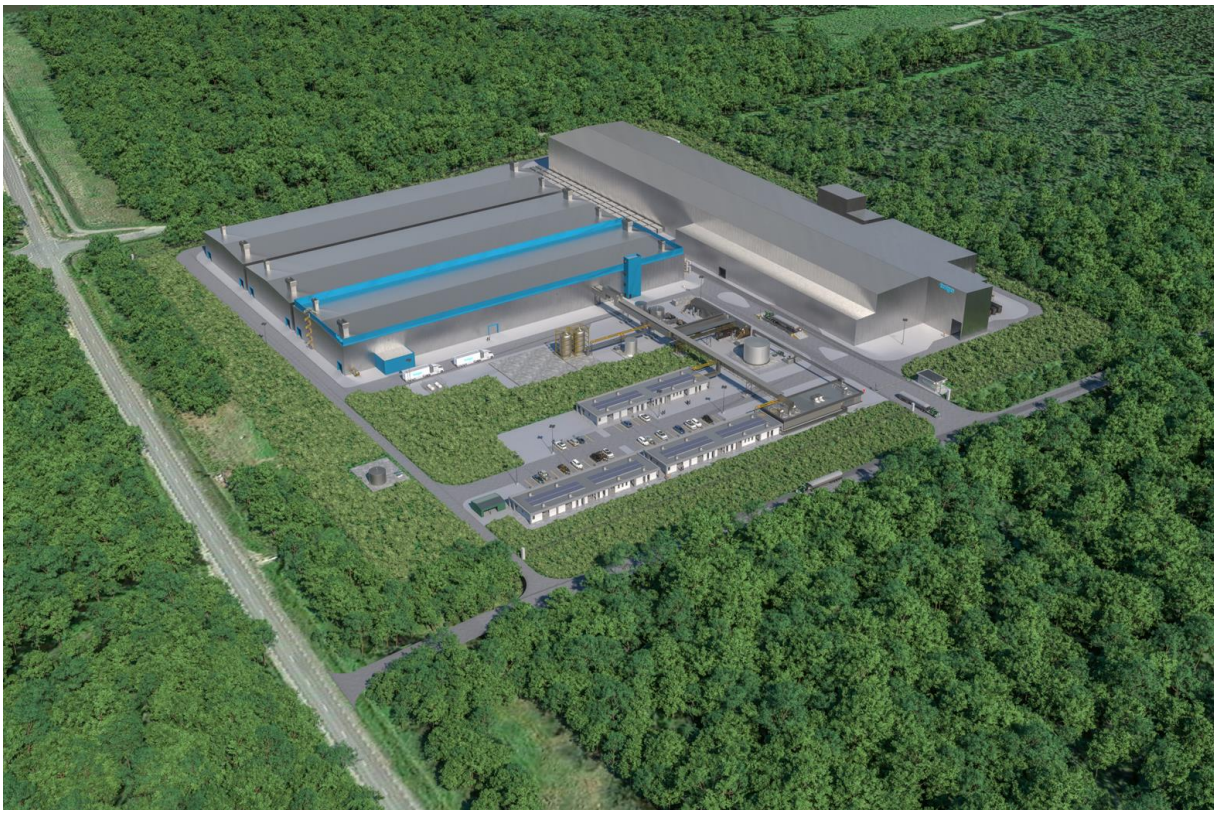
ANNEX B – ENVIRONMENTAL IMPACT STATEMENT

TALGA AB

2022-06-23



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Talga AB

CLIENT

Talga AB

CONSULTANT

WSP Environmental Sverige
Box 574
WSP Sverige AB
201 25 Malmö
Besök: Jungmansgatan 10
Tel: +46 10 7225000

wsp.com

CONTACT DETAILS

Christin Jonasson, Talga AB, 010-303 71 11
Sara Edlund Fredholm, WSP Sverige AB, 010-722 91 42

ASSIGNMENT
Talga AB, Technical description and EIA

ASSIGNMENT NUMBER
10330552

AUTHORS
Cecilia Borgenhede, Ida Zwahlen & Sara Edlund Fredholm

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Reviewed by
Anna Enborg

Approved by
Sara Edlund Fredholm

NON-TECHNICAL SUMMARY

Background

Talga AB (Talga or the Company) is a Swedish, wholly-owned subsidiary company of the Australian company Talga Group Ltd. Talga is an innovation materials company that develops and manufactures green battery anode products, technology and innovation materials. The core business is primarily the manufacture of graphite-based battery materials, but Talga also develops other innovation materials. The company now intends to manufacture anode materials for lithium-ion batteries, which will primarily be used in the electric car sector.

Talga's first large-scale factory for the manufacture of the anode product Talnode-C® is planned to be established within Luleå Industrial Park (Hertsöfältet), Luleå municipality. Large-scale production is planned to begin in 2024 and then be scaled up further in 2025. At the plant, a maximum of 25,000 tons of graphite concentrate will be processed per year to produce a maximum of 22,000 tons of Talnode-C® per year. The process requires, among other things, nitrogen gas, which will be produced at the plant in an amount of about 19,500 tons per year.

Luleå Industrial Park is today an undeveloped area located about 7 kilometers southeast of Luleå city. The field consists of flat woodland of managed young forest with elements of marshlands, wetlands and smaller watercourses and ditches. The area is planned to be used, according to the existing development plan, for the establishment of heavy industries and other industrial activities that produce nuisances. The project is consistent with the detailed development plan, as well as the master plan. The industrial area in development plan is bordering in the southwest by Inre Hertsöfjärden and in the southeast by Sörbrändöfjärden and by Hertsövägen in the northeast. South of the project area, on the other side of Hertsöfjärden, is Svartön where an existing industrial area is located. Luleå Industrial Park and Svartön's industrial area are connected by a bridge that is currently equipped with a security gate.

The nearest residence is located about 900 meters east of the project area. The nearest residential areas are located about 1.4 kilometers to the east and west.

The project area is not located within any area protected under Chapter 7 in the Swedish Environmental Code. The nearest designated protected area is the nature reserve Ormberget-Hertsölandet, which is located about 620 meters north of the project area, on the other side of Hertsövägen. In addition to this, there is a national interest in nature conservation about 2.8 kilometers and two Natura 2000 sites designated under the Habitats Directive about 4.8 and 5.5 kilometers respectively from the planned area of activity.

The project area is within two areas of national interest for outdoor recreation under § 2, chapter 4 and § 6, chapter 3 in the Swedish Environmental Code, respectively. Both of these national interests extend over very large areas in the Norrbotten archipelago. A number of designated national interests for communication regarding railways, roads and airports are located in adjacent areas. Luleå Airport/Kallax Swedish Air Force Wing is located approximately 7 kilometers from the project area. The industrial area is covered by the Minimum Safe Altitude or MSA-area of the airport. The planned area of activity is also within the national interest for defence and the Armed Forces.

The company plans to extract cooling and process water from Inre Hertsöfjärden and discharge treated process wastewater together with heated cooling water to Sörbrändöfjärden. In total, water withdrawal can reach up to 14 million m^3 per year. To enable this, water pipes need to be built. Sörbrändöfjäden, which will be the recipient of the treated process wastewater discharges, is classified with good ecological status but does not achieve good chemical status.

Preparation of the project area with respect to the construction and installation of the Company's plant requires local and temporal lowering of the groundwater surface during the construction period by diversion or pumping. The establishment of the facility will also entail a limited, but permanent, lowering of groundwater levels (corresponding to approximately 0.1-0.4 meters) in the area. The extent of groundwater subsidence is mainly within the Company's own area of plant.

Due to use and management of hydrofluoric acid, the planned facility is covered by the provisions of the Swedish Law (1999:381) on measures to prevent and limit the consequences of serious chemical accidents (Seveso Directive for industrial activities) and is categorised in the upper tier. Other chemicals covered by the Seveso legislation that will be handled within the facility are LPG and diesel. A safety report and associated risk assessment have been produced for the operation, which can be found in appendix D of the permitting application.

A number of potential locations have been investigated, before Luleå Industrial Park was chosen as most favourable. As an alternative to Luleå, different locations in Skellefteå, Boden and Piteå have also been studied and compared. The assessment has taken into account environmental aspects, but also functionality, logistics, marketing and production costs. The alternatives were of equivalent importance in many aspects, but Luleå has, in an overall assessment, stood out as most advantageous in terms of environmental aspects, accessibility for transport, expansion opportunities, good labour market and suitable conditions for discharge in surface water. Additionally, the airport is in close proximity, and there are good opportunities to interact and collaborate with other companies.

The planned facility is covered by the European Commission's Best available techniques (BAT) reference documents (BREFs) for the non-ferrous metals industries (BREF NFM). The facility is also covered by general BREF documents, with respect to Industrial Cooling Systems (ICS) and Emissions from storage (EFS).

The zero alternative describes the future situation in the area if the Company does not build its facility at the planned location. Because the land is already regulated by the detailed development plan and s marked as industrial area, the project area in question will be, regardless the actualization of this project, used for industrial purposes including side activities, such as laying of cables, constructing new roads, ditches, etc. So, in the zero alternative the area would instead be exploited by another facility operator. Since it is not known what other type of industry would be built on the site, the zero alternative involves, in this case, all the necessary activities so that the property is ready for industrial use.

Since the zero alternative itself represents a significant change compared to the current situation, which involves an unconstructed natural environment, an assessment has also been made in comparison to the current situation.

Impact assessment

Based on the environmental impact assessment, the biggest impact of the planned facility, in comparison to the current situation, are moderately negative impact regarding use of land and water resources, natural environment, energy use and waste. Furthermore, the project is considered to have a small negative impact compared to the current situation regarding outdoor recreation, reindeer husbandry, raw materials and chemical products, landscape, water supply and use, groundwater, discharge to surface water, air emissions, noise, transport and risk and safety. However, in comparison with the current situation, the project is considered to have insignificant impact with respect to the cultural environment, other types of protected areas and external incidents.

Compared to the zero alternative, the project is estimated to have moderately negative impacts regarding energy use and waste, while it is considered to have small negative impacts on landscape, use of land and water resources, natural environment, raw materials and chemical products, water supply and use, discharge to surface water, air emissions, noise, transport and risk and safety. The

project, compared to the zero alternative, entails insignificant impact on reindeer husbandry (although small negative impact is expected in the short-term period), cultural environment, outdoor recreation, other area protection, groundwater and external incidents.

The energy use will correspond to the annual energy use of approximately 8,700 (detached) houses and is estimated to have a moderate impact on the environment, from an energy resource consumption perspective, in comparison to both the current and the zero alternatives. However, the planned facility will be using renewable electricity, and therefore the energy consumption is estimated to have an insignificant impact on the climate.

The proposed facility is not expected to affect the ecological or chemical status of the nearest surface water bodies, as a whole. The planned activities are also not considered to jeopardize the ability to reach current environmental quality standards. However, the project involves the release of particularly polluting substances (zinc and arsenic) at concentrations that exceed the assessment criteria for good status, according to the Swedish Agency for Marine and Water Management's regulations, within a small area directly adjacent to the outlets. The project is not expected to affect the status of Inner Hertsöfjärden or Sörbrändöfjärden, as a whole.

The operation of the facility will cause a rise in air emissions, mainly due to release of carbon dioxide and particles. A smaller amount of hydrofluoric acid and nitrogen oxides will also be emitted. The concentrations at the nearest residence are expected to be below the values of both the environmental quality standards and the environmental objectives.

The noise levels that the facility can be expected to produce at the nearest residence and in the nearest nature reserve are at all hours of the day below the guideline values established by the Swedish Environmental Protection Agency and which in practice have been considered acceptable. The business's transports are estimated to constitute a small portion of the total traffic situation.

The implementation of the project is not considered to prevent the use of the area that has been designated as a national interest for outdoor recreation or communication in the immediate area, nor to affect the interests of the Swedish Armed Forces. However, some impact on the landscape will occur.

A certain negative impact is expected to occur on the natural environment, as a result of the implementation of the project, mainly in comparison to the current situation. Impact on species in the area will only occur at a local level, not at a regional or national level. The same applies to reindeer husbandry. This is due to the exploitation of the undeveloped forest areas. However, compared to the zero alternative, the impact is considered to be insignificant.

The company will actively work on minimizing and recycling waste produced into the facility. Sludge from the water treatment plants constitutes a significant part of the facility’s waste, and to the extent that it can no longer be recycled or reused, it will be transported to a landfill.

The planned facility entails risks that are mainly associated with handling of hydrofluoric acid and LPG. However, the risk assessment carried out has shown that these risks are considered acceptable. It is estimated that possible effects on human life and health in the surrounding environment can only occur in connection to a major leakage of hydrofluoric acid outdoors or in the event of a gas tank failure with ignition. The individual-based risk assessment indicates that the risks to third parties are limited to the area closest to Talga's facility. It is considered unlikely that an incident at Talga's plant could initiate a serious chemical accident at nearby Seveso industries. The risk assessment regarding consequential activities shows that the risk levels linked to the transport of hydrofluoric acid to Talga's industrial plant are acceptable from an individual and societal risk perspective. Mitigation and safety measures are planned for all identified risk scenarios.

The overall assessment is that the environmental impacts of the planned industrial plant are acceptable due to the facility’s scale and location, the mitigation and safety measures that will be

taken, and the company's continuous efforts to reduce its environmental impact. When comparing the project at hand to the current situation and the zero alternative, it can be concluded that the environmental effects related to the operation of the facility are of equal extent from a short, medium and long perspective. Thus, no actual obstacles are considered to arise with respect to issuing permits for Talga’s proposed facility.

TABLE OF CONTENTS

ANNEXES

1 INTRODUCTION

1.1 ADDMINISTRATIVE INFORMATION

Facility operator:	Talga AB
Organisation number:	559155–0677
Address:	Kungsgatan 5B, 972 35 Luleå
Contact person on environmental issues:	Christin Jonasson, Environmental Engineer, MSc
Contact details:	christin.jonasson@talgagroup.com, 010-303 71 11
Property designation:	Hertsön 11:1010, Hertsön 11:1
Region / County:	County of Norrbotten
Municipality:	Luleå Municipality

1.2 ASSIGNMENT

WSP Sverige AB has been assigned to do and environmental impact assessment (EIA) to investigate the environmental impact of the planned facility and compile this environmental impact statement (EIS) based on information about the planned facility provided by Talga AB (Talga or the Company) and performed investigations. The EIS is included as part of the Company's permit application and aims to describe the impact of the applied business on people, the environment and the management of natural resources.

1.3 BACKGROUND

The world is currently facing very great challenges in terms of changing the global climate. Slowing down global warming requires, among other things, reducing greenhouse gas emissions. At international, national and regional level, decisions on an energy transition have been taken. Fossil and finite energy sources, such as coal, gas and oil, will be phased-out towards more environmentally friendly alternatives. Within the EU, there are targets for at least 32% of the EU's total energy consumption to come from renewable sources by 2030. This is part of the effort to achieve the Paris Agreement, which entered into force in 2016. The Swedish government has set an energy policy goal that Sweden's energy production by 2040 should be 100% renewable. In order to meet this goal, the use of fossil fuels must be phased-out in favour of fossil-free alternatives, not least in the automotive industry. The electrification of vehicles, both passenger cars and transport and industrial vehicles, is an important tool to enable this transition. At the same time, electrification means an increased need for electricity and thus batteries for electric cars.

Talga AB (Talga or the Company) is a Swedish, wholly owned subsidiary of the Australian company Talga Group Ltd. Talga is an innovation materials company that develops and manufactures green battery anode products, technology and innovation materials. The core business is primarily the manufacture of graphite-based battery materials, but Talga also develops other innovation materials. The included-in-this-application project aims to be part of the green transition and create sustainable growth by refining socially necessary metals and minerals. The company therefore intends to operate a large-scale facility for the manufacture of the anode product Talnode-C®, which is used in car batteries.

Talga has been investigating minerals in Sweden since 2011 and has made major investments in exploration, permits, feasibility studies and enrichment and processing methods to design an integrated project from ore to finished product. The planned plant will be designed to process graphite from Talga's planned graphite mines in Nunasvaara and eventually also Niska, both located in Kiruna municipality, in which so-called Vittangi graphite will be mined. Nunasvaara graphite deposit constitutes national interest for valuable substances or materials and is thus a resource of national importance. At Nunasvaara South, it is planned to extract up to 120,000 tons of graphite ore per year that will be crushed and enriched on site. The concentrate from the enrichment will then be transported to the applied plant in Luleå for processing. Applications for processing concessions and permits, according to the Swedish Environmental Code (Miljöbalken or MB) for mining operations, are currently being processed by the Geological Survey of Sweden and the Land and Environment Court in Umeå, respectively.

Vitangi graphite has unique properties that provide significant environmental benefits over the industry standard for natural graphite. The high quality of Vittangi graphite in terms of high graphite content means that significantly (3–8 times) less ore needs to be mined to produce the same amount of graphite concentrate compared to other deposits globally. In addition, the Vitangi graphite has advantages linked to its location. In northern Sweden, where the deposit is located, processing can be carried out with electricity with low carbon intensity which is available in the electrical power grid.

Manufacturing of graphite anode materials is an energy-intensive process that today is mostly carried out in China, Japan and South Korea. In these countries, the manufacture of anodes relies on synthetic graphite which is largely made from crude oil by using fossil energy produced from coal. By mining natural graphite and producing anode material in northern Sweden by using electricity produced by renewable energy sources, the carbon dioxide emissions associated with the product will be significantly lower compared to conventionally produced anode material.

In comparison with metals such as iron and copper, anode manufacturing requires complex and often specialized techniques for the extraction and chemical processing of the raw material. For applications, such as batteries, demanding prerequisites are also set on several properties such as shape, consistency and purity. For this reason, extensive testing is required to qualify the mineral for use. Talga, therefore, plans to produce and test anode materials on a pilot scale during a 1 to 2-year product qualification process. The pilot plant will be subject to permitting in a separate process that is expected to be carried out in a shorter time than the permitting process that Talga is now starting with the present application and technical description. The design described below refers to the design of the plant, including the parts of the pilot plant. Thus, this permitting application that is now being submitted intends to replace the planned permit for the pilot plant. In this EIA, no assessment of the pilot plant is made.

1.4 FACILITY'S CLASSIFICATION

The planned full-scale plant is classified according to the following provisions in the Swedish Environmental Permitting Ordinance (2013:251) (MPF):

- Chapter 4, paragraph 12, Category A and activity code 13.20-i, *plant for roasting or sintering metal-containing ore, including sulphide ore*.
- Chapter 12, paragraph 45, Category B and activity code 24.45, plant to manufacture gas- or liquid chemical products through only physical processes on an industrial scale.

Talga plans to take out cooling and process water from Inre Hertsöfjärden and build pipes to discharge heated cooling water and treated process wastewater to Sörbrändöfjärden, and temporarily during the construction phase locally lower the groundwater level. Due to the fact that these activities affect water

resources, a permitting application for implementing those activities, according to Chapter 11, § 3, bullet points 1, 2, 3, 4 and 6 in the Swedish Environmental Code (MB), will also be included.

1.5 OTHER RELEVANT LEGISLATION

The planned facility is subject to a permit in accordance with the provisions of Chapter 9, § 6, MB and Chapter 11, § 9 MB and the Swedish Environmental Permitting Ordinance (2013:251), MPF, as described above. In addition to this, the planned facility is subject to a permit according to the Flammable and Explosive Goods Act (SFS 2010:1011), which the present permit application for the plant does not include or cover.

The planned facility is also subject to the provisions of the Industrial Emissions Ordinance (2013:2509). BAT reference documents related to the planned plant were adopted on June 13, 2016, and are the BAT reference documents for the non-ferrous metals industries (NFM). General BAT reference documents according to ICS (Industrial Cooling Systems) adopted in December 2001 and EFS (Emissions from Storage) adopted in July 2006 are also applicable to the planned plant. A status report is attached to the application.

The planned plant is covered by provisions in the Act (1999:381) on *measures to prevent and limit the consequences of serious chemical accidents*, and is categorised in the upper tier. A safety report is attached to the current application.

Beside the permit that is now being applied for this facility, according to Chapter 9 and Chapter 11 in the MB and the above-mentioned provisions, the facility may eventually be subject to other permits or derogations under other chapters of the Environmental Code or under other legislation.

1.6 PUBLIC CONSULTATION

Because the planned plant is subject to a permit in accordance with Chapter 4, § 12 of the Environmental Permitting Ordinance, the facility falls under the category of activities that automatically entail significant environmental impact, in accordance with § 6 of the Environmental Assessment Ordinance. Since the extent of environmental impact that the facility entails is already regulated by the above-mentioned ordinance, no investigative consultation has been carried out, according to Chapter 6, § 23, MB, just an open public consultation with respect to scoping and assessment.

On April 9, 2021, the company sent out consultation documents to authorities and individuals who can be expected to be particularly affected by the project as well as the public and organizations that can be assumed to be affected. The consultation has been supplemented on 22 April 2021 with information on the construction of pipes and related equipment for the withdrawal of cooling and process water from Inre Hertsöfjärden, as well as the discharge of treated process wastewater to Sörbrändöfjärden. A further addition was made on 25 November 2021 regarding planned activities affecting water resources and how serious chemical accidents should be prevented and limited (issues related to Seveso Directive). On 8 June 2022, the consultation was further complemented by information on a new inlet for the abstraction of cooling and process water and the construction of associated pipelines for this, as well as information on planned nitrogen production.

The County Administrative Board of Norrbotten has declined a general consultation meeting and has instead participated in a limited meeting regarding, among other things, the delimitation of the application and risks in connection to transport. Consultation meetings concerning activities in or nearby water resources and risk and safety issues have been held with SSAB, LKAB and the Fire and Rescue Service.

Iinvitations to participate in the public consultation have been advertised in both Norrbottens-Kuriren and NSD newspapers.

During the consultation process, actors, beneficiaries and stakeholders have been given the opportunity to participate, give inputs and comment on the planned facility, described in the consultation paper and in subsequent additional documentation. The public consultation lasted until the 20th of June 2022, last day for incoming comments and inputs (with regard to the final public consultation conducted).

A consultation report has been prepared, which includes the comments and inputs received in their entirety and the Company's response to those, see further Appendix B:1.

After the Company has taken into consideration all the incoming comments and inputs, the present EIA and EIS has been conducted.

2 EIA METHODOLOGY

2.1 SCOPING

A delimitation of the content of the EIA means a focus on significant issues and environmental effects that must be impact assessed. The environmental effects described and assessed in this EIA are: the business's use of land and water area, impact on the natural environment, reindeer husbandry, cultural environment, outdoor life and landscape, other area protection, energy use, raw materials and chemical products, water supply and use, groundwater, emissions to surface water, emissions to air, waste, noise and vibration, transport, external events and risk and safety. Consequences for environmental objectives and standards are described throughout.

environmental impact assessment is also limited in time perspective and within the geographical area in which an impact can take place.

The environmental impact assessment is limited in substance to the activity applied for. The activities applied for concern the processing of up to 25,000 tonnes of graphite concentrate per year in order to produce up to 22,000 tonnes of anode material annually, and the production of 19,500 tonnes of nitrogen per year. The company also plans to take out cooling and process water from Inre Hertsöfjärden and discharge heated cooling water and treated process wastewater to Sörbrändöfjärden. The total withdrawal is estimated to amount to 1,600 m³ per hour, of which the withdrawal of cooling water will amount to 1,500 m3 per hour and the withdrawal of process water will amount to 100 m3 per hour.

, the impact assessment has mainly been limited to the area directly concerned by the activity applied for in accordance with Section 5. However, the geographical delimitation of each environmental impact may vary and be highlighted to the extent deemed necessary. Figure 1 presents the approaches that lead to the determination of geographical delimitation.

In terms of time, environmental impacts are assessed in the short, medium and long term.

Short term is up to 5 years.

The medium term is up to between 25 and 30 years, that is, the time that permits according to MB are usually used before they are replaced with new permits.

Long term is up to 75 years, that is, the equivalent of an average life expectancy of a human being.

Figure 1. Workflow for identifying geographical delimitation in EIA.

2.2 ASSESSMENT CRITERIA

The starting point in the present EIA is to report the environmental effects of the applied business based on a worst-case scenario at maximum production and maximum withdrawal of cooling and process water. The environmental impact assessment is qualitative, but is mainly based on certain frameworks that are referred to here as assessment criteria.

By applying the assessment criteria, the environmental effects of the planned activity can be put in relation to the value of each effect.

In the present EIA, the concepts of environmental impact, environmental effect and environmental impact are used. The impact and/or consequence can be of both a direct and indirect nature and relate to the value of the environmental effect, but can also be related to national, regional and local environmental objectives, environmental quality standards as well as national guideline values, limit values and current practice.

- The impact, effect and consequence of the activity applied for can be explained as follows:
- Environmental impact is the actual change in environmental and health aspects, such as the expansion of a road.
- Environmental impact is a change in environmental quality caused by an impact, e.g. noise.
- Environmental impact is the consequence of the environmental effects for any interest. The consequence is usually expressed as an evaluative assessment, e.g. impact on water and the risk of spreading pollutants in water. The consequence may be of a direct or indirect nature at a national, regional and/or local level.

In order to avoid or to reduce negative consequences, various measures (protective measures) are proposed if necessary.

The assessment is made by weighing up the value of the environmental impact and the extent of the planned action. The impact level is described according to a five-point scale; positive consequence, insignificant consequence, small negative consequence, moderate negative consequence and large negative consequence, see below Table 1. The assessment is made in relation to the zero option described in section 6.3.

Where appropriate, an assessment should also be made of the cumulative effects of other activities.

Tabell 1. Assessment criteria

Positive consequence	The activities entail an improvement for human health and / or the environment, which is given importance when assessing between values / aspects.	- The business contributes in a clear way with measures in the direction of the environmental goals.
Insignificant consequence	The business is not expected to have any effect, either positive or negative, on the value/aspect.	- No relevant items in the area that may be affected. - No obvious effect on relevant objects.
Small negative consequence	The business is only expected to have a negative impact of a minor nature and extent that does not entail any significant deterioration or damage to the value / aspect.	- Common impacts. - Impact on commonly used values that can withstand certain influences. - Influences that are accepted within current regulations and recommendations.
Moderate negative consequence	The business is expected to have an impact of a moderate nature and extent that entails a deterioration of or minor damage to the value / aspect.	- Impact on commonly used but sensitive values. - In cases where measures can be taken that mitigate the consequences, these may instead be assessed as a small negative or insignificant consequence.
Big negative consequence	The business is expected to have a greater nature and extent impact that entails a	- on a unique value. - In cases where measures can be taken that mitigate the consequences, these may instead be assessed as moderate or small negative consequences.

	serious deterioration of or damage to the value / aspect.	

3 PROJECT DESCRIPTION

3.1 GENERAL

As previously described, Talga intends to manufacture anode materials for lithium-ion batteries. The product is aimed at several industries, such as power supply, energy storage, vehicle manufacturing and shipping. The tallow production process will extend from mining and grafite mining to anode manufacturing plant. Mining is planned to be conducted in Nuunasvaara and eventually in Niska, both in Kiruna municipality, where so-called Vittangigrafit will be mined.

Talga's first large-scale factory for the anode product Talnode-C® is planned to be established within Luleå Industripark (Hertsöfältet), Luleå municipality. The purpose of the plant is to produce anode material for lithium-ion batteries for the electric car sector. The planned operation will be the first to produce battery anode material outside Asia. The processes are unique and have not been applied in the EU before.

3.2 PROJECT

Talga intends to apply for a permit from the Land and Environment Court at Umeå District Court in accordance with Chapters 9 and 11. MB for processing up to 25,000 tons of graphite concentrate per year in order to produce up to 22,000 tons of anode material annually. The company also intends to seek a permit for the production of up to 19,500 tons of nitrogen gas per year. The company intends to locate the facility for the manufacture of the anode material to the Hertsö field (Luleå Industripark) in Luleå municipality.

The application also includes a planned withdrawal of cooling and process water from Inre Hertsöfjärden and discharge of heated cooling water as well as treated process wastewater to Sörbrändöfjärden. The withdrawal is estimated to amount to a total of 1600 m³ per hour, of which the withdrawal of cooling water will amount to 1,500 m³ per hour and the withdrawal of process water will amount to 100 m³ per hour.

Luleå Industrial Park is today an undeveloped area, and Talga plans to establish a new business on the site. The plant is designed to process all production from Talga's proposed graphite mines, for which applications for processing concessions and environmental permits are currently being processed by bergsstaten and the Land and Environment Court in Umeå, respectively.

Preparation of the Company's operating area requires that the groundwater surface needs to be lowered locally and temporarily during the construction period by diversion or pumping.

The establishment of the plant will entail a limited, but permanent, subsidence of groundwater levels in the area. The groundwater subsidence takes place mainly as a result of the ditches that, in addition to those built by Luleå Municipality, will be built to divert stormwater from the operational area. The ditches are not built for the purpose of dewatering land, but only to divert stormwater. For the establishment of the business, large areas within the planned business area will also be hardened. In some areas, elevation of land will be carried out, which means excavation and filling in areas that can be considered water areas.

3.3 FACILITY DESIGN PARAMETERS

Talga's designated land area amounts to approximately 100,000 m^2. Three main buildings, consisting of two process buildings and one building for other facilities, will be erected. The area of the buildings will amount to approximately 41,700 m^2. In total, approximately 57,500 m^2 of the area is estimated to be built (including roads). The plant will be fenced. A proposed plant overview is shown in Figure Figure 2 and in the application's Appendix A:1. The final design of the facility is subject to change in the final design of the business.

The process buildings will consist of a building for the graphite purification process and a building for the anode production process. The building for the graphite purification process will be located in the northwestern part of the plant and the building for anode production will be located in the southeastern part of the plant. Mill and service areas will be located around the process buildings. A third building, containing, among other things, offices, guard, dining room and changing rooms will be located in the northeastern part of the facility. Parking areas will also be located to the northeastern part of the plant.

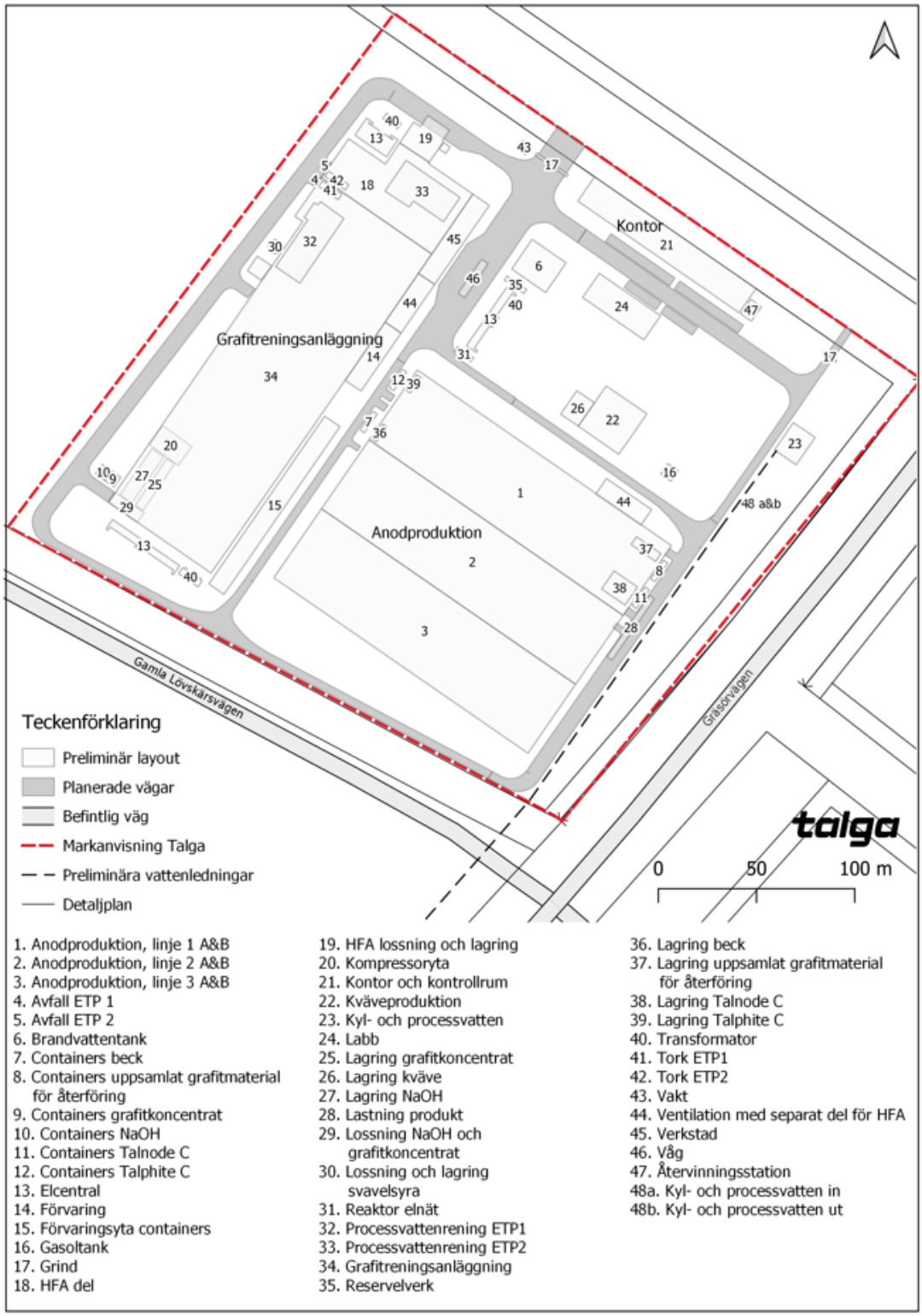


Figure 2. Plant overview.

3.3.1 Graphite treatment plant and anode production plant

The building for the graphite purification process will be about 250 meters long, about 80 meters wide and about 20 meters high to the nock, and will be built on one floor. The building for the anode production will be about 160 meters long, about 130 meters wide and about 20 meters high to the nock. The design of the buildings is preliminary and the buildings may be designed differently in connection with the detailed design of the business.

3.3.2 Roads and transport

To the extent possible, existing routes will be used. However, new roads will need to be built. The main entrance of the facility will be provided with a gate and a guard will be located in the northern part of the facility (numbers 17 and 43 in Figure Figure 2). The main route for transportation will be between the graphite purification plant and anode production. In addition to this, there are roads mainly along the outer edge of the plant and in the northeastern part of the facility, where, among other things, a fire water tank, electrical central, transformer, LPG tank and lab are located. In this area, nitrogen production is also planned to take place. In addition to this, an additional entrance for emergency use will be located in the northeast corner of the facility.

The external transport of the planned activities is further developed in section 8.15

3.3.3 Embankments

The building for the graphite treatment plant will be equipped with concrete floors and be fully embanked. The floor will have a slope that allows the diversion of spills via wells or gutters to a collection tank.

Storage facilities for sulfuric and hydrofluoric acid will be fully embanked, as well as the unloading sites of hydrofluoric acid and sulfuric acid. Further information on the handling and unloading of sulphuric and hydrofluoric acid is further described in section 8.8.

3.3.4 Stormwater management

Stormwater that occurs within the plant will be collected by wells or diverted directly to ditches at the outer edge of the plant through pipes and surface runoff. In some cases, stormwater is led directly to the municipality's stormwater ditches. The stormwater flow diverted via pipes from the surfaces in the northeastern part of the area will be directed to the green space between the anode production building and the office for oversilting and fixing particulate matter and oil. Stormwater in the municipality's stormwater ditches will be diverted further east via a drum under Gräsörvägen to Sörbrändöfjä rden. Further information on stormwater management can be found in section 8.11.

3.3.5 Safety meassures

Several protective measures related to, among other things, fire, gas detection, firefighting, extinguishing water management and handling of hazardous substances such as hydrofluoric acid and sulfuric acid have been taken into account when designing the facility. Protective measures are further described in section 8.17.

3.4 PRODUCTION AND PROCESSES

Production will be in operation around the clock, during all days of the year, with planned downtime as needed. Transports will mainly take place during the day at 06:00-22:00 but can sometimes also take place at night. About 95 people will work at the plant.

3.4.1 Graphite purification process and anode material production

The planned operations consist of a graphite treatment plant and an anode production facility.

Graphite concentrate will be delivered to the plant in Luleå by truck from Vittangi.

In the graphite treatment plant, the graphite concentrate is purified in an alkaline roasting and leaching process whose purpose is to remove impurities such as silicates and sulfides. The final product of the

graphite treatment plant is a dried graphite product, Talphite-C®, which is pneumatically transferred to the building for anode production. [1]

In the graphite purification process, hydrofluoric acid will be used. Concentrated hydrofluoric acid will only be handled within a separate part of the business (number 19, Figure Figure 2). The room will be equipped with a separate ventilation and extraction system connected to a scrubber. The premises where concentrated hydrofluoric acid is handled will also be equipped with a separate embankment for collecting any spillage, which will be diverted to a neutralization tank.

In the anode plant, graphite (Talphite-C®) is then treated to produce anode material. The anode process consists of a coating stage, where the graphite is treated with pitch, and a pyrolysis step. The pyrolysis takes place in a nitrogen gas-inertated environment in furnaces heated to about 1,100 °C. Final product, Talnode-C®, can finally be separated into fractions of different sizes before being packaged for transport.

The graphite purification process and anode production are described in detail in Appendix A to the application, Technical description. For further description of protective measures related to the handling of hydrofluoric acid see sections 8.8 and 8.17 and Annex A, Technical description. Figure 3 below also describes the continued process, after the searched business's final product Talnode-C®, up to the finished battery product.

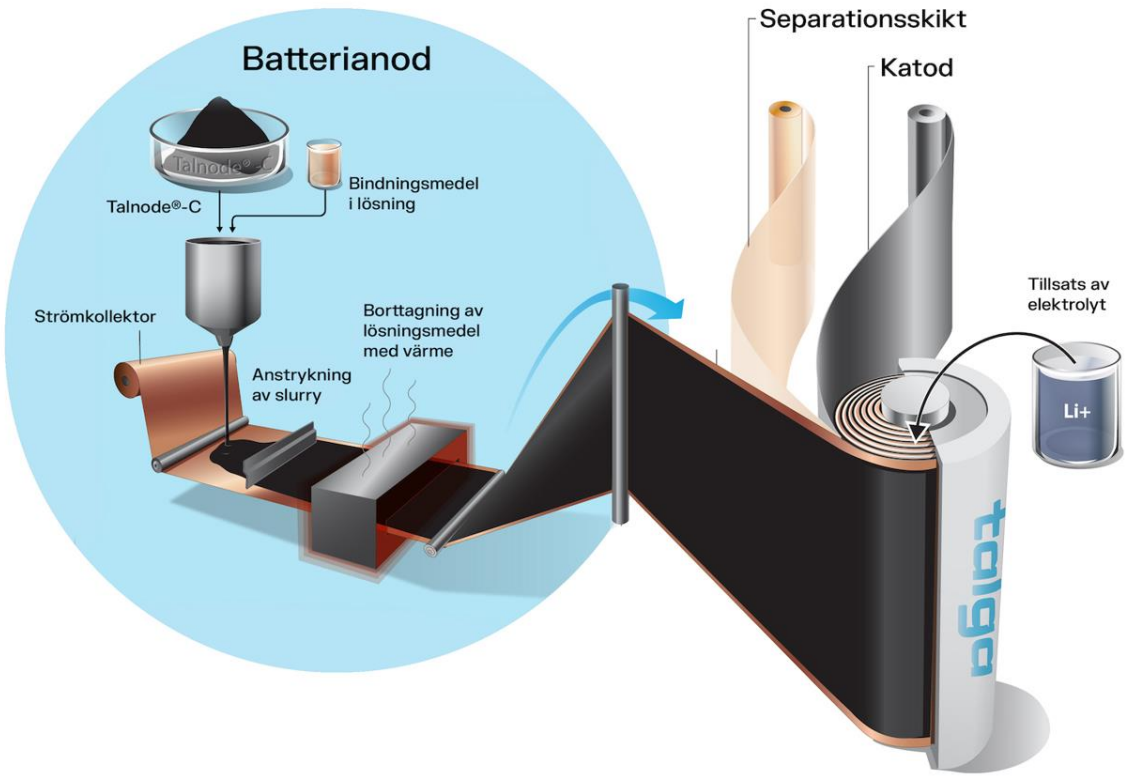


Figure 3. Production of a battery product using Talnode-C®

3.4.2 Withdrawal and return of water

The company plans to take out cooling and process water from Inre Hertsöfjärden and discharge treated wastewater together with heated cooling water to Sörbrändöfjärden. The total withdrawal of cooling and process water will amount to a maximum of 1,600 m 3 per hour, of which the withdrawal of cooling water amounts to a maximum of 1,500 m 3 per hour (corresponding to approximately 0.42 m 3 per second) and the withdrawal of process water amounts to a maximum of 100 m 3 per hour

[1] Pneumatics = Compressed air technology

(0.028 m^3 per second). In total, the water withdrawal amounts to 14 million m^3 per year. The corresponding amount is returned through the discharge to Sörbrändöfjärden. Water management is developed in sections 8.9, 8.11 and in the technical description.

3.4.3 Nitrogen production

Due to the high need for nitrogen gas and to eliminate the risks associated with the transport of liquefied nitrogen, nitrogen will be manufactured at the plant using electric PSA (pressure swing adsorption) equipment. The annual nitrogen requirement at the plant amounts to approximately 19,500 tonnes per year, which will be produced on site. For a more detailed description of nitrogen production, please refer to the technical description.

3.4.4 Treatment plants

At the graphite treatment plant, two water treatment plants (ETP1 and ETP2) will be located, in which filtrates from the graphite treatment plant will be treated. In ETP2, filtrate from the leaching with hydrofluoric acid will be treated and in ETP1, the remaining filtrate will be treated.

Air emissions from the graphite treatment plant and anode production plant are through scrubbers, textile dust filters and a VOC incineration plant. The emissions of the business to air and the purification of process water are described in more detail in the technical description.

4 SUSTAINABLE DEVELOPMENT AND CLIMATE IMPACT

4.1 SUSTAINABLE DEVELOPMENT

Sustainable development means finding the optimal balance between a complex range of issues that affect stakeholders at different levels throughout the life cycle of a business. Economic, technical, social, as well as environmental issues must be addressed. In order to identify the most sustainable alternative, it is necessary to take into account all potential environmental and socio-economic impacts, at local, regional and global level from both short and long time perspectives. A sustainable solution must also be economically and technically feasible.

The purpose of an EIA is to identify, describe and evaluate the direct and indirect consequences that the applied activity may entail for the environment, human health and the management of natural resources. Through an EIA, it is also necessary to find the solution with the slightest negative consequences.

As a company, Talga strives to be at the forefront and have a long-term and sustainable development perspective, where future mining of metals and minerals should be climate-smart. The products produced must meet requirements for both environmental and social sustainability. The company adheres to the guidelines that apply within Svemin and builds systems for ISO 14,001 certification. Svemin is a trade association for mines, mineral and metal producers in Sweden. Through Svemin, the international mining council ICMM's basic principles and tools for a safe, fair and sustainable mining industry are also followed.

To guide the work with both local and global stakeholders, the Company has adopted seven principles:

- establish and maintain respectful relationships with stakeholders through the implementation of clear processes,
- inform stakeholders about the company's ongoing projects in an appropriate and accessible manner;
- create opportunities for early and meaningful consultations to gather views in order to take them into account in the decision-making process;
- include feedback from stakeholders in decision-making processes;
- feedback back to stakeholders,
- building partnerships with local stakeholders;
- Create a clear and effective mechanism for feedback, suggestions and any complaints from stakeholders.

4.2 CARBON FOOTPRINT

The burning of fossil fuels is the largest source of greenhouse gas emissions, which contribute to climate change. Examples of fossil fuels are coal, diesel, gasoline and natural gas. The transport sector is a major contributing factor to these emissions, accounting for a third of Sweden's total greenhouse gas emissions. A transition from fossil fuels to renewable fuels and electrification is described as an important part of the work to reduce emissions from the transport sector.[2]

Battery-powered cars are an alternative that contributes to reducing greenhouse gas emissions. The demand for battery-powered cars has increased sharply, an example of which is that almost 80% of new car sales in Norway in October 2021 consisted of battery-powered cars. The graphite anode

[2] Sweden's environmental goals. Retrieved 2022-03-17.

makes up about 40-50% of the volume of active material in a battery. [3]At present, graphite is mainly imported into Europe and68% of the world's graphite assets are located in China. Today's production of batteryanodes is on a global level also dependent on synthetic graphite which is made from coke and crude oil using coal power. The manufacturing process is very energy intensive.

In Sweden, there are large assets graphite, SGU estimated in 2014 the assets at about three million tons of graphite. The Vittangi deposit has since been estimated at 7.2 million tonnes. So far, graphite has been mined from time to time at one location in Sweden, kringelgruvan in Ovanåker municipality. By mining graphite in Sweden, greater traceability and a closer [4]anodeproduction will be offered to the European batterymarket. In addition, the anode material is made from natural graphite, and not by converting the fossil raw materials coke and crude oil.

The graphite that the Company will extract from the Vittangi mine has completely unique properties that are environmentally very advantageous compared to the industry standard for natural graphite. The Grafit ore one mined in Vittangi maintains exceptionally high graphite content and has properties that are naturally adapted to battery anodes. Vittangigraphite has such a high quality that 3-8 times less ore needs to be mined to produce the same amount of graphite concentrate compared to other deposits globally. The properties of Swedish graphite, in combination with the Company's technologies and technology, enable the production of anode materials that result in batteries being able to charge significantly faster, last longer and can be used in a larger temperature range, which improves durability.

The intended location of the business is strategically placed to limit the impact of production on the climate. The location in northern Sweden makes it possible for the Company to use energy produced from fossil-free sources, which is difficult to access globally and also in other parts of Sweden. By placing the business in close proximity to the city of Luleå, it is also possible to use existing roads as well as proximity to the port and railway for further transport of the products to the European continent. The proximity to the Company's mine where graphite is planned to be extractedfurther contributes to short transports, which is positive from a climate point of view.

By mining natural graphite and producing anode material in northern Sweden with renewable electricity produced, the carbon dioxide emissions associated with the product will be significantly lower compared to conventionally produced anode material. Thus, production contributes to reduced greenhouse gas emissions. A life cycle assessment (LCA) for the product being produced, Talnode-C®, has been developed in 2021. The analysis that was carried out showed that the [5]carbon dioxide emissions at Talga's applied manufacturing method for anodes are significantly lower than in traditional manufacturing, and that the production of battery anode materials in the applied business will be able to take place with a significantly smaller climate footprint compared to conventional manufacturing. [6] The analysis also showed opportunities for improvement in the Company's work, where it emerged that the chemicals used in the purification process and anode production contribute to the greatest impact on the environment. The chemicals are produced by a third party, and the Company will in its sustainability work work work with which chemicals are used and set requirements for purchasing. By continuing to update the life cycle analysis when operations begin, results will be able to show additional measures that can be taken to optimize the product and thus further minimize climate impact.

