryozoans and sponges.

In the western part of the Gulf of Finland, the blue mussel may form very dense communities (more than 20,000 ind./m²), with a biomass covering all suitable hard substrates in outer archipelago areas. The distribution of the blue mussel is limited by salinity and the species'

eastern distribution boundary shifts between Helsinki and Kotka, depending on the prevailing salinity level. In the eastern Gulf of Finland, the freshwater zebra mussel becomes more abundant with decreasing salinity and reaches abundance values that are almost similar to those of the blue mussel.

Fishing

Professional fishery in the Gulf of Finland includes both coastal and offshore fishing. Offshore fishing is comprised of trawling and longline fishing. Fishery in the offshore areas of the Gulf of Finland and the northern Baltic Proper is characterised by a low number of target species. This phenomenon is a consequence of the brackish characteristics of the northern Baltic Sea and especially the Gulf of Finland. The main target species include herring and sprat. The planned pipeline route crosses the most used trawling areas over a total distance of 220 km in the Gulf of Finland.

The planned pipeline will be laid outside of a coastal band which is 12 nautical miles wide. The sea above the pipeline will be open for fishermen from other EU member states that hold an allocated catch quota.

Trawls are the principal gear type used in commercial fishery in the open waters of the Baltic Sea. Pelagic trawls, i.e. mid-water trawls, are used to capture herring and sprat. Pelagic trawls are also used by Finnish fishermen in the offshore areas of the Gulf of Finland and the northern Baltic Proper. Pelagic trawls are used in the middle water column but can also be used close to the bottom when fish schools are located in deep water. In soft-bottom areas where the seabed topography is smooth, a trawl can be towed close to or on the seabed. According to data from the Finnish Fishermen's Association, both pelagic and bottom trawling (or trawling taking place less than 4 meters from the bottom) are somewhat regularly carried out in the central and western Gulf of Finland.

Nature conservation sites

The Natura 2000 areas closest to the pipeline are the Söderskär and Långören Archipelago and the Kallbådan islets and waters. These are located within a distance of approximately 10–11 km from the pipeline. The Kallbådan islets and waters are located closest to the munitions objects to be cleared: the distance to the closest munitions objects is approximately 10 km. The Ministry of the Environment has proposes new areas to be included in the Finnish Natura 2000 network. Four of these areas are located at a distance of 3–15 km from the pipeline. Of the proposed new Natura 2000 areas, Sandkallan, at a distance of 10.7 km, is situated nearest to the munitions to be cleared.

Ship traffic

In 2002, a mandatory ship reporting system for the Gulf of Finland (GOFREP) was established between Finland, Estonia and Russia. In accordance with the system, Finland, Estonia and Russia require that all vessels exceeding 300 GT participate in the GOFREP system when sailing on the international waters of the Gulf of Finland.

There are three primary ship routes in the Finnish project area which are mainly used by commercial traffic throughout the year.

Cables

There are several electrical and telecommunications cables on the seabed of the Gulf of Finland and the Baltic Sea. The shortest distance between a cable and a munition to be cleared is about 140 metres.

Munition ID	Distance to nearest cable (km)
R-8AG-W-014	1.80
R-8AG-W-009	0.67
R-E8C-10223	0.92
R-W8A-10317	0.34
R-8CG-E-004	0.14
R-8CG-E-003	0.39
R-W8A-10312	0.98
R-W8A-10313	1.02
G-08-009	1.01
R-W8A-10005	1.02
R-8CG-E-002	0.70
R-8CG-E-001	0.83
R-08-2805	1.61 0.47 1.01
R-08-159	0.44 0.47 1.71 0.58
R-09-27	1.46 0.35 1.60
S-09-3135	1.51

Firing danger areas

The planned pipeline will pass through a stretch of a firing danger area, named Örö D52, partly situated in the Finnish EEZ. There are also a few other firing danger areas close to the pipeline route, such as firing danger area Katajaluoto D34. According to the information that the applicant has obtained from the Finnish Defence Forces, practice and firing activities are mainly limited to Finnish territorial waters.

Cultural heritage sites

An object, estimated to possibly be a whale skeleton, is located at a distance of 350 metres from the nearest munition to be cleared. Moreover, the wreck of a wooden sailing ship (estimated to date back to the late 19th century) is located at a distance of 980 metres from the nearest mine to be cleared, and the wreck of the ironclad vessel "Rusalka" (built in 1868) is located at a distance of 1.17 kilometres from the nearest munition to be cleared.

Munition ID	Distance to nearest cultural heritage site (km)	Description
R-07-004	0,35	A possible whale skeleton
R-07-2655	1.17	Rusalka
R-8AG-W-009	0.98	A wooden sailing ship
	1.35	Wreck identified from SSS, significance of the wreck has not been assessed
R-E8C-10223	0.88	
	1.43	A wooden sailing ship
R-W8A-10317	1.41	Wreck identified from SSS, significance of the wreck has not been assessed
R-8CG-E-004	0.90	
R-8CG-E-003	1.62	
S-09-3135	1.55	
R-09-04	0.54	
R-11-3395	1.29	Wreck of a typical coastal vessel from the 20th century

IMPACT

Munition-specific circumstances and impact

Munition ID	Water depth (m)	Seabed type	Charge (kg)	Radius of the crater established (m)	Amount of sediment released (metric tons)
R-06-003	69	Sand	350	5.8	333
R-E7B-10466	68	Gravely sand	0.8	2.0	14
R-07-004	78	Clay with coarse sediments	150	4.6	165
R-07-2655	74	Very soft clay	150	5.8	329
R-8AG-W-014	41	Crystalline bedrock	300	0.0	0
R-8AG-W-009	66	Clay with coarse sediments	30	4.2	127
R-E8C-10223	66	Silt and fine sand/ some gravel	30	4.2	127
R-W8A-10317	65	Silt and fine sand	30	4.2	127
R-8CG-E-004	65	Silt and fine sand	30	4.2	127
R-8CG-E-003	66	Silt and fine sand/ some gravel	30	3.3	63
R-W8A-10312	64	Silt and fine sand	30	4.2	127
R-W8A-10313	65	Silt and fine sand	30	4.2	127
G-08-009	65	Silt and fine sand	30	4.2	127
R-W8A-10005	64	Silt and fine sand	30	4.2	127
R-8CG-E-002	65	Silt and fine sand/ gravel patches	30	3.3	63
R-8CG-E-001	65	Silt and fine sand	30	4.2	127
R-08-2805	71	Very soft clay	350	7.3	667
R-08-159	69	Silt and fine sand	115	4.3	135
R-09-27	68	Crystalline bedrock/ coarse-grained	115	0.4	0.1
S-09-3135	63	Gravely sand/ sandy clay	300	7.0	583
R-09-04	65	Gravely sand	0.8	1.6	7
R-09-192	61	Silt and fine sand	115	5.4	270
R-11-3395	81	Very soft clay	100	5.3	245
R-11-5167	80	Clay with coarse sediments	250	5.3	249
R-12-008	64	Gravely sand Large boulders	64	3.8	92
R-12-3463	78	Very soft clay	300	7.0	583

General information about the detonation

Chemically-bound energy will release and turn into heat energy, kinetic energy and pressure energy within a gas bubble when an explosive charge is detonated. A spherical explosive charge detonated

from the centre and containing approximately 200 kg of TNT will change into the gas phase in 50 microseconds. Overpressure in such a gas bubble is approximately 10 GPa, with a temperature of approximately 3,000ºC. Particle movement and pressure within the gas bubble will create pressure and movement in the water near the charge. Such a shock wave contains pressure and kinetic energy and will travel in water at a supersonic velocity, i.e. faster than 1,500 m/sec. Initially, the pressure wave increases radically. The boundary layer between the compacted and undisturbed water is only 10^{-7} cm thick. In free water, the shock wave will travel symmetrically in all directions and contain approximately one-third of the original energy of the charge.

Explosives usually contain fuel, oxygen and plenty of chemical energy. When a charge is blasted, water, carbon dioxide, free carbon, and gaseous nitrogen are released in proportion to the composition of the charge. The transformation of burning explosives during an explosion is more efficient in water than in the atmosphere. Therefore, burned explosive substances that have not reacted, such as nitrate, are only released to a small extent when TNT explodes underwater. The creation of released carbon shows that the explosive was underbalanced for oxygen. If the explosive contains metallic aluminium, aluminium oxide will also be created. If the explosion takes place in the atmosphere, part of the released carbon will burn into carbon dioxide when it comes to contact with the oxygen in the atmosphere. If the explosion takes place in water, there is only little air available, and the released carbon will in turn be released into particles.

The explosives contained in mines are likely to be TNT, nitrocellulose and capryl and/or a mixture of these and hexanite. TNT is toxic to fish and shellfish.

Impact on the seabed

Munitions clearance will result in a crater on the seabed. The radius of the crater will be about two to eight metres. The size of the crater created by the munition detonation, and the amount of sediment released in the process, have been calculated using an empirical formula. In the formula, the radius of the crater is comparable to the size of the charge. The calculation also takes into account the type of seabed. The amount of sediment released has been calculated with the assumption that the depth of the established crater is 50% of its radius. In the calculation, a safety factor of 1.5 has been used for the radius of the crater. The calculations are based on practical experience. All munitions to be cleared are conventional. Chemical munitions have not been found in the Finnish EEZ.

The munitions clearance will cause suspension of seabed sediments close to the detonation sites. The suspended sediments will travel with currents and mostly land back on the seabed instead of remaining in the water. The amount of sediment has been estimated as

slightly below 700 metric tons for one munition at the highest. The average is about 200 metric tons. The amount will depend on the type of seabed on which the munitions object lies.

The seabed will be restored to the state before sedimentation in a period of weeks to several years, depending on the seabed type. Munitions clearance may cause permanent changes if the seabed is hard.

Impact on water quality

The suspension of seabed sediments due to munitions clearance will increase the turbidity levels in the water. Some contaminants and nutrients will be released from the suspended sediment. The Gulf of Finland normally has a background concentration of suspended solids of 1–4 mg/l.

DHI Water-Environment-Helth's MIKE3 and MIKE3PA and models have been used for sediment spreading. The grid size of the MIKE3PA model, describing the spread of particles, is 250x250 metres, and the thickness is one metre. The starting point for the modelling was that as a result of the detonation, the seabed sediment and the impurities and nutrients bonded to it will mix with the water volume above the entire site, and move farther along with currents. Besides the spreading of solids, the modelling results have been the basis for calculating the behaviour of the following substances identified in the seabed sediment: cadmium, mercury, lead, zinc, arsenic, copper, chrome, nickel, PAH compounds, and TBT.

The negative and direct impact on the water from the munitions clearance will extend throughout the whole water mass (from seabed to water surface) in the direct vicinity of the source. The duration of the impact from munitions clearance will be short-term. After the activity has ceased the suspension will be gone in less than three days. The assessment suggests that a total of approximately 5,000 metric tons of sediment will spread when all the 27 munitions objects are cleared. The assessment has been prepared according to maximum spreading.

The maximum extent of the impact is three kilometres when using an increase of 10 mg/l solids in the water. However, it must be considered that only the smallest particles move such a distance. Larger particles will re-sediment to the seabed in the immediate vicinity of the detonation point.

The organic-rich soft sediments deposited in the so-called accumulation areas of the Finnish project area contain considerable amounts of nutrients. These nutrients are typically bound to sediment particles or chemical compounds and may be released into the water in connection with the sediment spreading during munitions clearance, which could increase biological growth. However, only the dissolved parts of nutrients are directly available for biological growth. If these

are utilised by vegetation (e.g. phytoplankton) then these nutrients will move further in the food chain. Nevertheless, some of the nutrients will remain attached to particles (in these cases they are not bioavailable) and will eventually re-settle on the seabed. The project will not add nutrients to the water in the Finnish project area, but only re-suspend existing nutrients from sediments. The release of nutrients will result in an increase in nutrient concentration within normal limits, and therefore, the impact on the water has been assessed to be minor.

On the seabed, contaminants typically occur in accumulation areas as bonded to the sediment particles, or are dissolved in the pore water. Metals and organic contaminants may have harmful impact on organisms in increased concentrations. The concentrations that may cause direct and negative impact vary depending on the harmful substance and on the potential impact target, i.e. the animal or plant species. In order to cause a toxicological effect, a contaminant has to be bioavailable.

The bioavailability of contaminants that are tightly bound to clay-rich sediments is usually relatively low. Contaminants that remain dissolved in the water have the capability to move into the food chain, where they may bioaccumulate. After a certain period, the contaminants typically return back to the seabed through the sedimentation process.

The amount of dioxins that may spread into the water during munitions clearance has been calculated based on the mean concentration value and the amount of sediments spreading from the surface layer. According to studies completed in the pipeline route, the sediment density close to the surface is 0.54 t/m³ for solid matter, and the density at deeper levels is 0.60 t/m³. It has been calculated that munitions clearance will release approximately 162 m³ of surface sediment into the water (0–30 cm). This corresponds to approximately 88 metric tons of sediment as solid matter. Based on the surface sediment's (0–30 cm) average dioxin concentration of 37 pg WHO-TEQ/g, a total of 3.2 mg of dioxins (WHO-TEQ) may spread into the seawater with the sediment. This is 0.008% of the amount of dioxin transported by the Kymi River into the Gulf of Finland annually.

The solubility of the contaminants in water is slow, and the munitions clearance is assessed to mainly cause only a relocation of the contaminants on the seabed. The expected amount of contaminants spreading due to the munitions clearance will be low, and the duration of increased contaminant concentrations will be short.

The applicant has located six barrels on the seabed close to the munitions to be cleared. It has been assessed that the release of hazardous substances or damage to the barrels is unlikely, partly because the contents of the barrels have already leaked into the water or the contents have solidified. One of the barrels may move by up

to 10–12 metres as a result of the clearance. The barrel in question is already open, however, and thus its contents have probably already spread into the water or solidified. The other barrels will transfer for shorter distances or remain completely still, and these barrels are not expected to have any major impact.

Munition ID	Distance to nearest barrel (km)	Description of barrel	Estimated horizontal displacement (m)
R-8AG-W-009	0.03	Metal debris. Small metal drum.	5.0
	0.70	Metal barrel with rope coiled around, the lid of which is loose.	1.2
R-E8C-10223	1.21		0.6
	0.54	Metal debris. Small metal drum.	0.6
R-W8A-10317	1.32		0.1
	1.77	Metal debris, 44-gallon drum	0.3
	1.73	Metal barrel with rope coiled around, the lid of which is loose.	0.3
R-8CG-E-004	1.97		0.2
	1.39	Metal debris. Small metal drum.	0.1
	1.69	Metal debris, 44-gallon drum	0.08
R-8CG-E-003	0.84		0.3
R-W8A-10312	0.43		1.0
R-W8A-10313	0.36		1.3
G-08-009	0.20		2.5
R-W8A-10005	0.30		1.6
R-8CG-E-002	0.33		1.5
R-8CG-E-001	0.08		4.6
R-11-3395	1.63	Standard oil drum in scoured hole. Probably empty as lid is missing.	0.4
R-12-008	0.71	Corroded metal barrel, slightly inclined in seabed.	1.2

Impact on benthic flora and fauna

It has been assessed that the benthos will recover quickly after the suspension of the sediments. It is likely that any benthic flora and fauna in the immediate vicinity of the munitions objects will be destroyed. It is estimated that vascular plants such as sea sandwort will be destroyed close to the munitions clearance sites. The resuspended material will also increase the concentration of suspended matter in the water near the bottom, which may impair filter-

ing benthic organisms. In addition, it is likely that the pressure waves from munitions clearance will damage benthos near the munitions object. The losses will be compensated for within a few months by virtue of migration. However, if long-lived species occur, complete regeneration may take a few years.

The re-suspended sediments will be transported by currents and eventually re-settle after some time (typically hours), resulting in net sedimentation. The area affected and the magnitude of the effect are influenced by a number of factors, such as the amount of re-suspended material, grain size, currents and temperature. At sites where increased sedimentation takes place, the existing benthos may be covered and impaired. The impairment and its intensity depend on the extent of cover and the existing colonisation of benthos. Most of the species that occur on soft bottoms can also survive under substantial cover, where they move upwards actively.

The re-suspension of fine-grained sediments, may also increase oxygen consumption in the lower water column. A release of organic-rich, oxygen-consuming sediments may further aggravate seabed areas with local oxygen deficiency. In pipeline route sections where benthic fauna is already stressed due to reduced oxygen concentrations, additional oxygen consumption may temporarily increase the impairment. This can be assumed only for small stretches of the pipeline route in Finnish waters. However, the amounts of re-suspended sediment are relatively small, and the effects on benthic fauna, if any, will be weak and short-term.

Considering the short time scale, the elevated values in the water and the overall behaviour of the suspended chemicals, it can be assumed that the re-suspension of contaminated sediments does not constitute a special threat to benthic fauna. Therefore, no severe impact on benthos due to an increase in the bioavailability of contaminants is expected.

