H2 green steel

SWECO

ANNEX B
ENVIRONMENTAL IMPACT ASSESSMENT

H2 Green Steel

Application for authorization under the Environmental Code for the construction and operation of new steel works, etc. in Svartbyns area of activity, Boden municipality, Norrbottens län

MISSION NUMBER 30018072-300

12/16/2021

Non-technical summary

Activity sought

The steel industry is one of the most CO2 emitting industries - accounting for 7% of CO2 emissions globally. H2 Green Steel's (H2GS) goal is to accelerate the transition by building a new plant for large-scale fossil-free steel production in Boden. The plant is planned to become operational in 2024. In the production process at the new plant, hydrogen will replace the carbon in steel production, which will result in a significant reduction in CO2 emissions.

H2GS applies for an environmental code permit to build and operate a plant for the production of steel, cast materials and hydrogen. The planned activity will produce 5.0 million tons of steel per year. The application also includes diversion of Lillbäcken.

The planned activities will include the following processes; electrolysis for hydrogen production, direct reduction of iron ore by hydrogen, electric arc furnace, casting, hot, cold and trim rolling, pickling, annealing, hot dip galvanizing and other surface treatments. The processes in the business will be mainly electric. The electricity used will come from renewable sources. The final product is steel strips that can be used to produce parts for cars, white goods and furniture.

The planned activities will be built in Svartbyn located east of Boden's urban area in Boden municipality. There is good access to electricity from renewable energy sources, proximity to iron ore from the ore fields and proximity to rail and a port in Luleå.

The municipality of Boden is working to develop a detailed plan for the area where the activities are planned in parallel with the work on the permit application for H2GS activities. The purpose of the NRP is to create opportunities for electricity-intensive, large-scale and other industrial activities.

Soil construction work will last approximately 18 months. The land preparation in the planned area of activity will consist of, among other things, excavation and filling and diversion of Lillbäcken. Some material will be transported in from surrounding existing supplies. When the land is ready for industrial activity, the groundwork begins.

The basic work includes, in addition to the construction of parking and roads within the industrial area, piling and concrete works for the building tiles. Then the construction of the building frame assembly followed by facade and roof works continues. The business area will be built from the southern part of the intended industrial area and north.

Zero option

The consequences of the main option are compared with a zero option which means that no exploitation of the area takes place. Since the area is planned in detail to enable the establishment of large-scale, electricity-intensive industrial activities,

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the planned steel and hydrogen plant is not established on site, it is likely that other large-scale, electricity-intensive industrial activities will be located there.

Alternative Localization and Design

H2GS has investigated possible alternative locations for the planned activities in northern Sweden and Finland. Each localization option has been analyzed based on its technical and environmental requirements. The chosen location has been judged to be the most appropriate one when the criteria set by H2GS are met.

For parts of the processes in the planned activity, alternative technologies are available that have been discarded in favor of technologies that involve less CO_2 emissions, less energy consumption and no emissions to water.

Environmental impact assessment of planned activities

The consequences of the activity sought, i.e. when the installation is fully operational, and the consequences during the construction phase are described below.

National Interests

Total Defense: The planned activities mean that high buildings will be built within and near several of the Swedish Armed Forces' designated national interests with areas of influence or areas of importance for the total military part. The location and design of the buildings have been adapted to the height limitations that exist in the area and are deemed not to affect the national interests of the total defense. In order to investigate what measures are required to avoid the proposed location being in danger of causing material damage to an area of national interest in the category "Other areas of influence", the Swedish Armed Forces has begun a preparation.

Communications: To the west of the area goes national road 97 and the main line through Upper Norrland, which constitute national interests for communications. Transport to and from the planned operation will be carried out by rail and road 97. A new industrial track will be built into the area with a new road running parallel to the railway track. With the planned expansion of the infrastructure in the area, national interests are not deemed to be adversely affected.

Environmental protection: The national interest of Boden (BD 74) consists of five parts, one of which, Gammelängsberget is located just northwest of the area where the activities are planned.

The national interest has been taken into account in the location and design of the business area. Since no measures are planned in the area of national interest, the influence on the national interest is mainly visual as the plant will become a clear feature of the area and create a new silhouette in the landscape. Orientations between different nuclei are not considered to be affected as they are mainly located west and north of the planned installation. The influence on the national interest is considered small.

Reindeer husbandry: About 5 km east of the planned activities is a migratory route of national interest for the reindeer industry. The route crosses road 383 between Svedjan and Vibbyn which is expected to have a small increase in the number of traffic movements as a result of the planned activities. The increase in traffic movements is small and the route is used sporadically during emergency years and then for a short time to move between work. The consequences for the national interest are considered minor.

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Agricultural land of national importance: The planned activities involve the use of farmland and forestry land in order to realize the essential social interest in climate-neutral steel production. Local intrusion into agriculture and forestry can be considered limited. The impact on the national interest in agriculture and forestry is estimated to be small.

Surface water

Operating stage: The activity has been designed so that no process water or cooling water will be discharged from the planned activity. It will be purified and then recirculated in the business. This means that there will be no emissions to any recipient except purified surface water.

Daywater flows from the different areas within the area of activity will be managed separately depending on the degree of pollution. Surface water from higher polluting areas will be directed to the process water treatment plant and recirculated in the activity. The surface water from less polluting areas will be diverted to Lillträsket after having been treated and delayed in purification ponds. From Lillträsket, the water reaches Norrbäcken and Gammelängesbäcken to Lörbäcken, which is the closest body of water in which environmental quality standards apply. The design of the treatment plant has been calculated so that the discharge of surface water shall not cause a deterioration of the environmental quality standards in the Lörbäcken.

It is estimated that the impact of stormwater management from the planned area of activity will be small.

Construction stage: The location of roads and industry means that Lillbäcken, which today crosses the planned area of activity, will be redirected. The proposed measure constitutes water activity.

Groundwater

Operation and construction stage: The planned area of activity shall consist partly of cutting and partly of filling. The section consisting of cutting the soil and the rock will lead to a permanent reduction in the area's groundwater.

A preliminary assessment of the area of influence has been made on the basis of map studies, geotechnical studies and groundwater surveys. According to the preliminary assessment carried out, energy wells, agricultural land, woodland and swamp forests are within the preliminary maximum impact area. The results of the ongoing hydrogeological investigations will be used to calculate the area of impact in even more detail and to design protective measures.

The impact of the reduction in groundwater is provisionally assessed as moderate. The assessment may be modified when more knowledge of the hydrogeological conditions on the site is available.

Air

Operating stage: The air emissions of the planned activity are mainly CO2, NOx, dust and organic pollutants. The plant will not give rise to any specific or lasting fragrance.

The planned activities will be relatively close to residential areas and will result in increased emissions to air compared to the current situation. With planned protection measures such as purification plants and process containment, the EQS are calculated and

the environmental quality objectives of the built-up area are undercut. The impact of emissions to air from the activity is estimated to be small.

Construction stage: In addition to mass transport and supplies, normal construction traffic, such as passenger cars and transport to and from the workplace, will be on the road
605. This will result in a local increase in emissions of particulate matter and nitrogen dioxide in the area.

With planned protection measures to prevent dusting and minimize NOx emissions from machinery, the impact on air quality is considered to be small during the construction phase. The impact of emissions to air from the construction of the activity will be small.

Pollution of soil and groundwater

Operating stage: The substances deemed to present a risk of pollution damage in soil and groundwater at the time of the planned operation are petroleum products such as fuel oil/diesel, hydraulic oil, greases, transformer oil, lubricating oil, hydrochloric acid, metal alloys (copper, chromium and nickel), alkaline detergent, hydraulic liquid, chromium passivation solution and rolling emulsion.

The risk of spreading pollution may be associated with accidents, for example during loading and unloading, technical faults in the installation and through dusting. Protection measures are planned to avoid and minimize the risk of environmental pollution. Land within the area of activity will be sealed and provided with storm water wells leading the surface water to purification plants. A large contiguous aquifer relevant to local or regional water supply is not present within or adjacent to the planned area of operation. With planned protection measures, the impact is estimated to be small.

Construction stage: The work required for the construction of the site means that a large number of excavation and filling operations will be carried out. No increased levels of pollutants have been found in the soil environmental sampling which has been carried out and which may involve the spreading of pollutants at shafts. There is no groundwater reservoir near the planned activities.

Soil work means that sulfide soil will need to be managed. Safeguard measures will be taken to prevent the spread of low-pH metals and water when handling the sulfide soil.

With planned protection measures, the impact is estimated to be small.

Noise

Operating stage: Noise will come from the business, the predominant noise sources are deemed to be the DRI towers.

The planned activity involves noise nuisance for the nearby properties. The most noisy construction parts are located in the southern part of the area. With noise abatement at source, the noise level at the nearest homes will be below the Environmental Protection Agency's industrial noise guidance values. The noise impact of the activity is estimated to have a small negative impact locally. It is estimated that the impact of operating noise will be small.

Construction stage: The installation will generate noise, for example during excavation, blasting and piling. In order to reduce disturbance for local residents,

silencing or alternative methods whenever possible. Noise measurements will be carried out to check that the Environmental Protection Agency's guide values for noise from construction sites are contained.

Noise pollution during the construction phase will be limited in time.
The impact of noise from the construction of the activity will be small.

The additional construction traffic on road 605 is estimated to be 375 heavy vehicles per day, traffic mainly takes place during daytime weekdays. Even with the additional construction traffic, the existing action levels for nearby buildings are well met.

Landscape image

Establishing activities in the area will transform the landscape from a forest and agricultural landscape to an area characterized by industrial buildings and associated infrastructure. The highest buildings within the business area will be the DRI towers, which will be about 140 m high.

Protection measures have been taken in the design of the area of operation, with the highest buildings being placed in the southern part of the area of operation and a forest curtain being planned for the residential area of Norra Svartbyn. Additional protective measures are envisaged in the design of the installation, the aim of which is to adapt the installation as far as possible to the environment.

The high towers and also the lower industrial buildings will become partly dominant landscape elements and new landmarks in the area. The impact on the landscape is estimated to be small-moderate.

Cultural environment

Southwest of the planned area of activity is the area Svartbyn which is designated in Norrbotten's conservation program for the cultivated landscape. The Svartbyn area largely coincides with the landscaped area Lövronningen. The planned activities may involve the use of a small area of land in the north-eastern corner of the area. This is not deemed to entail any further closure, or change in the farming landscape in Svartbyn. The impact on the area is estimated to be small.

Several military remains have been found in the north-west part of the planned area of operation. The establishment of the business involves the significant removal or impact of the remains. In addition to the military remains, there are no recorded ancient and cultural remains within or directly adjacent to the planned area of activity.

Climate change

The planned activity will have much lower CO2 emissions (about 0.1 tons CO2 per ton of steel) compared to traditional steel production (about 2 tons CO2 per ton of steel). The main sources of CO2 emissions are from the use of natural gas in the injection of coal in the DRI process and the use of coal in the electric arc furnaces. The sources of carbon dioxide emissions are due to the use of carbon-containing materials, where carbon is a raw material and not a fuel.

The construction of a new steel production plant, using the best available technology, has a small negative impact at local level, which is deemed to have little impact.

With the construction of the planned activities, work is being driven towards a less climate-damaging steel industry. In the long term, this will mean a reduction in greenhouse gas emissions at national and global level, which will have positive consequences in terms of reducing the climate impact. The planned activities therefore make a positive contribution to the national environmental goal of limiting climate impact and to the UN's global goal of combating climate change.

Climate Adaptation

The planned activities will in themselves lead to increased water flow through the sealing of large areas and the reduction of infiltration. The surface water study has proposed a general surface water solution for delaying and purifying surface water designed for 30 years of rainfall.

The impact of flooding caused by a changing climate is estimated to be manageable by well thought out altitude and stormwater management within the area of operations. The consequences of flooding caused by a changing climate are therefore estimated to be small.

Risk and safety

Operating stage: The handling of hydrogen and natural gas is the one that is most likely to cause a serious chemical accident.

Activities will work to protect the public, employees, entrepreneurs and the environment by continuously preventing and limiting the consequences of major chemical accidents.

The calculations of the probability and consequence of accidents show that risk mitigation measures within the planned area of activity are required. All hazardous substances and other chemicals shall be safely handled and stored to minimize the risk of serious chemical accidents occurring. Both preventive and restrictive protection measures are planned.

No scenarios within the planned activities of H2GS are deemed to cause domino effects that risk affecting neighboring activities. The domino effects considered are in particular those limited to the site of the activity.

The consequences that can affect people in the area or the environment are considered moderate.

Construction stage: Accidents at the construction stage such as road accidents and emissions from machinery and fuel tanks can lead to soil and groundwater pollution. Safeguard measures will be taken to reduce the likelihood of impacts on soil and groundwater.

It is not considered that the consequences of any discharges at the construction stage may develop into serious environmental consequences or may affect third parties outside the construction site.

Resource Management Energy

The planned activities require large amounts of energy, mainly in the form of electricity. The most energy-intensive parts of the planned activities are the hydrogen plant and the direct reduction of iron ore.

The choice of location has been made on the basis of the availability of renewable electricity from hydro and wind power. The plant is built on the basis of being as energy-efficient as possible in operation, using modern technology and energy-efficient equipment. Residual heat will be recovered and heat losses minimized. By having continuous processes, for example direct casting, there are large energy savings when reheating for hot rolling is not required. By having a continuous process, large energy savings will be made.

The business is judged to have small-moderate consequences based on the fact that the large amounts of energy needed to run the processes will be used optimally within the business but will also be able to be used externally through, for example, the residual heat generated. These can, if used, become heat in Boden and Luleå's district heating network and can then have a positive influence on energy consumption within the region.

Residues and waste

In terms of quantity, oxygen is the largest residual product produced. The oxygen will be defined as by-product and used, inter alia, in its own activities. In order to minimize waste quantities, slag, incandescent shell, sludge and dust will be used or recycled within their own facility or externally.

Waste in different fractions will be generated within the activity, but the aim is to minimize the amount of waste and its content of harmful substances for humans and the environment. The amount of waste deposited shall be minimal. By reclaiming residual steel from own and customer production and using it in steel production, the quantities of waste are reduced internally and externally. On this basis, the impact is estimated to be small.

Nature

Operation and construction stage: The majority of the planned area of activity is of low natural value, with the exception of an area classified as a key habitat with a high natural value. As the establishment of the planned activities means that the key biosphere will disappear completely, ecological compensation is proposed. It is appropriate to do this by locating a similar environment (marsh coniferous forest) in the same landscape section and providing formal protection, preferably in the form of a nature conservation agreement.

With proposed protection measures, the project is deemed not to affect the species covered by the Species Protection Regulation in such a way that the activity is deemed to be prohibited under the Regulation. Habitat loss will occur for some species, but for most similar environments, it is estimated that the surrounding landscape is so large that the population will not be limited by habitat loss of a smaller area which, moreover, is already largely affected.

Against this background, it is considered that no derogation from the SPA is required for the birds in the area. Thus, according to current legislation and practice, the prohibitions in the Species Protection Regulation are deemed not to be updated in the case of birds. In order to ensure that the pearl owl, the Eurasian sparrow owl and the slag owl are not adversely affected, hooks will be set up in nearby forests which are not affected by the exploitation.

In the case of the Lapp Rane, it is considered necessary to relocate the local stock in order not to violate the prohibitions in the Species Protection Regulation. It is considered relatively easy to find suitable habitats in surrounding landscapes to move the species to, so this protection measure does not assess the local population of the Lapp ranuncle to be affected and therefore the prohibitions under the Species Protection Regulation are not deemed to be triggered.

The impact on the natural environment is estimated to be moderate due to the disappearance of the key habitat.

This has a moderate impact on the natural environment.

Outdoor activities and recreation

The area where the activities are planned has good conditions for recreation or outdoor activities in terms of size, content and accessibility. With the construction of the site, it will no longer be possible to use it for recreation. Moving ski tracks, riding routes and snowmobile skiing means that these activities can still be carried out in the immediate area. The distance to the open air area Mining Mountain means that it is not deemed to be affected by the planned activities.

The planned activities are considered to have a small negative impact on outdoor life as similar areas are nearby. Overall, the impact on outdoor and recreational activities is estimated to be small.

Reindeer husbandry

Operating stage: The planned area of activity is within Gällivare sameby's winter pastures. The planned activities will result in a direct loss of grazing in the areas under development and an indirect loss of grazing within about 2 km of the planned activities due to the fact that the reindeer avoid the area where the disturbances occur. Gällivare sameby considers that the area where the activities are planned is not a valuable area for winter grazing. The consequences for reindeer husbandry are estimated to be small-moderate.

The planned activities are not considered to contribute to the existing disturbances that the reindeer industry in Gällivare sameby is currently experiencing from forestry, predators, mining, wind power, climate change, hunting with loose dogs and gravel and rock quarrying. Protection measures are planned to reduce the cumulative impact of traffic and outdoor activities. The contribution of the planned activity to the cumulative effects of mineral exploration and the disposal of land for building housing is considered small.

Construction stage: Disruptions in the form of increased human activity, transport and construction work during the construction phase can lead to an indirect grazing loss in the winter grazing area. Safeguard measures are planned, consisting of information and consultation of the sami village on the location of infrastructure and times for explosions and planning of construction transport. The consequences of possible indirect grazing loss are considered small due to Gällivare sameby's sporadic use of the grazing area.

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Cover image: Photo montage from the cemetery east, image produced by Sandellsandberg Arkitekter AB, 2021.

1 Administrative tasks

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2 Background

Steel is one of the most important industrially produced materials. Steel is used in industry, housing, cars, white goods and many other applications. Our modern society is simply dependent on steel. At the same time, the steel industry is one of the most CO2 emitting industries, accounting for 7% of CO2 emissions globally.

We are now facing the biggest technology shift in the global steel industry ever. H2 Green Steel's (H2GS) goal is to accelerate the transition by building large-scale fossil-free steel production, this is done by building a brand new plant from scratch.

The report of the Intergovernmental Panel on Climate Change (IPCC) in August 2021 shows that the climate is changing faster than research has previously shown. With the current emissions rate, the Paris Agreement's target of a 1.5 degree temperature increase will be passed within ten years, that is, ten years earlier than previously thought. It is therefore urgent to reduce the steel industry's carbon footprint as soon as possible. Steel's major impact on other industries' path towards sustainable solutions underlines the importance of this transition.

The planned new steelworks will use a new production process where hydrogen replaces coal and means that CO2 emissions will be reduced by the equivalent of 95% per ton of steel compared to conventional steel production. The steel plant will be part of the biggest technology shift in the global steel industry ever.

Large-scale fossil-free steel production is a necessity for the Paris Agreement's climate objectives to be achieved and will give Sweden and Norrbotten a central role in this global transition.

Activities will maximize environmental performance by:

It will not result in any emissions to water (other than mainly unaffected surface water). This is unique in the iron and steel industry and very unusual in other industries as well.

Emissions to air will be very limited compared to other similar activities. H2GS also undertakes to explore the possibility of further emission reductions.

Invest in an integrated, air-cooled slag handling to minimize environmental disturbances and optimize the use of the slag. No deposit of slag will be needed.

Meet the Environmental Protection Agency's guidelines for noise from newly established industry, which is also quite unique in the steel industry. Most of the plant parts will be built in to minimize environmental impact.

In the planned activities of H2G, the traditional blast furnace-based technology is replaced by direct reduction. The technology has been used for more than 50 years in places where natural gas can be extracted at low cost. In the planned H2GS plant, the natural gas is replaced by green hydrogen. Each production step in the flow will be driven by electricity, which reduces CO2 emissions. In the long term, the ambition is to bring emissions down to zero.

The plant will be fully integrated, which means that the proportion of energy used can be limited, as well as the storage and handling of materials. The plant will also maximize circularity by, among other things, recycling scrap in the process, using waste heat as district heating and using slag in other activities.

Using the latest technology in each step, a fully integrated production line is created which will be the first large-scale fossil-free steel production in the world. The product is fossil-free, high-quality steel that can be used in the automotive and automotive industries as well as in the manufacture of electronics, white goods, furniture and industrial machinery, etc.

The manufacturing process is flexible. Inward process steps can be varied based on desired properties of the final product. The following process steps are planned in the area of activity; electrolysis for hydrogen production, direct reduction of iron ore with hydrogen, electric arc furnace, casting, hot, cold and trim rolling, pickling, annealing, hot dip galvanizing and strip coating.

Figure 2-1 Drönarvy seen from Svartbyn east over the planned facility. The image is a photomontage produced by Sandellsandberg Arkitekter AB, 2021.

3 Timetable

Construction is scheduled for the summer of 2022 and the plant is scheduled to start operating in 2024. Production will increase stepwise, by 2026 the plant will have a capacity to produce 2.5 million tons of steel per year and by 2030 the plant will have reached its full capacity to produce 5 million tons of steel per year.

4 Scope of the application

H2GS applies for a license under Chapter 9, Section 6 of the Environmental Code for the construction and operation of a steel plant, etc. within Svartbyn's business area in Boden municipality including the production of 280 000 tons of hydrogen and 4 200 000 tons of iron mushrooms per year and the following annual maximum production (invoiced products):

a) 5 000 000 tons each of prime substances and hot rolled strips,

b) 2 100 000 tons of annealed, pickled and cold-rolled strips,

c) 2 100 000 tons of galvanized bands, and

d) 400 000 tons of lacquered ribbons.

The activity is an industrial emissions activity and is therefore covered by the Industrial Emissions Regulation (2013:250). A status report under Chapter 1, Paragraph 24(p). The Industrial Emissions Regulation has been established, see Annex B9.

The activities are covered by the Act (1999:381) on measures to prevent and limit the consequences of serious chemical accidents (Seveso Act) and are subject to the higher level of requirements.

The construction of the business also includes diversion of Lillbäcken, H2GS also applies for permission for that action.

5 Localization

H2GS will establish operations in the region of Boden-Luleå, where a number of world leading companies and research institutions in the metal and mining industries have their base. Norrbotten offers unique conditions for fossil-free steel production with good access to energy from renewable sources, high-quality iron ore and a large port in Luleå.

Figure 5-1 H2GS plans to establish operations in Boden.

5.1. Field of activity

The area is located east of the northern Svartbyn and today consists mainly of woodland and to some extent agricultural land. The area currently has a few residential buildings and holiday homes, these have been acquired by the municipality of Boden and they will therefore not be used as housing in the future. To the west of the business area is the residential area Norra Svartbyn. The distance to the total settlement in northern Svartbyn is 300 meters. The closest housing units are three buildings 155-170 meters from the boundary of the business area (north of the planned business area). As the business area is very large and different parts differ greatly in degree of disturbance, distance to the nearest residential building is reported from a number of construction parts below. DRI and electric arc furnaces are considered most disturbing to the environment while

After-treatment lines such as galvanization are deemed to cause very little to no disturbance to the environment.

Table 1 Distance to nearest residential buildings from different parts of the installation

Installation part	Distance to nearest residential immovable property
DRI plant and steelworks	about 800 m
Raw material management	1050m
Nearest operational building (galvanizing line)	360m
The edge of the industrial area (north)	155m

No other activities have been established in the area so far. A major existing switchgear with extended grid consisting of both regional and trunk networks is located near the area.

The area is close to Highway 97, the railway between Boden and Luleå (Malmbanan) and the Main Line through upper Norrland.

The planned activities will mean that the infrastructure in the area will have to be expanded. The road, rail and power line are planned to be extended to the area. The State Road 605, which is currently in the planned area of operation, needs to be partly rebuilt.

The majority of the land in the area is now owned by the municipality of Boden. Before the operation begins, the land will have changed hands to H2GS.

Figure 5-2 Preliminary possible design of the installation. Please note that this may be adjusted during the investigation. Situationsplan developed by Sandellsandberg Arkitekter AB, 2021.

5.2. Plan conditions

5.2.1. Master plan

The area of activity is located within Svartbyn VU5 which in the municipality's master plan, adopted in 2017, is designated as an area of investigation for activities. Svartbyn VU5 covers an area of approximately 500 hectares where access to green electricity and large areas of land provide unique conditions for the establishment of surface demanding activities aimed at electricity intensive industries. Within the municipality of Boden there are no other locations with equally favorable conditions for the location of large-scale establishments, given that the following requirements for localization are met in the area:

- **The availability of green electricity is high.**
- **Proximity to existing communications in the form of road and rail exists or can be created.**
- **The disturbances of the activity on existing buildings are small.**

The northern part of the planned area of activity of H2GS is partly outside the scope of the MIP-designated area of investigation VU5. This is because geotechnical studies have shown that the soil conditions of the chosen location are better adapted to the specific requirements of that activity than the soil conditions further south.

Figure 5-3 Research area for activities (VU5) available in the master plan for Boden municipality.

5.2.2. Detail plans

The municipality of Boden is working on a detailed plan for the Svartbyn VU5 business area in which H2GS plans to build its business. The purpose of the NRP is to create opportunities for electricity-intensive, large-scale and other industrial activities. Work on the development of the detailed plan is ongoing in parallel with the work of H2GS on the application for a permit for the planned activities.

The detailed plan area covers the entire VU5 field of investigation from the master plan and adjacent areas. Within part of the area a detailed plan has been developed earlier and in another part of the area detailed planning work has started. With the new detailed plan being developed, the previously developed detailed plans are deleted.

The State Road 605 is currently within the planned area of operation. The focus of the municipality of Boden when planning the detailed activities of Svartbyns area, where H2GS plans to build its operations, is to enable mainly establishments that contribute to the transition for a more environmentally friendly and sustainable industry. In order to make possible the extensive building bodies and the infrastructure required for establishment in this direction, there is a need for large, coherent areas of activity. In order to

If this is to be possible, sections of road 605 passing through the plan area are proposed to be redirected. The existing road is planned as quartz land.

Figure 5-4 Detail plan area of the Svartbyn VU5.

Work is also under way to develop a detailed plan for an area which is designated as a ground reserve for infrastructure in the Municipality of Boden's 2025 master plan to ensure connection between the business area Svartbyn and the traffic site Södra Svartbyn. See Figure 5-5.

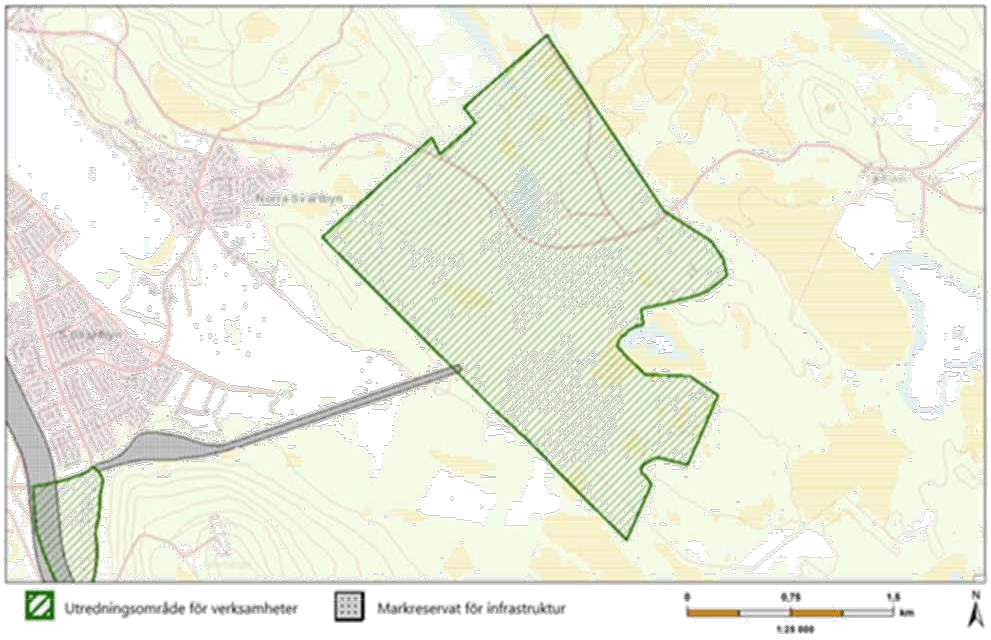

Figure 5-5 Infrastructure ground reserve (marked in gray) Business investigation area (VU5) contained in the master plan for Boden municipality (green striped marking). Map from Boden municipality map service for the overview plan.

6 Delimitation and methodology

6.1. Basis for the EIA

It is the impact of the requested activity as described in the technical description (Annex A) that shall be subject to an impact assessment.

The following conditions apply to the operation:

Water both for use in the business processes as well as for electrolysis and cooling is taken from Lule river (supplied by Boden municipality).

The only discharge of water from the site will be treated surface water from sealed surfaces with a lower level of pollution. Processed purified water, cooling water and surface water from sealed surfaces with a higher degree of pollution will be recirculated within the plant and no discharge of these waters to any recipient. For this reason, the EIA does not include any receiving waters study.

The activities are being carried out in areas that will be covered by detailed plans for industrial activities. Work on the development of the detailed plan is ongoing in parallel with the application for authorization.

Safeguards and control

H2GS will implement a range of operational safeguards. Safeguard measures taken are defined by the proposed conditions set out in the application and in the technical description. Safeguard measures are also described in section 8 of this EIA.

The activity will also take the protective measures laid down in the detailed plans to which the field of activity will be subject.

A draft operational control program will be submitted to the regulatory authority before the planned start of operations.

6.2. Geographical delimitation

The consequences of the planned activities have been examined and described both for the area of activity itself and from a wider geographical perspective, within the area which may be affected by the activities. The size of the impact range varies depending on the environmental aspect being studied.

6.3. Time delimitation

The EIA covers both the construction phase and the operation phase of the installation. The construction phase refers to the period of time during which the planned activities will be carried out. The 'operation stage' means the period after the planned operation has been completed and put into operation. Assessing effects and consequences over a long period of time means that the longer the period of time over which assessments are carried out, the greater the uncertainty. The assessments

is made on the basis of current conditions, with respect to conditions in nearby areas.

The following starting points apply to the temporal delimitation:

The current situation is based on 2021.

The impact on the operational phase (including the zero option) is assessed on the basis of 2030, as it is at this point that the plant will be fully operational.

The construction phase is estimated to be just over 2 years starting in 2022.

6.4. Environmental aspects

The aspects affected by the planned measures and therefore subject to an impact assessment in this EIA have been defined by the compilation of facts and information and by the conduct of consultations. The environmental aspects assessed are presented in Table 2 and described in more detail and are assessed for impact in Section 8.

Table 2 Environmental aspects where the risk of operational and construction impacts is assessed.

Environmental aspects	Consistency described in MKB	Comment
National Interests	Section 8.1	The planned activities are: the proximity of a number of designated areas as national interests.
Surface water	Section 8.2	~~The activity involves the discharge of~~ surface water from non-cabled contaminated surfaces.
Groundwater	Section 8.3	The activities may have an impact on groundwater level.
Air	Section 8.4	~~the activity involves the emission to air~~ of: mainly carbon dioxide, nitrogen oxides (NO_x), dust (containing metal oxides and lime) and organic pollutants.
Pollution of soil and groundwater	Section 8.5	~~Soil environmental studies have been~~ carried out.
Noise	Section 8.6	the activity is expected to generate noise; from the different processes and transport and traffic which will be increase in the area.

Environmental aspects	Consistency described in MKB	Comment
Landscape image	Section 8.7	This activity will change the area from a forest and agricultural area to a industrial area and that high will be built on site, including: two about 140 m high DRI towers.
Cultural environment	Section 8.8	The planned activities are: proximity of areas designated as of cultural interest, including a national interest.
Climate change	Section 8.9	Although the planned activities of the long-term perspective means a reduction of CO2 emissions from the steel sector, the activities greenhouse gas emissions from different process elements by means of: transport and traffic which will increase within the area.
Climate Adaptation	Section 8.10	There is also a risk of operations due to external events caused by climate change.
Risk and safety	Section 8.11	The planned activities will include: substances which may give rise to accident hazards to managed. There is also a risk of environmental effects following external events.
Resource Management - Energy	Section 8.12	The activity involves consumption of electricity and waste heat is generated.
Residues and waste	Section 8.13	This activity involves the by-products.
Nature	Section 8.14	The establishment of the activity involves: areas with designated natural values will be built.
Outdoor activities and recreation	Section 8.15	Within and close to the planned the area of activity is snowmobile; ski tracks and riding trails.

Environmental aspects	Consistency described in MKB	Comment
Reindeer husbandry	Section 8.16	The planned activities fall within Gällivare samebys winter country.

6.5. Construction stage

Soil construction work will last approximately 18 months. Construction of buildings is scheduled for Q3 in 2022 and the plant is scheduled to start operating in 2024.

Construction of road connections (e.g. new connection to road 97) and railway outside the operational area is carried out and managed by the municipality of Boden.

The soil preparation in the planned area of activity will include excavation and padding. The current Lillbäcken will be re-directed around the area according to Figure 6-1. What remains are the last 500 meters before Lillbäcken flows into Storbäcken.