As the business is not yet in operation, the work today is focused on reducing the impact on the environment through planning and design of buildings and operations. By the Company managing the process from mining to the production of battery anodes, the entire production chain can be controlled,

[3] Talga Group website. Retrieved 2022-05-12.
[4]SGU's website. *Graphite*. Retrieved 2022-05-12.
[5] Calculation based on average battery pack of 76.5 kWh similar to VW ID.4 and Tesla Model 3. Note: 1kWh = 1.2 kg Source: Benchmark Mineral Intelligence Report.
[6] Talga Group. *Annual report (2021). Sustainability and people.*

which is not possible in conventional battery anode production. A constant work is underway within the Company to find new technologies and technology to further minimize negative impact on the climate and work sustainably.

Assessment of the impact of the applied activity on the natural environment, energy use and transport carried out and thus emissions to air is assessed in sections 8.2, 8.7 and 8.15 of this EIA.

5 PROJECT AREA DESCRIPTION

5.1 GENERAL INFORMATION ABOUT THE AREA

The business is planned to be located in the Hertsö field within Luleå Industripark in Luleå. The industrial park is located about 7 kilometers east of Luleå city center. Luleå Industrial Park consists of Hertsöfältet and Svartön and covers a total of 125 hectares of land and is expected to be fully developed by 2030. [7] Hertsöfältet consists of flat forest land of managed young forest with elements of marshes, wetlands and smaller watercourses and ditches. The Hertsö field is bounded in the southwest by Inre Hertsöfjärden and in the southeast by Sörbrändöfjärden and by Hertsövägen in the northeast. Talga's operations are planned to be located in the central part of the Hertsö field, within the property Luleå Hertsön 11:1010. South of the planned business area, on the other side of Hetsöfjärden, the industrial area Svartön is located. Among others, SSAB (coke oven), Linde Gas AB, St1 Sverige AB, LKAB (depot and port with dolomite and scrap iron handling) and the Port of Luleå conduct operations within the Svartön industrial area. The Hertsö field and the Svartön industrial area are connected by a bridge that is currently equipped with a security gate, see Figure
Figure 4. Map of Luleå Industrial Park and the business area. .

Figure 4. Map of Luleå Industrial Park and the business area.

[7] Luleå municipality's website. *Luleå Industrial Park – Hertsö field.* Retrieved 2022-01-03.

The nearest residence is located about 900 meters east from the planned business area. Thenearest residential areas are Hertsö meadows and Hertsölandet, which are located about 1.4 kilometres west, and about 1.4 kilometres east, respectively, from the planned operating area. At the area of Hertsön, west of the planned business area, there are schools, preschools, sports fields, an allotment area and an equestrian facility, see Figure 5 below.

Just north of Hertsövägen is the nature reserve Ormberget-Hertsölandet.

About 330 yards east of theplanned operationsarea is the emergency services fire drill site.

About 1.1 kilometres south-east of the planned area of operation there is also a marina, and additional ports are further east on the headland.

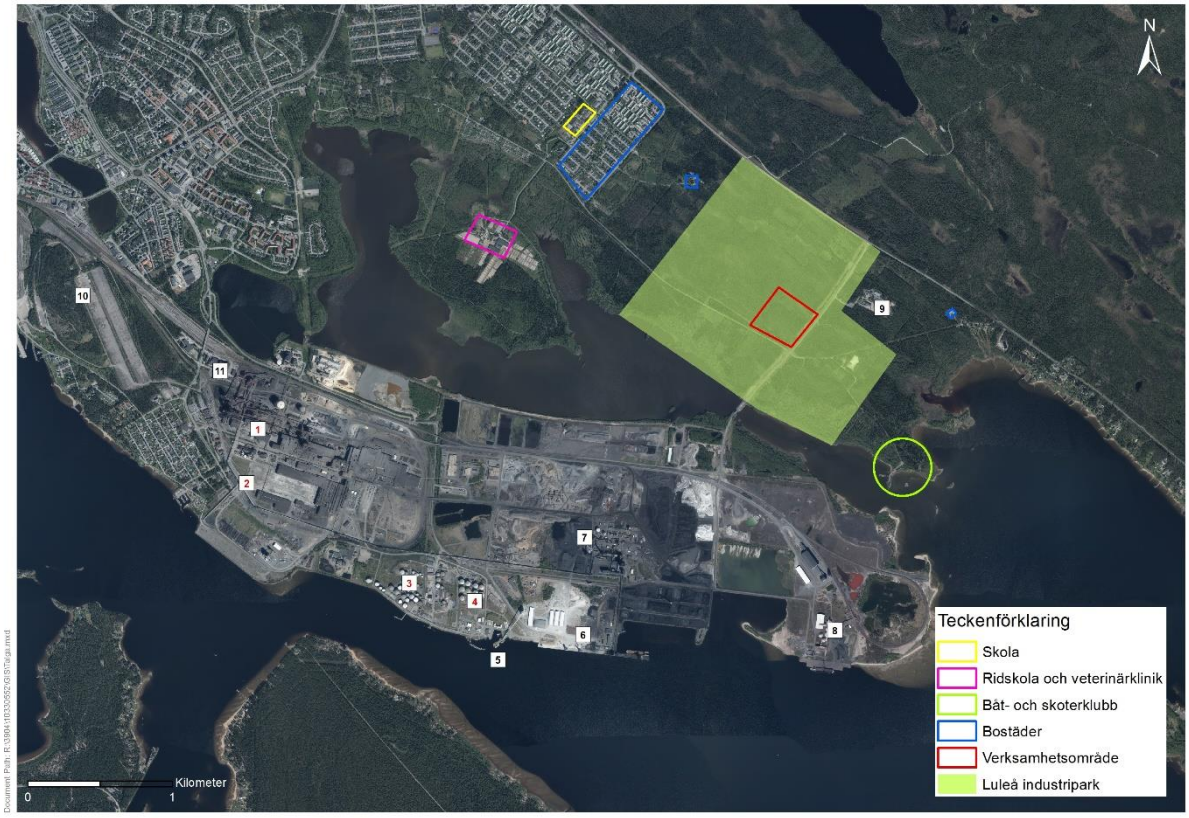


Figure 5. The planned location for the Company's business area within Luleå Industrial Park. The area of operation is excellent in red, the nearest housing in blue and the nearest school in yellow. The nearest located operations are marked with numbers, red numbers denote Seveso operations, and black numbers denote other nearby businesses. 1. SSAB EMEA AB. 2. Linde Gas AB, 3. St1 Sverige AB, 4. LKAB (depot), 5. Port of Luleå, 6. Port of LKAB (dolomite and scrap iron), 7. SSAB coke oven, 8. LKAB, ore loading, 9. Emergency Services Fire Drill Site, 10. Hybrit Development AB (hydrogen storage), 11. Swerim (LPG storage)

A new residential area is planned adjacent to the hertsö meadows area with a distance of about 2.5 kilometers fromthe business area and is called Hertsöheden, see Figure 6.

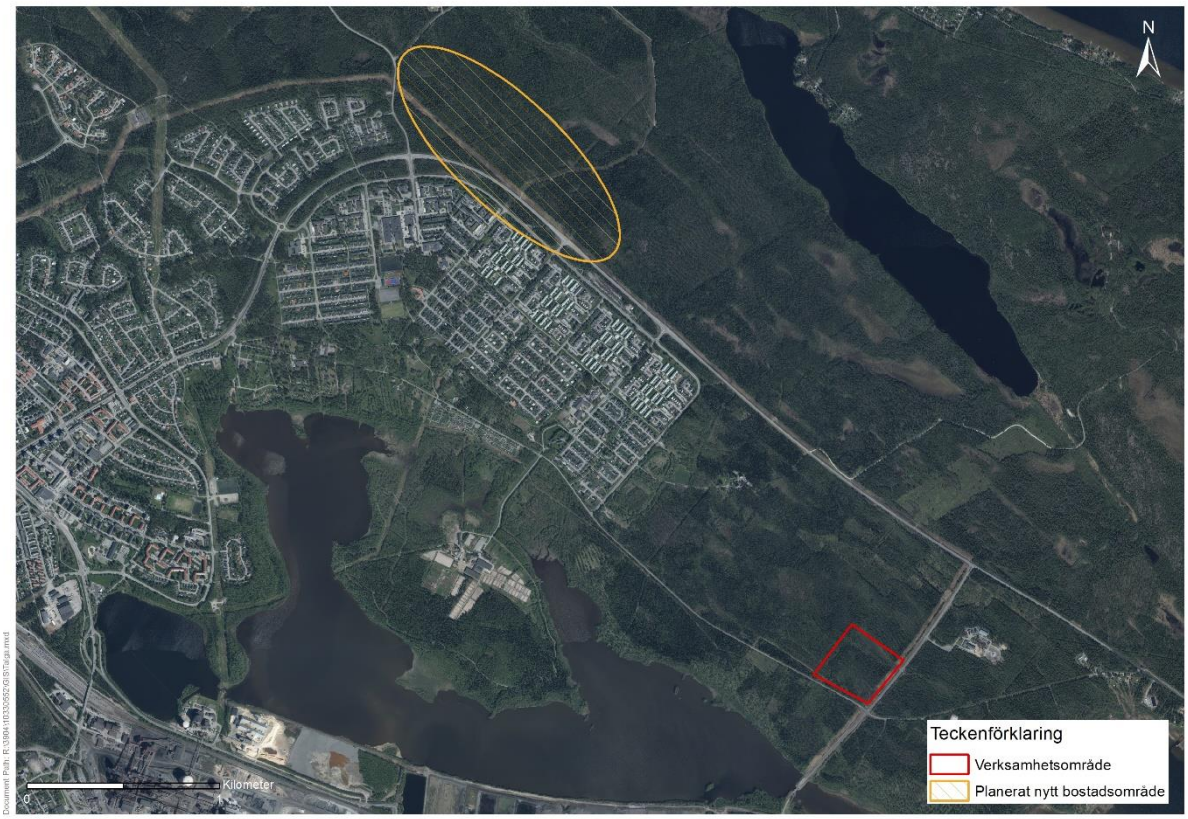


Figure 6. Map of the location of the planned new residential area Hertsöheden in relation to the planned area of activity.

5.2 GEOLOGY

According to SGU's map viewer, the soil types in the area around the planned area consist of moraine, peat and gravel, see Figure 7. The bedrock is of basalt-andesite. The entire plan area varies at an altitude of 5-9 meters above sea level, and the soil depth varies between 5-20 meters.

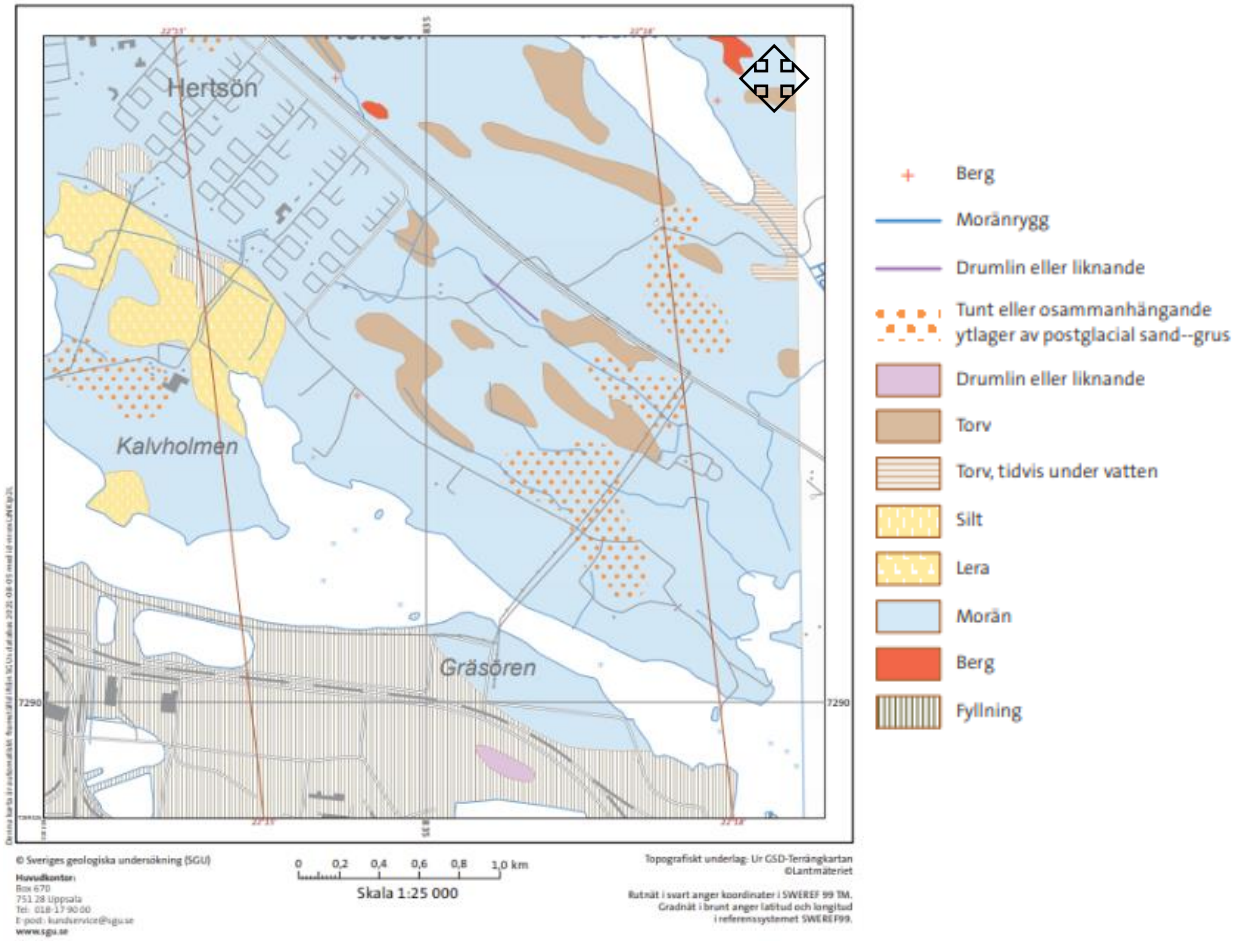


Figure 7. Earth map of the area. Source: SGU Earth map.

During the planning process, sulphide soils were found at two sites in three boreholes. The sulphide soils were found south of Gamla Lövskärsvägen and next to Hertsövägen. Where sulphide soil has so far been found, the land is regulated in the zoning plan as protected as well as natural land. Sulphide soils occur naturally in Sweden, mainly in coastal and beach areas that have risen from the sea through land uplift. Sulphide minerals have formed when these areas were covered in water and dead algae and plankton fell to the bottom. In the oxygen-free environment that then arose, iron and sulfur reacted, and sulphide minerals were formed. As long as the soil is not exposed to air, the sulphide minerals are stable, and are then called acidic sulfate soil. Upon contact with oxygen, the pH can drop drastically and then become so-called active acid sulfate soil, which can negatively affect the surrounding water when metals are released from these sulfate soils. Often it is in connection with construction projects or cultivation that the soil is lowered and the acidic sulfate soil is exposed to oxygen. Sulphide soil can also be problematic as it is often prone to settling at high loads and very loose with poor bearing capacity. [8]

Within the property, sulphide soil has been found in the northern part. Approximately 9800 m^3 are estimated to be sulphide soils, but the volume may decrease during planned geotechnical surveys. Excavated sulphide soils will, if possible, be reused within the facility or deposited. Clean masses will be reused within the plant or in other operations.

5.3 HYDROGEOLOGY

The nearest groundwater body is located on Sandön south of the Lule River, about 4 kilometers south of the planned facility. The groundwater body (WA32234053) has both good chemical and quantitative

[8]SGU's website. *Sulphide soils a potential environmental culprit*. Retrieved 2022-04-12.

status. Both just east and west of this groundwater body are additional groundwater bodies, SE728323-180057 and WA22310881, respectively. The eastern one has been assessed as having good chemical and quantitative status while the western one has unsatisfactory chemical status and good quantitative status.[9]

According to the groundwater investigation carried out by AFRY on behalf of the Company (see Appendix B:6), the groundwater level is superficially located in large parts of the area, about 0–3 meters below the ground surface.

In the marsh areas, the groundwater surface is at the level of the soil surface and periodically these areas are flooded. In higher-lying areas, the groundwater level is 0.5–1.5 meters below the soil surface.

The Hertsö field is surrounded by the bays Hertsöfjärden and Sörbrändöfjärden. There are several ditches that dewater the area and direct the surface and groundwater towards the bays. The area is largely made up of marshy areas and there are many open water areas. The direction of flow is estimated to be mainly directed to the southeast, although local variations occur as the topography varies in the area.

A number of groundwater pipes have been established in the area and measured groundwater levels (meters above sea level) are shown in Figure 8. The level measurements show that the groundwater flow generally follows the topography.

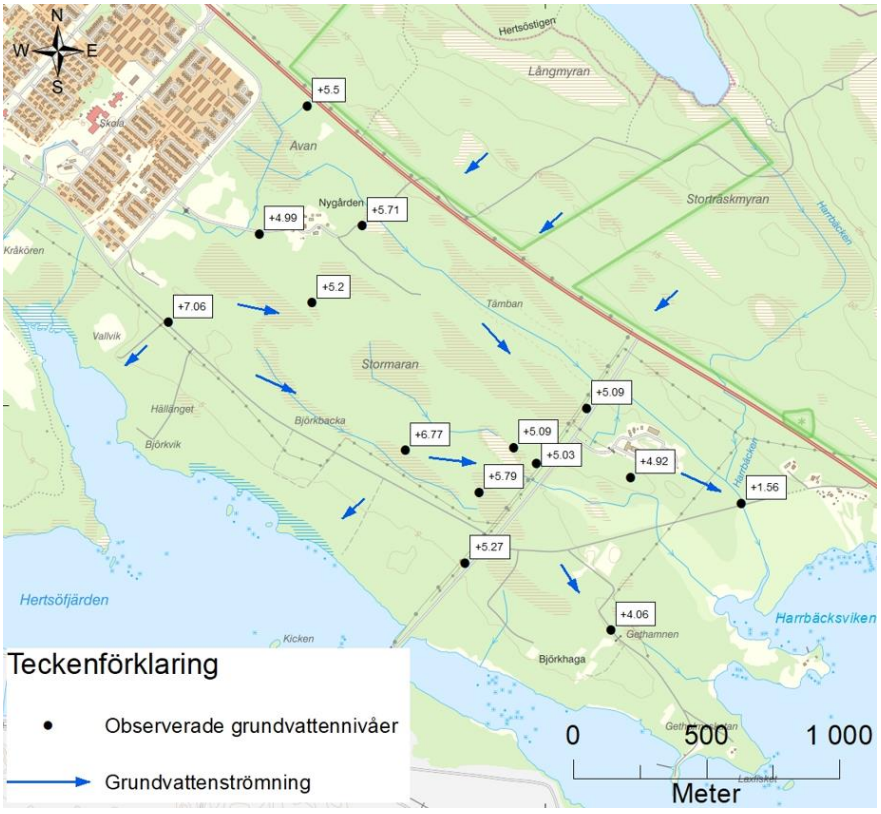


Figure 8. groundwater levels (metres above sea level) used during groundwater calibration; The level measurements were carried out by different actors between 2019 and 2022. For those observation tubes where several measurements were made, the latest measurement was chosen where all pipes had been measured. This corresponded to a level at which groundwater was judged to be relatively high. Source: AFRY, Appendix B:6.

For further descriptions of the hydrological and hydrogeological conditions in the area, please refer to the groundwater survey in Appendix B:6 and section 8.11 below.

[9] VISS (Water Information Sweden). Retrieved 2022-01-03.

5.4 PLAN CONDITIONS

5.4.1 Master plan

On 27 September 2021, Luleå Municipality adopted a new master plan, *Master Plan 2021*. This plan has been appealed, so when developing the present EIA, the older master plan, *Master Plan 2013*, still applies.

In the *Master Plan 2013*, the area where the business is planned to be built is described as "an area for highly disruptive activities". In the area, activities with a certain degree of noise or air pollution can be located. Natural values must be taken into account in planning. In the later (but not yet valid) master plan [10]*Master Plan 2021*, the area is still designated as relevant for disruptive activities. The area is described as suitable for businesses that should not be mixed with housing. For example, it can be activities that can be disruptive, environmental impactful, surface-intensive or that generate heavy traffic. In the master plan, changes in current land use are estimated to be relevant between 2020 and 2030.[11]

An in-depth master plan for Hertsön and Lerbäcken is under development but not completed when this EIA is developed. In this plan, Hertsöfältet (Luleå Industripark) is singled out for activities that are disruptive and that should not be located in close proximity to homes.[12]

5.4.2 Zoning plan

A detailed plan exists for the area in question and the plan gained legal force on January 21, 2021 and is called *Zoning Plan for part of Hertsön 11:1 and others Hertsöfältet.* The plan area is shown below in Figure 9. The zoning plan states that the area will be used for industrial activities. It also appears that the need for industrial land in Luleå municipality is great, and that the area is considered suitable with regard to proximity to the port and railway. The planned area is located east of the residential area of Hertsön. South of the industrial area, on the other side of Inre Hertsöfjärden, is Svartön, which is an existing industrial area. The areas are connected by a bridge that is closed off by a gate. Talga's operations are planned to be built centrally in the zoning area. The properties that are relevant for the new zoning plan are all owned by Luleå Municipality. The zoning plan allows for 50% development [13](buildings) of the property, and the Company will comply with the provisions of the plan.

The purpose of the plan is to create a new industrial area on the Hertsö field. The municipality plans to build infrastructure, roads, ditches and water and sewage for the industrial area. The effect of a development according to the zoning plan means that marshes will be drained and that groundwater will be submerged. In addition, ditches will be built along the roads and along the outer edges of the area, with the aim of diverting the increased amount of stormwater that will arise as a result of the planned hardening of large areas. The municipality is only responsible for infrastructure to and within the Hertsö field, and thus not for other water activities within the Hertsö field that may be necessary for activities in the area.

[10] Luleå Municipality. *Master Plan 2013* – Appendix *Area Recommendations.*
[11] Luleå Municipality. *Master plan 2021*. Retrieved 2022-01-03.
[12] Luleå Municipality. *Master plan 2021*. Retrieved 2022-01-03.
[13] Luleå Municipality. *Plan description. Detailed plan for part of Hertsön 11:1 and others Hertsöfältet.*

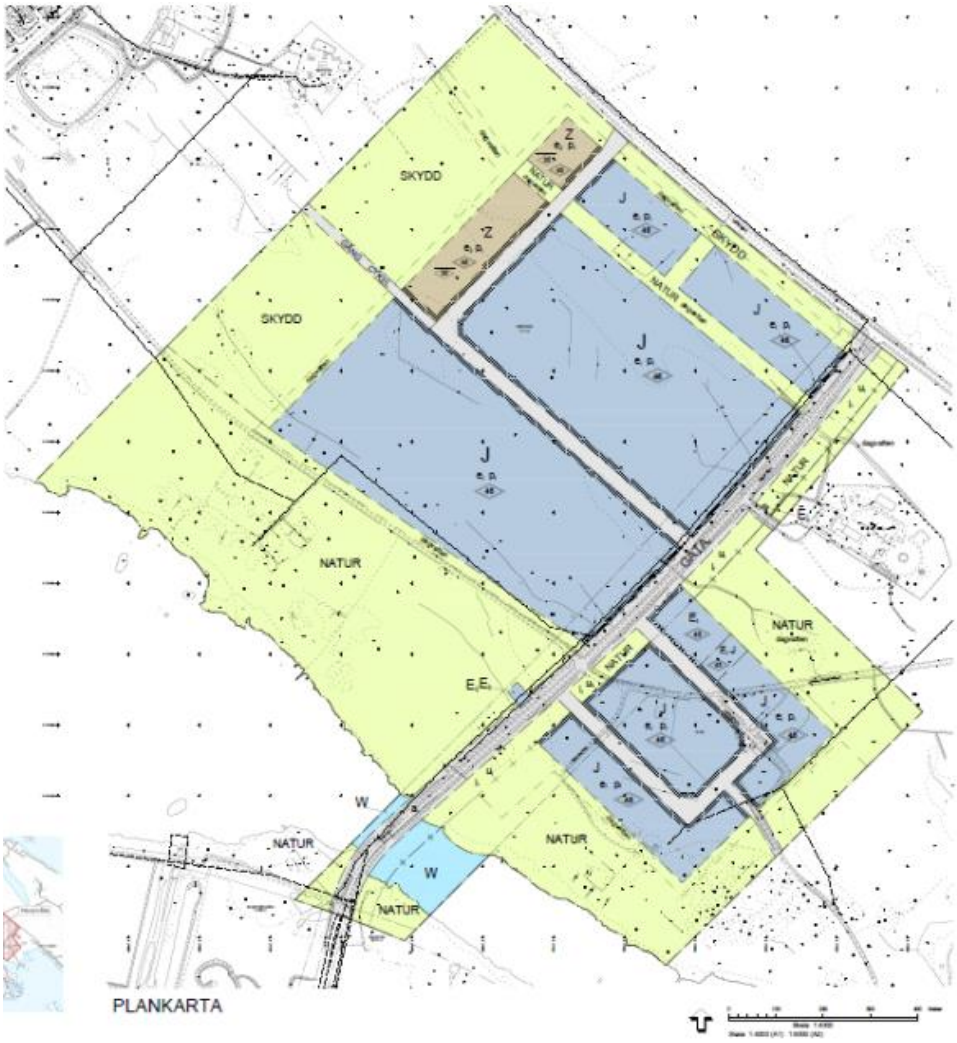


Figure 9. Plan map for detailed planning area for Hertsö field. Green area consists of natural land or protection with certain land reserves for, for example, pipes, while dark blue and brown area consists of planned industrial land. The light blue area, marked with w, marks part of the water included in the plan area.

1. NATIONAL INTERESTS

The company's planned facility inthe area of Luleå Industripark affects or adjoins a number of national interests. These consist of national interest for outdoor life, mobile outdoor life, total defense, influence area for airport and for commercial fishing on the coast. The impact on these national interests is described under the respective sections of Section 8.

5.5 SITE PROTECTION

About 620 meters north of theplanned businessarea is the Ormberget-Hertsölandet Nature Reserve. At additional distances, other protected areas can be found in the form of, among other things, Natura 2000 sites. A detailed description of, and assessment of the impact on, these areas can be found in section 8.2.

6 ALTERNATIVES

6.1 LOCALISATION INVESTIGATION

Prior to the application for a permit, the company has investigated alternative locations for the planned facility for the manufacture of anode materials. Several cities have been studied for the purpose, including Boden, Piteå, Skellefteå and Luleå. In comparing the locations in the different cities, the following objectives were set out to be pursued:

1. Functional goals regarding the location meeting site requirements, the ability to handle waste, the possibility of future expansion and the time aspect with good opportunities for construction with few uncertainties
2. Environmental and health objectives regarding safety for people and the environment, consistent with current plans and few values in conflict with potential activities.
3. Economic goals regarding reasonable establishment costs, good access to market for both the product and investors, staff and business partners, and favorable local labor market.

For location assessment of water discharge points, see sections 8.1.4 and 8.11.3.

In summary, the investigation shows the following results, see Table 2. The green color below has three levels where dark green there represents what is judged as the best option for each parameter and the lightest green color represents what is judged the least favorable.

Table 2. Localisation investigation

Parameters	**Location 1 Luleå, Hertsöfältet (Luleå Industrial park)**	**Location 2 Boden, f.d. helicopter base**	**Location 3 Piteå, Haraholmen**	**Location 4 Skellefteå, Skelleftehamn**
Location requirements	An undeveloped area where the zoning process for industry was then started. Several industries already exist in the immediate area, the possibility of handling waste is thus streamlined.	The opportunity to take over an existing facility, major renovations and extensions would be required. Theestablishment is very close to other activities.	Two sites were investigated. The opportunity to take over an existing facility, redevelopment and extension is required or undeveloped land. There is a detailed plan for industry for the undeveloped land.	Two sites were investigated. The opportunity to take over an existing facility, redevelopment and extension is required or undeveloped land. Regarding the undeveloped area, a detailed plan for industry was initiated. There was a detailed plan for the existing building.
Time	Luleå municipality owns the land under investigation. Zoning process when the long time (today legally forced).	Bexisting tenant who must get new premises. Detailed plan for industry.	The existing building is owned by a private operator and the municipality owns the undeveloped land. The existing operator is in the premises and must be moved.	The municipality owns both undeveloped land and existing premises. The existing operator is in the premises and must be moved.
Possibility of future expansion	Large areas are available from the start, about 125 ha, and additional surfaces are floury for possible expansion, about 200 ha.	Another 50 ha of land is located near the investigated site, however, the land is not detailed planning for disruptive industry.	In total, 74 ha of industrial land is found on the undeveloped land.	The undeveloped land has a total of 10 ha that will be detailed for industry. Opportunities for expansion also exist for existing buildings.

Parameters	Location 1 Luleå, Hertsöfältet (Luleå Industrial park)	Location 2 Boden, f.d. helicopter base	Location 3 Piteå, Haraholmen	Location 4 Skellefteå, Skellefteå hamn
Environmental considerations	Nature reserve within 1 kilometer. More than 5 kilometres to Natura 2000 site. Within the national interest for outdoor life and mobile outdoor life. Close to the national interest in nature conservation. Good distance to surrounding businesses. About 1 kilometer to the residence.	Two nature reserves within 5 kilometers. No national interests within 10 kilometers. Less than 500 meters to urban area.	Nature reserve within 1 kilometer. About 2 kilometers to the water protection area. Relatively close to Natura 2000 sites. High cultural values in the vicinity of the investigated site. Good distance to surrounding businesses. Within the national interest for outdoor life and mobile outdoor life. Close to the national interest in nature conservation. Nearest potential residence within 500 meters. About 200 meters to the hotel and camping where people stay.	A nature reserve within 5 kilometers. Over 10 kilometers to national interests. Less than 500 meters to ancillary activities. About 1 kilometer to the residence.
Discharge of process wastewater	Best opportunity to manage process water discharge.	Best opportunity to manage process water discharge.	Less opportunity to handle process water discharges.	There is the possibility of discharge of process water.
Transport/Ability to reach out to market in the area	Various transport options are possible, close to the larger terminal and to Luleå Airport. The railway is under heavy load and rail transport requires trucking the last bit to the investigated facility. There may be an opportunity to build a new track in the long term. About 30 minutes to Luleå Airport. Good opportunity for conferences and meeting places. Proximity to several major players in industry, closer than Boden.	Various transport options are possible, proximity to a larger terminal in Boden and a car to Luleå (45 min). Rail transport requires trucking the last bit to the investigated facility. About 45 minutes by car to Luleå airport Good opportunity for conferences and meeting places close to Luleå. Proximity to several major players in industry.	Various transport options are possible. Farther to the airport than for the other options investigated (about 70 min). Relatively far to larger terminal. Good rail links. Possibility to ship containers via port. Good opportunity for conferences and meeting places. Proximity to several major players in industry.	Relatively close to the market in southern Sweden and close to air transport. Northvolt's facility entails an interesting potential future market. Possibility to ship containers via port. About 30 minutes to Skellefteå Airport. Good opportunity for conferences and meeting places. Strong private sector. Large export city with visitors from all over the world. .
Labour market	Close to Luleå University of Technology. Is the center of the region's labor market. Is the capital of residence. In the city, large operations have been built in recent years, examples of this are Facebook's server hall. Demonstrates the	About 30 minutes from Luleå University of Technology. The Luleå region (which includes Boden, Piteå, Älvsbyn and Kalix) has a large workforceAbout 30 minutes from Luleå University of Technology. The Luleå region (which includes Boden, Piteå, Älvsbyn and Kalix) has a large workforce.	About 45 minutes from Luleå University of Technology. The Luleå region (which includes Boden, Piteå, Älvsbyn and Kalix) has a large workforce.	In Skellefteå there are, among other things. Luleå University of Sweden and Umeå Universityrepresented A good labor market, Umeå can be reached within 1 h and 30 min. In the city, large businesses have been built in recent years, examples of this are Northvolt. Demonstrates the

Parameters	Location 1 Luleå, Hertsöfältet (Luleå Industrial park)	Location 2 Boden, f.d. helicopter base	Location 3 Piteå, Haraholmen	Location 4 Skellefteå, Skelleftehamn
	municipality's ability to attract larger facilities.			municipality's ability to attract larger facilities.
Overall assessment	**1**	**3**	**3**	**2**

Before Talga began planning the applied activities, questions were sent out to the municipalities concerned for information about the possibility of establishment. Once information had been collected for the sites under investigation, an assessment was made of environmental considerations in the areas. It then emerged that Piteå would be excluded due to proximity to homes and protected areas as well as the technical difficulty in the discharge of cooling water, which would lead to a large environmental impact as a very long pipeline would have to be expanded in the Baltic Sea. Subsequently, Boden was removed as urban agglomerations were very close, less than 500 meters away from the investigated site and that the location was surrounded by light industry and was an area that was not technically possible or suitable for the planned activities. Skellefteå and Luleå were judged to be relatively equivalent from an environmental point of view, although the nature reserve Ormberget-Hertsölandet is within 1 kilometer of Luleå's location. The sites that were made possible in Luleå and Skellefteå were already heavily affected by heavier industry, which is expected to have a more limited impact from a new facility. The company thus went further and looked at other aspects that are important in an establishment like the one applied for.

When it came to transport, Skellefteå was judged to be best suited, as Luleå's railway is not sufficiently developed. However, the transport opportunities in Luleå are still considered good as the airport and port are close by. From a market perspective, both Luleå and Skellefteå were judged to have good opportunities as major players such as Facebook and Northvolt have already been established. Important aspects regarding the location in Luleå were considered to be the large labor market and the possibility of expansion. It was also assessed that there were good opportunities for water discharges. Furthermore, Luleå municipality showed interest in the business. Luleå was judged to be the best technically and environmentally suited.

When the detailed plan for Luleå Industripark/Hertsöfältet was appealed, a location on Svartön just south of Hertsön was considered. Both Luleå Industrial Park and Svartön's industrial area are located about 7 kilometers southeast of Luleå's center. Luleå Industrial Park has been assessed as the most suitable location with regard to the emerging industrial area, which is an investment in a new industrial area. Limited impact on people and the environment further contributes to the choice of location. Black Island was judged to be a worse alternative due to the fact that it is a filled area with unknown geotechnical conditions and a risk of soil contamination. On Svartön there are also already a number of property owners and usufruct holders who would entail a more complicated establishment.

6.2 ALTERNATIVE DESIGN AND BEST POSSIBLE TECHNOLOGY

According to *Chapter 2. Section 3 MB*, the best possible technology must be used to prevent an activity from causing harm or inconvenience to human health and the environment.

The company is judged to use the best possible technology in the planned operations. By using natural graphite as a raw material (instead of synthetic graphite), and through the production processes that the company itself has developed or refined, it is estimated that the desired business

can manufacture battery anode material with a lower energy and chemical consumption and with a smaller emission of carbon dioxide and other air pollutants compared to conventional manufacturing of battery anode materials. The reasons for this assessment are developed below.

The electrification of vehicles, both passenger cars and transport and industrial vehicles, is an important tool for enabling a transition to a fossil-free society. At the same time, electrification means an increased need for electricity, which places high demands on efficient energy storage solutions, i.e. batteries. The purpose of Talga's planned operations is to accelerate the green transition, by operating a facility for large-scale production of anode materials for lithium-ion batteries for the electric car sector.

The graphite anode makes up about 40-50% of the volume of active material in a battery for a battery-powered car. At present, graphite is mainly imported into Europe and68% of the world's graphite assets are located in China. Today's production of batteryanodes is globally dependent on synthetic graphite, which is made from coke and crude oil using coal power in a very energy-intensive manufacturingprocess. The manufacture of anode material from natural graphite occurs globally, but so far this type of graphite has not been used for batteries for cars.

In the electric car market today, the graphite anode material used for batteries is made exclusively from synthetic graphite. One of the reasons for this is that the synthetic graphite can often achieve a greater purity compared to the natural graphite. In addition, the material properties of synthetic graphite are normally better adapted to battery anode materials, it is more stable over time, and the structure of it is better adapted for anode manufacturing. Natural graphite usually consists of graphite layers that need to be processed, "spheroized", to achieve the correct structure of the graphite particles, which leads to a loss of material. The durability is then generally lower than that of synthetic graphite. Synthetic graphite is produced so that it should have the desired particle shape and does not need to be spheronized to the same extent.

The manufacture of synthetic graphite and anode materials takes place mostly in China, Japan and South Korea, and the energy source used is often largely based on coal power. The use of coke and oil as a raw material and coal as an energy source in anode production involves the use of fossil raw materials and the emission of carbon dioxide. This means that the production of synthetic graphite entails large emissions of carbon dioxide. The process also causes large emissions of dust, NO_X, SO_2 and PAH due to the content of sulfur, nitrogen and other impurities in coke and oil. In addition, the manufacturing process of synthetic graphite is very energy-intensive. The carbonization process, where coke, oil and pitch are converted to graphite, requires large amounts of energy as this is done under very high temperature for a longer period of time. The production of synthetic graphite thus entails a large environmental impact[14].

The company has found an opportunity to manufacture battery anode material from natural graphite without the negative environmental effects associated with synthetic graphite, and at the same time, through its unique process, produce anode materials with the same functional properties as anode materials made of synthetic graphite.

The graphite that the Company will extract from its planned mines in Vittangi has completely unique properties, and is environmentally very advantageous compared to the industry standard for natural graphite. The Grafit ore one mined in Vittangi maintains exceptionally high graphite content and has properties that are naturally adapted to battery anodes. Vittangigraphite has such a high quality that 3-8 times less ore needs to be mined to produce the same amount of graphite concentrate, compared to other deposits globally. In addition, Vittangi graphite has unique properties such as particle size and shape, which means that they require less processing to become an effective anode material compared to other natural graphites. The properties of Swedish graphite, in combination with the

[14]Batteries 5, 48 (2019): *Life Cycle Analysis of Lithium-Ion Batteries for Automotive Applications.* MDPI.

Company's techniques and technology, make possible production of anode materials that result in batteries being able to charge significantly faster, last longer and can be used in a larger temperature range. Through the use of natural graphite, many of the negative effects of synthetic graphite manufacturing can be avoided. Emissions to air are significantly reduced when carbonization of crude oil and coke is avoided, and energy consumption is significantly lower than in synthetic graphite production.

By also being able to use renewable produced electricity, Talga will be able to manufacture anode materials with significantly lower carbon dioxideemissions than conventionally manufactured anode material. A life cycle assessment (LCA) for the product being produced, Talnode-C®, has been developed in 2021. The analysis that was carried out showed that the carbon dioxide emissions at Talga's applied manufacturing method are very low, and that the production of battery anode material in the applied for business will be able to take place with a significantly smaller climate footprint compared to conventional manufacturing.

Talga's production processes are partly completely unique, partly a further development of conventional anode manufacturing. An example of the latter is the processes in the grafiring plant. In graphite production from natural graphite, a graphite purification step always occurs. The purpose of this is to remove residual rock material from the graphite material. This is done, as at the Talga plant, in a leaching process. In conventional graphite manufacturing, large amounts of hydrofluoric acid are used in this step, which is a very toxic substance. In many cases, only hydrofluoric acid is used, in other cases this is combined with other acids to some extent. Talga has developed a process in which part of the hydrofluoric acid is replaced by sulfuric acid in order to minimize the amount of hydrofluoric acid used and thus reduce the risks to both the environment and human health with the process. As a reference value for conventional graphite production, a use of 180 kg hydrofluoric acid per ton of purified graphite can be stated, and in Talga's process the consumption is approximately halved compared to this. Hydrofluoric acid is used in talga's process only in those parts where it is not possible to replace the acid with another alternative.[15]

The anode production facility uses partly existing and proven technology, and partly processes that are unique to the business sought. In this production part, Talga takes advantage of the advantages that economies of scale bring. It will use the largest production equipment that is commercially viable, which means greater efficiency, and as has been assessed, less emissions.

As for purification equipment, Talga uses proven technology for water purification (chemical precipitation and filtration) and for air emissions (textile filters for dust, combustion of VOC emissions) in order to minimize the emissions that occur. The purification equipment is adapted and tested for the specific activity that will be conducted.

In summary, the company's manufacturing process is judged to mean that the best possible technology is used as far as practicable.

6.3 COMPLIANCE WITH BAT CONCLUSIONS AND BREF DOCUMENTS

As a result of the former so-called IPPC Directive (Directive 96/61/EC) and the current Industrial Emissions Directive (Directive 2010/75/EU) (IED), work is underway in the EU to define BAT (Best Available Techniques) for a number of industrial activities. Accounting takes place in a so-called BREF document (BREF = best available techniques reference document). There are documents relating to very well specified and delimited activities/industrial processes (vertical) as well as more transversal documents (horizontal) that apply to all industries covered by the provisions of the Industrial Emissions Regulation.

[15]Journal of Cleaner Production 336 (2022): *Life cycle assessment of natural graphite production for lithium-ion battery anodes based on industrial primary data.* Elsevier.

The activities of the planned installation are covered by the *Industrial Emissions Regulation (2013:250)* and the BAT conclusions produced regarding the non-ferrous metal industry, BAT NFM, published on 30 June 2016. Section 6.3.1 and Annex B:3 describe the relationship of the planned installation in these BAT conclusions.

There are also two horizontal BREF documents of some relevance to Talga's operations: *Emissions from Storage* (EFS) adopted in July 2006 and *Industrial Cooling Systems* (ICS). In episodes 6. 3.2-6. 3.3 Below is a description of how the activity applied for relates to these BREFs.

6.3.1 Non Ferrous Metals (NFM)

6.3.1.1 Introduction

Talga's planned operations are covered by *Chapter 4. Section 12 of the Environmental Review Ordinance*, plant for roasting or sintering metal-containing ore, including sulphide ore. According to chapter 2. Section 29 of the *Ndustriemissions Ordinance* applies to this type of activity BAT conclusions for the non-iron ore industry.

The BAT conclusions contain two parts that are partly relevant to Tallow, a general part and a part specific to the manufacture of carbon and/or graphite.

The general part sets out 19 conclusions on environmental management systems (BAT 1), energy management (BAT 2), process control (BAT 3 and 4), measures to prevent/reduce diffuse emissions (BAT 5 - 9), monitoring of emissions to air (BAT 10), measures to prevent/reduce emissions of mercury (BAT 11), sulphur dioxide (BAT 12) and nitrogen oxides into air (BAT 13), measures to: prevent/reduce waste water generation and discharges to water, monitoring of such discharges and BAT-AEL thereof (BAT 14 – 17), noise reduction (BAT 18) and reduction of odours (BAT 19).

The activity-specific part of the BAT conclusions contains conclusions on measures to prevent/reduce emissions to air in the form of diffuse emissions (BAT 177); dust and PAHs (BAT 178-181), sulphur dioxide emissions (BAT 182), organic compounds (183) and waste reduction measures (BAT 184).

Reporting of the fulfillment of relevant BAT conclusions is made in Appendix B:3, designed with the Swedish Environmental Protection Agency's template for reporting compliance with BAT conclusions as a basis. The general BAT conclusions and those that are activity-specific for the manufacture of carbon and graphite are presented here. Other BAT conclusions apply to other types of processes and are not reported.

BAT 11, 12, 13, 177, 179, 181 and 182 do not apply to Talga's planned activities for reasons set out in the attached report and in Section 6.3.1.2 below.

The general considerations for the conclusions state that there is no requirement to use the techniques set out and described in the BAT conclusions, nor should they be considered complete and comprehensive. Other techniques may be used if they provide at least equivalent environmental protection.

6.3.1.2 1. BREF, conventional graphite manufacturing and Talgas process

The *reference document on Best Available Techniques in the Non Ferrous Metals Industries* (BREFen) covers the complex area of non-ferrous metals and covers the production of metals from both primary and secondary raw materials.

Talga's planned operations mean that battery anode materials will for the first time be commercially produced outside Asia. The planned processes are unique and have not been applied in the EU before. Talga's process involves the manufacture of battery anode material from graphite

concentrates. The graphite concentrate is purified in an alkaline roasting and leaching process whose purpose is to remove impurities such as silicates and sulfides. In this process, sodium hydroxide, sulfuric and hydrofluoric acid are used. In the anode plant, purified graphite is then treated to produce anode material, and here nitrogen gas and coating with pitch are used.

In conventional graphite manufacturing, graphite is made from coke and crude oil, so-called *synthetic graphite*. It is mainly processes associated with synthetic graphite that are described in the BREF, and thus several of the described processes and techniques are not applicable to Talga's planned activities.

Section 1.9 of the BREF provides an overview of carbon and graphite production, and section 10 provides more specific information on the processes, emissions, consumption and techniques to prevent or reduce environmental impact.

According to the BREF, carbon and graphite are mainly used in current-conducting materials (cathodes and graphite electrodes) and as chemical reducing agents in the aluminum industry. Furthermore, it is stated that carbon and graphite manufacturing can be divided into five groups:

- Green mix and paste used mainly in the aluminium and iron alloy industry
- Anodes, mainly used in the aluminum industry as a reduction material
- Carbon and graphite, mainly used in the steel industry and as cathodes in the aluminum industry
- Special carbon and graphite, a large number of applications with requirements for high purity, mechanical strength and heat resistance
- Calcinated anthracite and petroleum coke for use in steel production

Talga's planned plant and processes do not fit into any of the above groups, but constitute a completely new type of graphite manufacturing that was previously not applied.

Section 1.9.2 of the BREF states that the production of carbon and graphite materials is mainly based on petroleum coke and coal (anthracite) and tar-based coke. Beck ("petroleum pitch" and "coal tar pitch") are used as binders, and this is converted into inert solid coal, coke or graphite by combustion or in the user phase.

The process is further described in the BREF's section 1.9.3. So-called degassed pasta is produced by coating coke or anthracite with pitch (14-18 by weight%), and to produce electrode paste, burnt anthracite or petroleum coke is coated with pitch (20-30%). The prepared pasta then goes through a number of steps that include molding, baking, impregnation and graphitization.

Both the raw materials and to some extent the approach differ mainly from Talga's process where graphite concentrate is primarily purified in a roasting and leaching process. Thus, the main raw material is graphite concentrate and not coke. However, parts of the anode process can to some extent be likened to the baking processes, namely the coating stage where graphite particles are formed and coated with pitch, and the pyrolysis where the pitch coating is carbonized and the volatile organic compounds are driven off. In Talga's coating stage, where pitch is used, the pitch content is about 8%, the rest is pure graphite.

The BREF states that the main environmental aspects associated with carbon and graphite production are the air emissions of dust, tar/pitch and PAHs from the handling and combustion (in the baking and graphitization stage) of pitch, sulfur dioxides from coke and fuels, and VOCs from impregnating additives.

As coke will not be used and impregnation will not be performed, specified techniques related to the reduction of emissions of SO_2 and VOC are not considered relevant for the planned activities.

The BREF shows that emissions of dust, tar/pitch and PAHs occur mainly during storage of pitch, during mixing and forming, in graphitization in the furnaces and during impregnation. This is applicable to emissions from pitch storage and at the pyrolysis stage in Talga's operations.