Impact on plankton

Availability of light is a prerequisite for the photosynthetic activity of phytoplankton. Thus, any increase of turbidity in the photic zone due to increased concentrations of suspended matter will reduce primary production. Released nutrients may stimulate phytoplankton production and subsequently also zooplankton production, and therefore have an effect on the entire food chain. Contaminants, such as heavy metals, can have an impact on the planktonic environment. During munitions clearance, contaminants bound to sediments or dissolved in pore water may be partly dissolved in the water and, therefore, become biologically available to organisms. Dissolved contaminants without any settling velocity may be spread across the entire water column. The severity of the effect depends on the contaminants and their concentrations. Low concentrations do not pose a threat to plankton but might cause problems via bioaccumulation at higher levels of the food chain.

Impacts on birds

Underwater blasting may cause damage related to acoustic trauma and shock waves, particularly to diving sea birds. Damages may include bleeding in the lungs, rupture of the liver and kidneys, and rupture of the eardrum. These effects will, however, only ensue if there are diving sea birds in the vicinity of the munitions clearing location during the clearing.The noise and pressure waves resulting from munitions clearance may cause injury or death to sea birds present close to the explosion.

Indirect impacts via the impacts of noise and pressure waves on fish and therefore reduced prey availability can be excluded because the impact on fish will be minor. If several detonations are carried out in a small area, injured or dead fish may attract gulls and other birds close to the detonation area after previous detonations.

Higher turbidity can lead to changes in feeding conditions for birds. On the other hand, higher turbidity can also result in improved food resources because the stirred sediments may include benthic fauna. Suspended matter concentrations of more than 15 mg/l are considered to impair the vision of diving sea birds. If the concentrations of suspended solids are 15 mg/l, the visibility in water is approximately 2 metres.

Impact on mammals

Munitions clearance may cause damage or death of marine mammals. However, damage can be avoided by conducting explosion activities when no marine mammals are nearby. Although the populations of marine mammals in the Finnish project area are known to be relatively small and no known seal haul-outs are located closer than 10 kilometres from the pipelines, it is necessary to make sure that no animals are present within a two-kilometre safety zone around the blast location. If marine mammals are present in the area, they can be deterred from the area by using special acoustic devices designed for this purpose.The lethal distance from the munitions objects being cleared is only approximately 35 metres for mammals, depending on the charge size. The distance where damage occurs – where mortality is assessed at 25–35% – extends to a maximum of 240 metres from the munitions object.

Suspension of sediments may cause direct impacts on marine mammals by constraining their sight and predation. The impact may also be indirect in the form of an impact on prey fish and benthic fauna. Hunting would not, however, be significantly affected due to the relatively low increase of turbidity and because the mammals will be able to leave the area or hunt by efficiently utilising their sensitive hearing, which is their primary sense when hunting. Furthermore, the sediment plumes will mostly occur close to the seabed. Thus, increased turbidity will have no impact on marine mammals. The re-

suspension of sediments and contaminants due to munitions clearance have been assessed as having no impact on marine mammals.

Impact on fish and fish stocks

The noise and pressure waves resulting from munitions clearance may cause injuries or death to some individual fish near the blasting site. Fish are the most sensitive of all sea animals to underwater explosions. According to studies, small fish are more sensitive than large ones, and fish that have a swim bladder seem more sensitive than those with no swim bladder. According to studies, newly hatched salmon and Baltic herrings may survive a pressure of 5 kPa, while fish of the same two species 3 to 6 months old and already having a swim bladder will die within 24 hours of exposure to a pressure of over 2 kPa.

Sediment suspension in excess of certain threshold values will cause reactions in fish during munitions clearance. For example, sediment suspension can impair vision and thus the ability to find prey. At high concentrations, suspended matter in the water may get stuck in gills and reduce oxygen absorption. Sharp-edged particles may also damage and irritate gills, which are very sensitive organs. Because adult and juvenile fish may be injured or killed in this way, they tend to avoid or flee from areas with too high suspension concentrations. Fish will be able to return to these areas after the suspension has returned to values that are below species-specific threshold values.

Concentrations of suspended material must be high for fish to be injured or die. However, pelagic fish are more sensitive to suspended sediment than demersal fish. Herring are assumed to have the lowest threshold value and thus are considered the most sensitive fish species with regard to suspension of sediments.

Suspended material from sediment plumes may become attached to fish eggs and cause physical and chemical irritation, which will increase mortality. When the total amount of suspended sediment attached to fish eggs reaches a certain species-specific level, the sediment prevents ionic transfer between the water and the fish eggs, causing the fish eggs to die. Pelagic fish eggs floating and drifting within the water column may also be affected if suspended matter adheres to them, causing them to sink to the bottom, where there is a risk of oxygen depletion. In general, fish eggs and fry are more sensitive to increased concentrations of suspended sediment than juvenile or adult fish. Therefore, if suspended sediment reaches eggs, it will have a negative and direct impact on fish eggs. The impact will only affect individual fish eggs, and there will be no impact at the species level, unless a large portion of eggs is lost. The importance of this impact on fish and fish stocks has been assessed as low.

Contaminants may have an impact on fish due to long-term or short-term exposure. Fish may take in contaminants either directly from the ambient water or from food. For sprat eggs, contaminants can increase mortality. Only individual fish or eggs will be affected and no impact at the species level is expected due to the small impact area. Theoretically, some portion of released contaminants may accumulate in the food chain and with other exposure sources cause potential adverse effects.

High concentrations of dioxins have been measured in Baltic herring and salmon. These dioxins are not of sedimentary origin; atmospheric deposition is suspected to be the main source of the compounds found in fish. Dioxin levels in Baltic herring are close to the allowed maximum level in Europe. It has been estimated that the amount of dioxin suspended from the sediment due to munitions clearance is approximately the same as the amount found in 200 tonnes of herring (which is approximately 0.1% of the annual herring catch in the Baltic Sea).

Fish species living in open sea areas of the Gulf of Finland are plankton feeders which get their nutrition from the pelagic environment. Plankton will not be significantly affected by sediment-released contaminants, and plankton-feeding fish will not be significantly affected, either directly or through the food chain. Furthermore, the suspension of sediments will cause fish to avoid the plume area, which will further reduce exposure to contaminants. Route selection and optimisation have mitigated the impact of contaminants on fish and fish stocks in order to limit the amount of sediment and contaminants released from it.

For fish that swim in dense schools, it has been suggested that acoustic fish finders be used to check the area before detonation. This would ensure that mortality is kept to a minimum. Furthermore, it is recommended that dead or injured fish are located and dead fish are removed when clearing the munitions. The lethal distance from the munitions objects being cleared is only approximately 35 metres for fish (the same as for mammals), depending on the charge size. The distance where damage occurs – where mortality is assessed at 25–35% – extends to a maximum of 240 metres from the munitions object.

Impact on protected areas

Suspended sediments may influence protected areas if munitions are cleared in the immediate vicinity of such areas. However, the munition objects to be cleared are relatively far away from Natura 2000
areas. The closest munitions object to be cleared is approximately 10.8 km from a Natura 2000 area. The impact of suspended sediments at a distance of 10 km, 1 mg/l, is 36 hours. Sediment suspension and reworking, or the spreading of contaminants have been assessed to have no impact on Natura 2000 areas.

Impact on shipping

The clearance activities may interfere with the regular ship traffic in the area. The munitions clearance causes a pressure wave, which might have a negative impact on vessels. The work requires that a safety zone be established around the construction area for a couple of days at a time.

Verification surveys will be carried out with a radius of 1 kilometre from the munitions object. When explosives are installed next to the munition, the safety area must be maintained at a radius of 2 kilometres from the munitions object. In this way, impact can be avoided if the explosion takes place by accident or in an uncontrolled manner. When the munitions are exploded, a safety area with a radius of 2 kilometres is required in order to avoid impact on ship traffic. Post-detonation verification surveys and waste collection will be carried out within a radius of 1 kilometre from the munitions object.

The applicant is developing the ship traffic management plan in co-operation with the Finnish Maritime Administration. There is a connection between the practices developed by the munitions clearance contractor and the GOFREP system that will ensure the safety of ship traffic. The plan will include cooperation between the VTS centres of Helsinki and Tallinn. Clear communications channels will be implemented between the VTS centres. These will be used for coordinating and managing the ship traffic in the GOFREP system.

Strict limitations are required for clearing munitions that are located within or in the immediate vicinity of the traffic separation schemes. Many simultaneous detonations might be carried out in the traffic separation scheme area south of Porkkala in order to minimise the possible interruption to westward traffic.

Impact on fishing

The safety zone established during the munitions clearance may cause harm to fishing vessels, which may have to change their courses because of the safety zones. The restrictions caused by the safety zones will be imposed only during munitions clearance. The impact from sailing restrictions due to these activities are within the range of normal navigational conditions in busy shipping routes.

Increased turbidity close to munitions clearance sites will cause avoidance reactions in fish. However, the area that fish will avoid due to sediment plumes will be limited to the vicinity of the activity at hand. The concentration that will cause avoidance reactions (the amount of suspended solids being above 10 mg/l) will not exceed a distance of 3 kilometres from the pipelines, and the duration will be less than a day. The impact is temporary, and fish will soon return to the area. The significance of the impact has been assessed as low, and no damage to be compensated for will occur to private or public

fishing. All parts of munitions which might hamper bottom trawling will be removed after the clearance.

Impact on military areas

Since the clearance activities will only take a couple of days per munitions object, the munitions clearance has not been expected to cause any major disturbances to the use of military areas.

Impact on cultural heritage sites

No munitions clearance will be required within close range of cultural heritage sites, which is why no impact has been anticipated. The maximum pressure caused by munitions clearance is not expected to damage wrecks. However, loose objects on the cultural heritage object or around it may be moved by the pressure wave.

Impact on cables

No impacts on the cables near the munition objects are expected. The closest munitions objects are 140 metres away from cables. A safe distance between a munitions object to be cleared and a cable is 50 metres when a 500-kilogram charge is being used. Existing cables and pipelines will be taken into account during munitions clearance. Munitions clearance will be carried out in a manner that will not damage the cables.

Impact on other munitions

Clearance of one mine should not trigger a chain reaction down the mine line. The distance between individual mines is planned according to the safety distances specific to each type of mine. One explosion will not cause the destruction of the adjacent mine or whole barriers. Aged mines may contain even more sensitive explosive material than in the original state. The shortest distance is 32 m between two 30 kg mines. This is within the 20 m safety distance for munitions up to 50 kg TNT. Based on the presently available information it is highly unlikely that clearance of munitions will trigger other detonations and other munitions.

Transboundary impact

The shortest distance from the boundary between the respective EEZs of Finland and Estonia to a munition to be cleared is 460 metres. Moreover, ten munitions are located at a distance of 1 to 2 km, and the rest are located at a distance of 2 to 5 km. The clearance activities are not expected to have any transboundary impact. However, detailed survey information about possible cultural heritage sites and barrels in the Estonian EEZ is not available. When taking into account the small probability of unexpected incidents, their impact has been estimated as minor.

Although the impacts of the munitions clearance have been assessed as minor in the Estonian EEZ, the transboundary impact can further be mitigated by avoiding clearance when considerable current velocities prevail from the clearance sites towards the Estonian EEZ. Since the currents in the Gulf of Finland are complex and usually caused by winds, clearance should be avoided in sites located near the Estonian border during extended periods of time when winds result in southern currents. Moreover, it may be necessary to measure the profile of vertical currents before the detonations to ensure that there is no continuous current from the north.

RISK ASSESSMENT

The risk assessment has reviewed a scenario as follows:

– In activities related to the construction of the gas pipeline system, sediment mixes with water and travels along with water currents.

– Solids mainly settle on the seabed at the velocity determined by the particle size. The most coarse material settles near the activity area, but fine material may remain for a long time in the water, and the cloud formed by the fine material will disappear mainly along with diluting.

– The soluble concentration of dioxins in the water is determined according to the balance principle with the solids concentration and distribution factor values.

– The dioxins dissolved in the water are in a very bioavailable form to sea animals, and the part bonded to solids is of small significance in this regard.

– Dioxins dissolved in the water accumulate in fish, for example. The accumulation in fish varies according to different dioxin compounds and fish species. Tetrachlorodioxins and pentachlorodioxins have the highest accumulation rates. The fat concentration in fish has an impact on the accumulation, and the highest amounts of dioxins accumulate in fat-rich fish, such as herring and salmon.

– When people use the fish for food, the dioxins will accumulate in the people. Together with exposure from other sources, the dioxins accumulating from fish to people increase the dioxin concentration in the body. If a large amount of dioxins is accumulated, this may result in health issues. The impact will appear the first in the development of foetuses and small children (such as changes in children's tooth enamel).

The share of organic material in the sediment is important for dioxins' bioavailability, since the amount of organic material is inversely proportional to dioxins' dissolution in water. The amount of organic material in the sediment along the pipeline in the Gulf of Finland has been surveyed at different depths (0–0.6 m). The mean loss of igni-

tion was 4.6%. Near the surface (0–0.3 m), the mean was 4.4% (n=14). The amount of organic carbon is about half of the loss of ignition, and for the munitions clearance situation, the share of organic carbon was specified as 2.2%.

Dioxins are bonded tightly to the organic material in the sediment and release very slowly even in sparse water. From the Kymi River sediment, for example, in ten hours, only 1.2% of the amount of 1,2,3,4,6,7,8-heptachlorofuran (the most common dioxin compound in the sediment) dissolved. No research information is available on the dioxin dissolution from the target area's sediment, and the numeric values related to the dioxin dissolution in water were specified according to the assessed worst-case scenario. In the analysed samples of the sediment in the target area, the amount of pentachlorofurans and pentachlorodioxins covers about 66% of the dioxin toxicity equivalent (TEQ). Said dioxins are more hydrophobic, and their mobility in the environment is of a smaller magnitude than that of TCDD, but reliable information about their distribution factors was not found. A normalised distribution factor, Koc, has been measured for TCDD in the desorption that occurred in the sediments in Lake Ontario. The conclusion was that log(Koc)>7.1. For the target area sediment, the distribution factor Kd was calculated with the help of TCDD's aforementioned normalised distribution factor and the concentration for organic carbon as follows:

- $Kd = foc * Koc = 0.022 * 10^{7.1} = 2.8*10^5$ l/kg

The concentration for the dissolved dioxin in the water was calculated as follows:

$$C_w = \frac{C_{sed} \times SS \times 10^{-6}}{K_d \times SS \times 10^{-6} + 1}$$

Where:
C_w = concentration of the dissolved dioxin in the water, ng/l
C_{sed} = concentration of the dioxin in the sediment, ng/kg dw
SS = concentration of suspended sediment in water, mg/l
K_d = distribution factor, l/kg

On the basis of the modelling results, the sediment concentration in the water will decrease below 10 mg/l within two days at the latest. This is why the soluble shares were calculated using a sediment concentration of 10 mg/l. In the munitions clearance situation, 26% of the dioxins were assumed to be in a soluble form, and thus possibly bioavailable. Thus, the total amount of dioxins (WHO-TEQ) dissolved in the water in the munitions clearance is 0.8 mg.

The concentration for dioxins dissolved in the water were calculated with the assumption that all dioxin dissolving according to the balance theory would be released immediately when the sediment mixes with water. The mean concentration in the activity area at 0 to 1 km from the pipeline was calculated on the basis of the concentra-

tion change identified in other contaminants. In munitions detonations, the sediment cloud will disappear faster than in the situation regarding rock placement, which is why the risk calculation was carried out according to the concentration calculation for rock placement. The dissolved concentration of the dioxins in the water was calculated to be 2.2×10^{-8} µg/l. Accumulation in fish was calculated according to the accumulation value (34,400 l/kg) presented for TCDD. Since TCDD accumulates more strongly in fish than the dioxin sediments prevailing in the Gulf of Finland sediment, the calculation describes a situation which is worse than the actual one, and is pursuant to the precautionary principle. The concentration for fish was calculated to be 7.2×10^{-4} µg/kg, that is, 0.72 pg/g (per fresh weight).

Human exposure was calculated using the following initial values:

- Fish caught near the area near the pipelines (0–1 km) is eaten regularly for a month per year.

- The amount of fish eaten corresponds with the average fish consumption of Finns (13.5 kg/year).

- The weight of the person is 60 kg

- The absorption in the body is 100%.

With the aforementioned methods and initial information, the dioxin accumulation from the pipeline construction during the construction was calculated to be 3.6×10^{-2} pg/kg/day.

The calculatory accumulation of dioxins was compared with the tolerable dioxin accumulation value, 1–4 pg/kg/day, determined by the WHO. The calculated accumulation is only 0.9–3.6% of the tolerable accumulation, which means that the exposure will not result in a significant risk even to this target group which has the highest exposure.

The pipeline construction will be a temporary situation, and even an exposure slightly over the tolerable level would require a period of several years for the risk of health issues to be significant. The possible additional exposure calculated above will even out to a period of several years, which further decreases the significance of the exposure.

The aim was to control the uncertainty of the risk assessment by following the precautionary principle, that is, using methods and assumptions through the influence of which the risks were assessed probably higher than the actual ones. The calculations regarding dioxin spreading, accumulation in fish and further exposure to people are based on the worst-case scenario. When using more detailed initial information, the risk would probably turn out to be smaller than that calculated in this risk assessment.