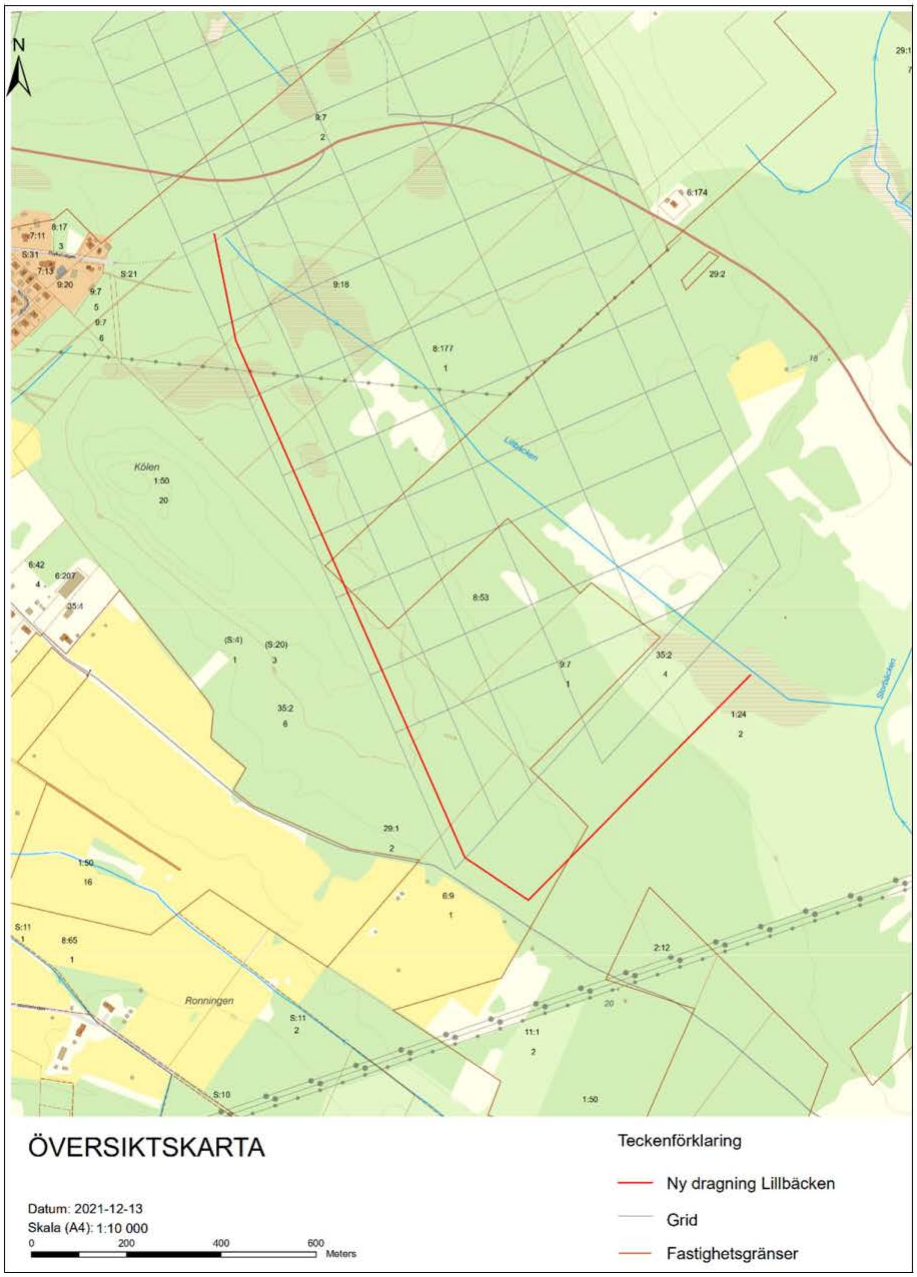

Figure 6-1 Lillbäcken is led around the area of operations. Most of the existing stream is closed. New draw is denoted by a red line in the figure.

When the land is ready for industrial activity, the groundwork begins.

The basic work includes, in addition to the construction of parking and roads within the industrial area, piling and concrete works for the foundations of the buildings. Then the construction of the building frame assembly followed by facade and roof works continues. The business area will be built from the southern part of the intended industrial area and north.

In total, about 6 million m³ of earth will be terraced in the area by excavation, transportation and filling. Some material will be transported in from surrounding existing supplies.

In addition to mass transport and supplies, normal construction traffic such as passenger cars and transport to and from the workplace will be on road 605. In total, an estimated 375 vehicle movements (passenger transport not included) per day will be required for the construction work. This will result in an increase in emissions of particulate matter and nitrogen dioxide in the area.

During the construction phase, dusting can also occur from, for example, open gravel surfaces, loading of loads and other transport. Dust abatement measures will be applied during the production phase.

The installation will generate noise, for example during excavation and piling. Silencers or alternative methods will be used whenever possible to reduce disturbance for local residents. Regular noise measurements will be carried out as a check against the Environmental Protection Agency's guide values for noise from construction sites.

7 Activity sought

The business will produce hot rolled, cold rolled, annealed, galvanized and varnished bands. Production will increase gradually and by 2030 the plant will have reached its full capacity to produce 5 million tons of steel per year.

The following is a summary description of the planned activities as described in detail in the technical description (Annex A).

7.1. Design

The area of activity is divided into two areas. The steelworks occupies an area of about 160 ha in the west and the electrolysers occupy an area of 20 ha in the east. Part of the steel business means that some tall buildings will be built on the site. The highest buildings within the business area will be the two DRI towers, which will be about 140 m high. The DRI towers will be located in the southern part of the planned area of operation, to get further from existing buildings. In the north of the area, the buildings for the coating lines will be located. In between, the building for electric arc furnaces will be located. Most buildings will be 25-30 m high, but there will be buildings 80-85 m high. There will also be several lower towers, about 60-70 m and chimneys. Transport to the area will mainly take place via new rail and road which will be built the far south.

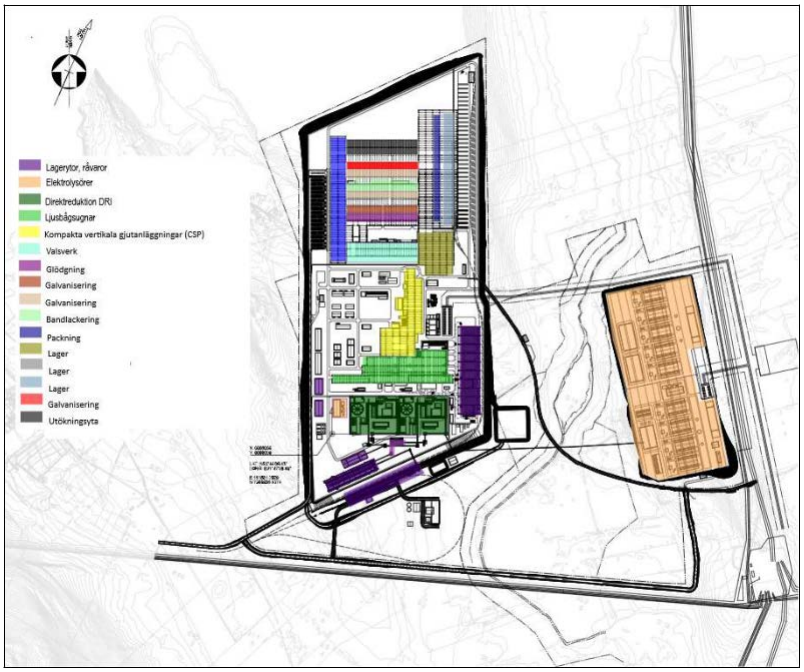

Figure 7-1 Preliminary layout of the installation.

7.2. Production process

The manufacturing process is flexible, which means that input process steps are varied based on desired characteristics of the final product. The following processes are planned to be included in the installation; hydrogen production, direct reduction of iron ore pellets, smelting of electric arc furnace input material, adjustment of kiln melt, direct casting and hot rolling, pickling and cold rolling, annealing and galvanizing in three production lines, trim rolling and strip coating.

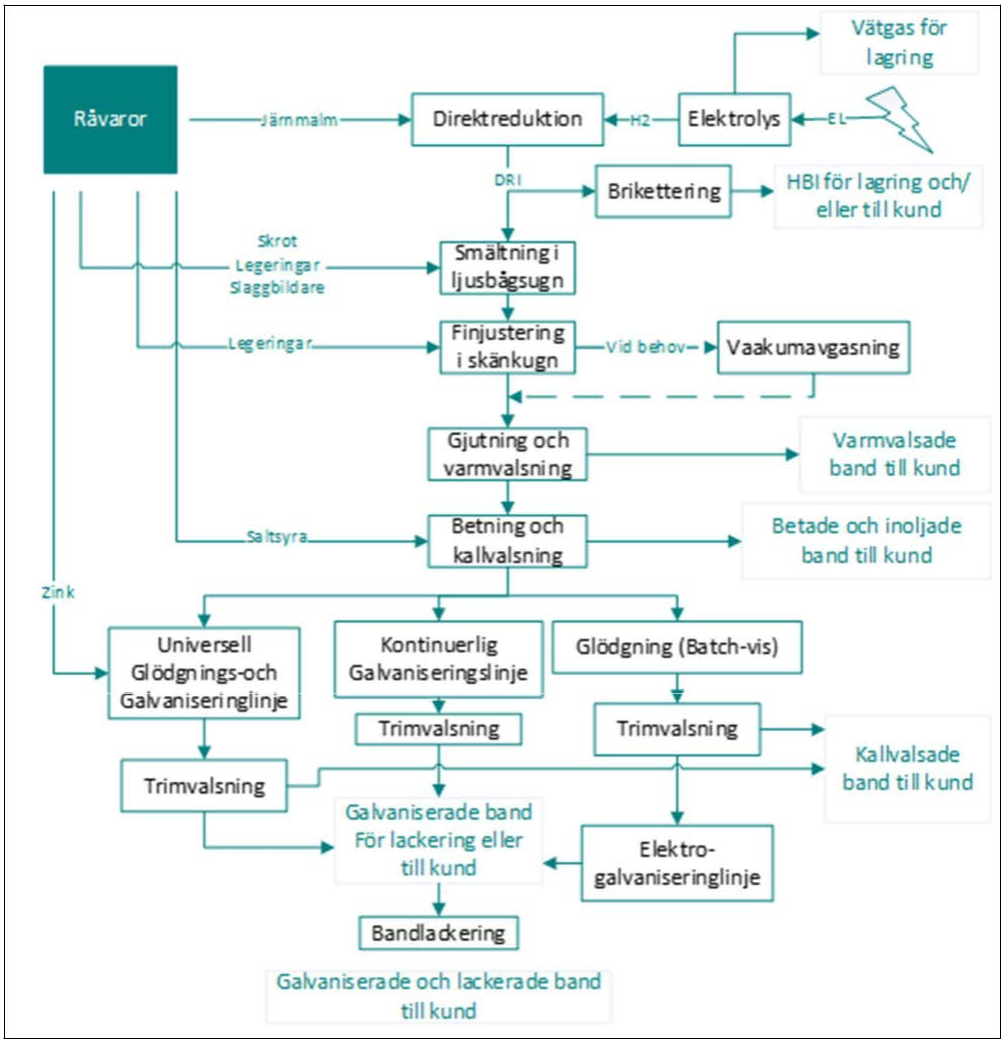

Figure 7-2 Summary sketch of the planned manufacturing process.

Manufacture of hydrogen

At the planned plant, hydrogen will be produced by electrolysis of water. Electrolysis is the cleavage of water into hydrogen and oxygen by electricity in an electrolyzer. Electricity from renewable sources such as water and wind power will be used in the electrolysis. This defines H2GS as green hydrogen. The hydrogen is used primarily for iron ore reduction.

Most of the hydrogen produced will be used immediately and delivered by pipeline to the iron ore reduction (DRI plant). A warehouse, equivalent to a few hours' needs, will be available for three purposes (i) secure shut-off of DRI, (ii) support the transmission network with frequency balancing and (iii) offer back-up power to the steel plant via fuel cells. The latter represents a major investment for H2GS but eliminates the need for a diesel generator for back-up power. This reduces emissions and the impact of the environment.

There are mainly three techniques of electrolysis today; Alkaline (ALK), Proton Exchange Membrane (PEM) and Solid Oxide Electrolyzer Cell (SOEC). Hydrogen production for steel production is an innovative technology that will develop rapidly in a short time. It is therefore not appropriate to indicate which technology will be used in the planned installation.

The main principle of the three technologies is the same. The main difference between the techniques is the chemical reaction with which this is achieved and the distribution of energy during the reaction.

The planned plant will consist of a number of modules that can produce jointly over 30 tons of hydrogen per hour. The electrolyzer consists of smaller modules which are connected together and connected to a whole.

Direct Reduction

In the plant, pelleted iron ore will be directly reduced to iron fungus (DRI) with hydrogen produced by the electrolysers of the business. In traditional steel production, the reduction step generates large amounts of carbon dioxide emissions. The use of hydrogen means that the CO2 emission from the reduction step is eliminated.

Electric arc furnace

In order to produce crude steel, intermediate materials consisting of hot DRI and dried scrap and slag formers are loaded in arc furnaces for melting.

Jaw and vacuum exhaust

After the electric arc furnace, the chemical composition and temperature of the melt in the shaker are fine-tuned for casting. The melt is stirred to obtain a homogeneous mixture and a uniform temperature. Alloys are added to obtain the desired properties of

the final product. For certain steel grades, the melt is purified for sulfur and nitrogen in a vacuum exhaust.

Direct casting and hot rolling

Unlike traditional steel production, where continuous casting is the most common method of casting, the technique of direct casting will be applied. The technique involves casting and hot rolling of thin slabs directly into the line without intermediate storage and reheating in a so-called Compact Strip Production (CSP) plant with two casting machines. The process entails significant energy savings compared to continuous casting.

pickling and cold rolling

After hot rolling, the straps will be treated in a stretch of bite where iron oxide is separated from the surface of the straps by treatment in hydrochloric acid.

In the planned operation cold rolling will be carried out in a tandem mill. Rolling in tandem mills is a continuous, non-reversible process aimed at reducing the thickness to 2,5 - 0,3 mm depending on the intended final product.

Surface treatment

Surface treatment is carried out to give the material desired properties regarding e.g. hardness, corrosion resistance and appearance.

Four coating lines are included in the design of the plant, three for galvanization, one of which includes electrogalvanization and one for painting (painting) of materials.

Two of these are broadly designed the same with the process steps of degreasing and cleaning, rinsing and drying, annealing, cooling and hot dip zinc, finishing and trimming. The production lines differ with regard to the design of the annealing furnace and depend on the desired steel grade. The third galvanizing line is called electrogalvanization and differs from others by including an electrolytic cleaning step in the process configuration.

Finally, the strips can be painted in a strip coating line.

7.3. Treatment plants and emissions

Manufacture of hydrogen

Filtered raw water for hydrogen production will be deionized in a separate plant before being used for electrolysis. The deionization results in an elevated metal and salinity sludge which is diverted to a neutralizing vessel to prevent large volumes of water with large variations in pH being diverted to the central water treatment plant.

Hydrogen production does not produce any emissions to air other than oxygen.

Direct Reduction

Sponge iron is a porous and dusty product. Therefore, in order to minimize the problem of diffuse dusting, the iron sponge is transported from the DRI plant tower to the electric arc furnaces in covered heated conveyor belts. Iron ore spillages are collected and reused.

Sponge handling will be complemented by dust removal systems consisting of textile latch filters, ID fans, dust removal systems and chimneys.

The DRI towers are equipped with a wet scrubber where particles and water are filtered out of the gas. The gas can be partially reused in the gas heater. The gas heater gives rise to unconsumed reducing gas (hydrogen and carbon monoxide) and a sludge. Part of the surplus gas will flare, resulting in less CO2 emissions.

Water is used for direct and indirect cooling. The process affects the pH, nitrogen and sulfide content in the water. In a sedimentation tank, the water flocks and the purified water is reused in the scrubber. The sludge is channeled to a water treatment plant where sludge thickening and filter pressing are carried out.

As the DRI system produces noise, noise abatement measures will be applied.

Excess gas from the DRI process, i.e. unconsumed reducing gas (hydrogen and carbon monoxide) will be purified in a Pressure Swing Adsorption (PSA) facility. The residual gas from the PSA plant is burnt in a torch, which results in a lower level of CO2 emissions.

Melting in electric arc furnace

Melting produces emissions of metallic dust, carbon dioxide, nitrogen oxides and sulfur to air. Small amounts of mercury and dioxins are also emitted from electric arc furnaces. In order to minimize mercury, scrap containing it is avoided where possible. Primarily, internal scrap and scrap from H2GS customers will be used. All incoming scrap will be subject to reception control for radioactivity, for example.

Emissions from electric arc furnaces will be treated in flue gas purification plants to minimize emissions to air. Waste heat from the flue gas cleaning will be reused. Purification facilities consist of a combination of direct extraction, hooding and encapsulation, including cyclone separator, activated carbon injection, filter unit and stack.

The electric arc furnaces' flue-gas channels will be provided with continuous dust measurement.

The water used for cooling in the electric arc furnace does not come into direct contact with the material and is thus only thermally charged.

The introduction of scrap also produces noise, so that noise emissions are minimized, the electric arc furnaces will be encapsulated. In addition, the melting process gives rise to slag, dust and bricks.

Jaw and vacuum exhaust

Emissions from the kiln and vacuum exhaust will be treated in the flue gas plant described above.

Direct casting and hot rolling

The process gives rise to incandescent shells. Water used to remove the incandescent shell is collected in a glow scale basin where separation of the incandescent shell and water occurs. The water is then pumped to the water treatment plant for treatment. Cooling water used for cooling of e.g. rolls is fed to the same treatment plant.

In order to be able to produce steel grades with high surface requirements for the material, e.g. structural steel for the automotive industry for exposed vehicle parts, the process step oxygen planing is planned. Syragas planing is a process of melting a thin layer of surface with burners using oxygen in combination with: a combustion gas, such as hydrogen. The objective is to remove surface defects which: for example surface oxides, slag and flakes. The dust arising at the oxygen planing will be separated in filter plants. The detached dust will be disposed of and reprocessed, the metal content of the dust makes it a valuable residue.

pickling and cold rolling

The relevant parts of the stretch of pasture will be encapsulated as a work environment measure to prevent vapors to the surrounding working area. The vapors are led to an absorption tower, some vapors will first go via the drop separator. Purified air is released via the chimney.

To reduce the consumption of acid, regeneration will take place. This is done by removing dissolved metals from spent hydrochloric acid. The dissolved metals consist of iron oxide which can be reused in the electric arc furnaces. Water used is recirculated in the regeneration process. Rust gases are purified from hydrochloric acid with countercurrent absorption in a tower (wet scrubber), with water as absorption media. The gas leaving the top of the absorption column undergoes an additional cleaning step in a other wet scrubber (protective tower) with a much higher proportion of absorption liquid. After the absorption towers, purified rust gas is passed through a final cleaning step consisting of a combined absorption tower and a venturi rubber. The water injected into this absorption tower is collected at the bottom and recirculated both to a venturi rubber and to the absorption tower. This prevents the formation of water that requires treatment. The purified air contains dust, sulfur and nitrogen oxides. Purified air is released into the atmosphere through a chimney that is formed, purified in absorption towers and released to the atmosphere via the chimney.

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Cold rolling produces oil mist which is purified with oil mist separators before purified air is released to the atmosphere. Separated oil is led to an oil pit, from which oil-containing sludge is treated as waste. Dust formed is separated in textile latch filters. Water used is purified in the water treatment plant and recirculated within the activity.

Surface treatment

In the galvanizing line, the purification and rinsing stages will be provided with extraction where the residues of the alkaline solution will be separated in a drip separator.

The exhaust gases for the ignition furnaces consist of nitrogen and hydrogen and hot air.

Waste water from alkaline degreasing is led to a flotation process. The water is then treated with neutralization and filtration in the water treatment plant.

Water is used for cleaning, rinsing and cooling in the process. The rinse water is treated in a pre-treatment step before being diverted to the water treatment plant for purification and recirculation. Cleaning steps including rinsing are supplemented by absorption towers where the residues of the alkaline solution are separated before purified gas is passed into the atmosphere. Smaller amounts of nitrogen, carbon monoxide, carbon dioxide and water are emitted to air. Residues of volatile organic gases (VOCs) are emitted to air after the gases are oxidized at high temperature to carbon dioxide and water.

Industrial water treatment plants

Various steps will be taken to purify used industrial water according to its origin and degree of pollution. These include the cleaning steps; oil separator, neutralization, metal precipitation and polishing. All water will be purified and recirculated. No process or cooling water will be diverted to the recipient.

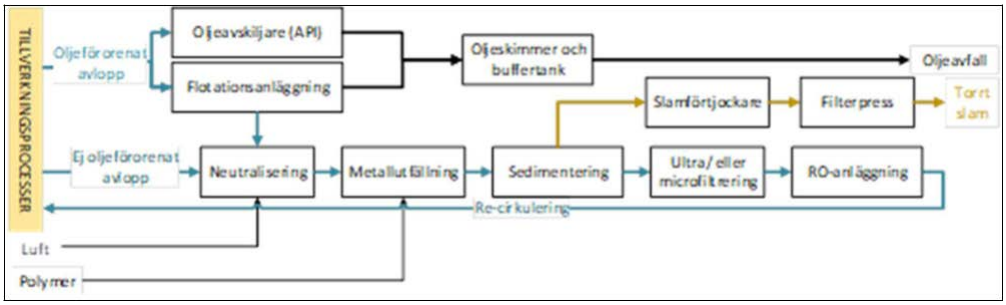

Figure 7-3 Overview of water treatment

7.4. Other activities

A number of other activities will be needed to support manufacturing processes. Examples of such activities include mechanical workshops, masonry workshops, stockpiling of supplies and processes for reprocessing, handling and storing residues. There will be own emergency services within the operation.

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7.5. Raw materials, chemicals and media

The raw materials consist mainly of water and energy for hydrogen production, as well as iron ore pellets and hydrogen to produce iron fungus. In addition to the iron sponge, the crude steel is produced using scrap, alloys and slag formers as well as electrical energy for the smelting and refining of the steel. In addition, a number of chemicals are also used, including for water purification and for steel finishing.

Iron ore pellets will be stored indoors in silos. Raw materials in the form of scrap, alloys and slag formers and foundry powder will be stored in the planned raw material farm under roof. Raw materials in powder form are stored in lined silos or in original packaging.

Chemicals will be stored indoors or outdoors depending on what is most safe and optimal in terms of internal transport and production processes. The unloading of dangerous substances that may take place outdoors will take place under roof and with secondary barrier (bundling) on sealed surfaces. There will be several storage areas for supplies in a central warehouse, an oil warehouse and a fireproof warehouse. The use of chemicals containing substances included in the Swedish Chemicals Inspectorate's PRIO list of phase-out substances and risk reduction substances shall be restricted. All chemicals used shall have been subject to internal risk evaluation prior to purchase and use.

Scrap

The scrap used in the production will consist mainly of internal scrap but also sales scrap and recycled steel. Internal scrap is scrap from its own operations, such as end caps and discarded material. Return steel is produced by H2GS customers where the products are cut, cut, pressed and more. Return steel has a known analysis and quality which makes it very useful as a input material in the arc furnace.

Purchases of PPP are made from the open scrap market. Purchasing scrap has more or less known origin and may consist of, for example, scrapped cars or household appliances. There will be no processing of scrap at the plant, for example cutting scrap.

Water

Water will be required for hydrogen production, cooling, cleaning, rinsing and pickling. All the water needed for the plant is purchased from Boden municipality and is raw water from Lule river.

The water used in the cooling activity is divided into water used for direct cooling (the water comes into direct contact with the material) and indirect cooling (the water does not come into direct contact with the material). Process water used for direct cooling will be directed to the treatment plant where it is treated before the purified water is recirculated in the activity. Cooling water for indirect cooling of equipment will be thermally charged but will not contain any pollution, also this cooling water will be recirculated in the activity. See Chapter 7.4 Treatment plants and emissions.

The surface water generated in the area will be treated differently according to where within the installation it occurs. Groundwater coming into contact with pollutants will be purified and used in the process while other surface water is specifically treated. Delay and purification is done in order not to load the treatment plant with unpolluted water and to reduce the impact on the surrounding watercourses and the environment.

Extinguishing water arising in the event of a fire shall be collected in such a way that it does not infiltrate into the ground and thus spread to the recipient. After collection, sampling and analysis may be performed to assess the degree of contamination.

In the planned installation, no water will be released to receiving waters, except for treated surface water from less polluted surfaces.

Steam/hot water

Steam will be produced by the recovery of residual heat from the electric arc furnaces, but an electric boiler is available in cases where the electric arc furnaces are not running. Steam is used in several processes.

Compressed air

Compressed air will be needed throughout the plant, therefore a compressor system will be installed. The compressors will be placed inside the buildings.

Gases

It is not possible to supply the plant by pipeline with natural gas; the gas will be transported to the plant by road or rail. The gas will be stored in tanks and distributed via pipelines to the parts of the production where it is used. It is the plant's intention to minimize the use of natural gas in the future and to evaluate gas burners that can run on hydrogen as an alternative.

Other gases that will be used are mainly argon, nitrogen and oxygen. These gases will be produced within the plant via a gas separation plant.

7.6. Power and mains connection

Large quantities of electricity will be required to operate the planned activities. The most electricity-intensive parts of the planned activities are the hydrogen plant and the direct reduction of iron ore. The adjacent switchgear will probably need to be expanded. At the plant, the voltage will be switched down in a substation.

The activity will generate residual heat, which will be reused as much as possible within the activity, but may also be used externally, such as district heating and land heating in cooperation with, among others, local energy companies.

7.7. Residues and waste

The residues arising from the operation consist mainly of oxygen, slag, incandescent, sludge and dust. The aim is to recycle, re-use as much as possible the residues arising from operations

The electrolysis of water into hydrogen also produces oxygen. Investigation is under way as to whether the oxygen can be used internally in steel production, otherwise there are external uses such as seawater oxygenation, fish farming or other industries.

Residues and waste will be generated in steel production. These consist mainly of slag, incandescent shell, sludge and dust from steel production and chemical residues from steel finishing. Investigations are under way into how slag can be used or recycled. Possible uses of the slag are for construction purposes, as input materials in cement, as cover layers of mining waste. There is also the possibility of extracting metals from the slag. No landfill of slag is planned in the area of activity. Glow shells can be reused internally in an electric arc furnace or in the DRI process. sludge will either be sent to an external operator for recycling of iron or be disposed of. Electric arc furnace dust has varying composition depending on the scrap used. If the zinc content is high, the dust can be used as input material for zinc producers.

In addition to the abovementioned residues, waste such as lubricating oil from plants and vehicles, packaging residues etc. are generated. Waste also occurs in the form of process parts that need to be replaced when worn.

7.8. Transport

Transport to and from the planned operation will be carried out by rail and road 97. A new industrial track will be built into the area with a new road running parallel to the railway track.

Material transportation into the business is estimated to consist of about 9 trains and about 32 trucks per day that supply pellets, gas, scrap, zinc and other materials. Deliveries will be made by truck from Tornio, by train from Malmberget and Aitik and by both train and truck from Luleå port.

Transport out of the business is estimated to consist of about 4 trains and about 12 trucks per day running products and waste. Transport out of the business will be by train to Luleå port and Boliden and by train and truck to Luleå.

Hydrogen will be transported internally within the area via a line from hydrogen production. Within the facility, different transport vehicles will be used for internal transport. The number of internal transport within the field of activity is minimized by the use of conveyor belts, pipes and wires.

Figure 7-4 Overview of planned shipments.

8 Environmental impact

The consequences of the activity sought, i.e. when the installation is fully operational, and the consequences during the construction phase are described below.

The impact assessment is structured in such a way that the assessment criteria and the current situation/conditions are described first, then the proposed protection measures are presented, after which the impact assessments themselves follow.

8.1. National Interests

National interests are regulated in Chapters 3 and 4 of the Environmental Code and are areas that contain such special values or have such special conditions that they are deemed to be important for the kingdom as a whole. In an area of national interest, the value or importance of the site must not be significantly damaged by exploitation or other environmental interventions.

8.1.1. National interest of the Total Defense

The planned area of operation is in the national interest for the total defense pursuant to Chapter 3, Paragraph 9 of the Environmental Code regarding obstacle free area for firing fields. The reason why there should be freedom from obstacles in practice areas is because in those areas there are joint exercises between air and ground forces. In order to cover the need for obstacle freedom, the Swedish Armed Forces have designated a barrier-free area. In obstacle-free areas, the Swedish Armed Forces analyzes every case where the obstacle freedom is in danger of being jeopardized. This means that new objects can be allowed if deemed appropriate and there is therefore no general ban on measures in obstacle free area.

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Luleå/Kallax flotilla airport operates both military and civil aviation. The airport is partly a national interest for the military part of the total defense under Chapter 3, Paragraph 9 of the Environmental Code and partly a national interest for aviation under Chapter 3, Paragraph 8 of the Environmental Code. Within the high-end stop area and the MSA area of the national interest, height restrictions are set. Within the stopping area, the height limits apply to objects higher than 20 meters outside the contiguous settlement and higher than 45 meters within the contiguous settlement. Within the minimum safe altitude (MSA) in question, the construction of objects higher than 600 meters above sea level would cause significant damage to the national interest. The planned operation is just outside the stopping area for high objects and within the MSA area belonging to the national interest Luleå/Kallax flottiljairport.

Part of the area of activity is within one of the Swedish Armed Forces' designated areas of influence, incidentally, national interest. The national interests included in the category "Other areas of influence" are covered by confidentiality pursuant to Chapter 15, Section 2 of the Act on Public Access to Information and Secrecy (2009:400).

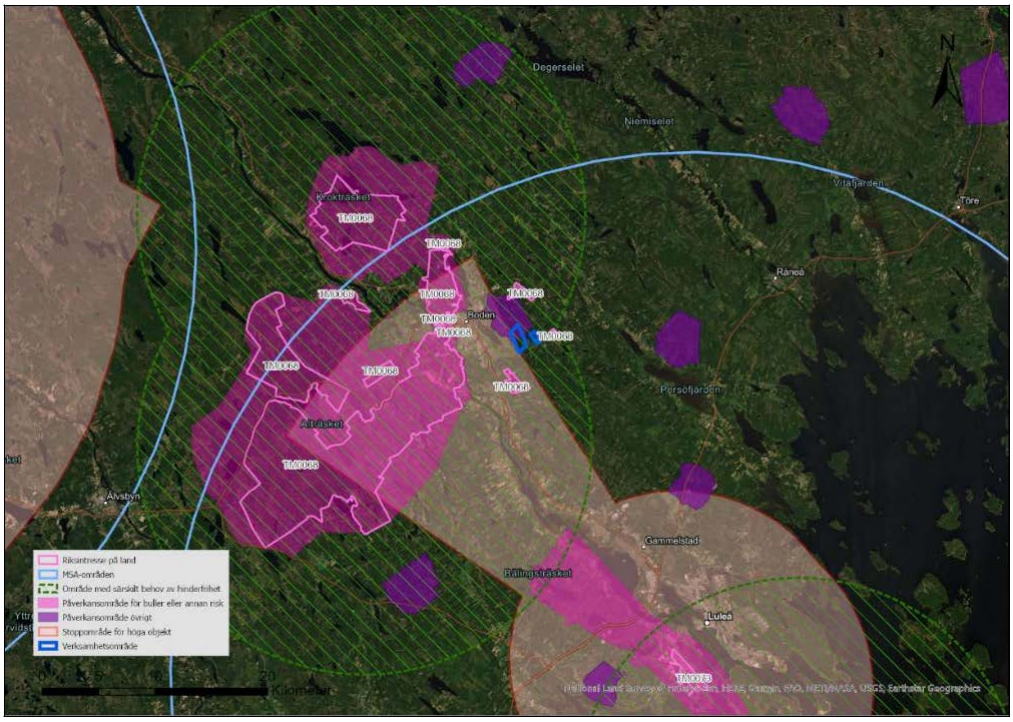

Figure 8-1 Areas of national interest for the total defense. The approximate location of the planned operation is highlighted in blue.

8.1.2 Public interest communications

To the west of the area goes national road 97 and the main line through Upper Norrland, which constitute national interests for communications under Chapter 3, Section 8 of the Environmental Code.

National Road 97 is considered to be of national interest as it is of particular importance for regional and interregional traffic. The part of the road between Boden and Luleå is an important link between two regional centers, which further underlines the importance of the road for the region.

The tramway through Upper Norrland is part of the designated TEN-T network and is of international importance. The line stretches between Luleå and Bäcke, it is also included in the strategic freight network. The line is very important not only for freight traffic but also for passenger traffic. The course is the link between southern Sweden and Central Europe with the Ore Line and the North Cap area with connections to Northern Norway, Finland and Russia.

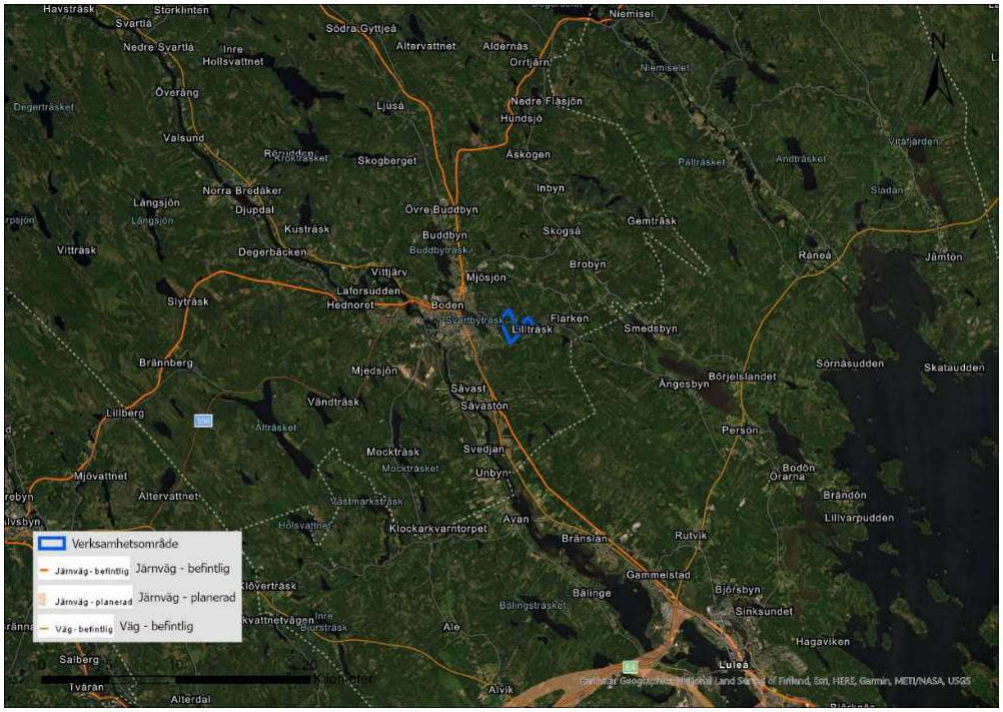

Figure 8-2 Identified roads and railways of national interest for communications. The approximate location of the planned operation is highlighted in blue.