Since the production processes described in the BREF largely concern synthetic graphite and not the production processes that will be applied in Talga's operations, several of the BAT conclusions will not be applicable to the business. Therefore, in the accounting for the fulfillment of BAT-NFM, a description has been made of the processes/techniques that are applicable, and of those that are relatively comparable.

6.3.2 Emissions from storage (EFS)

The document applies to all storage, transfer and handling of liquids, liquefied gases and solids, regardless of industry or type of industry. The document deals with emissions to air, soil and water with the greatest focus on emissions to air.

The document covers, inter alia, the following areas:

1. Storage of liquids and liquefied gases
2. Transfer and handling of liquids and liquefied gases
3. Storage of solids
4. Transfer and handling of solids.

The document is divided into seven chapters. Chapter 1 provides a general introduction to environmental aspects and emission risks associated with the storage and handling of substances/products. Chapter 2 deals with the classification of substances and different classification systems. Chapter 3 describes different technologies for storage, transmission, and management. For each technology, relevant operational activities such as commissioning, refilling, cleaning, deaeration and possible emission sources are described. Chapter 4 describes various precautions (ECM – Emission Control Measures) to be taken into account when determining the best available techniques for each storage method. Chapter 5 describes the methods, techniques, and activities that make up BAT. In many places, Chapter 5 refers back to previous chapters. Chapter 6 discusses new/upcoming technologies and chapter 7 provides final comments.

Information in Chapter 5 that is of importance for the activity sought is presented below, and in italics it is stated how the planned activity relates to the respective BAT conclusion.

6.3.2.1 Storage of liquids and liquefied gases (in cisterns)

BAT for storing liquids and liquefied gases in cisterns is described in three sections.

The first section describes general BAT solutions to prevent and reduce emissions during storage in cisterns (sections for cistern design, inspection and maintenance, location and design, cistern paint, emission minimization, (applies only to large storage facilities), monitoring of VOCs (applies to facilities where significant VOC emissions are likely to occur from storage) and dedicated systems for the purpose.

It is BAT to consider the following in terms of tank design:

- The physicochemical properties of the substance being stored.
- How the storage is carried out.
- Alarm about deviations from normal process conditions.
- How the storage is protected against deviations from normal process conditions.
- What equipment needs to be installed.
- What maintenance and inspection plan needs to be implemented and how this is facilitated.
- Maintenance and inspection work.

- How emergencies are handled.

For inspection and maintenance, it is considered BAT to establish risk-based maintenance and inspection plans. For localization, BAT is to locate a tank in atmospheric pressure above ground. However, BAT for flammable liquids can be stored in underground tanks in a place with limited space.

Furthermore, BAT is to apply a tank paint with a thermal or light radiation reflectivity of at least 70%, or a sunscreen for above-ground tanks containing volatile substances.

> *In the case of applied activities, liquids are stored in the form of hydrofluoric acid, sulfuric acid and diesel fuel. Liquefied gases are handled in the form of LPG. Most of the stored liquids are not classified as flammable.*
>
> *The tanks that will be within the business will be designed based on the physical and chemical properties of the products to be stored, how the storage will take place and what equipment is needed.*
>
> *All storage of liquids is located above ground, and no pressurized storage tanks occur, apart from the LPG storage.*
>
> *The acids are stored in the graphite purification plant.*
>
> *Hydrofluoric acid will be stored in a tank that holds about 50 m^3. The tank is double-jacketed, constructed in cross-linked high-density polyethylene (XHDPE), placed in a separate indoor space and fitted with embankment that holds the entire volume plus 10%. Even embankment is coated with a material that is resistant to hydrofluoric acid.*
>
> *Sulfuric acid will be stored in a tank that holds about 160 m^3. The tank consists of metal and is located in a separate space indoors in an embankment that holds the entire stored amount plus 10%, and which is resistant to sulfuric acid.*
>
> *The diesel tank will be embanked or double-jacketed and protected from precipitation. The LPG tank will be designed and placed in accordance with the requirements of the Law on Flammable and Explosive Goods, and placed outdoors.*
>
> *Monitoring of VOC emissions is not relevant for the plant as no liquid substances containing VOCs are stored, except for diesel which is only stored in a small amount.*
>
> *Talga will implement a comprehensive system for controlling the entire business, including instructions and procedures, which will be implemented through the Company's integrated management system. Within the framework of the Company's management system, there will be procedures for continuous supervision of tanks, pipelines and other equipment necessary to ensure that quality, environmental and safety requirements are met. There will also be well-developed systems and programs for continuous supervision and maintenance, which will be developed based on, among other things, the risk assessments that have been made and will be continuously carried out for the business. The frequency and type of supervision and maintenance are controlled, for example, by factors such as how safety-critical the equipment is, operating conditions and the environment in and around the equipment. This is described in more detail in the Safety Report prepared for the operation and attached to the application (Annex D). The supervision includes, among other things, checking for visible damage and leakage and checking of level sensors. Supervision will be recorded. Emergency preparedness procedures will also be in place.*

The second section describes specific BAT solutions for different types of cisterns. For the storage of volatile substances that are toxic, very toxic or carcinogenic, mutagenic and toxic to reproduction category 1 and 2, BAT is to use a gas purification plant. For other substances, it is stated that BAT is to apply all, or a combination of different specified techniques, depending on the properties of the

stored substance. BAT is to use pressure limiting valves set to the highest value. For liquids/solutions that contain a lot of particles, BAT is to stir the stored product to avoid deposits that would require extra purification steps.

> *Planned activities do not involve the storage of volatile substances, and no carcinogenic, mutagenic or reprotoxic substances will be handled in tanks. The toxic substance that will be stored within the plant (hydrofluoric acid) can to some extent be considered volatile, and a purification system will be used. All storage and handling, including unloading, of hydrofluoric acid will take place indoors. Storage tank for hydrofluoric acid as well as unloading space will be ventilated through a scrubber system. The same applies to storage tank for sulfuric acid. When unloading, a so-called vent-back system is applied where vapors are returned to the tanker truck.*
>
> *Liquids and solutions containing particles are not stocked, but are present in the production process in the purification stage of the graphite treatment plant. In these stages, the fluids are in motion.*
>
> *Pressurized storage occurs only for LPG storage. This will be equipped with pressure limiting valves.*
>
> *There are no ground-based tanks.*

Finally , the third section describes BAT solutions to prevent accidents and emergencies. Initially, it is stated that BAT is to implement a safety management system. The section contains BAT solutions for safety and risk management, operating procedures and training, leakages due to corrosion and/or erosion, operating procedures and equipment to prevent overfilling, instrumentation and automation to detect leaks, risk-based models for emissions to soil under cisterns, ground protection around cisterns (containment), flammable areas and sources of ignition, fire protection, firefighting equipment and collection of contaminated extinguishing water/fire extinguishing with*electricity).*

> *Within the framework of the Company's integrated safety management system, there will be procedures for safety and risk management, continuous supervision and maintenance, operating procedures and training to prevent accidents and emergencies, which are further described in the safety report. Tight supervision and monitoring will be done of all pipelines, hoses and connections through established procedures and checklists. Protective equipment will be available for the Company's operators, such as a respirator mask and equipment that can be used during decontamination.*
>
> *Acid storage tanks will be equipped with level monitoring, high-level alarms and overfill protection. The hydrofluoric acid tank will be double-jacketed and placed in a separate fully embanked space indoors. The space between the two layers of the tank is equipped with leakage alarms, in hydrofluoric acid detection here the pump automatically stops when unloading.*
>
> *The sulfuric acid tank is placed indoors in a separate space, also this fully embanked.*
>
> *The hydrofluoric acid storage space as well as some strategic locations where hydrofluoric acid is handled will be equipped with hydrogen fluoride detection and automatic alarm for quick indication of leaks. The space will form its own fire cell and allow evacuation of the acid from outside in the event of a fire. Pipelines and connections will be fully welded for all pipes located outside embankments, the number of connections / flanges is reduced as far as possible. Fittings that are not fully welded are provided with paint that indicates acid discharge in the event of minor leaks.*

The diesel tank is located inside embankment. LPG tanks will be equipped with safety valves and placed so that no ignition sources are nearby. A sprinkler system will be available at the LPG storage for cooling in case of fire in adjacent buildings.

The entire graphite treatment plant, including the unloading sites of hydrofluoric acid and sulfuric acid, is embanked, which allows the collection of spills. Within the graphite treatment plant, where toxic substances in the form of hydrofluoric acid are handled, there will also be the possibility of collecting extinguishing water to prevent leakage to the sewer network in the event of a fire or spill. The graphite cleaning plant has a comprehensive sprinkler system.

A comprehensive automatic fire and evacuation alarm will be installed, the sound signals will be supplemented with lights that flash red light in the event of an alarm.

Smoke and flame detectors will be located in areas where hydrofluoric acid is handled, LPG management will be equipped with flame and gas detectors.

A plant-wide toxic release alarm system is installed. This can be started via manual alarm points or via the control room to the graphite treatment plant if the hydrogen fluoride detectors have indicated an emission.

A safe space within the facility ("toxic refuge") will be installed where personnel can be evacuated in the event of a spill, and from this location rescue operations will be able to be led and emergency control handled.

A storage tank for fire water will be installed with the aim of ensuring access to extinguishing water in the event of a fire. The tank will be connected to a system of wires and pumps for the entire site. The fire water system will have two pumps of 100% capacity, where one pump is powered by electricity and the other by diesel. The fire water pumps will be able to provide the entire plant with sufficient flow and pressure. The system will primarily be used to facilitate the evacuation of own personnel and protect emergency service personnel, screen fires and cool down equipment and building parts that are exposed to fire or heat impact. The fire water pumps will have both automatic and manual activation, but stops will only be available locally.

Fire extinguishers will be available at strategic locations in all premises.

The place where LPG is stored will be equipped with sprinklers, and in places with sensitive equipment there will be extinguishing gas.

The storage of liquids and liquefied gases at the planned operations is thus considered to be designed to meet the relevant requirements of the BREF document.

6.3.2.2 Storage of packaged liquids and liquefied gases

At the outset, it is stated that for activities that fall under the Seveso Directive, BAT is to comply with the requirements regarding action programmes, safety management systems and safety reports that this legislation requires.

Packaged liquid products or liquefied gases do not occur, only storage in tanks.

Talga has established an action programme that will be integrated and implemented through a safety management system, as described in the safety report.

Furthermore, it is stated that BAT is to appoint a person responsible for the operation of the plant and to train this person in current emergency procedures, to store packaged liquids and liquefied gases under cover, to store hazardous packaged products separately from ignition sources, to store products within embankment (the size of which is to be determined on a case-by-case basis), as well as to have firefighting equipment and the possibility of collecting extinguishing water.

The site manager is responsible for the operation of the facility. The safety report reports the safety management of the business. The regional manager will have the overall responsibility for the management of serious chemical accidents and the main responsibility for the business's action plan and safety management system. The site manager and the technical manager have significant roles in the implementation of the safety management system. Training in emergency procedures will be provided by all relevant personnel, as described in the safety report. The internal response plan will be tested through internal exercises as well as exercises involving external actors. Based on these exercises, the plans will be updated as needed.

No products that can self-ignite are handled in the business. Sources of ignition are well separated from stored products.

Fire-fighting equipment and equipment for collecting extinguishing water are described in section 6.3.2.1

The storage of packaged liquids and liquefied gases at the planned operations is thus considered to be designed to meet the relevant requirements according to the BREF document.

6.3.2.3 Handling and transfer of liquids and liquefied gases

The following general principles are listed as BAT for the movement and handling of liquids and liquefied gases:

1. Develop tools for preventive maintenance and carry out inspections of the facilities developed from a risk perspective.
2. To apply a safety management system to prevent accidents and incidents according to the requirements of the Seveso legislation.
3. To train staff in safe and responsible procedure.

As mentioned earlier, within the framework of Talga's safety management system, there will be procedures for preventive supervision and maintenance, as well as procedures for the training of personnel.
Procedures for emergency preparedness and for checking and inspecting tanks and pipelines will be in place. Equipment and procedures to prevent leakage to stormwater during unloading of hydrofluoric acid will also be in place. Accidents and incidents will be reported and followed up. Staff will be trained on an ongoing basis. This is further described in the safety report, Appendix D.

Furthermore, BAT is indicated for pipeline systems, both above and below ground, for the reduction of emissions during filling and emptying, for joints of pipeline systems and the prevention of corrosion, for valves, pumps and compressors and for sampling lines.

For the transport of liquids and liquefied gases in pipelines, it is stated, among other things, that BAT is to place pipelines above ground for new plants and to minimize the number of flanges and replace them with welded connections. BAT is also indicated to prevent corrosion, including choosing materials that are resistant to the chemical in question.

BAT for unloading and loading volatile substances to or from cars and boats is to install a gas purification plant for the treatment of significant emissions. What constitutes a significant discharge is determined on a case-by-case basis.

Finally, specific BAT is specified for valves, pumps and compressors. For pumps, it is considered BAT to, among other things, correctly fix the pump, to use the pump in a way recommended by the manufacturer, to balance the moving parts of the pump correctly and to regularly monitor and maintain both rotary equipment and sealing systems.

All pipelines for liquids and gases at the plant are located above ground (excluding water pipes) and consist of materials that are resistant to the chemical products handled in them. Fully welded connections are used for all hydrofluoric acid pipelines that go outside the storage area and embanked areas, pipelines with flanges are provided with paint that may indicate acid discharge. Talga generally strives to minimize the number of flanges, especially for longer wires.

Pumps are used in the manner intended by the manufacturer, and procedures for regular inspection of the same are in place.

The liquid substances that are unloaded are hydrofluoric acid, sulfuric acid and diesel fuel. Throughout the unloading process, staff are on site to monitor the unloading and unloading is also controlled by established procedures. Among other things, several manual and controlled steps in the process are required to be able to have both authorization and the necessary knowledge. Procedures for checking equipment as well as for taking action in the event of a leak will be in place.

The release of hydrofluoric acid occurs in a specially enclosed space. A return line directs fumes from the storage tank back to the tanker, a so-called vent-back system. In other cases, the air released from the tank and ventilation from storage space and unloading space are purified through a scrubber system.

The place of unloading of sulfuric acid will be provided with a roof and secondary protection, such as a waste chute connected to the collection caisson or similar device with a corresponding function. The collection volume will be at least equal to the volume of a tanker plus 10%.

Areas where the handling of flammable substances takes place (LPG and diesel) will be equipped with prohibition and warning signs in accordance with MSB's and the Swedish Work Environment Authority's regulations. There is also a flame and gas detector within the plant.

The handling and transfer of liquids and liquefied gases at the planned operation is thus deemed to be designed to meet the relevant requirements of the BREF document.

6.3.2.4 Storage of solids

BAT is primarily to store end-of-life materials in silos, containers, magazines, etc. For storage in magazines, BAT is to install equipment for mechanical ventilation with dust removal and to keep doors closed. BAT is also to install dust cleaning equipment with the emission level 1 – 10 mg/Nm^3 depending on the properties of the stored material.

The same BAT conclusions for the storage of packaged solids are given as for the storage of packaged liquids and liquefied gases. See above under section 6.3.2.20.

BAT to prevent incidents and accidents is to use a safety management system according to the requirements of seveso legislation.

The solids stored within the plant are graphite materials (concentrate and finished product), natrum hydroxide, ferrous sulfate, burnt lime, precipitation chemicals and pitch.

All handling and processes take place indoors. Most of the solid raw materials are stored inside the buildings. Incoming graphite materials are stored in sealed double sacks (plastic and fabric) in closed containers outdoors. Sodium hydroxide granules and solid pitch are mostly stored inside, but will also be able to be stored outside in closed containers in smaller quantities. No open handling of materials takes place outside.

In the graphite treatment plant, extractors are equipped with cyclones and filters in emission points where solid materials are handled to collect dust. Solid materials are stored in closed

containers. Dust collected in cyclones and filters will be returned to the process to the greatest extent possible.

In the anode plant, solid raw materials (graphite, pitch) are handled in fully enclosed systems. The facility has been designed on the principle of "zero dust environment". When carrying out repairs and maintenance, work is carried out in enclosed spaces with vacuumut suction.

The plant will be designed so that the dust emission amounts to a maximum of 5 mg/Nm³.

Talga has established an action programme that will be integrated and implemented through a safety management system, as described in the safety report.

The storage of solids at the requested activity is thus considered to be designed so that it meets the relevant requirements according to the BREF document.

6.3.2.5 Handling and transfer of solids

The BAT conclusions on emissions from the transfer and management of solids begin with conclusions on general methods for reducing dust emissions including:

1. Scheduling of outdoor transmission activities.
2. Mitigation measures in discontinuous transport:
    1. Cleaning roads and vehicle tires.
    2. Wetting of the product.
    3. Minimizing fall speed.
    4. Minimizing free fall height.

The BAT conclusions on general methods are followed by conclusions on the minimisation of dust emissions from the transfer methods of claws and transporters. When it comes to conveyors, BAT is to design them so that spills are minimized and that – where relevant – they should be covered.

Open transportation of solid materials within the facility will not occur. All handling of materials takes place indoors, some storage of solid material in closed containers takes place outdoors. Measures to prevent dusting outdoors are not applicable.

Solid raw materials in the form of graphite concentrate are handled outdoors in closed systems (see above), and transported to the graphite treatment plant in closed pipe systems. All other handling of solid raw materials takes place indoors, and the materials are delivered in closed sacks or containers.

All handling and transfer of solid materials is done in closed systems equipped with dust collection systems.

In the graphite treatment plant, extractors are equipped with cyclones and filters to collect dust for the areas where solid materials are handled (including the roasting process, drying and drying of residual products from the water treatment). Dust collected in filters will be returned to the process to the greatest extent possible.

In the anode plant, solid raw materials (graphite, pitch) are handled and transported in fully enclosed systems. The facility has been designed on the principle of "zero dust environment". The air emissions from the process tray where pitch is handled, the forming, mixing and packing are equipped with filters, and the dust is returned to the process to the greatest extent possible.

When carrying out repairs and maintenance, work is carried out in enclosed spaces with vacuumut suction.

The plant will be designed so that the dust emission amounts to a maximum of 5 mg/Nm3.

The handling and transfer of solids at the applied activity is deemed to be designed to meet the relevant requirements of the BREF document.

6.3.3 Industrial Cooling Systems (ICS)

The BREF document *Industrial Cooling Systems (ICS)* was adopted in December 2001. The Industrial Refrigeration Systems Document is a transversal document that covers the use of refrigeration systems in several different industrial sectors and is thus not a document specific to Talga's type of plant. The document only covers cooling systems that use air and/or water for heat exchange.

The BREF document is divided into five chapters in which Chapter 4 summarizes techniques and, where possible, emission and consumption levels, associated with applying BAT to various industrial refrigeration systems.

Information in Chapter 4 relevant to the planned activity is presented below.

6.3.3.1 Process and localization requirements

The choice between wet, dry and wet/dry cooling to meet the requirements of the process and the site shall aim to achieve the best overall energy efficiency. To achieve a high energy efficiency when handling large amounts of low-level heat (10-25 °C), BAT is to cool through non-circulating systems. The use of groundwater for cooling should be minimized to reduce the risk of depletion of groundwater resources. When cooling hazardous substances with a high risk to the environment in the event of a leak, indirect cooling systems should be used.

> *Talga strives to achieve optimal energy efficiency. The cooling system used for cooling in the anode plant is based on the intake of seawater and return to the recipient after cooling. All cooling systems within the applied activity are indirect and non-circulating. Groundwater is not used for cooling, and cooling of hazardous substances does not occur in sought-after activities.*

The process and localization requirements according to the BREF document are generally considered to be met in the planned operations.

6.3.3.2 Reduction of direct energy consumption

When designing a cooling system, BAT is to:

1. Reduce water and air resistance in the cooling system.
2. Using energy-saving equipment.
3. Reduce the amount of energy-intensive equipment.
4. Optimize water treatment in non-circulating systems to avoid surface damage, fouling and corrosion.

Regarding the overall energy efficiency, non-circulating systems are considered to be BAT. This is especially true for processes that require a large cooling capacity (>10 MW_{th}).

> *Talga will strive to use low-energy equipment and to streamline and optimize cooling water extraction and cooling. The system is non-circulating. Cooling water chemicals will be added to the cooling water to prevent marine organisms from taking hold in the cooling water pipes, and the additive will be optimized to achieve the desired effect. The addition and release of cooling water chemicals will be monitored to ensure that the released cooling water does not contain residues of the substance.*

The design of the cooling system is judged to be designed to meet the relevant requirements regarding the reduction of direct energy consumption according to the BREF document.

6.3.3.3 Reduction of water consumption and heat emissions to water

Reducing water consumption and reducing the release of heat to water are closely interconnected and the same technical options apply. The amount of water needed for cooling depends on the amount of heat to be released. The higher the degree of water reuse, the less water is required. It is BAT to minimize the use of limited sources with little water supply. Circulation of cooling water using open or closed circulating systems is BAT, when the availability of water is small or unreliable.

For existing cooling systems, BAT includes:

- Reduce the need for cooling.

  Talga's processes require cooling and work with process optimization and energy efficiency will be a priority within the business, among other things to reduce the need for cooling. Talga will use an open system when the supply of seawater is good.

The design of the cooling system is judged to be designed to meet the relevant requirements regarding the reduction of water consumption according to the BREF document.

6.3.3.4 Reduction of retraction of organisms

In this area, no clear BAT has been identified, but emphasis has been placed on an analysis of the biotope for intake and emission points, as the local conditions are crucial. The strategies should be to analyze the affected biotope in the surface water recipient and to optimize the speed of the intake to minimize sedimentation.

Talga has commissioned a study of the water recipient to determine which intake and discharge point is optimal from a technical, economic and environmental perspective. The water intake point is located just west of the bridge that connects the Hertsö field with Svartön (Gräsörvägen). The discharge point is located about 350 meters west of the point that in Sweco's recipient investigation (Appendix B:4) is called Udden. The background to the selection of intake and emission points is set out in sections 8.1.4 and 8.11.3 of the EIA, and in brief the choice has been made based on the local conditions in the recipient.

Relevant requirements regarding the reduction of *retraction of organisms according to the BREF document are considered to be met.*

6.3.3.5 Reduction of emissions of chemical substances into water through optimized treatment of cooling water

BAT is to reduce the need for treatment of cooling water by reducing the occurrence of contaminants and corrosion through appropriate design. Furthermore, it is considered BAT to design cooling systems so that stagnant zones are minimized to prevent fouling and corrosion.

BAT is to reduce the use of biocides through targeted dosing in combination with monitoring of the organisms that can cause fouling and the residence time of the cooling water in the system. In non-circulating systems, discontinuous treatment may be sufficient to prevent fouling.

BAT is not to use compounds of chromium, mercury, organic metals, mercaptobenzothiazole as well as shock treatment with biocides other than chlorine, bromine, ozone and hydrogen peroxide.

The cooling system will be constructed in a corrosion-resistant material adapted to the local conditions. The design will ensure that stagnant zones are avoided. Cooling water chemicals containing any of the substances listed above will not be used. When choosing cooling water chemicals, the inherent properties of the substance will be taken into account in order to obtain as low an environmental impact as possible. Monitoring of the organisms that can cause fouling will be carried out with the aim of optimising the addition of cooling water chemicals.

The design of the cooling system is judged to be designed to meet the relevant requirements regarding the reduction of emissions of chemical substances according to the BREF document.

6.3.3.6 Reduction of risk of leakage and microbiological risk

BAT is to prevent leaks through the correct design of the cooling system, to operate the system according to its established design limits and to carry out regular checks of the cooling system.

To prevent microbiological risk (mainly Legionella), it is considered BAT to avoid stagnant areas and maintain sufficient water flow rate, as well as to optimize the treatment of cooling water to reduce pollution, algae and amoeba growth and spread.

> *Talga will work to prevent leaks in cooling water systems both in design and operation. The wires within the site will mainly be located above ground. Wires outside the field of activity will be land-laid. The wires will not be pressurized, and they will be pre-laid in drivable concrete caissons where traffic must pass. The plant will be designed to avoid stagnant zones, and an optimized use of cooling water chemicals will occur to avoid biological activity in the cooling water system.*

The design of the cooling system is judged to be designed to meet the relevant requirements regarding the reduction of leakage risk and microbiological risk according to the BREF document.

6.4 ZERO ALTERNATIVE

An EIA that is established for an activity that is likely to have a significant environmental impact must contain a report on how the current state of the environment is expected to change in the future if the intended activity does not come about, a so-called *zero alternative*. The purpose of accounting for the zero option is to provide a basis for being able to evaluate what change the activity or measure entails from an environmental point of view. The zero option thus means that the location of the business undergoes a different development than would be the case if the requested activity were to take place.

The zero option in this case means that the applied for activity does not come to fruition. This would mean that the environmental consequences described in the EIA would not materialise. The applied activity is planned to be established in an area that is planned for industrial activities, and the business area will be prepared for industrial activities regardless of whether the applied activity comes into being or not. The preparation includes the construction of roads and ditches as well as the laying of cables and pipelines, etc. Furthermore, in the zero option, the area of the applied activity is expected to be prepared, filled out and hardened for other industrial activities. The zero option also means that the major environmental benefits of manufacturing anode materials in northern Sweden, and that the jobs that the desired business is judged to entail, are absent. In the zero option, the company will try to find another place to build the planned business.

As the demand for anode materials for batteries is expected to increase in the future, a likely scenario is that the production of anode materials will also increase in already existing manufacturing facilities, which generally result in significantly higher greenhouse gas emissions compared to the activities soughtIn this production, it can be expected that the environmental standard is lower, and the energy used to mine and process the material in most cases comes from fossil fuels, as reported in section 4.2.

7 ENVIRONMENTAL OBJECTIVES AND STANDARDS

The following chapters summarise the main conditions taken into account in this EIA. Requirements relating to each type of condition are described in more detail in Chapter 8.

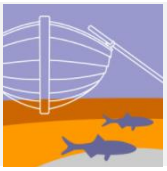
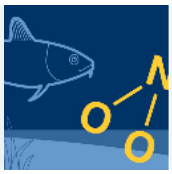
7.1 ENVIRONMENTAL OBJECTIVES

Table 3 below presents the national environmental quality objectives that concern the activity. The compilation has been prepared on the basis of data on the environmental quality objectives from www.sverigesmiljomal.se, which is the official and up-to-date portal for information on the sixteen national environmental quality objectives. Table 3 comments on the way in which the activities sought relate to the objectives, and also provides a reference to the chapters of the present EIA where more detailed accounts are available.

Norrbotten County has no decided regional environmental goals, but works according to the national environmental goals and also has specific action programs. Norrbotten County has also decided on a climate and energy strategy in which designated areas of intervention are located, see more in section 7.2.

Table 3. National environmental quality objectives of importance for the activity applied for and how the activities applied for concern the environmental objectives.

ENVIRONMENTAL OBJECTIVE	HOW THE ACTIVITY APPLIED FOR CONCERNS THE ENVIRONMENTAL QUALITY OBJECTIVE
 Reduced climate impact	The applied business involves the production of anode materials for lithium-ion batteries used, among other things, in electric vehicles. Production entails a climate impact in itself, but overall, the applied activities are involved in reducing dependence on fossil fuels and thus limiting climate impact. By locating operations in northern Sweden, with close access to the raw material and renewable electricity, and by using the Company's developed technology, the production of anode materials results in less greenhouse gas emissions compared to conventional production methods. Greenhouse gas emissions from the activities applied for are relatively small. The business also involves transports that entail emissions of, among other things, carbon dioxide. See also sections 4.1, 8.7, 8.12 and 8.15.
 Clean air	Due to the large distance to housing, emissions to air from both processes and transports of, among other things, particles, NOx and hydrogen fluoride are not considered to result in environmental quality standards or environmental goals being exceeded. See also sections 8.12 and 8.15.
 Natural acidification only	Sulphide soils have been found in the zoning area, which can cause acidification. If sulphide soil is found within the applied field of activity at the time of establishment, the soil will be managed appropriately. See also section 8.1. The activity applied for also means a small emission of NOx and emissions from transport, see further sections 8.12 and 8.15.
 A non-toxic environment	The activity applied for involves the handling and consumption of chemical products, including hydrofluoric acid and sulfuric acid. See also sections 8.8 and 8.17. The activity applied for also involves emissions to air of, among other things, hydrofluoric hydrogen, see further section 8.12.

	A balanced marine environment, flourishing coastal area and archipelagos	The applied activity involves the discharge of cooling and process water to Sörbrändöfjärden. According to the completed recipient investigation, the activities applied for are not considered to affect the chances of achieving the environmental quality standards for the water body concerned. See also section 8.11.
	Zero eutrophication	Applied activities involve small emissions of nitrogenoxides into the air, which can cause eutrophication through atmospheric deposition of nitrogen. See also section 8.12.
	Flourish lakes and streams	The applied activity will not involve any emissions to Harrbäcken. See also section 8.11.
	Good-quality groundwater	The activity applied for entails a limited groundwater subsidence but is not expected to affect the quality of groundwater. See also section 8.10.
	Thriving werlands	The establishment ofone of the zoning plan inthe industrial area, and secondarily the activity applied for, means that wetlands within managed forest land are taken up and thus disappear. See also section 8.2.
	Sustainable forests	The activity applied for means that managed forest land is used for the facility, but the activity is not expected to affect nearby nature reserves. See also section 8.2.
	A good built environment	The applied activity will generate waste, which will be handled by approved carriers and recycled as far as possible. However, a significant part of the waste will need to be taken to landfill. See also section 8.13. The activity will also cause noise, see further section 8.14.
	A rich diversity of plant and animal life	The area of activity applied for did not contain any red-listed species at the time of the inventories in connection with the detailed planning work. See also section 8.2.

7.2 ENVIRONMENTAL PROGRAMME FOR NORRBOTTEN COUNTY

Norrbotten County has decided on a climate and energy strategy whose purpose is to point out a common direction for the work for the county's actors and provide support for priorities in the work. The strategic directions as well as the focus and intervention areas concern fossil-free transport, world-class production, future consumption and trade, resource-efficient buildings and flexible and robust energy systems. The strategy aims to keep the increase in the earth's average temperature below two degrees, and therefore the national goal of no net emissions of greenhouse gases from 2045 in the county is adopted. Furthermore, the national target of energy use being 50% more efficient by 2030 compared to 2005 is adopted and the county's electricity production to be renewable by 2040.[16]

[16] Länsstyrelsen i Norrbotten (2019). *Med sikte mot 2045 – Norrbottens klimat- och energistrategi 2020-2024.*

1. ENVIRONMENTAL PROGRAMME FOR LULEÅ MUNICIPALITY

In January 2016, Luleå Municipality's municipal council decided on two environmental goals for the municipality:

1. Carbon dioxide emissions will decrease by 60% between 1995 and 2030 and by 100% by 2040, excluding SSAB.
2. Carbon dioxide emissions will decrease to 1.4 tonnes per capita by 2030, excluding SSAB.[17]

Since 2015, Luleå municipality has also been a participant in the Covenant of Mayors, which is a European movement launched by the European Commission. The Covenant of Mayors was launched in 2008 with the ambition to bring together local authorities to voluntarily commit to achieving and exceeding the EU's climate and energy policy objectives. Participants commit to take action to achieve the EU's 40% greenhouse gas emission reduction target by 2030 and to adopt a common approach to climate change mitigation and adaptation.[18]

Luleå municipality has also decided on guidelines for climate adaptation for the municipality. These must be applied when planning and decisions on investments, the exercise of public authority and advice. Luleå municipality has also decided on a Green Plan, which will be used as a basis in the municipality's planning process and planning work as a support in prioritization between different interests, land use and development opportunities. The plan will be used as a tool to inform about the value of nature by showing what services nature provides to people and society[19].[20]

7.3 ENVIRONMENTAL QUALITY STANDARDS

Environmental Quality Standards (EQS) are a legally binding instrument that was introduced with the Environmental Code in 1999. The purpose of the standards is to prevent or remedy environmental problems, to achieve environmental quality objectives and to implement EU directives.

According to *chapter 5. Section 2 MB* requires an environmental quality standard to specify the levels of pollution or disturbance to which people may be exposed without danger of significant nuisances or with which the environment or nature may be burdened without danger of significant nuisances. Norm values exist for hours, days and years. An environmental quality standard is considered to be in breach if at least one of these standard values is exceeded.

When granting permits in accordance with the Environmental Code, it must be ensured that the permit does not contribute to any environmental quality standards being exceeded.

Today, there are environmental quality standards for:

- → various pollutants in the outdoor air (SFS 2010:477)
- → different parameters in water bodies (SFS 2004:660)
- → various chemical compounds in fish and mussel waters (SFS 2001:554)
- → environmental noise (SFS 2004:675)

Relevant environmental quality standards for surface water and outdoor air are presented in red information boxes under the respective sections of Chapter 8.

[17] Luleå municipality's website. *Climate*. Retrieved 2022-01-04
[18] Luleå municipality's website. *Reduce climate impact in Luleå*. Retrieved 2022-01-04
[19] Luleå Municipality (2015). *Guidelines for adaptation to climate change.*
[20] Luleå kommun (2020). *Grönplan Luleå.*

8 IMPACT ASSESSMENT

The following chapters present the conditions for the activity applied for and the impact, effects and consequences that are estimated to arise on the environment and human health as a result of the activity applied for. The impact assessment is divided into sections for each aspect. The following information is provided for each type of impact:

1. Conditions
2. Impact and effects
3. Protective measures
4. Impact assessment

A comparison is also made with the zero option, which is further described in section 6.3.

The environmental impact assessment is qualitative, but is mainly based on certain frameworks and the impact level is described in this EIA based on a five-point scale; positive consequence, insignificant consequence, small negative consequence, moderate negative consequence and *large negative consequence,* see Table 4. See also section 2.2 Assessment criteria.

Table 4. Symbol explanation assessment criteria.

Positive consequence	*Insignificant consequence*	*Small negative consequence*	*Moderate negative consequence*	*Big negative consequence*
				

8.1 USE OF LAND AND WATER AREA

8.1.1 Conditions

The area where the business is planned to be established is today undeveloped and consists of flat forest land with elements of marshlands, wetlands and smaller watercourses and ditches. The forest is mainly made up of coniferous forest with elements of deciduous trees such as birch, sallow and aspen. The area is affected by forestry with thinned production forest and less drained wetlands.

Luleå municipality has decided that the area will be used for a new industrial area, Luleå Industripark, where Hertsöfältet and Svartön will open up for investment in the industry of the future. The land in question is owned by Luleå Municipality. Directly adjacent to the Hertsö field is a fire drill field as well as natural and forest land. South of the area of the planned facility is the Svartön industrial area with several large industries. Here you will find, among other things, four Seveso operations, Linde Gas AB, LKAB, St1 Sverige AB and SSAB EMEA AB. Information on related Seveso activities can be found in the Safety Report, Appendix D, and in Section 8.17. Northwest of the planned business area is the Hertsö meadows residential area and to the southeast is the residential area Hertsölandet.

Furthermore, Vattenfall has received a decision on a notified network concession for a line for a new 170 kV ground cable between Lerbäcken and Hertsöfältet in Luleå municipality. The pipeline will go from Lerbäcken along Hertsövägen to Gräsörvägen.

In addition to this, there is an ongoing application to narrow and strengthen the road betweenHert'sisland road and Gräsörvägen. A new pedestrian and bicycle path is also planned to be built between the intersection to Gräsörvägen and the intersection of old Lövskärvägen about 7 kilometers east of Luleå city center.

As described above in section 5.4.2, there is an agreed zoning plan for the area which shows that the land should be made available for industry that should not be mixed with housing.

Taking into account that a new industrial area is planned to emerge, new facilities for technical supply, such as sewage, energy, as well as IT, will be required. Hertsövägen passes north of the detailed planning area and runs east towards the sea. According to the agreed zoning plan, this road will continue to be a connection for homes and businesses on Hertsön.

At the Fire and Rescue Service's fire drill field east of the planned area of operation, firefighting foam with highly fluorinated substances (PFAS) has previously been used. Thecouncil is contaminated with PFOS/PFOA. Luleå municipality has, in connection with the development of the detailed plan, had an environmental and health risk assessment carried out to assess whether pollution from the previous operations has given rise to unacceptable risks. The municipality's assessment shows that the pollution is expected to remain for a long time to come. The assessment is also the development within the zoning plan with the lowering of groundwater and increased flows of stormwater in the ditches not expected to increase the rate of spread of PFAS from the fire drill field, see more below in this section.

In the area of operation of theplanned area, sulphide soils can adversely affect the surrounding water if it comes into contact with oxygen, as described above in section 5.2. Sulphide soils are common in coastal areas in northern Sweden.

As a completely new industrial area is to emerge, some changes in infrastructure are also required. Vattenfall Eldistribution AB (Vattenfall) has previously shown the intention to apply for a network concession for a line (permit) for two new 150 kV overhead lines between Svartbyn in Boden municipality and Hertsöfältet in Luleå municipality. At the time of development of this EIA, the application for these overhead lines has been withdrawn and at present there is no available information on what future planning looks like. The overhead lines should not be built to supply Talga with electricity and are not a prerequisite for the activity applied for. In view of the withdrawal of the application and the fact that Talga is not dependent on the construction of these lines, these will not be further described or taken into account in the assessments in this EIA.

8.1.2 Establishment

When the business is established, soil masses within the Company's planned business area on the Hertsö field will be excavated and replaced with rock masses and cab stone, in order to achieve sufficient stability for the facility. Where buildings are planned to be erected, shallow, silty and muddy masses will be removed down to solid moraine. After that, the areas will be filled up with rock masses and hut rock.

Two external existing roads run parallel to the planned operational area: in the south Gamla Lövskärsvägen and in the west Gräsörvägen. Before the production buildings are erected, new roads will be built for access to the plant area and enable transport within the area. Also to these new roads, external infill masses will be moved to the area. Water and sewage will be built for the business. In higher-lying areas, the groundwater level is located about 0.5–1.5 meters below the soil surface. Parts of the area of activity can be considered as water areas, that is, areas that are under water at the highest foreseeable water level. The works described above require that the groundwater surface be lowered locally temporarily during the construction period by diversion or pumping and also permanently due to the establishment, see further section 8.10.

Luleå municipality will build new roads and associated ditches in connection with the construction of the new industrial area. The construction of the ditches entails a lowering of groundwater. The greatest impact of this is estimated to occur along Hertsövägen and in bog areas where the groundwater level is close to the soil surface. The planned development will thus drain the surface and groundwater from the Hertsö field, especially in areas with marshland. The municipality's development of the industrial area will also lead to a groundwater subsidence within Talga's planned area of operation. More on this is described in section 8.10.

Large-scale production is planned to begin in 2024 and then be scaled up further in 2025. More details about the establishment phase are described in Appendix A Technical description.

8.1.3 Pipelines

The pipeline for the extraction of cooling and process water is planned to be built along Gräsörvägen at the edge of existing power line street. Some felling may be necessary due to the protective distance of 16 meters to the power line, but any felling will be minimized. The pipeline for the discharge of heated cooling water and treated process wastewater is planned to be built along a new road/pipeline street according to the detailed plan and the existing Salmon Fishing Road, see Figure Figure 10 and the application's Appendix A:4. This means that land and water areas will be used even outside the applied area of activity.

The area where the pipelines are planned to be located is partly within the zoning area, either designated as *J Industri* or *Gata*. The pipeline along Gräsörvägen is also partly located within or adjacent to the area specified as *N Nature* in the detailed plan.[21]

The wires will be placed at a depth of about 2.5 meters below the ground surface. The dimension of the wires is 700 mm. The depth of the shaft will be about 3 meters and the shaft width will be about 7 meters. Shafts are continuously backfilled with excavated masses. Excess masses are driven to receivers with the required permits. The wires are built with shafts down to Inre Hertsöfjärden and Sörbrändöfjärden, respectively, assembled on land and anchored to the bottom with weights. Under the wires at the bottom, coarser material is first laid, and on it a finer material in order for the wires to lie stably.

Different routes for the onshore abstraction and discharge lines have been taken into account. The wiring has primarily had to be adapted to Luleå municipality's planned lines for water and electricity and for Vattenfall as well as Luleå Energi's planned lines for electricity supply to Luleå Industrial Park and Svartön. In the first instance, the pipelines have located on existing pipeline streets and roads to minimize the use of untouched land and the impact on the natural environment. The location near existing roads makes it easier to access the wiring for maintenance and repairs.

The withdrawal of cooling and process water will take place directly upstream of the Gräsören bridge to minimize the pumping distance, see Figure Figure 10. As Inner Hertsöfjärden is pent-up, the water level does not vary as much as downstream in the canal and bay. The elevated water temperature in Inner Hertsö Bay does not significantly affect the possibility of using the water as cooling water. The pumping station is planned to be located near the outlet point and Gräsörvägen for accessibility and power supply. The pumping station can also be placed in the existing pipeline street with adaptation to existing and, to the extent possible, planned power lines. In this way, the impact on adjacent riparian forests with high nature values is minimized.

The outlet pipeline is planned to be carried out by itself and will be placed together with Luleå municipality's planned pipelines and then, as far as possible, follow Laxfiskevägen down to Sörbrändöfjärden, see Figure Figure 10. The parts of the pipeline that run together with the municipality's pipelines can also be built at the same time to shorten the construction time and reduce the impact.

The last section of the pipeline to the discharge point is planned to be drawn along the pier. This means that machines can stand on land and thus simplify construction work. The water depth at the end of the pier is also sufficient for the outlet to end up at a suitable depth, which means that the need for excavation is minimized compared to placing the pipeline further out in the shallower water area.

[21] Luleå Municipality. *Plan description. Detailed plan for part of Hertsön 11:1 and others Hertsöfältet.*

Discharge the pipeline is placed so that the outlet ends up at an ice-free depth or above the water surface if possible depending on the height conditions.

The discharge line will be protected and marked so that boats can safely enter the marina on the inside of the pier. The location at the pier also avoids any problems with ice that may affect the pipeline as the area is already affected by warmer water from Inner Hertsöfjärden and thus is often ice-free in winter.

Further investigations such as measurements, bathymetric measurements, geotechnical surveys, investigations of the aquatic ecology and modelling of the emission will be carried out during the summer of 2022 and may mean that the exact location of the wires and the socket and release points may be adjusted.

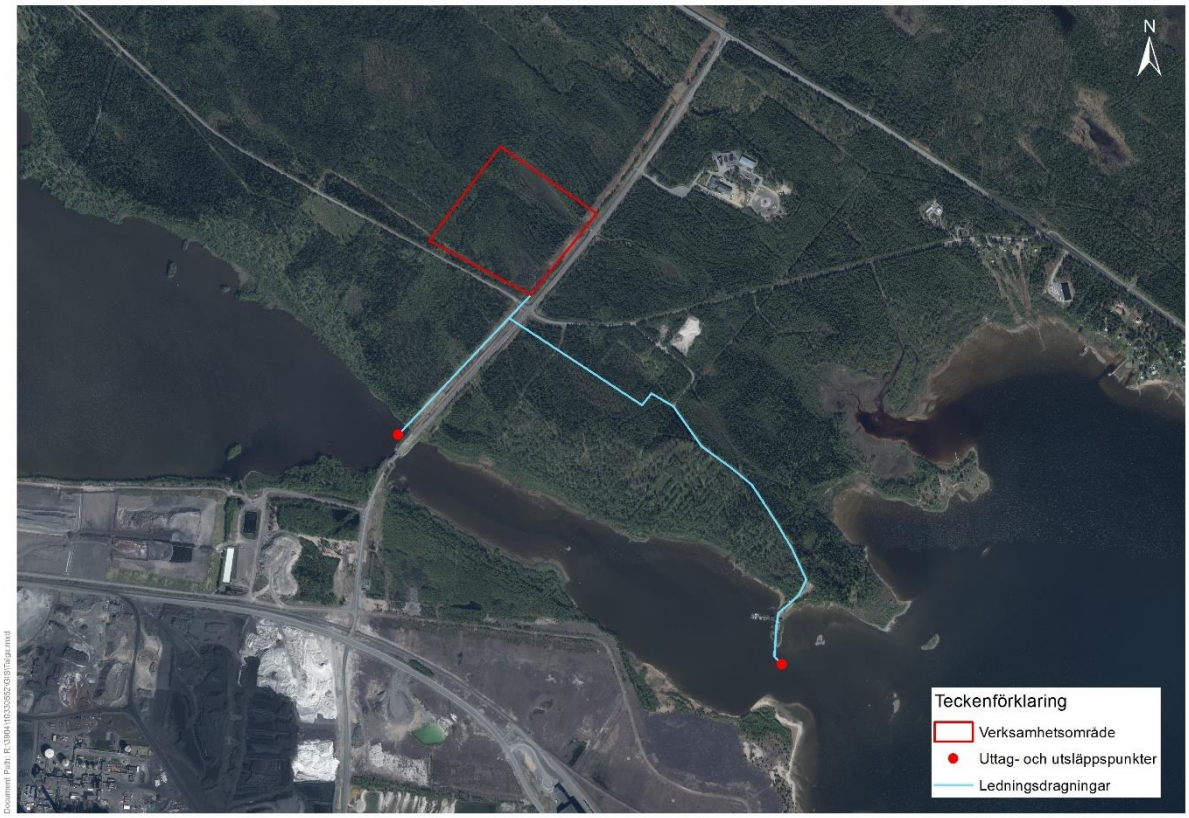


Figure 10. Pipelines and points for abstraction and discharge of cooling and process water in the requested activity.

8.1.4 Impact and effect

The business will use undeveloped land when the planned facility is to be built. A new facility will thus entail a significant change in land use compared to the current situation. In comparison with the zero alternative, the applied activity is considered to have some impact as the zero option means land that is prepared for industry, but the applied activity also includes pipes for abstraction and discharge of water.

Both the current master plan and the new master plan that is under construction state that the area is intended for disruptive activities. The zoning plan is designed for a new industrial area to emerge at the place where the Company plans to establish its operations. The planned installation is therefore compatible in this respect with the existing plans.

As the area is planned to contain additional activities of an industrial nature, and that the area will grow together with the already existing industrial area Svartön, south of the Hertsö field, technical supply

necessary for the planned activities will also benefit other facilities. In this way, positive effects can be created. For risk assessment of related activities, see section 8.17 and application Appendix D:2 (Risk assessment).

As mentioned in section 5.2, sulphide soil can be problematic as it is often prone to settling at high loads and very loose with poor bearing capacity. Sulphide soil can also negatively affect the surrounding water if it comes into contact with oxygen.

Regarding the contamination identified at the fire drill field, east of the planned area of operation, the investigation commissioned by Luleå Municipality shows that the spread of the pollution is considered to be possible via dusting / erosion, surface and groundwater and uptake of plants. The entire zoning area is located upstream of the pollution area, and thus it is not expected to spread there. The risk of spreading through dust is assessed as small as the land where the pollution occurs is mostly overgrown. The detailed plan states that it is not considered likely that the planned development of the Hertsö field would result in such a reduction in groundwater levels in the area downstream of the fire drill field that it would affect the contamination of PFAS that is present in groundwater today.[22]

The intended location has few opposing and specifically designated values. The land is already affected by logging and by the industrial area on Svartön. The activities will not affect the accessibility of the nature reserve located just north of the planned location.