On the basis of the risk assessment results, the activities related to the construction of the gas pipeline system will mean that a total (all activities) of less than 100 mg dioxins will mix along with the sediment in the water. Less than 10 mg of this will dissolve in the water in a possibly bioavailable form and travel along with the water currents. The majority of the dioxins spreading to the water will result from rock placement. Even near the pipeline, the concentration of dioxins dissolved in the water will remain very small, and the impact on dioxin concentrations in fish will remain small. The gas pipeline system construction activities may increase exposure of the target group even with the highest exposure by a maximum amount corresponding to a few per cent of the many-year exposure considered to be tolerable.

MONITORING

The environment and social affairs management system (ESMP, construction) is an important part of the occupational health, safety, environment and social responsibility plan (HSES MS) of the entire gas pipeline project. The system complies with the ISO14001 and OHSAS 18001 standards.

The monitoring schedule for the munitions clearance is a fixed part of the overall monitoring programme for monitoring the impacts of the activities during the construction. The purpose of the monitoring is:

- To ensure that munitions clearance will not result in any previously unidentified impact or any impact which is more extensive than anticipated
- To ensure that the munitions are cleared according to the permit provisions
- To monitor environment recovery after the clearance
- To ensure that the modelling results used for anticipating the environmental impact are realistic.

The applicant has supplemented the monitoring plan for munitions clearance with a monitoring programme (D1) dated 11 September 2009. The programme has expanded the water quality and sediment monitoring in regard to the sampling locations and analyses.

Seabed morphology

Seabed morphology changes will be reviewed before the munitions clearance using a multi beam echo sounder and visually using a ROV device. After the detonation, the crater size will be investigated using the same tools. The seabed morphology survey results obtained with the ROV device present the seabed characteristics before and after the munitions clearance in the immediate vicinity of the clearance site.

Water and sediment quality

Sediment re-suspension will be reviewed through measuring and water sampling in order to confirm the modelling results in regard to the total amount of re-suspended sediment, and in regard to the extent and duration of the spread of the sediments.

The calculation of the total amount of re-suspended sediment is based on the size of the crater caused by the detonation; the size is determined through an exact survey of the seabed before and after the detonation. The total amounts of the re-suspended fine material, nutrients (phosphorus and nitrogen) and contaminants will be calculated on the basis of the monitoring results and the material in the initial situation. The extent and duration (turbidity) of the spreading of the sediments will be assessed using many different methods, such as optical sensors with which both vertical profiling is carried out, as well as carrying out reviews on lines that go horizontally through the sediment cloud. The sensors will measure turbidity, temperature, electrical conductivity, depth, and oxygen content.

Sediment re-suspension taking place during munitions clearance will be monitored from pre-selected observation locations. Measurement is carried out at fixed times in order to estimate the correctness of the anticipated spread of the sediment cloud. Munitions clearance monitoring will be based on the following methods:

- Automated measurement from a vessel (observation locations VOM1, VOM2, VOM3, VOHE1 and VOHE2)
- Fixed sensors (observation locations FIX1 and FIX2)
- Long-term monitoring at the ADCP station (observation locations CONTROL1 and CONTROL2).

Automated measuring carried out from a vessel during the munitions clearance will be carried out in five observation locations. Three observation locations (VOM1–3) were selected on the basis of how close the munitions are to the boundary of the Estonian EEZ, what types of sediment occur in the munitions clearance locations (main focus on soft sediments), and what the amount of explosives in the munitions is (main focus on large charge size). The selected munitions are located at a depth of 60 to 80 m on soft clay, silt or fine sand, which will result in sediment spreading during the detonation. Two observation locations (VOHE1–2) were selected on the basis that HELCOM stations are considered as possible impact targets of turbidity spreading resulting from the munitions clearance.

Automated measuring from a vessel will be carried out using a multiparameter probe which measures vertical turbidity, temperature, electrical conductivity, depth, and oxygen content. The measurements will be carried out using an automated probe which will be lowered from the support vessel (RIB) through the water column. Material will be collected from surface to seabed at intervals of 20 to 50 cm. The density of the survey lines will depend on the charge size of

the munition to be cleared, and the density will be specified prior to each measurement. There will be two survey lines during the measurement. In regard to munitions clearance, surveys will be conducted once in every measurement location prior to the detonation and twice after the detonation so that enough information is obtained about the spread and dissolution of the sediment cloud. The first measurement of each monitoring location before detonating the munitions describes the background value for turbidity.

Fixed sensors (FIX) will be used in two observation locations to monitor the impact that may possibly extend to the existing Finnish Natura 2000 areas as a result of clearing the munitions in the Russian EEZ. The sensors used are multi-parameter probes measuring vertical turbidity, temperature, electrical conductivity, and oxygen content. The sensors will be anchored to a distance of about 1 to 2 metres from the seabed. The sensors will gather data at intervals of 30 to 60 minutes, starting two weeks before the munitions clearance and ending two weeks after the clearance.

The observation locations have been selected near the Russian border. From the boundary of the Russian EEZ, the distance of the FIX observation stations to the nearest munitions to be cleared in Russia is about 5 to 7 km. Background concentrations of temperature stratification and electrical conductivity stratification will be measured along with the regular information loading carried out regularly from the stations. An automated probe will be used for the measuring: the probe will be lowered from the support vessel through the entire water column. Measurement observations will be collected at intervals of 20 to 50 cm.

Long-term monitoring will be carried out at two ADCP stations (CONTROL1–2) using Acoustic Doppler Current Profilers (ADCP), to which turbity meters have been connected. The ADCP measures changes taking place in underwater current fields (velocity and direction of the current) in regard to the entire water column. The stations will also be equipped with automated turbidity meters. A detector to be installed near the seabed will monitor turbidity, electrical conductivity, temperature, and oxygen content. The ADCP will be placed near the seabed about two weeks before the munitions clearance begins. The devices will monitor the conditions at about 1 to 2 metre intervals from seabed to surface every 30 to 60 minutes. The data obtained from the station will be used as comparison data for data obtained from other monitoring locations. Furthermore, the results will be used to study the natural variation, and the changes resulting from different seasons. The monitoring will continue for about two weeks after the end of the munitions clearance.

To obtain the background levels of temperature stratification and salinity stratification, the CTD profile will be measures on a regular basis. An automated probe will be used for the measuring: the probe will be lowered from the support vessel through the entire water col-

umn. Measurement observations will be collected at intervals of 20 to 50 cm.

Water samples will also be taken from the VOM and VOHE stations for calibrating the monitoring results (turbidity, suspended solids, electrical conductivity, and oxygen content). Moreover, the concentrations of dissolved nitrogen and phosphorus, total nitrogen and total phosphorus, and metals (As, Cd, Cr, Co, Cu, Hg, Ni, Pb, Zn) will be analysed. The results will be combined with the turbidity observations, and the possible spread of the metals along with the sediment suspended as a result of the munitions clearance will be calculated.

Water samples will be taken from the FIX and CONTROL stations in order to calibrate the results of the automated monitoring (turbidity, suspended solids, electrical conductivity, and oxygen content), and to analyse the concentrations of dissolved nitrogen and phosphorus, and of the total nitrogen and phosphorus.

Sediment samples

The sediments samples will be taken at five stations (VOM1–3 and VOHE1–2) in order to gather data about the metals, dioxins, organic tin compounds, and their possible spreading during the clearance. The samples will be analysed for the same metals as for the water samples (As, Cd, Cr, Co, Cu, Hg, Ni, Pb, Zn), as well as for dioxins, and organic tin compounds. In addition, the following items required for the normalisation will be specified in the samples: grain size distribution, clay content, and total carbon (TOC). The samples will be taken using a GMAX sample device or similar.

Sediment samples will be taken once at all stations (VOM1–3 and VOHE1–2) before the detonation, to the prevailing current direction, and once after the detonation, to the direction of the spreading of the sediment could, in three points located at distances of 50, 400, and 1,000 metres from the munition monitored. At a distance of 50 m, the samples will be taken for depths 0–2 cm, 2–10 cm, and a compilation sample at 0–20 cm. At distances of 400 m and 1,000 m, the sample will be taken for a depth of 0–2 cm, and the compilation sample at 0–20 cm.

The sedimentation data for all munitions monitored (VOM1–3 and VOHE 1–2) will be combined with the graphs to represent the sediment spread from munitions clearance in the relation between differently-sized charges and distance.

Noise

The noise impacts will be estimated with pressure waves and sound pulses to be able to estimate the impacts of underwater munitions detonations on marine mammals and fish. The monitoring also includes an assessment on the impact of the munitions clearance on the cultural heritage, barrels, and the existing infrastructure regard-

ing each munition. The assessment results will be confirmed by measuring the pressure wave and the sound pulses caused by it, in order to document the extreme values of the pulses and their attenuation in relation to the distance in four locations. During the measurement, one pressure wave sensor will be placed on the seabed at a distance of 500 m from the munition to be cleared, and another sensor will be placed near the protected location, or both sensors will be placed near the object being monitored. A sensor (hanging from a vessel) at a depth of about 20 m will measure the background concentration of underwater noise farther from the clearance location. The pressure wave sensors will include a hydrophone operating on the frequency 8–500 Hz, up to pressure area 500 psi.

Four measuring locations have been selected based on the munition's charge and the protected object. The noise measurements will be as follows:

• NOISE 1: During the clearance of the first munition. The explosive charge is higher than 100 kg. The locations to be monitored will be determined once the munition-specific clearance plan is ready. The pressure wave sensors will be placed at distances of 500 m and 1,000 m from the munition.
• NOISE 2: During the clearance of munition F4 (R-07-2655). The size of the munition charge is 150 kg. The munition is located near the Rusalka wreck (MB-07-2736). The pressure wave sensors will be placed at a distance of 500 m from the munition, and near the wreck.
• NOISE 3: During the clearance of munition F17 (R-08-2805). The munition charge is 350 kg and the munition is located near the Estlink cable. The pressure wave sensors will be placed in joint locations 9 and 6, at the distances of 1.01 km and 2.36 km from the munition.
• NOISE 4: During the clearance of munition F18 (R-08-159). The munition charge is 115 kg and the munition is located near the Estlink cable. The pressure wave sensors will be placed in joint locations 9 and 6, at distances of 1.22 km and 0.87 km from the munition.

The pressure wave sensors will be in a radio connection, and the launcher is located in the vessel. The recording frequency is 65 KHz, and the sensors will activate 5 to 10 min before each detonation. The gathered data will be presented visually as a graph showing the relation of pressure to time and distance.

One passive audio monitoring buoy (PAM) will be placed at the distance of 200 m for all munitions to be cleared. Two pressure wave sensors will be connected to the PMA buoy, along with one low-frequency hydrophone (frequency sensitivity: 0.1–20 kHz – 3 dB), and one high-frequency hydrophone (frequency sensitivity: 40–200 kHz – 3 dB). The recorded measurements will be given in decibels, and the recording will continue for one hour after the detonation.

Cultural heritage sites

The pressure waves resulting from munitions clearance are not expected to cause any impacts on cultural heritage sites. This is why the monitoring will focus on the wrecks located up to one kilometre from the munitions to be cleared. The wrecks include:

• S-08-2939 (0.98 km from munition F6, R-8AG-W-009, with a charge of 30 kg)
• 3_9 (0.88 km from munition F7, R-E8C-10223, with a charge of 30 kg, and 0.90 km from munition F21, R-09-04, with a charge of 30 kg)
• 4_9 (0.54 km from munition F21, R-09-04, with a charge of 0.8 kg)

Cultural heritage sites will be surveyed with a visual inspection carried out with an ROV before and after the detonation.

Barrels

The monitoring will focus on barrels selected on the basis of integrity, staticity, and contents. The barrels will be monitored through visual observations up to one kilometre from the clearance site before and after the detonation.

The barrels to be monitored include R-W8A-10041, R-08-2938 and R-E8C-10202. The distances of the nearest barrels from the munitions are 0.03 km and 0.08 km. Barrel R-12-380, located at a distance of 0.71 km from the 64 kg charge munition F25/F26 (R-12-008), will also be included in the monitoring.

Cables

The pressure waves resulting from munitions clearance are not expected to cause any impacts on the existing cables. This is why the monitoring will focus on cables located up to one kilometre from the munitions. The cables to be monitored include:

- Lauttasaari-Meremoisa
- Helsinki-Hanko
- Helsinki-Tallinna
- Porkkala-Kakumäe

The distances between the cables and the munitions range from 0.14 to 1.02 km. The cables will be monitored to find out their structure on the seabed before and after the detonations. The cable operators will be notified before and after the clearance of possible harmful impact on cable performance.

Ecological impact

The impacts of the pressure waves and noise caused by the munitions clearance on fish, marine mammals and sea birds will be moni-

tored. The distance outside which no impact is expected for vertebrates living in the sea is two kilometres.

The monitoring will make observations of the marine mammals, shoals of fish, and sea birds located in the safety zone surrounding the detonation location. Observation will begin at least 30 minutes before the intended detonation. The following observation methods will be used:

• Visual observations for the presence of marine mammals and sea birds in the area, carried out by Marine Mammal Observers (MMO) from a survey vessel. To carry out the observation in an effective way, the measures will be carried out in daytime when the sea is calm, or the swell of the sea is minor.
- Passive Acoustic Monitoring (PAM) to observe sounds made by marine mammals. The PAM buoy has one underwater listening device for low frequencies (sensitivity to frequencies 0.1–20 kHz - 3 dB point) and one underwater listening device for high frequencies (sensitivity to frequencies 0.1–20 kHz - 3 dB point). The PAM buoy will be placed at a 200-metre distance from the munition before the munition is cleared, and the signals from the device will be transmitted to a radio receiver set on a survey vessel. Recording will start one hour before the detonation.
- Active acoustic fish surveying will be carried out with an echo sounder to identify shoals of fish. The echo sounder is sensitive for frequencies 50 kHz and 200 kHz, and has a 50/200 kHz converter.

Ecological monitoring will be carried out during the clearance to be able to ensure that the dislodgment measures have duly been carried out. The Marine Mammal Observers on the vessel will have reporting papers, on which they will daily enter all observations of marine mammals, sea birds, and shoals of fish before the detonations. If sea mammals, sea birds, or shoals of fish are identified within the safety zone, the detonation will be postponed. After the detonation, all cases of sea birds and marine mammals being wounded or fish mortality will be entered in the papers.

Ship traffic

The movement of all vessels with more than 300 gross register metric tons are monitored through the Gulf of Finland reportign system (GOFREP) in the international waters of the Gulf of Finland. GOFREP is a compulsory reporting system for ships, and the International Maritime Organisation (IMO) has approved the system. GOFREP was established to improve maritime safety, protect the sea environment, and to monitor the compliance with the International Regulations for Preventing Collisions at Sea. The Gulf of Finland sea waters are monitored together by Finland, Estonia and Russia. Smaller vessels outside the GOFREP system will be notified of the clearance activities with notifications intended for boaters.

During the munitions clearance, vessel movement will be monitored according to the administration plan for ship traffic. The monitoring plan will be prepared in co-operation with the Finnish Maritime Administration. The GOFREP will be taken into account when developing the plan to ensure the safety of third-party ship traffic.

The Finnish Maritime Administration will be notified well in advance of the commencement of the clearance works. The GOFREP and VTS (vessel traffic service) centres concerned will be provided with daily and weekly reports when the clearance is underway. During the surveying conducted before and after the clearance, the safety zone is one kilometre from the munition to be cleared. During the detonation, the safety zone is two kilometres from the munition to be cleared.

Fishing

A safety zone will be established around the munition clearance location during the clearance. During the survey conducted before and after the clearance, the safety zone will be one kilometre from the munition to be cleared. During the detonation, the safety zone will be two kilometres from the munition to be cleared. Fishing will be forbidden in the safety zone during the clearance work. Fishermen's associations will be notified of the safety zones before the munitions clearance commences.

GROUNDS FOR THE WORK COMMENCEMENT PERMIT

Munitions clearance is an important part of the entire gas pipeline project, which is a long-term construction project that covers several intermediate stages extending to a long period of time. The plan is to start the entire project with munitions clearance, and thus any postponement of the clearance will automatically delay the entire gas pipeline project.

In order to reduce environmental impact, munitions clearance should not be performed when the sea is covered by ice, during fish spawning seasons or during marine mammal migration seasons. Thus, the best time to perform the munitions clearance is between September and December 2009, which will also avoid the risk of the entire planned project schedule being delayed. According to the plans, the first pipe will be laid during the last quarter of the year 2010 in the route parts outside of the Finnish EEZ. Since the area in which a pipe is laid cannot be covered by ice, even a minor delay in munitions clearance could lead to a notable delay of the entire project.

All the highly specialised external experts and specialised contractors involved in the project have time limits in which they have to perform their work. The contractors and experts may have some spare time in their schedule, but they cannot undertake the contracted work in a totally different time period. The market is narrow and the number of these highly specialised contractors very limited, and de-

lay may result in these contractors being assigned to other projects. For example, there is only one DP laying lay barge on the world market that could be used for the gas pipeline project. Delay of the project time schedule due to a delay in munitions clearance could cause substantial damage and delays to the whole gas pipeline project.