8.1.3. National interest in cultural environment

The national interest of Boden (BD 74) consists of five sub-areas, one of which, Gammelängsberget is located in the vicinity of the area where the activities are planned. The area is of national interest to the cultural environment under Chapter 3, Chapter 6 of the Environmental Code. The national interest consists of a military environment and garrison town that reflects Sweden's defense and defense policy during the 20th century at a strategically located junction for country roads, waterways and railways. The protection provided by the environmental code means that development and other measures may only be implemented in such a way that they do not significantly damage the cultural values of the area.

Gammelängsfortet, which is part of the national interest area, is a listed building according to a 2015 decision. A State building may be declared a State listed building if it has a particularly high cultural and historical value or is part of a built-up area with a particularly high cultural and historical value under the regulation on State listed buildings. These include the maintenance and maintenance of facilities so that the value of cultural history does not diminish. The same applies to troop fortifications and defense facilities within the defined area.

Figure 8-3 The sub-area Gammelängsberget of the National Interest for Cultural Environment is highlighted in red. The approximate location of the planned operation is highlighted in blue.

8.1.4. National interest in reindeer husbandry

The reindeer industry is a public interest in whose activities there are designated areas of national interest which, taken as a whole, aim to preserve the conditions for reindeer herding. There are, among other things, designated core areas, work and intermediate migratory routes that together create a coherent reindeer land. The national interests of the reindeer industry shall be protected against land use that significantly damages the connection of national interests and the operation of the industry.

The nearest area of national interest for the reindeer industry is a migratory route located about 5 km east of the planned activities. The route crosses road 383 between Svedjan and Vibbyn. The migration route follows the distances from Vibbyn and out to the coastal band, but is broken just north of Persön by road E4 which forms a strong barrier. The reindeer breeders in Gällivare sameby have stated that the pastures south of road E4 are usually only used as emergency pasture because the road is so difficult to move the reindeer across. In order to use the land on the south side, reindeer herders must gather the reindeer and move them on truck over the E4 road.

The other areas of interest for the reindeer husbandry are described in section 8.16.

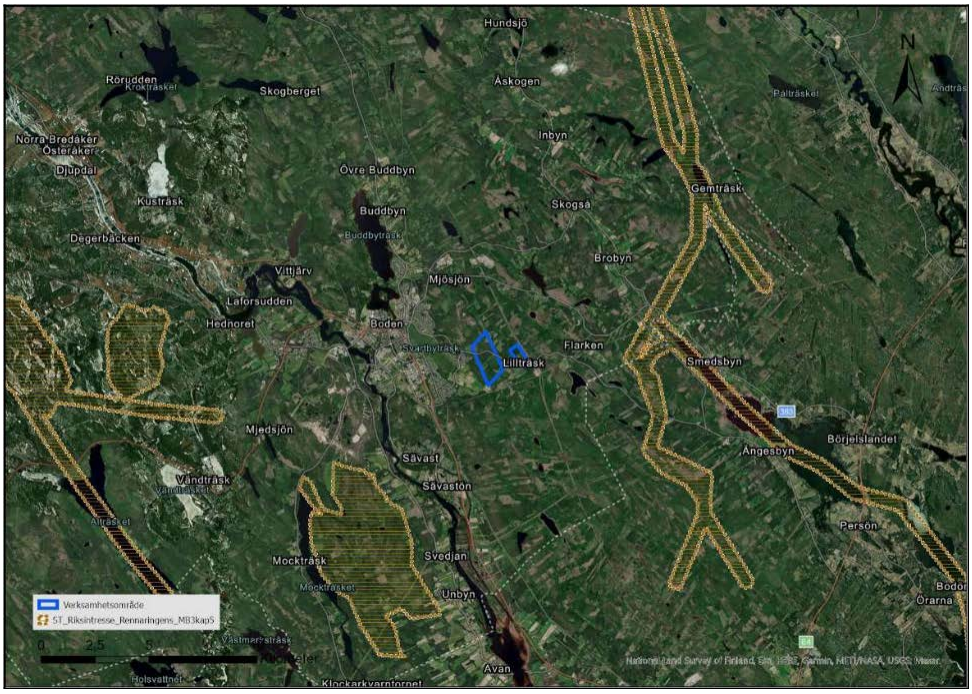

Figure 8-4 Areas of national interest in the reindeer herding industry (yellow striped mark) in relation to the approximate location of the planned activity (blue mark).

8.1.5 Agricultural land of national importance

Under Chapter 3, Section 4 of the Environmental Code, agriculture and forestry are of national importance. Useful agricultural and forestry land may therefore be used only for building or construction purposes where this is necessary to satisfy essential social interests which cannot be satisfactorily satisfied from a general point of view by the use of other land.

The agricultural and forestry land in the area where the activity is planned is classified as farmland. However, the municipality of Boden considers that the detailed plan drawn up for the area Svartbyn VU5 is of major interest to society, since the area is identified in the municipal master plan as a research area for activities, and that the detailed plan aims to enable long-term sustainable industrial establishments with access to green and secure electricity. The land planned has, since the vicinity of the switchgear, conditions for access to green and secure electricity which is not located elsewhere in the municipality of Boden.

8.1.6. Safeguard measures

Swedish National Interest Total Defense

The heights of the planned activities buildings are within the height limits specified in the detailed plan that the municipality of Boden works with for the area Svartbyn VU5. The detailed plan has been adapted in dialog with the Swedish Armed Forces to the interests of the defense.

The Swedish Armed Forces have started a preparation to investigate what is required if establishment in part of the proposed area of activity is not to cause damage to the national interest with the name "other areas of influence". The Swedish Armed Forces will continuously conduct dialog with Boden Municipality and H2GS.

National interest communications

The municipality of Boden is planning to develop a new detailed plan for infrastructure corridor which will enable a new railway and road link between road 97 and the Old Lulev road and the business area Svartbyn VU5. The proposed road link is a prerequisite for the detailed plan for Svartbyn VU5 as it both allows water and sewage connection of the plan area and provides sufficient transport capacity to and from the plan area.

National interest cultural environmental conservation

When selecting the location of the activity, account has been taken of the fact that the area of activity falls outside the national interest for cultural environmental care.

The lowest buildings in the area of activity will be located in the northern part of the area bordering the area of national interest for

cultural environment to reduce the contrast between the settlement and the values of national interest.

Ren industry

H2GS provides financial assistance for the reindeer moving by truck over road E4 when there is a need for emergency grazing.

H2GS undertakes to refer as far as possible to heavy transport of inputs by road 97, the Ore Railway and the planned road and rail connection infrastructure corridor.

8.1.7. Consequences of the activities sought

Swedish National Interest Total Defense

The planned activities mean that high buildings will be built within and near several national interests identified by the Swedish Armed Forces with areas of influence or areas of importance for the military part of the total defense. The location and design of the buildings have been adapted to the height limitations that exist in the area and are deemed not to affect the national interests of the total defense.

The planned activities are partly within an area of national interest for the total defense which is included in the category "Other areas of influence". In a consultation opinion, the Swedish Armed Forces have expressed the view that it is possible to find a solution where the proposed location of planned activities does not risk causing substantial damage to the national interest. Such a solution may require specific measures which the on-going preparation aims to identify.

National interest communications

Transport to and from the planned operation will be carried out by rail and road 97. A new industrial track will be built into the area with a new road running parallel to the railway track.

The venture requires major new and rebuilding infrastructure in the form of tracks, switches and signals etc.

With the planned expansion of the infrastructure in the area, national interests are not deemed to be adversely affected.

National interest cultural environmental conservation

A cultural environmental analysis of the planned field of activity and related areas has been carried out (Annex B7). The cultural environmental analysis shows, among other things, the national interest and the impact of the planned activities on this. The assessments in the cultural environmental analysis have been carried out according to a different matrix than the one used in the EIA. The assessments set out in the Annex and in the EIA are therefore slightly different.

Boden is an environment of special cultural importance. The environment is well preserved and is part of a clear context. The area therefore has a high cultural historical value of great interest in a national perspective.

The fact that the planned activities are being built in the vicinity of the national interest area does not mean that any physical expression and properties disappear within the national interest. The impact is predominantly of a visual nature, where the extensive plant will become an additional clear feature of the area and create a new silhouette in the landscape. The impact is deemed to be indirect regarding the national interest since no action proposals are planned in the area of national interest. The expression and nuclei of national interest are of a military nature and are designed and placed to have a hidden location in the landscape so that they do not visually constitute tangible elements in the environment and they are therefore not considered to be dominated by or diminished by additional installations. Values are not considered to be fragmented, discontinued or lost. Orientations between different nuclei are not considered to be affected as they are mainly located west and north of the planned installation. The effect on the national interest is therefore considered to be small.

A small negative impact on an area with high cultural historical values means small-moderate consequences for the cultural environmental interest. The planned activities are not deemed to involve a risk of material damage to the national interest Boden.

The planned activities do not involve any physical interventions within the construction site Gammelängsfortet and are not considered to break historical lines of sight or cultural historical connections in the area. The building memory is 800 m from the planned area of activity and is assessed in summary not to be affected.

Ren industry

The migration route, which is of national interest for the reindeer industry, is crossed by road 383, which is estimated to have a small (6 % in the construction phase and 8 % in the operational phase) increase in the number of traffic movements due to the planned activities. The increase in road traffic could potentially mean that the reindeer are avoiding the area. The increase in traffic movements is small and the route is used sporadically during emergency years and then for a short time to move between work.
The consequences are therefore considered to be minor.

The consequences for the rest of the reindeer husbandry are described in sections 8.16 and 9.2.

Agricultural land of national importance

The planned activities involve the use of farmland and forestry land in order to realize the essential social interest in climate-neutral steel production. Local intrusion into agriculture and forestry can be considered limited. The planned activities may have a small negative impact on local agriculture and forestry. The impact on the national interest in agriculture and forestry is therefore estimated to be small.

CONSTRUCTION AND OPERATION OF NEW STEEL WORKS, ETC., IN SVARTBYN SAREA OF ACTIVITY, BODENSKOMMUN, NORRBOTTENS LÄN

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8.2. Surface water

8.2.1. Investigations

A groundwater assessment (Annex B3) has been carried out. The surface water assessment describes the current run-off in the area and the impact of the planned activity, as well as the flow delay and treatment that will be required after exploitation in order to ensure that the natural downstream environment is not affected by pollution, faster run-off and increased flows.

8.2.2. Basis of assessment

The Water Framework Directive (2000/60/EC) and its daughter directive on environmental quality standards (2008/105/EC) require all geographically divided water bodies (surface and groundwater) to achieve the objective of good ecological and chemical status. The objective of the environmental status of a body of water is called the environmental quality standard (EQS). The EQS summarizes a large number of underlying quality factors, such as physico-chemical and biological. These are assessed using the Swedish Maritime and Water Authority's regulations HVMFS 2019:25 which specifies how the environmental permit for a body of water is to be classified.

Paragraph 4 of Chapter 5 of the Environmental Code and the Water Management Regulation (2004:660) lay down what is known as the 'Environmental Code'. 'non-deterioration', which means that an activity may not be licensed if the environmental status of the water body is liable to deteriorate or if the possibility of achieving the EQS is jeopardized. According to the Weser judgment (Case C-461/13), deterioration of status should be interpreted as a deterioration of an individual environmental quality factor. For specific pollutants, there are assessment criteria according to which the determined content may not be exceeded for any of the substances present if good ecological status is to be achieved in the water body. It is therefore important that an operator is aware of the impact of discharges of substances on the levels of a body of water.

The local environmental status and space for the assessment criteria/limits of the body of water set the limits for the proportion of pollutants to be loaded to a recipient. The influence of an activity on the receiving water is therefore not only determined by the load but also by the design, hydrodynamics and influence of the water body from other sources (background content).

The delaying volumes calculated in the surface water study have been calculated using the rational method according to Swedish Water Publication P110 and standard values for run-off from large natural areas. A rainfall with 30 years return time has been chosen as the design for delay within the area.

8.2.3. Prerequisites

The planned area of activity currently consists of forests, wetlands and agricultural land with natural watercourses and landscaped ditches that drain the area. The

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Most of the superficial runoff is via Lillbäcken, Storbäcken, Kallvikbäcken and Norrbäcken that crosses the area and joins together to Lillträsket before it flows out of the area.

Lillbäcken runs through the area where the steelworks is planned. Lillbäcken is formed today by the road ditch at Flarkenvägen running together. Lillbäcken then flows southeast where it flows into Storbäcken.

The water from the streams in the area flows to Lillträsket which is a smaller lake with a depth of about 2-4 m. Lillträsket does not constitute a body of water in which environmental quality standards apply. In connection with the work on the detailed plan for the area Svartbyn VU5 detailed plan work in 2021, the municipality of Boden has produced a preliminary assessment of the physico-chemical status of Lillträsket. The assessment indicates unsatisfactory status due to the measured annual average total phosphorus and the particularly polluting substances copper, zinc, uranium, arsenic and cadmium. The depth of vision indicated poor status while the oxygen content was good. Based on pH and calcium concentration, no acidification problems were considered. The three sampling tests on which the assessment is based were all carried out in late autumn, so the result is not considered to provide a general description of the prevailing conditions.

From Lillträsket the water reaches Lörbäcken (SE731687-177729) via Norrbäcken and Gammelängesbäcken. Lörbäcken is the closest body of water in which environmental quality standards apply and then on to Smedsbyfjärden.

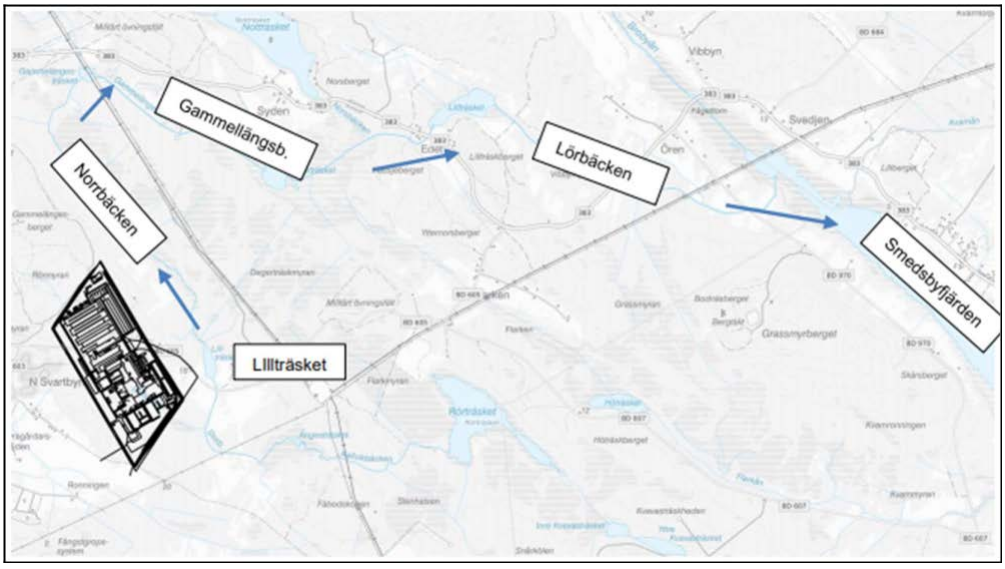

Figure 8-5 Recipients and streams downstream of the planned area of operation. Map from the stormwater survey.

According to the latest assessment (2017-02-23), the ecological status of Lörbäcken is classified as moderate. The assessment is based on the fact that the watercourse is affected by morphological changes, flow controls and impaired connectivity.

Like other Swedish water bodies, Lörbäcken does not achieve good chemical status with respect to mercury and polybrominated diphenyl ethers (PBDEs).

Table 3 Last status assessment and adopted EQS for the surface water body concerned. Source: VISS (retrieved 21-08-18)

Designation / ID	Water category	Ecological status/potential and chemical status	Decided environmental quality standard
Lörbäcken WA93367626	Rivers	Moderate and not achieving good*	Good ecological potential 2027, Good chemical surface water status**

* **The water body is not considered to achieve good chemical status with respect to Brominated Diphenyl Ethers (PBDEs), mercury (Hg) and mercury compounds. The limit values for PBDE and Hg are exceeded in all surface water bodies surveyed in Sweden; lakes, watercourses and coastal waters. This is a national classification made by the Water Authority.**

** **A derogation in the form of less stringent requirements has been introduced for brominated diphenyl ethers (PBDEs) and for mercury (Hg), in accordance with Annex 6 to the Regulations of the Sea and Water Authority (HVMFS 2013:19).**

According to the surface water assessment, the catchment area upstream of Lilltträsket is estimated to be about 2 776 ha. The surface runoff of the natural land has been calculated to be 8,3 m^3 /s in a rain with a 30-year return time. The current surface run-off from the part of the area to be developed is estimated to be about 1,2 m^3/s in a rainfall with 30 years return time according to standard values for natural land.

8.2.4. Safeguard measures

Process water and cooling water

The activity has been designed so that no process water or cooling water will be discharged from the planned activity. It will be purified and then recirculated in the business. The same applies to stormwater that may come into contact with pollutants.

Groundwater

Surface surface streams with higher pollution levels will be separated from surface streams with lower pollution. Hard-made surfaces where surface water flows can be expected to be higher in terms of pollution are mostly open material/mass storage sites where pollutants can be flushed off in case of rain, operational parts where there is a higher risk of chemical emissions and paved areas where regular transport of raw materials occurs. The surface water from these areas will be diverted to the treatment plant for process water and industrial sewage. The surface water from sealed areas with a lower degree of pollution will be diverted to Lilltträsket after having undergone the purification and delay in ponds and biofilters that will be built between the site and Lilltträsket

Surface surface ground water where the steelworks are planned and the surface where the electrolysers will be placed are handled separately.

The purification of the surface water will consist of delay in a delay reservoir followed by a pre-sedimentation for sediment and particulate decontamination and then a post-polishing in the form of purification ponds or biofilters. The surface water treatment will be built between the operational areas and Lillträsket.

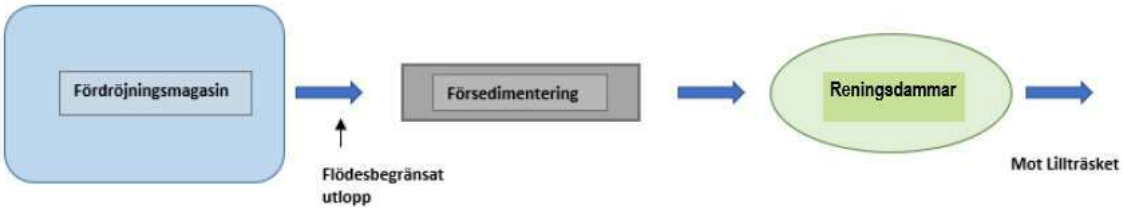

Figure 8-6 Schematic of the delay and clean up steps.

The dimensioning flow from the field of activity after exploitation is based on the land use presented in Table 4 and Table 5 and calculated using the rational method from Swedish Water P110.

Table 4 Surfaces within the activities of the steelworks

Surfaces	Size (m^2)	Drain coefficient	Reduced area (m^2)
Roof surface	799,674	0.9	719,706
Hard-made surface (low pollution)	190,461	0.8	152,368
Hard surface (higher pollution)	76,927	0.8	61,5416
Ground/Open area	533,938	0.2	434,000
Total	1.600.000	0.65	1,040,204

After exploitation, the running time is assessed to 60 min within the steel works surface due to the hard-made surfaces and faster diversion. The runoff coefficient is increased to an estimated 0,65. In addition, future flows are to be enumerated with a climate factor of 1,25 (according to the methodology described in Swedish Water P110). The dimensioning future surface flow from the built-up area is then about 13 m^3 /s and with a limited outlet of about 1,2 m^3/s a delaying volume of about 48 000 $m^{3\ is}$ required to avoid the total flow in the receiving water to increase and risk damage to watercourses. This corresponds to an area for laggards of an estimated 40 000-55 000 m^2 depending on the depth. Since

flows from surfaces with higher degree of pollution will not be diverted to other surface water management after purification, the volume of supply can be reduced by about 5000 m^3.

Table 5 Surfaces in the field of activity of electrolysers

Surfaces	Size (m^2)	Drain coefficient	Reduced area (m^2)
Roof surface	116,924	0.9	105,231
Hard-made surface (low pollution)	41,538	0.8	33,230
Hard surface (higher pollution)	Not available within area	-	-
Ground/Open area	41,538	0.1	4,153
Total	200,000	0.71	142,615

After exploitation, the running time is estimated to be 30 min in the field of activity of the electrolysers due to the sealing surfaces and the drainage coefficient increases to an estimated 0,71. In addition, future flows are to be enumerated with a climate factor of 1,25 (according to the methodology described in Swedish Water P110). The dimensioning future surface flow from the built-up surface is then about 3 m^3/s and with a limited outlet of about 0,45 m^3/s a delaying volume of about 4400 m^3 is required to achieve flow neutrality in the receiving water. It corresponds to an area for laggards of an estimated 4000-6000 m^2 depending on the depth.

After delaying dust, post-polishing in purification ponds represents about 2-5% of the reduced area of the developed area. This means that an estimated purification dust of 20 000-25 000 m^2 is needed for the steel works surface and 2800-3000 m^2 for the electrolyte surface.

Figure 8-7 Estimated surface area for surface water management. The surface water management from the steel works surface is marked with red and the surface water management with electrolysers is marked with blue.

Land run-off from surrounding areas shall be diverted so that it does not enter the built-up area or pass through the area without risk of flooding and damage.

In order to reduce the need for surface water treatment, pollutant emissions to surface water will be minimized as much as possible already at source. This means, for example, placing potentially polluting activities under shelter, choosing environmentally friendly building materials and preventing the release of dust and sediment.

8.2.4. Consequences of the activities sought

Effects of process water and cooling water

The activity has been designed so that no process water or cooling water will be discharged from the planned activity. It will be purified and then recirculated in the business. This means that there will be no emissions to recipient from the activity. This means that there is no risk of pollution or heat impact on nearby water bodies from the activity.

Effects of surface water

The planned activities mean that the area will consist of sealed surfaces for roads, warehouses and industrial activities. This means that the run-off of surface water and the pollution load from the area are increasing. After purification, only surface water from areas with a low level of pollution will be discharged from the activity. H2GS intends to ensure in the further design of the activity that the levels of pollutants in the surface water from the low-pollution surfaces are equivalent to those from a common pavement or pedestrian street. The design of the treatment plant has been calculated so that the discharge of surface water does not cause a negative impact on the possibility of containing EQS in Lörbäcken.

Overall, the impact of surface water management from the planned area of activity is estimated to be small.

8.2.5. Protective measures and consequences during the construction phase

The location of roads and industry means that Lillbäcken which today crosses the planned area of activity will be closed again. Lillbäcken will instead be routed around the planned area of activity according to the map in Figure 6-1. What remains of Lillbäcken's existing route is the last 500 meters before Lillbäcken flows into Storbäcken. The planned measure involves water activities.

After diversion, the water in Lillbäcken will be led to the same watercourses as before, that is, Storbäcken. The fact that the Lillbäcken is directed around the area instead of being cultured through the planned area of activity means that the open water surface is maintained, which means that the stream can continue to form the habitat, distribution corridor and guide in the landscape for plants and animals. The consequences of the diversion of the Lillbäcken are therefore estimated to be small.

8.3. Groundwater

8.3.1. Investigations

The planned activities do not rule out the possibility of lowering groundwater. A preliminary assessment of the maximum area of impact has been made based on mapping studies, geotechnical studies and initial groundwater surveys.

8.3.2. Basis of assessment

The Water Framework Directive (2000/60/EC) and its daughter directive on environmental quality standards (2008/105/EC) require all geographically divided water bodies (surface and groundwater) to achieve the objective of good ecological and chemical status. The objective of the environmental status of a body of water is called the environmental quality standard (EQS). The EQS summarizes a large number of underlying quality factors, such as physico-chemical and biological. These are assessed using the Swedish Maritime and Water Authority's regulations HVMFS 2019:25 which specifies how the environmental permit for a body of water is to be classified.

According to VISS (Water Information System Sweden), there is no body of groundwater where environmental quality standards apply in the area.

8.3.3. Prerequisites

The planned area of activity shall consist partly of cutting and partly of filling. The section consisting of cutting the soil and the rock will lead to a permanent reduction in the area's groundwater. The cut will be up to 20 meters deep in the north. The main part of the cutting is carried out in the soil layers but in the north the cutting will also be carried out in the mountains. The mountain level is uncertain, but in the northwest corner, the cut can be up to 10 meters in mountains. The groundwater level is about 1 meter below the surface of the area.

The range of the groundwater decline is heavily dependent on hydraulic conductivity (K) in soil layers and mountains. The main soil in which the cutting is planned is a solid or very solid moraine. Superficially, silty or sandy sediments may occur. Based on the soil samples taken in the geotechnical study, a reasonable range of the hydraulic conductivity of moraines K below the groundwater surface is estimated to be $1 \cdot 10^{-7}$ to $6 \cdot 10^{-5}$ m/s. The permeability of mountains has been estimated from energy wells carried out in the area. A reasonable range of hydraulic conductivity in rocks at expected cut depths is estimated to be $1 \cdot 10^{-7}$ to $1 \cdot 10^{-5}$ m/s, but locally it may be higher at much fractured rocks. Based on these assumed intervals, the impact area in the soil layers is considered to be in the range 50-500 meters from the cut, depending on the depth of cut. The range of influence of mountains can be estimated to be 200 - 1000 meters from the cut, depending on the depth of the cut.

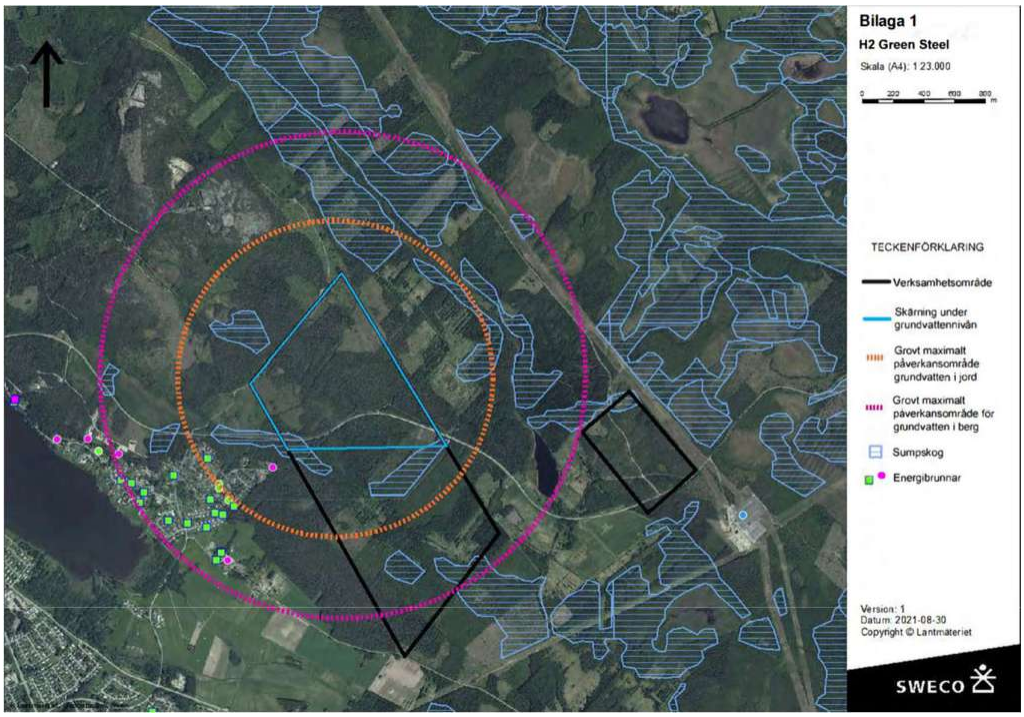

Figure 8-8 Preliminary maximum impact range.

According to the SGU (Swedish geological survey) well archive, there is a registered well nearby, located east of the area on the same property as the switchgear, Svartbyn 3:107. There are also properties with energy wells within the estimated impact area. According to SGU, there is no groundwater reservoir in the area.

8.3.4. Safeguard measures

In-depth hydrogeological surveys are ongoing in the area. The results of the study will be used to design any specific structural protection measures.

No groundwater dissipation is planned. The groundwater will end up in the diverted Lillbäcken.

8.3.5. Consequences of the activities sought

According to the preliminary assessment carried out, energy wells, agricultural land, woodland and swamp forests are within the preliminary maximum impact area. The results of the ongoing hydrogeological investigations will be used to calculate the area of impact in even more detail.

Overall, the impact in the field of groundwater is assessed as moderate.

8.3.6. Protective measures and consequences during the construction phase

Groundwater pipes have been installed in the mountains and soil of the area and measurements have been made prior to the construction of the activity. The results of the measurements will be used to design protective measures during the construction phase.

8.4. Air

8.4.1. Investigations

Dissemination calculations have been carried out (Annex B4). The application calculations describe the environmental impact of the activity with respect to emissions of nitrogen oxides (NO_x), sulfur dioxide (SO_2), particles such as PM_{10}, dioxin, mercury and VOC (Volatile Organic Compounds). The scattering calculations are performed with respect to the maximum permissible emission levels under BAT conditions where applicable.

8.4.2. Basis of assessment

Environmental quality standards

The Environmental Quality Standards (EQS) Regulation (2010:477) for outdoor air describes, on the one hand, the levels of pollutants that may not be exceeded or may only be exceeded to a specified extent, and, on the other hand, the levels of pollutants that 'shall be sought'. Table 6, Table 7 and Table 8 below set out the environmental quality standards for nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and particulate matter as PM_{10}. In addition, environmental quality standards are not applicable in this case, $PM_{2,5}$, carbon monoxide, lead, benzene, arsenic, cadmium, nickel, PAH (BaP) and ozone. The environmental quality standards for arsenic, cadmium, nickel, PAH and ozone define levels to be 'aimed for'.

Environmental quality standards are lacking for dioxins, mercury and VOC.

Table 6 Environmental quality standards for nitrogen dioxide in outdoor air

Subject	Default value	Protection of human heath	Maximum number of exceedances
Nitrogen dioxide	Annual average [1)]	40 µg/m³	Arithmetic mean
	Daily average [2)]	60 µg/m³	7 times per calendar year
	Hour averages [3)]	90 µg/m³	175 times per calendar year if level does not exceed 200 µg/m³ for one hour more than 18 times per calendar year

[1)] Yearly mean is defined as arithmetic mean value where the sum of all values is divided by the number of values. [(2)] 98 percentile values are valid for daily averages, meaning that the daily average nitrogen dioxide content may be exceeded for a maximum of 7 days in a calendar year (2 % of 365 days). [(3)] For hourly averages the 98 percentile value applies, which means that the hourly average nitrogen dioxide content may be exceeded for a maximum of 175 hours in a calendar year (2 % of 8760 hours) if the 200 µg/m^3 content is not exceeded by more than 18 hours (99,8 percentile values).

Table 7 Environmental quality standards for sulfur dioxide (SO_2) in outdoor air

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Subject	Default value	Protection of human heath	Maximum number of exceedances
Sulfur dioxide	Annual average [1]	20 µg/m³	Arithmetic mean
	Daily average [2]	100 µg/m³	7 times per calendar year if the level of pollution never exceeds 125 µg/m³ more than 3 times per calendar year
	Hour averages [3]	200 µg/m³	175 times per calendar year if the level of pollution never exceeds 350 µg/m³ for one hour more than 24 times per calendar year

[1] For annual average, the limit value applies to vegetation protection > 20 km outside urban areas or 5 km from other built-up area, industrial plant or motorway to vegetation protection.
[2] For daily average values, the 98 percentile value applies, which means that the daily average sulfur dioxide content may be exceeded for a maximum of 7 days in a calendar year (2 % of 365 days) unless the sulfur dioxide content exceeds 125 µg/m^3 more than 3 days per year (99 percentile values).
[3] For hourly averages, the 98 percentile value applies, which means that the hourly average sulfur dioxide content may be exceeded for a maximum of 175 hours in a calendar year (2 % of 8760 hours) unless the sulfur dioxide content exceeds 350 µg/m^3 more than 24 hours per year (99,7 percentile values).

Table 8 Environmental quality standards for particulate matter PM_{10} in outdoor air

Subject	Default value	Protection of human heath	Maximum number of exceedances
Particulates PM10	Annual average [1]	40 µg/m³	Arithmetic mean
	Daily average [2]	50 µg/m³	35 times per calendar year

[1] Yearly mean is defined as arithmetic mean value where the sum of all values is divided by the number of values.
[(2)] For daily average values, the 90 percentile value applies, which means that the particle content (PM_{10}) as a daily average value may be exceeded for a maximum of 35 days in a calendar year.

Environmental quality objectives

On 26 April 2012, the Government decided on the environmental objectives system, Swedish environmental objectives - clarifications of the environmental quality objectives and a first set of interim targets, Ds 2012:23.

The environmental quality objective 'Fresh air' is defined as meaning that levels of air pollution do not exceed low-risk levels for cancer or target values for protection against diseases or impacts on plants, animals, materials and cultural objects.

Benchmarks are set taking into account sensitive groups and include:

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the PM_{10} particle content does not exceed 15 µg/m^3 air calculated as an annual average value or 30 µg/m^3 air calculated as a daily average value (90 percentile);

the nitrogen dioxide content is less than 20 µg/m^3 and less than 60 µg/m^3 as a 98 percentile hourly average.