The new industrial area will, as described above, entail several other ancillary activities and measures. As a result of expected new construction, Hertsövägen will be narrowed and strengthened. Three new power lines are planned in the area. These ancillary activities follow from Luleå municipality's exploitation of the area and not from the establishment of Talga's operations. The cumulative effect of the impact of these activities together with the current application leads to a certain cumulative impact, although each individual measure can be assessed as limited. The ground cable and the planned reinforcement of the road will be done on a limited area and carried out according to protective measures. However, a decision on these overhead lines has not yet been taken.

The construction of the pipes for the abstraction and discharge of cooling and process water from Inre Hertsöfjärden to Sörbrändöfjärden is not considered to affect the water bodies in a way that will lead to a decrease in status or jeopardize compliance with current environmental quality standards. At the beach adjacent to the outlet, a small part at the edge of an area with natural value class 2 will be affected by felling and shafts. As the affected surface is a small part of the natural value and adjoins existing infrastructure, the impact is assessed as small. The construction of the pipeline is carried out within and on the edge of the existing pipeline street along the existing road in an already affected area. Furthermore, the pipeline for the discharge of cooling and process water is planned to be built in the same pipeline street as Luleå municipality's planned pipes and is thus considered to have only a small impact.

8.1.5 Protection and mitigation measures

The sulphide soil that needs to be replaced with masses with higher bearing capacity will be handled appropriately, part of this sulphide soil will be deposited and to the extent possible it will be reused.

All work in water will be carried out with great care to minimize the appearance of clouding and to reduce the risk of oil and other environmentally harmful contaminants reaching the water. Contractors will follow a self-monitoring program that ensures that protective measures are carried out and that the impact on the surroundings in connection with the construction works is minimized. Excavation at the bottom mainly needs to take place in the narrow areas n when connecting to land. Silt curtains can be used to minimize the spread of clouding associated with shafts in the water area.

[22] Luleå Municipality. *Plan description – detailed plan for part of Hertsön 11:1 and other Hertsö field.*

8.1.6 Impact assessment

The planned activities are consistent with the current zoning and master plan. The location is an area where the municipality has assessed that disruptive activities can be built. On the site where the business is to be built, there are very few designated natural values. The availability of nature reserves or housing is not considered to be affected.

Any sulphide soil that may be found will be handled according to appropriate procedures and protective measures will be taken if deemed necessary.

As mentioned above, Talga's operations are located upstream and within another catchment area from the contaminated area of the fire drill area and thus it is not expected that the spread of PFAS will occur there. The exploitation of the Hertsö field is not expected to lead to such a reduction in groundwater levels in the area downstream of the fire drill field that it would affect the contamination of PFAS that exists in groundwater today.

The assessment of the impact of the pipelines on the water bodies concerned and environmental quality standards is set out in Section 8.11.

In comparison with the current situation, when the land consists of managed forest land and will change into industrial land, the planned activities are expected to have a *moderate negative impact*. The area is detailed planning for industry, but taking into account the pipelines that are planned, the applied for business is also expected to have *little negative impact* in comparison with the zero alternative.

The activities applied for are not considered to prevent the national environmental goals *Good built environment*, *Living forests* and *Sea in balance as well as living coast and archipelago* from being met.

Consequence of the project	***Consequence of the project in comparison to the zero alternative***
Overall, the activity applied for is considered to have a *moderate consequence* in terms of the use of land and water area in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	Overall, the activity applied for is considered to have a *small negative consequence* regarding the use of land and water area in comparison with the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.

8.2 NATURAL ENVIRONMENT

8.2.1 Conditions regarding the natural environment and protection of the area

As previously described, the land where the facility is planned to be built consists of managed forest land with elements of wetlands on the coast of Luleå. In the immediate area there are shallow coves with surrounding beaches and alder forests as well as coniferous-dominated mixed forest with elements of birch. Where the applied activity is planned to be built , the land is affected by forestry and some smaller, drained, wetlands.

A number of areas within 6 kilometers of the planned area of activity are protected according to Chapter 7. the Environmental Code. The areas are summarized in Tabell 5Figure Figure 11

Tabell 5. Areas protected under Chapter 7. the Environmental Code within about 6 kilometers of the planned business.

Type of protection	Name	Distance from the project area
Natural reserve	Ormberget-Hertsölandet (NRV-ID 2021406)	Approximately 620 meters (n)
National interest for nature conservation	The archipelago outside the mouth of the Lule River	2,8 kilometers (so)
Natura 2000-area (SCI) and natural reserve	Stenåkern (SE0820052 and NRV-ID 2001285)	4,8 kilometers (sv)
Natura 2000-area (SCI) and natural reserve	Likskäret (SE0820305 and NRV-ID 2001072)	5,5 kilometers (so)

In the vicinity of the planned activity, about 620 meters away, is the nature reserve **Ormberget-Hertsölandet (A)**. The nature reserve stretches along the entire northern part of the peninsula Hertsölandet and is delimited from the planned industrial area and already existing residential areas by Hertsövägen / Lövskärsvägen. From a nature conservation point of view, the area constitutes a valuable core area for natural forests and species living in such an environment. The values are particularly noteworthy given the urban location of the forest and the forest-based industries that exist in the immediate area. The reserve contains several different forest types as well as unaffected wetlands with great biodiversity. The area's urban location promotes outdoor life and is thus well visited for forest walks, exercise, skiing, fishing, etc. Several sites within the reserve have been assessed by the municipality as possessing very high natural values. The purpose of the reserve is to preserve the area's valuable natural environment and provide opportunities for included ecosystems and species to survive. Habitats should be preserved in a favorable condition. Natural processes and successions must be preserved and endangered or disadvantaged species must be allowed to survive. The reserve includes water area off the current shoreline with respect to land uplift. The area must also meet the need for outdoor recreation.[23]

About 2.8 kilometers southeast of the planned area of operation, there is a designated national interest in nature conservation, **the archipelago outside the mouth of the Lule River (B)**. The area is of national interest for nature conservation with regard to the design of the area, unaffected status with scenic lands, the presence of endangered and rare species and a rich bird fauna. The value of the area can be negatively affected by hard exploitation on the mainland, activities upstream in the Lule River, shipping and logging.

About 4.8 kilometres south of the planned activity is a designated Natura 2000 site under the Habitats Directive called **Stenåkern (C)** (SE0820052). EU countries work together to protect biodiversity and have agreed on which species and habitat types are particularly important to protect and preserve. These are listed in the Habitats Directive and in the Birds Directive. The overall aim is to locally preserve or restore a favourable state of conservation for the habitats and species designated. The values that are designated in the area are the forest, which for a long time has developed freely through natural succession and the influence of storms and fires. The area has been subjected to very little human impact and thus there are rich natural environments of unaffected character and biodiversity. Forests, wetlands and ecosystems must be given the opportunity to develop without negative human impact. Examples of the threat scenarios highlighted are forest measures and various types of exploitation. The area is also designated as a nature reserve of the same name. The area consists of scientifically and pedagogically valuable geological formations, such as shingle fields. Capercaillie, wolverine and woodcress are located within the reserve, and the area is also a place for outdoor recreation.[24]

[23] Luleå Municipality (2009). *Formation of the nature reserve Ormberget-Hertsölandet in Luleå municipality.*
[24] Länsstyrelsen i Norrbottens webbplats. *Stenåkern*. Hämtad 2022-05-23 samt Länsstyrelsen i Norrbotten (1970). *Naturreservatet Stenåkern*.

Another nature reserve is located about 5.5 kilometers southeast of the business, **Likskäret (D)**. The area has a primeval coniferous forest with coarse spruce trees that in some places have fallen, and in the area there are many endangered species of, among other things, ticks. The influence of the sea has led to shingle fields and vast aerial sand dunes on the outer side. In the dune landscape there are beach rye, beach vial and salt marsh. Here you will find Luleå sailing company's club facility and guest harbor with beach. The same site is also designated as a Natura 2000 site (SE0820305) under the Habitats Directive. [25]The values that have been pointed out in Likskäret are the forest, the marine environment and the sandy environments that for a long time have developed freely through land uplift, natural succession and natural impact of storms and fires. There are rich natural environments with sensitive species. Nature types should be allowed to continue to develop freely. The threat scenario is considered to be, among other things, physical exploitation (including coastal exploitation and extraction of energy, materials and minerals), roads and waterways, use of biological resources, modification of the natural water system and pollution.[26]

There are also a number of swamp forests and key biotopes designated by the Swedish Forest Agency, both within and outside the field of activity.

All protected and designated natural areas are presented in Figure 11 below.

For the influence of noise, see section 8.14.

[25]The County Administrative Boardof Norrbotten's website. *The corpse cut*. Retrieved 2022-05-23.
[26] County Administrative Board of Norrbotten (2018). *Corpse cut SE0820305. Natura 2000 site conservation plan.*

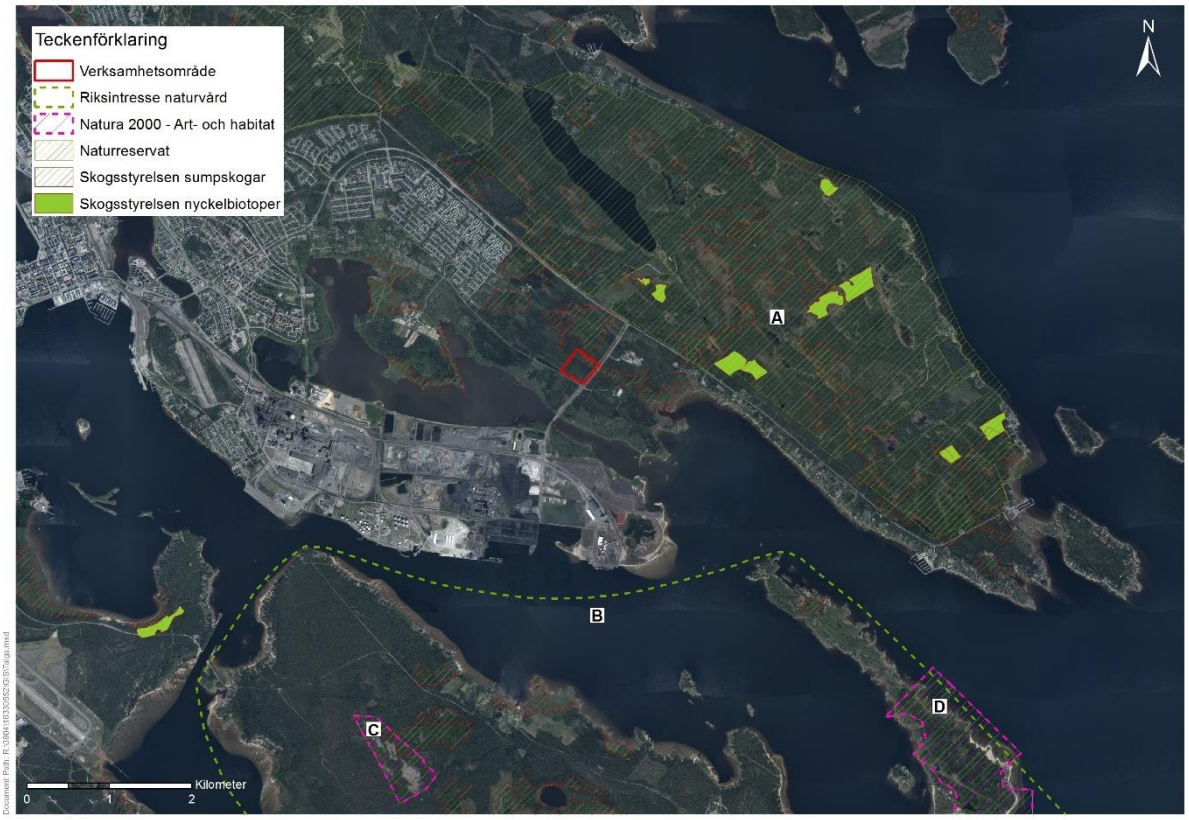


Figure 11. Protected natural areas in the vicinity of the applied activity, A. Hertsölandet. B. The archipelago outside the mouth of the Lule River. C. Stenåkern. D. The corpse cut. The map also shows swamp forests and key biotopes identified by the Swedish Forest Agency.

8.2.2 Prerequisites for coastal areas protection

Coastal area protection is a general protection that applies throughout the country to seas, lakes and streams regardless of size. The protected area is normally 100 meters from the shoreline both on land and in water. Under certain conditions, the County Administrative Board can extend the beach protection to 300 meters.

Hertsöfjärden and Sörbrändöfjärden are covered by beach protection. Harrbäcksviken and Björkhaga are covered by an extended beach protection. Theelectricity from the outgoing water line to the discharge point that runs along the Salmon Fishing Road runs partly within the riparian protected area. The zoning plan for Luleå Industrial Park meant that the beach protection was lifted for part of Hertsöfjärden and Sörbrändöfjärden.

8.2.3 Protected species

The Species Protection Regulation includes provisions for the protection of species, and also contains conservation provisions as well as EU provisions under the Habitats and Birds Directives. It provides for prohibited measures for certain animal and plant species, which is further developed in this section.

The Swedish Red List is a categorization of species with regard to the risk of extinction (population reduction) from the country. The categorisation is determined by the Swedish Species Information Centre. The status of the species is categorized as follows: [27]

- CR Critically *Endangered*
- EN *Endangered*

[27]SLU Swedish Species InformationCentre's website. *How does a species get red-listed?* Retrieved 2022-01-11.

• VU *Vulnerable*
• NT *Near Threatened*

Before Luleå municipality detailed planning for the area, a nature value inventory was made in 2018 and 2019. Within the zoning area, several finds with certain, tangible or high nature value were identified, as can be seen in [28]Figure 12 below. Only the areas numbered as 5, 15 and 25 are directly affected by the Company's planned facility. The socket line passes on the outskirts of areas 18, 22 and 20. Areas 5, 18, 22 and 25 have been assessed as having Class 4, some natural value while area 15 has tangible natural value and area 20 has high nature value. Area 20, the outskirts of which are affected by planned water pipes, consists of uncultivated and multi-layered riparian deciduous forest with a content of dead wood. It is a long untouched beach zone with beach meadow. Area 15 is an overgrown former cropland dominated by birch and aspen. Sun-exposed solitaires raise the natural value along with scattered standing dead wood. Area number 5 is a swamp forest with some naturalness succession in about 100 years. There are mosses such as birch moss and star moss as well as a shrub layer with squamous frame and young trees. The object is considered to have an insignificant species value, however, there are several biotope qualities such as natural succession and dead wood with woody fungi. In the area, a Teal with cubs has been identified. The area marked as number 18 consists of overgrown marshland with hints of birch and a soil layer of white mosses in wetter areas, heather, crowberry and squamous ram in drier. Traces of woodpeckers, capercaillie and elk have been identified. Area number 25 consists of young lignified birch forest with a spruce undergrowth and is considered to give some variation to the coniferous landscape, otherwise containing limited natural values.[29]

The nature value inventory shows that it is mainly the riparian areas that have higher nature values, which is also where most bird sightings have been made. It appears that white-tailed eagles and dovehawks have been noted to fly over the area and have been judged to be foraging and not nesting. It also emerges that this could potentially be a place where the white-backed woodpecker is located, which, however, has not been confirmed during the inventories carried out.

[28] Luleå Municipality. *Plan description. Detailed plan for part of Hertsön 11:1 and others Hertsöfältet.*
[29] Lund Municipality. *Environmental impact assessment - Detailed plan for Hertsön 11:1 and others Hertsöfältet.*

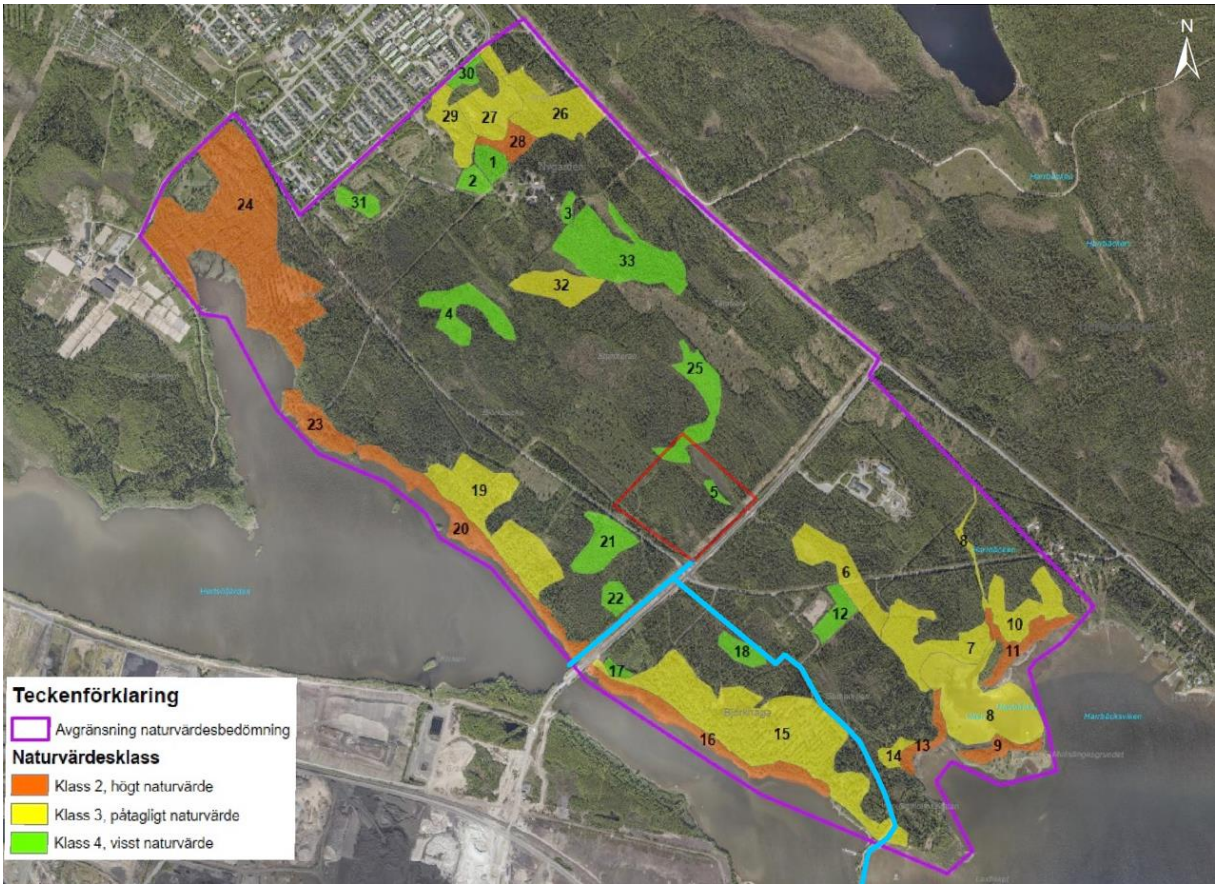


Figure 12. Natural value inventory commissioned by Luleå Municipality and carried out by ÅF in August 2018. Applied activity marked in red and water wiring marked in blue.

The detailed plan shows that observations of red-listed species have been made in the vicinity of the plan area and at Gräsörabridge. The red-listed species are not considered to be settled in the plan area, but may be passing and foraging. The sites where these species have been observed will remain even after industrial activities within the plan area have been established. In the detailed plan, riparian areas have been protected and marked as *Natural Land* so that exploitation does not take place, this in order to protect the white-backed woodpecker.

A search for reported species between 2016 and 2022 in Artportalen is presented below in Figure 13. In the planned facility's immediate vicinity, there are almoste reported finds along Gräsörvägen, where a Red Winged Grid (NT) has been registered in 2021. Several finds can be found around Gräsörenbron, the cape towards Sandöfjärden and along Gräsörvägen. The finds consist mainly of several birds such as Årta (EN), Brunand (EN), Bergand (EN), Thorn Sealer (EN), Great Curlew (EN), Red-headed Curlew (EN) and Greenfinch (EN). In total, the search showed over 200 reported bird species. [30] All wild birds are protected under Section 4 of the Species Protection Ordinance.

The search also shows that finds of otter have been reported on several occasions at gräsören bridge as well as a registered find southeast of the applied activity, at the cape on Hertsön out in Hertsöfjärden, see the map in Figure 13 below. The otter is marked with N in Appendix 1 to the Species Protection Regulation and thus receives special protection.

The search showed no reported findings of other mammals, amphibians and reptiles, wildanimals, vascular plants, fungi, mosses, lichens or algae protected under sections 4 or 6-9 of the Species Protection Ordinance.

[30] Artportalen. Search done 2022-06-17.

Figure 13. Map showing search in Artportalen 2022-06-17. Yellow dots mark where observations have been made. Gray circles indicate uncertainty distances for the observations.

8.2.4 Impact and effect

The following assessment is made based on the nature value inventory that was made before the development of the detailed plan and the search carried out in Artportalen.

When new buildings are to be built in thearea of the Hertsö field, an impact on vegetation will occur as a result of Luleå municipality's felling. The construction of Talga's facility will result in the disappearance of individual local species specimens and habitats, but no populations or habitats at regional or national level will be affected. No impact on regional or national conservation status will thus occur. A significant part of the valuable land will remain around the applied activity, and the protected riparian areas will be preserved. The ecological function of species on the site is thus considered to remain with only limited impact, and taking this into account, no impact on local conservation status is assessed to arise as a result of Talga's activities.

An impact can be made on movement patterns and ability to spread as a result of Luleå municipality's exploitation of the area. The applied activity is part of this impact, but this impact will largely occur even if Talga does not locate its operations in the area. The water pipes that the requested business plans to build may have additional impacts, as they affect areas out into the water.

As mentioned above, otters have been found near where the company's planned water pipes will run. Above all, findings have been noted where the planned withdrawal line will be built. The otter may not be intentionally killed or caught, disturbed during certain sensitive periods and its habitat shall not be damaged or destroyed in accordance with Section 4 of the Species Protection Ordinance. The activity applied for will not result in the intentional killing or injury of otters. The greatest risk may be considered to exist in terms of impacts on habitats. The pipeline that will be built at Gräsörenbron, where the otter has been noted, will be built in the existing pipeline street, which means that the impact will be reduced. Prior to planning, further investigation of possible protective measures will be taken to prevent disturbing species specimens in the area during sensitive periods. For example, it may be a matter of choosing time for construction work, if it is deemed appropriate.

All wild birds are protected under Section 4 of the *Species Protection Ordinance*, and most bird species have been listed in the local area of the applied activity. As previously described, an establishment like this risks causing individual species specimens to disappear and there is also a risk that habitats may be affected, especially when constructing the water pipes as many of the species

registered in Artportalen are linked to the aquatic environment. The activity applied for will not result in the deliberate death or injury of species specimens. As described above, the withdrawal line is planned to be built in the existing pipeline street, which minimizes the impact on the existing natural environment. The company undertakes in the application to carry out work in water with the water pipes outside the breeding season, so as not to interfere during the mating period. The activity applied for is thus not considered to affect the bird species found at the population level.

Luleå municipality carries out the logging that will take place where the main plant is to be located, and this is thus not something that the Company can control.

The planned operations are expected to lead to a significant increasein traffic to and from the Hertsö field along Hertsövägen compared to today and are thus expected to have a certain impact on noise and emissions to air. This is estimated to have a negative impact on plants and animals in the vicinity of the road. However, the increase will occur gradually, giving species an opportunity to adapt. However, individual specimens are in danger of disappearing locally in direct proximity to the road.

The highest natural values have been found along the beach area, where riparian forests are located. According to the zoning plan, these areas may not be built on. The area of activity applied for is located outside the beach protected area and thus does not concern this. However, the water abstraction line runs along Gräsörvägen towards Inre Hertsöfjärden and the pipeline for outgoing water to the discharge point along Laxfiskevägen partly within the riparian protected area and at the outer edge of area 20 of nature class 2 (high nature value) area 15 of nature value class 3 (tangible nature value), see Figure 12. Where the abstraction line is planned, a small part at the edge of the area with natural value class 2 will be affected by felling and shafts. As the affected surface is a small part of the natural value and adjoins existing infrastructure, the impact is assessed as small regarding beach protection. The construction of the pipeline is carried out within and on the outskirts of the existing pipeline street along the existing road in an already affected area.

The groundwater report that has been produced states that no major impact is made on hydrology in the area closest to the beach, read more in section 8.10. The felling that may be needed for the construction of the pipes is expected to be minimal as the pipes are located in the existing pipeline street or along the existing road and common new pipeline street. In light of this, the impact on the riparian forest is estimated to be limited as a result of the requested activity.

The planned activities are not expected to make it more difficult to get to the nature reserve north of the planned facility. A busy road separates the nature reserve from the industrial area where the business is planned to be built.

As a result of the distance, no negative impact on other areas worthy of protection is expected to occur.

8.2.5 Protection and mitigation measures

As described above in section 8.2.4, the Company has undertaken in its application to carry out pipeline work in waters outside the breeding season for birds and that prior to planning, further investigation of any protective measures will be taken to prevent disturbing species specimens in the area during sensitive periods.

8.2.6 Impact assessment

Due tothe construction of Luleå Industrial Park and thus also the Company's operations, surfaces will be hardened and vegetation will change, which will mean that individual species specimens locally disappear. However, no local, regional or national impact on species, habitat or conservation status is expected to occur. From the results of the inventory that Luleå Municipality previously commissioned, it appears that the business is not planned to be built mainly on land with high natural values, but one

water pipe will touch the outskirts of an area with high nature value. The increased traffic will lead to increased noise as well as emissions from air and species that live and move in connection with Hertsövägen in particular are considered to be affected by this.

There are generally few identified red-listed species in the area. The planned activities are not considered to make the conditions for conservation and development of these species more difficult. In connection with the planned pipeline for the withdrawal of cooling water, most bird species have been noted in Artportalen. Furthermore, otters have also been found in this area. Taking into account the information currently available, the protective measures taken and how the pipeline is built in the existing pipeline street, it is not considered that the applied activity will result in any of the prohibitions in section 4 or sections 6-9 of the Species Protection Ordinance being violated.

A limited negative cumulative effect is expected to occur regarding the Company's planned operations together with the ancillary activities that Luleå Municipality's exploitation of the new industrial area entails. What cumulative effects may arise as a result of other operations establishing themselves in the industrial area cannot currently be determined as information about these activities is lacking in the development of the present EIA.

All in all, the activity applied for is expected to have a *moderate negative consequence* in comparison with the current situation, taking into account that the land today is undeveloped. However, the zoning plan allows for the construction of industries, which means that surfaces will be hardened, power lines will be built and roads will be strengthened. However, the applied activity also entails the addition of water pipes, with the impact on the natural environment aspect being judged to be *slightly negative* in comparison with the zero alternative.

The applied activities are not considered to prevent the national environmental goals *Limited climate impact, Teeming wetlands* and *Living forests* from being met. Some species specimens will locally disappear from the site where the plant is to be built as a result of the municipality's exploitation, but this is not considered to prevent the national environmental goal *A rich plant and animal life* from being met.

Impact of the project	***Impact of the project in comparison to the zero alternative***
Overall, the activity applied for is expected to have a *moderate negative impact* on the natural environment in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	All in all, the activity applied for is expected to have a *small negative consequence* regarding the natural environment in comparison with the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.

8.3 REINDEER HUSBANDRY

8.3.1 Conditions for reindeer husbandry

The business in question is planned to be built on land located within Gällivare Sami village. The Sami village is a forest Sami village with winter pastures below the Lappmark border, partly within Luleå Municipality. The planned activities are thus located within the winter pastures of the Sami village. The Sami village has about 35 group reindeer herders and the maximum number of reindeer allowed in the winter herd is 7,000.

In the winter country, reindeer husbandry is usually carried out by dividing the entire herd of the Sami village into winter groups, which is necessary for the winter's grazing areas to be grazed efficiently.

The eastern parts of the Sami village's winter [31] grazing, down to the coast where the planned activities are located, are probably used by one of the Sami village's winter groups. Winter pastures may only be used for reindeer grazing during the period 1 October to 30 April.[32]

In the nature reserve Ormberget-Hertsölandet, which is located just north of the planned business, there is a collection area. In communication with the company, Gällivare Sami village has stated that individual reindeer cross Hertsövägen, which runs along the southwest edge of the collection area (see map below), but the reindeer move mainly north of Hertsövägen. The nearest national interest is located cirka 3.6 kilometers southwest of Luleå Industrial Park within an area shared by Sirges, Tuorpon, Udtja and Jåhkågasska Sami villages. The closest national interest within Gällivare Sami village is a migration route that begins just north of the above-mentioned collection area, and cirka 12 km north of the planned activity.

The various areas of interest of reindeer husbandry in the vicinity of the activities applied for are presented in Figure 14.

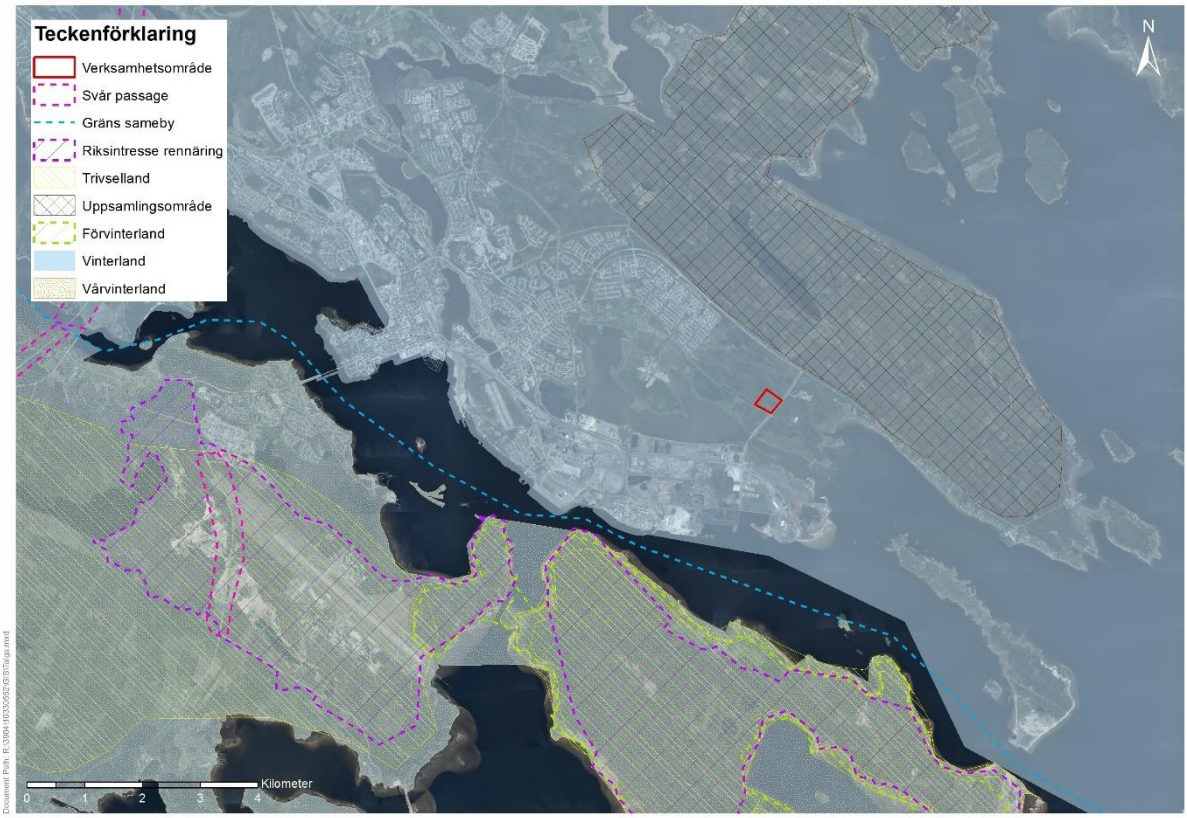


Figure 14. The different areas of interest of reindeer husbandry in relation to the area of activity applied for.

Effective and sustainable reindeer husbandry requires appropriate calving grounds, functioning migration routes with rest pastures, collection points and access to grazing areas during each season. Reindeer move between different pastures according to the season, and in winter grazing the reindeer graze in different areas depending on grazing availability, but other factors also affect where the reindeer graze such as climate and snow conditions and the presence of predators. The choice of grazing area is partly controlled by the reindeer themselves, but especially in winter, the herds are often more or less guarded and are often driven by the reindeer herders when moving between

[31] The Sami Parliament's website. The conditions of reindeer husbandry. https://www.sametinget.se/83615 (2022-01-14); In forest Sami villages, reindeer husbandry largely takes place in groups also during other parts of the year.
[32] The Sami Parliament's website. Glossary reindeer husbandry. Retrieved 22-05-19 https://www.sametinget.se/ordforklaringar

grazing areas. When the reindeer graze, it is in constant motion and it can move over large areas in a short time.[33]

Access to, and choice of, grazing areas is also affected by competing land use in the form of human activities and infrastructure such as forestry, wind power, roads, railways, mining and quarrying, outdoor recreation, etc. Studies show that buildings such as roads, railways and power lines create barriers in the landscape, which affects the directions of the reindeer's natural roaming and migration for food. [34] Research also shows that human activities often give rise to a so-called disturbance zone that reindeer completely or partially avoid grazing within. [35] These often vary in size from a few to a few kilometers but in some cases can be significantly larger than that. Disturbance zones should also be context-specific and [36] thus vary depending on e.g. the nature of the source of disturbance, factors that limit the spread of disturbance, e.g. topography and vegetation, type of reindeer grazing land / season, etc.

While many activities, when assessed individually, can be considered to have little or perhaps acceptably small effect on reindeer husbandry, they, together with other activities, can have a significant cumulative effect and lead to difficulties in conducting reindeer husbandry.

The construction of Luleå Industrial Park will entail several ancillary activities, in addition to the industries for which the area is intended. Roads will be strengthened, a new pedestrian and bicycle path will be built in the immediate area and a ground cable will lead electricity into the industrial area. This has an effect of reducing pastures and undisturbed areas in general. For overhead lines, see section 8.1.2.

The Sami village has stated in telephone communication with the company that cumulative effects are the biggest issue, and that the majority of reindeer are killed on the E10 road.

8.3.2 Impact and effect

The planned business is an industry in which the main activity is conducted indoors. Human activity outdoors consists primarily of transporting people to and from the workplace as well as transporting raw materials, chemicals and products. The business, and Hertsövägen, are also surrounded by forest, which means that visual impact is expected to be very limited. The Hertsö field today consists of managed young forest. The completed noise investigation, Appendix A:3 to the application, shows a very limited spread of sound from the business – already in direct connection to the industrial area, and thus also at several hundred meters from the collection area north of the business, is modeled level of external noise <40 dBA. The investigation also shows no risk of exceeding guidelines when assessing cumulative noise. This conclusion applies to both residential and the nearby nature reserve. Noise from additional traffic along Hertsöroad as a result of Talga's operations is considered to be negligible and not to have a negative impact on the existing sound environment. The visual impact and/or noise spread from the planned activities is thus not expected to have a significant impact on reindeer husbandry.

Between Luleå Industrial Park and the nature reserve/collection area north of there is a road that can be a barrier for the reindeer. There are also residential areas in close proximity to the industrial park, and Luleå urban area with surrounding activities and infrastructure is only a few kilometers away. Svartön's industrial area is further located just south of the planned business. The area can thus already be considered to be strongly influenced by buildings, industries and various types of human activity.

[33] Wind selection. Reindeer and wind power. Study from the construction of two wind farms in Malå Sami village. Report 6564. 2013.
[34] County Administrative Board of Västerbotten. Wind farms and reindeer husbandry -ON CUMULATIVE EFFECTS. 2011.
[35] See e.g. Skarin & Åhman (2014).
[36] See e.g. Flydal et al. (2019).

The interests of reindeer husbandry cover large areas, this creates a flexibility in the choice of pastures. The more that is exploited, the fewer areas can be used by reindeer husbandry. The area where Talga's operations are planned to be built is not designated as a particularly important area for Gällivare Sami village's operations. The area today consists mainly of managed young forest. [37]In the present case, a small cumulative impact from surrounding future industries and roads is expected to arise. In this context, the applied activity is considered to have primarily a local significance with very little direct impact on reindeer husbandry. During the construction phase, it is estimated that a certain negative impact could occur, taking into account that transports to and from the area are then at their highest.

The area is detailed for industrial land and will be built regardless of Talga's operations. Surfaces will be hardened and infrastructure will be built, which will change the currently undeveloped area. A certain impact will thus occur regardless of Talga's operations.

8.3.3 Protection and mitigation measures

In the application, the company has undertaken to conduct a dialogue with the Sami village concerned during the construction phase in order to exchange information and, if possible, be able to adapt the schedule and execution of the construction work.

No other protective measures are deemed necessary.

8.3.4 Impact assessment

Compared to the current situation, the activity applied for is estimated to have a *small negative consequence* on reindeer husbandry as a result of the fact that the business plans to use undeveloped land and requires infrastructure to be built. In comparison with the zero option and in the light of the above-mentioned protective measures, the activity applied for is considered to have a *small negative consequence* from a short perspective, taking into account transport during the construction phase and *insignificant consequences* from a medium and long-term perspective as the area will be developed regardless of Talga's facility. As the area is detailed for industry, the land will be prepared for industrial land and thus pastures will disappear.

Project's impact on reindeer husbandry	***Project's impact in comparison to zero alternative***
All in all, the activity applied for is expected to have a *small negative consequence* regarding reindeer husbandry in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	Overall, the applied activity is estimated to entail a *small negative consequence* regarding reindeer husbandry in comparison with the zero alternative from a short perspective. Overall, the activity applied for is considered to have an *insignificant consequence* regarding reindeer husbandry in comparison with the zero alternative from a medium and long-term perspective.

[37] The Sami Parliament's website, *Gällivare Sami village*

8.4 CULTURAL ENVIRONMENT AND ARCHAEOLOGICAL REMAINS

8.4.1 Current situation

The applied activity will be built in an area that is currently undeveloped. No recorded ancient monuments are found within the planned industrial area. The nearest ancient monuments are just over 1 kilometer west in the residential area Hertsö meadows. These are identified as possible ancient monuments. No cultural reserve is within [38]the planned field of activity.

Hertsön was for several centuries a fishing and farming village with salmon fishing as an important industry. In the second half of the 1900s, there have been plans to build steel mills, offices, training centers with a bus terminal and parking on the site. The steel mill was never built, but the district with current residential areas emerged during the 1970s. Otherwise, the current field consisted of forest areas and a road between Hertsön and Lövskär did not emerge until the 1930s.[39][40]

On the eastern parts of Hertsön there are three farms preserved from the time before the major expansion began.

The nearest national interest in the cultural environment is called **Svartöstaden**, which is located about 4 kilometers west of the planned activities, see Figure 15. The area is designated as a national interest given that the urban environment is a regional reflection of the social process that industrialization from the 1800s to modern times constituted.[41]

[38] The County Administrative Board of Norrbotten's website. *County map Norrbotten*. Retrieved 2022-01-11.
[39] Luleå Municipality. *Plan description. Detailed plan for part of Hertsön 11:1 and others Hertsöfältet.*
[40] The website Hertsön.se. Retrieved 2022-01-12.
[41] Riksantikvarieämbetet. *Riksintressen för kulturmiljövården – Norrbottens län (BD).*

Figure 15. National interest in cultural heritage conservation in relation to the area of activity applied for.

8.4.2 Impact and effects

Taking into account the distance that exists between the planned activities and identified cultural-historical remains, no impact is expected to occur.

An impact on the landscape will take place locally, see further section 8.5. The national interest Svartön consists of an old industrial environment, and given its nature and the distance to the planned operations, no impact is expected to arise.

8.4.3 Protection and mitigation measures

If ancient monuments are found during construction work, the work will be immediately suspended and the relationship reported to the County Administrative Board in accordance with Chapter 2. Section 10 of the Cultural Environment Act.

8.4.4 Impact assessment

The activities applied for are not considered to lead to any cultural environment interests being adversely affected. There are no designated interests in the vicinity of the planned activities. The distances to the designated areas are considered to be so great that cultural environments are not affected.

In comparison with both the current situation and zero alternatives, the consequence is considered *to be insignificant*.

Project's impact	***Project's impact in comparison to zero alternative***

All in all, the activities applied for are considered to have an *insignificant consequence* regarding the cultural environment in comparison with the current situation. The consequence is judged to be the same from a short, medium and long perspective.	All in all, the activity applied for is considered to have an *insignificant consequence* regarding the cultural environment in comparison with the zero alternative. The consequence is judged to be the same from a short, medium and long perspective.

8.5 RECREATION AND LANDSCAPE

8.5.1 Current situation – Recreation

Along the entire coast of Norrbotten stretches a designated area that constitutes a national interest for outdoor life. As the closest thing, the area is about 600 meters from the planned activities as the national interest includes the nature reserve Ormberget-Hertsölandet just north of the planned activities. The national interest is called **Norrbotten's coast and archipelago** and is judged to have particularly good conditions for enriching experiences in nature and / or cultural environments, outdoor life and water-related outdoor activities. As the large area is very varied, a large number of different leisure activities are practiced. Threats to the area's valuable interests are considered to be, among other things, exploitation along the coastline and emissions from heavy industries along the Norrbotten coast as well as "old environmental sins" stored in bottom sediments that affect water quality.[42]

A designated national interest in mobile outdoor life also extends along the entire coast of Norrbotten, called **Norrbotten's archipelago.** The national interest covers the entire eastern part of the municipality. The area is considered to be of particular importance for tourism and outdoor recreation. According to chapter 4. Section 2 MB, interests in the areas deemed to be of national interest for mobile outdoor recreation shall be particularly taken into account when assessing the admissibility of development companies or other interventions in the environment.

The aforementioned national interests are shown in Figure 16 below.

[42] County Administrative Board of Norrbotten (2017). *Value description*.

Figure 16. National interest in outdoor life and mobile outdoor life in relation to the applied field of activity.

As described above in section 8.2, the **Ormberget-Hertsölandet** Nature Reserve is located approximately 620 meters north of the planned facility. In addition to the many natural values that exist in the reserve, the area is also a popular destination for outdoor life and recreation, and outdoor life is an important part of the reserve's function. The area is close to the urban area and has expanded trail systems, hiking trails and barbecue areas. The area around Ormberget is particularly well developed for recreation with illuminated trails, ski trails and ski slopes with lifts. Fishing and hunting occur in the area.

A marina is located 1.1 kilometers southeast of the planned business. There is also a snowmobile club on the cape on Hertsön and Gräsörenbron is a well-visited place for bird watching.

8.5.2 Current situation - landscape

In the vicinity of the industrial area where the business is planned to be built, there are several environments that can be affected by a changed landscape. There are residential areas to the east and west of the planned business, a nature reserve to the north and archipelago environment around the entire Hertsö field.

The landscape in the immediate area of the Hertsö field is mainly flat with occasional topographical differences. However, the N atur reserve has greater level differences.

In the detailed plan for the Hertsö field, a volume study and photomontage have been developed to assess the impact of the industrial area that the detailed plan allows. In the assessment, it has been calculated on buildings that are between 20–45 meters high and building rights of 60 percent per property. Sight lines have also been developed. It shows that Luleå municipality estimates that the landscape will be most affected at the residential area Hertsö meadows (residential area west of the planned facility) and at Hertsöträsket in the nature reserve (north of the planned facility). For both of

these sight lines, it emerges that the height and density of vegetation are crucial to how visible the activities will be at these points.

The buildings that Talga will construct within the planned business area will be approximately 20 m to the nock in accordance with the detailed plan, and may thus be visible over the vegetation.

8.5.3 Impact and effects

Taking into account the large nature reserve north of the planned facility, it is likely that this is where the practice of outdoor recreation primarily takes place. The activities are not expected to affect the possibility of practicing outdoor activities in the nature reserve.

The two national interests that are designated for outdoor life along the coast of Norrbotten extend over large areas. It appears in their descriptions that exploitation along the coast should be taken into account with regard to these designated interests. However, with regard to the national interest in mobile outdoor life, norrbotten's archipelago, thedesignation shall not entail obstacles to the development of urban areas or local business according to Chapter 4. 1 § 2 st MB.

The planned activities will take up undeveloped land and thus be visible and change the landscape in the archipelago and for residents in the immediate area. The fact that the business will be built in close proximity to the city of Luleå, that other buildings are located in the immediate area and that there is vegetation around the planned business, is expected to mean that the business will be less dominant in the landscape. The planned activities are also not considered to prevent the possibility of exercising outdoor activities in either the local area or in the Norrbotten archipelago.

However, the impact will take place on the landscape of the area, and the view from the nature reserve Ormberget-Hertsölandet is expected to be affected and changed. Ingeneral, the view from Hertsöträsket and Lilltträsket in the nature reserve may be affected. The road that extends north of the planned facility (Hertsövägen) leads to housing east of the facility, and the area will thus be passed by people daily. An overhead line through the nature reserve is also planned, which, if erected, will entail a change of view both within and with a view from the nature reserve.

An impact on the surrounding landscape and prevailing landscape is inevitable when a new establishment of a larger industrial business. How much impact is expected to be depends on the landscape of the area and how resistant it is to changes. Durability depends on the values, such as experience values or utility value, that the landscape possesses. The experience of the landscape is subjective, and the assessment of the magnitude of the impact is therefore dependent on the viewer. The viewer in this case can be residents of the area, traders or outdoorsmen.

The Hertsö field will also be partly built together with the already existing industrial area Svartön. In view of this, it is not only the activities in question that contribute to a change in the landscape, cumulative effects occur when several activities already exist and are planned in the area. Cumulative effects refer to how proposed activities, together with other ongoing and future activities/measures, affect the environment in an area.

In the direct vicinity of the planned business, i.e. in the emerging industrial area, the impact will be marked as the area today is undeveloped and consists of forest land. At a slightly longer distance, the impact on the landscape image will not be as marked, as mainly vegetation makes the facility's place in the landscape less dominant. When the other parts of the industrial area are built, the planned activities will most likely become part of the total landscape of the industrial area. This is expected to have cumulative effects, where a completely new industrial area with several new activities in the area is considered to have a tangible impact. Svartön's industrial area, which is nearby, also affects the landscape today, and Luleå municipality has stated that this industrial area will grow together with the Hertsö field. This can reduce the impact of the planned business alone, as it becomes part of a larger context. However, the overall impact of these two large industrial areas is estimated to affect the

landscape of the area. Both the view from the sea and the view from the marina and Harrviken could possibly be affected.

The requested activity will be designed in accordance with the detailed plan.

8.5.4 Protection and mitigation measures

No additional protective measures are deemed necessary to be taken.

8.5.5 Impact assessment

The planned activities will be located about 620 meters from the nearest nature reserve in which outdoor activities are largely conducted. Nearby there is also a marina and Gräsörenbron is a well-visited place for bird watching. The ability to practice outdoor recreation is not considered to be affected by the planned facility.