If the start of the munitions clearance and thus the project as a whole is delayed, the applicant's loss of transportation tariffs will be EUR 500 million per annum. If the project is delayed, the applicant will, in addition to the loss of transportation tariffs, suffer additional losses due to, inter alia, capital costs for the pipeline materials, operational and capital costs for logistics and coating and additional construction costs due to price escalation and stand-by fees. These additional costs will amount to EUR 600 million per annum.

Munitions clearance will take place in open sea areas in the Finnish EEZ in deep water areas, and this is why the negative impact from the clearing will be minor and short-term. The only impact that may be partially reversible is possible craters on the seabed. All the other conditions can be restored in substantial part. The craters, which will be partially filled due to natural sedimentation, will not cause any negative impact and are thus, as estimated by the applicant, not a barrier to granting a permit for starting work. The craters can also be filled with stone matter when necessary.

PROCESSING THE PERMIT APPLICATION

Communication related to the permit application

Pursuant to Chapter 16, Sections 6, 7 and 8 of the Water Act, the Environmental Permit Authority has announced the matter at the Environmental Permit Authority, in the cities of Länsi-Turunmaa, Espoo, Hanko, Helsinki, Raasepori and Porvoo, and the municipalities of Kemiönsaari, Inkoo, Kirkkonummi, Siuntio, Pernaja and Sipoo, thus reserving the opportunity for issuing remarks, claims and views related to the application during the period from 15 July and 14 August 2009. The publishing of this announcement has been notified on 15 July 2009 in an official paper.

On 8 July 2009, the Environmental Permit Authority requested a statement from the Finnish Environment Institute (SYKE) concerning the application.

Remarks and claims

1) **The Ministry of Transport and Communications** states that the munitions clearance would take place place in a high-traffic area in the Gulf of Finland where the vessel traffic is monitored with the Gulf of Finland Reporting System (GOFREP), which is maintained in co-operation by Finland, Russia and Estonia. A joint agreement on sending the International Maritime Organisation (IMO) a joint appli-

cation concerning the initiation of the GOFREP system was drawn up between the Ministries of Traffic in Finland, Russia and Estonia in 2001. The establishment of the GOFREP system was approved by the IMO's Maritime Safety Committee meeting on 6 January 2003 and the system was initiated on 1 July 2004.

On the basis of the map annexed to the application, it is planned that the munitions are to be cleared within three Traffic Separation Schemes in the GOFREP area. It has been stated in the application that strict limitations will be required for the munitions that are located within or in the immediate vicinity of the traffic separation schemes. However, the application does not say what kind of restrictions these would be, to what or to whom they will apply, who would have the authority to set them, or what the relationship of the required restrictions would be with the GOFREP system which already substantially restricts the free movement of vessels.

The Ministry finds that the application is flawed in regard to the risk management, risk assessment related to and impacts on the vessel traffic moving in an organised manner within the Gulf of Finland GOFREP area within the Traffic Separation Schemes. Securing the safety of the vessel traffic must be taken into account in the permit provisions. The Ministry has presented the following permit provisions:

– The applicant must prepare a scheduled plan for the clearance activities carried out within the GOFREP area, and for the vessel traffic safety measures required by the activities, as well as the authority measures and resources required.

– The clearance work plan must explain how the work will impact on the use of Traffic Separation Schemes and the operation of the GOFREP system, and the obligations on advance notification and reporting to the IMO, other contracting states, and the vessel traffic.

In particular, the following matters should be resolved: as the vessel used in munitions clearance work moves in the Traffic Separation Schemes and in their immediate vicinity it should be considered, according to Rule 3 in the Convention on the International Regulations for Preventing Collisions at Sea (GOLREG), as a "vessel restricted in her ability to manoeuvre" which is a vessel which by the nature of its work is restricted in its ability to manoeuvre as required, and which, pursuant to Rule 10, Section I), has been released from observing the Traffic Separation Schemes as required in order to carry out the work.

In accordance with the GOLREG agreement Rule 10, Section l), if a vessel is engaged in an operation for the laying of a submarine cable within a Traffic Separation Scheme, the government maintaining the Traffic Separation Scheme must provide advance notification and reports of this, according to the EV10 Ships Routeing set of provi-

sions (2003), Part A, Section 3.20, and try to limit working within the Traffic Separation Scheme when visibility is limited.

If the vessel in question is not "a vessel restricted in her ability to manoeuvre" or if the other vessels cannot navigate within the Traffic Separation Schemes according to the international Rules and the decision to implement the GOFREP system, the Traffic Separation Schemes should be temporarily altered.

When temporarily altering the Traffic Separation Schemes, the government maintaining the Schemes should follow the procedure according to the IMO Ships Routeing set of provisions part A, section 7. According to section 7.4., both IMO and the concerned sea chart authorities are to be informed about the details of the required changes at least four months prior to commencing the works in the Traffic Separation Schemes.

– When drawing up a plan for clearance work that takes place in the GOFREP area, in addition to the matters, requirements and deadlines to be resolved that are mentioned above, the IMO resolution with which the GOFREP system was established must be taken into consideration for the cooperation between the GOFREP authorities and reporting to the IMO and vessel traffic.

–The plan must be submitted to the authorities maintaining the GOFREP system for approval, and the change must be notified according to what the IMO's decisions require, before the munitions clearance equipment moves to the GOFREP area and commences clearance.

Clearance work to be carried out within the GOFREP area must be arranged so that it will result in as little disruption as possible to vessel traffic.

– The party carrying out the clearance work must be obliged to repay any possible costs to the authorities resulting from ensuring the safety of vessel traffic during the construction work .

The permanent vessel traffic arrangements in the Gulf of Finland, which are organised using the GOFREP system, are a central feature that adds to the anticipation and safety of vessel traffic as well as a preventative factor of accidents, and personal and environmental damage caused by accidents.

2) **the Uusimaa Regional Environment Centre** has stated that the application is for the most part adequate, but in some parts the materials used in the application have deficiencies, which creates uncertainty in the assessment of the project's impacts. For these parts, the application has to be supplemented to ensure the reliability of the conclusions before the permit is granted. The supplements do not need to be submitted to the Environment Centre for an additional statement.

Concentrations of metals, PAH, PCB, TBT, and total DDT have been presented in the permit application in a table format that is clearer than the presentation in the EIA materials. However, the results presented in the application only pertain to the sediment layer of 0–2 cm. There is also no map of the sampling stations, even though according to information obtained by the Regional Environment Centre, the assessment of the impact of contaminants is primarily based on samples collected in the vicinity of Kalbådagrund. According to the results, the concentrations of tributyl-tin were high in the survey area. The concentrations of several other contaminants surveyed were also occasionally elevated. The EIA materials lead to the impression that the applicant has also had access to results of sediment contaminant analysis in a wider area, but apparently these results have not been utilised in drafting the permit application. According to information received from the applicant, the applicant additionally carried out sediment surveys in the summer of 2009, the results of which have not been submitted as a supplement to the application.

The risk assessment included in the permit application considers the possible spreading of dioxins to seawater, based on two sampling locations used in a survey carried out by the Finnish Environment Institute. In addition, a supplement to the permit application refers to the results of dioxin analyses from sediment surveys carried out in the summer of 2009. According to the conclusions presented in the permit application, the overall amount of dioxins released by munitions clearance is too small to cause any significant impact.

The distribution of solid concentration values deviating from the background levels of seawater, as well as the transboundary impacts of the spreading of sediment across EEZ boundaries, have been presented more extensively in the application documents than in the environmental impact assessment report. The spreading of contaminants has also been described in more detail. However, a more detailed assessment of the distribution of nutrients and sediment contaminants in the different water layers has not been presented, but the distribution has been described in areas. Thus it remains unclear, for instance, whether the described increase in the concentration of solids pertains to water near the bottom or near the surface. The application contains detailed maps of the locations of munitions and their near vicinities. The permit application does not include enough information regarding the water quality models used. Apparently, this missing information has at least partially been discussed in the report on the spreading of sediment and contaminants, referenced in the application.

According to the coordinating authority’s statement on the environmental impact assessment report, objects whose content has not been determined must be considered as hazardous waste. However, the assumption is made in the application that the barrels located

near the munitions are either empty or stagnated and that their possible disturbance would not have a significant impact.

The sites and nature conservation areas of the Natura 2000 network are located so far away from the munitions to be cleared that most likely the clearance work will not cause any significant adverse impact on their ecological value.

The monitoring plan attached to the application only describes the general principles of the monitoring procedures. In addition, some parts of the monitoring plan are difficult to understand. According to the Environment Centre, the monitoring surveys of the plan pertain to central impact of the activities specified in the application, such as the spreading of sediment into water. However, the content of monitoring must be presented in significantly more detail before the monitoring plan can be processed. For instance, the sampling locations, depths, and frequencies for water samples, as well as the analyses performed on the samples and the methods used, must be specified. The implementation of turbidity surveys must be presented in a way that facilitates the assessment of whether the scope of the surveys and the vertical measurements are adequate. The submission of results and reporting must also be included in the monitoring plan.

The monitoring plan must include all monitoring procedures for all of the activities specified in the application, even though some of these procedures will apparently overlap with phases to be permitted later. The sampling and survey methods of these monitoring surveys must also be described in the monitoring plan. Although surveys of benthos and sediment, for instance, have been carried out and their methods reported in the baseline studies already, the methods need to be presented in the monitoring plan as well so that it will function as an independent document.

In addition, the Environment Centre has emphasised that the monitoring surveys must be carried out by an independent party.

Because of the urgency of the project, and because the project area extends to the jurisdictions of several supervisory authorities, the Environment Centre considers it expedient to issue regulations for the monitoring procedures in conjunction with the permit decision. This requires that the applicant submits to the permit authority a sufficiently detailed revised monitoring plan, which will be sent to the Environment Centres of Uusimaa and Southwest Finland for comments. The monitoring plan shall be changeable in accordance with the approval of the supervisory authorities.

The munitions clearance work within the Finnish EEZ must be carried out in such a manner and at such time that it causes minimal impact to the marine environment. All work should be carried out during the ice-free period as described in the application plan, while avoiding fish spawning times, the breeding seasons of marine

mammals, and the summer season, during which the nutrients released might contribute to the growth of phytoplankton.

Underwater detonations can cause injuries or death to seabirds and marine mammals if they are present in the vicinity of the clearance site. As needed, seabirds and marine mammals must be driven away from the impact areas of detonations in the manner described in the application plan.

The vicinity of the munitions must be inspected with acoustic sonar before detonation, and the detonation must be postponed if significant shoals of fish are found in the area. Dead and injured fish must be removed from the water after the clearance work so that they will not attract seabirds or marine mammals to the area.

The applicant must ensure that munitions clearance does not endanger the safety of maritime traffic.

The applicant must notify the Uusimaa Regional Environment Centre of the project's start, as well as to notify separately of the start of munitions clearance work in the EEZ that borders the sphere of authority of the Uusimaa Finland Regional Environment Centre. The start notification must include a detailed plan of the clearance work and its schedule, a communication plan for the clearance work, and the contact details of a contact person. The supervisory authority must be immediately notified of any unexpected situations.

The Environment Centre has requested that the Environmental Permit Authority take the coordinating authority’s statement on the EIA report into consideration when deciding on the matter.

When making the permit decision, the environmental impact assessment documents related to the consultation process pursuant to the Espoo Convention and the comments made on them are to be appropriately considered, in accordance with article 6 of the Convention on Environmental Impact Assessment in a Transboundary Context (decree 67/1997). In the same way, the results of impact assessment, including the environmental impact assessment documents, the comments made on them, and the results of negotiations are to be appropriately considered in accordance with article 13 of the treaty with Estonia regarding the environmental impact assessment in a cross-boundary context (Finnish decree 435/2002).

3) **The Southwest Finland Regional Environment Centre** has stated that the munitions clearance work within the Finnish EEZ should be carried out in such manner that it causes minimal impact to the marine environment. As stated in the application, the munitions to be cleared cannot safely be transported to be destroyed at another location. Thus, the applicant has decided to detonate them on site. The application plan also states that munitions clearance carried out by detonation will cause changes in the sediment. Due to these changes, quite large quantities of soil from the seabed will

pass into a suspended state and settle partly at a new location. If the sediment includes substances harmful to the environment, these will be transferred with the soil moved by the detonation as they are bound to fine seabed material. In addition, sudden changes in pressure will cause harm to marine fauna and fish. These matters have been taken into account in the application plan, but an actual programme to monitor the possible harmful effects caused by the project is lacking.

The project impacts on the marine environment must be monitored in a way approved by regional environmental centres. A proposal for the monitoring programme must be delivered to the Uusimaa Regional Environment Centre and the Southwest Finland Regional Environmental Centre in good time before starting the munitions clearance work. If the proposal for a monitoring programme is delivered to the Environmental Permit Authority, the Environmental Permit Authority must request a statement for the monitoring programme from the above-mentioned regional environmental centres before making a decision.

The applicant must be obliged to notify the Southwest Finland Regional Environment Centre of the project's start and separately of the start of the munitions clearance work within the Finnish EEZ that borders the sphere of authority of the Southwest Finland Regional Environment Centre (primarily targets 25–27).

4) **The Uusimaa Employment and Economic Development Centre** has stated that fairly high amounts of nutrients may be released into the water due to the munitions clearance activities, some of which will be in a form that phytoplankton will be able to utilise. Such impact must be mitigated by performing the munitions clearance activities at a time when the impact on the phytoplankton community will be as minor as possible. The permit decision shall determine a time for munitions clearance that is as harmless as possible based on this fact.

Some of the contaminant concentrations in the sediment of the clearance areas were fairly high: at some clearance areas, the concentration of cadmium and chromium exceeds Level 1 of the dredging instructions, and organic contaminants remain below Level 1 of the dredging instructions, except for a couple of areas. In three areas, the tributyltin concentration exceeds Level 2 and in all areas Level 1; trifenyltin has not been mentioned. The Employment and Economic Development Centre does not know whether or not the sediment dredging instructions are to be applied to munitions clearance, but the spreading of contaminants in the water column must be monitored in any case.

The monitoring plan included as an appendix to the application is far too general to be approved in the proposed form as the project monitoring programme. The only actual fish monitoring actions are the fish school scans to be performed in the immediate vicinity of clear-

ance areas, as well as the assessment of the number of dead fish after the clearance activities have been performed. These are necessary, but they must be described in more detail, including descriptions of the equipment to be used. The same applies to the methods to be used to deter fish. In addition to actual fish monitoring actions, all activities included in the water monitoring programme also offer useful information for assessing the impact on fish. These must also be described in much more detail than proposed.

5) **The Southwestern Finland Employment and Economic Development Centre** has stated that when estimating in advance, the detonation works will not result in a significant disadvantage to fishing. However, the work must be carried out by minimising any disadvantages. This is why the application should more clearly say what means will be deployed to achieve this. The application must be further clarified in regard to how and with what tools the fish and shoals of fish occurring in the hazard zone and their movement will be discovered, and it in how extensive an area and in what kind of detail the assessment will be carried out must also be clarified. The applicant must also present some kind of scale for measuring the amount of fish identified in the hazard zone. The application is also flawed in regard to deterring fish. The applicant must specify the equipment and method deployed for deterrence, what kind of deterrence devices are used, how many, and how they will be placed in the horizontal and vertical direction. The applicant must also ensure that the deterrence system will function as intended, that is, the method must be tested in conditions corresponding to those prevailing in the detonation areas.

The monitoring plan annexed to the application says that the amount of fish in the hazard area before the detonation will be found out, and the aim is to deter the fish. After the detonation, the amount of dead fish will be roughly estimated. The Employment and Economic Development Centre finds that these measures are not actual monitoring, but fixed activities related to the detonation work, with which the damage incurred are minimised. Estimating the amount of fish risen to the surface can be considered as fishery monitoring, but that also provides a partial truth of the amount of the dead fish, since some of the exploded fish will probably remain in the water column or sink to the seabed.

The Employment and Economic Development Centre finds that in regard to the impacts on fishery by the project, the focus shall be on minimising the disadvantages. The Employment and Economic Development Centre has not required actual fish monitoring for the project.

6) **The Finnish Maritime Administration** has stated that munitions clearance within the Traffic Separation Schemes located in the international waters of the Gulf of Finland makes it necessary to control the vessel traffic flows in a different way during the works. Regarding any temporary revisions or decommissioning related to the route dis-

tribution areas, the respective authorities of Finland, Russia and Estonia must submit a joint notification to the IMO no later than four months before the revisions take effect. This is why the applicant must provide the Finnish Maritime Administration with a preliminary plan on the implementation and schedule of the clearance work no later than six months prior to commencing the work, and submit the final plan, with its schedule, no later than four months prior to commencing the work.

To ensure navigational safety and to communicate about the works, the applicant must notify the exact time of the works separately for each Traffic Separation Scheme of the Gulf of Finland to the Finnish Maritime Administration no later than one month before commencing the works. A notification of the completion of the work must be submitted to the Finnish Maritime Administration for each Traffic Separation Scheme no later than one week after the end of the clearance work.