In addition, there are intermediate targets for particles such as $PM_{2.5}$, benzene, benzo(a)pyrene, butadiene, formaldehyde, ozone and corrosion.

Environmental quality targets are missing for dioxins, mercury and VOCs.

8.4.3. Prerequisites

In the absence of measured levels of air pollutants in Boden, the background levels are assumed to be in line with the calculated levels for Boden by SMHI for nitrogen dioxide and particulate matter PM_{10} (SMHI Meteorology No 150, 2012). In the case of sulfur dioxide, overall levels are estimated to be very low. The background levels of mercury (Hg0+Hg-reactive) at the national measuring station Råö on the west coast show levels in the last three years of about 1,2 ng/m^3. For background levels of dioxin, the measurements at Aspvreten show levels of about 1 fg/m^3. Table 9 presents a summary of the assumed background levels.

Table 9 Adopted Background Contents in Boden

Air pollution	Annual averages	24 hours 98-percentile	24 hours 90-percentile	Hour 98 percentile*)
Nitrogen dioxide, µg/m^3	7	15		20
Particulates PM_{10}, µg/m^3	10		15	
Sulfur dioxide, µg/m^3	1	2		3
Mercury, ng/m^3	1 - 2			
Dioxin, fg/m^3	1			

*) For the higher percentile values for nitrogen dioxide 99,8 and sulfur dioxide 99,7 respectively, a background level of 25 µg/m^3 and 4 µg/m^3 respectively is assumed.

The air emissions of the planned activity are mainly CO2, NOx, dust and organic pollutants.

Table 10 Total emissions to air per year from the planned activities.

Subject	Amount (ca)	Unit	

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Carbon dioxide	550,000	tons/year
Nitric oxide	469	tons/year
Sulfur dioxide	344	tons/year
Dust	101	tons/year
Mercury	30	kg/year
TVOC	71	tons/year
Dioxin	1.5	g/year

The plant will not give rise to any specific or lasting fragrance.

8.4.4. Safeguard measures

All process steps that could cause significant ambient air emissions are planned to either be closed or process air will be directed to purification equipment to minimize environmental impact. The treatment plants are described summarized in section 7.4 of this EIA and in more detail in the technical description (Annex A to the application).

8.4.5. Consequences of the activities sought

The results of the spillover calculations show that the contribution of the planned activities, including background levels, is below the EQS and the EQS at the time of construction by a margin. The estimated maximum levels of dioxin, mercury and VOC buildings are considered low to very low. The business needs for truck transport are estimated to have very small to negligible impacts on outdoor air quality.

The overall assessment is that the effects of the emissions on the residential exposure of the air pollutants studied do not entail any increased health risk.

Table 11 summarizes the maximum contribution of the activity to the planned activity at the nearest settlement where the standards are to be met. Background levels and background amounts are also listed in the table to provide information on the total levels.

Table 11 Results of calculations, maximum contents according to planned activities

Concentrations 1.5 meters above ground level	Maximum contribution*	Background	Total*	MKN**	MKM**
NO2 annual average, µg/m^3	0.5	7	8	40	20
NO2 day 98 percentile, µg/m^3	4	15	19	60	-

NO2 hour 98 percentile, µg/m^3	6	20	26	90	60
NO2 hour 99,8 percentile, µg/m^3	14	25	39	200	-
SO2 annual average, µg/m^3	0.3	1	1	20	-
SO2 day 98 percentile, µg/m^3	4	2	6	100	-
SO2 hour 98 percentile, µg/m^3	5	3	8	200	-
SO2 hour 99,7 percentile, µg/m^3	12	4	16	350	-
PM10 annual average, µg/m^3	0.3	10	10	40	15
PM10 day 90 percentile, µg/m^3	1	15	16	50	30
Annual mean of dioxin, fg/m^3	1	1	2	-	
Mercury annual mean, ng/m^3	0.02	1 - 2	1-2	-	-
VOC annual average, µg/m^3	0.6			-	

***Refers to contents and quantities outside the business area**
****EQS ***EQS MKM**

The planned activities will be relatively close to residential areas and will result in increased emissions to air compared to the current situation. With planned protection measures such as purification plants and process containment, the environmental quality standards and objectives of the built-up environment are estimated to be undercut. Overall, the impact of emissions to air from the activity is estimated to be small.

8.4.6. Protective measures and consequences during the construction phase

During the construction phase there will be an increase in construction transport in and to the area, which means increased emissions of particulate matter and nitrogen dioxide. With the estimated construction traffic of 375 vehicle movements per day, the estimated nitrogen dioxide content by road becomes annual average <1µg/m^3, during the construction phase also dust can occur from e.g. open gravel surfaces, loading of loads and other transport.

Machinery is usually diesel-powered, which results in local emissions of air pollutants such as particulate matter and nitrogen oxides.

Careful planning of mass transport with the aim of reducing the number of journeys and thus emissions to air and dust from cars.

Where necessary, disruption caused by dust from civil engineering works will be prevented by means of irrigation, for example.

Environmental requirements will be imposed on the working vehicles, transport vehicles and propellants used.

With planned protection measures to prevent dusting and minimize NOx emissions from machinery, the impact on air quality is considered to be small during the construction phase. Overall, the impact of emissions to air from the construction of the activity is estimated to be small.

8.5. Soil and groundwater pollution

8.5.1. Investigations

A baseline report has been prepared for the planned activities (Annex B9). The purpose of a baseline report is to identify, at the time of closure, the pollutants that have been produced during the course of the activity since the baseline report was established. The report describes how the area is used, has been used and will be used, the soil and groundwater situation and the known pollutants present in the soil and groundwater in the area of the planned activities.

As part of the baseline report, an environmental ground study has been carried out in the planned area of activity in spring and summer 2021. The environmental technical investigation included sampling of soil, groundwater and a sample in surface water. Soil sampling focused on the more superficial soil layers, where aggregate samples were mixed and analyzed for metals, PAH and oils. The groundwater survey included sampling in 8 groundwater pipes, two of which were located just outside the planned area of activity. Groundwater was analyzed for a wider range of substances including, inter alia, pH, metals, organic hydrocarbons, PFAS, glycols, aldehydes, pesticides, chlorinated and organic compounds.

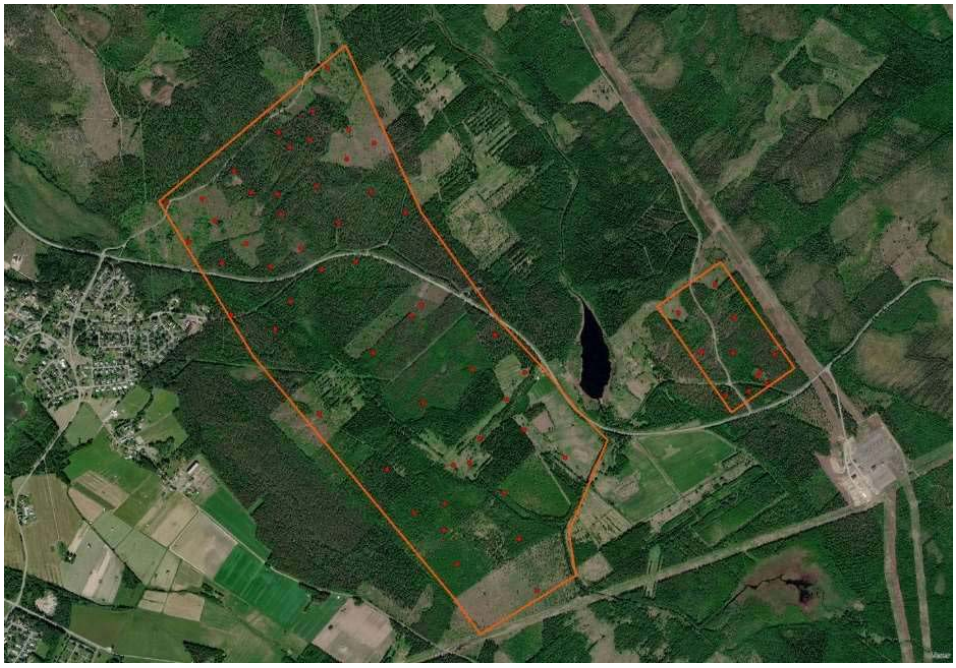

Figure 8-9 Location of the sampling points for soil sampling. Map from environmental technical land survey report.

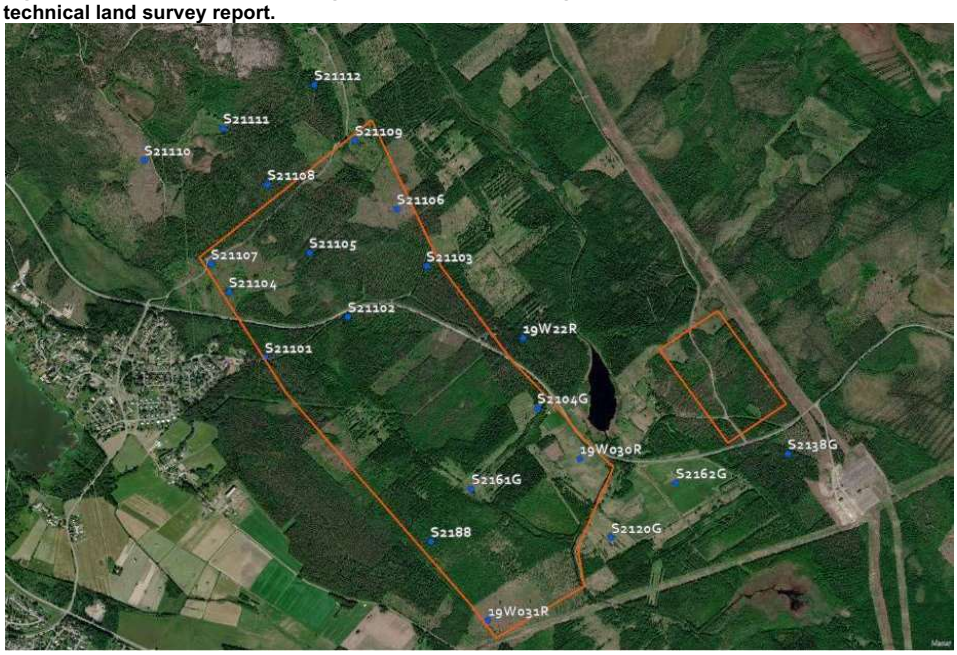

Figure 8-10 Location of groundwater pipes when sampling groundwater. Map from environmental technical land survey report.

8.5.2. Basis of assessment

Results from soil sample analysis have been compared with the Environmental Protection Agency's guideline values for contaminated land (Report 5976) less sensitive land use (MKM). The Environmental Protection Agency's guidance values in report 5976 are intended to be used in connection with simplified risk assessments of contaminated areas. They indicate levels of soil contamination below which the risk of adverse effects on humans, the environment and natural resources is normally acceptable.

For groundwater assessment, SGU groundwater assessment criteria (according to report 2013:01) have been used. SGU has divided the state assessment for a number of selected parameters into five classes. The grounds for assessment constitute a reference for the levels of various substances that can be found in Swedish groundwater and provide a basis for assessing whether the levels are likely to be of natural origin or a result of pollution.

The results of the PFAS analyzes have been compared with the preliminary guideline values for groundwater set by SGI (Publication 21).

The results for organic hydrocarbons are compared with SPI's guidance values for petroleum hydrocarbons in groundwater (SPI, 2010). The guidance values are designed primarily for use in connection with contaminated service stations and diesel installations with the aim of reducing the long-term risk of damage or inconvenience to human health and/or the environment. They are also applicable as support in the assessment for other objects and sites where petroleum pollution is suspected. The guidance values exist for different objects of protection, in this study, protection of surface water has been taken into consideration.

8.5.3. Prerequisites

Site characteristics

The land in the area consists of woodland with elements of agricultural land.

Genetic engineering studies have been performed. The geotechnical conditions are well in line with those in the map of the earth in Figure 8-11. Generally, the heights of the terrain are solid morainland (blue) and the flat low-lying ground is composed of silt and clay soils with elements of sulfide (yellow) soils.

Groundwater is generally found within a depth of 1 m throughout the area, in the western and eastern elevations possibly deeper.

According to VISS (Water Information System Sweden), there is no body of groundwater where environmental quality standards apply in the area. According to the SGU (Swedish geological survey) well archive, there is a registered well nearby, located east of the area on the same property as the switchgear, Svartbyn 3:107. There are also properties with energy wells within the estimated impact area. According to SGU, there is no groundwater reservoir in the area.

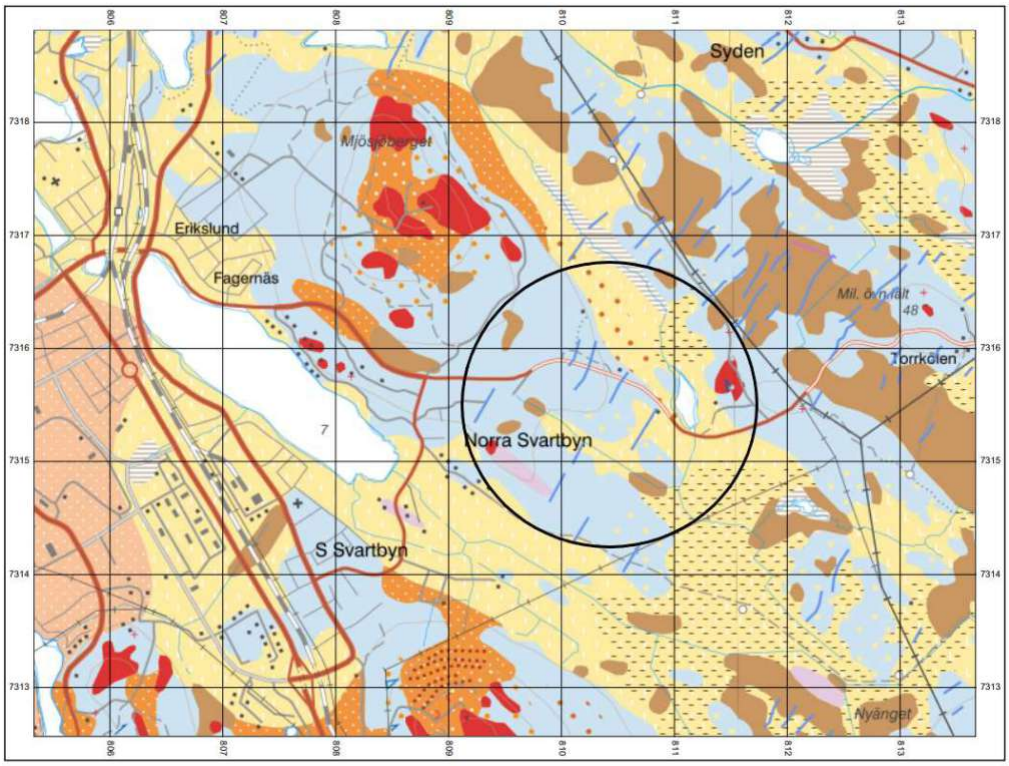

Figure 8-11 Soil species in the area. The approximate position of the planned area of operation is indicated by a circle. Within the area are found shallow peat areas (brown), loosened with hints of sulfide (yellow), moraine (blue) and mountains in the day (red). Pink color shows a doodle information. Map from SGU's map viewer.

Existing pollutants and sources of pollution

Potential sources of pollution within the planned area of activity that may have resulted in soil and groundwater contamination are road 605, the military activities and the sulfide clay and silt recorded in the lower part of the planned steelworks area in previous geotechnical investigations. Sulfide clay and silt can cause acidification effects in soil works and effects on groundwater levels. The soil in the whole area consists of dense sediments and moraine soils and with the groundwater level near the soil surface, which means that any pollution spreading in the soil is slow and pollution can be expected to be most widespread in the surface layer of the soil. Analyzes have therefore been carried out on superficial samples.

The results of the soil sampling show low levels of metals and only low levels of heavy oil fractions in a few samples containing peat, where the natural content of the peat is considered to be the cause.

The results of groundwater sampling show that there may be some influence from the sulfide soil in the form of low pH and slightly elevated metal concentrations compared to

normal levels. Oil or other organic matter has been recorded in three of the groundwater pipes, because one of the pipes is deemed to have had an effect on the analysis while for one of the pipes it is estimated to have come from the installation work. The measured oil levels are low and are not considered to be the cause of any action. The more comprehensive analyzes all show levels below the laboratory limit of detection.

The results of the analysis show that the soil does not contain increased levels of impurities.

Possible sources of pollution in planned activities

The baseline report (Annex B9) has identified the substances that are hazardous to the environment and health that will be dealt with in the planned operation and that may cause pollution damage to soil and/or groundwater. The potential pollution risk of the substances has been assessed on the basis of their chemical and physical properties. The pollution risk has also been assessed on the basis of the amount that is expected to be managed. Chemicals that will only be used to a minor extent have not been assessed.

The substances assessed as being at risk of pollution damage in soil and groundwater are petroleum products such as fuel oil/diesel, hydraulic oil, greases, transformer oil, lubricating oil, hydrochloric acid, metal alloys (copper, chromium and nickel), alkaline detergent, hydraulic liquid, chromium passivation solution and rolling emulsion.

The risk of spreading pollution may be associated with accidents, for example during loading and unloading, technical faults in the installation and through dusting.

8.5.4. Safeguard measures

H2GS will take protective measures to avoid and minimize the risk of environmental contamination. Fuel and waste management shall be carried out in such a way as to minimize the risk of soil and water pollution.
Storage of liquid chemicals and fuels will only occur on a flat, flat surface, with anti-precipitation, in double-sheathed cistern without welling or in ways that provide equivalent protection against spillage and leakage. Where bundling is used, it shall contain at least half of the total volume, but at least the volume of the largest container plus 10 % of the volume of the other vessels. Any storage of chemicals will be protected against collision. Any spillage or leakage will be immediately collected and dealt with.

All the surface water in the area will be collected in storm drains and diverted to a purification plant. Surface surface water likely to have higher pollution will be diverted to the process water treatment plant and recirculated in the activity. Daywater streams of sealed surfaces with a lower degree of pollution will be diverted to Lillträsket after having undergone purification and delay in ponds and biofilters that will be built between the site and Lillträsket.

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8.5.5. Consequences of the activities sought

Possible uncontrolled events can lead to deviations with the result that environmentally hazardous substances reach the soil and groundwater. Protection measures are planned to avoid and minimize the risk of environmental pollution. Land within the area of activity will be sealed and provided with storm water wells leading the surface water to purification plants. A large contiguous aquifer of importance for local or regional water supply does not exist within or adjacent to the planned area of activity. With planned protection measures, the impact is estimated to be small.

8.5.6. Protective measures and impacts during the construction phase

The work required for the construction of the site means that a large number of excavation and filling operations will be carried out. Primarily it is moraines that will be moved from the north to the south of the surface. Building on loose areas will require stability-enhancing and subsidence-reducing measures. No increased levels of pollutants have been found in the soil environmental sampling which has been carried out and which may involve the spreading of pollutants at shafts. There is no groundwater reservoir near the planned activities.

Soil work means that sulfide soil will need to be managed. Safeguard measures need to be taken to prevent the spread of metals and water with a low pH when handling the sulfide soil which is in the planned area of activity.

The classification of sulfide soil is carried out at shafts or by pre-classification when it is clear where excavations are to be carried out. Sulfides will be handled in such a way that surface water receiving waters are not adversely affected. This may include short storage times before off-site transport, protection against precipitation during storage, placement of temporarily stored masses with protection distances to surface water.

With planned protection measures, the impact is estimated to be small.

Construction of the establishment

Accidents at the construction stage such as road accidents and emissions from machinery can lead to soil and groundwater pollution. Safeguard measures will be taken to reduce the likelihood of impacts on soil and groundwater. Temporary routes will be designed with clear markings, signage, speed limits and, if necessary, safety rails and impact protection. Cisterns and other risk objects are placed in view of dangerous situations/situations. Plans will be drawn up for the management of emissions of fuels and chemicals handled at the construction stage. There will be stockpiles of decontamination agents.

There is no groundwater reservoir near the planned activities. It is unlikely that any discharges would affect the water in private wells when the nearest groundwater well is located in another catchment area more than 2 km from the farm.

With planned protection measures, the impact is estimated to be small.

8.6. Noise

8.6.1. Investigations

An external noise assessment has been carried out for the planned activity (Annex B5). The purpose of the noise assessment is to calculate noise from the planned activities at the nearest homes and compare the results with the guidance values for industrial noise as set out in the Environmental Protection Agency's report 6538 - Guidance on industrial and other operational noise and the Public Health Authority's guidance values for noise levels and low frequency noise inside.

The noise data for the noise sources in the planned operation has been taken from the suppliers of the equipment and where major noise abatement measures have been deemed necessary, these have been verified with the suppliers to ensure that these are feasible. The noise assessment has calculated only rail transport within the planned area of activity.

8.6.2. Basis of assessment

Calculated sound levels from the plant have been compared to the guidance values in the Environmental Protection Agency's report 6538 - Guidance on industrial and other operational noise, see Table .

Table 12 Outdoor industrial noise benchmarks for housing, schools for nurseries and nursing rooms. Source: Environmental Protection Agency report 6538, Guidance on industrial and other operational noise.

	L_{eq} day (from 06 to 18)	L_{eq} evening (18-22), as well as holiday (06-18)	L_{eq} night (from 22 to 06)
Outdoor guideline value at housing, schools, preschools and nursing home	50 dBA	45 dBA	40dBA

In addition to the values in Table:

Maximum sound levels (L_{Fmax} >55 dBA) should not occur during the night at 22-06 hours, except occasionally.

Some sound characters are particularly disturbing. Where the noise of the activity is characterized by frequent impulses such as riveting work,

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unloading of scrap metal and similar or containing sound with clearly audible tonal components, the values in Table 12 should be reduced by 5 dBA.

In cases where the noisy activity is only part of the time periods above, or where the sound level of the activity varies greatly, the equivalent sound level should be determined for the time when the noisy activity is ongoing. However, the equivalent sound level should be determined for at least one hour, even for shorter events.

Calculated sound levels have also been compared to guidance values in the Public Health Authority's General Council on indoor noise (FoHMFS 2014:13), see table below.

Table 13 Guidelines for the assessment of health hazards in the Public Health Authority's General Council on indoor noise (FoHMFS 2014:13)

Sound level type		Benchmark (dB)
Maximum Audio	L_{AFmax}[1]	45
Equivalent sound	L_{AFmax}[2]	30
Audio with audible tonal components	L_{AFmax}[2]	25
Audio from music facilities	L_{AFmax}[2]	25

1 The maximum A-weighted sound level.

2 The A-weighted equivalent sound level over a given period of time (T).

A typical façade of a wooden villa can be said to have a flat-rate phase insulation against industrial/business noise of about 20-25 dB. It is reasonable to assume that the houses in the northern Svartbyn are well insulated because they are located in a relatively cold climate and therefore are more noise-reducing than the template. This means that as long as equivalent sound levels are below 50-55 dB, there are good conditions for the retention of the R&HMFS 2014:13 benchmark values.

In FoHMFS 2014:13 there are also guidance values for low frequency noise, the guidance values are given in the table below.

Table 14 Guidelines for low-frequency noise in the Public Health Authority's General Council on indoor noise (FoHMFS 2014:13)

Tersband [Hz]	31.5	40	50	63	80	100	125	160	200
~~sound pressure~~ level, Leq [dB]	56	49	43	42	40	38	36	34	32

8.6.3. Prerequisites

At present, the sources of noise are road traffic 605, snowmobile traffic during the season, model flights during the summer months, and part of agriculture and forestry machinery.

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There is no recreational area within the meaning of the Environmental Protection Agency's report 6538 in the surrounding area (area in the master plan for the mobile outdoor life or other areas that are used more frequently for outdoor life where the natural experience is an important factor and where a low noise level constitutes a special quality).

West of the planned activities is the residential area Norra Svartbyn. The dwellings closest to the planned activities are 155 meters from the boundary of the business area. The distance to the total building from the operating area is about 300 m. The closest distance from the most noise-producing part of the activity (direct reduction) is almost 800 m.

8.6.4. Safeguard measures

In the planning of the area of activity, the most noisy activities, that is to say the DRI towers, have been located in the southern part of the area of activity, in order to get as far away as possible from residential buildings.

Noise abatement measures on each source will be carefully dimensioned during further design. Some examples of possible measures are insulation, various types of enclosure, silencers in chimneys and more.

Facades and roofs of the buildings where noisy activities will take place will be dimensioned to ensure that they do not radiate too much noise.

In the zoning plan for the Svartbyn VU5 district, Boden municipality has designated an area in the north-west part of the plan area to enable possible protection against nearby residential developments.

8.6.5. Consequences of the activities sought

Noise will come from the business, the predominant noise sources are deemed to be the DRI towers.

In order to include the Environmental Protection Agency's guideline values at the nearest dwellings, noise abatement measures are necessary. Noise abatement will take place at source, for some operating parts the sound power needs to be reduced by about 30 dBA, which has been verified with manufacturers of the operating parts as a possible measure. For other sources, which are mainly fans and chimneys, there is a noise reduction requirement of 0-10 dB, which has also been assessed as possible measures.

The study shows that the facility is possible to construct according to the conditions given above. With the right measures at the right sources, the plant should be able to include guidance values from the Swedish Environmental Protection Agency's report 6538 and indoor guidance values from FoHMFS 2014:13.

At night, the noise level contribution is estimated to contain the benchmark 40 dBA by a small margin at the most noisy dwelling. The distance between the operational area and the

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The total settlement in northern Svartbyn is about 300 meters. The closest accommodation is about 155 meters from the operating area border and about 260 meters from the nearest operational building. Instantaneous nocturnal noise levels are not estimated to exceed 55 dBA.

The plant must at a later stage be designed and designed in such a way that the sound at the dwellings does not contain audible tones or frequent impulse sounds.

The Public Health Authority's benchmark for indoor sound levels and low-frequency noise is estimated to be contained in surrounding dwellings. This is because the distance to the plant is relatively long and the calculated noise levels outdoors are low.

Transport to and from the facility will mainly be by freight train. In total, it is estimated to be nine shipments of materials entering the plant per day and four shipments of products and waste per day. All trains run along the track on the outskirts of the facility.

Traffic noise from vehicles moving within the plant will not affect the noise contribution from traffic to surrounding housing.

The planned activity involves noise nuisance for the nearby properties. The most noisy construction parts are located in the southern part of the area while the northern part is deemed to cause little to no noise nuisance. With noise abatement at source, the noise level at the nearest homes will be below the Environmental Protection Agency's industrial noise guidance values. The noise impact of the activity is estimated to have a small negative impact locally. Overall, the impact of operating noise is estimated to be small.

As there are no other major industries in the area at present, the planned activities are not considered to contribute to cumulative effects in respect of industrial noise.

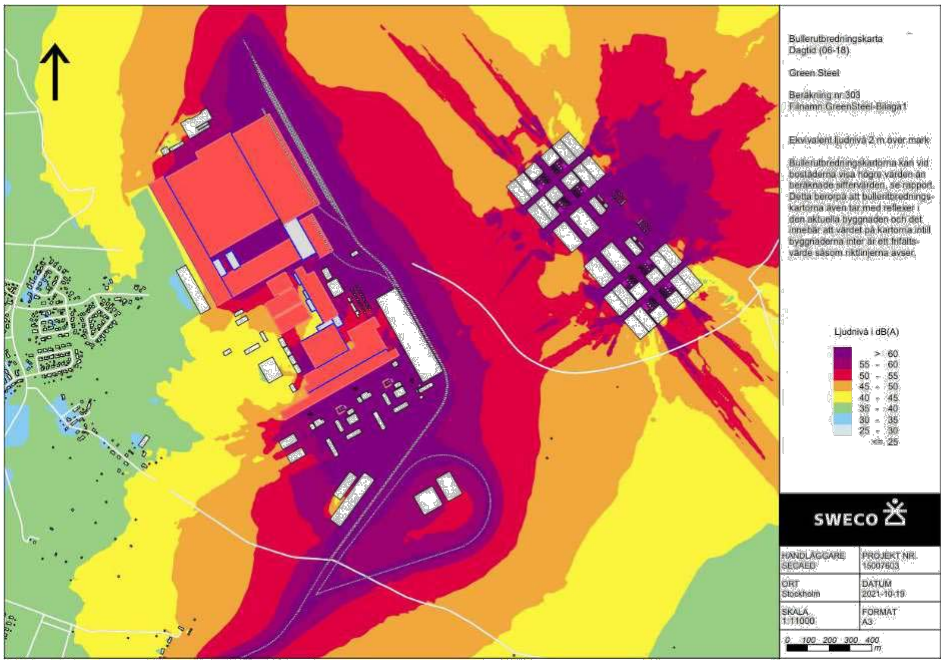

Figure 8-12 Calculation of equivalent daytime sound level. Image from noise investigation.

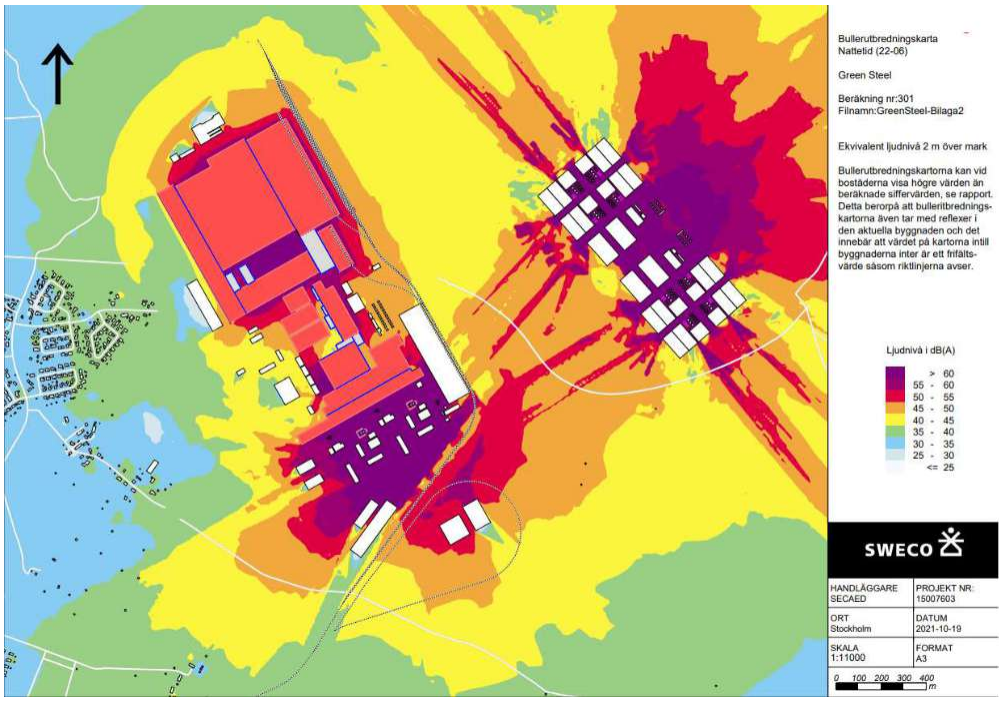

Figure 8-13 Calculation of equivalent nocturnal sound level. Image from noise investigation.

8.6.6. Protective measures and consequences during the construction phase

Noise at the construction stage can be further investigated once the choice of construction methods and production schedule have been developed. Work such as excavation work, the basic reinforcement of buildings, embankments, and switching on etc. will generate noise.

Regular monitoring will be carried out to ensure that the Environmental Protection Agency's General Council (NFS 2004:15) on noise from construction sites is contained. Furthermore, particularly noisy works such as piling and blasting will only be carried out on weekdays from 07.00 to 19.00. Palling will mainly take place in the southern part of the area of activity, the nearest residential area is at the height of the northern part of the area of activity.

The planned activities are relatively close to residential areas and sound from the construction of the activities will be heard at adjacent residential areas. The noise impact from the construction of the activity is estimated to have a small negative impact locally.

Construction traffic

Existing traffic on road 605 is 552 vehicles per day, of which 58 are heavy vehicles (10.5%). The residential buildings are closest about 15-20 meters from the road. All residential buildings along the route are estimated to be from before 1997 and are therefore managed

as "legacy existing environment" for the level of measures and assessment of the need for protective measures. The sound level of existing road traffic has been assessed on the basis of the volume of traffic, speed and distance to the nearest dwelling along the road (15 m distance from the road edge) and shows a maximum sound level of 73 dBA and an equivalent sound level (average over the day) of 51 dBA.

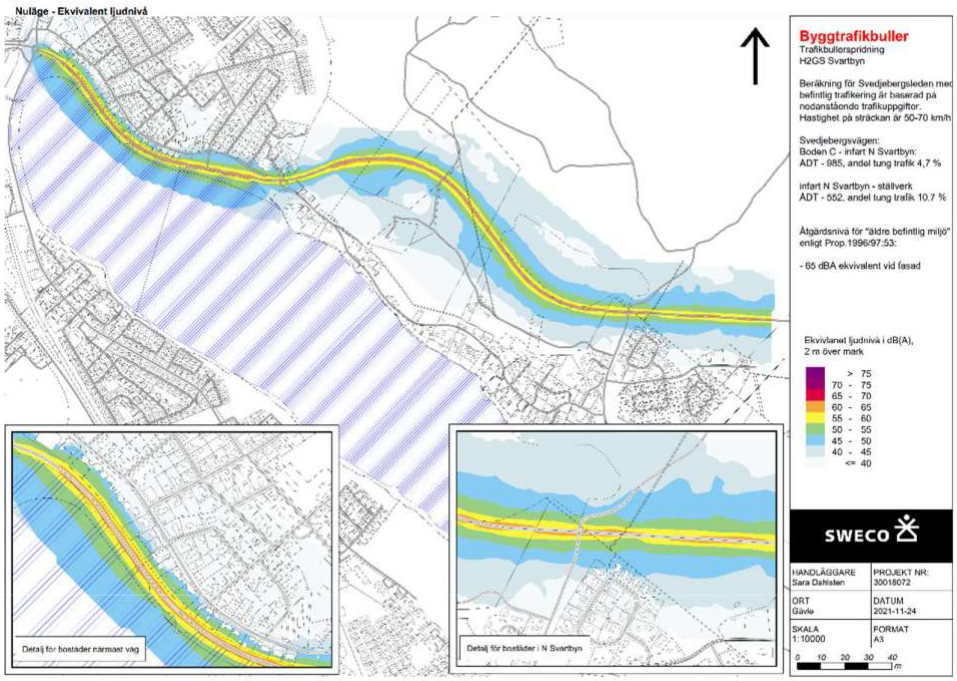

Figure 8-14 Traffic noise propagation at present

Existing action levels on road traffic for "legacy existing environment", Proposition 1996/97:53

65 dBA equivalent noise level at bevel

The additional construction traffic on the route is estimated to be 375 heavy vehicle movements per day, traffic is mainly done during daytime weekdays.