It is inevitable that the landscape will be affected when a new industry is built, especially in undeveloped areas. The plant's planned location is in an emerging industrial area, close to the city of Luleå and svartön's industrial area. Byggnation is thus already present in the immediate area.

Compared to the current situation, a *small negative consequence* is expected to occur with regard to a changed landscape picture taking into account the height of the planned building is about 20 meters and thus will not be visible over all tree tops. The buildings will be lower than what photomontages in the detailed plan show. The opportunity to practice outdoor activities in nearby nature reserves will not be significantly affected, but a green space will disappear, which is why the applied activity is expected to have a *small negative consequence* on outdoor life in comparison with the current situation. The activity applied for does not defeat the purpose of the designated national interests for outdoor recreation along the coast. In comparison with the zero option, which implies prepared industrial land, an *insignificant* consequence is estimated to arise for outdoor recreation and a *small negative consequence* for the landscape.

The planned activities are not considered to prevent the environmental goals *Good built environment* or *Sea in balance and living coast and archipelago* are met.

Project's impact	***Project's impact in comparison to zero alternative***
Landscape	
All in all, the activity applied for is expected to have a *small negative consequence* regarding the landscape in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	All in all, the activity applied for is estimated to have a *small negative consequence* regarding the landscape image in comparison with the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.
Recreation	
All in all, the activity applied for is expected to have a *small negative consequence* regarding outdoor recreation in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	All in all, the activity applied for is considered to have an *insignificant consequence* regarding outdoor recreation in comparison with the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.

8.6 OTHER PROTECTED AREAS

8.6.1 Communication and Military interests

The planned operations are located about 7 kilometers from **Luleå / Kallax air wing airport**, wild which is conducted both military and civil air traffic. The airport is of national interest for communication and national interest for the Armed Forces, and there is thus a restriction regarding tall buildings. A flight obstacle analysis has been commissioned by Luleå Municipality in connection with the detailed plan for Luleå Industrial Park being prepared in 2019. The analysis shows that the entire zoning area is located within the airport's airspace (TMA and CTR) and in areas that are of importance for entry and exit procedures (including MSA surface). However, no remarks have been recorded and no impact as a result of the development in the area is expected to occur according to the analysis.

The port of Luleå is also of national interest for communication, and is located on Svartön, about 3 kilometers south of the planned operations. The port is part of the TEN-T network, which is the trans-European transport network. Outside the port there are also waterways that are designated as national interest. The fairways extend into the Sandöfjord and out into the Gulf of Bothnia. The fairways have a buffer zone of 200 meters where no measures that may adversely affect shipping may be taken.

Through Luleå, **the road** runs **an E4/595** that is designated as a national interest for communication taking into account that it connects to Luleå harbor, which is of national interest. Any expansion as a result of densification of the urban area or increased traffic safety must be designed with the national interest in mind.

A new **railway**, which is designated as a national interest, is planned to be built in Luleå, and will then pass from Luleå Airport over Sandöfjärden to Svartön and towards the city center. It extends almost 4 kilometers from the planned operations, but transport to and from the business will benefit from a developed railway system. The nearest railway is currently located about 1 kilometer from the business.

Throughout Luleå and out into the archipelago, a **national interest in total defense** extends, and operations are planned to be located within this area of influence. The regulations for this area mean that it is a stopping area for tall objects as well as being located within the airspace and weather radar impact area. This means that fixed installations over 45 meters may not be erected in cohesive buildings, or over 20 meters outside cohesive buildings. Luleå municipality writes in its master plan that the municipality assesses that exceptions can be made for buildings or other objects of great regional or national importance. Luleå/Kallax [43]aviationflotilla airport constitutes a national interest for the total defense according to Chapter 3. Section 9 MB, and access to the area must therefore not be made more difficult. The Armed Forces have also pointed out that risks in the event of accidents must be investigated so that access to the airport is not hampered. In their consultation opinion, the Armed Forces have stated that 20 meters is the stopping height within the zoning area.

Affected national interests are shown below in Figure 17.

[43] Luleå Municipality. *Master plan 2021*. Retrieved 2022-01-14.

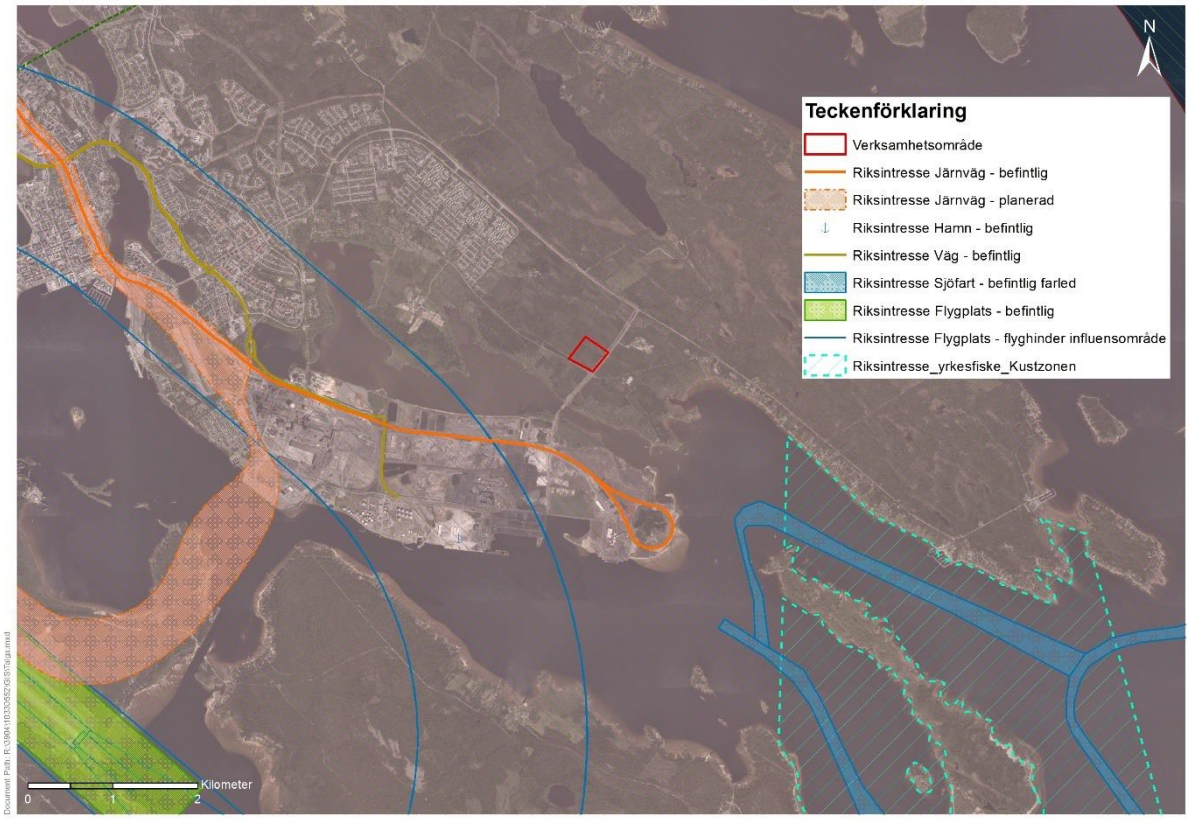


Figure 17. Other national interests in relation to the area of activity applied for.

8.6.2 Other protected areas

About 2.5 kilometers from the business, along the tip of Hertsön and south stretches a **national interest in commercial fishing**, called **the Lule archipelago**, see Figure 17 above.

8.6.3 Impact and effects

The distances to the designated areas from the planned activities are generally large, which reduces the impact. The designated area for commercial fishing is located 2.5 kilometers from the Company's planned point of discharge of water. However, the company's planned operations are not expected to affect the possibility of exercising commercial fishing on the coast of Luleå. The impact of operations on the natural environment and emissions to water are reported in sections 8.2 and 8.11.

The national interest in defense extends over the entire planned area of activity. As for the height of the planned business buildings, these will stay within the heights allowed by the zoning plan, which is 20 meters to the nock. When the building height is fully determined, the Company will contact the Armed Forces with this information. The flight obstacle analysis previously commissioned by the municipality has shown that construction within the zoning area can be done without remark. In their consultation opinion, the Armed Forces have stated that they want more detailed information about the facility and possible impact on Luleå Airport/Kallax Air Force Base. The latter is in view of the fact that the airport is of great importance for the activities of the Armed Forces and that any form of restriction in the use of the airport would have a major impact. The airport is located 7 kilometers from planned operations, which may be considered a distance of importance. As the facility will not be equipped with taller buildings than the zoning plan allows, this is not expected to affect the Armed Forces' ability to conduct its operations. The business's transports will contribute to a certain increase in transports to Luleå, but this is not considered to be to the extent that the airport's use is affected. The design of the plant is described in Appendix A (Technical description). At present, no electromagnetic equipment is

planned to be added to the plant. Ifthis changes, a dialogue should be conducted between the Company and the Armed Forces. For any impact on risks that may arise as a result of chemical handling, please refer to section 8.17 for risk and safety.

The national interest in port aims to protect the use of important port functions. The same goes for all national interests in communications. The planned activities will not make it more difficult to use either road, rail, port or airport that are designated as national interests. However, the business will be able to use these in its operations, and both railways, roads and airports contribute to the appropriate location of the designated location. The possibility of good communications facilitates the transport of both personnel and materials, which may also be considered the purpose of identifying areas as national interest for communication. A dialogue should be conducted with surrounding businesses in order for the roads in the area to be used in the best way. Information on the transport of dangerous substances is set out in sections 8.15, 8.17 and the safety report prepared for the application (Annex D).

8.6.4 Protection and mitigation measures

Protective measures with regard to the risk of accidents are presented in the safety report, Appendix D, and in section 8.17. Otherwise, no protective measures are deemed necessary.

8.6.5 Konsekvensbedömning

The planned activities are not considered to prevent the use of the designated national interestsa for area protection that exist in the vicinity of the planned activity. The distances are so great that no impact is expected to occur. The cumulative impact of the requested activity is judged to be negligible on the designated national interests.

In comparison with the current situation and the zero alternative, the activity applied for is considered to have an *insignificant consequence*.

The business is not considered to prevent the environmental goal *Good built environment* from being achieved.

Project's impact	***Project's impact in comparison to zero alternative***
All in all, the activity applied for is considered to have an *insignificant consequence* regarding other area protections in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	All in all, the activity applied for is considered to have an *insignificant consequence* for other site protection in comparison with the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.

8.7 ENERGY USE

8.7.1 Current situation

The energy needs of the business sought will be met exclusively through electricity from renewable energy sources such as solar, wind and hydropower and will be purchased from Luleå Energi. The electricity for the business will reach the business via a new facility belonging to Luleå energi with 150/20 kV on the other side of Gräsörvägen in Luleå industrial park.

The largest energy consumption within the plant comes from nitrogen production, furnaces, dryers and formers.

Heating of the premises will be done with district heating distributed by Luleå municipality and produced by the combined heat and power plant Lulekraft AB, where the fuel is combustible excess gas from SSAB Tunnplåt's steelmaking.[44]

The municipality will ensure that the necessary systems are in place before the Company's production starts. In addition to heating premises, district heating will also be used for heating process water and some heating of the ventilation. LPG will be used as fuel for the VOC emission treatment plant. Diesel will be used as fuel forbackup units and fire water pumps, see Table 7 in section 8.8.

The estimated total energy consumption of the activity applied for is presented in Table 6.

Table 6. Approximate useof energy and activity (MWh/year).

Types of energy	Anode material production plant	Graphite treatment plant	Total
Electricity	145 000	73 000	218 000
Heating			110 000
Total			**328 000**

* The specified amount of district heating has been estimated based on maximum need, i.e. the amount is calculated on a full-year basis based on the amount of district heating needed at the coldest period of the year. Thus, the annual amount of district heating used in the table is greatly overestimated.

8.7.2 Impact and effects

From an energy point of view, the applied activity is considered to be modern and efficient, but involves a relatively large consumption of renewable electricity from a resource consumption perspective. However, from a global perspective, the activity applied for means significantly less energy consumption for the production of anode materials compared to conventional manufacturing methods at existing facilities around the world. In conventional methods of manufacturing synthetic graphics, fossil energy is used to achieve higher temperatures for a longer period of time.

The use of energy in the applied operations is estimated to correspond to the annual use of approximately 8,700 villas and is estimated to have a moderate impact from a resource consumption perspective on human health and the environment in comparison with both the current situation and the zero alternative. The fact that the plant uses renewable electricity means that the climate impact from electricity consumption is insignificant.

8.7.3 Mitigation and energy-saving measures

Modern equipment will be installed to enable energy use to be measured and evaluated to continuously find opportunities for improvement.

Energy recovery will be built into several parts of the planned operations, for example, hot cooling water will be used to heat water streams in the water treatment plants. How heat released through the business's emissions to air can be reused will be investigated in connection with the detailed design of the business.

8.7.4 Impact assessment

The zero option means that the area is prepared for the establishment of industries according to the zoning plan. Since it is not possible to quantify the amount of energy consumption that a possible replacement industrial activity would entail, the assessment is based on the fact that the energy consumption in the zero option is non-existent. Thus, the zero option is the same as the current

[44] Luleå Energi AB's website, visited 2022-06-21

situation. Since the applied business will use renewable electricity, the climate impact of the electricity production itself is not expected to have any consequence. However, from a resource consumption perspective, the operation's energy consumption is estimated to have a *moderately negative consequence* compared to both the current situation and the zero alternative.

On Svartön there are already a number of large industries that consume a lot of energy, including SSAB, which in 2021 had an electricity and district heating consumption of 370,000 MWh, which is on par with the applied operations. [45]In addition, SSAB also had an energy consumption from its own gas production of 1.9 million MWh in 2021, which means that the applied business compared to SSAB entails significantly less total energy consumption.

In total for Luleå municipality, electricity and district heating consumption in 2017 was approximately 2 million MWh. Cumulative impact from the applied activity can therefore be considered relatively large and entails a [46]*moderately negative consequence* compared to both the current and zero alternatives.

When the applied business uses renewable electricity, the energyconsumption of the business is not considered to prevent the possibility of achieving the environmental quality goal *Limited climate impact*.

Project's impact	***Project's impact in comparison to zero alternative***
Overall, the activity applied for is expected to have a *moderately negative impact* on energy use from a resource consumption perspective in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	Overall, the activity applied for is expected to have a *moderately negative impact* on energy use from a resource consumption perspective in comparison with the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.

8.8 RAW MATERIALS AND CHEMICAL PRODUCTS

8.8.1 Current situation

8.8.1.1 Raw materials

The main raw material used in the process is graphite concentrate. Graphite ore, so-called Vittangigraphite with a very high graphite content, is planned to be mined in the Company's proposed graphite minesor in Nunasvaara and Niska in Kiruna municipality. The graphite ore is crushed and enriched on site into a concentrate that is transported to the plant in Luleå. The graphite concentrate is then converted to Talphite-C® in the graphite treatment plant, and finally to Talnode-C® in the anode plant. Maximally 25,000 tons of graphite concentrate will be processed per year to produce 22,000 tons of Talnode-C® per year.

Talphite-C® and Talnode-C® will be stored in supplieddoublesacks placed in closed containers outdoors and inside the process buildings. In normal operation, approximately 1,400 tonnes of graphite concentrate and approximately 1,800 tonnes of Talnode-C® will be stored at the plant instantaneously.

[45]SSAB website. *Environmental report 2021 SSAB Luleå*. Hintended 2022-05-24.
[46]Energy Office North (2019). *Energy overview Luleå municipality.*

8.8.1.2 Chemical products

Applied activities also involve the consumption of a number of different chemical products. The main process chemicals used in the graphite purification process are sodium hydroxide, sulphuric acid (98% and 70%) and hydrofluoric acid (70%). In the water treatment plants, iron(III) sulphate, burnt lime and flocculants are used.

In anode production, the main process chemical is pitch. Nitrogen gas, which is manufactured at the plant, is used for inerting in the pyrolysis process. LPG is used as fuel for the treatment plant for VOC emissions (after the combustion chambers) from the pyrolysis process. Diesel is used for the backup unit and fire water pumps used in the event of power failure (UPS system).

The classification, annual consumption and maximum quantities stored of the abovementioned chemical products are shown in Table 7.

Table 7. Classification and estimated annual consumption of the chemical products planned to be used in the activity applied for.

Subject	Hazard statements	Annual use	Maximum stored quantity
Hydrofluoric acid	H300 Dödligt vid förtäring H310 Dödligt vid hudkontakt H330 Dödligt vid inandning H314 Orsakar allvarliga frätskador på hud och ögon H318 Orsakar allvarliga ögonskador H290 Kan vara korrosivt för metaller.	2 200 ton	62 ton
Lpg	H220 Extremt brandfarlig gas. H280 Innehåller gas under tryck. Kan explodera vid uppvärmning.	370 ton	10 ton
Diesel	H226 Brandfarlig vätska och ånga. H315 Irriterar huden H331 Giftigt vid inandning H351 Misstänks kunna orsaka cancer H411 Giftigt för vattenlevande organismer med långtidseffekter	200 ton	5 ton
Sulfuric acid 98 %	H290 Kan vara korrosivt för metaller H314 Orsakar allvarliga frätskador på hud och ögon H318 Orsakar allvarliga ögonskador	11 200 ton	295 ton
Sodium hydroxide	H290 Kan vara korrosivt för metaller H314 Orsakar allvarliga frätskador på hud och ögon H318 Orsakar allvarliga ögonskador	10 900 ton	400 ton
Burnt lime	H315 Irriterar huden H318 Orsakar allvarliga ögonskador H335 Kan orsaka irritation i luftvägarna	8 700 ton	30 ton
Iron(III) sulfate	H290 Kan vara korrosivt för metaller H302 Skadligt vid förtäring	1 600 ton	60 ton

	H315 Irriterar huden H318 Orsakar allvarliga ögonskador		
Beck	H317 Kan orsaka allergisk hudreaktion H340 Kan orsaka genetiska effekter H350 Kan orsaka cancer H360 Kan skada fertiliteten. Misstänks kunna skada det ofödda barnet H413 Kan ge skadliga långtidseffekter på vattenlevande organismer	1 800 ton	150 ton
Nitrogen	H280 Innehåller gas under tryck. Kan explodera vid uppvärmning	19 500 ton	72 m^3

At present, it has not been decided which flocculants will be relevant to the water treatment plants. The flocculant that has the least harmful effects on the environment will be chosen. Approximately 10 tonnes of flocculants will be consumed annually at the plant.

In addition to the above-mentioned chemical products that will be consumed in larger quantities, smaller amounts of oils, fats and detergents will also be used for maintenance and cleaning.

8.8.2 Impact and effects

Raw materials in the form of graphite concentrates and chemical products will arrive by truck and for each raw material / product there will be a separate loading space. Most of the solid raw materials will be stored inside the buildings, which means that the risk of impact on the environment from waste is insignificant.

Hydrofluoric acid and liquefied petroleum gas will be handled and stored in such quantities that they are subject to the requirements of the Seveso legislation, see further section 8.17.

All handling of hydrofluoric acid will take place in a separate part of the graphite treatment plant in the northwestern part of the plant. Unloading hydrofluoric acid will take place in a separate unloading compartment. Before unloading, the space is closed to minimize the risk of spreading hydrogen fluoride outside the building in the event of a leak. A system for returning vapors to the transport tank of the tanker will be applied, and the tank breathing from the storage tank and the unloading compartment will be purified through a scrubber system. The unloading space will have HF detection to be able to quickly detect a leak.

The hydrofluoric acid is pumped via fixed pumps and piping to the double-jacketed storage tank located in a separate fully embanked indoor space. The unloading area is also equipped with separate embankment that can accommodate an entire tanker volume plus 10%. Any spills will be able to be collected and treated in a neutralization tank. From the storage tank, hydrofluoric acid is pumped via a fixed management system to a dilution tank where the acid is diluted to about 2%. The diluted hydrofluoric acid is then used in the leaching process and then pumped further to be treated with iron sulfate in the water treatment plant.

LPG and diesel arrive at the plant by tanker truck. LPG is unloaded into two tanks outdoors, which will be designed and placed in accordance with the requirements of the Law on Flammable and Explosive Goods. The LPG tanks will be equipped with safety valves and placed so that no ignition sources are nearby. A sprinkler system will be provided at the LPG storage for cooling in case of fire in adjacent buildings. Diesel is unloaded into a double-jacketed and embanked tank placed precipitation-protected adjacent to the backup generator in the central parts of the plant.

Concentrated sulphuric acid (98%) arrives by tanker truck and is unloaded outdoors at an unloading site in the western part of the plant. The unloading site will be provided with a roof and secondary protection, such as a waste chute connected to the collection caisson or similar device with a corresponding function. Unloading is done to a tank placed in a separate space indoors in embankment. The tank will also be equipped with level monitoring, high-level alarms and overflow protection. From the tank, the sulphuric acid is led to a dilution system where the acid is diluted to 70% and led further into the leaching process via solid pipelines.

Sodium hydroxide (>99%) arrives in pellet bags. Upon arrival, they can be stored outside in closed containers in their transport packaging, or inside the southwestern part of the graphite treatment plant. The containers will be manually emptied into a pocket from which the material is transported using a screw conveyor to the pelletizing stage of the roasting process.

Iron (III) sulphate is delivered to the plant in sacks that are unloaded via forklift for transport into storage space in the graphite treatment plant. Inside the plant, the iron sulphate is used for the water treatment plant and stored in a tank adjacent to the water treatment plants and the HF surface.

Burnt lime (CaO, >99%) will be delivered as a coarse-grained powder in sacks or with tank transport. Depending on the method chosen, the lime will then either be drained or blown into a pocket, and then with a screw conveyor will be taken to a tank where it will be extinguished by mixing with water into a slurry. The slaked lime is further pumped into a slurry tank from which the slurry is pumped continuously to the water treatment plants.

Flocculants will be delivered in solid form in sacks and stored in the northern part of the graphite treatment plant near the water treatment plants. The flocculant will be transferred mechanically through a closed system to a mixing tank and on to a storage tank from which it is then dosed to the thickener of the water treatment plants.

Solid form pitch is delivered in sacks and stored in the northern part of the anode plant or in smaller quantities in closed containers outdoors between the process buildings. Inside the building, pitch is emptied into pockets and then transferred in a fully enclosed vacuum system to the coating stage of the anode plant.

The business's routines regarding the purchase and handling of chemicals contribute to a reduced likelihood and consequence in the event of a spill. Planned protective measures also mean a significant reduction in risk. For further assessment of the business's risks, see section 8.17.

Within the framework of the permit application, a status report has been produced which further describes the use of chemicals, see Appendix E to the application.

Tallow gas technology means that it is possible to use less hydrofluoric acid by partially replacing it with sulfuric acid. Since the applied business also uses natural graphite instead of manufacturing synthetic graphite, the applied business thus means a smaller consumption of resources compared to conventional methods for manufacturing anode materials at existing plants around the world.

8.8.3 Protection and Mitigation measures

Unloading of packaged solid raw materials can take place outdoors to a lesser extent, but all handling of raw materials takes place inside buildings, with the exception of sulfuric acid, which is unloaded on a protected surface outdoors. No open handling of materials takes place out ofthe house. The liquid substances that are unloaded are hydrofluoric acid, sulfuric acid and diesel fuel. Throughout the unloading process, staff are on site to monitor the unloading and unloading is also controlled by established procedures. The unloading sites are embanked or provided with other types of secondary protection. Even tanks will be embanked.

For risk and safety safeguards, see section 8.17.3.

8.8.4 Impact assessment

The zero option means that the area is prepared for the establishment of industries according to the zoning plan. It is not possible to quantify a possible resource consumption for the industries that would be established instead of the applied activity at a zero alternative, which means that the assessment is based on a resource consumption that is non-existent. Thus, the current situation is the same as the zero option.

Compared to both the current situation and the zero alternative, the activity applied for, taking into account planned protective measures and that the applied activity entails a smaller consumption of resources than conventional methods for producing anode material, is considered to entail a *small negative consequence* in terms of raw materials and chemical products.

The activity applied for is assessed, taking into account planned protective measures, not to prevent the possibility of achieving the environmental quality objective *Non-toxic environment*.

Project's impact	***Project's impact in comparison to zero alternative***
All in all, the activities applied for are expected to have a *small negative consequence* regarding raw materials and chemical products compared to the current situation. The consequence is considered to be the same from a short, medium and long perspective.	All in all, the activities applied for are estimated to have a *small negative consequence* regarding raw materials and chemical products compared to the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.

8.9 WATER SUPPLY AND WATER USE

8.9.1 Conditions

The company plans to extract cooling and process water from Inre Hertsöfjärden. The withdrawal shall take place north of the Gräsören bridge, see Figure 10 in section 8.1.3.

The total withdrawal of cooling and process water will amount to a maximum of 1,600 m 3 per hour, of which the withdrawal of cooling water amounts to approximately 1,500 m 3 per hour (corresponding to approximately 0.42 m 3 per second) and the withdrawal of process water amounts to approximately 100 m ^{3} per hour. In total, water abstraction amounts to 14 million m^3 per year, see summary in Table 8.

Table 8. Estimated water consumption in the applied business.

Type of water use	**Estimated water consumption per hour (m^3)**	**Estimated water consumption per year (m^3)**
Sanitary water (municipal drinking water)*		12 000 m^3
Process water	100 m^3	87 000 m^3
Cooling water	1 500 m^3	13 100 000 m^3
Total process and cooling water	1 600 m^3	About 14 million m^3

* The specified amount of sanitary water corresponds to the total amount that the municipality can supply to the facility. The actual consumption of sanitary water is expected to be lower. Since it is difficult to estimate the consumed amount of sanitary water at present, the assessment is made on the maximum available amount.

Raw water from the bay to be used in the process is deionized and stored in a tank before being pumped into the process. Approximately 870,000 m^3 of deionized water will be used annually.

The pipes for the withdrawal of cooling and process water are dimensioned with an outer diameter of 700 mm.

Sanitary wastewater is diverted to the municipal wastewater network in separate pipes to be treated in municipal wastewater treatment plants. Heated cooling water and purified process water are discharged to Sörbrändöfjärden, see further section 8.11.

8.9.2 Impact and effect

According to calculations, water abstraction amounts to about 20% of the water flow during the winter and about 10% during the summer. The water withdrawal is thus only considered to have a small impact as the same amount of water that is taken out from Inre Hertsöfjärden is returned to Sörbrändöfjärden through the discharge of cooling and process water, see further section 8.11. It is not considered that there is any risk of negative impact on the aquatic environment or the possibility of achieving the quality requirements of water management as a result of the planned water withdrawal at Gräsörenbron.

8.9.3 Protection and mitigation measures

The intake line will be equipped with equipment that prevents fish and other organisms from following the cooling water into the system.

No other protective measures with regard to water supply and use are deemed necessary.

See section 8.11.5 for protective measures with regard to discharges to water.

8.9.4 Impact assessment

The zero option involves the exploitation of the area, but since it is not possible to quantify a possible water consumption, the assessment is based on the fact that the water consumption in the zero option is non-existent. Thus, the current situation is the same as the zero option.

Compared to both the current situation and the zero alternative, the water consumption, in particular the withdrawal of water from Inre Hertsöfjärden, from the applied activity is estimated to have a *small negative consequence* as Talga's water consumption may be considered relatively significant. In addition, the activity applied for means that water is taken out of one body of water and discharged into another, but the total amount of water in the receiving water will not be affected, see further section 8.11.

Project's impact	***Project's impact in comparison to zero alternative***
Sammantaget bedöms ansökt verksamhet medföra en *liten negativ konsekvens* avseende vattenförsörjning och vattenanvändning i jämförelse med nuläget. Konsekvensen bedöms vara densamma sett ur ett kort, medellångt och långt perspektiv.	Sammantaget bedöms ansökt verksamhet medföra en *liten negativ konsekvens* avseende vattenförsörjning och vattenanvändning i jämförelse med nollalternativet. Konsekvensen bedöms vara densamma sett ur ett kort, medellångt och långt perspektiv.

8.10 GROUNDWATER

8.10.1 Conditions

Modelling carried out by AFRY on behalf of the Company (see groundwater investigation in Appendix B:2) of current conditions for groundwater levels in the area around Talga's planned business area is presented in Figure 18 below. The Hertsö field currently consists of forest and marshland. According to the modelling, the groundwater level is just below or at the surface of the soil within several parts of the area (red fields in Figure 18), which is due to the presence of bog areas with water that are judged to be in contact with groundwater.

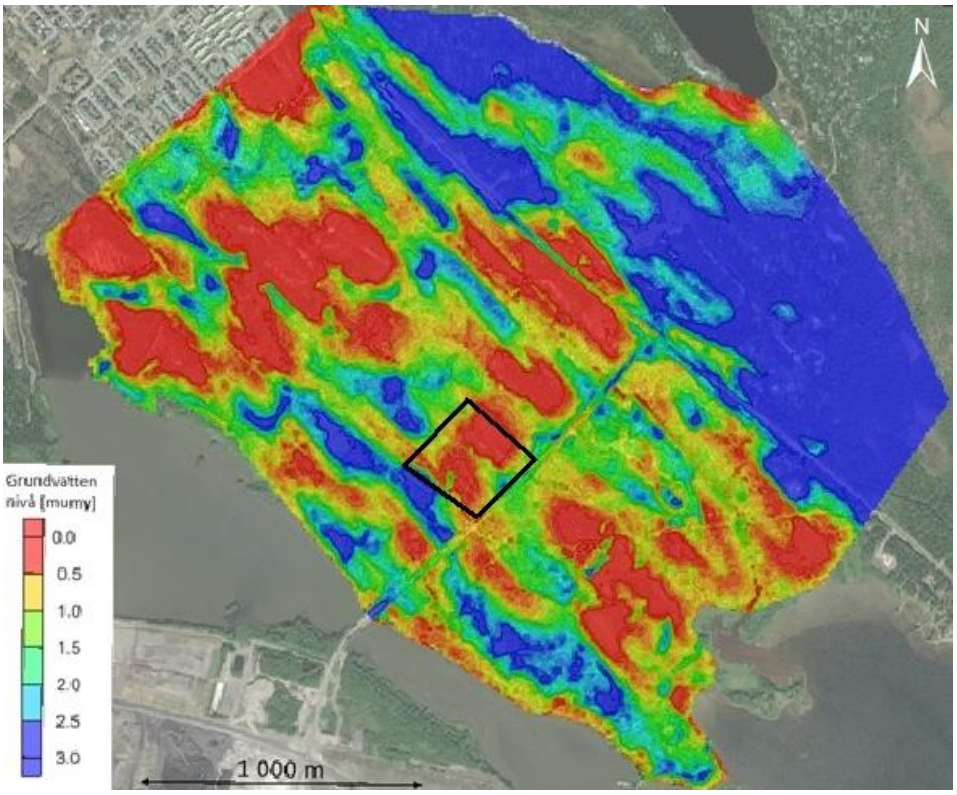


Figure 18. Modelled groundwater levels in metres below the surface of the ground under current conditions (current situation). The colors correspond to the groundwater level in meters below the soil surface. Talga's area of operation in black. Source: AFRY Appendix B:2

Figure 19 shows the estimated decrease in groundwater levels as a result of Luleå Municipality's planned development of the area, compared to current conditions. The estimated groundwater subsidence is generally limited, amounting to between 0.1–1 meters. The greatest impact is estimated to occur along Hertsövägen (about 1 meter of groundwater subsidence) and in marsh areas where the groundwater level is close to the ground surface. Luleå municipality's planned exploitation of the area, and above all the municipality's planned ditches, will thus drain away the surface and groundwater from the Hertsö field, especially in areas with marshland.

The municipality's planned ditches will also lead to a groundwater subsidence within the Company's planned area of operation. The greatest impact is estimated to be in the northeastern parts of the business area (about 0.7 meters) but also in the southwestern part (about 0.4 meters).

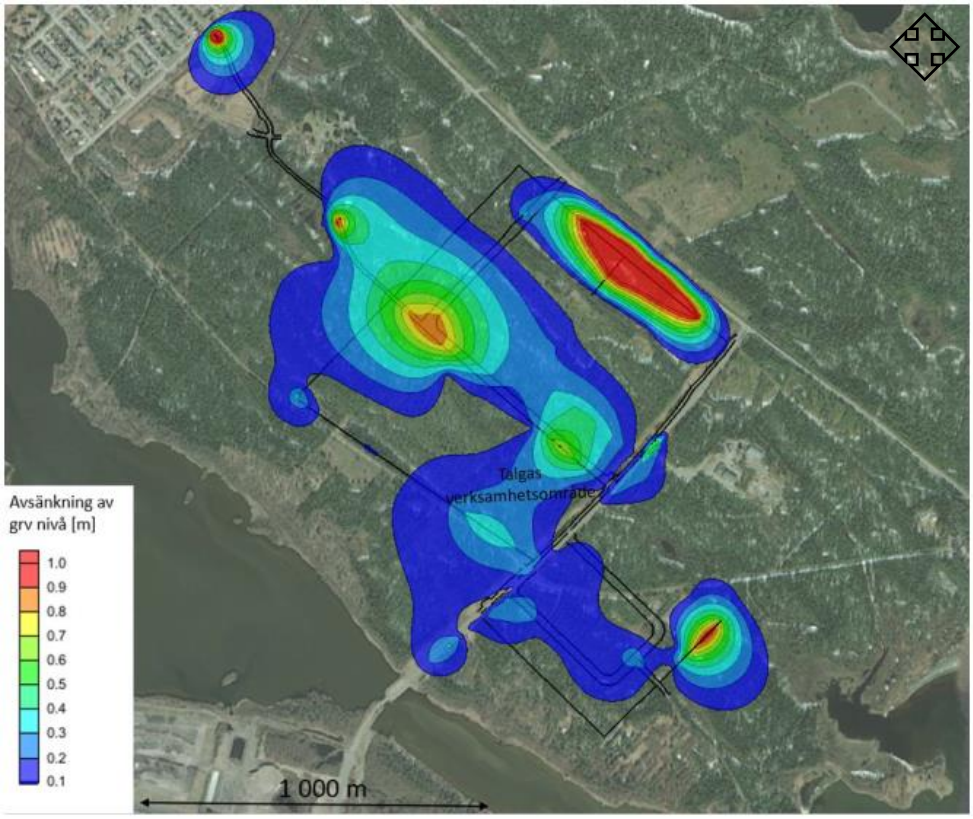


Figure 19. Estimated subsidence of the groundwater level in meters as a result of the planned ditches of the municipality (illustrated by black lines in the figure). Source: AFRY Appendix B:2

In connection with the establishment of the applied business, additional ditches will be built by Talga. The ditches are built solely for the purpose of diverting stormwater, but are still considered to have some effect on groundwater levels in the area. For the establishment of the business, large areas within the planned business area will also be hardened, and in some parts height of land will be carried out.

8.10.2 Impact and effect

In its modelling, AFRY has also taken into account the measures that the Company intends to implement and that may affect groundwater levels, see further the groundwater investigation in Appendix B:2 and Figure 20-22 below.

Figure 20 shows modelled groundwater levels and flow directions, after both Luleå Municipality's ditches are constructed and the Company's operations are established. The direction of flow is generally not expected to change in the area, but also to continue to follow the topography from northwest to southeast. However, there will be local changes in the flow pattern towards the newly established ditches.

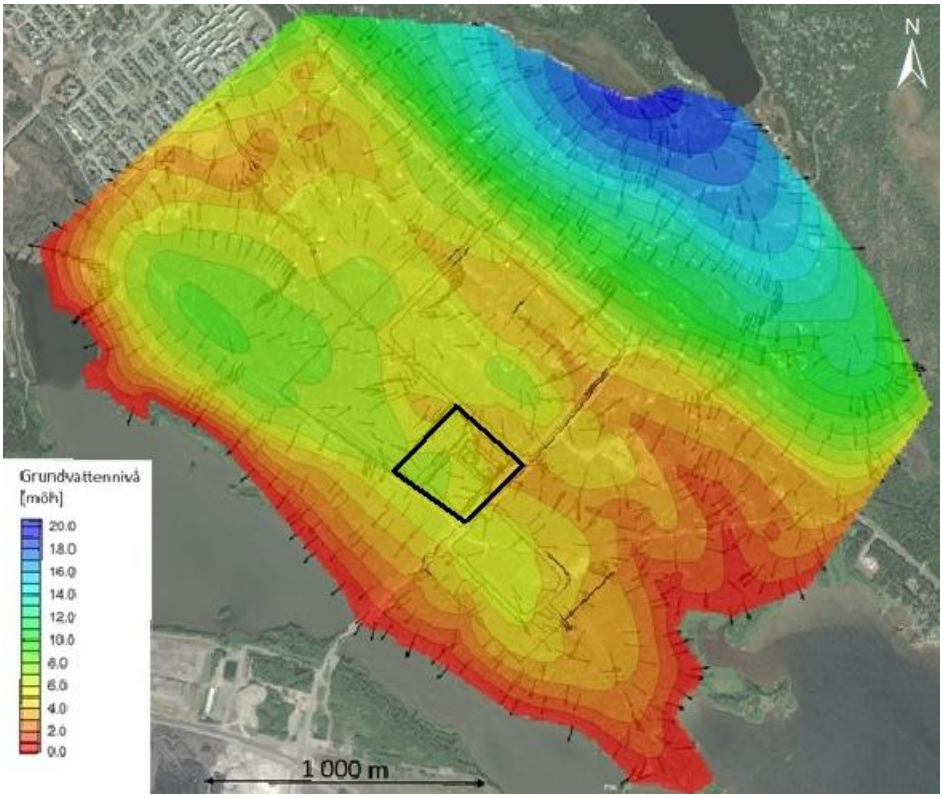


Figure 20. Modelling of groundwater levels and flow after the municipality's ditches and after the establishment of the applied activity. The colors correspond to the groundwater level in meters above sea level, and the arrows show the direction of the groundwater flow. Applied field of activity marked in black. Source: AFRY Appendix B:2

Figure 21 shows the estimated cumulative subsidence of groundwater levels that the municipality's ditches and the establishment of the applied activity are expected to bring, compared to current conditions.

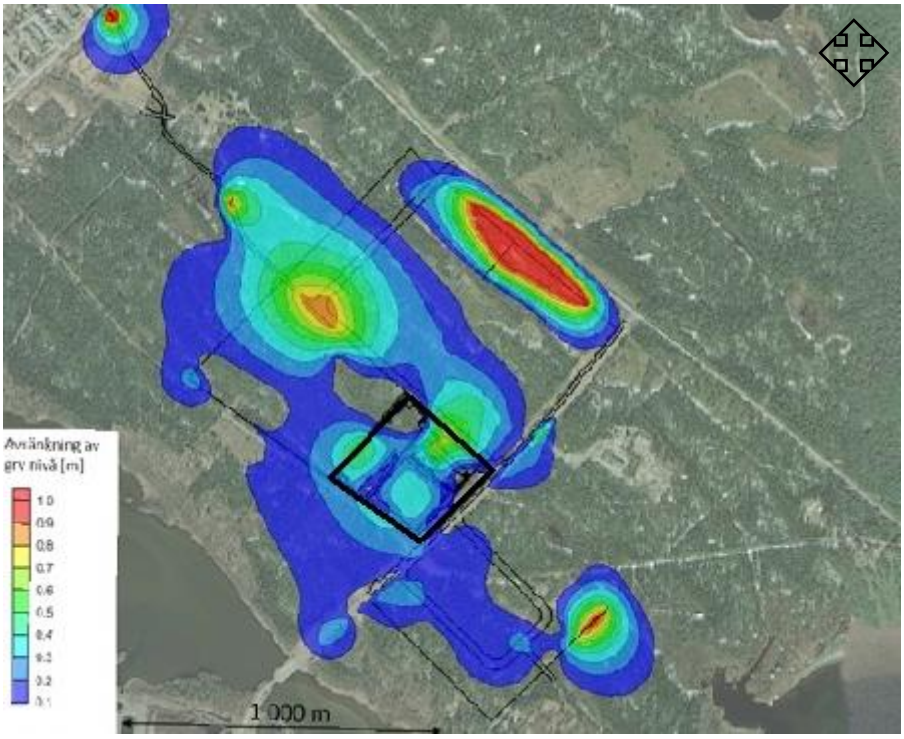


Figure 21. The figure shows the estimated subsidence of groundwater levels in meters as a result of the municipality's ditches and the establishment of the applied activity (marked in black). Source: AFRY Appendix B:2

Figure 22 shows estimated groundwater subsidence as a result of the establishment of the activity applied for. The calculation assumes that the municipality's ditches are already landscaped. The expected groundwater subsidence is limited, at most 0.4 meters within the northwestern parts of the planned business area. The impact of the applied activities is limited because the municipality's planned ditches will be at a lower level than the ditches built by the Company around the business area. The extent of groundwater subsidence is greatest in those areas where the municipality does not plan to build ditches, but where the Company will build ditches. Part of the subsidence in the planned area of operation is also estimated to be due to the construction of hardened surfaces, which reduces groundwater recharge. However, this impact is considered to be limited. The extent of groundwater subsidence mainly covers the Company's own area of operation.

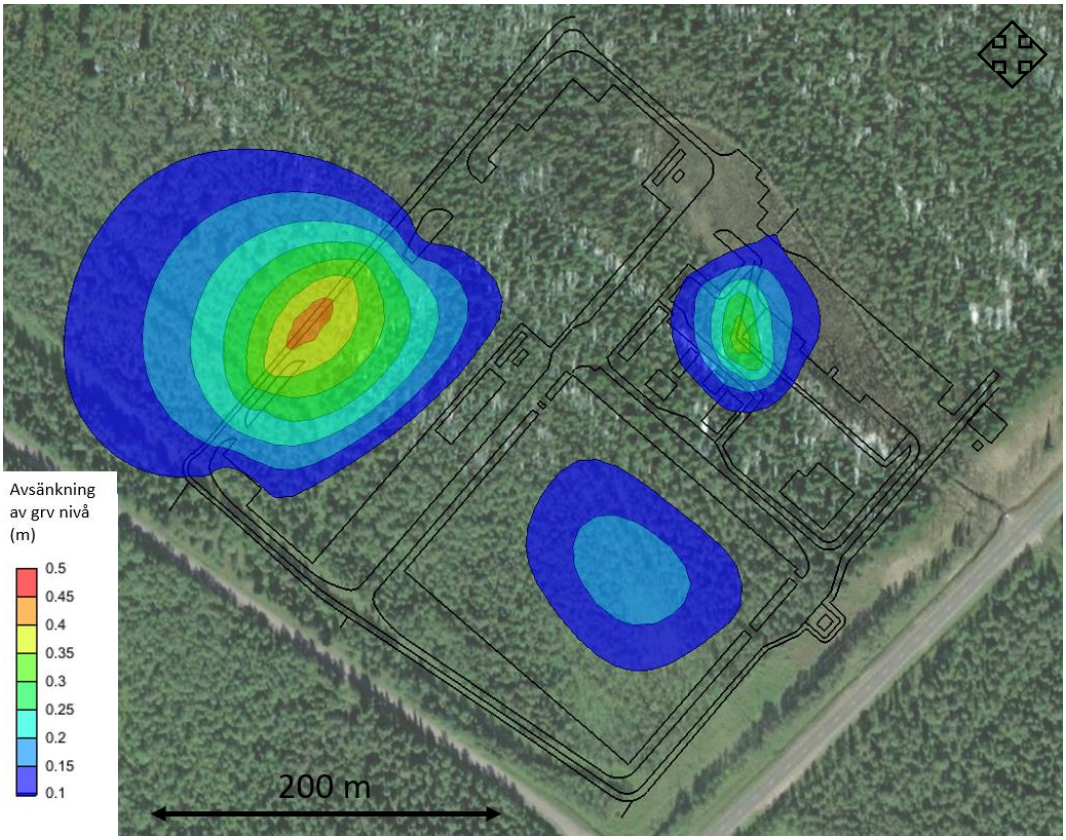


Figure 22. groundwater subsidence in the area as a result of the establishment of the activity applied for; The modelling assumes that the municipality's ditches have already been built. Source: AFRY Appendix B:2

The groundwater subsidence from the applied activity is not expected to affect Gamla Lövskärsvägen or Gräsörvägen, which is why the risk of settling is considered to be low. No other buildings or wells are found in the area where surface and groundwater subsidence is expected to occur.

According to the groundwater model, the establishment of the applied activity will not affect the fire drill area. The fire drill area is also not expected to be affected by the roads and ditches that are planned to be built by Luleå municipality.

The activity applied for is estimated to result in a groundwater subsidence between 0.1–0.4 meters on an area of the order of 44,500 m^2. The natural groundwater variations in the area have been measured at over one meter. In summary, the impact on the environment is assessed as limited. No public or individual interests are adversely affected by the expected groundwater subsidence.

During the construction phase, a temporary additional groundwater subsidence will take place through the removal of groundwater in order to be able to carry out the necessary construction works. When the area of operation is then backfilled with rock masses, moraine masses and road materials, the groundwater level will be reestablished to the level permitted by the surrounding ditches of the municipality, i.e. the level reported in Figure 22 above. The impact on groundwater levels and groundwater quality is therefore expected to be local and have only minor consequences. No groundwater bodies or drinking water wells are assessed to be affected.

The direction of flow is generally not expected to change in the area but is expected to continue to follow the topography from northwest to southeast. However, there will be local changes in the flow pattern towards the newly established ditches.

8.10.3 Protection and mitigation measures

If necessary, sedimentation facilities can be arranged to prevent soil material from spreading in connection with shafts and temporary removal of groundwater.

No other protective measures with regard to groundwater are deemed necessary.

8.10.4 Impact assessment

The establishment of the requested activity is estimated to lead to a permanent groundwater subsidence of a maximum of 0.4 meters. The calculations of the impact of the applied activity are carried out on the condition that the municipality's ditches are already landscaped and that some groundwater subsidence has thus already taken place.

The extent of groundwater subsidence is mainly in the Company's own area of operation. As the municipality's ditches will be deeper than the Company's, the municipality's ditches will have a greater impact on groundwater conditions. Groundwater subsidence as a result of Luleå municipality's exploitation of the industrial area, i.e. the zero alternative, entails a groundwater subsidence in the area of up to 1 meter, while Talga's establishment entails a groundwater reduction of a maximum of about 0.4 meters. The greatest impact thus arises from the municipality's exploitation and will take place regardless of whether the applied business is established or not.

Compared to the current situation, the activity applied for is considered to have a *small negative consequence*, taking into account that the area today is not affected by ditches to any great extent. Compared to the zero alternative, the activity applied for is considered to have an *insignificant consequence*.

The activity applied for is not considered to prevent the possibility of achieving the environmental quality objective *Groundwater of good quality*.

Project's impact on groundwater	***Project's impact on groundwater in comparison to zero allternative***
All in all, the activity applied for is expected to have a *small negative consequence* regarding the impact on groundwater in comparison with the current situation. The consequence is judged to be the same from a short, medium and long perspective.	All in all, the activity applied for is estimated to have an *insignificant consequence* in terms of impact on groundwater in comparison with the zero alternative. The consequence is judged to be the same from a short, medium and long perspective.