The clearance work must be carried out in as continuous a manner as possible in each Traffic Separation Scheme.

The procedures concerning co-operation between the vessels carrying out the clearance, and the Gulf of Finland sea traffic centre (in charge of the operations of the compulsory Gulf of Finland Reporting System) must be agreed separately in more detail with the Finnish Maritime Administration prior to commencing the clearance works. The vessel must have appointed personnel who are in charge of communication with the sea traffic centre, and other waterborne traffic.

There must be personnel on the clearance vessel who ensure during the clearance works that there is no waterborne traffic within the safety zone or near it. The task of the sea traffic centre is to notify, and warn (when necessary) the vessel traffic of the clearance work, but the centre cannot prevent vessel entry to the safety zone.

During the clearance works, the clearance vessel must, without delay, notify the sea traffic centre of the establishment and removal of respective safety zone of each individual clearance location. The clearance vessel must daily report the progress of the work to the sea traffic centre.

7) **The Finnish Maritime Administration's southwest Finland route unit** has not issued any remarks about the permit application. Any work that prevents sea traffic must be notified to the route authorities as soon as possible.

8) **The Board of Antiquities** has stated that its sea archeology unit has reviewed the seabed surveying material in the pipeline installation corridor area and prepared a report on the culture historic sites in the area during 2008. The cultural heritage site assessment in the pipelines' anchoring corridor area commenced in spring 2009 and

will be concluded in autumn 2009. The applicant shall be responsible for the costs incurred by these tasks as presented by the Board of Antiquities.

The closest to the clearance works (distance 540 m), there is a ship wreck, the quality and culture historic significance of which are not accurately known, since an SSS image is the only visual material available of the wreck. There are four wrecks at a distance of about one kilometre from the clearance work. Of them, the wreck of the Russian battleship Rusalka (sunk in 1893) has been considered as the one with the most significance in regard to cultural history. Rusalka has sunk fore first deep into the seabed sediment. Other culturally historic sites are located farther away from the detonation work. The application documents have also mentioned an object located at a distance of 350 metres from the clearance work. The sea archaeology unit has assessed the object to be a marine mammal skeleton. This object is not a primary conservation object.

The Board of Antiquities has a limited amount of information and experience related to the impacts of underwater detonations on underwater cultural heritage sites. No munitions detonations will be carried out in the immediate vicinity of the cultural heritage sites in the gas pipeline project area, and the detonations' distance to locations that the Board of Antiquities considers to be the most significant in the gas pipeline project area (Rusalka, 1.17 km, and the so-called artillery piece sloop wreck S-W8A-10289, 5.9 km from the nearest detonation) is quite substantial. The Board of Antiquities has assessed that the pressure targeting the cultural heritage sites will not be harmfully powerful, which means that a permit may be granted to the munitions clearance, with the following conditions:

The five shipwreck sites mentioned in the project documents (MB-07-2736/Rusalka, S-08-2939, 3_9, 4_9 and S-11-3138) shall be checked through ROV imaging before and after the detonations. The party carrying out the inspection must contact the sea archaeology unit of the Board of Antiquities before the ROV imaging preceding the clearance in order to obtain possible instructions. As soon as possible after the imaging, the material from the ROV imaging shall be submitted to the sea archaeology unit of the Board of Antiquities for reviewing.

9) **The Environment Committee of the City of Helsinki** has stated that the City of Helsinki has regularly monitored the condition of its waters since the 1960s. A decrease in the nutrient load has improved the water quality in the sea areas of Helsinki. The potential impact from the munitions clearance activities shall be mediated by scheduling the clearance activities in such a manner that the impact on phytoplankton communities will be as minor as possible and the probability of causing blue-green algae blooms will be as low as possible.

Marine mammals occurring in the affected zone include grey seals and ringed seals. The munitions clearance activities will generate pressure waves and noise that may cause damage or death to marine mammals, diving sea birds, and fish. In order to mitigate the damage, fish shall be monitored and marine mammals shall be carefully deterred from the detonation areas.

Mitigation and minimisation of impact from munitions clearance activities shall be taken into account in all project planning. The environmental impact can be assessed as by monitoring measures. The monitoring plan annexed to the application needs to be further specified in regard to assessing the status of sea areas. Information about detonations and other construction-related activities shall be communicated as early as possible.

10) **The Environment Protection Committee of the City of Porvoo** has stated that the munitions clearance shall be carried out in such a manner that minimal impacts and danger are caused to the environment. The precautions dealing with munitions clearance that are stated in the application are justified and necessary. In addition, it shall be considered that no detonations are carried out in close vicinity to valuable reefs.

11) **The Finnish Association for Nature Conservation,** ja **Uudenmaan ympäristönsuojelupiiri ry** have stated that clearing the munitions from the seabed is support worthy. It is also a good thing that the matter is processed as a water permit matter. This means that the mitigation measures proposed in the application and the EIA report can be stipulated as binding permit provisions. The best approach would have been to process the entire gas pipeline project in a single permit. In that case, it would have been possible to better take into account the combined impact of different work stages.

Another problem is that the application was made before the Environmental Impact Assessment procedure was concluded with the statement by the co-ordinating authority. Therefore, the application still also has quite a general description of, for example, the distribution and behaviour of contaminants in sediment during explosions, including their cumulative effects and uncertainty factors. This is problematic because there might be at least some local exceedance of contaminants.

Since the detonations may impact on some barrels nearby, the removal of the barrels must be added to the permit. According to the precautionary principle, they shall be processed as potential hazardous waste.

The works must be scheduled for the late autumn. However, the autumn migration of arctic diving water birds, such as the long-tailed duck, is unpredictable. This is why the presence of flocks of birds shall be verified before the detonation. The detonation must not be carried out if there is a flock of birds present. This applies to seals,

the deterrence of which is not easy, as shown by experiences obtained in fishing. Besides the pressure wave, diving species are also threatened by underwater noise.

Any waste rising to the surface shall be removed. Dead fish, for example, could be collected with a net or a sweep net to be piled onto the shore. In this way, after the detonation, a large amount of fish-eating birds and seals would not accumulate in the area and be exposed to the contaminants released from the sediment.

The permit to commence work would make appealing futile, since detonations are irreversible.

12) **AS Nordic Energy Link** as the owner and operator of the Estlink electrical cable has stated that the two mines located at distances of 1.01 km and 0.44 km from the cable may result in damage to the cable when detonated. The pressure wave resulting from the detonation should not result in damage to the cable, but there are three factory-made joints in the cable at a distance of about 1.1 to 1.4 km from the intended detonation work. The party making the remark is concerned over the detonations' pressure wave damaging the joints. For the most part, the cable is buried in the seabed near the intended munitions clearance. The detonations may result in the seabed sediment partially moving away from on top of the cable, thus exposing the cable.

No munitions clearance should be carried out at a distance of less than two kilometres from the Estlink cable. The party making the remark finds that it is necessary to move the two nearest munitions farther before detonating them. The actual peak pressure of the detonations must be measured. The applicant shall check that sediments have not moved. If the burial depth of the cable has changed as a result of the work, the original conditions must be restored.

13) **Pohjolan Voima Oy** as the holder of the permit granted to the Estlink cable concerning the use of the Finnish EEZ has announced that it concurs in the remark by 12) AS Nordic Energy Link.

Statement by the Finnish Environment Institute (SYKE)

The Finnish Environment Institute (SYKE) has made a statement concerning the impacts of the munitions clearance on the solids of the seabed sediments, saying that the application has adequately presented the detonation impact in the water and assessed potential consequences using available military research data. According to the application, marine animals will be displaced from the area using ultrasonic devices. According to the view of the Finnish Environment Institute (SYKE), the impact of the proposed measures on the solids contained in the bottom sediment have been assessed based on the available information, and the precautions are justified.

The barrels located on the seabed may contain hazardous agents – in extreme cases, even dumped hazardous industrial waste or other agents hazardous to the environment. Even if the barrels are more recent than WWII, they may be in poor condition due to corrosion. The pressure impact of a munitions object detonated close by will probably destroy a corroded barrel lying on top of the sediment, which will cause the agents inside the barrel to spread into the water. This possibility has not been reviewed in the application.

The Finnish Environment Institute (SYKE) has proposed requiring the applicant to present a risk assessment on the probability of the destruction of these barrels and the potential impact. The risk assessment should include a review of which of the barrels will probably be destroyed as a result of munitions clearance, as well as an assessment of what kind of impact detonation of the barrels could cause, based on different kinds of assumptions of their contents. If it is possible that a detonation will cause a major spike in the hazardous agent load, measures to reduce the risk of such load spikes shall be considered. If the munitions clearance activities will cause the spreading of hazardous agents to the environment, the damage caused will be irreversible. This is why it is necessary to anticipate the probability of such damage and its extent.

Remark supplement

6) **The Finnish Maritime Administration**, in its remark supplement submitted to the Environmental Permit Authority on 26 August 2009, has stated that the Finnish Maritime Administration is to inform the International Maritime Organisation (IMO) of the temporary closure of the Traffic Separation Schemes. The notification must be sent to the IMO no later than four months prior to the temporary closure. Not all mines to be cleared create a need to close the Traffic Separation Schemes. A preliminary plan to be completed six months in advance and a final plan to be completed four months in advance are required for the mines that require closing some of the Traffic Separation Schemes. Based on an initial review, this applies to nine mines located off Porkkalanniemi.

The Finnish Maritime Administration has considered that the vessel used in munitions clearance work is, according to Rule 3 of the Convention on the International Regulations for Preventing Collisions at Sea, a “vessel restricted in her ability to manoeuvre” because the vessel is engaged in underwater operations and mine clearance operations. In addition, the Finnish Maritime Administration considers that the vessel engaged in munitions clearance work is, according to Rule 10, Section l, exempt from complying with the Rules applying to Traffic Separation Schemes to the extent necessary to carry out the operation because the vessel is engaged in an operation for the laying, servicing or picking up of a submarine cable as mentioned in Rule 10, Section I.

Explanation by the applicant

Regarding the remark by the 1) **the Ministry of Transport and Communications**, the applicant has stated that the clearance plan and schedule will be submitted to the Finnish Maritime Administration for carrying out monitoring. The IMO's GOFREP-system-related decision, as well as the requirements set out by the COLREG Rules, will be taken into account in the communication and in operations arrangements in the way as presented in the response (below) to the remark by 6) the Finnish Maritime Administration.

Regarding the claim concerning the costs incurred, the applicant has left the claim to be solved by the Environmental Permit Authority. The applicant accepts all payment obligations based on binding national or international decrees or provisions.

Regarding the remark by 2) **the Uusimaa Regional Environment Centre**, the applicant has stated that the requested field study report, as well as the nutrient and contaminant memorandum 43A-12 (an updated version of the document mentioned by the Environment Centre) are annexed to the explanation. Further information about the subject is also provided in the qualitative analysis concerning the spreading of contaminants. The analysis is also annexed to the explanation. The applicant has stated that the update to memorandum 43A-12 has taken into account the uncertainty factors which have previously been described in Appendix 4 of the permit application. Regarding the results of spreading, the information in Appendix 4 is primarily in comparison to memorandum 43A-12.

The requests concerning the monitoring programme have been taken into account in the final version of the monitoring plan (annexed to the explanation), and in its Chapters 5.7 and 5.5 in particular. Luode Consulting Oy will be in charge of the monitoring. Other requirements presented have been commented below in the responses to the remarks by 3) the Southwest Finland Regional Environment Centre and 4) the Uusimaa Employment and Economic Development Centre. Ship traffic risks have been addressed in the responses to the remarks by 1) the Ministry of Transport and Communications, and 6) the Finnish Maritime Administration. Appendix 4 of the permit application states that in relation to the munitions clearance, it is unlikely that dangerous substances or hazardous waste would be released from them.

Regarding the remark by 3) **the Southwest Finland Regional Environment Centre** , the applicant has stated that according to the applicant's view, the monitoring programme is approved by the Environmental Permit Authority, and the Southwest Finland and Uusimaa Regional Environment Centres are given the opportunity to give their views on it. The commencement the work will be notified well in advance to the supervisory authorities.

Regarding the remark by 4) **the Uusimaa Employment and Economic Development Centre**, the applicant has stated that the aim, as presented in the permit application and the monitoring pro-

gramme, has been to set the timeframe of the clearance works so that the resulting harms in regard to both nutrients release, and organisms would be minor. Timing the clearance is an important part of impact mitigation. The impact on marine mammals is smallest during the ice-free period, since the ringed seal gives birth on the ice. On the other hand, harm may result to sea birds during the ice-free period, since it is their migration and breeding time. However, this impact will be unlikely since the munitions to be cleared are located far away from nesting locations, and partially on ship routes with frequent traffic, and these are unlikely resting or eating locations for sea birds during their migration. The spawning season of sprat and herring takes place during the ice-free period, but their spawning areas do not overlap with the munitions clearance sites. During the autumn and spring, and in the winter, nutrients will not restrict phytoplankton growth, and at that time minor spreading of nutrients from sediments will not impact on phytoplankton growth. The conclusion is that the best time for munitions clearance is during the ice-free period in the autumn or the spring, at which time there are no significant changes of temperature in the water column.

It has been planned that the first-stage clearing will be carried out during the ice-free period in late autumn in 2009, and the second-stage clearing is intended to be carried out during the ice-free period in spring 2010. It is estimated that the clearance will take about two months per stage. This is also partially due to the international reporting obligations related to ship traffic. No work has been planned to be carried out during the summer. The information about the spread of contaminants has been further specified in the monitoring programme, as well as in the Environmental Field Survey 2009 reports included as Appendices 2 and 3 to the explanation, as well as in the qualitative assessment report concerning the spread of contaminants in the sediment. Regarding fish and fishing, the applicant has referred to the applicant's statement issued below regarding the remark by 5) the Southwestern Finland Employment and Economic Development Centre, as well as Sections 5.2 and 5.5 of the monitoring programme.

Regarding the remark by 5) **the Southwestern Finland Employment and Economic Development Centre**, the applicant has stated that Section 5.5 of the monitoring programme describes fish and mammal observations in the clearance area, and the tools and methods used to deter them, in the manner required by the Employment and Economic Development Centre. The use of deterrent charges is an established method deployed when clearing munitions, and carrying out similar work. The "JNCC Guidelines for Minimising Acoustic Disturbance to Marine Mammals Whilst Using Explosives", annexed to this explanation, is an example of this. The deterrence measures are also described in detail in Section 5.5 of the monitoring programme.

Regarding the remark by 6) **Finnish Maritime Administration**, the applicant has stated that the applicant and the remarking party have

reached mutual understanding on carrying out the clearance and taking navigation into account. It is intended that the procedures of the COLREG-system-related advance reporting obligation, and of the continuous reporting related to the GOFREP, will be discussed in detail at a meeting on 10 September 2009, and to reach a common position also in this regard. The outcome of the aforementioned meeting will immediately be made available to the Environmental Permit Authority. All changes to the operations will always be notified to the Finnish Maritime Administration and other competent authorities immediately along with the operations. Section 5.6 and Chapter 6 of the monitoring programme discuss the procedures followed regarding daily reporting.

In the discussions with the Finnish Maritime Administration, a shared view has been reached regarding that eleven mines of the munitions to be cleared require a reporting procedure pursuant to IMO Rules. At a meeting on 10 September 2009, a shared position will be established regarding other munitions requiring the aforementioned procedure.

Regarding the remark by 7) **the Finnish Maritime Administration's southwest Finland route unit**, the applicant has referred to the applicant's statement concerning the remark above by 6) The Finnish Maritime Administration.

Regarding the remark by 8) **the Board of Antiquities**, the applicant has stated that Section 5.4 of the monitoring programme describes the inspection of cultural heritage sites in the clearance works. The requests by the Board of Antiquities have been taken into account in this context.

Regarding the remark by 9) **The Environment Committee of the City of Helsinki**, the applicant has referred to what it has presented above, as well as to Chapter 3 of the monitoring programme.

Regarding the remark by 10) **the Environment Protection Committee of the City of Porvoo**, the applicant has stated that Appendix 4 of the permit application, and Section 5.2 of the monitoring programme discuss the impacts of the clearance works on nature conservation areas. The Kallbådan islets and waters (FI0100089) are the nearest existing Natura 2000 area, located at a distance of 10.8 km from the nearest munition. The Sandkallan southern sea area (FI0100106) is the nearest proposed new Natura 2000 area, located 10.7 km from the nearest munition. Because of the significant distance between the munitions and Natura 2000 areas and other protected areas, no physical impact, e.g. spreading of sediments and noise impact on biota, is expected inside any of these areas.

Regarding the view of 11) **The Finnish Association for Nature Conservation** and**Uudenmaan ympäristönsuojelupiiri ry**, the applicant has stated that the contaminants description has been supplement with Appendices 2–4 to the explanation. Regarding the

timeframe of the clearance work, and the removal of dead fish, the applicant has referred to what it has stated above, and to Chapter 5 and Section 5.5 of the monitoring programme. The response given above to the remark by the 4) the Uusimaa Employment and Economic Development Centre provides a more detailed discussion about the question related to the timeframe of the mine clearance.