The additional traffic increases the share of heavy traffic to 47 % on the route. This results in increased sound levels at the nearest home to 56 dBA equivalent sound level and 77 dBA maximum sound level.

Consequently, even with the additional construction traffic, the existing levels of measures for this type of development are well met.

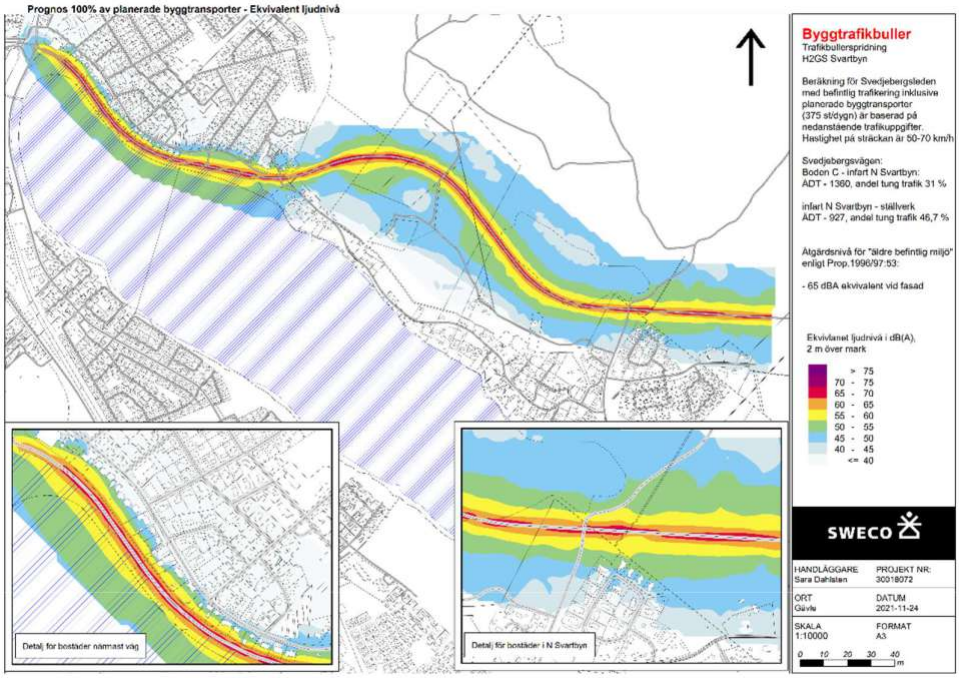

Figure 8-15 Road noise including construction traffic if all transport arrives at the site from the north

If construction traffic is divided so that half of the traffic is on road 605 from the north-west and half from the south-east, the sound contribution from construction transport will fall by 3 dBA. The total sound level at the nearest dwelling is then 54 dBA equivalent sound level and 75 dBA maximum sound level.

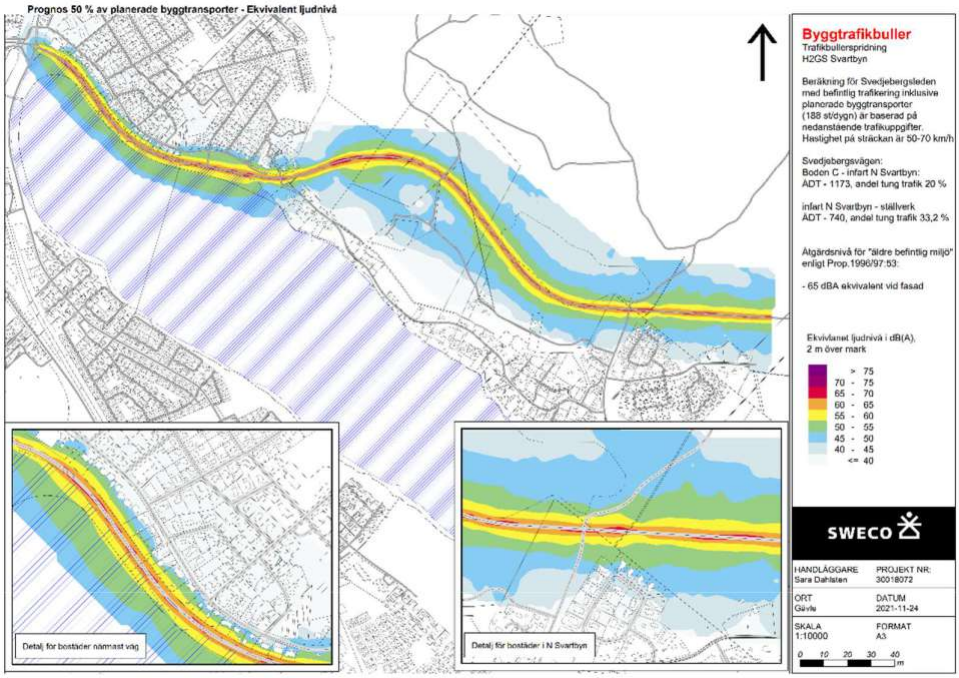

Figure 8-16 Road noise including construction traffic if half of the transport arrives at the construction area from the north and half from the south

Weight of evidence assessment

Noise pollution during the construction phase will be limited in time. Overall, the impact of noise from the construction of the activity is estimated to be small.

8.7. Landscape image

8.7.1. Prerequisites

The southern and central part of the area is mainly relatively flat. The northwestern part is located on the outskirts of Gammelängsberget which entails large differences in height. The landscape is characterized by the ongoing land use with forestry and agriculture. No specific landmarks exist in the area. To the northwest of the area is the residential area Norra Svartbyn and to the east the area borders a power line street.

Southwest of the area is Fyragårdarshöjden with surrounding cultivated landscape, which is protected by the name Lövronningen (County Administrative Board Norrbottens County, 1972). Landscape protection is a protection established under Paragraph 19 of the Nature Conservation Act in its version prior to 1 January 1975. In general, the protection includes measures that can significantly damage the experience and understanding of the landscape. For each area there are specific provisions aimed in particular at protecting the visual

the values of the landscape. In the case of Lövronningen, the decision states that new building, warehouses, construction of air traffic control and waterproofing activities in the area are subject to permit. The area covered by landscape protection largely coincides with the area Svartbyn which is designated in Norrbotten's conservation program for the cultivated landscape (Länsstyrelsen i Norrbottens län 1993) and described in section 8.7.

Photo Montage has been developed as a basis for the detailed plan for the area Svartbyn VU5 where example design has been introduced to see the plan's impact on the landscape (Sandellsandberg Arkitekter AB, 2021).

8.7.2. Safeguard measures

H2GS works on a well-thought-out design of the facility and one objective is that it should be adapted as far as possible to the surroundings, for example by placing the highest parts of the facility at the longest possible distance from the national interest area and the state building memory. The facades of the buildings should be designed with non-reflective material and the coloring should take into account the surrounding natural landscapes. Lower buildings within the facility can be designed based on local inspiration related to Boden's military history past, for example with saddle roofs, discreet coloring and materiality. This is part of the planning process.

The highest buildings in the area of activity, the DRI towers, will be located in the southern part of the planned area of activity to get further from existing buildings.

A forest curtain of about 100 m will cut off the planned the area towards the residential area of Norra Svartbyn.

The height of buildings will be adapted to the detailed plan. Within a limited area a total height of up to 160 meters is allowed.

8.7.3. Consequences of the activities sought

The planned activities will change the landscape of the area. Establishing activities in the area will transform the landscape from a forest and agricultural landscape to an area characterized by industrial buildings and associated infrastructure.

Part of the steel business means that some tall buildings will be built on the site. The highest buildings within the business area will be the DRI towers, which will be about 140 m high. The DRI towers will be located in the southern part of the planned area of operation. These new buildings within the business area will be new landmarks for the surrounding area visible from the surrounding landscape.

Visualizations of how the facility may be perceived from different angles have been developed (Sandellsandberg Arkitekter AB, 2021). The illustrations below show views from

The quadrangle height (Figure 8-17), Gammelängsfortet (Figure 8-18), the residential area of Northern Svartbyn (Figure 8-19), Svartbyleden (Figure 8-20), Gruvberget (Figure 8-21), Rödbergsfortet (Figure 8-22) and Södra Åbergsfortet (Figure 8-23). Please note that the design may change during the project.

Figure 8-17 Drönarvy seen from Fyrgårdarshöjden east over the planned plant. The image is a photomontage produced by Sandellsandberg Arkitekter AB, 2021.

Figure 8-18 Drönarvy seen from Gammelängsfortet towards the southeast of the planned facility. The image is a photomontage produced by Sandellsandberg Arkitekter AB, 2021.

Figure 8-19 View from Fårhagsvägen in the residential area Norra Svartbyn east towards the planned facility. The image is a photomontage produced by Sandellsandberg Arkitekter AB, 2021.

Figure 8-20 View from Svartbyleden east towards the planned facility. The image is a photomontage produced by Sandellsandberg Arkitekter AB, 2021.

Figure 8-21 Drönarvy seen from Gruvberget north over the planned facility. The image is a photomontage produced by Sandellsandberg Arkitekter AB, 2021.

Figure 8-22 Drönarvy seen from Rödbergsfortet east over the planned plant. The image is a photomontage produced by Sandellsandberg Arkitekter AB, 2021.

Figure 8-23 View from Södra Åbergsfortet east over the planned plant. The image is a photomontage produced by Sandellsandberg Arkitekter AB, 2021.

The landscape is affected locally by the fact that an area of activity with buildings, road networks and lighting etc. will characterize the area instead of the current forest and agricultural landscape.

The high buildings will be visible from some vantage points in the western parts of Boden urban area and along the Luleå river. As buildings may be visible across the edge of the forest in some places, the experience of the landscape protected area Lövronningen, which is deemed to be of moderate value, is deemed to be affected. The high towers and even the lower industrial buildings will become partly dominant landscape elements and become new landmarks in the area and have a moderate negative impact on the experience of the landscape. Moderate negative impacts in a moderate range overall have small-moderate negative impacts on the landscape.

As the municipality of Boden's detailed plan for the area Svartbyn VU5 enables large building rights where a limited area allows buildings with a maximum total height of 160 meters, this may mean that shadows can occur in the area. A solar study of the northern and western part of the plan area closest to the settlement in Norra Svartbyn has been prepared. Overall, the development of the northern Svartbyn is not considered to have a significant influence of shading in the implementation of the zoning plan.

8.8. Cultural environment

8.8.1. Investigations

A cultural environmental analysis of the planned field of activity and related areas has been carried out (Annex B7). The cultural environment analysis shows the area's known cultural historical values, the legal values that may be affected by the planned activities and proposals for continued management of the cultural environment. The assessments in the cultural environmental analysis have been carried out according to a different matrix than the one used in the EIA. The assessments set out in the Annex and in the EIA are therefore slightly different.

Archeological investigations have been carried out by Norrbotten Museum in and around H2GS's planned area of activity for the establishment of detailed plan in the area. An archeological investigation was carried out in 2020 within part of the area of activity and in 2021 a stage II investigation was carried out in a limited area within the area of activity (see Figure 8-24). In summer 2021, an archeological investigation was carried out into the north-west part of the planned area of operation. A large number of military installations were found in the area of analysis (Figures 8 to 25).

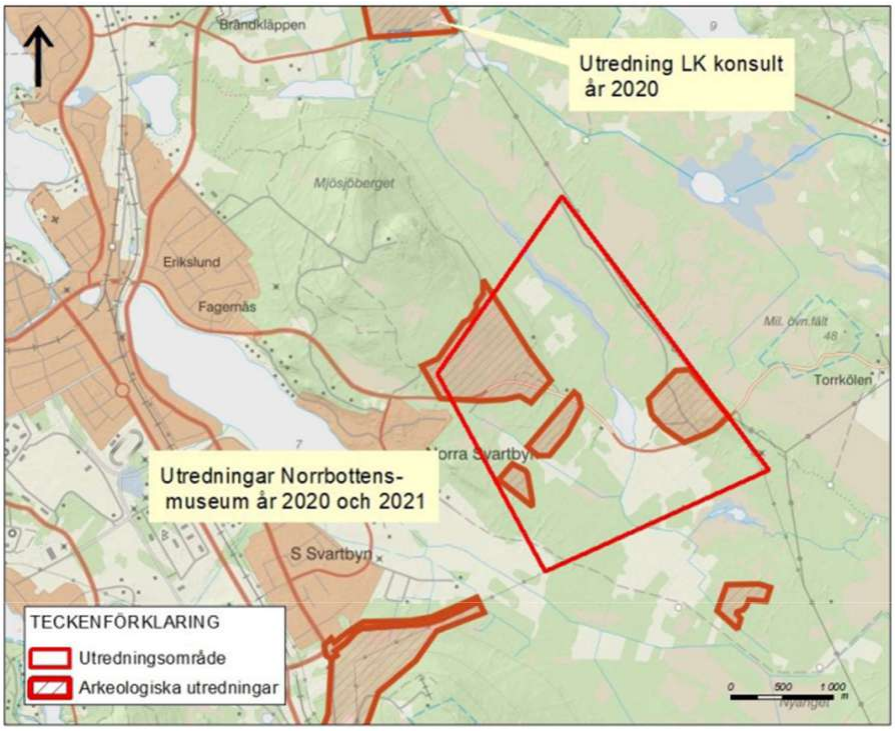

Figure 8-24 Archeological investigations carried out within and near the planned area of operation.
Map from the Cultural Environment Analysis report.

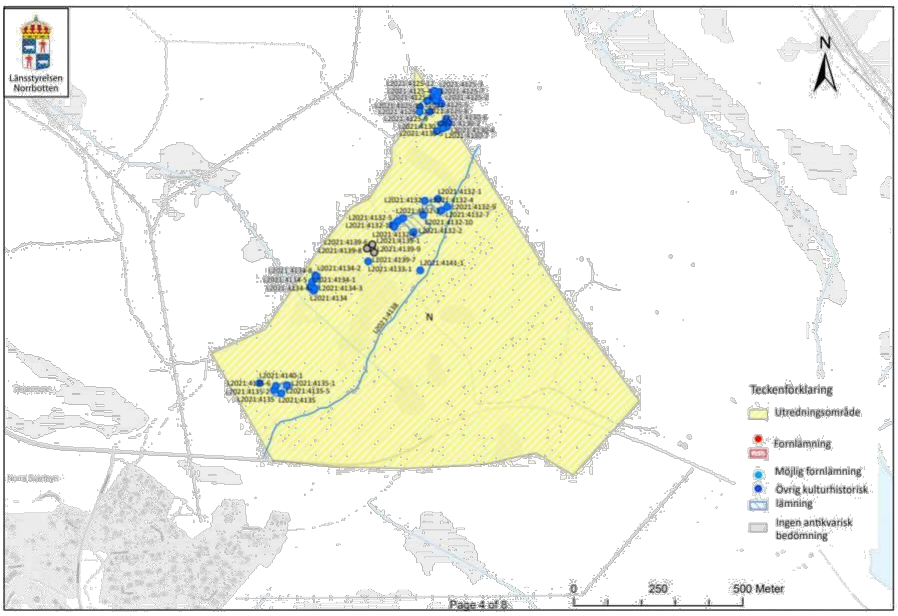

Figure 8-25 Additional archeological investigation carried out in the planned area of activity 2021. Map from the County Administrative Board Norrbotten's message about archeological investigation.

8.8.2. Prerequisites

To the north, in direct connection with the planned area of activity is Riksspartiet Boden BD 74, description and assessment of the impact on this can be found in section 8.1.

In the southwest is the area Svartbyn which is pointed out in Norrbotten's conservation program for the cultivated landscape (Länsstyrelsen i Norrbottens län 1993). The Svartbyn area largely coincides with the landscape protected area Lövronningen (described in section 8.6). There are flat farmlands on sediment that are both used for grazing and mowing, in the area there are about 40 barns. The area has been designated for its natural value in the same program because of its ornithological value. The area of Ängeträsk-Lillträsk, which lies within the planned area of activity, is also identified in the same conservation program as a valuable bird hall, this area is described in detail in section 8.12.

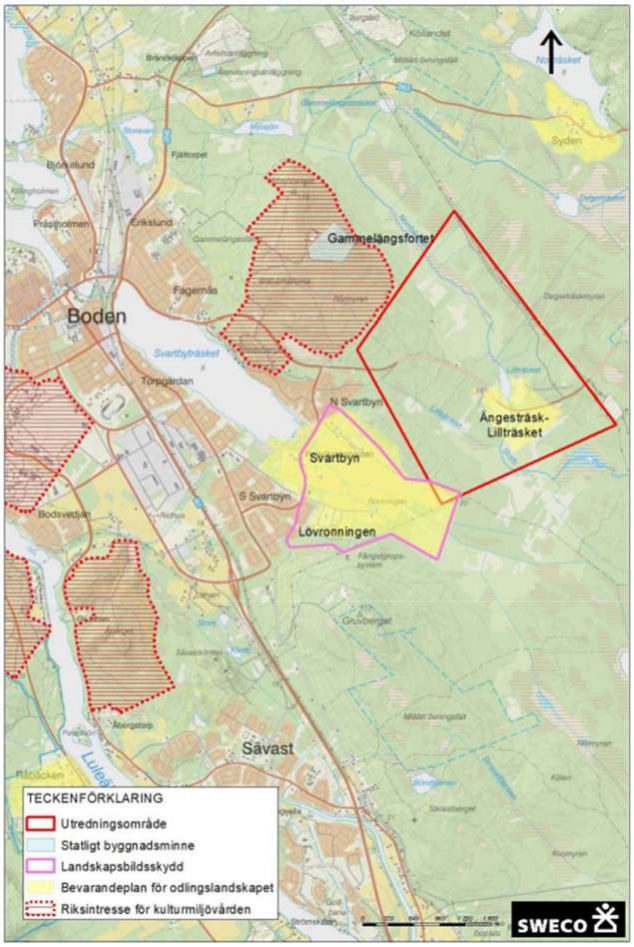

Figure 8-26 Areas of interest for the cultural environment in and near the planned area of activity. Map from the Cultural Environment Analysis report.

Bodentrakten was inventoried at the National Heritage Board's archeological inventory in 1988. At that time, a rich and varied archeological environment was registered, especially south and southwest of the planned activities. However, there are no known remains in the planned area of activity. The sub-areas investigated by the archeological investigation conducted in 2020 were not considered to be well suited to the ancient and cultural remains. The ground was damp or very moist with densely growing forest and lush undergrowth. The ridges within the sub-areas are long, narrow and large block.

The archeological survey conducted in 2021 (see Figure 8-25) recorded, in the western part, a large number of military installations. These include shooting ranges, bunkers and running graves. They are bounded, centrally in the area, by an approximately 1 200 m

long and 8 m wide tank blockade consisting of three parallel stone rows. The military facilities are classified as other cultural heritage sites.

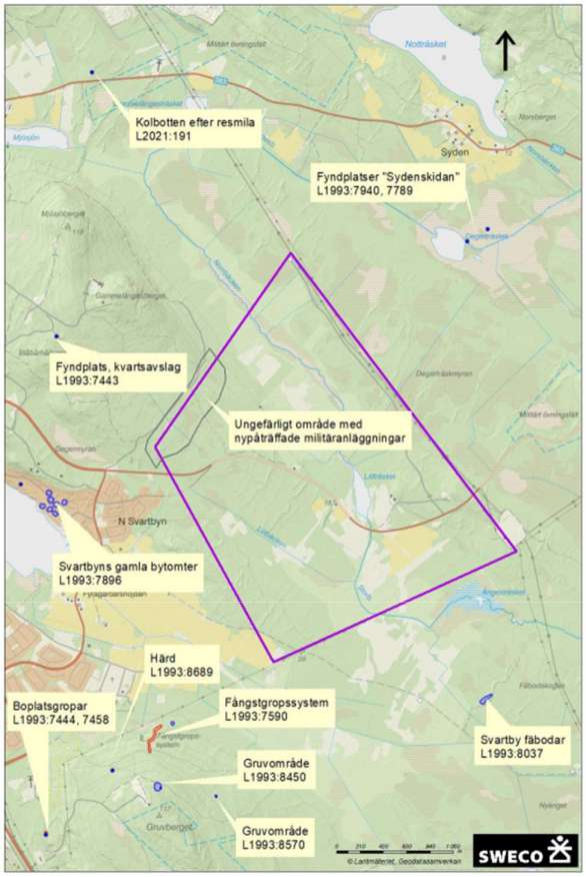

Figure 8-27 Known antiquities and other cultural historical remains. The approximate location of the planned activities is marked by the purple figure. Map from the Cultural Environment Analysis report.

8.8.3. Safeguard measures

Facilities have been set up to save the farmland in Svartbyn area. The area is designated in Norrbotten's conservation program for the cultivated landscape and largely coincides with the landscape protected area Lövronningen. A forest screen separating the industrial plant from the area Svartbyn will be left behind or planted.

8.8.4. Consequences of the activities sought

The Svartbyn area is designated in Norrbotten County's conservation plan for the cultivated landscape. The conservation program aims to maintain the continued use of the open landscape;

including small biotopes and historical habitats in the cultivated landscape. Svartbyn is a peri-urban farmland with barns, and constitutes a representative environment that tells about a historical function and context. This is a type of cultural environment that is relatively common, but is important for the historical readability and experience of the landscape. It is therefore considered to have a moderate cultural historical value. The planned activities may involve the use of a small area of land in the north-eastern corner of the area. However, it is not considered that this should lead to further abandonment or change in the cultivated landscape in the designated area, and the effects are therefore considered to be minor negative. Small negative effects in an area with moderately high cultural environmental values mean totally small negative consequences for the area.

Several military remains have been found in the north-west part of the planned area of operation. The establishment of the business involves the significant removal or impact of the remains. In addition to the newly discovered military installations, no recorded ancient and cultural remains are present in or directly adjacent to the planned area of activity.

8.9. Climate change

8.9.1. Investigations

H2GS has assessed the greenhouse gas emissions of the planned activity. The emissions have been calculated using guidelines from the Greenhouse gas protocol and the World Steel Association. The amount of raw materials for the processes considered to be the main emission sources is calculated and multiplied by an emission factor to calculate the total emissions. In the calculations, the main sources of CO2 emissions have been assessed as electricity consumption in the electrolysis, direct reduction and electric arc furnaces, and the use of natural gas as an additive in the DRI process.

8.9.2. Basis of assessment

The UN's global goal "Fight climate change" and Sweden's national goal "Limited climate impact" have been the basis for the assessment. Greenhouse gas emissions such as CO2 continue to rise and, as a result, we risk achieving average global warming of over two degrees, with serious consequences for ecosystems, ocean acidification, human safety, food production, water supply, health and an increased risk of natural disasters. The combustion of fossil fuels such as oil, coal and natural gas is responsible for the largest contribution to climate change, both in Sweden and worldwide. The temperature increase at our northern latitudes is faster than the world average. For example, the effects may be extensive for agriculture and forestry, as well as for natural ecosystems. Sensitive environments in the mountains and the Baltic Sea can be damaged or completely disappeared. Climate change affects Sweden both through direct local effects and indirect effects of changes in the surrounding world.

Steel production is responsible for 25% of European industry's CO2 emissions. In total, the European steel industry emits more CO2 than the Nordic countries do together. If we are to meet the climate targets, it is necessary to restructure the steel industry, and new technology makes that possible. H2GS aims to accelerate the pace of change through a manufacturing process that eliminates virtually all CO2 emissions from steel production.

The report of the Intergovernmental Panel on Climate Change (IPCC) in August 2021 shows that the climate is changing faster than research has previously shown. With the current emissions rate, the Paris Agreement's target of a 1.5 degree temperature increase will be passed within ten years, that is, ten years earlier than previously thought. It is therefore urgent to reduce the steel industry's carbon footprint as soon as possible. Steel's major impact on other industries' path towards sustainable solutions underlines the importance of this transition.

The new steelworks will use a new production process in which hydrogen replaces coal which will reduce CO2 emissions by 95% per ton of steel compared to conventional steel production. The steel plant will be part of the biggest technology shift in the global steel industry ever.

Large-scale fossil-free steel production is a necessity for the Paris Agreement's climate objectives to be achieved and will give Sweden and Norrbotten a central role in this global transition.

8.9.3. Prerequisites

Greenhouse gas emissions are expected to be about 0.1 tons of CO2 per ton of steel. This compares with approximately 2 tons of carbon dioxide per ton of steel produced by conventional blast furnaces. Natural gas has been largely replaced by hydrogen and also by the electrification of the DRI process where normal natural gas is used to a greater extent. Natural gas has also been replaced by electrification during mileage, cold rolling, galvanization and annealing, The main sources of carbon dioxide emissions are from the use of natural gas in the coal injection process during the DRI process and the use of carbon in the electric arc furnaces to lower the dioxin and mercury levels in outgoing air. The sources of carbon dioxide emissions are due to the use of carbon-containing materials, where carbon is a raw material and not a fuel.

8.9.4. Safeguard measures

H2GS builds a fully integrated, digitized, automated and sustainable production facility. Combining raw materials, renewable energy, leading expertise and artificial intelligence reduces emissions in production.

H2GS is working towards reducing the amount of natural gas used in the DRI process to a "carbon neutral" gas produced with renewable energy that would provide a significant reduction of the carbon footprint. H2GS is also working towards replacing natural gas with hydrogen in the burners used in the preheating of process equipment, which would also lead to reduced greenhouse gas emissions.

8.9.5. Consequences of the activities sought

The planned activity will have much lower CO2 emissions than traditional steel production. The construction of a new steel production plant, using the best available technology, has a small negative impact at local level, which is deemed to have little impact.

With the construction of the planned activities, work is being driven towards a less climate-damaging steel industry. In the long term, this will mean a reduction in greenhouse gas emissions at national and global level, which will have positive consequences in terms of reducing the climate impact. The planned activities therefore make a positive contribution to the national environmental goal of limiting climate impact and to the UN's global goal of combating climate change.

8.10 Climate change adaptation

8.10.1. Investigations

A groundwater assessment (Annex B3) has been carried out for the planned activity. The surface water assessment describes the current run-off in the area and the impact of the planned activity, as well as the flow delay and treatment that will be required after exploitation in order to ensure that the natural downstream environment is not affected by pollution, faster run-off and increased flows.

An environmental risk analysis (Annex B10) has also been prepared for the planned activities.

The environmental risk analysis identifies, analyzes and assesses risks associated with accidents that may be caused by the establishment and that could cause serious damage to human health and the environment. The environmental risk analysis also assesses which measures are deemed reasonable to implement in order to reduce these risks and achieve an acceptable level of risk.

8.10.2. Basis of assessment

The municipality of Boden has a stormwater strategy that was established in 2019. The overall objective is for stormwater management to mimic nature's approach to precipitation and thus create the conditions for long-term sustainable stormwater management. According to the Baden municipality's stormwater strategy, infiltration of surface water is to be applied where possible by seeking an increased proportion of permeable surfaces. The delaying and disposal of surface water shall be as close as possible to the source where the surface water is generated before being passed on to the overall diversion. When planning new areas, buildings and/or infrastructure, free waterways shall be ensured and altitude shall be provided to prevent harmful impoundment. If land use changes occur, runoff from the area should not increase.

Swedish Water Publication P110 provides recommendations / instructions on dimensioning return time for different types of residential buildings as well as for central and business areas. Where areas of activity are to be designed, balancing

be made on a case-by-case basis, based on the possibilities of creating delay volumes and flood surfaces. The breakdown between different types of buildings (and therefore the choice of return time) should also reflect the possibilities of managing surface water volumes without serious consequences.

8.10.3. Prerequisites

According to the Norrbotten County Administrative Board's report on climate change and its impact on environmentally hazardous activities and polluted areas in Norrbotten County (Länsstyrelsen Norrbotten 2018), increased precipitation is generally expected to increase to varying degrees within Norrbotten County in the future. The climate parameters that are deemed to have the greatest impact on contaminated soil and environmentally hazardous activities are floods, landslides and erosion. These natural disasters are mainly due to changes in precipitation and to the flow rate in high-flow situations (10- and 100-year runoff). These climate parameters increase most in the western part of the county (the mountain and inland) and least in the eastern parts of the county (the coast and the Torne Valley).

No major depressions or confined areas exist within the planned area of activity today, but there are low-lying areas with poor fall and small differences in level to surface waters. In the central low-lying parts there is therefore a risk of flooding at high flows in Storbäcken.

8.10.4. Safeguard measures

Surface surface surface surface water where the steelworks are planned and the surface where the electrolysers are planned will be handled separately. The management of the surface water will consist of delay in a delay reservoir followed by a pre-sedimentation for sediment and particulate decontamination and then a post-polishing in the form of purification ponds. The surface water treatment will be built between the operational areas and Lillträsket. In order to reduce the risk of damage occurring at points of discharge and on downstream watercourses, it is recommended that delaying measures with limited outflow be taken. The limited outflow has been calculated using the rational method in accordance with Swedish Water Publication P110 and standard values for run-off from large natural areas. A rainfall with 30 years return time has been chosen as the design for delay within the area. The details of surface water management are described in section 8.2.4.

In order to reduce the flow load from surrounding river basins and to allow for surface water management within the area, the surface water review recommends that the area be inclined towards the south-east and that cutting ditches around the area be established to divert flows from upstream lying areas around or through the area, and surface water from the area is led to laggards with purification. The long distances and likely flat areas are likely to require technically advanced solutions with pumping and intermediate/storage of surface water within the area to direct all surface water to the treatment plant.

Based on the surface water assessment (Annex B3) carried out, buildings shall be constructed higher than the calculated level of damming in the watercourses. Height setting should be performed so that natural

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flooding water up to the level +14.1 meters does not damage the construction of buildings. Generally speaking, within three meters of buildings, the ground surface shall have a slope of at least 1:20 towards the surrounding surfaces.

8.10.5. Consequences of the activities sought

The planned activities will in themselves lead to increased water flow through the sealing of large areas and the reduction of infiltration. The surface water study has proposed a general surface water solution for delaying and purifying surface water designed for 30 years of rainfall. The final design of the stormwater management will be developed in conjunction with the design of the facility

According to the environmental risk analysis carried out (Annex B10), torrential rain could lead to flooding in the area concerned. In general, flood risks are expected to increase in the future due to the ongoing climate change. However, the area is considered to have good conditions for water disposal. The natural drainage direction of both surface and groundwater is well defined, which facilitates the disposal of surface water from the area. The risk of flooding other than in the event of a dam break in the Luleå river is considered to be low and no further risk mitigation measures with respect to flooding are therefore deemed justified.

The impact of flooding caused by a changing climate is estimated to be manageable by well thought out altitude and stormwater management within the area of operations. The consequences of flooding caused by a changing climate are therefore estimated to be small.

8.11 Risk and safety

8.11.1. Investigations

An environmental risk analysis (Annex B10) and a safety report (Annex C) have been prepared for the planned operation.

The environmental risk analysis identifies, analyzes and assesses risks related to accidents that the planned activities may cause and that could cause serious damage to human health and the environment. The environmental risk analysis also assesses which measures are deemed reasonable to implement in order to reduce these risks and achieve an acceptable level of risk.

The safety report describes the risks present on the installation and the structure of the safety work to limit accidents and how the consequences of an accident are limited.

8.11.2. Assessment basis

The planned activities are covered by the law on the control of major chemical accidents (the so-called Seveso law). The activities are subject to the higher level of requirements based on the

natural gas and hydrogen to be managed and therefore a safety report has been produced (Annex C).

Risk is defined as an aggregation of the probability of an unwanted event and the consequence of that event. The probability describes the probability of the event occurring and the consequence describes the extent of the damage that may occur.

Risks where the installation has an impact on the environment and risks where the environment may affect the installation are included in the assessment.

8.11.3. Prerequisites

Accidents at the installation may cause sudden and adverse effects mainly through effects on human health from the release of dangerous substances, heat radiation from fire or pressure from explosion. Depending on the cause and the source of risk, objects of protection such as surface water, groundwater, drinking water, local residents, bystanders, animals, infrastructure and other activities may be affected.

The planned activities could also lead to increased levels of risk for other types of accidents, for example, if the location of the activities could result in an increased risk of flooding elsewhere, or if the installation were to be built, the possibilities for intervention in the event of a forest fire would be significantly reduced.

Possible hazards identified include:

Management/storage of chemicals, gases, fuels and

waste

Natural accidents (forest fire, flood, snow loads, landslides, storm)

Activities outside the area

No operations with handling of quantities of flammable products subject to authorization, Seveso activities or environmentally hazardous activities subject to authorization have been identified in the vicinity of the planned area of operation.