8.11 DISCHARGE TO SURFACE WATER

8.11.1 Environmental quality standards for water

Within the framework of the EU Water Framework Directive (2006/60/EC), environmental quality standards for water have been developed. For surface water, the standards contain quality requirements regarding ecological status and chemical status. Norms also exist for artificial and heavily modified water bodies (for example, hydroelectric dams). As a general rule, all water bodies must achieve the good status standard by 2015 and the status must not deteriorate, however, exceptions may be granted until 2021 or 2027.

Environmental quality standards for the water bodies in question Inre Hertsöfjärden and Sörbrändöfjärden were decided and announced in December 2021 for the period 2017-2021.

Table 9. Classification and environmental quality standards for the bodies of water for the abstraction and discharge of cooling and process water from, and to, the planned installation. Source: Water Information System Sweden (VISS), www.viss.lansstyrelsen.se

	Inre Hertsöfjärden (Lake) SE729068-833633	**Sörbrändöfjärden** (Coast) SE652920-222650
Ecological status		
Environmental quality standard	Good ecological status 2027	Good ecological status
Status classification	Poor	Good
Chemical status		
Environmental quality standard	Good chemical surface water status	Good chemical surface water status
Status classification	Failing to achieve good	Failing to achieve good

Inre Hertsöfjärden is a lake located south of the planned operations, and forms the bay between Hertsön and Svartön. The ecological status is considered unsatisfactory taking into account the status of phytoplankton, connectivity in lakes and morphological condition in the immediate area around lakes. The ecological status has been classified as poor in terms of the parameter "connectivity in the upstream and downstream direction in lakes", and more than 75 percent of the shallow water area is thus assessed as having a lack of connectivity. The chemical status does not achieve good as a result of the assessment of priority substances (brominated diphenyl ether, mercury and mercury compounds, fluoranthene and PFOS) and polyaromatic hydrocarbons (PAHs). Exceptions for later target years are available for PFOS, less stringent requirements for brominated diphenyl ether and mercury and mercury compounds, and other deadlines for a number of substances. Sources of impact on the water body are considered to be IED industry, contaminated sites, diffuse sources such as urban land use and atmospheric deposition. Furthermore, changes in connectivity due to dams linked to industrial activities, changes in morphological condition and land use for agriculture and urban agglomerations, and historical pollution from settlements, sewers, industry and agriculture that may have given rise to nutrient-rich sediments that can release nutrients to the water are sources of influence.

Sörbrändöfjärden is a body of water in the coastal category, which reaches out into the Bayof Botten east of Hertsön. The ecological status is assessed as good. The chemical status does not achieve good. This is due to the assessment of priority substances (brominated diphenyl ether, mercury and mercury compounds, dioxins and dioxin-like compounds). There are exceptions for later target years for dioxins and dioxin-like compounds as well as less stringent requirements for brominated diphenyl ether and mercury and mercury compounds. Sources of impact are considered to be IED industry, contaminated sites as well as diffuse sources such as transport and infrastructure as well as atmospheric deposition. Furthermore, changes in connectivity through dams, barriers and locks and other significant impacts in the form of soil drainage are also sources of impact.

8.11.2 Recipients for discharges to surface water

A detailed recipient investigation conducted by Sweco on behalf of the Company can be found in Appendix B:4. Below is a summary of the results and conclusions from the recipient investigation.

The company plans to discharge heated cooling water and treated process water to *Sörbrändöfjärden*, which is a body of water with an area of 95 km^2. Sörbrändöfjärden is considered to have good ecological status but does not achieve good chemical status, see Table 9 above.

Sampling performed at 2 test points in Sörbrändöfjärden by the coordinated recipient control (SRK) Norrbotten is presented in Table 10 below.

Table 10. Annual average values for all parameters sampled in Sörbrändöfjärden.

Parameter	**Sörbrändöfjärden (mean values 2018–2020)**
Alkalinity - (mg HCO3/l)	16,9
Magnesium Mg (filtrerat) - (mg/l)	15,4
Total-nitrogen - (µg/l)	172
Nitrite-nitrogen (NO2-N) - (mg/l)	0,001
Vanadium V (filtrerat) - (µg/l)	0,243
Silver Ag (filtrerat) - (µg/l)	0,005
Nitrate-nitrogen (NO3-N) - (mg/l)	0,050
Ammonium-nitrogen (NH4-N) - (µg/l)	39,8
Mercury Hg (filtrerat) - (µg/l)	0,050
Arsenic As (filtrerat) - (µg/l)	0,21
Cobalt Co (filtrerat) - (µg/l)	0,010
Chloride - (mg/l)	266
Chlorophyll a - (µg/l)	2,19
Barium Ba (filtrerat) - (µg/l)	7,38
Calcium Ca (end surgjort) - (mg/l)	10,8
DOC - (mg/l)	2,62
Phosphorus P - (µg/l)	9,55
Hardness ber, like calcium- (mg/l)	34,8
Color (410 nm) - (mg Pt/l)	20,2
Phosphate phosphorus (PO4-P) - (mg/l)	0,006
Turbidity - (FNU)	0,85
TOC - (mg/l)	2,83
Salinity - (PSU)	0,64
pH	7,35
Chromium Cr (filtrerat) - (µg/l)	0,057
Zinc Zn (filtrerat) - (µg/l)	1,28
Copper Cu (filtrerat) - (µg/l)	0,490
Lead Pb (filtrerat) - (µg/l)	0,018
Nickel Ni (filtrerat) - (µg/l)	0,324
Cadmium Cd (filtrerat) - (µg/l)	0,003

The specific pollutants assessed in the VISS are arsenic, chromium, zinc and copper and priority substances cadmium, mercury, lead and nickel respectively. A compilation of annual and three-year

averages and assessment criteria according to the Swedish Agency for Marine and Water Management's regulations for these substances is presented in Table 11[47].

Table 11. Annual averages 2018-2020, three-year average and assessment basis for specific pollutants (arsenic, chromium, zinc, copper), as well as priority substances (cadmium, mercury, lead, nickel) for the 2 sampling points in Sörbrändöfjärden.

Parameter	År	Årsmedel	Medel 2018–2020	Bedömningsgrund (årsmedel)	Bedömningsgrund (max konc.)
Arsenic (µg/l)	2018	0,21	0,21	1,03*	1,58*
	2019	0,22			
	2020	0,19			
Chromium (µg/l)	2018	0,07	0,06	3,4	-
	2019	0,05			
	2020	0,05			
Zinc (µg/l)	2018	0,94	1,28	1,65*	-
	2019	1,03			
	2020	1,87			
Copper (µg/l)	2018	0,51	0,49	1,45	-
	2019	0,50			
	2020	0,46			
Cadmium (µg/l)	2018	0,002	0,003	0,20	0,6
	2019	0,003			
	2020	0,003			
Mercury* (µg/l)	2018	-	0,05	-	0,07
	2019	-			
	2020	0,05			
Lead (µg/l)	2018	0,02	0,018	1,30	14
	2019	0,02			
	2020	0,02			
Nickel (µg/l)	2018	0,29	0,324	8,60	34
	2019	0,37			
	2020	0,31			

*All mercury samples (only 2 each for L2 and L3 for 2020) are below the reporting limit (<0.1 µg/l) and are reported as half the value of the reporting limit in the table. NB! The reporting limit is too high to give a fair picture of the real mercury content, which is likely to be significantly lower. In 2018 and 2019, sampling data for mercury are missing.

In March and April 2022, Sweco took sediment samples near the intake and discharge points for cooling and process water and analyzed these for metals, PCBs, PAHs and tin compounds. [48]

In HaV's regulations on classification and environmental quality standards for surface water (HVMFS 2019: 25) there are limit values for sediments for cadmium, lead, anthracene, fluoranthene and TBT. None of these limits were exceeded at any of the sampling occasions in the 2 points in question. The

[47] The Swedish Agency for Marine and Water *Management's regulation Classification and environmental quality standards for surface water (HVMFS 2019:25)*.
[48]Sweco 2022-05-03. *Sampling The Gräsören canal.*

Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME) were used as a comparison for other metals and PAHs. The Canadian assessment criteria are given as ISQG (Interim freshwater sediment quality guidelines) corresponding to low risk level and PEL (Probable effects level) which corresponds to possible risk. Arsenic, chromium and copper are partly above the low risk level but below the level of possible risk at the point of discharge. Measured levels of PAH are below the low risk level in both points. PCBs, dioxin-like PCBs, dioxins and furans, and TBT (tributyltin) were at both sampling points at levels below the reporting limit.

8.11.3 Conditions

8.11.3.1 Stormwater

Within the Hertsö field there are two existing ditches that drain the area towards Gräsörvägen in the southwest. At Gräsörvägen, the southern ditch flows north along the road until it meets the northern ditch and both are led under Gräsörvägen in the same drum. The average flow in the ditches, calculated from the area of the catchment area and the net rainfall, is about 0.01 m^3 per second. Existing ditches and marshy areas will be filled out in connection with the excavation and foundation work as existing soil masses are replaced and the ground level is raised by about 1 to 1.5 meters.

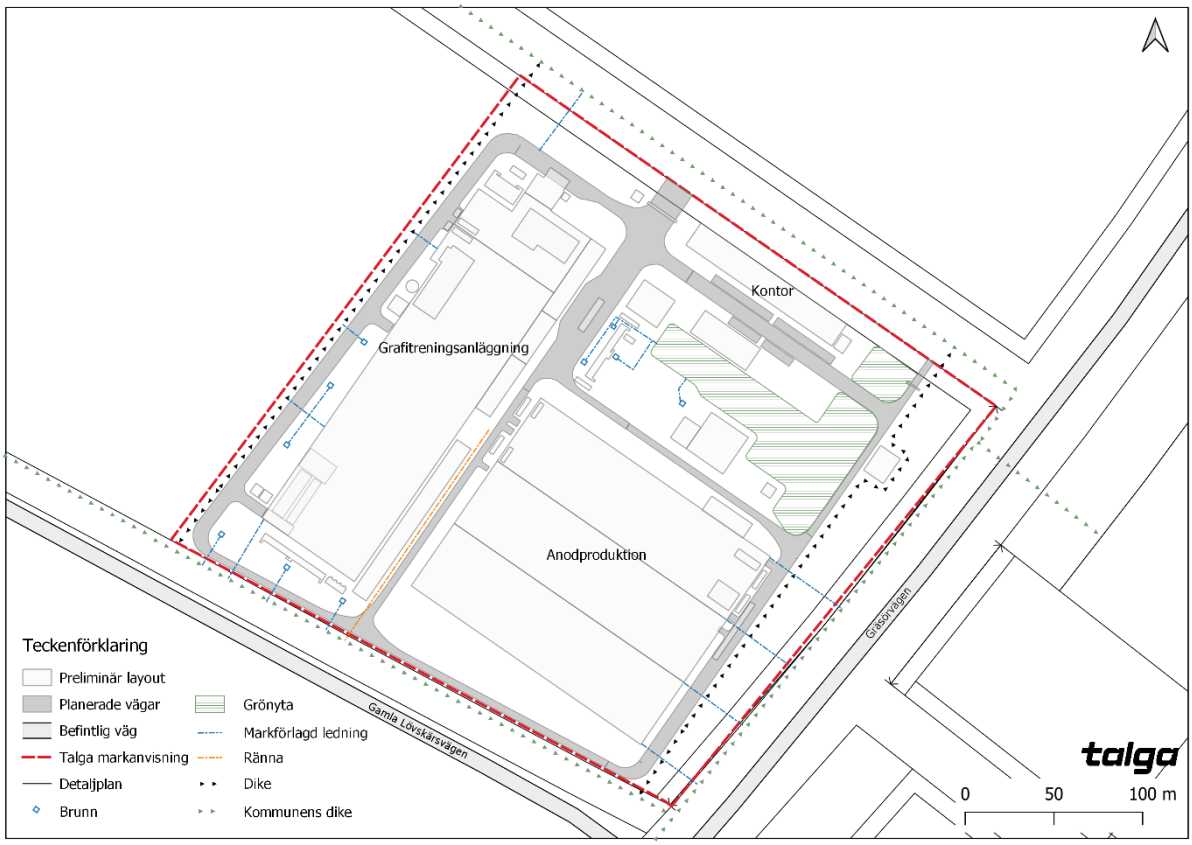
Ditches to divert surface water will be constructed around the operational area. Luleå municipality will build roads and ditches south, east and north of the business area. Surface water will be diverted to the municipality's ditches to the north and to the southeast. The municipality's ditches mean that the groundwater level is lowered locally south, east and north of the operational area, see further section 8.10. Talga's adjoining ditches on the municipality's roads will be at a lower level than the ditches built by the municipality around the operational area.

No activity beyond transportation as well as loading and unloading of raw materials and chemical products will take place outdoors.

Stormwater that occurs within the plant will be collected by wells or diverted directly to ditches at the outer edge of the plant through surface runoff. In some cases, stormwater will be directed directly to the municipality's stormwater ditches. The stormwater flow diverted via pipes from the surfaces in the northeastern part of the area will be directed to the green space between the anode production building and the office for oversilting and fixing particulate matter and oil. Stormwater in the municipality's stormwater ditches will be diverted further east via a drum under Gräsörvägen to Sörbrändöfjärden via an outlet at the far end of the bay north of the discharge point Udden in Figure 24 below. Transport routes within the area will, where possible, have a slope towards the ditches in the outer edge of the facility to allow for a direct runoff to these. If this is not possible, runoff to ditches will take place via stormwater wells in the road. The structure of the stormwater system is shown in Figure 23. The company will make conscious material choices for roofs and other building materials to reduce the presence of pollutants. Parking areas will be adapted and placed adjacent to green areas to increase the possibility of fixing particulate matter and oil.

In the planned design of the property, cutting ditches will be constructed to the west of the property. A ditch will also be built along a new road north of Talga's property , to which stormwater will be diverted. Stormwater will also be diverted into ditches along Gamla Lövskärvägen and along Gräsörvägen, and finally diverted to the existing drum under Gräsörvägen.

Shoveled snow will be stored between roads and fences, within green spaces and in the southwest corner of the facility. If these areas are insufficient, snow will be transported to Luleå municipality's snow landfill.



Figur 23. Overview stormwater systems.

8.11.3.2 Cooling and process water

The applied activity entails the release of heated cooling water and purified process water containing, among other things, zinc, chromium, arsenic and copper.

Cooling water

The cooling water system within the anode production plant is closed and the water is recirculated in the process steps. No cooling water is used in the graphite treatment plant. Through heat exchangers, the closed system is exchanged for the cooling water from the Inner HertsöBay. Used, heated cooling water and purified process water are pumped back to Sörbrändöfjärden with a maximum amount of 1,600 m^3 per hour. The discharge will be monitored to ensure that the cooling water does not contain residues of cooling water chemicals. When choosing cooling water chemicals, the inherent properties of the substance will be taken into account in order to obtain as low an environmental impact as possible.

Average values for sampling by SSAB at Gräsörenbron in 2018-2021 are presented below in Table 12. This can be considered equivalent to the background levels in Inner Hertsö Bay (at the withdrawal point).

Table 12. Average values for sampling carried out by SSAB. Source: Sweco Appendix B:4.

Parameter	**Gräsörenbron (mean value 2018-2021)**
Acenaphthene - (µg/l)	0,039
Acenaphthylene - (µg/l)	0,026
Anthracene - (µg/l)	0,0087
Benzo(a)anthracene - (µg/l)	0,0088
Benzo(a)pyrene - (µg/l)	0,0082
Benzo(b,k)fluoranthene - (µg/l)	0,018
Benzo(g,h,i)perylene - (µg/l)	0,0059
Diben(a,h)anthracene - (µg/l)	0,0050
Phenanthrene - (µg/l)	0,049
Fluoranthene - (µg/l)	0,043
Fluorine - (µg/l)	0,036
Indeno(1,2,3-cd)pyrene - (µg/l)	0,0067
Krysen - (µg/l)	0,0093
Naphthalene - (µg/l)	0,082
Pyrene - (µg/l)	0,025
Total carcinogenic PAH - (µg/l)	0,10
Total PAH with High molecular weight - (µg/l)	0,15
Total PAH with low molecular weight - (µg/l)	0,16
Total PAH with medium molecular weight - (µg/l)	0,19
Total PAH (other) - (µg/l)	0,29
Arsenic As (filtrerat) - (µg/l)	0,38
Lead Pb (filtrerat) - (µg/l)	0,21
Cadmium Cd (filtrerat) - (µg/l)	0,0053
Calcium Ca (filtrerat) - (mg/l)	12
Copper Cu (filtrerat) - (µg/l)	1,2
Chromium Cr (filtrerat) - (µg/l)	0,12
Magnesium Mg (filtrerat) - (mg/l)	9,4
Nickel Ni (filtrerat) - (µg/l)	0,55
Silver Ag (filtrerat) - (µg/l)	0,0050
Uranium, U (filtrerat) - (µg/l)	0,15
Vanadium V (filtrerat) - (µg/l)	8,4
Zinc Zn (filtrerat) - (µg/l)	3,3 (Median*: 2,2)
Absorbance 420nm/5cm - (A.U.)	0,072
DOC - (mg/l)	3,2

Parameter	Gräsörenbron (mean value 2018-2021)
TOC - (mg/l)	4,2
Phosphate phosphorus (PO4-P) - (mg/l)	0,0052
Phosphorus P - (mg/l)	0,025
Chloride - (mg/l)	120
Chlorophyll a - (µg/l)	11
Nitrate nitrogen (NO3-N) - (mg/l)	0,25
Nitrite nitrogen (NO2-N) - (mg/l)	0,013
NH4-N - (mg/l)	0,27
NH3-N** - (µg/l)	2,9 (Median*: 2,4)
Sulfate - (mg/l)	36
Temperature - (ºC)	14
Total-nitrogen - (mg/l)	0,74
Turbidity - (FNU)	5,6
PH at 25°C	7,7
COND at 25°C	53

**The zinc and ammonia nitrogen content at Gräsörenbron varies significantly, which leads to the median value being used in this investigation.*

***The ammonia content is calculated from the measured ammonium content and the support parameters pH and temperature.*

Process water

The process water is recirculated and the surplus is diverted to the receiving Sörbrändöfjärden after it has been treated in the water treatment plants (ETP1 and ETP2) so that it meets the current emission conditions.

Table 13 presents calculated emission concentrations for relevant parameters broken down by emission scenario *A* and *emission scenario B* respectively. Scenario A (100 m 3/h) corresponds to a discharge of purified process water, while scenario B (1,600 m 3/h) corresponds to a discharge of purified process water mixed with outgoing cooling water before being released to the recipient. Scenario A therefore has higher concentrations and less volume while scenario B has larger volume with lower concentrations. The volume of cooling water will in practice be able to vary, where discharge scenario B describes the maximum volume of cooling water that is planned to be discharged from the plant. Thus, emission scenarios A and B describe two extremes: emission scenario A is a worst case from a halt perspective and emission scenario B is a worst case from a load perspective. In practice, the process water will always be mixed with cooling water before it is diverted to the recipient as it does in Scenario B. Scenario A is therefore only a theoretical scenario.

Table 13. Calculated concentrations of relevant parameters for discharges to water from the activity applied for. Emission scenario A corresponds to the discharge of purified process water, while emission scenario B corresponds to the discharge of purified process water mixed with outgoing cooling water. Scenario A is only a theoretical scenario because the cooling water will always be discharged along with purified process water. Source: Sweco Appendix B:4.

Parameter	Units	Discharge scenario A	Discharge scenario B
Discharge	(m^3/h)	100	1 600
Temp	(°C)	25	20
As	(µg/l)	30	2,3
Cd	(µg/l)	0,5	0,05
Cr	(µg/l)	50	3,2
Cu	(µg/l)	10	1,9
Ni	(µg/l)	10	1,1
Pb	(µg/l)	5	0,48
Zn	(µg/l)	50	4,3
Hg	(µg/l)	0,1	0,008
U	(µg/l)	0,05	0,0031

In Luleå municipality, there are no developed guideline values for emissions to recipients, but for Skellefteå municipality there is a stormwater strategy with guideline values for stormwater that is diverted to the recipient, see below in Table 14. Even if in Talga's case it is a process water and not a stormwater, the guideline values can be considered relevant as a comparison when the water is diverted to the recipient. The limit value for suspended solids diverted to recipients is set in the stormwater strategy at 60 mg/l. No measurements of suspended matter in outgoing process water have been made, but Talga will ensure that the outgoing content of suspended matter in the process water is below the specified content. The pH of outgoing process water will be close to seven.

8.11.4 Impact and effect

8.11.4.1 Stormwater

On behalf of the Company, Sweco has produced a memo for stormwater, see Appendix B:5. Below is a description of the background and conclusions from the current memo.

Stormwater from the application area is diverted to the existing drum under Gräsörvägen via the existing ditch to the recipient Sörbrändöfjärden. To estimate the pollution content that stormwater from the applied activity may receive, Sweco has used standard levels and runoff coefficients from the StormTac database, see Table 14. These are linked to intended land use, such as roof surfaces, asphalt surfaces, parking areas, gravel surfaces and grass areas.

The EIA for the zoning plan specifies the annual acceptable load per pollutant. Acceptable load means the maximum annual quantity of pollution (kg/year) that can be added to a recipient without the recipient receiving higher concentrations (µg/l) than the limit values of the environmental quality standard allow. The limit values are based on the environmental quality standard for good status and acceptable load means that the amount of pollution added to the recipient does not impair the status. [49] The total annual acceptable load is presented together with the estimated load in Table 14 below.

[49] Luleå municipality, *Environmental impact assessment Detailed plan for part of Hertsön 11:1 et al. Hertsöfältet* (page 51)

Table 14. Estimated total load and stormwater concentrations from the applied operating area according to StormTac, annual acceptable load according to the assessment criteria and guideline values for stormwater at the connection point according to Skellefteå municipality. Source: Sweco Appendix B:4 and B:5 and Environmental Impact Assessment Detailed plan for part of Hertsön 11:1 and others Hertsöfältet (page 52)

Parameter	Estimated total load according to StormTac (kg/year)	Annualacceptance according to the assessment criteria for good status (kg/year)	Calculated content according to StormTac (µg/l)	Riktvärde för dagvatten vid förbindelsepunkt enligt exempel från Skellefteå kommun (µg/l)
P	7	-	150	230
N	69	-	1 400	3 500
Pb	0,3	11 000	6,3	15
Cu	0,62	400	13	40
Zn	1,9	1 400	41	140
Cd	0,031	230	0,65	0,5
Cr	0,34	2 100	7,3	25
Ni	0,29	1 700	6,1	30
Hg	0,0013	-	0,028	0,1
Susp	2 100	-	44 000	100 000
Oil index	14	-	300	5 000
BaP	0,0012	0,03	0,026	0,1

According to the results from StormTac, all concentrations except for cadmium are estimated to be below guideline values for stormwater (example from Skellefteå municipality).

The reason that cadmium (Cd) is just above the guideline values is probably due to the fact that the standard content for "Tak" has relatively high levels for cadmium, and that the roof surfaces make up a large part of the total property. However, the final choice of roofing material will affect both the concentrations and which sources of pollution may actually occur. As mentioned above, the Company will consciously select materials to reduce the occurrence of pollutants.

It is worth pointing out that these are precisely standard levels, the actual stormwater from the business area may look different. In addition, the estimated total load specified in the EIA for the zoning plan is significantly higher than the values given in the table above.[50]

Sweco estimates that the determination of particulate matter and particle-bound pollutants in stormwater will take place within the area on green areas and gravel surfaces, during runoff over ditch slopes and when draining into ditches around the property. Based on the results in Sweco's memo, the assessment is that there is no need for stormwater treatment for the property in question, and that stormwater does not risk impairing the recipient's ability to achieve environmental quality standards (EQS).

Northeast of the applied area of operation runs Harrbäcken, which flows into Sörbrändöfjärden. No surface water runoff is or will be made to Harrbäcken from the area of activity applied for.

[50] Luleå municipality, *Environmental impact assessment Detailed plan for part of Hertsön 11:1 et al. Hertsö field* (page 52)

8.11.4.2 Cooling and process water

Current points for the abstraction and discharge of cooling and process water as well as the discharge points investigated in the recipient investigation (Appendix B:4) are presented below in Figure 24. As the selected emission point is located between the Canal and Udden, Sweco's calculations for the Channel (emission scenarios A and B) will be used as a basis for assessment. The assessment will thus correspond to a worst-case scenario. However, as the selected discharge point is closer to the Cape than the Canal, calculations for the Cape will also be reported as a comparison. Sweco has summarized a general assessment of the selected emission point in a memo (see Appendix B:6).

The applied activity involves the discharge of heated cooling water with the same concentrations as in the recipient for the withdrawal of water (Inre Hertsöfjärden) as only the process water will be purified in the plant. However, the water from Inner Hertsöfjärden would still have reached Sörbrändöfjärden due to the direction of flow.

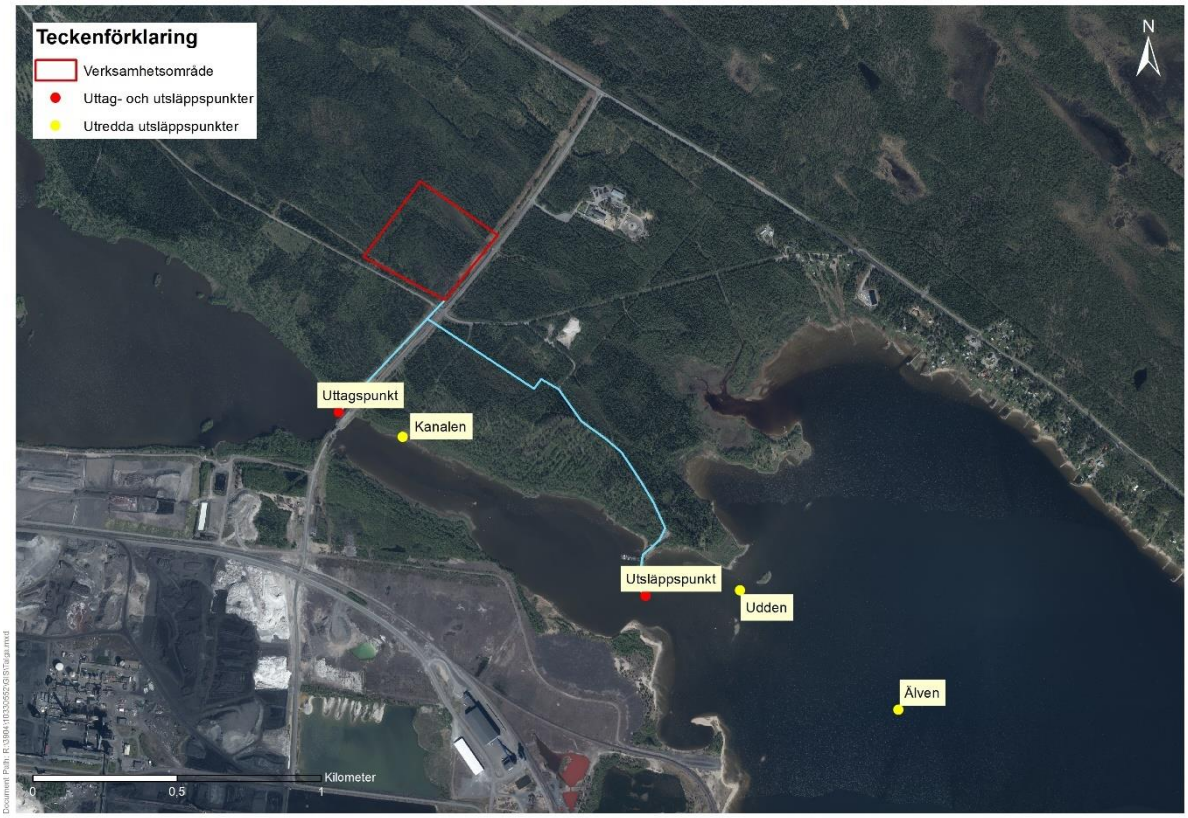


Figure 24. The selected withdrawal and discharge point in red and the emission points investigated in the recipient investigation in yellow. Blue lines correspond to wiring.

In addition to zinc and arsenic, all parameters have a dilution number below 16 for emission scenario A and below 2 for emission scenario B. According to the recipient investigation, these parameters are diluted to levels corresponding to good status in principle immediately, regardless of the assessment basis for coastal or inland waters. This means that the possibilities of meeting the EQS for the water body concerned are not compromised.

For arsenic and zinc, a certain dilution is required to undercut the assessment criteria. Sweco's calculations show that the largest proportion of Sörbrändöfjärden's area that is affected by zinc and arsenic, in concentrations that exceed the assessment criteria, is approximately 0.1 – 0.3%. In other words, it is a very small part of the bay that can locally be affected by zinc and arsenic.

Table 15 presents the total calculated levels of zinc and arsenic for the channel and the Cape for both scenarios A and B.

Table 15. Calculated levels of zinc and arsenic (µg/l, solute). The total concentrations are calculated based on two different background levels in the recipient: average sampling in 2018–2020 and median sampling at Gräsörenbron from February 2018 to January 2021. The dilution figures are modelled on winter conditions for the Channel and on the basis of summer conditions for the Cape, to correspond to the worst dilution conditions for each emission point.

Discharge-point	Scenario	Discharge-content (µg/l)	Minimum dilution ratio	Calculated content supplement* (µg/l)	Background content (µg/l)	Estimated total content** (µg/l)
Zinc						
Channel	A	50	29	1,7	1,3	3,0
					2,2 (Gräsörenbron)	3,9
	B	4,3	2	2,2	1,3	3,4
					2,2 (Gräsörenbron)	4,4
Cape	A	50	20	2,5	1,3	3,8
	B	4,3	2	2,2	1,3	3,4
Arsenic						
Channel	A	30	29	1,0	0,21	1,2
					0,38 (Gräsörenbron)	1,4
	B	2,3	2	1,2	0,21	1,4
					0,38 (Gräsörenbron)	1,5
Cape	A	30	20	1,5	0,21	1,7
	B	2,3	2	1,2	0,21	1,4

*Calculated content supplement = Emission content/Minimum dilution value.

**Calculated total content = Calculated supplement content + Background content.

Table 15 shows that regardless of the emission scenario, concentrations of the same magnitude are estimated to occur within approximately 15–20 metres of the emission points.

Discharge point The canal also risks causing a certain temperature impact in winter. For emission scenario A, it is estimated that in winter there will be an increase in water temperature of approximately 1–2 °C in an area extending along the northern edge of the canal. For emission scenario B, it is estimated that there will be a temperature increase of approximately 7–8 °C directly adjacent to the emission point. The temperature change then decreases with the distance from the discharge point and at the far end of the channel, before the water is completely diluted in the river, the water temperature is increased by about 1–2 °C. According to the Ordinance (2001:554) on environmental quality standards for fish and mussel water, the temperature at the limit of the mixing zone must not exceed the normal, unaffected water temperature by more than 3 degrees. This is undercut in emission scenario A. For emission scenario B, although the impact is higher than three

degrees in a limited area within the mixing zone, the impact decreases rapidly outwards and is 1-2 °C in the outer parts of the channel.

For the cape discharge point and emission scenario B, it is estimated that there will be an increase in the water temperature of about 3-4 °C during the winter in a smaller area right next to the discharge point. In an area that extends out to the river and to the shores of the cape, the temperature increase is approximately 1–2 °C.

Sweco's assessment is that environmental quality standards regarding temperature impact are met for both emission scenarios A and B in the release points Kanal and Udden, respectively.

During the design, after the recipient investigation was carried out, it emerged that the selected emission point was more advantageous for several reasons, see further section 8.1.3. The selected discharge point (A4, see Figure 25) is located at the marina about 350 meters west of the point Udden, inside the boundary where the flow of the Lule River dominates the dilution conditions. According to Sweco's assessment (see Appendix B:6), the dilution of the emission from A4 can therefore be expected to take place in the same way as for the emission from the Channel. This means a smaller dilution initially in the flow from Hertsöfjärden and then a stronger dilution when the spreading plume reaches the area at the height of the point Udden. The area with poorer dilution conditions will thus be significantly smaller than for the discharge in the Channel and the local impact will thus be less. In comparison with the point Udden, the local impact on A4 is estimated to be somewhat more widespread, but only to a small extent and without any consequences of importance to ecology.

The change in the impact on the water body and the possibilities of achieving EQS are considered negligible in terms of emissions in point A4 in Sörbrändöfjärden, compared to the results of the recipient investigation (Appendix B:4).

Figure 25. Selected emission point A4 in relation to the Canal and Cape.

8.11.4.3 Impact on environmental quality standards

The impact on environmental quality standards from both emissions of cooling and process water as well as stormwater in the water body concerned Sörbrändöfjärden is summarized below in Table 16.

Table 16. Environmental quality standards, quality factors and status of the water body Sörbrändöfjärden (extract from VISS), as well as overall assessment for the activity applied for by quality factor.

Environmental quality standards Sörbrändöfjärden	**Classification according to VISS**	**Comments**	**Impact from facilities**
Good ecological status	Good	The assessment is based on the weighting of measurement data for phytoplankton (chlorophyll a), visibility depth, oxygen conditions and nutrient status as well as measurement data on particularly polluting substances.	**Applied activities do not jeopardise the chances of reaching the environmental quality standard.**
Biological quality factors			*Does not risk reduced status due to applied activity.*
Phytoplankton	Good		The process water does not involve any release of nutrients. The applied for activities result in the release of nutrients from stormwater that are below the guideline values for stormwater, according

			to Skellefteå municipality. Does not affect the status of the water body as a whole.
Bottom fauna	Not classified / Unknown		Applied activities involve only small interventions in water area. Does not affect the status of the water body as a whole.
Physicochemical quality factors			*Does not risk reduced status due to applied activity.*
Light	High		Stormwater discharges can generally cause eutrophication and also suspended solids. However, from the applied activity , these substances are estimated to be below the guideline values for stormwater according to Skellefteå municipality. The activity applied for may thus cause impaired lighting conditions in connection with the emission point. Does not affect the status of the water body as a whole.
Nutrients	High		The process water does not involve any release of nutrients. The applied for activities result in the release of nutrients from stormwater that are below the guideline values for stormwater, according to Skellefteå municipality. Does not affect the status of the water body as a whole.
Particularly polluting substances	Good		The activity applied for involves the release of zinc and arsenic at concentrations that exceed the assessment criteria for good status in a small area directly adjacent to the outlet. Does not affect the status of the water body as a whole.
Hydromorphological quality factors			*Does not risk reduced status due to applied activity.*
Connectivity in coastal and transitional waters	Moderate	The status has been assessed as moderate, as 16% of the coastal area is shielded by migratory barriers and therefore there is a lack of connectivity.	Applied activities involve only small interventions in water area. Does not affect the status of the water body as a whole.
Hydrographic conditions in coastal waters and waters of the transition zone	High		Applied activities involve only small interventions in water area. Does not affect the status of the water body as a whole.
Morphological condition in coastal and transitional waters	Good		Applied activities involve only small interventions in water area. Does not affect the status of the water body as a whole.
Good surface water chemical status (excluding brominated diphenyl	Failing to achieve good	The assessment is based on measurement data on dioxins, furans and dioxin-like PCBs as well as extrapolation indicating that the	**Applied activities do not jeopardise the chances of reaching the environmental quality standard.**

ether and mercury/mercury compounds)		limit values for mercury and PBDE are exceeded. In Sweden today, mercury and PBDE exceed the limit values in all surface waters.	
Priority substances	Failing to achieve good		*Does not risk reduced status due to applied activity.*
Brominated diphenyl ether	Failing to achieve good		The activity applied for does not involve the release of brominated diphenyl ether. Does not affect the status of the water body as a whole.
Naphthalene	Not classified / Unknown		The activity applied for does not involve the release of naphthalene. Does not affect the status of the water body as a whole.
Lead and lead compounds	Good		The activity applied for involves the release of lead under the assessment criteria for good status. Does not affect the status of the water body as a whole.
Cadmium och cadmium compounds	Good		The activity applied for involves the release of cadmium under the assessment criteria for good status. Does not affect the status of the water body as a whole.
Mercury and mercury compounds	Failing to achieve good		The activity applied for involves the release of mercury under the assessment criteria for good status and the background levels, which means that the applied activity will not increase the levels in the recipient. Does not affect the status of the water body as a whole.
Nickel and nickel compounds	Good		The activity applied for involves the release of nickel under the assessment criteria for good status. Does not affect the status of the water body as a whole.
Dioxins and dioxin-like compounds	Failing to achieve good		The activity applied for does not involve the release of dioxins. Does not affect the status of the water body as a whole.
Tributyltin compounds	Failing to achieve good		The activity applied for does not imply the release of tributyltin. Does not affect the status of the water body as a whole.

A certain morphological impact on Inner Hertsöfjärden is expected to arise at the construction of the pipeline for the extraction of cooling and process water at Gräsörenbron. However, the activity applied for is not considered to jeopardise the chances of achieving the environmental quality standards for the water body Inner Hertsöfjärden as a whole.

8.11.5 Protection and mitigation measures

- The process water is purified in two treatment plants (ETP1 and ETP2) before being mixed with the outgoing cooling water and released to the recipient.
- The water quality of the outgoing water from the treatment plants will be checked regularly.
- Allh antation of materials will take place indoors.
- Tanks and cisterns will be embanked.

- Purification of airborne emissions.

Several protective measures related to, among other things, fire, gas detection, firefighting, extinguishing water management and handling of hazardous substances such as hydrofluoric acid and sulfuric acid have been taken into account when designing the facility. Safeguards are further described in section 8.17.

8.11.6 Impact assessment

At present, the area is wooded with a few ditches. As the area of operation will be hardened, stormwater will arise from hardened surfaces, which differs from runoff from a forest area. Compared to the current situation, the activity applied for is thus considered to have a *small negative consequence* in terms of discharge of stormwater to the recipient.

Compared to the zero alternative, it is estimated that the discharge of stormwater to recipients has an *insignificant consequence* for human health and the environment as the area is detailed planning for industry, which means that stormwater of a similar nature and quantity arises regardless of whether the applied activity is built or not. The applied activity is not expected to result in any pollution levels above the comparison values according to Skellefteå municipality in the stormwater from the operating area.

The applied activity involves a discharge of heated cooling water and purified process water where the calculated concentrations at the discharge point are below the assessment criteria for good status for both coastal and inland waters for all analyzed metals except zinc and arsenic. In the case of zinc and arsenic, a very small part of the surface water body area (maximum 0.3 %) is estimated to be affected by concentrations that exceed the assessment criteria for good status as the concentrations are rapidly diluted when the discharge reaches the strait.

Emissions of cooling and process water to the selected discharge point (A4) are estimated to have only small local consequences without any consequences of importance to the ecology. The activities applied for are not considered to jeopardise the chances of achieving the environmental quality standards for the water body Sörbrändöfjärden as a whole. Regardless of the scenario, only a marginal part of the water body is estimated to show concentrations that exceed assessment criteria or limit values in the Swedish Agency for Marine and Water Management's regulations *HVMFS 2019: 25*.

The temperature impact of the business, regardless of the emission scenario, is not expected to lead to any negative consequences of importance for the ecology of the area.

Since the applied activity involves a discharge of cooling and process water that has a small local impact on the water body, the discharge of cooling and process water is estimated to have a *small negative impact* on human health and the environment compared to both the current and zero alternatives.

The background concentrations of pollutants in the recipient together with the emissions from the applied activity represent the cumulative impact. As previously stated, the activity applied for involves a local impact taking into account the background levels, but no impact is expected to occur in the water body as a whole.

The total impact on the recipient, from both stormwater and emissions of cooling and process water, as a result of the applied activity is estimated to entail a *small negative consequence* compared to both the current situation and the zero alternative.

All in all, the applied activity is not considered to affect the status or individual quality factor of the water body Sörbrändöfjärden as a whole. The activities are also not considered to jeopardize the ability to reach the environmental quality standards for the recipient.

The applied activity is not considered to prevent the possibility of achieving the environmental quality goals *Living lakes and watercourses, Sea in balance and living coast and archipelago* or *No eutrophication*.

Impact on surface water quality	***Impact on surface water quality in comparison to zero alternative***
All in all, the activity applied for is expected to have a *small negative consequence* regarding discharges to surface water in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	All in all, the applied activity is estimated to have a *small negative consequence* regarding emissions to surface water in comparison with the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.

8.12 AIR EMISSIONS

8.12.1 Environmental quality standards for air

The Air Quality Regulation (2010:477) lays down environmental quality standards (EQS) for nitrogen dioxide and oxide, sulphur dioxides, carbon monoxide, ozone, benzene, particulate matter (PM_{10} and $PM_{2.5}$), benzo(a)pyrene, arsenic, cadmium, nickel and lead in air. The standards specify the maximum content of each substance in the outdoor air, see Table 17. The table also lists the environmental objectives that exist for nitrogen dioxide and oxides of nitrogen as well as for particulate matter.

Table 17. Environmental quality standards for the parameters affected by the Company's operations.

Parameter	**Hourly average (µg/m³)**	**Daily average (µg/m³)**	**Annual average (µg/m³)**	**Environmental objectives**
Nitrogen dioxide and oxides[1)]	90	60	40	20 µg/m³ per year and 60 µg/m³ per hour
Sulfur dioxide[2)]	200	100	-	-
Particles (PM_{10})[3)]	-	50	40	15 µg/m³ per year and 30 µg/m³ per day
Particles ($PM_{2,5}$)	-	-	20	10 µg/m³ per year and 25 µg/m³ per day
Benzo(a)pyrene (BaP)	-	-	0,001	0,1 ng/m³ per year

[1)] The hourly average may be exceeded 175 times per calendar year provided that the level of pollution never exceeds 200 micrograms per cubic metre of air for one hour more than 18 times per calendar year. The daily average may be exceeded 7 times per calendar year.

[2)] The hourly average may be exceeded 175 times per calendar year provided that the level of pollution never exceeds 350 micrograms per cubic metre of air for one hour more than 24 times per calendar year. The daily average value may be exceeded 7 times per calendar year provided that the level of pollution never exceeds 125 micrograms per cubic metre of air more than 3 times per calendar year.

[3)] The daily average may be exceeded 35 times per calendar year.

8.12.2 Recipient for air emissions

The EQS for nitrogen dioxide (NO_2) has previously been exceeded in Luleå city centre. This resulted in an action programme in 2015 to improve air quality. The reason for exceeding the EQS is estimated to be road traffic, meteorological conditions, street space design and emissions from industries.

Currently, measurements of nitrogen dioxide and particles (PM_{10}[51]) are made on Sandviksgatan in central Luleå, which is about 7 kilometers from the planned location of the applied business. During the years 2016-2020, the EQS has not been exceeded, however, the environmental target for particles and nitrogen dioxide has been exceeded in 2018.[52]

Through the Krondropps project, IVL has made measurements of air concentrations for NO 2, sulphur dioxide (SO_2), ammonia and ozone at 20 locations throughout Sweden. For the 3 measurement points located in Norrbotten, the concentrations for NO_2[53] are below 1 µg/m^3 (half-yearly averages).

The environmental impact assessment for the zoning plan for the Hertsö field states that the air emissions from actual production of all operations including road traffic on Svartön amount to 778 tons NO_X, 300 tons PM $_{10}$ and 572 tons SO_2. Simulations of specified emissions show pollution levels at the nearest homes that are well below both the environmental quality standards and the environmental goal *Fresh air*. Even licensed production on Svartön is by a good margin below both the environmental quality standards and the environmental goal for the residential area Hertsön.[54]

8.12.3 Conditions

8.12.3.1 Emissions from production

Emissions to air of, among other things, carbon dioxide (CO 2), particles and nitrogen dioxide (N_2O) from the requested activity arise both from the processes, the water purification and the hydrofluorocarbon scrubber and the sulfuric acid scrubber in the graphite treatment plant and from the processes in the anode production plant. Nitrogen production does not result in net emissions to air.

Emissions to air from transport are described and assessed in section 8.15 and are therefore not further described in this section.

In total, the business has 18 emission points to air: 6 emission points from the graphite treatment plant and 12 emission points from anode production. All emissions from the activities applied for are described in more detail in the technical description (Annex A).

In the graphite treatment plant, there are emission points to air after the hydrofluoric scrubber and after the sulfuric acid scrubber. During normal operation of the plant, there is no discharge at these points as the scrubbers are dimensioned to fully remove the acid departing from the storage tanks for hydrofluoric acid and sulfuric acid. In the event of an incident with the release of acid as a result, the load on the scrubbers will be higher and at these times lower levels of hydrofluoric acid and sulfuric acid may be present in the outgoing air. The content on these occasions is assessed as not exceeding 1 mg/m^3.

No odor emissions are estimated to arise from the applied activity. All dusting management takes place indoors and the business thus entailsno dust emissions.

Emission concentrations and total annual amounts of emissions to air are shown in Table 18 together with current BAT-AELs. Note that BAT-AELs for the emission of particles and benzo(a)pyrene according to BAT-NFM should be applied only to the handling of coke and pitch, which makes the levels in Talga's process directly applicable only to the pitch handling in anode production. Furthermore, there are no BAT-AELs for hydrogen fluoride or sulfuric acid for the Tallow type of activity, but there are BAT-AELs for other types of activities which are listed in Table 18 below. BAT-AEL for VOCs is applicable to the mixing, baking and impregnation processes. Neither baking nor

[51] Luleå Municipality (2015). *Action programme. Better air in Luleå city centre – An action plan to improve air quality.*
[52] Luleå municipality's website. *Street measurement nitrogen dioxide*. Retrieved 2022-01-18.
[53] Krondroppsnets websitep. Retrieved 2022-05-23.
[54] Luleå kommun (2020). *Miljökonsekvensbeskrivning Detaljplan för del av Hertsön 11:1 m.fl.*

impregnation is carried out in Talga's process, which is why this limit value is not directly applicable to the applied activity either..

Tabell 18. Utsläppshalter och utsläppsmängder till luft från ansökt verksamhet samt utsläppshalter enligt BAT-slutsatser.

	Utsläppshalter (årsmedelvärde)	**Utsläppsmängd (ton/år)**	**BAT-AEL**
The graphite purification process			
Particles	5 mg/Nm^3	1,1	2-5 mg/Nm^3
N_2	720 g/Nm^3	27 000	-
CO_2	360 g/Nm^3	8 500	-
HF (vätefluorid)	<1 mg/Nm^3		1-3 mg/Nm^3*
H_2SO_4	<1 mg/Nm^3		10 mg/Nm^3*
Anode material production			
Particles	5 mg/Nm^3	2,5	2-5 mg/Nm^3
N_2	990 g/Nm^3	420	-
CO_2	6,2 g/Nm^3	2,8	-
CO	64 mg/Nm^3	0,03	-
NO_x	0,2 mg/Nm^3	0,08	-
N_2O	6,4 mg/Nm^3	2,7	-
Benso(a)pyrene	0		≤0,01 mg/Nm^3
VOC	0		≤10-40 mg/Nm^3

*Comparator value, BAT-AEL for metal manufacturing other than graphics (zinc and aluminium).