The applicant has stated that the preconditions for the permit to start the work are met as described in the application, and that there is no principled or legal obstacle to granting the permit to start the work.

Regarding the remarks by 12) **AS Nordic Energy Link** and 13) **Pohjolan Voima Oy**, the applicant has stated that the requirements by the parties making the remarks will be taken into account primarily through bilateral negotiations and a contract with them. Once the contract has been signed, it will be submitted to the Environmental Permit Authority for decision-making.

Regarding the statement by the **Finnish Environment Centre (SYKE)**, the applicant has stated that Appendix 4 to the permit application describes the barrels located in the vicinity of the munitions to be cleared, as well as estimates their contents and the impacts of the detonations. The barrels' descriptions are included in Table 3.4 and the conclusions presented after it. The conclusions state that, based on the reviewing carried out, it can be concluded that the munitions clearance will not generally impact on the barrels, and mitigation measures will not be required.

Moreover, the applicant has stated that mainly the John Lethbridge vessel owned by the Bactec company will be used in the munitions clearance. The applicant has requested that the Environmental Permit Authority approve the use of this vessel, and that other vessels could be used by notifying the relevant authorities of this in advance.

Remark supplements

2) **The Uusimaa Regional Environment Centre** and 3) **the Southwest Finland Regional Environment Centre**, based on a request by the Environmental Permit Authority, have presented changes and supplement proposals to the monitoring plan annexed to the explanation by the applicant.

Application supplementation

In its application supplement submitted to the Environmental Permit Authority on 17 September 2009, the applicant has stated that the applicant carries out visual supplementary surveying around specified munitions. The purpose of the surveying is to identify the objects selected in the geophysical anchor corridor surveying. Surveys like this are a usual preparatory measure before clearing munitions, since clearance contractors require more comprehensive surveying prior to carrying out the actual detonations. In the survey, the appli-

cant has identified new munitions which the detonation of specified munitions may have an impact on.

When carrying out the clearance works, it is important to avoid an unplanned consequential detonation of nearby munitions. To avoid such unplanned incidents, it is safer to clear the nearby munition at the same time as the controlled detonation. The clearance contractor has prepared a conservative estimate of the distance of the sympathetic detonation by using the minimum mine distance specified by the German navy, and to the figure thus obtained, adding a safety margin of 100% (corresponds to an overpressure of 1 MPa). The contractor continuously reviews new survey data to evaluate the risks of a consequential explosion, and the aim of this process is to ensure clearance work safety.

Based on the reviews prepared so far, the applicant and the clearance contractor have identified one new munition which may explode sympathetically. It is located near munition R-06-003 and has been issued the following ID: R-W6F-10747.

The applicant has also requested for a permit to clear the aforementioned mine using the method described in the application. Moreover, the applicant has requested a permit to clear all such munitions possibly identified before or during the clearance work which might explode sympathetically. The applicant has proposed that if such a situation occurs, the matter would be notified to the competent Environment Centre in advance, and a clearance plan and impact assessment would be presented to the Centre, and the plan and assessment would correspond to the clearance plan and impact assessment included in the permit application concerning specified mines. In this way, the supervisory authorities would have the opportunity to supervise all munitions clearance work, and also to issue instructions if a new permit is required due to the impact caused by new clearance work.

Munitions R-06-003 and R-W6F-10747 will be detonated simultaneously, due to which this simultaneous clearance is consireded as a detonation of a single munition equipped with a combined total charge. According to a conservative estimate, the charge of R-06-003 is 350 kg, since it has not been possible to confirm the type and charge of the munition. Also, it has not been possible to confirm the charge of R-W6F-10747, which is why a conservative estimate of the charge is likewise 350 kg. Thus, the single charge is 700 kg. However, if the original estimate is correct, the total charge will be 350 + 100 = 450 kg instead of the 700 kg assumed now.

If the munitions are detonated simultaneously, the safe distance for marine mammals and fish is 2,400 m (previously 1,900 m), the distance causing damage to mammals/probable fish mortality 25–35% is 310 m (previously 250 m) and the distance causing death to mammals/probable fish mortality 75–100% is 40 m (previously 35 m).

No cables or cultural heritage sites have been found in the area. The barrel, located in an eroded depression on fine sand, is located at a distance of 477 m from R-06-003 and at a distance of 535 m from R-W6F-10747. If the munitions are detonated simultaneously as planned, the barrel will move about one metre sideways.

If the munitions are detonated simultaneously according to the plans, the conservatively estimated spread area of suspended sediments and contaminants is double the spread area of sediment clouds and scope calculated for the original R-06-003 munition.

The applicant has also submitted an updated monitoring plan which takes into account the feedback supplied by the Environment Centres.

The applicant has also submitted a meeting memorandum where safety arrangements related to the munitions clearance were agreed on with the Finnish Maritime Administration. Appendix 1 to the meeting memorandum has grouped the munitions to be cleared as agreed with the Finnish Maritime Administration, to two clearance stages, the first of which will not require traffic control measures. The mines of the second clearance stage are located on a ship route, which is why the IMO reporting procedure and a temporary restriction of the use of the ship route will be required during the clerance work. Since the IMO must be notified at least four months prior to the intended construction work, the mines of the second clearance stage can be cleared as late as spring 2010. At the first clearance stage, a total of eleven munitions can be cleared with no impact on sea traffic.

The applicant is preparing a contract with AS Nordic Energy Link and Pohjolan Voima Oy concerning the clearance of two munitions. Due to their location, the clearance of these munitions requires the IMO reporting procedure, which is why the clearance will not take place during the first clearance stage. These two munitions cannot be moved during the clearance work due to the uncontrolled risk of explosion. On the basis of the cable impact assessment submitted by the applicant to the Environmental Permit Authority on 18 September 2009, the pressure wave targeting the cable joints will not result in damage. For the most part, the joints are buried.

Official letter by the Finnish Border Guard

On 22 September 2009, the Finnish Border Guard provided the Environmental Permit Authority with a memorandum on a meeting that took place at the Helsinki sea traffic centre on 10 September 2009. The meeting agreed on the exchange of information related to the monitoring and safety of the munitions clearance.

Application supplements

On 24 September 2009, the applicant provided the Environmental Permit Authority with reports in Finnish and Swedish concerning the detonations' impact on the Estlink cable, and on 29 September 2009, a report concerning the impact caused to the Finnish area resulting from the munitions cleared in Russia.

DECISION BY THE ENVIRONMENTAL PERMIT AUTHORITY

Permit decision

The Environment Permit Authority grants Nord Stream AG a permit for clearing 28 munitions (R-06-003, R-E7B-10466, R-07-004, R-07-2655, R-8AG-W-014, R-8AG-W-009, R-E8C-10223, R-W8A-10317, R-8CG-E-004, R-8CG-E-003, R-W8A-10312, R-W8A-10313, G-08-009, R-W8A-10005, R-8CG-E-002, R-8CG-E-001, R-08-2805, R-08-159, R-09-27, S-09-3135, R-09-04, R-09-192, R-11-3395, R-11-5167, R-12-008 (2 pcs), R-12-3463, R-W6F-10747) in the Finnish EEZ according to the plan annexed to the application.

The munitions clearance permit also applies to random and previously unidentified munitions which are located in the installation corridor of the intended pipeline of the Russia/Germany natural gas pipeline project, or in its immediate vicinity, and which, on the basis of the safety assessment, may detonate as a result of detonating a munition nearby.

It is pre-estimated that the project will not result in any damage, harm, or other losses of benefit subject to compensation pursuant to the Water Act.

The permit holder must follow the regulations set out in the Water Act and the Environmental Act, as well as the permit provisions mentioned below.

Permit provisions

Carrying out the clearance

1) Before the detonation, a remote-controlled device must be used to check the object to be detonated, and to inspect the previously identified barrels located within a 1,000-metre radius. The inspection must be carried out again after the detonation to ensure that the munition has been made harmless by the detonation, and to note any movement of the barrels, and the condition of the barrels.

If it is noticed that a barrel has been damaged, the condition of the barrel must be found out, and an estimate must be prepared about the possible impact and risk caused by the barrel. The estimate must be submitted to the regional environment centre in charge of monitoring, and the estimate must be included in a monitoring summary pursuant to permit provision 11), and in a possible report pursuant to permit provision 12).

The condition of cables must be inspected before and after the detonation.

2) At least 30 minutes before the intended detonation, observation for any marine mammals, shoals of fish, and sea birds must be started in the safety zone surrounding the detonation location. During the clearance, the radius of the safety zone must be at least 1.5 kilometres when the explosive charge is less than 100 kg; at least 2 kilometres when the explosive charge is 100–300 kg; at least 2.5 kilometres when the explosive charge exceeds 300 kg but is less than 500 kg; and 3 kilometres when the explosive charge exceeds 500 kg.

The observation must be based on acoustic methods and visual inspection pursuant to the plan.

If any marine mammals, sea birds, or significant shoals of fish are noticed in the safety zone, the detonation must be postponed until they have been deterred from the area.

If there are any significant flocks of birds resting or eating near the clearance location, no clearance measures must be taken until the flocks have left.

An expulsion charge for fish must be used in every location before the detonation.

3) Before detonating the munition, it must be ensured that there are no vessels or small boats within a two-kilometre radius.

4) The clearance must be carried out using such methods and schedules that will cause as little harm as possible to the sea area and its use.

The clearance work must be carried out when there is no ice in the area. The spawning times of fish, and the breeding seasons of marine mammals are to be avoided.

Detonation activity is to be avoided during periods when weather conditions result in strong currents. Before detonation, currents must be measured from surface to bottom to ensure that there are no continuous strong currents in the area. The measurement results must be submitted to the regional environment centre in charge of monitoring, and the results must be included in a monitoring summary pursuant to permit provision 11), and in a possible report pursuant to permit provision 12).

5) Once the clearance is complete, the remains of the munitions must be removed from the detonation area. Whenever possible, dead and damaged fish must be removed from the sea using surface trawling or a similar method after the clearance.

6) The clearance of any previously unidentified munitions found in the gas pipeline installation corridor or its immediate vicinity during clearance tasks or related surveying must comply with the procedures set out in the application plan.

All new objects must be notified to the regional environment centre in charge of monitoring, and at least the following information must be submitted to the centre before the detonation: The precise location of the munition, and information about the neighbouring areas, corresponding to what has been set out in the permit application, an estimate of the sediment movement, and the contaminants in the sediment, as well as grounds for the necessity of the clearance.

7) The shipwreck sites MB-07-2736/Rusalka, S-08-2939, 3_9, 4_9 and S-11-3138 must be inspected with a remote-controlled device before and after the detonation. The Finnish National Board of Antiquities (FNBA) must be notified in advance of the commencement of the clearance of the munitions closest to the aforementioned sites. The data from the inspection and an estimate of the impact of the detonations must be submitted to the FNBA as soon as possible after the clearance.

Maritime traffic control

8) For munitions R-E8C-10223, R-08-2805, R-08-159, R-09-27, R-8AG-W-009, R-W8A-10317, R-8CG-E-004, R-8CG-E-003, R-W8A-10312, R-W8A-10313, G-08-009, R-W8A-10005, R-8CG-E-002, R-8CG-E-001 and S-09-3135, a plan concerning the schedule of the clearance must be prepared. The plan must be submitted to the Finnish Maritime Administration no later than six months before the clearance commences.

9) The permit holder must submit an electronic notification to the control centre of the Gulf of Finland Coast Guard. The notification must include the information (mentioned below) required for the maintenance of marine and border security.

A general plan for carrying out the clearance: the schedule connected with the map, a detailed clearance plan, the vessels and aircraft used, their basic information, including information about the shipping company, the flag, contact details (Call Sign, MMSI, telephone numbers, e-mail), safety plans and safety equipment, rescue plan for diving activities, communications equipment, and vessel/aircraft permits for state vessels/aircraft.

Monthly plan: further specifications of the information provided in the general plan.

Weekly plan: changes (if any) to the monthly plan, a detailed work plan for the week, permits for activities subject to separate permits, number of personnel on the vessels/aircraft, personnel changes, material replenishments and exceptional movement, such as spare part

replenishments. The weekly plan must be submitted on the Friday of the previous week by 12:00 noon.

Daily plan: the weekly plan, further specified for the day in question, commencing and ending the permit-based operations, also including the information about the testing use of underwater equipment. The daily plan must be submitted on the previous day by 4:00 pm.

Personnel changes must be notified no later than 48 hours before the change, and if the change takes place on a small boat, for example, a notification must be submitted when the boat departs. The notification must include the following information: personal information, and information in the travel document (passport number, nationality), agent/shipping company, and the routing.

The control centre of the Gulf of Finland Coast Guard will distribute the notifications it has received, taking into account the forwarding rules for the information, to other national authorities and the Estonian border control authorities.

When giving notice of the detonation time, the location and the safety zone, as well as accidents, malfunctions, deviations from the plan, and any events posing a threat to the marine environment, the international regulations for navigational emergency and safety communications, as well as the instructions provided by the Finnish Border Guard, and the Finnish Maritime Administration, are to be followed.

Compensation

10) If activities pursuant to this decision cause loss, damage or other loss of benefit which has not been required when issuing the permit decision and for which the permit holder is responsible for, pursuant to the regulations set out in the Water Act, and an agreement on the matter is not reached, when the party suffering the loss of benefit so requires, or when the public interest so requires, the authority in question may (the legal force of the permit decision does not prevent it) submit the matter to be decided on by the Environment Permit Authority in the sequence as determined by the Water Act.

Any party suffering direct damage resulting from carrying out the work must, without delay, be compensated for the loss.

Monitoring

11) The permit holder is to monitor the impacts of the detonations on the sea area's water quality, seabed structure, sediment movement, and on the recovery of the conditions. Moreover, the permit holder must monitor eutrophication caused by nutrients released from the sediment, as well as the impact of contaminants on the biota.

Sediment samples are to be taken at stations VOM1–3 ja VOHE1–2 at distances of 50, 100, 200, 400, 800, 1,600 and 3,200 metres from

the munition detonated. In other respects, monitoring must be carried out pursuant to the monitoring scheme (version D1) dated 11 September 2009, included as an appendix to the application supplement. The monitoring plan may be further specified in the way accepted by the Uusimaa Regional Environment Centre and the Southwest Finland Regional Environment Centre, provided that the changes to the plan do not weaken the reliability of the results, or the coverage of the monitoring.

The results and summary of the monitoring are to be submitted to the Uusimaa Regional Environment Centre, the Southwest Finland Regional Environment Centre, the respective employment and economic development centres of Uusimaa and Southwest Finland, the respective environmental protection authorities of the cities of Länsi-Turunmaa, Espoo, Hanko, Helsinki, Raasepori and Porvoo, as well as to the respective environmental protection authorities of the municipalities of Kemiönsaari, Inkoo, Kirkkonummi, Siuntio, Pernaja and Sipoo, no later than three months after the completion of the work. When requested, the results and summary must also be submitted to those whose rights or benefits they may concern.

Any unexpected events and findings are to be reported immediately.

12) If the munitions are cleared at two stages so that the period between the stages is at least two months, the permit holder must, based on the monitoring and observation during the work, prepare a report of the impacts of the detonations carried out, and compare the actual impacts with the pre-estimated impacts. The report must be submitted to the Western Finland Environment Permit Authority no later than one month after the completion of the clearance work at the first stage.

On the basis of the report, the Western Finland Environment Permit Authority will, when necessary, further specify the work methods and the permit provisions for monitoring.

Validity of the permit, and notifications

13) The work must be commenced and its key elements must be completed within two years of the date of this decision becoming lawful and binding. If the permit holder fails to do this, the permit will be terminated.

14) Commencing the work must be notified in advance in writing to the Uusimaa Regional Environment Centre, the Southwest Finland Regional Environment Centre, as well as the respective employment and economic development centres of Uusimaa, and Southwest Finland. The starting notification shall include a plan of the clearance work and its schedule, a communication plan for the clearance work, and the contact details of a contact person.

15) The completion of the work must be notified in writing within 60 days to the Environment Permit Authority, the Finnish Board Guard, the Uusimaa Regional Environment Centre, the Southwest Finland Regional Environment Centre, the respective employment and economic development centres of Uusimaa and Southwest Finland, as well as to the Finnish Maritime Administration.

Basis

Basis for processing the matter

Munitions clearance will change the seabed and its conditions near the clearance sites, and the clearance may result in harmful impacts to the Gulf of Finland maritime traffic and fishing, as set out in Chapter 1, Section 15 in the Water Act. The release of sediments' nutrients and contaminants may result in water pollution near the clearance sites, as set out in Section 3 of the Environmental Protection Act, and Chapter 1, Section 19 of the Water Act. Besides the applicable regulations set out in the Water Act, the application processing, pursuant to Chapter 2, Section 1a of the Water Act, follows the applicable parts of Sections 41–44, 46, 55 and 58 of the Environmental Protection Act. Section 110 of the Environmental Protection Act has been taken into account as well.