Objects in the immediate environment likely to be affected in the event of a serious chemical accident within the planned activities are:

Residential building (North and South Svartbyn,

Boden) Traffic on national road 97

Railways on Malmbanan

Water areas (Lilltråsket, Svartbyträsket, Ängeträsket, Lule

älv) Transformer station/high voltage lines

Figure 8-28 Overview map with clarification of potential damage objects in the immediate environment. Red marks indicate the approximate extent of the area of operation.

8.11.4. Description of risks

The risks considered relevant from a Seveso point of view for the planned activities are deemed to be those associated with the management of hydrogen and natural gas. Hydrogen will be produced by electrolysis for use in steel production. The maximum quantity of hydrogen stored at any one time is expected to be 30 tons. Natural gas will be used in steel production. It will be stored in liquid form within the area in an estimated quantity of about 1500 tons.

The following describes what could lead to a major chemical accident.

Electrolyzer

The hydrogen will be produced by electrolysis of water into hydrogen and oxygen. The risks identified in relation to the electrolysis are estimated to come from a possible leakage of the oxygen and hydrogen produced.

Compressors

In order for the hydrogen produced by the electrolysis to be used in the business, it needs to be compressed. If the hydrogen is to be used directly in the process, it is compressed to 8 bar. If the hydrogen is to be stored for future use, it is compressed

the risks identified in the process of compaction of the hydrogen are estimated to be the result of possible risks from a leakage in the process.

Hydrogen management

The hydrogen is passed through tubes from the electrolyzer to the hydrogen tanks. The pipelines are assumed to be carried out as high pressure lines of 250 bar to the hydrogen tanks and low pressure lines of 8 bar to the rest of the process. The high pressure lines are estimated to have a length of about 1 500 meters and the low pressure lines to have a length of about 450 meters. Pipe diameter is estimated to be at most 150 millimeters.

The quantity of hydrogen handled will be approximately 30 tons. The storage pressure within the tanks is about 250 bar.

The risks associated with hydrogen management are mainly related to leakage. Leakage may occur in the event of flanges or valves, but also in the event of collision or damage. In the event of a leak within the pipelines or hydrogen tanks, there is a risk of jet flame, gas cloud fire and explosion. In the event of an explosion, there is a risk of major domino effects within the business.

Oxygen management

As a by-product of the production of the hydrogen at the electrolysis, oxygen is also formed. The oxygen will be cooled and stored in the field of activity. Oxygen has a fire support function. In the event of a leak of the cooled oxygen, there is a risk of a pölbrand.

Natural gas management

The natural gas is supplied to the operations in tankers of 30 m^3/each. The natural gas is stored refrigerated and liquid. The volume of natural gas stored in the business area is estimated at 1 506 tons. It is assumed that this volume is contained in a single pressurized tank with a pressure of approximately 7 bar. The tank is to be carried out in the form of external concrete structures with an internal steel container and insulating layers between them.

In the event of minor leakage of natural gas, most of it will evaporate directly. However, in the event of higher emissions, it can be expected to accumulate puddles, which evaporate and form larger, heavy gas clouds. This could lead to a gas cloud fire and/or a pölbrand. In the event that leaking natural gas ignites directly at the point of discharge, there is a risk of a jet flame occurring.

Transport, unloading and loading

Supplies of chemicals and raw materials for the operation will mainly arrive by train, but also by truck. It is assumed that natural gas is transported by tankers. The transport of dangerous goods by the planned routes means that the protection distance to third parties is shorter than from the area of activity. Risks that will be taken into account in the further work on transport include the risk of gas cloud fire, pölbrand

and explosion. The source of these risks is considered to be mainly the transport of natural gas.

Natural disasters

The plant can be damaged both directly and indirectly in a storm. This is due to the strong winds, surrounding objects and falling trees tearing down overhead lines. There is also a risk that parts from the plant will become detached and harm other property or people. The nearby forest can cause a risk of forest fire. Dust breakage in the Lule river can entail the risk of flooding.

8.11.5. Safeguard measures

H2GS will work actively to protect the public, employees, entrepreneurs and the environment by continuously preventing and limiting the consequences of major chemical accidents. The primary objective is the safe handling and storage of all hazardous substances and other chemicals in order to minimize the risk of serious chemical accidents occurring and affecting humans and the environment.

In this context, prevention means action taken with the aim of minimizing the likelihood of a serious chemical accident occurring. General preventive protection measures to prevent the release of flammable liquids, liquefied gases and environmentally hazardous substances will be bundled/double-jacketed tanks/vessels, overfill protection, monitoring, training, rounding, inspection and maintenance.

Restrictive measures are measures taken within the establishment to reduce the impact of the accident and the consequences for human health and the environment. General restrictive protection measures will be indoor or outdoor storage with protection distances for flammable liquids and liquefied gas, unloading/loading on sealed and paved surfaces, monitored and shut-off assembly surfaces and pipelines. The surface water system is designed so that emissions can be managed through delay systems, shut-off devices, etc.

Traffic within the area of operations will be subject to speed limits, traffic rules, signage, snow and slip control, maintenance of rails and possible switches, etc.

To prevent the occurrence of fire and reduce consistency, the activities will have a monitoring system, fire cell division, ATEX rating, training, rounding and a systematic fire protection work.

Restrictive measures include automatic extinguishing and fire alarm systems and the separation of environmentally hazardous substances from flammable substances. The operation will also have an internal rescue force in place.

The distance between the buildings (and handling points for flammable goods) and adjoining woodlands shall be sufficient to avoid an increased risk of radiation effects.

The Swedish Health and Safety Act (SFS 1977:1160), the Act and the Ordinance on Flammable and Explosive Goods (SFS 2010:1011, SFS 2010:1075) and the Swedish Agency for Social Protection and Preparedness Regulation (MSBFS 2020:1) are examples of laws and regulations that govern what applies within the working environment and when handling such things as flammable goods.

The risk mitigation measures proposed include protection distances from surrounding buildings and protection distances within the installation and fire protection measures.

8.11.6. Consequences of the activities sought

The calculations of the probability and consequence of accidents show that risk mitigation measures within the planned area of activity are required. No scenarios within the planned activities of H2GS are deemed to cause domino effects that risk affecting neighboring activities. The domino effects considered are in particular those limited to the site of the activity.

An accident that could lead to emissions of natural gas (stored amount of about 1 500 tons) would correspond to about 37 500 tons of CO_2-equivalent which can be compared to Sweden's total emissions of about 50.9 million tons of CO_2-equivalent in 2019 (thus 0.07%).
Natural gas is lighter than air at normal air temperature. Although in the event of a discharge the air is cold and emissions are thus for a period of time heavier than air, the dispersion to the environment is limited and there is no risk of direct poisoning on the surrounding environment. Emissions shall be prevented by constructing tanks and technical installations correctly, and by taking into account maintenance in its ongoing risk management. However, even a major disaster is not considered likely to have an environmental impact that would be unsuitable for the management of the business. The level of risk associated with natural gas management is considered acceptable from this perspective.

The risk of special accidents in the event of a storm is not considered to be a threat to the operation.

The probability of a forest fire occurring in areas should be comparable to other similar sites.

The probability of an earthquake of sufficient magnitude to cause damage is low and it is assessed that no further action is required beyond those described for other accidents.

The location of the activity is not deemed to affect the environmental capacity to deal with natural disasters, the activity does not imply a deterioration in the accessibility of the rescue services or the disappearance of natural flood areas or the construction of new dams.

In the event of heavy snow, the need for snow removal will increase and the operator will have to make his own machinery available so as not to hinder the municipality's own snow removal.

The risk of a dam break is considered small.

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The consequences that can affect people in the area or the environment are considered moderate. The consequences for people living in the area may be significant if risk mitigation measures are not applied.

8.11.7. Protective measures and consequences during the construction phase

The construction phase is considered to be a risk of accidents that may affect the environment. The operation of civil engineering machinery and the setting up of fuel reservoirs present a risk of leakage and spillage. Emissions can occur both in the event of accidents and sabotage or theft within and adjacent to the work area.

The increased volume of heavy goods transport can mean an increased risk of road accidents and a burden on the public road network for a limited period of time.

Risks associated with the construction phase of planned activities will be directed partly towards reducing the likelihood of something happening and partly towards reducing consistency if something happens. This shall be done, inter alia, by carrying out ongoing environmental and health and safety checks in order to ensure that the contractor complies with the safety and environmental requirements.

Preventive protection measures to reduce the risk of accidents with vehicles are the design of temporary routes with clear markings, signage and, where necessary, safety rails/boundaries and anti-impact protection. Speed limits are imposed.

H2GS will require the contractor to establish an emergency preparedness plan/procedure in the event of an environmental accident, for example in the event of oil or fuel leakage, indicating the emergency/environmental incidents that may occur and how to deal with them. The organization, powers and responsibilities shall be specified in the procedure. The emergency procedure shall be displayed in a clear place at the workplace.

Consequences during the construction phase may include emissions of substances dangerous for human health and/or the environment, accidents involving personal injury or damage to property, such as road accidents and limited access on nearby roads.

It is not considered that the consequences of any discharges at the construction stage may develop into serious environmental consequences or may affect third parties outside the construction site.

In conclusion, it is assessed that the risk of accidents and emissions to soil and water during the construction phase is low.

8.12. Energy resources management

8.12.1. Investigations

A cost-benefit analysis for the cooling of residual heat has been carried out (Annex D). The cost-benefit analysis presents a zero option which means that the plant is built without the possibility

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to supply waste heat to the district heating network and two comparison options for different rates of waste heat recovery. The Swedish Energy Agency has approved the cost-benefit analysis.

Investigations are ongoing into how natural gas can be replaced with synthetic gas to increase the carbon content of the DRI pellets.

More studies will be carried out, for example, on the use of excess steam and on the use of coolant water at lower temperatures. Technology will be evaluated to make cost-effective use of the heat energy available in cooling water at a temperature of about 50 degrees. In order to ensure future energy recovery from partial flows, further design will aim to separate flows with different temperature ranges.

8.12.2. Basis of assessment

The Swedish energy targets for 2030 and beyond are 50% more efficient energy use in 2030 compared to 2005 (through reduced energy intensity) and 100% renewable electricity production by 2040. Sweden's targets are based on the targets set within the EU.

8.12.3. Prerequisites

Energy consumption and energy efficiency is an area which H2GS gives a particularly high priority in its efforts to produce steel with minimal environmental impact. The continuous process results in large energy savings (the order of 1 TWh in the hot parts) by using heat from the previous process in the next step. By minimizing the use of natural gas and other fossil fuels and converting some processes to electricity, the electricity power requirement has increased to some extent compared to traditional process and is estimated to be in total around 2000 MW. The most energy-intensive parts of the planned activities are the hydrogen plant and the direct reduction of iron ore.

The activity will generate residual heat which is intended to be reused to the greatest extent possible.

8.12.4. Safeguard measures

The choice of location has been made on the basis of the availability of renewable electricity from hydro and wind power. The plant is built on the basis of being as energy-efficient as possible in operation, using modern technology and energy-efficient equipment.

Energy recovery has been an important part of the process design. Energy recovery and energy efficient solutions have saved a total of about 1.4 TWh/year of energy, which corresponds to the heating and household electricity of about 70 000 normal villas.

Residual heat must be recovered and heat loss minimized. By having continuous processes, for example direct casting, there are large energy savings when reheating for hot rolling is not required. By adding hot DRI to the electric arc furnace, heat is recovered instead of letting it depart during storage.

Excess heat can be used to heat water used internally or to external district heating networks. Heat from the flue gas of the electric arc furnaces will be recovered when the energy content is high. Partly in the hydrogen process and partly when necessary for scrap drying.

Most of the electrolyte modules will use lower energy-consuming technologies for hydrogen production. In addition, no external power is required to start up from hydrogen production shutdowns when this technology is used. Other as yet unproven technologies will be tested in some modules, where steam will be used produced by residual heat from the electric arc furnaces.

8.12.5. Consequences of the activities sought

The activities will have small-moderate consequences based on the fact that the large amounts of energy needed to run the processes will be used optimally within the business but will also be able to be used externally through, for example, the residual heat generated. These can, if used, become heat in Boden and Luleå's district heating network and can then have a positive influence on energy consumption within the region.

8.13 Residues and waste

8.13.1. Investigations

Investigations are under way to identify the best technical and financial means of exploiting the residues arising from the activities. For slag, tests are ongoing to develop different outlets. For oxygen, alternatives for internal reuse in steel production are investigated and also how the gas can be transported efficiently to be used externally.

8.13.2. Basis of assessment

Waste is defined under the Environmental Code as any substance or object which the holder discards or intends or is required to discard. All waste should be managed on the basis of the waste hierarchy, which means minimizing, reusing, recycling, extracting energy and ultimately depositing.

The Waste Regulation (2020:614) governs all waste management.

By-products are substances and materials produced without the main purpose of the activity being to produce those materials or substances. Under Chapter 15, Paragraph 1 of the Environmental Code, a number of other criteria must also be fulfilled for the materials or substances in question to be considered as by-products. For several of the material streams it is still too early to assess whether all the criteria will be met.

8.13.3. Prerequisites

For all residues, the use will depend on composition. That is, the content of precious metals and other substances (e.g. lime) and the characteristics of the residue such as leaching properties, size, bearing strength, wear resistance, binding ability, abrasion resistance and brittleness.

The appropriateness of the use of residues for civil engineering purposes or coverage is also affected by the guidance values available for current land use and soil pollution levels.

Hydrogen production also produces large quantities of oxygen.

In addition to the residues mentioned below, waste from the activity is generated by, inter alia, refractory materials from linings, chemical residues from steel finishing, lubricating oils from machine parts and vehicles, as well as packaging residues, etc.

No landfill is planned in the area of activity.

Handling, such as loading, unloading, crushing and sieving, results in dusting when handled outdoors.

Table 15 Estimated quantities for the largest residues.

Solid residues	Estimated quantity (tons/year)	Sample Action
Oxygen	1.700.000	Treatment of sewage or drinking water
Fine fraction from the DRI process	100,000	Recirculate Internal
Electric arc furnace dust	106,000	Processing for recovery of iron and zinc
Electric arc furnace dross	640,000	addition to structures or as a covering of mines; recovery of vanadium;
Suckling slag	52,000	For the cement industry
Oxygen planar granules	7,500	Recirculate Internal
Glow shell	80,000	Internal processing or sales
Internal return steel	380,000	Recirculate Internal
Zinc dross	6,000	Zinc extraction

Solid residues	Estimated quantity (tons/year)	Sample Action
sludges	50,000	Iron recovery after dewatering

8.13.4. Safeguard measures

Procedures shall be put in place to minimize the amount of waste, to minimize the content of hazardous substances in materials and articles and to minimize any adverse effects on human health and the environment that the waste may cause.

Reception control of external scrap will prevent the use of contaminated or radioactive scrap within the business.

By-products

In terms of quantity, oxygen is the largest residual product produced, about 1 700 000 tons per year. Oxygen has a number of uses, such as treatment of sewage or drinking water, oxygenation in natural lake systems, in fish farms, for bleaching in the paper industry or for other purposes in the glass and steel industries. H2GS also explores the potential for reuse of the oxygen in the planned activity.

Fine fractions from the DRI process (iron sponge residues) and falling residues (internal reusable steel) will be reused directly in the business. The fraction will be collected and briqued for reuse, either in the direct reduction or as input material in the electric arc furnaces.

Slags have historically been largely deposited. H2GS has made and is making great efforts and investments to avoid slag disposal.

The slag in H2G's planned activities can be separated into different slag fractions depending on the use. The largest amount of slag will come from the electric arc furnaces, about 640 000 tons per year, when production is applied for. In addition to the slag from the electric arc furnaces, dross also occurs at the shaker, the casting box and the zinc coating. Several types of slag have been registered according to the so-called The REACH Regulation and H2GS estimate that it is likely that one of the existing registrations will be able to be used by the electric arc furnace slag and thus be used for the same purposes as registered slag types. As production has not yet started, it has not been possible to investigate the chemical properties of the slag. However, similar types of slag have been investigated and further investigations are ongoing. The lactation tests carried out show that the leaching of impurities from the slag is essentially small. Based on the results obtained so far, several uses of the electric arc furnace slag have been identified. The slag can be separated into different fractions for different uses with the chosen slag handling technique, some examples are given below.

H2GS is holding discussions with other companies on the extraction of vanadium (and other value metals such as nickel, cobalt and lithium) from the electric arc furnace slag and has concluded a preliminary agreement. Such cooperation already exists between existing steel producers and extractive companies. H2GS intends to sell all high-content vanadium and other valuable metals to external operators for the extraction of these metals.

Slags can be used for civil engineering and construction purposes, replacing virgin material (crushed rock, moraine, sand and gravel). It is common for steel slag to be used in bonded or untied layers in road structures or as asphalt aggregates. Slags can also be used in the final coverage of landfills. In Sweden slag is also used for landfill constructions and slag has several properties that make it suitable for use as an asphalt aggregate. Before the slag is used for construction purposes, its properties will be further investigated. If the current assessment of the suitability of the slag can be confirmed, it will be possible to use it both in the planned field of activity and elsewhere.

A particular form of slag use where investigations are well advanced is the use of slag for the coverage of extractive waste. Slags can then be used in the protective coating or in the waterproofing layer. It can also be used as a leveling-off between extractive waste and waterproofing (mainly in the case of gray-rock storage). The nearest debated warehouse is located at the Aitiki mine, where the need for countervailing materials corresponds to around 300 000 tons per year, i.e. almost half of the falling slag at full production. The possibility of using the slag also in protective and waterproofing layers will be further investigated.

Slags with a high proportion of basic substances can be used as binders in cement. In Europe, cement is often replaced with ground granulated slag to reduce the climate footprint of concrete. In Sweden, such cooperation has begun in Oxelösund. Studies carried out to date indicate that the conditions for the use of electric arc furnaces in concrete production are good.

The slags must be dried and granulated. If done without prior cooling, crushing is required, generating dust and noise. If the cooling is done with water, extensive water management and a need for purification of the water used are required. H2GS will therefore apply air-based cooling where granulation occurs while the slag is cooled. In the process, the slag is bound in granules while at the same time a rapid, air-based cooling occurs that increases the glassy properties and reduces the leaching properties of the slag. Processing is done by batch. The granulation will take place indoors in a room with an exhaust and a textile latch filter. The exhaust gases from the granulation chamber are cooled with water applied by spraying technique. The water used for cooling evaporates and is passed as water vapor into the atmosphere via the chimney. Thermal energy from the granulation chamber will be reusable in other processes.

All the above by-products will have to be stored in the area of operation pending reuse or off-site transfer. H2GS intends to apply anti-dusting measures at the storage and unloading sites where dusting can be updated. In the case of slag, it should be noted that cooling is carried out on-board while loading may take place outdoors.

Other residues

The electric arc furnaces generate approximately 106 000 tons of fine dust (0,1-1 mm) per year collected in the flue gas treatment plants. The dust is typically a mix of iron oxides, calcium, magnesium oxide, silicon dioxide, aluminum oxide, zinc, lead and cadmium. The concentrations of these elements are largely dependent on the composition of the scrap loaded in the electric arc furnace. LB dust with sufficient zinc content, reused in the production process or by the zinc supplier to create a circular flow of zinc. If the zinc content is low, the materials can be reprocessed at an external plant.

Globe shells (about 80 000 tons per year) are formed when the outermost layer of oxide from the steel is removed from the steel surface and flushed to a glow shell basin from the direct casting and hot rolling part where they settle. The glow shell is raised periodically with a bucket attached to a traverse to a plate for dewatering. The uses of the incandescent shell include the reduction of the iron oxide to iron for insertion into the electric arc furnace, briquetting for insertion into the DRI process or reduction and use at another plant.

Sludge from the DRI process (approximately 50 000 tons per year) is a wet fraction generated in the cleaning of the DRI process wet scrubber. The sludge is drained and then sent to an external operator for the recycling of iron or landfill.

In the business, all handling of residues will be sacked, covered or indoors, which significantly reduces the risk of dusting problems. Some dusting may occur in the handling of filter dust bags, in transport on graveled surfaces and in the sweeping of anti-slip materials.

The handling of materials will be designed in such a way as to minimize the number of loading and unloading operations and transport distances. Other possible measures to reduce dust emissions from transport include speed limits, dust sequestrants or irrigation, cleaning of surfaces and construction of sealed surfaces.

Dust will be handled in a bag or silos to minimize the risk of dust and, where possible, moved using transporters or other safe handling equipment and safely stored in storage facilities.

The handling and intermediate storage of residues will be done according to production-specific procedures based on the type of residue. The procedures will be described in the context of the activity's own control program aimed at minimizing risks to health and the environment when handling and intermediate storage of residues. The self-control program will include, inter alia:

details of the processes that generated residual waste/waste and describe any processing operations;

description of the substances and properties involved,

Waste is assigned a waste code in accordance with the Waste Regulation and volume/quantity of waste is recorded together with documentation that allows the waste to be traced at the facility and in the Swedish Environmental Protection Agency's waste register.

Furthermore, the activities will ensure that:

Residues are not subject to factors or changes in factors (temperature, pressure, etc.) which affect the safety of handling.

If hazardous waste from the production of steel strips is handled outdoors, it will be done on sealed and coiled surfaces.

the external handling of H2GS residues by service providers and reception facilities are subject to the necessary authorizations;

Depending on the residual product and the use to be made, processing is required in the form of crushing, screening and separation of metals, for example by magnetic separation.

8.13.5. Consequences of the activities sought

The technique used for granulation of slag reduces dust and the risk of noise nuisance. It also improves the leaching properties of slag and enables the recovery of thermal energy. However, it is significantly more costly than other available technologies.

Waste in different fractions will be generated within the activity, but the aim is to minimize the amount of waste and its content of harmful substances for humans and the environment. The amount of waste deposited shall be minimal. By reclaiming residual steel from own and customer production and using it in steel production, the quantities of waste are reduced internally and externally. By-products and residues arising from operations shall, as far as possible, be reused or recycled. On this basis, the impact is estimated to be small.

8.14 Nature

8.14.1. Investigations

Several nature value inventories and in-depth surveys of amphibians, orchards and bats, as well as a bird survey, have been carried out within the planned area of activity. During the detailed planning process, the municipality of Boden has carried out natural value inventories of the entire planned zoning area (Ecogain 2019, 2021). In addition to these surveys, a bird survey and in-depth surveys of amphibians, orchids and bats have been carried out in the area. In addition to the investigations by the municipality of Boden, H2GS has carried out a natural value inventory of large parts of the area of the steelworks, including:

directly adjacent areas to the north and northeast. H2GS also carried out an additional bird survey. On the basis of the investigations that have been carried out, a species protection study has been produced. The full text of the SPA and the H2GS wildlife survey is given in Annex B6.

8.14.2. Basis of assessment

Areas of natural value

All natural value inventories that have been made within the planned area of activity have been made according to Swedish standard SS 199000:2014 (SIS Swedish Standards Institute 2014a-b). Natural value has been assessed in four natural value classes:

> Natural value class 1 Highest natural value - greatest positive importance for biodiversity
>
> Natural value class 2 High natural value - great positive importance for biodiversity
>
> Natural value class 3 Significant natural value - significant positive importance for biodiversity
>
> Natural value class 4 Certain natural value - some positive importance for biodiversity

The assessments are based on the conclusions of field visits and other available knowledge of the inventory area.

Conservation species

The collective term conservation species includes protected species, red-listed species and signaling species:

> Protected species are covered by the Species Protection Regulation (2007:845). All wild birds are covered by the Species Protection Regulation, but in accordance with the recommendations of the National Conservation Agency (2009), priority is given to red-listed, declining and species listed in the EU Birds Directive.
>
> Red-listed species are not automatically protected. The Red List is merely an assessment of the extent of the risk of extinction of species. The Red List is used as a basis in many different contexts for, among other things, nature conservation planning and as a basis for decisions when authorities assess which species need to be protected by, for example, shelter. There are different categories of red-listed species, these are: National extinction (RE), Acute threatened (CR), Endangered (EN), Vulnerable (VU), Near threatened (NT) or Knowledge deficiency (DD).
>
> Signal species are a term used for species that indicate forest habitats with high natural values and thus can be a key habitat.

Species protection

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The legal conditions for the species protection study on which the assessments in this EIA are based are set out in Annex B6.

In the SPA, the Municipality of Boden has been considered to be a reasonable delimitation for the local population of birds and mammals while for vascular plants and amphibians it extends some or a few kilometers from the area of the investigation. For birds and mammals, Norrbotten County is considered a reasonable delimitation for a regional population.

As regards continuous ecological function assessment (KEF), the species protection study has assessed whether the local population of birds and mammals has sufficient habitats in the surrounding landscape to ensure a favorable local conservation status.

8.14.3. Prerequisites

Areas of natural value

The area where the steelworks are planned (within the western blue marker in Figure 8-29) consists largely of forest. Large parts of the area are of low natural value and most have been characterized by human use through forestry, ditching and partly agriculture.

The H2GS natural value inventory of the surface area of the planned steelworks (Annex B6) found an area deemed to be of natural value class 2 (high natural value), area 7 in Figure 8-29. Area 7 was previously identified as a key habitat protected also by a nature conservation agreement. The area stands out as the most important part of the area's biodiversity and a large part of the conservation species was noted here. The species is also highly concentrated in Area 7.

Area 7 consists of a deciduous spruce forest and largely damp ground. The ground is flack, and an older spruce forest with hints of birch dominates. The forest has older effects, but has developed naturally over a long period of time and natural forest structures have emerged. Bitwise there are elements of aspen and seal. Dead wood is sparsely found, both as spruce and birch but also occasional seals and asps. In the most swampy parts was noted Lapp Ranunkel (protected). Other noted conservation species included the gull-cap (NT) and the signaling species fox-tick, skinnlav and wreath moss.

Nine other areas of natural value within the area where the steelworks is planned were assessed as having natural value class 4 (certain natural value), areas 1-6 and 8-9 in Figure 8-29. These objects consist of deciduous coniferous forests, wetlands, coniferous forests, older coniferous forests, mixed forests, abandoned farmland and birch-dominated forests. All areas of natural value in the area with natural value class 4 are considered to have a low or insignificant species value.

Figure 8-29 Natural value areas identified by the inventory of the planned steelworks area (Sweco 2021). The approximate location of the planned area of operation is highlighted in blue (the steel plant is planned within the western surface and the electrolysers within the eastern).

Lillbäcken runs through the area where the steelworks is planned (see Figure 8-30). Some stretches of Lillbäcken have been assessed as having a natural value class 2 (high natural value) where it is affected by felling all the way down to the stream and stretches that have been straightened out. Some stretches where the basin regained its natural meandering character have been assessed as of natural value class 3 (significant natural value) (Ecogain 2021). Lillbäcken is formed today by the road ditch at Flarkenvägen running together. Lillbäcken then flows southeast where it flows into Storbäcken.

A ditch from Lillbäcken in the north-east direction has provisionally been assessed as being covered by the general biop protection. However, in the planning proposal for the Black Village VU5 area, Boden Municipality has not introduced a protective provision for the ditch. In order to be covered by the biotope protection rules, at least one side of the pelvis or ditch shall be adjacent to agricultural land, to a maximum of two meters wide natural furrow or open ditch. If neither side borders agricultural land, the definition of the biotope is not met. The municipality of Boden considers that this ditch does not meet the definition.

Within the planned area of activity of the electrolysers (within the eastern blue marker in Figure 8-30) has a pine forest with old pine trees and single dead trees that:

assessed as having a natural value class 4 identified, the area has an insignificant species value (Ecogain 2019).

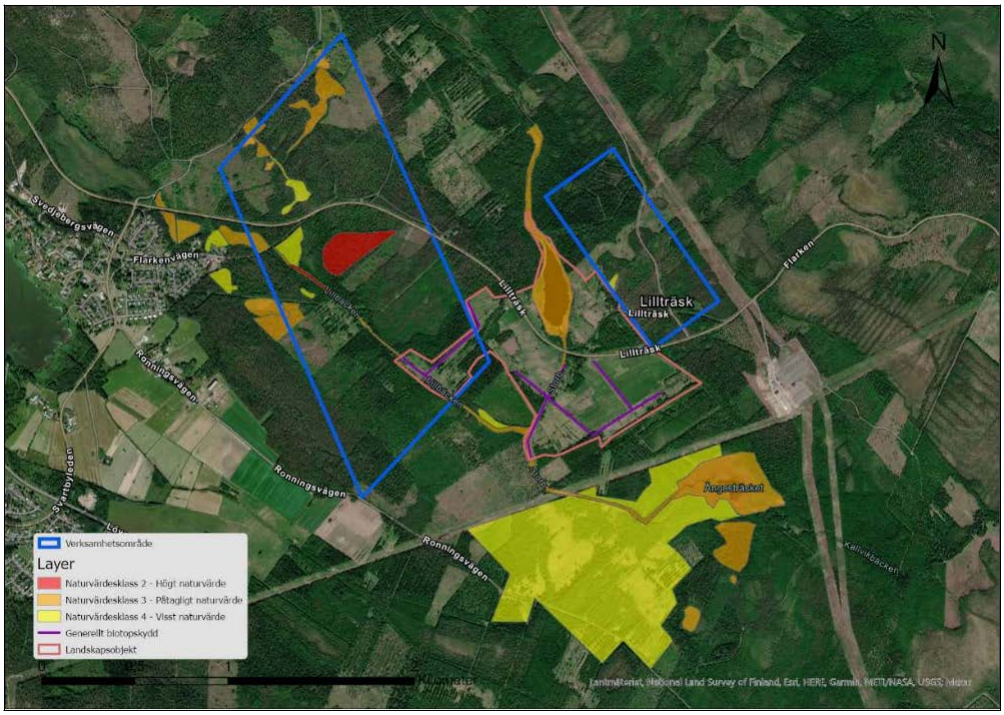

Figure 8-30 Nature value areas identified during inventories carried out in connection with the development of the detailed plan for the Black Village VU5 (Ecogain 2019) business area. The approximate location of the planned area of operation is highlighted in blue (the steel plant is planned within the western surface and the electrolysers within the eastern).

Between the area where the steelworks are planned and the area where the electrolysers are planned are Lillträsket and Storbäcken. In the course of the inventories carried out in connection with the development of a detailed plan in the area (Ecogain 2019), Lillträsket and Storbäcken were assessed as having natural value class 3, a significant natural value. The agricultural landscape around Lillträsk, with the lake Lillträsket and the streams Storbäcken and Lillbäcken, has also been identified as a landscape object.

In the vicinity of the area of activity there are two areas that are pointed out in Our claimed Norrbotten - Program for the conservation of the natural and cultural environmental values of the cultivated landscape in Norrbotten County (Länsstyrelsen i Norrbottens län 1993), see Figure 8-31. The area Ängeträsket-Lillträsket has mainly been pointed out for its total natural value and not for the value of the crop or culture. The area is described as farmland of high ornithological value. Svartbyn is located south of Svartbyträsket in direct connection to Boden's urban area. The area has been singled out for both its natural and cultural value. The area is described as a representative and peri-urban landscape with a number of barns and a great ornithological value.

Figure 8-31 Known natural values of the area. The approximate location of the business area is highlighted in blue.

Conservation species

Birds

The bird life in the area is relatively trivial with species typical of the region and habitat types. Talltita (NT), iron (NT), black-and-white flycatcher (NT), redwing thrush (NT), black grouse (Bird Directive), tree crawler, tufsmes and morkulla were noted in the inventory made in the area of the planned steelworks (Annex B6). All of these species are common in much of Norrbotten's woodlands. On the growing hyggen and farmland were yellowsparrows (NT) and pea singers (NT). The green legs (the Birds Directive) and the forest snatch were heard playing in the north-east of the area.

Since then, there have been sightings of a number of other species in the Artportalen between 2000-2021, including the Eurasian tree crow (NT), the Birds Directive (Bird Directive), the Eurasian owl (Bird Directive), the warbler (Birds Directive), the crane (Birds Directive), the rose finch (NT), the greenfinch (EN), the video sparrow (NT), the swifter (EN) and the greenwarbler (NT). Of these, the Eurasian pearl owl, Eurasian pygmy owl, rose-finch, green-warbler, and greenfinch have been recorded under breeding conditions. Of birds of prey, isolated streams of dove hawk (NT), golden eagle (NT), larch falcon and Eurasian sparrowhawk have been recorded.

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The grouse inventory did not detect a playground for capercaillie or grouse. Single drops were recorded at two locations in the northwest of the planned area of operations, but no game. Sprouting was also noted during the general bird census. capercaillie was not noted at all, but there are occasional older observations reported to the Artportal. It is likely that both species regularly visit and possibly even breed in the area, but the occurrence of a game is unlikely. For the orre, suitable playgrounds are almost completely missing. In the surrounding landscape, however, there are several suitable habitats with both open marshes and lakes, and the ferrets that possibly use the area for breeding or foraging probably have playgrounds there.

Earlier investigations (Enetjärn nature 2017) also show that beetle owl and beetle owl nest platforms are located at the border of the investigation area and in surrounding landscapes. Breeding of hooded owl occurred in 2015 at the border of the area of investigation and breeding of molested owl occurred in 2014 within 2 km of the area of investigation.

Vascular plants

The protected vascular plants spot keys, coral root, spider flower and patranuncle have been found within the planned area of activity.

Lappranunkel was found in Area 7, which has existing legal protection through a conservation agreement and is classified as a key habitat by the Swedish Forest Agency. The species is associated with moist woodlands with moving soil water or oversilting. The local population within a few kilometers of the area under investigation is considered small and it is a fairly rare species even regionally.

Bats

The Enviroplanning 2019 site has shown low bat activity in the area. Both the northern and the taiga bat occur sparingly and mainly in late summer within the area. The area offers few colonial sites, in the form of hollow trees and buildings. The area is mainly used for foraging during the latter part of the season of the two listed species. There are similar foraging areas in the area.