8.12.4 Impact and effect

8.12.4.1 Emissions from production

For hydrogen fluoride, AEGL values have been developed. AEGL stands for *Acute Exposure Guideline Levels* and constitutes health-based guideline values for acute exposure of the chemical substance. There are three different degrees of effects: AEGL-1, AEGL-2, and AEGL-3. AEGL-1 implies the lowest limit values and is defined as: *"The airborne concentration of a substance in which it is calculated that exposed people (including sensitive individuals) may experience discomfort, irritation or certain effects that do not produce symptoms. However, the effects are transient and do not affect the person's ability to act."* For hydrogen fluoride, the AEGL-1 limit value is 1 ppm (<1 mg/m^3) regardless of exposure time (up to 8 hours). [55]

The BAT conclusions for the non-ferrous ore industry do not set limit values for hydrogen fluoride emissions in graphite production. However, for primary and secondary aluminium production, which is also covered by BAT-NFM, 1-3 mg/Nm^3 is given as the limit value. The BAT conclusions for large

[55] AEGL-1 is 1 ppm which gives an approximate content of 0.82 mg/m^3 according to calculations on a molecular weight of fluouric acid of 20.01 g/mol

combustion plants (BAT-LCP) also set limit values of between 1 and 3 mg/Nm 3 for HF. These values can be used as comparison values for hydrogen fluoride emissions, even if they do not refer to the same type of process as the planned activity.

The activity applied for will involve a hydrogen fluoride emission of less than 1 mg/Nm 3 in normal operation, but the assessment is made at 1 mg/Nm^3 to correspond to a worst-case scenario in the event of a leak, see further section 8.17. In the event of emissions into the air, a rapid dilution will occur, which means that the concentrations that can occur in the environment are significantly lower. The emissions of hydrofluorochemicals from the requested activity are thus calculated to be below AEGL-1 and limit values according to BAT conclusions for anode manufacturing in the aluminum industry and BAT-LCP already at the point of release and are thus not considered to affect human health or the environment.

For sulfuric acid, there are no BAT-AELs in BAT-NFM that are relevant to the activity applied for. However, it is available for zinc production and there the limit value is 10 mg/Nm^3. The AEGL values for sulfuric acid at 8 hours of exposure are 0.2 mg/Nm 3 (AEGL-1), 8.7 mg/Nm 3 (AEGL-2) and 93 mg/Nm 3 (AEGL-3), respectively . Thus, the emissions from the applied activity are estimated to be slightly above AEGL-1 but below AEGL-2. It is also above the hygienic limit value for sulphuric acid which is 0.1 mg/m 3 (level limit value) and 0.2 mg/m^3 (short-term limit value). The calculated concentration applies precisely at the point of discharge, at least 20 meters into the air, and is not considered to lead to harm to human health. Due to the dilution that has occurred when it possibly reaches a person in absolute proximity, the concentrations should be at harmless levels. Since sulphuric acid emissions only occur during spills, emissions are also short and temporary.

For CO, the AEGL-2 limit value for 1 hour of exposure is 95 mg/m^3. AEGL-2 is defined as *"the airborne concentration of a substance above which it is calculated that the population, including sensitive individuals, may have irreversible or other serious and long-lasting health effects or a reduced ability to escape from exposure."* The emission levels of CO from the requested activity of 64 mg/m3 are thus below the AEGL-2 limit value for 1 hour of exposure at the point of discharge. Given the large distance to homes, the levels of CO are not considered to pose a health risk to people in the surrounding area.

For N_2 O there are no AEGL values but there are hygienic limit values according to the Swedish Work Environment Authority's *AFS 2018:1*. The lowest occupational health and safety limit value (level limit value) is calculated for an exposure of 8 hours and is 180 mg/m^3. The emission concentrations of N_2O from the requested activity of 6,4 mg/m3 are thus very much below the limit value already at the point of discharge and are not considered to pose a risk to human health in the environment.

The NO_x emissions in the activities applied for are derived from the combustion of LPG. For NO_x, there are no applicable BAT-AELs for Talga's type of activity, but it can be put in relation to the minimum BAT-AEL for large combustion plants which means 10-14 mg/Nm 3 when burning gaseous fuel. Furthermore, *the Regulation (2018:471) on medium combustion plants* specifies a minimum limit value of 15 mg/Nm^3 for gaseous fuels. There are also specified AEGL values for NO_x where AEGL-1 is 1.9 mg/m^3 regardless of exposure time. The emissions of NO_x of 0.2 mg/m^3 from the requested activity are below all the specified limit values by a good margin.

The nitrogen is taken out of the air for the production of nitrogen gas and then released again, thus there is no additional nitrogen than that which is already naturally present in the air.

Since the concentrations already at the point of discharge are generally low and are judged to be below the relevant comparative values, no scattering calculation has been made. However, experience has shown that other dispersion calculations have shown that the concentrations drop sharply so it is reasonable to assume that the concentrations at the nearest dwellings have fallen well below both EQS and environmental targets (see Table 16).

The emissions of particles will be within the range specified as BAT-AEL for the non-iron ore industry, and are judged based on available information not to cause the EQS at homes to be exceeded due to the long distance.

According to simulations made in the VOSS tool (see section 8.15.2), the background levels of NO_2 and PM_{10} are in the area both at present and in a scenario where Talga's transports have been included at <15 µg/m 3 and <12 µg/m^3 respectively as an annual average. This means that there is room left for EQS and that the applied activity is thus not considered to result in the EQS at the nearest housing being exceeded. There is also room for the environmental goal.

A comparison can be made with activities in the surroundings. In the nearby industrial area on Svartön, SSAB, among others, conducts operations. The operations entail, among other things, emissions of approximately 1.3 million tonnes of CO_2 and 350 tonnes of NO_x per year. Luleå combined heat and power plant is also located on Svartön and in 2021 emitted 1.9 million tonnes of CO_2[56] and 38 tonnes of NO_x.[57]

The estimated emission ofN 2 O of 2.7 tonnes by the activity sought corresponds to an emission of 805 tonnes of carbon dioxide equivalent per year. Including the carbon dioxide emissions from the business of 8,500 tons, this means a total emission of approximately 9,300 tons of carbon dioxide equivalents per year from the applied activity. In relation to the emissions [58]of a total of 3.2 million tonnes of carbon dioxide caused by SSAB and Luleå Combined heat and Power Plant on Svartön, greenhouse gas emissions from the applied operations are small. Greenhouse gas emissions should also be put in relation to the product that the Company will produce and its positive impact on the climate with the electrification of society, see further section 4.1.

Furthermore, the emissions of NO x of 388 tonnes per year from Svartön can also be compared with the emissions of NO_x from applied activities of 80 kilos per year, where the emissions from the applied activity are negligible.

8.12.5 Protection and Mitigation measures

- The emission points from the processes in the graphite treatment plant and anode production plant will be provided with cyclone and textile filters or only textile filters. The purification equipment is estimated to separate approximately 99.5% of the particles in the process air and the particle content to the atmosphere will amount to a maximum of 5 mg/m^3.
- Scrubbers for the acid and sulphuric acid of hydrogen acid in the graphite treatment plant will be dimensioned to fully remove the acid departing from the storage tanks for hydrofluoric acid and sulfuric acid. In the event of an incident, with the release of acid as a result, the load on the scrubbers will be higher and at these times lower levels of hydrofluoric acid and sulfuric acid may be present in the outgoing air. The content on these occasions is assessed as not exceeding 1 mg/m^3.
- Process air from the pyrolysis stage of anode production is treated in an afterburning chamber to reduce emissions to the atmosphere.
- The sub-processes in which dusting materials are handled will take place endlessly to avoid the release of particles.

8.12.6 Impact assessment

The zero option means that the area is prepared for the establishment of industries according to the zoning plan. It is not possible to quantify a possible emission to air from the industries that would be

[56] SSAB website. *Environmental report 2021 SSAB Luleå*. Hintended 2022-05-24.
[57]The Swedish Environmental ProtectionAgency's website. *Emissions in numbers - Lulekraft AB.* Retrieved 2022-05.24.
[58]The Swedish Environmental Protection Agency's website. *Calculate the climate impact.* Retrieved 2022-05-23.

established instead of the applied activity at a zero alternative, which means that the assessment is based on non-existent air emissions. Thus, the current situation is the same as the zero option.

Compared to both the current situation and the zero alternative, the activity applied for is estimated to have a *small negative impact* on human health and the environment regarding emissions to air. The air emissions from the activities applied for are not considered to jeopardise the achievement of environmental quality standards or objectives.

In relation to the emissions that occur from, among others, SSAB and Luleå combined heat and power plants, the emissions from the applied operations and the added cumulative effect as a result of the applied activity can be considered negligible.

The applied activities lead to emissions of mainly carbon dioxide and particles, but are assessed, based on planned protective measures, not to prevent the national environmental goals *Limited climate impact, Fresh air, Only natural acidification* and *No eutrophication* from being met. Emissions of hydrogen fluoride are not considered to prevent the national environmental objective *Fresh air* from being met.

Impact of activities on air quality	***Impact of activities on air quality in comparison to zero alternative***
All in all, the activities applied for are expected to have a *small negative consequence* regarding emissions to air in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	All in all, the activity applied for is estimated to have a *small negative consequence* regarding emissions to air in comparison with the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.

8.13 WASTE

8.13.1 Conditions / baseline

The current waste management plan for Luleå municipality was last revised in 2021. The waste management plan constitutes a steering document with the aim of developing waste management and steering towards the international, national and local environmental goals in the long term. The objectives decided locally are as follows:

- Prevention – Waste to be reduced
- Reuse – Reuse will increase
- Recycle – Recycling will increase
- Littering – Conserving natural values
- Spatial planning – Waste management will play an obvious role in community planning
- People in focus – Increase quality and service[59]

Most of the waste generated in the business comes from the process and the purification of the process water and the process air generated in it. The single largest waste fraction consists of sludge from the purification of process water. Dust from the particle separation of the process air will also occur. However, the dust consists of valuable graphite material and will be returned to the process as much as possible. The water generated by the scrubbers that, among other things, treat the ventilation gases from the tanks in which hydrogen fluoride acid and sulphuric acid are stored will be treated in the water treatment plants and thus will not leave the plant as waste. Furthermore, the adsorption

[59] Luleå Municipality. *Waste management plan 2021–2028.*

mass in the PSA plant, in which nitrogen is produced, will need to be changed at regular intervals (approximately once a year to once every three years).

In the graphite treatment plant, process water is produced and treated to remove metals before the water is diverted to the recipient. In the treatment plants, sludge is generated that leaves the plant as waste,

Table 19. Since there will be two different water treatment plants, two different types of sludge will arise. Approximately 9,700 tonnes of sludge from ETP1 is estimated to be generated per year. Some of the sludge is considered to be usable in the cement industry. Approximately 3,700 tonnes of sludge from ETP2 is estimated to be generated per year. The waste is considered to be recyclable in hydrofluoric acid production as a raw material.

If recycling of sludge from ETP1 and ETP2 as described above does not prove possible, the waste will be landfilled. Characterizations of the wastes have been carried out and, due to the leachability of the sulfates, the wastes have been assessed as hazardous waste. This means that the sludge at landfill will be deposited at a facility that is approved for this type of waste. The company today estimates that approximately two transports a day with sludge will take place.

Table 19. In the requested activity, volumes of waste that are currently quantifiable.

Waste type	Waste code	Amount (ton/year)	Final waste management stage / Disposal
Slam ETP1	06 05 02*	9 700	Cement production/landfill
Slam ETP2	06 05 02*	3 700	Hydrofluoric acid production/landfill

Other examples of types of waste linked to the process are:

- Empty sacks containing Talphite-C® (about 8,000 sacks per year)
- Empty sacks containing pitch (about 450 sacks per year)
- Replaced textile filters from particulate filters
- Empty containers containing water treatment chemicals
- Consumables from the workshop
- Laboratory consumables and packaging containing chemical products
- Used personal protective equipment
- Empty packaging containing oils and fats used in maintenance
- Sludge from oil separator emptying

Non-hazardous waste in the form of household waste generated in office premises consists of, for example, office paper, packaging and organic waste from lunchrooms. Household waste is sorted and collected according to local sanitation regulations. Examples of types of hazardous waste that arise in the business but are not linked to the process are sludge from oil separators, batteries and fluorescent lamps.

For handling sulphide soil masses, see section 8.1.

8.13.2 Impact and effect

Waste generated within the planned operations will be sorted at source and household waste will be sorted and collected according to local regulations.

Sludge is the single largest waste fraction. In total, the sludge is estimated to amount to 13,400 tons / year. As far as possible, the sludge will be recycled, but to the extent that this is not possible, the sludge will be landfilled. The environmental and health impact of a landfill depends on its location, the

protective measures being constructed and the characteristics of the landfilled waste. One potential risk with a landfill is that pollutants leak into the surrounding environment. Due to the total waste of the business, a certain negative impact on the environment and human health is estimated to arise[60].

8.13.3 Protection and Mitigation measures

The waste will be transported and disposed of externally by the waste contractor with the required permits.

The company will continuously work to minimize waste and recycle generated waste as far as possible.

8.13.4 Impact assessment

The zero option means that the area is prepared for the establishment of industries according to the zoning plan. It is not possible to quantify the waste that can arise from the industries that would be established instead of the applied activity at a zero alternative, which means that the assessment assumes that the generation of waste is non-existent. Thus, the current situation is the same as the zero option.

Talga will continuously work with waste minimization and the waste generated in the business will be recycled and reused as much as possible. Talga works in accordance with the waste hierarchy to ensure that generated waste is reused and recycled as far as possible before other recovery methods or disposal are used. Since it is currently not ensured that the sludge that arises in the business can be recycled, the impact assessment has been made on the basis that all sludge is deposited, and it is therefore significant amounts that are taken to landfill. Any resulting cases will be stored and handled in such a way that pollution will not reach the environment.

Compared to both the current situation and zero alternatives, the applied activity is estimated to entail a *moderate negative consequence* regarding the aspect of waste with regard to the large amounts of sludge that arises in the business and is to be landfilled.

The planned activities are not considered to prevent the achievement of the *environmental objective Good built environment.*

Project impact	***Project impact in comparison to zero alternative***
All in all, the activities applied for are expected to have a *moderately negative consequence* regarding waste in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	Overall, the activities applied for are expected to have a *moderate negative impact* regarding waste compared to the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.

8.14 NOISE AND VIBRATION

8.14.1 Conditions

In *the Regulation (2004:675)* on environmental noise, there are requirements for mapping, establishing and establishing action programmes that strive to ensure that environmental noise does

[60] The Swedish Environmental Protection Agency's website. *Landfilling of waste*. Retrieved 22-05-24.

not cause harmful effects on human health. Environmental noise refers to noise from roads, railways, airports and industrial activities.

Sound is pressure changes in e.g. air that spreads in the surroundings. The strength of the sound, the sound level, is expressed in several different physical quantities such as sound pressure and sound intensity. Sounds that are not desirable are defined as noise.

To describe the magnitude of sound, the concept of noise level is used, which is measured in decibels (dB). Sound in the frequency range of 20–20000 Hertz (Hz) together with the sound pressure level becomes the sound that our hearing organ can perceive and is referred to as decibel A (dBA).

Sound levels are indicated as either equivalent (LAeq) or maximum instantaneous (LAmax). Equivalent noise level refers to the average sound level over a certain period of time, while the maximum instantaneous noise level is the highest measured sound level during the same time period.

During April 2015, the Swedish Environmental Protection Agency published a guide *"Guidance on industrial and other operational noise",* REPORT 6538. The noise guideline values set out in the new guidance are outdoor guideline values for each area use as equivalent and maximum instantaneous sound levels. For dwellings, the following outdoor guideline values are given for equivalent noise levels from activities:

- 50 dBA, weekdays (Monday-Friday) daytime 6am-6pm.
- 40 dBA, at night from 10 p.m. to 6 a.m.
- 45 dBA, 6-10 p.m. and Saturday-Sunday and public holidays from 6 a.m. to 6 p.m.
- The instantaneous noise level at night should not exceed 55 dBA except occasionally.

For outdoor recreation areas, the following guide values are given for equivalent sound levels from activities:

- 40 dBA, weekdays (Monday-Friday) daytime 6am-6pm.
- 35 dBA, at night from 10 p.m. to 6 a.m.
- 35 dBA, 6-10 p.m. and Saturday-Sunday and public holidays from 6 a.m. to 6 p.m.

During operation, the requested activity will generate noise mainly from machines inside the plant (e.g. compressors, drying machines, the thermal treatment plant and inverters), fans/ventilation units and chimneys, and transport to and from the area.

A noise assessment has been carried out for the installation (Annex A:5). In this, noise from the facility and its impact on the surroundings have been calculated, both in terms of the nearest dwelling and the nearby nature reserve. The investigation has shown that the noise values are well below the Swedish Environmental Protection Agency's guideline values for industrial noise at all times of the day. Even guideline values for maximum noise levels are content by a good margin. Table 20 below sets out the maximum estimated noise levels at the nearest dwellings and in the nature reserve, as well as the guideline values of the Naturvårdsverket.

Table 20. Estimated sound levels for the Ormberget-Hertsölandet nature reserve and the nearest residence.

	Estimated noise level at all times of the day (dB)	**Guideline value at night (22–06) [dBA]**	**Estimated maximum noise level [dB]**	**Guideline value, maximum noise level [dBA]**
Nature reserve Ormberget-Hertsölandet	23	40	44	50
Nearest residence (Hertsön 4:166)	19	35	41	55

The contributing noise from transport to and from the plant has been studied. With the number of additional transports from Talga's operations, the daily equivalent noise level, L Aeq,24H, increases along the least trafficked part of Hertsövägen between Gräsörvägen and Kråkörvägen and past the nature reserve with less than 1 dB, which is estimated to have negligible effects. As the existing traffic flow increases towards Luleå city center, the transports of the business will decrease in percentage terms in relation to other traffic the further from the facility the transports come.

For noise during the construction phase, guideline values in the Swedish Environmental Protection Agency's *general advice on noise from construction sites (NFS 2004: 15)* will be applied, which means that noise from noisy construction work at 07-19, can reach 60 dBA at the nearest residential façade. At other times, only quieter construction work may take place.

In view of the location of the planned activity and the proximity to the Svartön industrial area, cumulative noise has also been investigated for the purpose of this application. The results show that there is no risk of overshooting as a result of cumulative noise at either homes or nature reserves.

In connection with the development of the detailed plan for Luleå Industrial Park, a traffic noise investigation for Hertsövägen was carried out by Norconsult by order of Luleå Municipality. The resultsshowed that an equivalent noise level of 65 dbA will be contained for a majority of the buildings along Hertsövägen, after the Hertsö field, Hertsöheden and Kronanvägen are fully developed. In the detailed plan, the municipality proposes noise-reducing measures. Full expansion is also expected to result in equivalent noise levels of traffic noise of 56 dBA and maximum noise levels of 71 dBA next to the road along the nature reserve Ormberget-Hertsölandet. The traffic increases are estimated in the detailed plan to mean that 35 dBA will be contained 400 meters into the nature reserve instead of 200 meters as at present. According to the detailed plan, protected areas with vegetation will be built, between the industrial area and the nearest residence on Hertsön, as well as between Hert'sisland road and the industrial area, to reduce noise. In the detailed plan, the final assessment is made that the proposalentails an increase in road traffic noise and industrial noise, but that no guideline values are considered to be exceeded.[61]

Vibrations powerful enough to be perceivable at the nearest dwellings will not occur in the applied business either during normal operation or during the construction phase. This aspect will therefore not be further assessed.

8.14.2 Impact and effect

The noise investigation carried out in preparation for this application has shown that the planned operations at the fully developed factory will result in a maximum of 23 dB at the natur reserve and 19 dB at the nearest residence, which is located east of the business. At housing, there are currently no measured levels, which is why it is difficult to make a comparison. However, the planned activity emits noise that is 18 dBA below the guideline values at night, which means that the activity does not give rise to any overruns at night even if the levels were currently tangential to the guideline value of 40 dBA. During the construction phase, the company will apply the Swedish Environmental Protection Agency's general advice on noise from construction sites.

The measured noise level from industries on Svartön amounts to a maximum of 38 dB in previous measurements (see Appendix A:5 Noise investigation for more information). At the same measurement point, the noise level from Talga's operations is calculated at a maximum of 36 dBA when the business is fully developed. The total noise level is estimated at 40 dBA.

As described above, the noise report has shown that the planned activities emit very low noise levels to the surroundings, and guideline values will be contained by a good margin during all hours of the day. The report also shows no risk of exceeding guidelines when assessing cumulative noise. This

[61]Luleå Municipality (2020). *Environmental impact assessment Detailed plan for part of Hertsön 11:1 and others.*

conclusion applies to both residential and the nearby nature reserve. Noise from additional traffic along Hertsöroad as a result of Talga's operations is considered to be negligible and not to have a negative impact on the existing sound environment.

8.14.3 Protective measures

No protective measures are currently deemed necessary.

8.14.4 Impact assessment

The zero option means that the area is prepared for the establishment of industries according to the zoning plan. It is not possible to calculate the noise that may arise from the industries that would be established instead of the applied activity at a zero alternative, which means that the assessment assumes that non-existent noise. Thus, the current situation is the same as the zero option.

The business's contribution to industrial noise is considered to be limited, and guideline values are considered to be contained. The same applies to noise from transport. The guideline values from only the applied activity are considered to be contained with good margins. The area is already currently affected by some traffic and noise from svartön's industrial area, and the grant of the applied activity is thus limited. In the noise investigation carried out, the cumulative noise has been judgedto contain current guideline values. At present, however, surrounding activities have not been determined, which must be assessed as a certain degree of uncertainty. However, the assessment with the information available today is that guideline values will be contained.

In comparison with both the current situation and the zero alternative, the applied activity is estimated to have a *small negative consequence* regarding the aspect of noise, taking into account that the activity causes noise, but guideline values will be contained.

The planned activities are not considered to prevent the achievement of the *environmental objective Good built environment.*

Project's impact on environment due to generated noise	***Project impact due to generated noise in comparison to zero alternative***
All in all, the activity applied for is expected to have a *small negative consequence* regarding noise in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	All in all, the activity applied for is estimated to have a *small negative consequence* in terms of noise in comparison with the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.

8.15 TRANSPORTS

8.15.1 Conditions

8.15.1.1 Traffic regulations in Luleå

Luleå municipality has proposed a new traffic plan that will deepen and concretize the master plan and the traffic strategy guidelines. The plan clarifies, among other things, the values that will be included in the planning and prioritization for all modes of transport and traffic networks:

- Travel and transport must be safe and secure
- Travel and transport must be accessible and equal

- Travel and transport must be sustainable
- Reduce the negative environmental impact of traffic
- Luleå must have good connections with the outside world and be a regional hub for Norrbotten.

Recommended routes to transport dangerous goods are according to the traffic plan E4 and road 97 and via Bodenvägen and Svartöleden to Svartön's industrial area. Dangerous goods can also be transported by rail. It also emerges that the Swedish Transport Administration has investigated a new coastal railway between Luleå and Umeå, norrbottniabanan. For the Port of Luleå, work is underway on the Malmporten project, which means an expansion of the port and improvements to the fairway that allow larger vessels to call at the port.[62]

Furthermore, the County Administrative Board of Norrbotten has decided on local traffic regulations regarding the transport of dangerous goods through central Luleå, which apply from March 15, 2022. The ban clarifies that it is the recommended route for dangerous goods to be used, that is, E4 - Bodenvägen (road 97), Älvsbyvägen (road 94) and Svartöleden.[63]

8.15.1.2 Roads

At present, the planned industrial area is reachedby Hertsövägen or Gräsövägen. Hertsövägen is part of the main road network and Gräsörvägen part of the local network. The bridge over Gräsörsundet can also be used, but it is not open to public traffic and according to the EIA that was developed for the detailed plan, there is a letter of intent between SSAB, LKAB, Luleå harbor and Luleå municipality that enables 10 transits of heavy traffic per day. To the extent possible, existing roads will be used, however, several new roads will need to be built. The main transport route for transport to and from the business is via Hertsövägen north through Luleå to the E4. The exception is transports with dangerous goods that will take place via Gräsörvägen across Svartön to the E4. The transports with dangerous goods will go on the roads recommended by Luleå municipality. The main possible transport routes are shown in Figure 25. [64]

Before the production buildings are erected, new roads will be built for access to the plant area and enable transport within the area.

8.15.1.3 Luleå Industrial park

Two traffic studies have been commissioned by the municipality, in connection with the detailed plan being developed forHert'sisland field for the expansion of the new industrial area. In one of these, the forecast is that the total car traffic flow to and from the area is estimated to be about 1,800 vehicles per day, of which about 150 heavy vehicles per day (8%). The result of the investigations is that the alternative Hertsövägen is recommended as the main route for transport to and from the industrial area. Road 97 (Bodenvägen) is recommended as a road for dangerous goods in the direction of the E4. Luleå municipality will carry out a strengthening of Hertsövägen between Avaviksvägen and Gräsörvägen in preparation for the exploitation of the Hertsöfältet.

8.15.1.4 External transports

All transports to and from the planned facility will be by truck. The planned business's incoming shipments mainly include deliveries of graphite materials, fuels (LPG and diesel) and process chemicals, including hydrofluoric acid. Graphite concentrate will be transported from the mines in Vittangi, where the Company's extraction of the raw material will take place. The distance between

[62]Luleå municipality's website. *Proposal for a new traffic plan.* Retrieved 2022-05-16.
[63] Luleå kommuns webbplats. *Transport av farligt gods genom centrum.* Hämtad 2022-05-17.
[64] Luleå Municipality (2020). *Environmental impact assessment for detailed plan for part of Hertsön 11:1 et al. Hertsö field.*

the applied business and the mine is about 330 kilometers. About 19 trucks of graphite concentrate per day are expected to arrive at the planned facility.

Several transport options for the graphite material from the Nunaasvaara Södra enrichment plant have been studied, and trucks have proven to be the most efficient mode of transport. Rail transport has also been considered, either for parts of the route or for the entire route. In order to be able to use rail for the entire transport route, new railways need to be built, and this has been judged to be too costly and time-consuming. Transporting the goods partly by rail is possible, but means that transshipments must take place from rail to truck, which would also entail very high costs.

A large proportion of other incoming transports consist of the delivery of the chemical products used in production. These transports are estimated to amount to approximately 19 per week, of which 11 of these consist of dangerous goods. The number of shipments of hydrofluoric acid and LPG amounts to 2-3 and two per week, respectively.

The hydrofluoric acid will arrive via ship at either Luleå harbor or Piteå harbor in ISO containers. The acid will then be transported by truck to the planned facility. In the event that Piteå harbor is used, the acid will be transported to Luleå via the E4. Regardless of the choice of port,the transport to the facility will take place via the recommended dangerous goods route at Svartön's industrial area and the bridge over Gräsörsundet to the Company's business area.

The planned business's outbound transports will mainly consist of produced product and are estimated to amount to approximately 19 transports per week. The manufactured product, Talnode-C, will leave the plant in a truck, and either continue to be transported by truck or boat container from Piteå harbor. Outbound shipments will also consist of waste from the process. The waste will be transported away from the facility by the contractor with the required permits and disposed of by recipients with the required permits. The number of waste shipments is estimated to be approximately 9 per week.

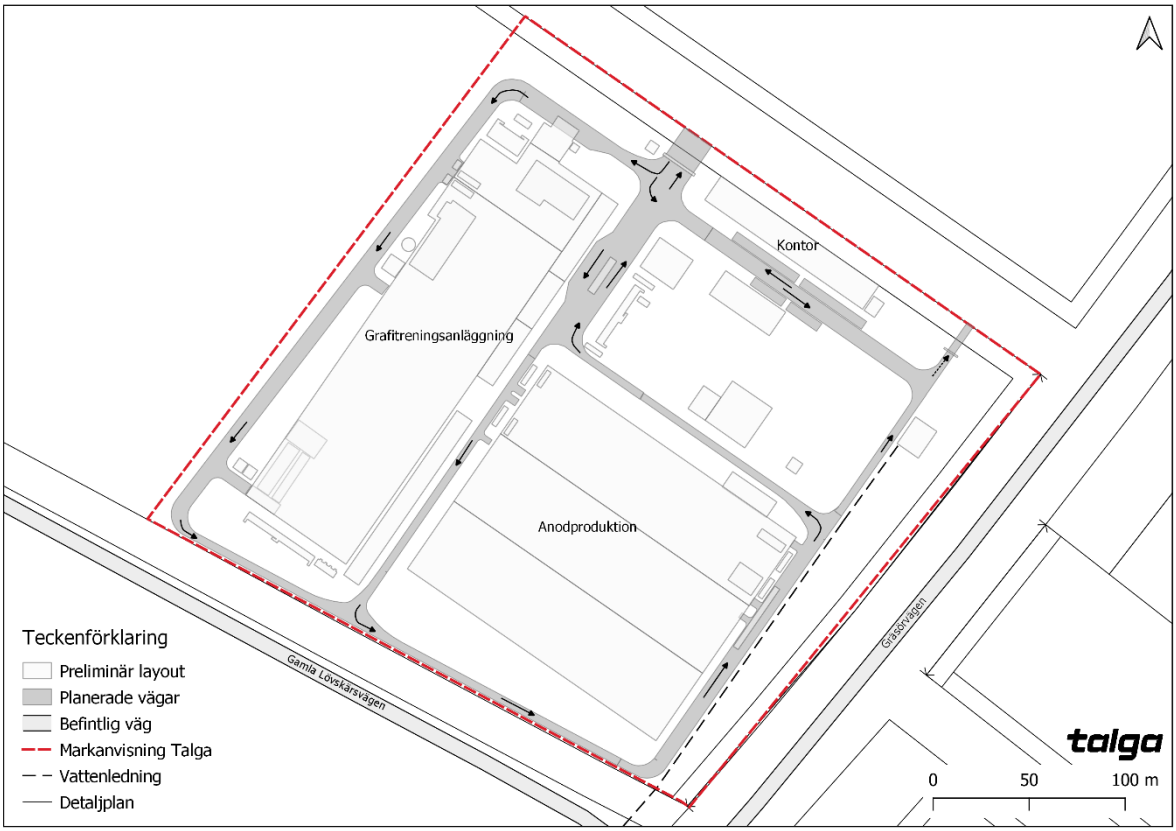
In total, approximately 50 heavy transports and approximately 40 heavy outbound transports are estimated to take place every week at maximum production according to the application. The daily average traffic is estimated to amount to approximately 13 heavy transports per day (corresponding to 26 vehicle movements). The number of passenger car transports is estimated to be approximately 100 per day (corresponding to 200 vehicle movements).

Transports to and from the facility will mainly take place during the day, at 06.00-22.00, but in some cases transports may occur at night. Delivery of hydrofluoric acid and LPG is only daytime.

Figure 26. Transport routes to and from the facility.

8.15.1.5 Interna transports

The main entrance of the facility, which is equipped with a boom and guard, will be located in the northern part of the facility (numbers 17 and 43 in Figure 2 in section 3.3). The main route for transportation through this will be between the graphite treatment plant and anode production. Internal transport flow is shown in Figur 27. In addition to this, there are roads mainly along the outer edge of the plant and in the northeastern part of the facility, where, among other things, a fire water tank, electrical central, transformer, LPG tank and lab are located. In this area, nitrogen production also takes place. In addition, an additional entrance for emergency use will be located in the northeast corner of the facility.



Figur 27. Översikt internt transportflöde.

8.15.1.6 Traffic measurements

The closest traffic measurement carried out by the Swedish Transport Administration on the road that is planned to be used by the applied business is registered on road 97 (Bodenvägen) about 1.3 km southeast of the exit to the E4. The latest survey registered on the Swedish Transport Administration's website is from 2018. In addition to the total traffic (average annual daily traffic, also called AADT), the proportion of heavy traffic was also measured. According to the measurements, 9,630 and 9,440 vehicle movements, of which 980 and 790 are heavy traffic, respectively, go on Route 97 in a northwesterly and southeasterly direction for one day. This means that heavy goods vehicles to and from the planned operations at maximum production would represent 1,3 % and 1,7 % respectively of the total number of transports on road 97 at the time of crossing the measuring point. If passenger car transport is also included in the calculations, this means that the transports to and from the requested activity would represent about 1.2% of the total number of transports by road 97. The annual average daily traffic at the measuring points and the transports of the business are presented in [65]**Error! Not a valid bookmark self-reference.**.

Table 21. Annual average daily traffic according to the Swedish Transport Administration's measurement in 2018 and the share of traffic that transport as a result of Talga's applied operations entails in the measurement points.

Measuring point	Total number of vehicle movements (of which heavy traffic)	Vehicle movements applied for, heavy + passenger cars (share of total AADT)
Väg 97 (Bodenvägen)	19 070 (1770)	26 + 200 (1,2 %)

[65] The Swedish Transport Administration's website. *Traffic information*. Retrieved 2022-05-18.

A traffic investigation has also been carried out for Hertsövägen[66] in 2019. Here, the traffic flow for the road sections between Kråkörvägen and Gräsörvägen is estimated to be low, up to about 1,300 vehicles / day with 5% heavy traffic. This means that the number of heavy transports to and from the planned operations would constitute about 30% of the heavy traffic on Hertsövägen. However, this is a conservative calculation, as the transport of dangerous goods will go over Svartön and Gräsörvägen. If passenger car transports are included, this means that the transports to and from the applied for operations would represent approximately 13% of the total number of transports on Hertsövägen.

8.15.2 Impact and effect

Transport facilities to the planned facility have been a decisive factor in Talga's location investigation. The proximity to the mines in Vittangi, from which Talga plans to extract graphite ore for battery anodes, makes the location suitable both from a cost perspective as well as from an energy and climateperspective.

Transport causes air emissions mainly in the form of carbon dioxide, nitrogen oxides, sulphur dioxide and particulate matter. Furthermore, noise is generated around the transport routes, as described in section 8.14.

VOSS is a tool based on SMHI's model system SIMAIR path for preliminary assessment of air quality for particulate matter (PM_{10}) and nitrogen dioxide (NO_2) intended for use by municipalities. The tool has higher uncertainty than more advanced models, but in the present case is considered sufficient for an assessment of the transports from the impact of the applied activity on the air recipient.

The parameters included in VOSS are annual traffic (AADT), street room width, house height, sanding or not, signposted speed on the road and proportion of heavy traffic. In the simulation, the street room width has been set to 40 meters (roadside to roadside), the house height to zero meters as no buildings are on the current stretch and the road is only surrounded by thin vegetation. Signposted speed is set at 90 kilometers per hour. No sanding for anti-slip during the winter is assumed to be carried out on the road as salting is considered a much more likely option on the current road.

Calculations in VOSS have been made on road 97 about 1.3 kilometers from the connection to the E4, as this is the only point for which data is available from the Swedish Transport Administration. Calculations have been made for the current situation, i.e. according to the Swedish Transport Administration's measurements in 2018, and for the applied activities, i.e. the number of additional vehicle movements as a result of the applied activity added to the Swedish Transport Administration's measurements. Calculated concentrations in the air receiver in these two scenarios are shown in Table 22. As can be seen from the table, the EQS and environmental targets for both nitrogen dioxide and PM_{10} are contained regardless of the type of mean for both scenarios. The total transport of the business at maximum production is estimated to represent a very small part, about 1.2%, of the total annual average traffic on the road.

[66] Luleå Municipality (2019). *Traffic investigation ng Hertsöfältet*, Norconsult AB.

Table 22. In VOSS calculated ambient levels for the current situation and the activity applied for as well as environmental quality standards and environmental goals (µg/m^3).

Parameter		Current situation	Project	EQS	Environmental objectives
NO_2	Annual average value	<15	<15	40	20 µg/m^3
	Daily average value	<20	<20	60	
	Hourly average value	<30	<30	90	60 µg/m^3
PM_{10}	Annual average value	<12	<12	40	15 µg/m^3
	Daily average value	15-21	15-21	50	30 µg/m^3

As described above, the calculations in VOSS have been carried out on route 97, as this is the only available measurement pointone. However, Hertsövägen is considered to be the point where an increased proportion of transport will be most noticeable, as the road is currently not trafficked to any great extent. In talks with Luleå municipality, it has emerged that traffic measurements on Hertsövägen are planned, possibly in 2022, to obtain a result that reflects the traffic situation before the planned establishment of the industrial area. However, Luleå municipality has taken the higher traffic load into account in the safety work that has begun. The fact that Hertsövägen will be more busy is not expected to make it more difficult to get to the nature reserve Ormberget-Hertsölandet or the homes located east of the business. Although the number of transport movements will increase along the way, no widening or expansion of the road is planned. Several residential areas will be passed by the business's transports.

The business will use the roads that Luleå municipality has recommended for the transport of dangerous goods. For further information regarding the transport of dangerous goods, see sections 8.8 and 8.17.

During the construction phase, the entry and exit of masses to/from Talga's property is estimated to generate approximately 11,000 transports (22,000 vehicle movements) in total (calculated based on 32 tons per truck and that the proportion of return loads is 25%) over approximately 9-12 months, which corresponds to approximately 40 transports per day during that period. Excavation and filling work is expected to last between April and December in 2023, provided that construction can begin until then. However, this timetable is indicative.

8.15.3 Protection and mitigation measures

Talga will continuously work with optimization of transports to minimize environmental impact.

No protective measures are deemed to be relevant.

8.15.4 The impact assessment

The zero option means that the area is prepared for the establishment of industries according to the zoning plan. It is not possible to quantify the number of transports that may arise from the industries that would be established instead of the requested business at a zero alternative, which means that the assessment assumes that the transports are as at present. Thus, the zero option is the same as the current situation.

The requested operations are estimated to result in emissions in the form of mainly carbon dioxide, nitrogen oxides and particles, as well as slightly higher noise levels compared to the current situation due to the transports that follow from the operations.

The number of vehicle movements will amount to approximately 26 heavy transports per day and approximately 100 personnel transports. At Bodenvägen, where the Swedish Transport Administration has made measurements, the business's total transports at maximum production constitute a very small part, about 1.2% of the total annual average traffic on the road. The business's heavy transports account for about 1.5% of the heavy transports that pass Bodenvägen. The business's total transports thus constitute a very small part of the total annual average traffic on Bodenroad.

The contribution of the business to transport on Hertsövägen is approximately 13% compared to the traffic situation in 2019, according to the traffic investigation carried out prior to the development of the zoning plan. However, the proportion is expected to be lower when the industrial area is built, taking into account the analysis made in the traffic investigation. For the influence of noise, see section 8.14.

The contribution to the transports on Hertsövägen is thus considered to be noticeable, but the total impact from the Company's transports in a larger area is considered to be limited, but taking into account the calculations from Bodenvägen. Thus, the contribution of tallow to the cumulative environmental effect and disturbance arising from traffic in the area is also considered to be a small proportion.

The calculations made in VOSS show that the total concentrations of nitrogen dioxide and PM_{10} in the environment are not significantly affected by the change caused by the applied activity compared to the current situation. Cumulative effects in the environment are thus not considered to be affected by the applied activity. The calculations also show that the activity applied for will not lead to an MKN or environmental targets for nitrogen dioxide and PM_{10} being exceeded.

The business will use recommended routes for dangerous goods and constantly work to streamline their transports.

In comparison with both the current situation and the zero alternative, the applied activity is estimated to have a *small negative consequence*, taking into account that the business's contribution to the total number of transports is considered to be limited.

In the light of the above, the activity applied for is not considered to prevent the possibility of achieving the national environmental quality objectives B*limited climate impact, Fresh air, Only natural acidification* and *Good built environment* regarding transport.

Project's impact due to transport	***Project's impact due to transport in comparison to zero alternative***
All in all, the applied for business is expected to have a *small negative consequence* regarding transport in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	All in all, the applied activity is expected to have a *small negative consequence* regarding transport in comparison with the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.

8.16 EXTERNAL INCIDENTS

8.16.1 Conditions for future climate in Norrbotten

Future climate change may increase the risk of natural disasters. Already in today's climate, businesses can be affected by weather events such as torrential rain, drought or heat wave. This can lead to knock-on effects such as erosion, forest fire, flooding, etc. Climate change may cause these weather events to increase both in strength and frequency, and thus also the consequences. For this reason, it is important that businesses review their preparedness to meet these possible effects.[67]

Luleå municipality has developed guidelines regarding climate adaptation that will be applied in planning and investment. It shows that sharp water level variations will continue and affect activities close to water. The climate of the future in Luleå is expected to lead to higher temperatures and more precipitation. A reference is made to SMHI, which assesses that it is reasonable to assume a rise in sea level by about 1 meter. However, land uplift is expected to compensate for this, especially in the northern parts of Sweden, and the net effect will therefore be close to zero.

During the period 2069-2099, according to the data in the guidelines, the annual average temperature will increase to up to 7 degrees compared to the normal average of 1.3 degrees for the period 1961-1990. It is mainly the winter that will be affected and the period of snow is expected to be just over a month shorter. According to estimates, annual average rainfall increases by about 30%. The risk of extreme flows in the rivers is not expected to increase, however, the total flow during the year will increase due to more rain and there is a risk of high water levels in the autumn as a result of the. [68]

8.16.2 Conditions in the immediate area of the planned activities

The applied activity is planned to be built on the coast where the temperature in Norrbotten is expected to increase by up to about 7 °C. Temperature on the east coast in the northern parts of Sweden generally has a highly calculated increase.

According to SMHI, the annual average burden is estimated to increase by 7–8 mm/month or 11–12 mm/month.[69]

Luleå municipality has described how operations should take into account any increase in water levels at the facility. Protective measures have been taken in the design of the facility, see more under section 8.17.3.

8.16.3 Impact and effect

A review of the impact of natural environmental factors on the business has been carried out as part of the assessment of the risks at the facility. These environmental factors can be considered as factors that need to be taken into account when determining the assessment of the influence of external events. They are considered to pose an increasing risk as a result of the ongoing climate change that is taking place. The following review has been made on the basis of the methodology recommended by MSB.[70]

[67] Environmental cooperation Sweden and the County Administrative Boards. *Climate adaptation in the testing and supervision of environmentally hazardous activities and contaminated sites.*
[68] Luleå kommun (2015). *Riktlinjer för klimatanpassning.*
[69]SMHI's website. *Simple climate scenario service*. Retrieved 2022-02-07.
[70] Myndigheten för samhällsskydd och beredskap (2017). *Riskbedömning av naturliga omgivningsfaktorer*.

8.16.3.1 High water levels (flooding and torrential rain)

Taking into account climate change, it is reasonable to expect that torrential rains will occur more frequently and with increased intensity. The largest daily rainfall measured so far in Norrbotten was in Fagerheden, south of Luleå, with 198 mm/day.

The planned operations will have large hardened surfaces at which water can accumulate. The stormwater pipes flow into the sea, which means that the water can be led away efficiently.

In the unlikely event that larger amounts of water enter the plant, this could lead to equipment and materials being affected. However, a flood of the operating area is not expected to risk, for example, tanks for hydrofluoric acid or sulfuric acid easing and floating up, as these will be located indoors and firmly anchored in foundations. The liquid level in the tanks will be significantly above any flood levels.

Luleå municipality is responsible for stormwater management in the area. A possible flooding of the Talga area is not considered to affect the likelihood of an accident that could cause significant harm to people or the environment occurring.

Luleå municipality's guidelines state that buildings and infrastructure must be flood-proofed up to +2.5 m in RH200. The land for the planned facility is higher than this according to the detailed plan for the area. The facility will be located about 500 meters from the sea. As the business area develops, the groundwater level is expected to decrease from today's levels when ditching and drainage will need to take place, and a certain increase in the soil level will take place.

Based on SMHI's future scenarios for mean water levels in Luleå municipality, the average water level will increase less than 0.1 m by the year 2100. This is because land uplift in the area roughly corresponds to sea level rise until the year 2100. However, it can be noted that the ground level within Talga's area is just over four meters above normal water level, which means that Talga has robust protection against rising sea levels. At Strömören, the water level has been measured since 2016. The highest water level measured since then is 130 cm in February 2020 and the lowest -106 cm in April 2019. Over the past five years, the Mediterranean water level has varied between 2–26 cm[71].

8.16.3.2 Collapse, landslides and erosion

The risk of collapse or landslides causing significant damage to the plant is assessed on the basis of existing conditions as very low. However, the risk cannot be excluded and erosion could have knock-on effects which, in several stages, could lead to serious accidents, taking this into account as an initiating event to accidents which may cause significant damage.

8.16.3.3 Lightning and thunder

The plant is located in an area that is not particularly exposed to lightning strikes and this is not considered to be a significant cause of a serious accident or impact on the environment. A lightning strike could lead to a loss of power, but this can be managed through the backup power system available at the plant. The plant will be equipped with lightning conductors on vital plant parts.

8.16.3.4 High wind speeds/storm

According to SMHI, it is rare for the average wind speed to reach full storm strength at Norrbotten's coastal stations. The highest village wind measured in Norrbotten since measurements began is 26 m/s and 32 m/s in village wind speed. Norrbotten, like other northern coastal landscapes, is less exposed to severe storms[72].

[71]Luleå Municipality (2015). *Guidelines for adaptation to climate change.*
[72] SMHI's website. *The climate in Sweden's landscape – Norrbotten's climate.*

Very strong winds can cause plates, ceiling sequences and lighting fixtures that are anchored to wear loose, which can cause material damage or personal injury. Strong winds are mainly expected to have economic consequences for Talga. High wind speeds are considered to be able to affect safety at the plant to some extent with regard to the handling of hazardous substances. Hydrofluoric acid is stored in a double-jacketed tank in a separate building and it is considered unlikely that high wind speeds would lead to damage causing an emission. However, high wind speeds could affect diesel or LPG tanks and, in the worst case, cause an emission, as further analysed in the risk assessment carried out for the plant.

8.16.3.5 Solar storm

Solar storms can primarily affect sensitive electronic equipment that is knocked out. Furthermore, this type of interference could affect control systems and alarm functions. No systems at the facility have been identified as particularly sensitive to solar storms.

8.16.3.6 Blizzard, snowdrifts and icing

The highest snow depth measured in Norrbotten was 162 cm in Övertorneå, north of Luleå, in 1974. Large snow depths can affect the ability to reach the factory for transport and personnel. In addition, snowdrifts can cause barriers such as access roads to be completely or partially blocked. The consequences of large amounts of snow are expected to be mainly economic.

Heavy snowstorms and icing can, among other things, affect transport and cause accidents that directly or indirectly affect the plant. Icing higher up on buildings and structures can lead to icicles or ice blocks falling down and damaging process parts. This can pose a risk if equipment for storing hazardous substances is damaged. However, this risk is not considered to be relevant for any part of hydrofluoric acid or sulfuric acid management as they are completely indoors. For the LPG tanks, the risk of icing will be continuously monitored.

8.16.3.7 Fog and humid environment

Fog and humid environment can increase the risk of corrosion, which in turn can lead to, for example, electrical faults. Heavy fog at the same time as gas emissions can cause the emitted gas to behave differently than expected, for example by remaining at ground level longer than expected.