Preconditions for granting the permit

Project benefits

Munitions will be cleared from the installation line of the Baltic Sea gas pipeline. The applicant's immediate financial benefit from the gas pipeline project will annually be about EUR 500 million in gas transfer fees. The gas pipeline project is important for the energy supply of Central Europe. The applicant will obtain a significant benefit from munitions clearance, as the clearance will enable safe installation and use of the Baltic Sea gas pipelines.

Munitions clearance is necessary for public safety, because munitions located on the seabed may explode uncontrollably due to anchoring or trawling, for example. Seabed munitions clearance is carried out annually as a co-operative effort by the Baltic Sea's coastal states and other states. From the general viewpoint, the clearance has a substantial benefit even if the gas pipeline project were not to be implemented, or if the pipeline were to be located in another area than from where the munitions are cleared.

Project disadvantages

Seabed type varies by sedimentation area. Some of the metal concentrations in the sediments remain below level 1 set out in the dredging and depositing manual by the Ministry of the Environment, and some exceed the level 1 limit value. No exceeding of the level 2 limit value (sediment classified as contaminated) has been identified.

Based on Ecotoxicological Assessment Criteria (EAC), the mean concentrations of metals (excluding mercury, nickel and lead) exceeded the threshold value. Annual concentration variations have been minor.

For some substances, the concentrations of organic harmful substances accumulated in sediments exceeded the level 1 limit value for dredging masses. However, concentrations exceeding the limit value were found in only some of the samples. Concentrations exceeding level 2 (contaminated sediment) were only found for organic tin compounds (TBT). However, most of the TBT concentrations remained below level 1, and only 3% exceeded level 2.

There was considerable variation in the dioxin concentrations for the sediments. Most of the concentrations were below level 1. The highest concentration in 2009 was 43 pg/g. The limit value for contaminated sediment (level 2) is 500 pg/g.

On the seabed, nutrients have accumulated both as bound to solids, and in a solvent form. The oxygen concentration of the water has a considerable impact on the nutrients remaining in the sediments. Nutrients dissolve in water from hypoxic sediments, whereas more sediments accumulate in oxygen-rich sediments.

Exploding the munitions will result in craters on the seabed. Depending on the quantity of the explosives, and the bottom quality, the maximum diameter of the craters will be about 15 m. The total amount of sediment movement as a result of one clearance will be about 200 metric tons on average, with a maximum of about 700 metric tons. All in all, the estimated amount of sediment movement is about 5,300 metric tons.

The explosion will result in a pressure wave which will progress in the water symmetrically to all directions. The solids released from the seabed will travel to the surface, and a cloud of solids will be observed to a maximum distance of about three kilometres, when the limit applied is a solids concentration of 10 mg/l for the water. Solids mixed with the seawater contain both inorganic and organic harmful substances. Some of the substances are firmly bound to the solids, and will again re-settle on the seabed when the solids re-sediment. A considerable part of the more coarse seabed material will re-settle on the seabed near the explosion site. In total, the impact on water quality by solids and the harmful substances bound to it will remain short-term and minor. The bioavailability of substances bound to sedimenting particles is also small.

The fine-grained material of the seabed sediment, and compounds existing as dissolved in the pore water will mix with the sea water above and travel farther along with the prevailing currents. The currents may vary in different water layers, which means that the layer-specific material spreading will be different.

Excluding one munition (about 40 m), the munitions to be exploded are located at a depth of 60 to 80 metres. Approximately 95% of the gas pipeline planned in the Finnish EEZ is located at a depth of more than 60 metres. The installation depth of the gas pipelines in the EEZ will be about 40 to 200 metres. In the Gulf of Finland, a seasonal halocline caused by the saline sea water is located at a depth of about 60 to 70 metres, and a thermocline resulting from the temperature in the summer is usually located at a depth of 30 to 40 metres. In the Gulf of Finland, the thermocline, and often also the halocline, dissolves in the late autumn, or in winter. Only a part of the nutrients and harmful substances spreading to the seawater as a result of the detonations will move to the productive surface layer. Some of the substances released from the sediments remain or move to the area below the halocline, where the oxygen situation is poor, which is why there are only few seabed fauna, or none.

Since only part of the nutrients released by the detonations will travel to the productive water layer, and the intention is to carry out the clearance during cool water, the nutrients will have a minor and temporary impact on the eutrophication of the Gulf of Finland. Also, most of the inorganic and organic harmful compounds will either remain in the hypolimnion, or spread over such an extensive area that their impact qill not be significant when taking into account the conditions in the Gulf of Finland.

The calculated amount of dioxins released from the sediments as a result of the detonations is 3.2 mg. The total amount of solvent (and therefore possibly bioavailable) dioxins released due to the detonations is estimated as 0.8 mg. In the risk assessment carried out according to the precautionary principle, munitions clearance may increase the exposure of the most exposed target group by a maximum amount that corresponds to less than 1% of the many-year exposure considered as tolerable. The supply and accumulation of dioxins and other solvent substances in food chains will not clearly increase in comparision to the amounts of substances already rotating in the Gulf of Finland, and in regard to the distribution of a possible additional exposure over a many-year period.

The assessment related to the project impacts and the accumulation of harmful substances must also take into account that besides the munitions clearance in the Finnish EEZ, the intention is to carry out a similar munitions clearance in the Russian EEZ possibly at the same time or with a timeframe close to the Finnish EEZ munitions clearance. Together with the impact resulting from the munitions clearance that is now being applied for, the impact resulting from the Russian EEZ may constitute a risk of increased impact. The impact caused by the munitions clearance in the Russian EEZ will be similar to those caused by the clearance taking place in the Finnish EEZ.

The intention is to clear munitions in the Russian EEZ (25 identified munitions). The munitions are located at a smallest distance of about

80 km from the easternmost munition according to this application. This means that there will be not joint impacts.

Any transboundary impact that may result from clearing munitions in the Russian EEZ will be monitored at three locations (FIX1, FIX2 ja CONTROL2).

It is estimated that the re-suspension of harmful substances will cause a minor total impact on water quality, seabed fauna, fish stocks, birds, marine mammals and fishing. Moreover, the impacts caused by the pressure wave on fish, birds, and marine mammals can be decreased by taking the deterrent measures presented in the plan and set out in the decision.

The nearest existing Natura 2000 area and the nearest proposed new Natura 2000 area are located at a distance of about 11 km from a munition to be cleared. Since the areas are situated far from the clearance sites, the clearance will not have a harmful impact on them.

The extent of the impacts estimated in the project plan can be confirmed through monitoring. If the munitions are exploded at two stages, the Environmental Permit Authority may, on the basis of monitoring results obtained during the first stage, provide further clarifying provisions for carrying out the work and the monitoring.

The pressure wave resulting from the detonation may cause damage or move the cultural heritage sites, and barrels on the seabed. The distance of the nearest shipwreck from the clearance site is 540 m, and the nearest distance of an object estimated to be a marine mammal skeleton is 350 m. The skeleton has not been classified as a primary conservation object. According to the surveys conducted, munitions clearance will not damage the archaeological sites. Pursuant to to the permit provisions, the sites must be checked before and after the detonations.

The location of barrels and sites corresponding to them have been found out, and the impact on them caused by the pressure wave has been estimated. A total of six barrels have been identified near the munitions to be cleared. The distance of the nearest barrels from the detonation sites is 30 and 80 metres. Some of the barrels will remain in place during the detonation. It is estimated that one barrel (which is already open) will move about 10 to 12 metres on the seabed.

There is no detailed information available about the contents of the barrels. As far as is known, no chemical munitions have been sunk in the clearance area. It is unlikely that the barrels will be damaged or that any harmful substances will be released to the sea water, since the contents of the barrels have already leaked into the sea, or the contents have solidified. The total risk incurred to the environment by the barrels is minor, when taking into account the number of the barrels and their distance from the clearance sites.

The pressure wave may incur a risk to the cables on the seabed. The nearest cable is situated at a distance of 140 metres from the detonation site. A safe distance for sea cables has been estimated as 50 metres when the explosive charge is 500 kg. The cables are on the seabed, relatively far away from the clearance sites. The risk of damage even to the nearest cables is minor. According to the permit provisions, the condition of the cables must be confirmed before and after the detonation. If damage is incurred to the cables, the permit holder is responsible for repairing them and compensating for them.

The location and type of munitions that may still be located near the clearance sites must be found out before the detonation. Munitions which may explode in a chain reaction may increase the amount of the released and spreading seabed material, and strengthen the impact of the detonations. This is why the aim has to be to explode any other munitions near the clearance sites at the same time. Exploding them simultaneously will not clearly increase the risks to the environment.

Clearing munitions by exploding them requires that there are no other vessels nearby. Some of the clearance sites are located near the traffic distribution routes pursuant the Gulf of Finland ship traffic control system (GOFREP). The clearance will result in disruption to the ship traffic control. However, traffic control can be carried out disruption-free by following the procedures required by the Finnish Maritime Administration, and the Finnish Border Guard. This means that the impact on maritime traffic will be minor.

The clearance may result in a minor disadvantage to fishing, as fishing in the respective safety zone of each clearance site will not be possible during the detonation for a maximum of a few days.

Munitions clearance will not prevent the use of military areas.

The shortest distance from the boundary between the respective EEZs of Finland and Estonia to a munition to be cleared is 460 metres, and the distance of other munitions is over 1,000 metres. When the munitions will be exploded according to the plan, and the permit provisions, the transboundary impacts resulting from the project will be minor.

All in all, it is estimated that the disadvantages resulting from the project will not be significant.

Granting the permit

In comparison to the damage, disadvantages and other losses of interests resulting from the project, the benefit gained from the munitions clearance is considerable. Clearing the munitions by exploding them is an acceptable method which is commonly used in the Baltic

Sea. Alternative clearance methods may result in hazards. The disadvantages and risks resulting from the clearance method can be reduces by carrying out the clearance according to the plan, and the permit provisions, as has been set out in Chapter 2, Section 3 of the Water Act.

The clearance operations can be arranged pursuant to Sections 41 and 42 of the Environmental Protection Act, in the way presented in the application, and by following the provisions set out in this decision so that the operations will not result in harm to health, significant environment pollution or risk thereof, the weakening of specific natural conditions, or putting other opportunities of use in danger in the impact zone. Furthermore, the operations will not result in consequences prohibited in the Environmental Protection Act.

Grounds for the permit provisions

Permit provision 1. The purpose of the inspection is to inspect to correctness of the munition information, while also inspecting the barrels in the area and their condition. A post-inspection will ensure that the munition has been eliminated successfully and check the barrel movement and condition to be able to take any further measures that may be required. The cables must be inspected to identify and repair any damage.

Permit provision 2. The detonation may damage or kill marine mammals, sea birds and fish if they are within the munitions clearance safety zone. Damage can be prevented by deterring them, or by postponing the detonation if mammals, sea birds, or shoals of fish are identified in the area, which it has not been possible to deter. Sea birds, such as long-tailed ducks, eiders, black scooters, and pochards may gather in large numbers in the open seas in the autumn and the spring to eat or rest before they continue their migration. Areas like this may be located off Porkkala or Hanko, for example. Deterring flocks resting or eating will be strenuous for the birds during the migratory period in particular, which is why deterring is forbidden, until the birds naturally move elsewhere. Using an expulsion charge for fish deters fish from the area and reduces the impact on fish. Using the charge in all situations will ensure that unidentified fish are also deterred from the area.

Permit provision 3. The provision has been issued to prevent ship and boat damage when detonating the munitions.

Permit provision 4. The purpose of the provision is to allocate the detonation activities to a timeframe which involves as few disadvantages as possible. On ice and ice floes, there may be seals resting, and the seals may end up in the clearance area. This is why the clearance area and its neighbouring areas must be ice-free. As a result of long-term winds, the currents in the Gulf of Finland may temporarily change. This would mean that the sediment suspended in the detonation and the contaminants in the sediment could expand

to a more extensive area, and in an unpredicted way. This is why it must be ensured before the detonations that the currents are normal.

Permit provision 5. After the detonation, it is necessary to collect the remains of the clearance site so that in the area, there no longer are any explosive remains, or remains that will result in harmful impacts on the environment, or make fishing difficult. Dead and injured fish must be removed so that the detonations will not lure seals or birds to the area.

Permit provision 6. During the work, munitions may be found in the pipeline installation corridor or its immediate vicinity, and based on the safety assessment, these munitions may cause an explosion as a result of a munition near them being detonated. It will also be necessary to clear such munitions. The clearance is to adhere to the same principles and provisions as has been set out for clearing the munitions as per the permit application. It is necessary to notify about the site in advance to monitor the clearance.

Permit provision 7. The purpose of the provision is to ensure the underwater cultural heritage, to ensure that the condition of important sites will remain as it is, and to make it possible to take the required measures.

Permit provisions 8 and 9. The plan for changing the ship traffic route distribution systems must be submitted to the authorities maintaining the GOFREP system for approval, and the changing must be notified according to what the IMO's decisions require, before the munitions clearance equipment moves to the GOFREP area and commences clearance. The munitions listed in provision 8) are located off Porkkala near a ship route, and changing the route requires communication as required by the IMO. Provision 9) has been issued to ensure that ship traffic in the Gulf of Finland is carried out in a safe and flexible way during the clearance. In the Finnish EEZ, the Border Guard is in charge of sea rescue operations, border security maintenance, carries out separately specified monitoring tasks (related to environmental protection, for example), and takes measures to prevent crimes in advance, investigate crimes and to report them for prosecution, as well as carries out police and customs assignments. In the EEZ, the control centre of the Gulf of Finland Coast Guard of the Border Guard acts as the co-ordinating distributor of information to other supervisory authorities, and authorities monitoring the public interest, as set out in the Water Act.

Permit provision 10. The provision is set out in case the munitions clearance causes such damage which have not been presumed. If the clearance causes damage to fishing or cables, the assignee may submit a claim regarding the damage to the Environmental Permit Authority, as set out in the Water Act.

Permit provision 11. The provision concerning monitoring has been issued to assess the impacts of the clearance and to supervise that the work is carried out according to the permit. To monitor the re-sedimentation of harmful substances and solids released from the sediment as a result of the detonations, more samples have to be taken than has been proposed in the monitoring schedule. It is necessary to make the sampling network denser to ensure that the impact of the detonations will be monitored as comprehensively as possible.

Permit provision 12. Based on this decision, it will be possible to clear the munitions in two stages by first clearing the munitions for which an advance notification required by permit provision 8) is not required to be submitted to the Finnish Maritime Administration six months before commencing the clearance. If the clearance is implemented in two stages, further clarifications and additions to the permit can be made on the basis of the first-stage clearance monitoring information and impact assessments in order to improve the monitoring or to minimise the disadvantages.

Permit provision 13. The provision has been issued pursuant to the Water Act. The two-year deadline is enough to complete the work. The deadline cannot be extended because conditions may change, which would mean that the reports concerning the permit application should be reviewed again.

Taking into account the assessment pursuant to the Act on Environmental Impact Assessment

Statement by the Uusimaa Regional Environment Centre

On 2 July 2009, as the co-ordinating authority, the Uusimaa Regional Environment Centre has issued a statement on the Environment Impact Assessment Report regarding the Russia/Germany underwater natural gas pipeline project in the Finnish EEZ. In its statement, the Uusimaa Regional Environment Centre addresses munitions clearance as part of the entire project.

The uncertainty factors in modelling related to water quality should have been addressed in more detail. The concentrations of contaminants in sediments should have also been investigated for the deeper layers.

The placement of the munitions clearance works in different sedimentation areas has not been addressed comprehensively enough. From now on, it is necessary to present more detailed impact areas for all of the measures to be carried out so that the figure and map presentations take the uncertainty factors into account. The additional clarifications must describe in more detail the occurrence of values deviating from the background levels of seawater, as well as describing the transboundary impact of the spreading of sediment. The spreading of contaminants as a result of munitions clearance

has not been discussed. The presented results do not clearly indicate which part of the harmful substances travels to the upper water layers. Regarding all munitions clearance work carried out near the boundary of the Finnish EEZ and the EEZs of other countries, the spreading of contaminants caused by the work must always be presented in a map format when one or more critical limit values (PNEC values) are exceeded. The dissolution of contaminants in surface water and the movement of contaminants to surface water must be discussed more clearly.

Further clarifications must take into account the significance of the dissolving of nutrients, and the significance of phosphorus in the pore water of the seabed sediment. This means that it will also be possible to clearly assess the impact caused by the released nutrients on plankton production in different timeframes.

Unidentified barrels and containers in the installation corridor and the security corridor must be considered as hazardous waste. In further preparations for the project, how these objects are intended to be processed must be presented.

The impacts on benthos have not been reviewed sufficiently. The species in the Sandkallans southern area off Kalbådagrund and the impact on the species must yet be reviewed in more detail, in case the Council of State decides to propose that the area be included in the Natura 2000 network.

Not all aspects of the impacts on plankton have been sufficiently reviewed. From now on, the assessment must be supplemented with a more detailed review on the impact of the released nutrients on plankton production, as well as on the spreading of contaminants, and the accumulation of contaminants in the food chain.

From now on, the spreading of contaminants into the entire water column must be reviewed, as well as the impacts of the contaminants on fish nutrition and fish. To support the review, initial data concerning the contaminant concentrations in fish in the Gulf of Finland must be provided. It is yet possible to mitigate the impact on fish by carrying out the munitions clearance outside the spawning periods of fish.