Amphibians

The frog surveys (Stefan Andersson Naturfaktar 2021) that have been carried out have revealed that field frog, common frog and common toad are common in the area. The frogs are mainly in Lillträsket and Ängeträsket, but also to a lesser extent in ditches and other smaller meltwater bodies in the cultural landscape surrounding the two main premises.

An assessment of population sizes was made in May 2021 by Stefan Andersson on behalf of Boden Municipality by counting the number of playing males. Around Lillträsket

There were estimated to be 200-300 males of arable frog, 100-200 males of common frog and 300-400 males of common toad. Around Ängeträsket, the number of males of arable frog was estimated to be about 1000 and the number of males of common toad to be 200-300.

8.14.4. Safeguard measures

In the light of the investigations carried out, the Municipality of Boden has proposed in the parallel detailed planning process that the coastal environments along Storbäcken and Lillträsket as well as a larger natural area in the east be designated as a natural area in the detailed plan, see the plan in Annex F and p. 26 in the description of the plan. The nature area in the east also partly includes the object Ängeträsk-Lillträsk, which is designated in Norrbotten County's conservation program for the cultivated landscape. The non-conserved parts of the object are agricultural land under overgrowth.

The detailed plan proposal also envisages, inter alia: Storbäcken and Lillträsket as a water area where most of the general beach protection of 100 meters is preserved.

Adjustments and protective measures have been deemed necessary for the species Lapland, Pearl Owl, Eurasian Eurasian Eurasian Eurasian Eurasian Eurasian Eurasian mud and hooded owl. The purpose of the adjustments and safeguard measures is to ensure that the local and regional conservation status of the species is not affected by the planned activities, in order not to trigger prohibitions and thus the need for the derogation.

As the site where the Lapp ranuncle is located will disappear in case of exploitation, it is proposed to move the Lapp ranuncle to a new location. Since the species is very specific in its habitat selection, it is crucial that an appropriate locale is located. This should be a coniferous forest with good access to movable soil water and humid microclimate. There should also be some solar radiation. It is best to choose a location with existing Lapp Rano base, as conditions can certainly be said to be favorable. However, other premises which are otherwise deemed to be of appropriate quality should also function. When moving, larger earth plugs should be dug around each plant so that the whole plant with roots is included. After moving, it is important to implement a control program to follow up the outcome. Plants have been moved several times in the past in other successful projects and the Lapp ranuncle is considered relatively easy to move based on the ecology of the species.

In order to ensure that the pearl owl, the Eurasian sparrow owl and the slag owl are not adversely affected, hooks will be set up in nearby forests which are not affected by the exploitation. Five pearl-owl nesting boxes, five pine-owl nesting boxes and five slag-owl nesting boxes are set up in suitable breeding environments which today lack suitable nesting holes.

When a key habitat (area 7 in Figure 8-29) will disappear completely, it is considered relevant to propose ecological compensation. This is best done by locating a similar environment (marsh coniferous forest) in the same landscape section. Depending on the nature value of such a stock, it may be appropriate to create certain structures, such as dead wood, or to allow the area to develop freely. This should be formally protected, preferably in the form of a nature conservation agreement.

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8.14.5. Consequences of the activities sought

The planned activities involve the conversion of forest and agricultural land into industrial land.

Areas of natural value

In most of the area where the steelworks is planned, forestry has been running for a long time and affected by human activity. The processes, structures and species that define a natural forest environment have not been allowed to exist and operate here. From a nature value point of view, this type of environment is therefore not considered sensitive to additional human intervention.

A protected area consisting of a key habitat covered by a conservation agreement will be affected.

Conservation species

Birds

All wild birds are protected but red-listed birds and birds included in the EU Birds Directive are to date prioritized in the Species Protection Regulation. It shall be prohibited to deliberately interfere with these, in particular during breeding and to destroy the breeding area or resting places of the species. Table 16 describes birds that are red-listed (RLs) in the 2020 Red List and/or included in the EU Birds Directive (FD) in Annex 1, as well as assessment of impacts during construction and operation and risk of prohibition.

Table 16 Birds species that are priority species in the SPA Regulation, i.e. birds that are red-listed (RL) in the 2020 Red List and/or are included in the EU Birds Directive (FD), Annex 1, as well as impact assessment and risk of prohibition.

Species	Classification	Assessment of presence and impact	Risk of ban?
Birch thrush	NT	Nests in the area. Habitat loss will occur. This species is common in the region and locally in Boden municipality. The retention status is not assessed affected. Continuous ecological function (KEF) be maintained despite habitat loss.	No
Duvhök	NT, FD	Assessed temporarily and hedges probably in the surrounding landscape. possibly breed in the area during certain years, and	No
Grayspit	FD	loss of habitat will occur even if the area habitat of the species is considered low within area of investigation. This species is relatively common in region and locally in the municipality of Boden. The conservation status is deemed not to be affected. Continuous ecological function (KEF) is assessed be maintained despite habitat loss. In order to minimize the risk of habitat loss and continued ecological function will be ecological compensation to be provided for nature conservation agreement in the area.	No
Green leg	FD	Breeds just outside the area. Species not assessed affected by habitat loss or potentially disruptive noise.	No

CONSTRUCTION AND OPERATION OF NEW STEEL WORKS, ETC., IN SVARTBYN SAREA OF ACTIVITY, BODENSKOMMUN, NORRBOTTENS LÄN

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Green finch	A	Nests in the area. The species is relatively common although it is classified as severely threatened, and the reduction is due to a parasitic disease that has decimated stock.	No
Green singers	NT, FD	It may breed in the area. Habitat loss will to take place. However, this species is relatively common in the region and locally in Boden municipality. Retention Status not be affected. Continuous ecological function (KEF) is considered to be habitat loss.	No
Yellow sparrow	NT	Nests in the area. Habitat loss will occur. However, this species is relatively common in the region and locally in Boden Municipality. The retention status is not assessed affected. Continuous ecological function (KEF) be maintained despite habitat loss.	No
Järpe	NT, FD	Nests in the area. This species is common in the region and locally in the municipality of Boden. Retention Status not be affected. Continuous ecological function (KEF) is considered to be habitat loss.	No
Eagle	NT	Only passing. The species is not considered to be affected.	No
Orre	FD	It may breed in the area. This species is common in region and locally in the municipality of Boden. The conservation status is deemed not to be affected. Continuous ecological function (KEF) is assessed be maintained despite habitat loss.	No
Pearl owl	FD	It may breed some years in the area. Habitat loss will happen. Population regionally assessed have favorable conservation status and are not assessed affected, but there may be a risk of local population in Boden municipality can of the individual breeding area disappears.	Some risk, see section 8.14.4. for protection measures for not to trigger prohibition.
Rosenfink	NT	It may breed some years in the area. However, the species is relatively common in the region and locally in Boden municipality. The retention status is not assessed affected. Continuous ecological function (KEF) be maintained despite habitat loss.	No
Red-wing break	NT	Nests in the area. This species is very common in region and locally in the municipality of Boden. The conservation status is deemed not to be affected. Continuous ecological function (KEF) is assessed be maintained despite habitat loss.	No
Slag owl	NT	It may breed some years in the area. Disruption and possible loss of habitat may occur to take place. The population regionally is estimated to have: favorable conservation status and are not assessed affected, but there may be a risk of local population in Boden municipality can of the individual breeding area disappears.	Some risk, see section 8.14.4. for protection measures for not to trigger prohibition.

LWORKS, ETC. WITHIN SVARTBYNS AREA OF ACTIVITY, BODENS KOMMUN, NORRBOTTENS LÄN.			
Eurasian owl	FD	It may breed some years in the area. Habitat loss will happen. Population regionally assessed have favorable conservation status and are not assessed affected, but there may be a risk of local population in Boden municipality can of the individual breeding area disappears.	Some risk, see section 8.14.4. for protection measures for not to

			trigger prohibition.
Cormorant	NT, FD	possibly breed in the area during certain years, and loss of habitat will occur even if the area habitat of the species is considered low within area of investigation. This species is relatively common in region and locally in the municipality of Boden. The conservation status is deemed not to be affected.	No
		Continuous ecological function (KEF) is assessed be maintained despite habitat loss. In order to minimize the risk of habitat loss and continued ecological function will be ecological compensation to be provided for nature conservation agreement in the area.	
Black and white flycatcher	NT	Nests in the area. Habitat loss will occur. This species is common in the region and locally in Boden municipality. The retention status is not assessed affected. Continuous ecological function (KEF) be maintained despite habitat loss.	No
Sångsvan	FD	Only passing. The species is not considered to be affected.	No
Talltita	NT	Nests in the area. Habitat loss will occur. This species is common in the region and locally in Boden municipality. The retention status is not assessed affected. Continuous ecological function (KEF) be maintained despite habitat loss.	No
capercaillie	FD	There is no game in the field of investigation. Species occurs occasionally and may possibly breed in the area in some years. This species is common in the region and locally in the municipality of Boden. Retention Status not be affected. Continuous ecological function (KEF) is considered to be habitat loss.	No
Sailor	A	Using the foraging area. Species assessed be able to benefit from suitable cavities for nesting sites are located in industrial premises.	No
Trana	FD	Only passing. The species is not considered to be affected.	No
Pea singers	NT	Nests in the area. Habitat loss will occur. This species is common in the region and locally in Boden municipality. The retention status is not assessed affected. Continuous ecological function (KEF) be maintained despite habitat loss.	No

Other conservation species

Table 17 below provides an assessment and assessment of impacts during construction and operation and risk of prohibition for other protected species, in this case vascular plants, amphibians and bats.

Table 17 Species included in Annex 2 of the Swedish Species Protection Regulation (AF), and assessment of impacts and risk of prohibition.

Species	§ AF	Assessment of presence and impact	Risk of

Laptop	7	Linked to moist woodlands with moving soil water or overloading. Observed within the nature conservation agreement in the field of investigation. These individuals will disappear upon establishment. The	ban? Yes, see section 8.14.4. for protection measures for

		local population within a few km of the area of investigation is assessed as small. Quite rare regional nature and is currently not assessed have a favorable local conservation status.	not to trigger prohibition.
Ink Keys	8	Common species both local, regional and national. Local or regional conservation status is not assessed affected by the establishment of industrial area of investigation.	No
Coral root	8	Common species both local, regional and national. Local or regional conservation status is not assessed affected by the establishment of industrial area of investigation.	No
Spider flower	8	Common species both local, regional and national. Local or regional conservation status is not assessed affected by the establishment of industrial area of investigation.	No
Field frog	6	Ordinary species locally and only single notes in the field of investigation. Largest occurrences is deemed to be in Lillträsket and Ängeträsket where many individuals were heard playing. Even a common species regional and national. Local or regional conservation status is deemed not to be affected by establishment of industrial land within area of investigation.	No
Common frog	6	Ordinary species locally and only single notes in the field of investigation. Largest occurrences is deemed to be in Lillträsket and Ängeträsket where many individuals were heard playing. Common species both locally, regional and national. Local or regional conservation status is deemed not to be affected by establishment of industrial land within area of investigation.	No
Common toad	6	Ordinary species locally and only single notes in the field of investigation. Largest occurrences is deemed to be in Lillträsket and Ängeträsket where many individuals were heard playing. Common species both locally, regional and national. Local or regional conservation status is deemed not to be affected by establishment of industrial land within area of investigation.	No
Taiga bat	4	Bat inventory has been performed and the conclusion The species feeds only within the area. None colonies are believed to exist. Appropriate foraging areas are located in the surroundings and loss of foraging areas for the species due to: the new activity is deemed not to affect the species.	No
Northern bat	4 and listed (NT)	Bat inventory has been performed and the conclusion The species feeds only within the area. None colonies are believed to exist. Appropriate foraging areas are located in the surroundings and loss of foraging areas for the species due to: the new activity is deemed not to affect the species.	No

Overall assessment

The overall assessment is that the impact of the

There is very little natural forest with low impact, which reduces the risk of affecting the local population and the continuous ecological function of bird species associated with old forests, for example. woodpeckers, owls and grouse. The location can thus be considered good.

With proposed protection measures, the project is deemed not to affect the species covered by the Species Protection Regulation in such a way that the activity is deemed to be prohibited under the Regulation. Habitat loss will occur for some species, but for most similar environments, it is estimated that the surrounding landscape is so large that the population will not be limited by habitat loss of a smaller area which, moreover, is already largely affected.

Against this background, it is considered that no derogation from the SPA is required for the birds in the area. Thus, according to current legislation and practice, the prohibitions in the Species Protection Regulation are not deemed to apply to birds. In the case of the Lapp Rane, it is considered necessary to relocate the local stock in order not to violate the prohibitions in the Species Protection Regulation. Plants have been moved in the past in other projects, which proved successful. It is considered relatively easy to find suitable habitats in surrounding landscapes to move the species to, so this protection measure does not assess the local population of the Lapp ranuncle to be affected and therefore the prohibitions under the Species Protection Regulation are not deemed to be triggered.

The impact on the natural environment is estimated to be moderate due to the disappearance of the key habitat.
This has a moderate impact on the natural environment.

8.14.6. Protective measures and consequences during the construction phase

In order to avoid damage to individuals of birds, mainly young birds and eggs, during the construction phase, felling and initial ground work should not begin during the main breeding period of the birds (15 March to 31 July).

8.15 Outdoor activities and recreation

8.15.1. Prerequisites

The recreational facilities in the area are snowmobile routes, riding routes, ski trails and a model-flight airfield. The area is close to urban areas, which means that the area is very likely used for outdoor activities such as both berry and mushroom picking and running. The area is also frequented by bird-watchers. The area is also used for hunting and is included in Svartbyns viltvårdsområde. To the south-west of the planned area is the open-air Mine Mountain area.

8.15.2. Safeguard measures

H2GS, together with the municipality of Boden, the association for Northern Svartbyns, Boden's snowmobile association and private individuals, is investigating alternative routes for ski trails, snowmobile trails and riding routes in the area.

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8.15.3. Consequences of the activities sought

With the planned activities, the area will no longer be used for recreation and recreation. Moving ski tracks, riding routes and snowmobile skiing means that these activities can still be carried out in the immediate area. Sponge and berry picking and bird watching areas within the planned area of activity will be used, but similar areas are deemed to be nearby. The distance to the open air area Mining Mountain means that it is not deemed to be affected by the planned activities.

In order to prevent unauthorized persons from entering, the area of activity will be fenced off. This will mean that new paths of migration and wildlife will emerge around the area.

The municipality of Boden has been in dialog with the model aviation club about moving the model airfield. The area concerned is located in areas that are zoned as natural land, which means that the model airfield can remain.

The planned activities are considered to have a small negative impact on outdoor life as similar areas are nearby. Increased noise levels are impeding the possibilities for recreation in the area. Overall, the impact on outdoor and recreational activities is estimated to be small.

8.16. Reindeer husbandry

8.16.1. Investigation

A pure-nutrient analysis has been carried out for the planned activity (Annex B8). The purpose of the reindeer nutrient analysis is to describe the land use of the reindeer industry in the area and the estimated impact of the planned activity on the reindeer industry. The analysis also shows Samebys assessment of the impact of the planned activities on the reindeer industry in the area. The assessments in the reindeer nutrient analysis are based on Gällivare sameby's description of the land use in the area and experience from previous studies of industrial activity and infrastructure effects on reindeer.

8.16.2. Prerequisites

Gällivare sameby is a forest Sami village in Norrbotten County. Samebyn has its year-round lands in Gällivare municipality. Reindeer husbandry areas are areas where reindeer husbandry may be carried out throughout the year. In the case of land which has been set aside for year-round, the use of the land must not be changed so as to cause considerable inconvenience to reindeer husbandry.

Gällivare sameby has its winter pastures in Gällivare, Överkalix, Jokkmokks, Luleå and Boden municipalities. The county authority in Norrbotten County has set Gällivare sameby's maximum number of reindeer in the winter herd to 7,000, including reindeer.

The planned area of activity is within Gällivare sameby's winter pastures. The nearest area of national interest for the reindeer industry within Gällivare sameby is a migratory trail located about 5 km east of the planned operation. The national interest and the estimated impact on this is described in detail in section 8.1.

The reindeer nutrient analysis (Annex B8) has been established in close cooperation with representatives of the board and reindeer herders in Gällivare Sameby. Samebyns reindeer herders have stated that they do not consider the location of H2GS's planned activities in the northern Svartbyn outside Boden as a valuable area for winter grazing within the samebyen village. The area is characterized by quite wet soils where grass grows, not marklav. There is also already a switchgear and two large power lines in the vicinity, which contribute to making the area unsuitable for redevelopment. Representatives of Gällivare sameby are more concerned about potential cumulative effects of the planned activities, see Section 9 for an assessment of these.

8.16.3. Safeguard measures

H2GS will have a contact person designated for contacts with the village and to have procedures that allow the village to contact any H2GS representative in urgent matters 24 hours a day.

During the operational phase, Samebyn will be informed about the activities, in particular about major planned services.

H2GS undertakes to continuously inform employees and temporary workers about expected responsible behavior in recreational snowmobile driving in areas where reindeer can be expected to be present as a preventive measure.

H2GS undertakes to refer, as far as possible, the heavy transport of construction materials and passenger transport by road 97 and the Ore Railway and the road and rail infrastructure corridor to the area of activity envisaged.

8.16.4. Consequences of the activities sought

The planned activities will mean increased human activity, noise, vehicle traffic and new infrastructure in the form of protective fences, buildings, jacking tracks, roads, power lines and substations within the winter grazing area. This is a direct loss of pasture in the areas under development. Within about 2 km of the planned operation, an indirect grazing loss may occur as a result of the reindeer avoiding the area where the disturbances occur. Based on information from Gällivare sameby, the area where the activities are planned is not considered a valuable area for winter grazing. A large negative impact on a low-value area means that the consequences are deemed to be small-moderate.

8.16.5. Protective measures and consequences during the construction phase

During the construction phase, disturbances are expected in the form of increased human activity, transport and construction. This may result in an indirect grazing loss in the winter grazing area within about 2-4 km of the planned activity due to the fact that the reindeer avoid the area where the disturbances occur. The impact of possible indirect grazing loss is considered small due to Gällivare sameby's sporadic use of the grazing area at a distance of up to 4 km from the planned activities.

The following protective measures are planned during the construction phase:

Consultation shall take place with the sami village before the location of roads, rail and electricity grids is finally decided. Where there are several technically and economically feasible alternatives for roads and parking areas, the preferred option from the point of view of reindeer herding shall be chosen.

H2GS will inform the affected Sami village about explosions taking place in or near the location at least 24 hours in advance, unless H2GS and the Sami village agree otherwise.

H2GS commits to contact the municipalities of Boden and Luleå for consultations regarding the possibility of municipalities to influence recreational snowmobile driving and its potential disturbance to the reindeer industry. The aim is to draw the attention of local authorities to the importance of continuous consultation between local authorities, scooter associations and reindeer representatives, with a view to designing joints and informing scooter drivers to reduce the disruption from recreational scooter driving.

H2GS undertakes to continuously inform employees and temporary workers about expected responsible behavior in recreational snowmobile driving in areas where reindeer can be expected to be present as a preventive measure.

H2GS undertakes to refer, as far as possible, the heavy transport of construction materials and passenger transport by road 97 and the Ore Railway and the road and rail infrastructure corridor to the area of activity envisaged.

9 Cumulative effects

As regards the cumulative effects, the impact on transport and the reindeer industry is considered relevant. The cumulative effects, i.e. the cumulative effects of impacts on transport and the reindeer industry resulting from H2GS activities and associated activities, are described below.

9.1. Transport

9.1.1. Prerequisites

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Transport to and from the planned operation will be carried out by rail and road 97. A new industrial track will be built into the area with a new road running parallel to the railway track.

Material transport into the business is estimated to consist of about 9 trains and about 32 trucks per day. Deliveries will be made by truck from Tornio, by train from Malmberget and Aitik and by both train and truck from Luleå port. Exit transport is estimated to consist of about 4 trains and about 12 trucks per day. Transport out of the business will be by train to Luleå port and Boliden and by train and truck to Luleå. Within the facility, different transport vehicles will be used for internal transport.

To the west of the area goes national road 97 and the main line through Upper Norrland. The part of road 97 that runs between Boden and Luleå is an important link between two regional centers, which underlines the importance of the road for the region. The trunk railway is of great importance mainly for freight traffic but also for passenger traffic.

The traffic flow on road 97, south of Boden, calculated as ÅDT (annual average daily traffic) for an estimated average was 1000 vehicles in 2019, of which 100 were trucks. In 2009, 2040 vehicles were built, of which 120 were trucks.

The number of train movements on the Gällivare-Boden route today (2021) is about 40 daily. The number of train movements on the Boden-Luleå route today (2021) is between 60 on weekends and 75 on weekdays.

9.1.2. Safeguard measures

H2GS undertakes to refer, as far as possible, the heavy transport of materials and passengers by road 97 and the Malmbanan and road and rail infrastructure corridor to the area of activity envisaged.

H2GS commits to co-finance the renovation of game fences along the Malmbanan line between Gällivare-Boden, in consultation with the Swedish Transport Administration which is the principal for the railway.

9.1.3. Cumulative impact

The planned activities will mean a slight increase in vehicle traffic and new infrastructure in the form of new roads and new tracks. The increase in the number of vehicles in the vicinity of Södra Svartbyn, which is the area most affected, will be about 12% compared to today's traffic. A new road will be built which will relieve the existing traffic system and reduce the impact on existing road networks.

The planned activities are estimated to give rise to a small increase (22) in the number of vehicle movements on the E4 road between Haparanda and Börjellandet, a small-moderate increase (<10%) in the number of vehicle movements on road 383 between Börjellandet and Flarken and an estimated moderate (about 13%) increase in the number of vehicle movements on road 605 between Flarken and Norra Svartbyn. The increase in vehicle movements is caused by an estimated

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the extent of future transport of inputs to the planned production and commuting to the installation.

The planned operation will also give rise to 66 vehicle movements with trucks between Luleå Port and the planned installation. Road 97 between Boden-Luleå is already heavily used today, both by professional transport but mainly by working commuting between the two places. The total volume of traffic varies slightly, depending on the point on the route measured, but in 2018 amounted to between 4 480 ÅDT (Sävastnäs) and 6 450 ÅDT (Gammelstad). The number of vehicle movements caused by the planned operation (66) entails an increase of ÅDT of between 1,4 % (Sävastnäs) and 1 % (Gammelstad) on the Boden-Luleå route.

The planned activities will not contribute to any increase in the number of traffic movements on either E10 between Gällivare and Töre or on road 356 between Morjärv and Boden.

The planned activities will increase the volume of rail traffic in the area. The planned operation is estimated to result in a further 6 train movements per day on the Gällivare-Boden route. This corresponds to an increase in the number of train movements by about 15% on the Gällivare-Boden route.

Although the planned activities will increase the number of trains on the Gällivare-Boden route, the protective measures envisaged will reduce the number of accidents at rest on the same route as H2GS plans to co-finance the refurbishment of the game fence along the Malmbanan line between Gällivare-Boden. The commitment requires that the Swedish Transport Administration initiates the action.

The planned operation is estimated to generate about 20 train movements per day on the Boden-Luleå harbor. The additional number of train movements resulting from the planned operation represents an increase of between 27 % and 33 % compared to the current situation, which can be considered as a moderate to large increase.

During the construction phase, road 605 traffic is expected to increase. The additional construction traffic on the 605 route is estimated to be 375 vehicle movements of heavy vehicles per day, traffic mainly takes place during daytime weekdays. The additional construction traffic contributes to the existing noise from the road. Even with the additional construction traffic, the action levels of the nearest settlement have been estimated to be met by a good margin.

Noise pollution during the construction phase will be limited in time.

9.2. Reindeer husbandry

9.2.1. Prerequisites

The existing disruptions currently experienced by the reindeer industry in Gällivare sameby come from forestry, infrastructure (roads, railways, power lines), mining, predators, wind power, climate change, hunting with loose dogs, moving outdoor life and tourism, gravel and rock mining and mineral exploration.

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Forestry

The planned activities will involve logging of forests when exploiting the site, no further logging is planned.

Roads

The planned activities do not contribute to an increase in the number of traffic movements on the road sections E10 between Gällivare and Töre and the road 356 between Morjärv and Boden which constitutes existing disturbances for Gällivare sameby due to impacts of reindeer.

The planned operation involves a small increase in the number of vehicle movements on the E4 road between Haparanda and Börjellandet (exit Smedsbyn), a small-moderate increase in the number of vehicle movements on the 383 road between Börjellandet and Flarken and a moderate-large increase in the number of vehicle movements on the 605 road between Flarken and Norra Svartbyn.

A moveway of national interest for the reindeer industry crosses road 383 between Svedjan and Vibbyn. The migration route follows the distances from Vibbyn and out to the coastal band, but is broken just north of Persön by road E4 which forms a strong barrier. The reindeer breeders in Gällivare sameby have stated that the pastures south of road E4 are usually only used as emergency pasture because the road is so difficult to move the reindeer across. In order to use the land on the south side, reindeer herders must gather the reindeer and move them on truck over the E4 road.

Railways

The ore line between Gällivare and Boden constitutes a major disturbance to reindeer husbandry within Gällivare sameby's pasture, mainly because the game fence along Malmbanan is in poor condition and no longer fulfills its function. The planned activities will involve the construction of a new footprint between the meeting station Sävast and the area of activity. The planned operation will also increase the number of trains in the area.

Power lines

Power lines cause disturbances to reindeer husbandry within Gällivare sameby with consequences in terms of both direct and indirect grazing losses. Power line streets result in direct grazing loss, when forests and soil are lost. Power line streets tend to become snowmobile in winter, snowmobile traffic allows reindeer to avoid areas near power line streets, resulting in indirect grazing loss.

The planned operation has made a request for the construction of a new 400 kV power line from Messaure/Letsi to Norra Svartbyn, including a new substation. The new power line is likely to follow the route of existing lines as far as possible, which means a widening of the wiring street by 50-60 meters. It is mainly in the immediate area of the planned operation that the additional power line passes over Gällivare sameby's pastures.

Mining

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The raw material for the planned activities is likely to be sourced from the Norrbotten region.

Predators

The planned activities are not expected to lead to an increase in the number of predators in the area.

Wind

H2GS has no information that any operator is planning to establish a wind farm in relation to the activity sought. The electricity supply to the business is organized with existing infrastructure.

Climate change

The planned activities will result in lower greenhouse gas emissions compared to traditional steel production. With the construction of the planned activities, work is being driven towards a less climate-damaging steel industry. In the long term, this will mean a reduction in greenhouse gas emissions at national and global level.

Hunt with loose dog

The planned activities are not expected to lead to an increase in hunting with loose dogs in the area.

Moving outdoor activities and tourism

The planned activities will mean an increased occupation in the Boden-Luleå area which may mean that the number of people who are engaged in outdoor activities and tourism in the area increases.

Gravel and rock

Mountain crusher and similar materials may need to be introduced for the development of the area. Otherwise, the mass balance within the area is even up. Material from the fence planned in the northern part of the planned area of operation will be used as a fill in the southern part of the planned area of operation.

Mineral prospecting

The raw material for the planned activities is mainly produced within existing mines in the Norrbotten region. Now processed iron ore assets have a limited life and mining companies are continuously prospecting to ensure continued future production. It is reasonable to assume that the planned activities contribute to this exploration by creating a demand for the raw material.

Residential development

The planned activities are expected to result in an increase in the number of people moving in and, as a result, an increase in the need for housing, which could lead to a loss of pasture land. The development of new residential areas is expected to take place in accordance with the municipal master plan land use plans.

9.2.2. Safeguard measures

H2GS undertakes to contact the Swedish Transport Administration and the municipalities of Boden and Luleå to explore the possibility of accelerating the construction of a new game fence along the Malmbanan line, including through H2GS co-financing of the fence measure.

The funding will be proportionate to the number of additional train movements resulting from the planned operation.

Financial assistance for the transfer of reindeer by truck over road E4 when the need for emergency grazing arises

Full financial compensation as calculated by representatives of Gällivare sameby for possible train-killed reindeer along the Malmbanan line between Murjek and Boden, exceeding the number of train-killed reindeer along the same route before the start of production for the requested activity.

Full financial compensation according to the calculation of representatives of Gällivare sameby for possible traffic-killed reindeer along road 383 between Börjellandet and Flarken and along road 605 between Flarken and Norra Svartbyn, exceeding the number of traffic-killed reindeer along the same stretches before the start of construction for the requested activity.

Consultation of municipalities, local scooter associations and the reindeer industry on guidelines for recreational skiing with scooters

9.2.3. Cumulative impact

Forestry

The planned activities are not considered to contribute to the existing disturbance from forestry.

Roads

Despite a small increase in the number of vehicle movements on the E4 road, the consequences are expected to be small as the road is already a large barrier with game fences on both sides and it is a shorter period that any of the samebyns winter pastures groups stay in the area with their reindeer.

The current situation is not deemed to be exacerbated by the increase in the number of vehicle movements on road 383 and on road 605 as a result of the planned activities, and the cumulative effect is therefore deemed to be small.

Rail

Provided that the protective measures envisaged in the form of H2GS cofinancing the refurbishment of game fences along the Malmbanan line between Murjek-Boden lead to a positive consequence for Gällivare sameby. The renovation of the game fence along the Malmbanan line would mean that Gällivare sameby can use its entire grazing area along the game fence, including the triangle between Malmo- and Haparandabanans railway tracks

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reindeer herders do not dare to let reindeer graze within, because the wild fence is in too bad a condition.

Power lines

The additional power line is not expected to increase the disturbances from power lines that Gällivare sameby already experiences. Rather, it is a good thing that additional infrastructure in the form of power lines and substations are being co-located with the existing facilities that already exist in the area.

Mining

The planned activities are not considered to contribute to further mining activities within Gällivare sameby's pastures.

Predators

The requested activity is not considered to have any cumulative effect together with the existing disturbance of predators within the Gällivare sameby pastures.

Wind

The planned activities are not considered to contribute to a negative cumulative effect in the form of wind power expansion within the Gällivare sameby bait area.

Climate change

The planned activities are deemed to contribute to a positive cumulative effect with respect to climate change.

Hunt with loose dog

The requested activity is not considered to contribute to any cumulative effect caused by hunting with loose dogs on the Gällivare sameby pasture.

Outdoor activities and tourism

The planned activities can be expected to produce a small-moderate cumulative effect in the areas of outdoor recreation and tourism, as a result of the expected migration of labor. The extent of the cumulative effect depends on the size of the migration and the interest shown by the newly arrived workforce in moving outdoor activities. H2GS is planning to develop protective measures in the form of a proposal to set up a consultation group to formulate consensus on issues related to snowmobile skiing, together with the municipalities concerned, local scooter associations and representatives of the reindeer industry in the county. The proposed protection measure can be expected to make a significant contribution to limiting negative effects by informing migrant workers about the taking into account of outdoor activities such as snowmobiling and skiing.

Gravel and rock

Lots of supplies needed at the construction stage will be taken from surrounding, existing supplies. No new revenue is planned today because of the planned activities and will therefore not contribute to the existing disturbance for Gällivare sameby from the mining operations.

Mineral prospecting

The requested activity plans to use a very small part of the mining company's total production as raw material in production. The assessment is that the activity sought thus contributes to a cumulative effect in the form of mineral exploration but that the contribution from the activity sought is small.

Residential development

The assessment is that the activity sought has little cumulative effect on the provision of land for the construction of housing to migrant workers.

10 Options

10.1 Zero option

The zero option shall reflect the likely development of the site if the proposed activities are not carried out. In this case, the zero option means that plants for the production of hydrogen and steel are not built.

The planned activities will be partly within and partly in direct connection with an area which is designated as an area of research for activities in the municipality of Boden's 2025 Master Plan. Detailed planning of an area covering the entire field of investigation from the master plan as well as adjacent areas is ongoing to enable the establishment of large-scale, electricity-intensive industrial activities. This means that even if the planned steel and hydrogen plant is not established on site, it is likely that other large-scale, electricity-intensive industrial activities will be located there.

It is very difficult to compare the impact that would result from other industrial activities in the area, since it is not known what type of activity would be involved. Any other activity would also need to be designed in accordance with the general rules of consideration of the environmental code and others.

Industrial activities are almost always land use, surface sealing, emissions to air and increased noise levels in the area. Industrial activities also almost always involve emissions to water, unlike the activity sought, where all process water and polluted surface water are recirculated in the activity without being discharged. If the planned area were to be developed with any other form of industry, the zero option would also be likely to result in emissions to water, air and soil, increased noise levels within and near the area and land and natural environment. Matters related to recreation, outdoor life, natural and cultural environment are more governed by the fact that the area is used for industrial activities than the type of activity that will be carried out.

Environmental and natural impacts in the EU are therefore expected to occur in the zero option as well.

In the short term, the zero option may mean that the area as a whole remains as it is at present.

10.2 Alternative location

H2GS has investigated the appropriate location for a new plant for the production of steel and cast substances and the production of hydrogen needed for the purpose. The location study (Annex B2) is summarized below.

The specific requirements of the business are a severe limitation of the ability to find suitable location options. The localization investigation covers four location options in Sweden (Boden, Piteå, Luleå and Kalix) and one in Finland (Kemi).

Each localization option has been analyzed based on its technical and environmental requirements. The fact that the research area also covers Kemi in Finland is due to the fact that it was initially considered uncertain whether the operational criteria could be met within Sweden's borders.