8.16.3.8 Forest fire or grass fire

A forest fire in the forest areas located adjacent to Talga's planned businessarea could affect operations with heavy fire smoke.

8.16.3.9 Extreme temperatures

The highest recorded temperature in Norrbotten is 36.9 °C in Harads (northwest of Luleå) in 1945. Temperatures such as this do not normally cause problems to any great extent. Very high ambient temperatures can also lead to increased wear and tear on equipment, which leads to higher maintenance costs. The consequences of high temperatures are expected to be mainly economic. The area is very rarely exposed to this type of extreme heat, which is why a heat wave is not considered to pose a significant risk of possible negative impact.

The lowest recorded temperature is -47.1 °C, which was measured in Björfors northeast of Luleå in 1956. Very low temperatures can, among other things, entail an increased risk of handling errors. However, extreme temperatures are not expected to increase the risk of an accident occurring. In general, the world is moving towards a warmer climate, and Luleå municipality estimates that winters

will be milder. Konsekvenserna till följd av extremt låga temperaturer samt stora mängder snö bedöms i huvudsak bli ekonomiska.

8.16.3.10 Earthquake

There is seismic activity in the area around Luleå. The occurrence of powerful earthquakes in Sweden, of such magnitude that they could compromise the safety of the facility, is not documented in historical times. Based on historical data and with knowledge of the structure of the bedrock in Sweden, the risk contribution is therefore dominated by local quakes within a radius of 20 km from the plant. In May 2020, for example, an earthquake measured 4.9 on the richter scale occurred in Kiruna. Earthquake could lead to extensive damage to equipment, and an accident scenario with the release of hazardous substance associated with the movement of wires or wiring supports. All wiring and wiring supports at the facility will therefore be designed to be able to withstand the influence of seismic activity.

8.16.4 Protection and mitigation measures

Several protective measures related to, among other things, fire, gas detection, firefighting, extinguishing water management and handling of hazardous substances such as hydrofluoric acid and sulfuric acid have been taken into account when designing the facility. Safeguards are further described in section 8.17.

8.16.5 Impact assessment

The risk of this type of external event is the same at present as in the zero option, and independent applied for activities.

As the business is to be designed from scratch, there are today good opportunities to secure the facility against external events as a result of climate change already at an early stage. Continued work to adapt the business to climate change will continue during operation with regard to new knowledge and research on climate change.

The climate in Luleå is expected to produce more precipitation and higher heat in the long run, but for such a long time that the business will have the opportunity to take any protective measures. The impact of any external events in the business area is expected to be primarily of an economic nature, as the operation of certain operations and the logistics opportunities in the area may be made more difficult or stopped.

Taking into account the protective measures to be taken regarding chemicals and water management, the external events aspect is considered to have *insignificant consequences* for the activity applied for, both in comparison with the current situation and the zero alternative.

Project's impact	***Project's impact in comparison to zero alternative***
All in all, the activity applied for is considered to have an *insignificant consequence* regarding the aspect of external events in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	All in all, the activity applied for is considered to have an *insignificant consequence* regarding the aspect of external events in comparison with the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.

8.17 RISK AND SAFETY

8.17.1 Conditions

Due to the handling of hydrofluoric acid, the activities are covered by the provisions of the *Act (1999: 381) on measures to prevent and limit the consequences of serious chemical accidents and* belong to the higher level of requirementsn. Other chemicals covered by the Seveso legislation that will be handled within the business are LPG.

A safety report and associated risk assessment have been produced for the establishment, which can be found in Annex D to the application.

8.17.1.1 Dangerous substances

At the plant, a variety of substances classified as hazardous will be handled, including hydrofluoric acid (70%), sulfuric acid (98%), sodium hydroxide, ferrous sulphate diesel and LPG. However, only hydrofluoric acid and LPG possess such properties, and which will be handled in such quantities, that they are subject to the requirements of the Seveso legislation. The tables below show the maximum quantities of hydrofluoric acid and liquefied petroleum gas at the plant.

Table 23. Hazardous substances, health hazards. Quantities expressed in tonnes.

Substance	Classification	Seveso category	Maximum occuring quantities	Lower level of requirements	Quota	Higher level of requirements	Quota
Fluorvätesyra	H300 Acute Tox 2 H310 Acute Tox 1 H330 Acute tox 2 H314, Skin Corr. 1A H318 Eye Dam. 1	H1, akut toxisk, alla exponerings vägar	62	5	12,4	20	3,12

Tabell 24. Farliga ämnen, fysikaliska faror. Mängder angivna i ton.

Substance	Classification	Seveso category	Maximum occuring quantities	Lower level of requirements	Quota	Higher level of requirements	Quota
Gasol	H220, Flam. Gas 1	Del 2, p18	10	50	0,2	200	0,05

Hydrofluoric acid (CAS No 7664-39-3) is hydrogen fluoride dissolved in water. The acid is heavily corrosive to some materials, including glass. The acid is also toxic and can lead to serious injuries and death when inhaled by vapors or by skin contact. The hydrofluoric acid that the Company will handle at the plant has a concentration of 70%, and is a colorless liquid with a pungent odor. The melting point is -69 °C and the boiling point is about 66 °C. The substance is stable under normal conditions and is not flammable or combustible.

In the event of a spill of 70 % hydrofluoric acid, a puddle of liquid may form from which evaporation occurs as a result of a toxic cloud of vapour being able to drift away and affect the surroundings. Direct contact with hydrofluoric acid causes severe corrosive damage and possible death if the acid is absorbed through the skin.

LPG is a colorless gas mixture consisting of light hydrocarbons, mainly butane and propane. The substance is highly flammable and explosive even at low levels. LPG evaporates very quickly and the

gas, due to being heavier than ambient air, can spread to spaces at lower altitudes. LPG can be dangerous if inhaled and in the worst case can cause suffocation as the gas can displace the air's oxygen. When exposed to liquid or flowing gas, there is also a risk of frostbite.

LPG and diesel are planned to be handled in the southern part of the plant (anode plant) and hydrofluoric acid in the northeastern part of the plant (graphite treatment plant).

The safety report attached to the application describes the hazardous substances in more detail in terms of physical, chemical and toxicological properties. The description contains the hazards of the substances to human health and the environment.

8.17.1.2 Environmental factors, other activities

The company has studied the environmental factors that could lead to a serious chemical accident at the plant. The safety report describes the environmental factors in more detail, both external activities and natural environmental factors.

Figure 5 illustrates the intended location, the nearest residential area and schools, the nearest Seveso operations and some other activities. The factors in the vicinity of the planned facility that could have a possible negative impact on the safety of the facility are primarily transport and operations at the nearby Seveso operations.

In order for an event outside the Company's area to lead to or aggravate a serious chemical accident within the business, a very specific scenario is required where an event entails damage to storage tanks or pipelines for hydrofluoric acid or LPG. For this to happen, severe damage or a very large fire reaching the business area is required, and the Company has not identified any activities or activities in the facility's immediate area that could result in this. The risk assessment (Appendix D:1) shows which accident scenarios at surrounding Seveso operations provide the greatest impact distance, and here it has been assessed that Talga's plant will be located beyond these. This means that there are no hazardous activities in the vicinity that could significantly affect the risk of serious chemical accidents at Talga's operations.

The following describes the surrounding activities.

Seveso facilities operating in the area

Within the Svartön industrial area, there are four operations that are subject to the higher level of requirements of the Seveso legislation. These consist of SSAB EMEA AB, Linde Gas AB, LKAB and St1 Sverige AB. Location is shown in Figure Figure 5 above. Other Seveso operations within Luleå municipality consist of quarries and are located at a longer distance from the planned facility than these. The information below about nearby Seveso operations is taken from Luleå municipality's website.

SSAB EMEA AB (about 2.7 km from the applied business) produces high-strength and toughened steel, and has a coke oven, blast furnace and steel mill in Luleå, where steel slabs are produced for further processing. In manufacturing, various gases are handled, such as LPG and process gases, as well as chemical substances such as benzene and coal tar that can affect people and the environment in the event of a serious accident. In general, the risks of serious damage to the environment are assessed as small. However, in certain accident scenarios, local residents may be significantly affected, for example in the event of a carbon monoxide emission. Another risk identified is cistern explosion (BLEVE), as the immediate surroundings may be exposed to high thermal radiation for a shorter period of time. The accident scenario that gives the greatest consequence distance is if the blast furnace's fire gas clock releases the entire contents instantaneously. If the gas emission does not ignite, it can spread about 1.1 km. Talga's plant will be located beyond this distance.

Linde Gas AB (about 3 km from the applied business) operates an air gas factory adjacent to SSAB in Luleå. The business includes the production, storage and distribution of oxygen, nitrogen and argon. The risks at the plant are mainly associated with the storage of liquefied oxygen. If a large discharge of liquefied oxygen were to occur, a gas cloud would form, which will spread after the ground, forming heavy fog and an increased fire risk. There is also a risk of oxygen explosion, which has devastating consequences, but mainly locally.

LKAB (about 3 km from the planned facility) conducts depot operations with storage and handling of fuel oil and diesel at Uddebo oil port on Svartön in Luleå. The products are unloaded by ship and stored in cisterns above ground. Loading is done by filling to either a railway wagon or a tanker truck. Fuel oil and diesel are classified as flammable and hazardous to the environment. The business is associated with environmental risks in the event of any spillage or overfilling of the cistern, as well as fire risks that may arise from leakage of the products and ignition. The scenario that has the greatest consequences for the surroundings is a ignited leak that leads to tank fire, with fire smoke and discharge of extinguishing water as a result, but the consequences are still to be considered local.

St1 Sverige AB (about 3 km from the planned facility) also conducts depot operations where petroleum products (mainly gasoline, aviation fuel and fuel oil) are unloaded, stored, and loaded before delivery to the end customer by tanker truck. The business is associated with environmental risks in the event of any spillage or overfilling of the cistern, as well as fire risks that may arise from leakage of the products and ignition. The risk of spreading liquid products outside the industrial area has been assessed as very small. In the event of a fire, however, a strong smoke development occurs that may affect surrounding homes.

It is mainly fires at the above facilities that could affect the planned operations, but as the distance to these is large, an event at nearby Seveso facilities is not considered to be able to trigger or contribute to the occurrence of serious chemical accidents at the planned facility.

Other facilities and activities

The industrial area Svartön south of the plant is mainly dominated by SSAB's operations and the Port of Luleå, but there is also energy production (combined heat and power plant adjacent to SSAB) and waste management.

The nearest recommended route for dangerous goods is currently located in svartön's industrial area at a distance of about 2 km from the planned facility. When the Hertsö field is established, transport to the area will also go along Hertsövägen, at a distance of 500 meters from the facility, and along Gräsörvägen, which is adjacent to the facility.

The Port of Luleå currently conducts operations on Svartön with, among other things, handling of goods from the mining and steel industry, cement, handling of liquid fuels and tugboat and icebreaker operations. Port operations are conducted at a distance of 2.6 km, southwest of the planned operating area. The Port of Luleå has been granted a permit to expand its operations on Svartön, Project Malmporten, east of existing port operations. The planned port area will be located approximately 1.5 km south of Talga's operations.

Luleå Airport, the largest airport in northern Sweden, is located about 7.4 kilometers south of the facility. The planned facility is not adjacent to the entry and exit route.

The rescue service's training center and fire drill site are located about 250 meters east of the planned area of operation.

SWERIM AB is a company that conducts research and development in the metal industry in Svartöstaden about 3.7 km west of the planned business area. The business handles up to 13 tonnes of LPG in the cistern in its area of operation.

Hybrit Development AB (Hybrit) has built a pilot/research facility in the industrial area on Svartön with hydrogen-based direct reduction of iron ore pellets. This facility includes an underground hydrogen storage facility being built in Svartöberget in Luleå on LKAB's land near SSAB's steel mill, about 4.5 km west of Talga's planned facility.

Natural environmental factors

Natural environmental factors are reported in the safety report and in section 8.16 above.

The natural environmental factors that the company has identified as factors that could affect the risk picture at the plant are high water levels, collapse, landslides and erosion, high wind forces, blizzard, snowdrifts and icing, and seismic activity.

Other natural environmental factors such as high water levels (flooding and torrential rain), thunderstorms, high winds (storms), solar storms, fog and humid environment, icing, forest fires or grass fires and extreme temperatures are not considered in the risk assessment to be able to contribute significantly to the occurrence of a serious chemical accident at the plant.

The impact on Talga's operations is further described in section 8.17.2.88.17.2.8

8.17.2 Impact and effect

8.17.2.1 Introduction

A risk assessment has been prepared as a basis for this EIA, as well as as a basis for the safety report that has been produced in accordance with the Seveso legislation. The purpose of the risk assessment has been to identify, analyze and evaluate the risks that are considered to be likely to cause harm to human health or the environment. This is to ensure that all risks that are deemed to cause significant harm to human life and health or to the environment are identified, but also that the focus is on both the description and assessment on the risks that are significant and relevant. The risk assessment and the safety report are set out in Annex D to the application .

The risk identification has been done based on a number of root causes; drift-related causes, external causes, cumulative effects, natural environmental factors and other causes. The risks were initially identified and analysed through a serious risk analysis. Inorder to ensure that any impact on the environment, nearby processes or activities is adequately managed, quantitative assessments of the risk associated with the planned installation and the transports (follow-on activities) to the installation have been established. Finally, accident butterfly methodology was used to ensure that barriers imposed (risk mitigation measures) can be considered satisfactory and robust.

8.17.2.2 Identified risk scenarios

A number of scenarios for a major chemical accident at the Talga plant have been identified. These include:

- Collision with hydrofluoric acid tanker truck in the area of operation, damage to tank and leakage of an outdoor tanker tank with the departure of toxic vapor to air, with impact outside the operating area.
- Leakage of hydrofluoric acid when unloading from tanker to storage tank, from hose, hose fitting, flange or from the connection to the pump, leakage in the enclosed unloading compartment, the leak ends up in embankment, toxic steam is kept within the building.
- Overfilling of storage tank for hydrofluoric acid when unloading with leakage from the tank ventilation, the leak ends up in the tank embankment indoors, toxic steam is kept within the building.

- Storage tank failure caused by, for example, defects in manufacturing, external influences or overloads during pipe connection, leakage of the entire amount of storage within indoor embankment, toxic steam is kept within the building.
- Leakage of hydrofluoric acid when transferred from storage tank to dilution tank due to pump or pipe leakage. The hydrofluoric acid ends up in the production building, toxic steam is kept within the production building.
- Scrubber failure due to loss of process water, discharge from scrubber ventilation when unloading in storage tank. The discharge occurs at high altitudes and the concentrations are assessed to be diluted to harmless levels before reaching ground level or areas outside the facility.
- Improper unloading of hydrofluoric acid, replenishment occurs in sulfuric acid tank with exothermic reaction (sulfuric acid and water content in hydrofluoric acid) and discharge of water with hydrofluoric acid through the sulfuric acid scrubber.
- Emission of hydrogen fluoride through ventilation systems, prompted by scenario 2-5 where hydrofluoric acid is released into the building, departure of toxic steam into air diluted by the ventilation system in the building and discharged controlled through the ventilation pipe at a height of 24 meters.
- LPG tank failure due to defects in manufacturing, external influences, overload at pipe connection, handling errors or fire in the environment, large emissions with or without ignition with impact outside the business area.
- Diesel tank failure due to defect in manufacturing, external influences, overload during pipe connection, handling error or fire in the environment, large emission with or without ignition. Impact in the field of activity.

Most of the scenarios involve a release of hydrofluoric acid inside the building. An indoor discharge will be captured by the embankment system and led to the neutralization tank in order to be handled safely. Toxic steam is kept within the building and can be vented out in low concentration through ventilation pipes that flow about 24 meters above ground level. Due to the fact that the discharge occurs at high altitude at a low concentration, the concentrations at ground level are judged to be so low that they do not cause damage to the surroundings. Some toxic vapour could also get through building materials and affect staff outdoors, but the dispersal calculations that have been made have shown that these levels are so low (< 2-3 ppm) that they do not cause any additional consequences for staff who are outdoors. These events mainly pose a risk to the Company's own staff, primarily if they are in the spaces where the leak occurs. In these cases, some of the incidents can result in serious injury or death of personnel.

The scenarios that, according to the risk assessment, could lead to impacts outside the business area are tanker collision and large emissions of LPG with ignition. The consequences of these events are detailed in the next section.

All major chemical accident scenarios identified are considered to have a very low probability with reference to the safety measures that will be taken and they have been assessed as falling within the so-called ALARP level, i.e. they can be tolerated if all reasonable risk reduction measures are taken.

For a more comprehensive description of the above-mentioned risk scenarios please refer to the application attached safety report.

8.17.2.3 Consequences for the environment in the event of an accident with hydrofluoric acid

The scenario with hydrofluoric acid that is expected to lead to an impact outside the business area is tanker collision within the business area. 70 % hydrofluoric acid arrives at the plant in ISO tanks

transported by tankers. It is estimated that there are about two transports a week, with an ISO tank with 20 m^3 of hydrofluoric acid per transport. If the tanker's tank were to fail, for example, by the tanker colliding with another vehicle at the plant, there is a risk of emissions of up to 20 m^3 of hydrofluoric acid. A puddle of hydrofluoric acid would form at the scene of the accident and is estimated to be 36 m^2 in size based on normal road width. Hydrogen fluoride will evaporate from the puddle and the liquid will flow down the sewage system.

In order to investigate the impact distances in the event of any event, scattering calculations have been carried out for this scenario. The impact distances for human life and health are based on AEGL guideline values for hydrogen fluoride. AEGL values indicate at what concentrations people generally experience the health impact of various types of toxic gases at a specified exposure time;

- AEGL-3 indicates the concentration (ppm) of a particular substance where it is assumed that the majority of the population would be exposed to life-threatening health effects or perish.
- AEGL-2 indicates the concentration (ppm) of a particular substance where it is assumed that the majority of the population would experience prolonged, irreversible, serious health effects.
- AEGL-1 indicates the concentration (ppm) of a particular substance where it is assumed that the majority of the population could experience irritation or discomfort. However, the health effects pass when exposure ceases.

In the calculation, an emission of 25 m^3 has been simulated, which is conservative in relation to the actual transported volume.

A large emission gives rise to a toxic gas cloud in connection with the leak. Since the drivers of the tanker truck and the vehicle the tanker collides with are close to the leak, they are assumed not to be able to escape the gas cloud. A gas cloud will spread over the plant, at different distances and in different concentrations depending on weather conditions. Based on the distribution of staff at the facility, another 4-8 people can be exposed. However, these people are judged to have better opportunities to evacuate. In bad weather conditions, the gas cloud can also spread to other parts of the Hertsö field industrial area

At this event, AEGL-2 at 30 minutes of exposure can be achieved at a distance of about 500 meters from the hazard source and AEGL-3 at a distance of about 320 meters in a worst-case scenario daytime. At 10 minutes of exposure, the distances are about 250 and 170 meters, respectively. Since no unloading occurs at night, this is to be considered the worst possible scenario. Within these distances there are currently no other businesses or accommodation. The impact area extends to surrounding roads, but not to the areas where housing is located or where the public resides. Figure 27 below illustrates these calculated consistency distances.

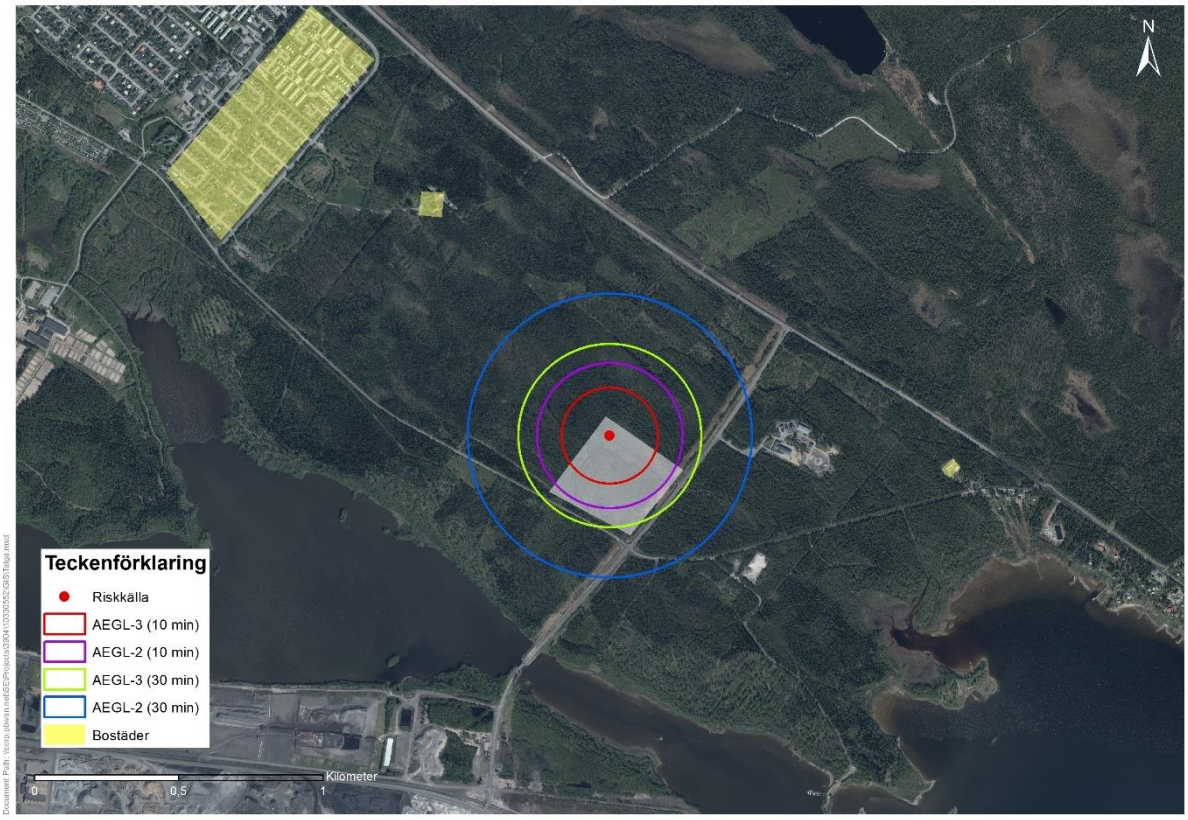


Figure 28. Consistency distance in the event of a hydrofluoric acid emission in a tanker collision, worst case scenario daytime (winter conditions).

According to the risk assessment, an environmentally hazardous concentration of hydrogen fluoride is estimated to be able to spread about 180 meters in the air. There is no protected nature in this area and the scenario is not expected to lead to any long-term effects on the environment. However, a release of hydrofluoric acid is estimated to be able to reach soil and be passed on to the stormwater system and have a local acidifying effect. Hydrofluoric acid is not in itself classified as environmentally hazardous or persistent in itself. The risk assessment has concluded that none of the events that could be identified lead to immediate damage to the environment as formulated in Annex VI of the Seveso Directive, i.e. permanent or long-term damage to terrestrial habitats, significant or long-term damage to freshwater or marine habitats, or significant damage to an aquifer or groundwater.

A tanker collision scenario has a very low probability due to the safety measures planned.

8.17.2.4 Consequences for the environment in the event of an accident with LPG

The influence of fire events with diesel and LPG, including jet flame, fireball and cistern explosion (BLEVE), has also been studied. Most of the events studied for LPG or diesel mainly involve an impact within the business area and do not reach the surroundings, but in the case of a jet flame or fireball, the impact on the road south of the plant can occur.

A leak or breakdown of one of the two LPG tanks would mean the release of flammable gas to the surroundings. If the flammable fumes ignite, the scenario could result in a jet flame or gas cloud fire. If a catastrophic breakdown occurs, there is also a risk of fireballs. In the scenario, BLEVE due to external influences from fire has also been taken into account. Due to the protective measures planned, such as detection and sprinkler systems at the LPG station, to be taken, these events are judged to have a very low probability.

Consequences beyond the area of operation are considered unlikely here as only a few scenarios have consequence distances extending beyond the plant area (fireball, jet flame). In addition, the impact occurs for a short time due to the limited amount of storage and the spread of the jet flame or a fireball depends on the direction of the wind.

8.17.2.5 Emergence of extinguishing water

Extinguishing water does not constitute a source of risk during normal operation, but the danger arises in connection with an accident. Water from a extinguishing insert, which does not evaporate, forms a more or less contaminated extinguishing water. Contaminated extinguishing water can give rise to an acute toxic effect on the environment if a larger amount reaches the recipient at the same time. The management of extinguishing water has been investigated in a separate extinguishing water investigation, which is an annex to the Safety Report (Annex D:2).

The environmental impact of a fire can occur if contaminated extinguishing water is spread to the recipient. In the Talga area there are no surfaces or buildings with elevated fire load, with the exception of the tanks with flammable goods. A fire in a building is not considered to be different from what can be expected in a normal industrial fire, provided that the fire does not spread and causes leakage of hydrofluoric acid.

In the extinguishing water investigation, theassessment is that in the event of a fire at the planned facility, taking into account the proposals for measures submitted, there are conditions for disposing of contaminated extinguishing water and preventing it from reaching the recipient.

8.17.2.6 Quantitative risk assessment

The individual risk to third parties has been calculated for the scenarios that are considered to have an impact outside the plant area. [73]A more detailed description of the calculation of individual risk is given in the risk assessment, below the results are summarized.

Individual risk is calculated with the risk source at the center, and the calculations have therefore been made based on three different locations; the transport distance between the gate and the hydrofluoric acid storage tank (scenario 1), the LPG tank (scenario 9) and the diesel tank (scenario 10). It should be noted that the calculations have been made on the assumption that each accident scenario occurs when the weather conditions for that particular event are at their least favourable, i.e. when the consequences are greatest.

In Sweden, there is no national decision on which approach or criteria to apply when assessing accident risks. The risk assessment applies the Association for Process Safety (IPS) proposal for acceptance criteria for individual risk to third parties and for newly established activities (acceptable risk, ALARP (acceptable if all possible measures are taken, As Low As Reasonably Practicable).

The carried out calculations indicate that the individual risk is for the most part acceptable outside the area of the facility. The area of unacceptable individual risk extends at its furthest about 65 meters from the site boundary, while the ALARP area at its longest extends 135 meters beyond the Talga area. It is the LPG in the ngen that gives the greatest result in the individual risk calculations.

The individual risk assessment indicates that the risks to third parties are limited to the area closest to Talga's facility. It passes a road east of the construction area, through the area with unacceptable individual risk, but the road is low traffic as it currently only leads to Talga's plant and traffic is not expected to become stationary, with road users only being exposed to the risk for a very short time. At

[73] Individual risk is the probability that an individual who continuously stays in a specific place perishes. The individual risk is site-specific and independent of how many people are staying in the given area. The purpose of the risk measure is to quantify the risk at the individual level to ensure that individuals are not exposed to unacceptable risk. See further risk assessment, Annex D:1.

present, there is no other activity within the distance that the individual risk from Talga's operations is unacceptably high or lies within the ALARP area.

In summary, the risk level of Tallow operations is considered acceptable in terms of the scenarios that have been assessed, but future expansion of the Hertsö field should take into account the risk distances specified in the risk assessment.

8.17.2.7 Risks associated with the transport of hydrofluoric acid

Risks associated with the transport of hydrofluoric acid have been assessed in connection with the preparation of the safety report.

The hydrofluoric acid will arrive in Norrbotten via ship, but at this stage it has not yet been decided whether the receiving port will be Luleå or Piteå harbor. The risk assessment has evaluated both options. However, the handling of hydrofluoric acid within the respective port area shall not be considered to be a follow-on activity of the activity sought, but potential risks may be managed within the activities of each port.

The investigated transport route consists of the road stretch from the Notviken interchange on the E4 in Luleå to the construction boundary. E4, Bodenvägen, Svartövägen and Uddebovägen, which leads out to the operations within the Svartön industrial area, are designated as primary transport routes for dangerous goods.

The results of the calculations indicate that both port options are viable and that the environmental impact of transport is acceptable from an individual and societal risk perspective. However, imports of hydrofluoric acid via Piteå port entail a relatively higher level of societal risk as the transports in this case will pass through Luleå urban area. Imports via the Port of Luleå are thus considered to be more advantageous from a risk perspective as the transports do not have to pass through densely populated areas, together with the transport distance being minimized. However, Talga does not have full control over which port can be chosen, as this is governed by each port's operations and permits.

The risk assessment shows that the risk levels linked to the transport of hydrofluoric acid to Talga's plant are acceptable from an individual and societal risk perspective. That an accident that occurs on an investigated transport route would lead to any domino effect is considered unlikely.

8.17.2.8 Influence of natural environmental factors

The facility is planned to be located about 500 meters from the sea. As the business area develops, the groundwater level is expected to drop from today's levels as ditching and drainage will take place and the soil level will be raised. An flooding of the area is not considered to be able to lead to hydrofluoric acid tanks easing and floating up, as these will be located indoors and firmly anchored to foundations. The liquid level in the tanks will be significantly above any flood levels. Avirtual flooding of the Talga area is not considered to affect the likelihood of an accident that could cause significant harm to humans or the environment occurring.

The risk of collapse or landslides causing significant damage to the plant is assessed on the basis of existing conditions as very low. However, the risk cannot be excluded and erosion could lead to knock-on effects which, in several stages, could lead to serious accidents, taking this into account as an initiating event to accidents which may cause significant damage.

High wind speeds can tear off heavy objects, such as plates, which in turn can damage equipment. Since hydrofluoric acid is stored in a double-jacketed tank in a separate building, it is considered unlikely that this would lead to an emission. In addition, the area is not exposed to extensive extreme weather in the form of a storm / hurricane. However, high wind speeds could affect diesel or LPG tanks.

Heavy snowstorms and icing can, among other things, affect transport and cause accidents that directly or indirectly affect the plant.

In the region, some seismic activity occurs. Seismic activity could give rise to a release of hydrofluoric acid in the event of a pipe rupture or rupture of pipe supports. All pipelines containing hydrofluoric acid will be constructed to withstand any upcoming seismic activities.

8.17.2.9 Summary of risk assessment

In summary, it is found that in most cases a discharge of hydrofluoric acid from the plant means an indoor discharge with possible damage to its own staff as a result. However, in the event of a tanker accident, the impact on the surroundings can be expected. The impact area extends to surrounding roads, but not to the areas where housing is located or where the public resides. The probability of all studied scenarios is assessed as very low.

The individual risk assessment indicates that the risks to third parties are limited to the area closest to Talga's facility. The predominant risk to the environment according to the quantitative risk assessment is linked to the storage of LPG. At present, there are no other activities within the distance that the individual risk is unacceptably high or lies within the ALARP area, but in future expansion of the Hertsö field, these risks should be taken into account.

As regards potential direct damage and indirect damage to the environment caused by accidents at the Talga plant, these have not been identified. No potential accident scenarios result in sufficiently serious or long-lasting effects for them to be assessed as causing significant damage to the environment.

It is estimated that possible effects on human life and health in the environment can only occur in connection with a major leakage of hydrofluoric acid outdoors or in the event of a gas tank failure with ignition. Other accident scenarios only result in local consequences.

The impact on nearby activities could arise from a larger emission of hydrofluoric acid. If a toxic gas cloud of hydrogen fluoride spreads to nearby businesses, these will need to be evacuated. However, due to large protective distances and the fact that nearby Seveso operations are in the opposite direction to the prevailing wind direction, it is considered unlikely that a release of hydrofluoric acid within Talga's area of operation could initiate a serious chemical accident in any of these activities.

The risk assessment regarding follow-on activities shows that the risk levels linked to the transport of hydrofluoric acid to Talga's plant are acceptable from an individual and societal risk perspective. That an accident that occurs on an investigated transport route would lead to any domino effect is considered unlikely.

8.17.3 Protection and mitigation measures

Talga will conduct extensive risk and safety work at the business. The work includes both preventive and injury-limiting work. Talga currently has test facilities to develop and test processes for the construction and operation of the planned facilities in Luleå. The test facilities include a treatment plant in Belgium and an anode production facility in Luleå, at Swerim's facility. Routines and processes, including safety and process safety management, experiences and lessons learned from these facilities form the basis for both the technical design and the operational procedures that will be implemented in Luleå.

Within the plant, a number of safety-enhancing measures are planned to prevent the spread of, above all, hydrofluoric acid and products with similar properties to the environment, the spread of acid vapors, the emergence of fire and the spread of extinguishing water. These include, among others:

- All handling of hydrofluoric acid takes place indoors in specially designed, embanked and fire-technically separated areas with separate ventilation. Exhaust air is treated through scrubber systems. The spaces are equipped with hydrogen fluoride detection linked to alarms.
- Storage of hydrofluoric acid takes place in a double-jacketed tank placed in an embankment that holds the entire amount plus 10% in a separate space. The tank is equipped with level monitoring, high-level alarms and overfill protection.
- Embankments will be coated with a material resistant to hydrofluoric acid and equipped with pumps to be able to direct any spill to a neutralization tank for safe handling.
- Fully welded connections are used for all hydrofluoric acid piping that goes outside the storage area and embanked areas, the number of connections/flanges is reduced as far as possible. Pipelines with flanges are provided with paint indicating acid discharge.
- Tight supervision and monitoring will be done of all pipelines, hoses and connections through established procedures and checklists.
- LPG tanks will be equipped with safety valves and placed so that no ignition sources are nearby.
- UPS systems ensure power supply and safe shutdown in the event of a power outage.
- The facility will have extensive perimeter protection including fencing of the entire industrial area, entry control of vehicles, registration of visitors, attendance registration for employees and rounding. It may also be relevant with camera surveillance of certain areas and processes as well as limited / special access to critical surfaces / systems / processes.
- Several alarm functions will be available, such as fire and evacuation alarms, sprinkler alarms, high-level alarms in the cistern and embankment for hydrofluoric acid, leak alarms in the double-jacketing of the cistern for hydrofluoric acid and in all surfaces for handling hydrofluoric acid.
- The facility will have a water tank with capacity for at least two hours of firefighting work, coupled to two diesel-powered fire water pumps.
- Sprinklers will be located in the graphite treatment plant and where the LPG is stored.

Section 12.3 of the technical description and the safety report and risk assessment describe in more detail the safety-enhancing measures that are planned to be taken.

The barrier analysis established in the risk assessment using the Bow-tie methodology states:

From the established barrier analysis, it can be concluded that Talga intends to implement risk mitigation measures for all identified risks. The measures are both preventive and harm-limiting. Actions come in all categories; technical and organizational, active and passive, which means that the plant's actions should be seen as robust. In addition, the completed barrier analysis can conclude that a high level of safety can be maintained even if barriers fall away for various reasons. Barriers exist in several stages and many of the barriers are independent of each other. As previously stated, containment of all handling of hydrofluoric acid is one of the single most important measures to ensure an acceptable level of risk both within and adjacent to the installation. In normal handling, the building must be closed and when unloading, it should not be possible to start this before it is closed about the tanker truck. The probability that the integrity of the building would not be intact in the event of an emission is assessed as low, but it should be noted that despite this, several measures are in place to detect, limit and/or prevent a major spill. Overall, the barrier analysis shows that the risk assessment carried out in both gross risk analysis and established quantitative risk assessments is robust and reliable.

8.17.4 Preparedness for and response to major accidents

8.17.4.1 Internal emergency plan

According to the Seveso Act, an internal plan for rescue operations must be in place for a Seveso facility at the higher level of requirements. The plan shall be updated and practiced at least every three years, or in the event of changing conditions leading to updating.

Talga has drawn up an internal plan for rescue operations. The purpose is to activate the necessary resources and start an effort to reduce the consequences in the event of an accident. Talga's internal plan for rescue operations includes instructions for organization, alarms, crisis management, operations, exercises, etc. The plan has been attached in its entirety to the safety report.

The internal plan is drawn up on the basis of the conditions known at the time of drawing up this permit application. When the plant is put into operation, additional details of associated routines and instructions regarding alarm functions and the like may need to be added or clarified.

8.17.4.2 Contingency organization

Talga plans that parts of the staff will be trained and equipped to be able to constitute a first task force that can act initially in the event of different types of alarms. Talga also plans for continuous collaboration, orientation, practice and contact with the local rescue service. Initial steps to this have been taken in the context of the consultation process being carried out as a basis for the application.

8.17.5 Impact assessment

The zero option means that the area is prepared for the establishment of industries according to the zoning plan. It is not possible to speculate on the type of risks that may arise from the industries that would be established instead of the applied business in the case of a zero alternative, which means that the assessment assumes that the risks are as at present. Thus, the zero option is the same as the current situation.

The activities applied for entail that risks arise, mainly associated with the handling of hydrofluoric acid and LPG. However, the risk investigation carried out has shown that these risks are considered acceptable. It is estimated that possible effects on human life and health in the environment can only occur in connection with a major leakage of hydrofluoric acid outdoors or in the event of a gas tank failure with ignition. The impact area extends to surrounding roads, but not to the areas where housing is located or where the public resides. Other accident scenarios only result in local consequences. No potential accident scenarios result in sufficiently serious or long-lasting effects for them to be assessed as causing significant damage to the environment. The probability of all studied scenarios is assessed as very low.

The individual risk assessment indicates that the risks to third parties are limited to the area closest to Talga's facility. It is considered unlikely that an event at Talga's operations could initiate a serious chemical accident at nearby Seveso operations. The risk assessment regarding follow-on activities shows that the risk levels linked to the transport of hydrofluoric acid to Talga's plant are acceptable from an individual and societal risk perspective.

Protective measures are planned for all identified risk scenarios, and these have been assessed in the barrier analysis as robust, and a high level of safety can be maintained even if barriers fall away for various reasons.

Compared to both the current situation and the zero alternative, the applied activity is estimated to have *a small negative consequence* regarding the aspect of risk and safety.

Based on planned protective measures, the risks at the plant are not assessed to prevent the national environmental quality objectives *Non-toxic* environment and *Good built environment* from being met.

Project's impact	***Project's impcat in comparison to zero alternative***
All in all, the applied business is considered to entail a *small negative consequence* with regard to the aspect of risk and safety in comparison with the current situation. The consequence is considered to be the same from a short, medium and long perspective.	Overall, the activity applied for is considered to entail a *small negative consequence* with regard to the aspect of risk and safety in comparison with the zero alternative. The consequence is considered to be the same from a short, medium and long perspective.

9 OVERALL ASSESSMENT

Table 25 has summarized the impact assessment for all aspects described in the present EIA. Thereafter, an overall assessment is made of the project's total environmental impact on human health and the environment.

9.1 IMPACT ON HUMAN HEALTH AND THE ENVIRONMENT

Table 25. Compilation of assessed impacts and risks to human health and the environment. The assessment takes into account the protective measures envisaged and presented under the respective sections.

Positive impact	*Insignificant impact*	*Small negative impact*	*Moderate negative impact*	*Big negative impact*

Assessed aspect	**Konsekvens ansökt verksamhet i jämförelse med nuläget**	**Konsekvens ansökt verksamhet i jämförelse med nollalternativet**
Use of land and water area	Moderate negative impact	Small negative impact
Natural environment	Moderate negative impact	Small negative impact
Reindeer husbandry	Small negative impact	Small negative impact from a short-term perspective. Insignificant impact from a medium- and long-term perspective.
Cultural environment and archaelogical remains	Insignificant impact	Insignificant impact
Recreation	Small negative impact	Insignificant impact
Landscape	Small negative impact	Small negative impact
Other protected areas	Insignificant impact	Insignificant impact
Energy use	Moderate negative impact	Moderate negative impact
Raw materials and chemical products	Small negative impact	Small negative impact
Water supply and water use	Small negative impact	Small negative impact
Groundwater	Small negative impact	Insignificant impact
Discharge to surface water	Small negative impact	Small negative impact
Air emissions	Small negative impact	Small negative impact
Waste	Moderate negative impact	Moderate negative impact

Noise and vibrations	Small negative impact	Small negative impact
Transports	Small negative impact	Small negative impact
External incidents	Insignificant impact	Insignificant impact
Risk and safety	Small negative impact	Small negative impact

9.2 COMPATIBILITY WITH CURRENT PLANS

The current master plan for Luleå (Master Plan 2013) specifies the area for applied activities as "area for severely disruptive activities". In the later (but not yet valid) master plan Master plan *2021* and in-depth master plan for Hertsön and Lerbäcken, the area is still designated as relevant for disruptive activities. The area is described as suitable for businesses that should not be mixed with housing.

A detailed plan exists for the area in question and the plan gained legal force on January 21, 2021 and is called *Zoning Plan for part of Hertsön 11:1 and others Hertsöfältet.* The zoning plan states that the area will be used for industrial activities.

The applied activity is thus deemed to be compatible with current plans.

9.3 IMPACT ON NATIONAL INTERESTS AND OTHER PROTECTED AREAS

The applied area of activity is located within the national interest for mobile outdoor life and national interest in total defense. The activities applied for are not considered to affect the purpose of the national interests concerned.

The applied activity is considered to be compatible with the functions identified as national interest for communication and not to prevent the use of these.

According to the dispersion modelling carried out with regard to the discharges of the activities to water, the activity applied for is not considered to affect any national interest in the natural environment or Natura 2000 site.

The noise investigations show that the sub-activities applied for contain guideline / limit values according to the Swedish Environmental Protection Agency's guidance in all points regardless of the time of day.

There is no risk of impact on the possibility of engaging in commercial fishing in the national interest area of commercial fishing as a result of the activity applied for.

According to the assessments above under sections 8.2 and 8.4-8.6, the activity applied for has an insignificant consequence on national interests or other protected areas compared to the zero option. However, the activity applied for is considered to have a small negative impact on the natural environment compared to the current situation.

9.4 COMPLIANCE WITH APPLICABLE ENVIRONMENTAL QUALITY STANDARDS

For current testing, environmental quality standards for outdoor air and for surface water are of relevance.

The Air Quality Ordinance (2010:477) contains established environmental quality standards in air for eleven compounds /substances and for particles (PM10 and PM2.5).

The operations generate emissions to air mainly in the form of carbon dioxide, particles and nitrogen gas. A smaller amount of hydrofluoric acid and nitrogen oxides is also emitted. According to assessments in sections 8.12 and 8.15, the concentrations are below both environmental quality standards and environmental goals at the nearest residence.

The activities are not considered to affect the physicochemical quality factors of the water bodies concerned due to nutrient inputs. However, the activity involves the release of particularly polluting substances (zinc and arsenic) at concentrations that exceed the assessment criteria within a small area directly adjacent to the outlets. The activities are not expected to affect the status of the water body as a whole.

Discharges to water from the activities applied for are not of such a nature that they are expected to affect the hydromorphological quality factors and the activity involves only small interventions in the water area.

All in all, the activities applied for are not considered to jeopardize the chances of reaching the environmental quality standard for ecological status for the recipient Sörbrändöfjärden.

As far as priority substances are concerned, the activity applied for involves the release of lead, cadmium, mercury and nickel below the limit values. The levels of mercury are also below the background levels, which means that the applied activity will not increase the levels in the recipient. The activities are not considered to affect the status and do not jeopardize the chances of reaching the environmental quality standard for chemical status in the recipient Sörbrändöfjärden.

9.5 RISK AND SAFETY

The activities applied for entail that risks arise, mainly associated with the handling of hydrofluoric acid and LPG. However, the risk investigation carried out has shown that these risks are considered acceptable. It is estimated that possible effects on human life and health in the environment can only occur in connection with a major leakage of hydrofluoric acid outdoors or in the event of a gas tank failure with ignition. The impact area extends to surrounding roads, but not to the areas where housing is located or where the public resides. Other accident scenarios only result in local consequences. No potential accident scenarios result in sufficiently serious or long-lasting effects for them to be assessed as causing significant damage to the environment. The probability of all studied scenarios is assessed as very low.

The individual risk assessment indicates that the risks to third parties are limited to the area closest to Talga's facility. It is considered unlikely that an event at Talga's operations could initiate a serious chemical accident at nearby Seveso operations. The risk assessment regarding follow-on activities shows that the risk levels linked to the transport of hydrofluoric acid to Talga's plant are acceptable from an individual and societal risk perspective.

9.6 SUMMARY

Based on the EIA, it can be concluded that the largest consequences of the applied activity in comparison with the zero alternative are linked to energy use and waste. Compared to the zero alternative, the applied activity is also considered to have a small negative impact on the aspects of use of land and water area, landscape, natural environment, raw materials and chemical products, water supply and use, emissions to surface water, emissions to air, noise, transport and risk and safety. Compared to the zero alternative, the activity applied for entails insignificant consequences for

reindeer herding (but little negative consequence from a short perspective), cultural environment, outdoor recreation, other site protection, groundwater and external events.

Compared to the current situation, the activities applied for are estimated to have moderately negative consequences in terms of the use of land and water area, natural environment, energy use and waste. Furthermore, the activities applied for are considered to have a small negative consequence compared to the current situation in terms of the aspects of outdoor recreation, landscape, reindeer husbandry, raw materials and chemical products, water supply and use, groundwater, emissions to surface water, emissions to air, noise, transport and risk and safety. However, in comparison with the current situation, the activities applied for are considered to have insignificant consequences for the cultural environment, other area protection and external events.

The overall assessment of the requested business is that with regard to the scope of the business, the protective measures taken and the Company's continuous work to reduce its environmental impact, its negative consequences are acceptable. When comparing the activity applied for and the current situation and the zero alternatives, it can be concluded that the environmental effects of the activities applied for are equivalent from a short, medium and long perspective. There should therefore be no impediment to the application.

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11 PRESENTATION OF CONSULTANTS' EXPERTISE

The following people have participated in the preparation of the environmental impact assessment:

Sara Edlund Fredholm, who is the project manager, has worked for more than 15 years with environmental law issues and permit examinations according to the Environmental Code, and for 10 years with issues related to the Seveso Law. She has worked at WSP with permit examinations for 6 years, before that she worked as an environmental officer at the County Administrative Board of Skåne for 8 years and as an environmental inspector at the municipality for 6 years. Sara has a master's degree in ecotoxicology and a master's degree in environmental management and policy from Lund University.

Jenny Pettersson, investigator in the project, has worked with permit examinations and other environmental law issues according to the Environmental Code for more than 15 years. She has worked at WSP with licensing for about 5 years. Prior to that, she has worked as an environmental and quality coordinator at various waste companies for 9.5 years. Jenny holds a Master of Science in Ecosystem Engineering from Lund University.

Cecilia Borgenhede, investigator in the project, is a lawyer at the School of Business, Economics and Law at the University of Gothenburg with a focus on environmental law. She has worked with law enforcement and permit matters for industries, wind power and power lines for about 4 years. She has previously worked at a state agency and in municipal administration.

Ida Zwahlen, investigator in the project, has been working with permit tests at WSP for about 5 years for industries, power lines and wind power, among others. Ida has a master's degree in environmental science from Lund University and a master's degree in built environment from Malmö University.

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WSP Sweden AB
Box 574
201 25 Malmö
Besök: Jungmansgatan 10

T: +46 10 7225000
Org nr: 556057-4880
Styrelsens säte: Stockholm
wsp.com