The munitions clearance will impact on mammals. From now on, the mitigation measures must yet be clarified further. The impact of the project on birds must yet be mitigated through the correct timing of the construction measures. Mitigation measures must also be presented for cultural heritage sites.

There are scientific monitoring stations located near the pipeline. From now on, a more detailed review must be provided concerning the locations of the monitoring stations, and how the project will impact on them. When necessary, a proposal must also be made concerning the measures to move the stations.

The project will be partially implemented within the route areas of the Gulf of Finland compulsory registration system (GOFREP). The risks of the project to maritime traffic must be reviewed.

From now on, more detailed reviews must be presented regarding the impact of the project implementation on other infrastructure in the area (cables), as well as a more detailed review of the establishment preconditions for various exclusion and restriction zones.

Taking the assessment into account

The application has been supplemented with the sediment sampling results of 2009. The application and the supplements have reviewed the depth distribution of harmful substances and nutrients, the solubility characteristics in sediment, and the quality and distribution areas (including transboundary impact) of the sediment in the detonation sites. In addition, the release of solids and harmful substances and their re-sedimentation must be monitored according to the permit provisions to monitor the impact of the detonations.

Water quality, the release of harmful substances and nutrients from the sediment, as well as their spreading and movement into the surrounding sea water, accumulation in the food chain, and impact on algae production have, in regard to the impacts of the detonations, and the application decision, been reviewed sufficiently in the reviews, models, and risk assessments annexed to the application. The uncertainty factors have been taken into account in the risk assessment according to the precautionary principle.

The mitigation of the detonation impacts on fish, birds, cultural heritage sites, barrels, maritime traffic, scientific monitoring stations, and cables have been taken into account in the permit provisions of the decision. The permit provisions also set out provisions and review obligations concerning exclusion and restriction zones, as well as monitoring the area before and after the detonation.

The reviews concerning the project's possible impact on the planned Natura 2000 area are sufficient.

The assessment has been taken into account as shown in the decision and its grounds.

Taking into account the statements issued by states concerning the Transboundary Environmental Assessment Impact procedure

Statement by Estonia

It has been estimated that the munitions clearance will cause impacts mainly on the Estonian EEZ due to its closeness. This is why Estonia has also been provided (for information) with the applicant's response to the views expressed by Estonia.

In its statement to the Uusimaa Regional Environment Centre, Estonia says that the Transboundary Impact Assessment is very superficial and insufficient. This applies to both the Espoo Report and the Finnish national EIA assessment report. The assessment reports do not provide an adequate review of the cumulative and transboundary impact caused by contaminant re-mobilisation and spreading. Particularly the release and spreading of dioxins have been discussed insufficiently. Surveys of contaminant concentrations in sediments located deeper than 6 cm are missing. The sediment must be surveyed up to a depth of 40 to 50 cm. There are no exact results for the suitability of the models used. The conducted risk assessment underestimates the impact. Estonia has paid attention to the fact that that not all surveys had been carried out, and the assessment results cannot be regarded as final until all of the information has been acquired and analysed. Estonia finds that a majority of the assessments made must be carried out again.

Estonia has been provided with further clarifications for consulting pursuant to Article 5 of the Espoo Convention, as well as article 12 of the bilateral treaty between Finland and Estonia regarding the environmental impact assessment. On 15 September 2009, Estonia provided the Western Finland Environmental Permit Authority with a statement on the further clarifications.

In its statement, Estonia finds that the biggest health risk is constituted by the area in the Gulf of Finland in the impact zone of Kymijoki River: the area has been intensively contamined by dioxins and mercury, and the highest concentrations are located in the depth of 8 to 17 cm in the sediments. The new sample results have also shown that the highest dioxin concentration would have been 64 pg/g in a sample taken at the mean depth. However, the results have been presented as combined with the respective dioxin concentrations for two other layers (upper and lower), the combined concentration (0–30 cm) being 33 pg/g. The method is unclear. The high dioxin concentration describes the impact on the Kymi River. Kymi River also has high concentrations of mercury, which is why there may also be more mercury than has been presented.

The new data is based on unclear surveys and they underestimate the mobilisation of contaminants and their accumulation in food chains. Mean and type values, for example, have been used in an unclear way.

The most significant health impact will result from contaminants accumulating in the fauna of the Gulf of Finland.

Estonia finds that due to the deficiencies in the reviews, the munitions clearance may constitute a serious risk and a serious transboundary impact on Estonia. The assessment of the health risk caused by dioxins has used erroneous assumptions. Fish consumption, for example, is as much as five to ten times higher than Finns'

fish consumption. Breast-fed children, in particular, may get a large amount of dioxins from breast milk.

The prepared monitoring plan is flawed, and supplementing it also requires that the views by Estonian experts are taken into account. The munition-specific assessment regarding the spreading of the impact is flawed. The impact on ship traffic control must be planned together with Estonian authorities.

Taking the statement into account

In 2009, more sediment samples have been taken, and their results have been annexed to the application documents. In regard to the project's environmental impact assessment, the quality of the sediments, the depth distribution of harmful substances, the amount of the harmful substances, as well as the release, spreading and resedimentation of the substances, have been sufficiently reviewed. Also, in regard to dioxins and mercury, the material is sufficient to assess the impact, as well as to stipulate the measures for preventing disadvantages and damage.

The mercury load impact zone that has entered through Kymijoki River is restricted mainly in the sea area in front of the River. The soluble dioxin load that has entered through the river has an impact on the entire Gulf of Finland area, like other pollution sources. In the concentrations of dioxins and other harmful substances, no particular areas are identified where an exceptional amount of them would have accumulated. The majority of the substances end up in the sedimentation areas of the entire Gulf of Finland.

The risk assessment concerning health and the environment has been prepared according to the precautionary principle. No erroneous assumptions have been identified in the use of the models. For the harmful substances released as a result of the detonation impact, the accumulation potential and health risk increase against the already circulating substance amounts have been stated to be minor. The impact caused by the detonations will be monitored pursuant to the permit provisions.

The transboundary impact of the detonations has been duly reviewed. The decision has issued provisions for disadvantages, damage, monitoring and compensation.

The permit application has been supplemented in regard to the monitoring plan, and a view shared by the applicant and the Finnish Maritime Administration, with the procedures as required by the GOFREP system during munitions clearance.

Applied legislation

Chapter 1, Sections 15 and 19; Chapter 2, Sections 1 a, 3, 6(2), 11 and 14 a of the Water Act

Sections 42, 43, 46, 52 and 110 of the Environmental Protection Act
Section 65 of the Nature Conservation Act
Article 6 of the Convention on Environmental Impact Assessment in a Transboundary Context (Treaty Series 67/1997)
Article 13 of the treaty between the Finnish State Government, and the Estonian State Government regarding transboundary environmental impact assessment (Treaty Series 51/2002)

Permit to commence work

The Environment Permit Authority grants Nord Streat AG a permit to commence the work before this decision becomes lawful and binding.

Before commencing the work, the permit holder must provide collateral of EUR 100,000 to the State Provincial Office of Southern Finland for any possible damage, detriment and compensation for damage, disadvantages and costs which may arise from the abolishment of the decision or a revision of the permit provisions.

Grounds

The urgent commencement of the work is to be considered important for starting the work included in the construction plan acting as the basis for the application, and postponement of the work would cause major damage to the applicant, or the work can be started without causing any permanent damage to other forms of water use, the nature or natural activities if the permit is denied based on an appeal or if the permit provisions are revised. Taking into account the characteristics of the clearance work, the environment (after carrying out the work) can in substantial part be restored back to the previous state if the permit is denied or if the permit provisions are revised.

Section of law

Chapter 2, Section 26 of the Water Act

Statement on remarks and claims

The Environmental Permit Authority takes 1) the Ministry of Transport and Communications' remark into account as is set out in the permit provisions. The claim concerning the compensation for costs incurred to the authorities is disallowed since the claim is not based on law.

As is shown in the permit provisions, the Environmental Permit Authority takes into account the remarks by 2) the Uusimaa Regional Environment Centre, 3) the Southwest Finland Regional Environment Centre, 4) the Uusimaa Employment and Economic Development Centre, 5) the Southwestern Finland Employment and Economic Development Centre, 6) the Finnish Maritime Administration, 7) the Finnish Maritime Administration's southwest Finland route unit, 8) the National Board of Antiquities, 9) the Environment Committee of the City of Helsinki, and the 10) Environment Protection Committee of the City of Porvoo, as well as the views of 11) the Fin-

nish Association for Nature Conservation, and the Uudenmaan ympäristönsuojelupiiri ry.

In regard to the remarks by 12) AS Nordic Energy Link, and 13) Pohjolan Voima Oy, the Environmental Permit Authority says that based on the further clarifications submitted by the applicant, the clearance works will not damage the joints of the Estlink cable. Permit provision 10) sets out the stipulations for compensation for unpredicted damage.

Regarding the statement by the Finnish Environment Institute (SYKE), the Environmental Permit Authority says that the munitions clearance impacts on barrels have been reviewed in the permit application with sufficient accuracy. Permit provision 1) sets out the stipulations for inspecting the barrels.

PROCESSING FEE AND ITS DETERMINATION

The processing fee for this decision is EUR 1,039.50.

The fee has been determined pursuant to the decree (1388/2006) issued by the Ministry of the Environment regarding payable assignments, and pursuant to the fee table annexed to the decree. According to the fee table, the fee for the processing of an application regarding other project pursuant to Chapter 2 of the Water Act totals EUR 770. The fee has been increased by 35% since the amount of work required by the processing is higher than that specified in the table.

APPEALING The decision can be appealed to the Administrative Court of Vaasa.

Appendices 1) Appeal directions
2) Map

Mika Seppälä

Tapio Kovanen Hannu Kokko

Johanna Juvonen

Environment counsellors Mika Seppälä, Tapio Kovanen (reviewing member) and Hannu Kokko have participated in making the decision. The matter has been presented by Johanna Juvonen, presenter.
JJ/ts

Appellate authority

The decision by the Western Finland Environmental Permit Authority can be appealed to the **Administrative Court of Vaasa**. The fee charged for processing the matter is appealed in the same sequence as the main matter.

Time for appeal

The time for making the appeal is thirty (30) days from the issuing date of this decision, excluding the issuing date. The time for appeal will expire on **2 November 2009.**

Right of appeal

The decision may be appealed by those whose rights or interests the matter may concern, as well as the following parties operating in the impact zone to promote environment protection, health protection, nature conservation, or a pleasant living environment: registered associations or foundations, the municipalities concerned, the regional environment centres, municipal environment protection authorities, and other authorities supervising the public interest in the matter.

Content of appeal

The petition of appeal to the Vaasa Administration Court must include the following information:

- The decision appealed
- The name and home municipality of the appellant
- Postal address, telephone number, and e-mail address (if any) where notifications concerning the matter can be delivered to the appellant (if there are changes to the contact details, you must provide notice of the changes to the Administrative Court of Vaasa, P.O. Box 204, 65101 Vaasa, e-mail: vaasa.hao@oikeus.fi)
- What aspects of the decision are being appealed against
- What changes are demanded to the decision
- The grounds for demanding the changes
- Signature of appellant, his/her legal representative, or proxy, unless the petition of appeal is submitted in electronic format (fax or e-mail)

Appendices to the appeal

The following must be annexed to the petition of appeal:

- Documents which the appellant bases their demands on, unless the documents have already been submitted to the authority
- The power of attorney of the proxy (if any), or a report on the proxy's authority when submitting the appeal in electronic format

Submitting the appeal to the Environmental Permit Authority

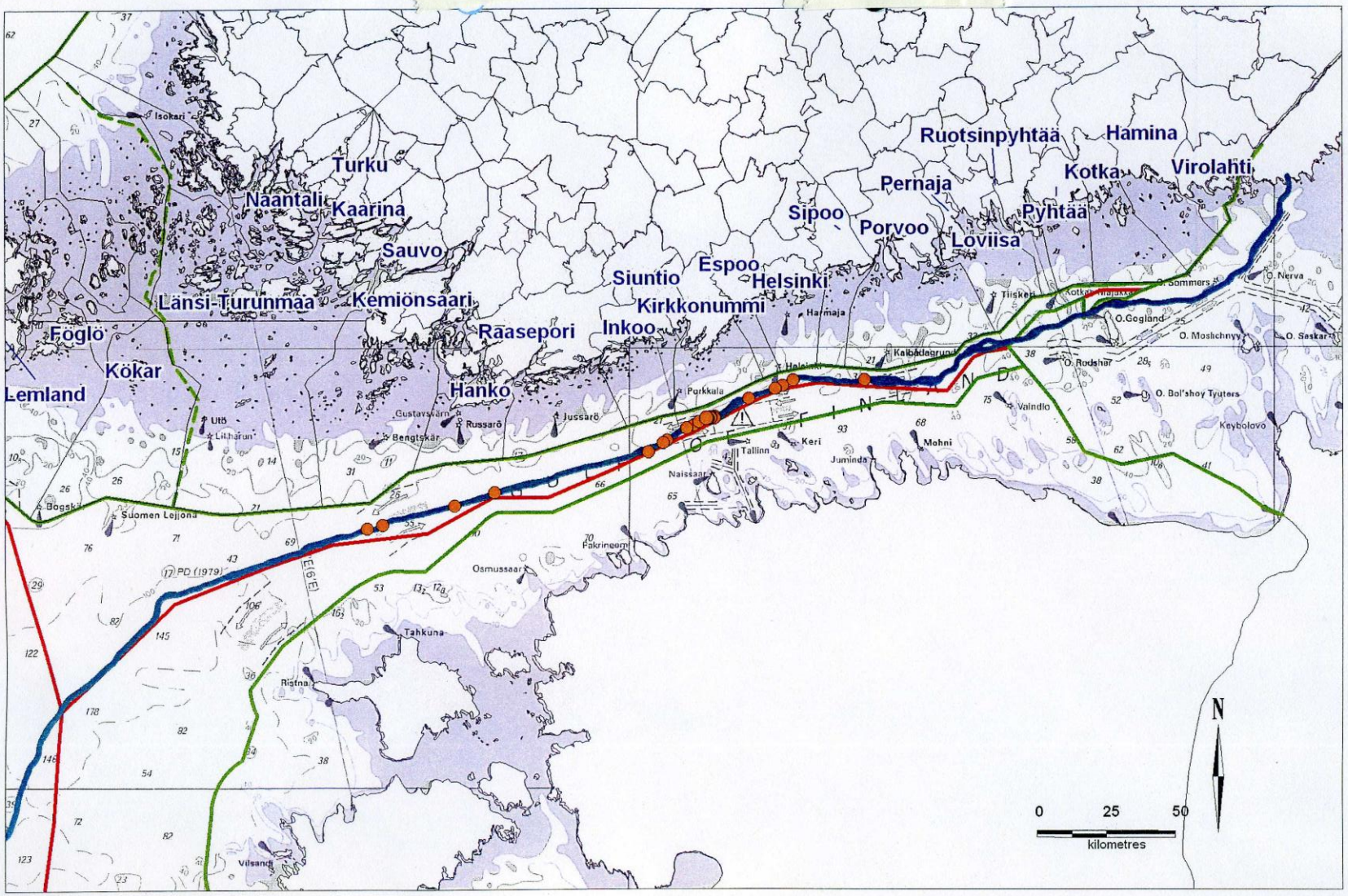
The petition of appeal and its appendices must be delivered in two copies to the register office of the Western Finland Environmental Permit Authority. **The petition of appeal must reach the office no later than the last day of the time of appeal** before the end of office hours. The petition of appeal and its appendices can also be submitted by mail, fax, or e-mail. When the petition of appeal is submitted electronically (by fax or e-mail), it must be submitted so that it will be available in the reception device or data system no later than the last day of the time of appeal before the end of office hours.

Contact information of the Western Finland Environment Permit Authority

Street address:	Asemapäällikönkatu 14, 00520 Helsinki
Mailing address:	P.O. Box 115, 00231 Helsinki
Telephone:	(switchboard) 020 610 121
Fax:	(09) 726 0233
E-mail:	kirjaamo.Lsy@ymparisto.fi
Opening hours:	from 8 am to 4:15 pm

Procedure fee

The appellant will be charged a procedure fee of EUR 89 for the processing of the matter by the Administration Court of Vaasa. The Act on fees charged for assignments carried out by courts of justice, and some judicial administration authorities separately stipulates certain cases where a fee is not charged.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Lemland
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Siuntio
Kirkkonummi
Espoo
Helsinki
Sipoo
Pernaja
Porvoo
Loviisa
Ruotsinpyhtää
Pyhtää
Kotka
Hamina
Virolahti
Isokari
Utö
Bengtskär
Russarö
Jussarö
Gustavsvärn
Purkkala
Tallinn
Keri
Naissaar
Juminda
Mohni
Vaindlo
Harmaja
Tiiskeri
Kalbådagrund
Suomen Lejona
Osmussaar
Pakrineem
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Talousvyöhykkeen raja

APPENDIX 2