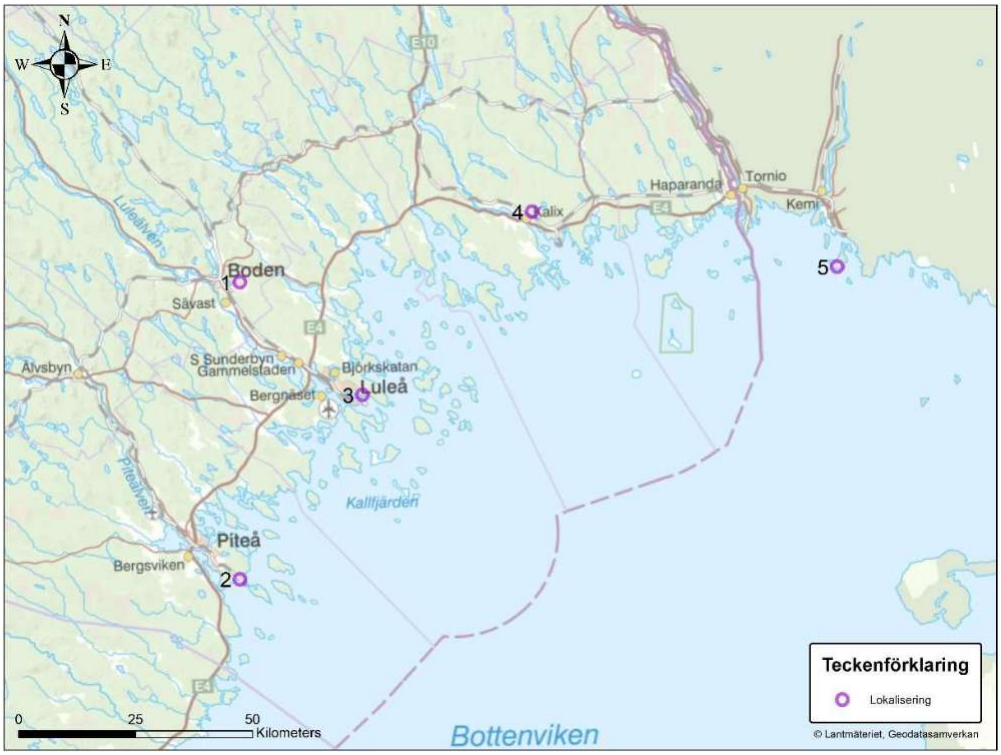

Figure 10-1 Overview map with all localization options.

The localization options have been compared for the following aspects; Technical criteria

- **Access to large quantities of electricity from renewable energy sources Area of at least 200 hectares**
- **The location must allow buildings/chimneys with height of up to 150 meters**

Proximity to major transport route

Proximity to the appropriate water area

skilled workers within reasonable commuting distance

Environmental, spatial and related aspects

Impact on protected areas

Impact on national interests for natural and cultural environment, outdoor life and reindeer husbandry Impact on national interests for the Swedish Armed Forces

Distance from neighbors

Conformity to Open

When comparing the location options, it can be concluded that option 4 (Kalix) does not meet the surface criterion, which means that the option is not appropriate. Option 3 (Luleå) also has clear disadvantages in terms of compliance with technical criteria, partly with regard to available surface area and partly with regard to the general ban on high buildings in Luleå. Option 3 (Luleå) is therefore not considered appropriate.

Options 1 (Boden), 2 (Piteå) and 5 (Kemi) meet the technical criteria. None of the options is an unacceptable location from an environmental point of view. On this basis, option 5 (Chemistry) has been removed from further investigation, as H2GS's intention has been to prioritize a Swedish location, provided that such a location is possible.

The remaining options are 1 (Boden) and 2 (Piteå). The alternatives are deemed to be environmentally equivalent. It can be concluded that there are competing interests regarding existing industrial track in option 2 (Piteå), which is not the case in option 1 (Boden) and that the conditions for increasing the power supply are deemed to be better in option 1 (Boden) than in option 2 (Piteå) Overall, option 1 (Boden) is considered to be the most appropriate option. Contacts with the municipality of Boden prior to the final choice of establishment have shown that the municipality has a positive attitude towards the project, which is of great importance because the project will require extensive urban planning.

10.3. Alternative design and location of the area of operation

Several alternative designs and locations of the field of activity have been considered. Both technical and environmental criteria have been taken into account.

Examples of one of the alternative designs considered are shown in Figure 10-2. The design in Figure 10-2 is that presented at the first delimitation consultation in April/May 2021.

When geotechnical studies were carried out, it appeared that the land in the proposed area of activity consisted of loose soil. Building on loose land requires stability-enhancing and set-reducing measures. Among other things, piling is required for buildings. In total, 3,000,000 meters of piles were expected to be required, which corresponds to the entire annual production of Sweden. It was estimated that the work to knock down the piles would take four years and it would take about 30,000 trucks to transport the piles to the area. It was also estimated that 300 000 tons of sulfide soil would have to be transported out of the business area, requiring 20 000 truck transports. Within reasonable distance

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it is not possible to deposit the declared mass. Overall, it would present such logistical difficulties, timescales and costs as well as remaining risks of subsidence that the project was deemed impossible to implement at the original location. **This meant that H2GS reconsidered placing operations in one of the locations mentioned in section 10.2. The company also considered placement in Northern Norway and evaluated a specific location based on previously identified requirements such as access to power and infrastructure. Talks were continued with the municipality concerned and the relevant power company. However, after close consultation with Boden Municipality, H2GS found that a location about 900 meters northeast of the original was suitable and because H2GS had intended to prioritize a Swedish location, provided that such a location is suitable, Boden was again chosen. The business area was therefore moved north within Svartbyn to an area with better soil conditions. The land in the northern area consists of solid to very solid ground, in a few places superficial mountain / mountain in the day. No stability problems are expected when building on land. The final design in the northern part of Svartbyn was presented in the additional consultation held in October/November 2021 and in this EIA.**

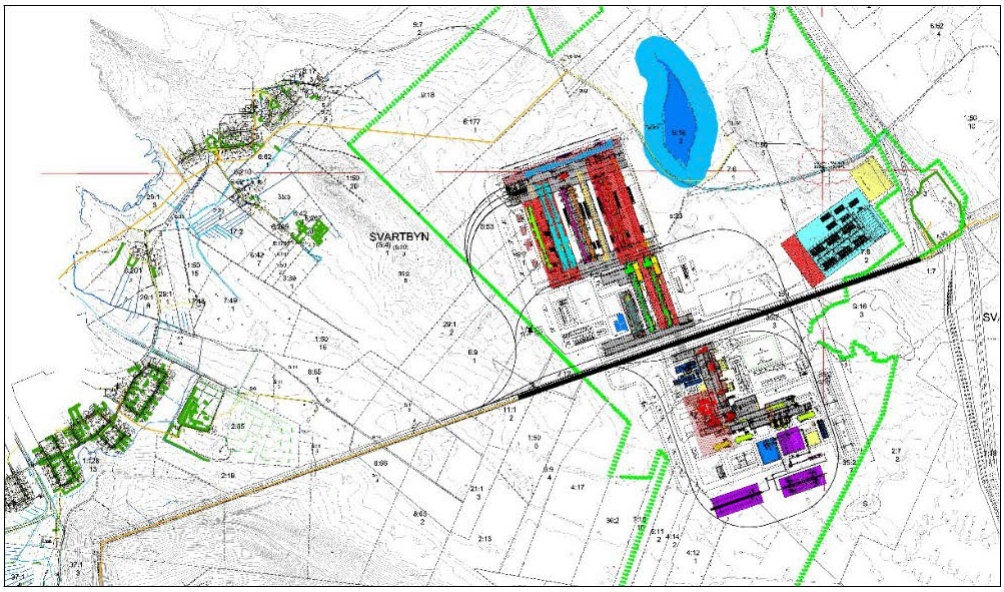

Figure 10-2 Alternative design of the area of activity presented at the first delimitation consultation held in April/May 2021.

The final design and location of the area of activity presented in the application has been assessed as the best design to avoid intrusion into the nearby national interest for the cultural environment as well as into the identified sprouting environment around Lillträsket and Ängeträsket. In the final design, the DRI towers, which have been judged to be the largest noise source within the area of operation, have been located so far from the residential area

Norra Svartbyn as possible. DRI towers are also the highest and thus most visible buildings within the area of operation and have been placed to avoid disruptions of views from different viewpoints in the landscape.

10.4. Alternative techniques

For parts of the processes in the planned operation, alternative technologies are available and have been selected out. These alternative techniques are described in detail in Annex A3. The alternative techniques chosen are summarized below.

10.4.1 Integrated iron and steel production with blast furnace

In integrated iron and steel production, steel is produced using coking plants, blast furnaces and an oxygen process. In the blast furnace iron ore is reduced by using the reducing agent coke. Coke is produced in a coke plant by heating coal without air access and then quickly extinguishing it with water. The raw materials iron ore, coke and slag formers are added to the top of the blast furnace and stored. As the iron ore is reduced and melted, the layers sink through the blast furnace while the blast air is added up. At the bottom of the furnace, liquid pig iron is collected and periodically bottled for freshness, which means that the carbon content is reduced by the use of oxygen. The production of crude iron in blast furnaces is based on the oxidation of iron in several steps using carbon, which generates large amounts of carbon dioxide emissions.

One of the main driving forces behind the establishment of the planned activities is to drive the transformation of the steel industry towards producing fossil-free steel. Replacing the blast furnace route with coke oven and blast furnace is essential for the business because reduction with coal in blast furnace generates about 85% of the steel industry's total carbon dioxide emissions. Against this background, the blast furnace route has been replaced by direct reduction of iron ore by hydrogen instead of coal, thus eliminating CO2 emissions from the reduction.

10.4.2. Induction furnace

An alternative process for the melting of scrap and iron raw materials is melting in an induction furnace. The principle of induction furnaces is that coils in the furnace create an alternating magnetic field where the material is affected by the eddy current that occurs and excessive heat development occurs inside the material. Induction furnaces are used, for example, in the production of duplex steel and at lower production volumes (typically 0,1 to 0,9 million tons of molten steel per year).

The production rate of 5 million tons of molten steel per year planned by H2GS is not matched by the capacity of induction furnaces. In addition, the induction furnace is more sensitive to variations in the quality of scrap and other input material which limits the types of scrap that can be melted in the furnace. The planned installation requires a furnace capable of handling scrap in different grades and sizes. This, combined with the fact that induction furnaces require more installed power than the electric arc furnace (5 - 100 MW more) and have higher energy consumption per ton of steel produced (approximately 520 kWh/t compared to 390 kWh/t) than the electric arc furnace, is the reason why electric arc furnace has been chosen instead of the induction furnace.

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10.4.3. Continuous casting

An alternative casting method for steel slabs continuous casting. In the case of continuous casting, the molten steel is transported to the casting station via a ladle from which the steel is drained in a casting box. From there, the steel is dropped into a water-cooled kokill where a shell solidifies, allowing the string to be transported out the bottom of the cowboy. The string is pulled out with drivelers to a series of cooling zones where the material is cooled with spray water cooling. The purpose of water cooling is to control the solidification rate to a completely solid before cutting.

With direct casting, the casting profile is much flatter (thinner) than in traditional continuous casting. This means that the steel slabs already have a solid shape right through the cross section. This means that the temperature of the substance is close to that suitable for hot rolling (about 1200 C in the core) which means that much less energy input is required to carry out the hot rolling because the substances can be hot rolled directly in the line. Direct casting is mentioned in the Commission's 2021 draft BREF document for iron and metal processing (FMP) to increase the energy efficiency of heating processes. Direct casting has thus been assessed as the best available technique for the operation, and continuous casting has been excluded as an appropriate technique.

10.4.4. Release of process and cooling water to the Lule river

An alternative to recirculating cooling water in the business that has been investigated is to instead release the cooling water into the Luleå river. A receiving water study has been carried out (Sweco 2021) where the current situation and the planned activity's impact on the Luleå river through the release of cooling water is described.

Releases of cooling water to the Luleå river from the operation were estimated to have a flow of about 0.078 m^3/s and a temperature of 35°C. The emission was planned about 2-3 km downstream of Boden power plant.

In order to calculate the expected temperature impact on the receiving water, a hydrodynamic model has been used to simulate emissions from six alternative emission points under four different flow scenarios and under winter and summer conditions. The hydrodynamic modeling shows that there is a very limited area where the 3 °C threshold set out in Annex 1 to Regulation (EC) No 554/2001 on environmental quality standards for fish and mussel waters is exceeded in summer and winter at the lowest low flow. For other flow scenarios, there is in principle no impact on the temperature increase. The emission of cooling water does not result in the temperature of 28 oC being exceeded, which is the limit value for water temperature that must not be exceeded downstream of a discharge. Nor is the release of cooling water calculated to result in the temperature limit of 10°C under Regulation 2001:554 being exceeded during periods of colder water temperatures. Thus, the release of cooling water was assessed to have no negative impact on fish species that require cold water for reproduction.

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The release of cooling water to the Lule river was not deemed to affect the hydrological regime, which is described as the hydrological condition of a surface water body with respect to water flow volume, water flow dynamics and available flow effect relative reference conditions. The reason is that the flow change caused by the activity at the different flow scenarios is non-existent or very small (at most about 0,01 %) relative to the flow in the Luleå river.

The disadvantages of the release of cooling water to the Lule river are that there is a certain risk of local impact on the ice formation conditions during the winter. This can affect reindeer husbandry, as it can limit the opportunities for reindeer to move across the ice. To some extent, the outdoor life on the ice can also be limited directly adjacent to the point of emission. When recirculating the cooling water in the activity, the heat can be used in the activity instead of being wasted in the receiving water.

10.4.5. Impact handling

The slag can be separated into different slag fractions depending on the use. For the slag from the electric arc furnaces, discussions are being held with other companies on the extraction of vanadium and other valuable metals such as nickel, cobalt and lithium, and a preliminary agreement has been reached. H2GS intends to sell all high-content vanadium and other valuable metals to external operators for the extraction of these metals.

An alternative process for the operation's slag handling is to use water cooling, crushing and sieving to different fractions. These processes are commonly used for electric arc furnace slag and kiln slag, which are the two slag fractions that will mainly be processed at the planned plant. In this process, the slag is cooled within a slag handling area by water spray and solidification. The slag is stored pending processing or used directly in construction. The processing into smaller fractions is done in a crusher and sieve plant.

The main reason why the activity has opted out of water spraying, crushing and sieving as slag handling in favor of dry granulation is to eliminate noise and dust normally associated with crushing and sieving works. In addition, since the granulation is not water-cooled, no treatment of water used for cooling will be needed.

One of the sources of diffuse dusting from the steel industry is the handling of materials, to which crushing, sifting, loading and unloading counts. As crushing and sieving are excluded from the operations' processes, only unloading and loading give rise to some dusting. Furthermore, the granulation of slag is encapsulated, which means that significantly less noise emissions arise from the activity compared with an outdoor crushing and sighting plant. Granulation of slag has been assessed by H2GS as the best available technology and sieve and crushing plants have therefore been excluded as appropriate technology.

10.4.6 Mercury and dioxin purification

In order to further reduce the dioxin and mercury content compared to an ordinary steel plant, an injection of activated carbon is planned before the flue-gases are directed to the filter units. Dioxins and mercury readily bind to particulate matter, which means that dust removal has a major impact on the levels of dioxins and mercury in outgoing air. The active carbon is made of brown coal and is a porous, very finely ground material designed to have a large surface area relative to volume to promote absorption.

10.4.7 Warm DRI for electric arc furnace

In the melting process, the input material is melted down into a melt, whose chemical composition and temperature are adjusted for the casting. The input material consists mainly of DRI, scrap and alloys. The plant will be equipped with three electric arc furnaces. In the furnaces, input material consisting of hot iron sponges is loaded in contrast to cold input material, which is the usual practice. The energy content of the heated iron sponge is about 0,8 TWh/year. The saving of 0.8 TWh per year corresponds to the heating and electricity consumption of more than 38 000 normal-sized villas.

11 Overall assessment

Impact of the planned activities has been assessed on the basis of value, sensitivity and duration

In order to determine the likely consequences for the areas concerned, the value adopted for the area is weighed together with the assumed impact on the area using a matrix as described below.

Table 18 Assessment Matrix

	Small Value	Moderate Value	High Value	Very high value
Significant negative impact	Small - moderate consequences	Moderate consequences	Large Consequences	Very large consequences
Moderate negative impact	Small Consequences	Small - moderate consequences	Moderate consequences	Large Consequences

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Small negative impact	Insignificant consequences	Small Conse sequences	Small - moderate consequences	Moderate Consistency sequences
No/insignificant impact	Minor consequences			
Positive impact	Positive impact			

National Interests

Total Defense: The planned activities mean that high buildings will be built within and near several of the Swedish Armed Forces' designated national interests with areas of influence or areas of importance for the total military part. The location and design of the buildings have been adapted to the height limitations that exist in the area and are deemed not to affect the national interests of the total defense. In order to investigate what measures are required to avoid the proposed location being in danger of causing material damage to an area of national interest in the category "Other areas of influence", the Swedish Armed Forces has begun a preparation.

Communications: To the west of the area goes national road 97 and the main line through Upper Norrland, which constitute national interests for communications. Transport to and from the planned operation will be carried out by rail and road 97. A new industrial track will be built into the area with a new road running parallel to the railway track. With the planned expansion of the infrastructure in the area, national interests are not deemed to be adversely affected.

Environmental protection: The national interest of Boden (BD 74) consists of five parts, one of which, Gammelängsberget is located just northwest of the area where the activities are planned.

The national interest has been taken into account in the location and design of the business area. Since no measures are planned in the area of national interest, the influence on the national interest is mainly visual as the plant will become a clear feature of the area and create a new silhouette in the landscape. Orientations between different nuclei are not considered to be affected as they are mainly located west and north of the planned installation. The influence on the national interest is considered small.

Reindeer husbandry: About 5 km east of the planned activities is a migratory route of national interest for the reindeer industry. The migration route crosses road 383 between Svedjan and Vibbyn which

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is estimated to have a small increase in the number of traffic movements due to the planned activities. The increase in traffic movements is small and the route is used sporadically during emergency years and then for a short time to move between work. The consequences for the national interest are considered minor.

Agricultural land of national importance: The planned activities involve the use of farmland and forestry land in order to realize the essential social interest in climate-neutral steel production. Local intrusion into agriculture and forestry can be considered limited. The impact on the national interest in agriculture and forestry is estimated to be small.

Surface water

Operating stage: The activity has been designed so that no process water or cooling water will be discharged from the planned activity. It will be purified and then recirculated in the business. This means that there will be no emissions to any recipient except purified surface water.

Daywater flows from the different areas within the area of activity will be managed separately depending on the degree of pollution. Surface water from higher polluting areas will be directed to the process water treatment plant and recirculated in the activity. The surface water from less polluting areas will be diverted to Lillträsket after having been treated and delayed in purification ponds. From Lillträsket, the water reaches Norrbäcken and Gammelängesbäcken to Lörbäcken, which is the closest body of water in which environmental quality standards apply. The design of the treatment plant has been calculated so that the discharge of surface water shall not cause a deterioration of the environmental quality standards in the Lörbäcken.

The impact of surface water management from the planned area of activity will be small.

Construction stage: The location of roads and industry means that Lillbäcken, which today crosses the planned area of activity, will be redirected. The proposed measure constitutes water activity. After diversion, the water in Lillbäcken will be led to the same watercourses as before, that is, Storbäcken. The consequences of the diversion of the Lillbäcken are therefore estimated to be small.

Groundwater

Operation and construction stage: The planned area of activity shall consist partly of cutting and partly of filling. The section consisting of cutting the soil and the rock will lead to a permanent reduction in the area's groundwater.

A preliminary assessment of the area of influence has been made on the basis of map studies, geotechnical studies and groundwater surveys. According to the preliminary assessment carried out, energy wells, agricultural land, woodland and swamp forests are within the preliminary maximum impact area. Results of the

ongoing hydrogeological investigations will be used to calculate the impact area in even more detail and to design protective measures.

The impact of the reduction in groundwater is provisionally assessed as moderate. The assessment may be modified when more knowledge of the hydrogeological conditions on the site is available.

Air

Operating stage: The air emissions of the planned activity are mainly CO2, NOx, dust and organic pollutants. The plant will not give rise to any specific or lasting fragrance.

The planned activities will be relatively close to residential areas and will result in increased emissions to air compared to the current situation. With planned protection measures such as purification plants and process containment, the environmental quality standards and objectives of the built-up environment are estimated to be undercut. The impact of emissions to air from the activity is estimated to be small.

Construction stage: In addition to mass transport and supplies, normal construction traffic, such as passenger cars and transport to and from the workplace, will be on the road
605. This will result in a local increase in emissions of particulate matter and nitrogen dioxide in the area.

With planned protection measures to prevent dusting and minimize NOx emissions from machinery, the impact on air quality is considered to be small during the construction phase. The impact of emissions to air from the construction of the activity will be small.

Pollution of soil and groundwater

Operating stage: The substances deemed to present a risk of pollution damage in soil and groundwater at the time of the planned operation are petroleum products such as fuel oil/diesel, hydraulic oil, greases, transformer oil, lubricating oil, hydrochloric acid, metal alloys (copper, chromium and nickel), alkaline detergent, hydraulic liquid, chromium passivation solution and rolling emulsion.

The risk of spreading pollution may be associated with accidents, for example during loading and unloading, technical faults in the installation and through dusting. Protection measures are planned to avoid and minimize the risk of environmental pollution. Land within the area of activity will be sealed and provided with storm water wells leading the surface water to purification plants. A large contiguous aquifer relevant to local or regional water supply is not present within or adjacent to the planned area of operation. With planned protection measures, the impact is estimated to be small.

Construction stage: The work required for the construction of the site means that a large number of excavation and filling operations will be carried out. None elevated

contamination levels have been found in the soil environmental sampling which has been carried out and which may involve the spread of pollution at shafts. There is no groundwater reservoir near the planned activities.

Soil work means that sulfide soil will need to be managed. Safeguard measures will be taken to prevent the spread of low-pH metals and water when handling the sulfide soil.

With planned protection measures, the impact is estimated to be small.

Noise

Operating stage: Noise will come from the business, the predominant noise sources are deemed to be the DRI towers.

The planned activity involves noise nuisance for the nearby properties. The most noisy construction parts are located in the southern part of the area. With noise abatement at source, the noise level at the nearest homes will be below the Environmental Protection Agency's industrial noise guidance values. The noise impact of the activity is estimated to have a small negative impact locally. It is estimated that the impact of operating noise will be small.

Construction stage: The installation will generate noise, for example during excavation and piling. In order to reduce disturbance for local residents, noise abatement or alternative methods are planned whenever possible. Noise measurements will be carried out to check that the Environmental Protection Agency's guide values for noise from construction sites are contained.

Noise pollution during the construction phase will be limited in time.
The impact of noise from the construction of the activity will be small.

The additional construction traffic on road 605 is estimated to be 375 heavy vehicles per day, traffic mainly takes place during daytime weekdays. Even with the additional construction traffic, the existing action levels for nearby buildings are well met.

Landscape image

Establishing activities in the area will transform the landscape from a forest and agricultural landscape to an area characterized by industrial buildings and associated infrastructure. The highest buildings within the business area will be the DRI towers, which will be about 140 m high.

Protection measures have been taken in the design of the area of operation, with the highest buildings being placed in the southern part of the area of operation and a forest curtain being planned for the residential area of Norra Svartbyn. Additional protective measures are envisaged in the design of the installation, the aim of which is to adapt the installation as far as possible to the environment.

The high towers and also the lower industrial buildings will become partly dominant landscape elements and new landmarks in the area. The impact on the landscape is estimated to be small-moderate.

Cultural environment

Southwest of the planned area of activity is the area Svartbyn which is designated in Norrbotten's conservation program for the cultivated landscape. The Svartbyn area largely coincides with the landscaped area Lövronningen. The planned activities may involve the use of a small area of land in the north-eastern corner of the area. This is not deemed to entail any further closure, or change in the farming landscape in Svartbyn. The impact on the area is estimated to be small.

Several military remains have been found in the north-west part of the planned area of operation. The establishment of the business involves the significant removal or impact of the remains. In addition to the military remains, there are no recorded ancient and cultural remains within or directly adjacent to the planned area of activity.

Climate change

The planned activity will have much lower CO2 emissions (about 0.1 tons CO2 per ton of steel) compared to traditional steel production (about 2 tons CO2 per ton of steel). The main sources of CO2 emissions are from the use of natural gas in the injection of coal in the DRI process and the use of coal in the electric arc furnaces. The sources of carbon dioxide emissions are due to the use of carbon-containing materials, where carbon is a raw material and not a fuel.

The construction of a new steel production plant, using the best available technology, has a small negative impact at local level, which is deemed to have little impact.

With the construction of the planned activities, work is being driven towards a less climate-damaging steel industry. In the long term, this will mean a reduction in greenhouse gas emissions at national and global level, which will have positive consequences in terms of reducing the climate impact. The planned activities therefore make a positive contribution to the national environmental goal of limiting climate impact and to the UN's global goal of combating climate change.

Climate Adaptation

The planned activities will in themselves lead to increased water flow through the sealing of large areas and the reduction of infiltration. The surface water study has proposed a general surface water solution for delaying and purifying surface water designed for 30 years of rainfall.

The impact of flooding caused by a changing climate is estimated to be manageable by well thought out altitude and stormwater management within the area of operations. The consequences of flooding caused by a changing climate are therefore estimated to be small.

Risk and safety

Operating stage: The handling of hydrogen and natural gas is the one that is most likely to cause a serious chemical accident.

Activities will work to protect the public, employees, entrepreneurs and the environment by continuously preventing and limiting the consequences of major chemical accidents.

The calculations of the probability and consequence of accidents show that risk mitigation measures within the planned area of activity are required. All hazardous substances and other chemicals shall be safely handled and stored to minimize the risk of serious chemical accidents occurring. Both preventive and restrictive protection measures are planned.

No scenarios within the planned activities of H2GS are deemed to cause domino effects that risk affecting neighboring activities. The domino effects considered are in particular those limited to the site of the activity.

The consequences that can affect people in the area or the environment are considered moderate.

Construction stage: Accidents at the construction stage such as road accidents and emissions from machinery and fuel tanks can lead to soil and groundwater pollution. Safeguard measures will be taken to reduce the likelihood of impacts on soil and groundwater.

It is not considered that the consequences of any discharges at the construction stage may develop into serious environmental consequences or may affect third parties outside the construction site.

Resource Management Energy

The planned activities require large amounts of energy, mainly in the form of electricity. The most energy-intensive parts of the planned activities are the hydrogen plant and the direct reduction of iron ore.

The choice of location has been made on the basis of the availability of renewable electricity from hydro and wind power. The plant is built on the basis of being as energy-efficient as possible in operation, using modern technology and energy-efficient equipment. Residual heat will be recovered and heat losses minimized. By having continuous processes such as direct casting, it will be important energy savings when

reheating prior to hot rolling is not required. By having a continuous process, large energy savings will be made.

The business is judged to have small-moderate consequences based on the fact that the large amounts of energy needed to run the processes will be used optimally within the business but will also be able to be used externally through, for example, the residual heat generated. These can, if used, become heat in Boden and Luleå's district heating network and can then have a positive influence on energy consumption within the region.

Residues and waste

In terms of quantity, oxygen is the largest residual product produced. The oxygen will be defined as by-product and used in its own operations. In order to minimize waste quantities, slag, incandescent shell, sludge and dust will be reused or recycled within their own facility or externally.

Waste in different fractions will be generated within the activity, but the aim is to minimize the amount of waste and its content of harmful substances for humans and the environment. The amount of waste deposited shall be minimal. By reclaiming residual steel from own and customer production and using it in steel production, the quantities of waste are reduced internally and externally. On this basis, the impact is estimated to be small.

Nature

Operation and construction stage: The majority of the planned area of activity is of low natural value, with the exception of an area classified as a key habitat with a high natural value. As the establishment of the planned activities means that the key biosphere will disappear completely, ecological compensation is proposed. It is appropriate to do this by locating a similar environment (marsh coniferous forest) in the same landscape section and providing formal protection, preferably in the form of a nature conservation agreement.

With the proposed protection measures, the project is deemed not to affect the species covered by the Species Protection Regulation in such a way that the activity can be considered prohibited under the Regulation. Habitat loss will occur for some species, but for most similar environments, it is estimated that the surrounding landscape is so large that the population will not be limited by habitat loss of a smaller area which, moreover, is already largely affected.

Against this background, it is considered that no exemption from the SPC is required. According to current legislation and practice, the prohibitions in the Species Protection Regulation are deemed not to be updated in the case of birds. In order to ensure that the pearl owl, the Eurasian sparrow owl and the slag owl are not adversely affected, hooks will be set up in nearby forests which are not affected by the exploitation.

In the case of the Lapp Rane, it is considered necessary to relocate the local stock in order not to violate the prohibitions in the Species Protection Regulation. It is considered relatively easy to find suitable

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The local population of the Lapp ranuncle is therefore not considered to be affected by this conservation measure and the prohibitions under the TDM Regulation are therefore not deemed to be triggered.

The impact on the natural environment is estimated to be moderate due to the disappearance of the key habitat.

This has a moderate impact on the natural environment.

Outdoor activities and recreation

The area where the activities are planned has good conditions for recreation or outdoor activities in terms of size, content and accessibility. With the construction of the site, it will no longer be possible to use it for recreation. Moving ski tracks, riding routes and snowmobile skiing means that these activities can still be carried out in the immediate area. The distance to the open air area Mining Mountain means that it is not deemed to be affected by the planned activities.

The planned activities are considered to have a small negative impact on outdoor life as similar areas are nearby. Overall, the impact on outdoor and recreational activities is estimated to be small.

Reindeer husbandry

Operating stage: The planned area of activity is within Gällivare sameby's winter pastures. The planned activities will result in a direct loss of grazing in the areas under development and an indirect loss of grazing within about 2 km of the planned activities due to the fact that the reindeer avoid the area where the disturbances occur. Gällivare sameby considers that the area where the activities are planned is not a valuable area for winter grazing. The consequences for reindeer husbandry are estimated to be small-moderate.

The planned activities are not considered to contribute to the existing disturbances that the reindeer industry in Gällivare sameby is currently experiencing from forestry, predators, mining, wind power, climate change, hunting with loose dogs and gravel and rock quarrying. Protection measures are planned to reduce the cumulative impact of traffic and outdoor activities. The contribution of the planned activity to the cumulative effects of mineral exploration and the disposal of land for building housing is considered small.

Construction stage: Disruptions in the form of increased human activity, transport and construction work during the construction phase can lead to an indirect grazing loss in the winter grazing area. Safeguard measures are planned, consisting of information and consultation of the sami village on the location of infrastructure and times for explosions and planning of construction transport. The consequences of possible indirect grazing loss are considered small due to Gällivare sameby's sporadic use of the grazing area.

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Table 19 Summary table, assessed impact of establishment on all environmental aspects

Environmental aspects		Impact assessment
National Interests	Total Defense	Minor consequences
	Communications	Minor consequences
	Environmental protection	Small/moderate impact
	Reindeer husbandry	Small impact
	Agriculture and woodland of national importance	Small impact
Surface water		Small impact
Groundwater		Moderate impact (preliminary assessment, groundwater survey is ongoing)
Air		Small impact
Pollution of soil and groundwater		Small impact
Noise		Small impact
Landscape image		Small/moderate impact
Cultural environmental values		Small impact
Climate change		Small impact
Climate Adaptation		Small impact
Risk and safety		Moderate impact
Resource management energy		Small/moderate impact
Residues and waste		Small impact
Natural values		Moderate impact
Cultural environmental values		Small impact
Outdoor activities and recreation		Small impact

Environmental aspects	Impact assessment
Reindeer husbandry	Small/moderate impact

12 Reconciliation with environmental and sustainability objectives

12.1 National environmental targets

The Riksdag has adopted 16 environmental quality objectives. The goals describe the quality and condition of Sweden's environment, natural and cultural resources that are ecologically sustainable in the long term. There is also a 17th goal, the Generation Goal. It is an overarching goal of environmental policy and guides environmental work at all levels of society

Table 20 Reconciliation with national environmental targets

	Environmental objectives	Impact of planned activities
	1.Limited climate impact 'The concentration of greenhouse gases in the atmosphere shall: reduced climate burden in accordance with the UN Framework Convention for climate change stabilizes at a level human impact on the the climate system will not be dangerous. The objective shall: the environmental objective. be achieved in such a way and in such a rate of biodiversity loss , food production and other objectives of sustainable development is not jeopardized. Sweden has together with other countries a responsibility to achieve the global objective.'	The planned activities will drive the work against a significantly steel industry. In the long term, reduce emissions of greenhouse gases. The planned activities therefore contributes positively to
	2. Fresh air 'The air shall be so clean that: the quantity of air pollutants into the environment from health, animals, plants and cultural values the planned activities are small. The not be harmed. The focus is: there is no risk of environmental quality standards the environmental quality objective shall be achieved within or environmental quality objectives will generation.'	Estimates carried out show that the contribution to be exceeded. The planned installation be deemed not to affect the fulfillment of negative.
	3. Only natural acidification 'The acidifying effects of deposition and land use shall be below the limits of soil and water. The deposition of acidifying substances shall also not increase the rate of corrosion of technical materials or cultural objects and buildings. The focus is on achieving the environmental quality objective within a generation.'	Calculations carried out show that the contribution to the quantity of airborne sulfur and nitrogen compounds to the environment from the planned activities is small. There is no risk that environmental quality standards or targets will be exceeded. The planned installation is not deemed to adversely affect the achievement of the environmental objective.

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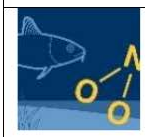
	Environmental objectives	Impact of planned activities
	4. Non-toxic environment 'The environment shall be free of substances and metals created or extracted by	The planned activities will apply storage and handling methods of chemicals and wastes which: any spillage and leakage do not result in
	society and which may threaten health or biodiversity. The focus is on the environmental quality objective within a generation.'	negative impact on human health and the environment. H2GS will work actively to: reduce the amount of waste by preventing, reduce, reuse and recycle waste. To example, scrap from H2GS customers will reused in steel production. Dioxin- and mercury levels in the flue-gases of the scrap melting will be kept at minimum levels by injection of coal. H2GS also explores the possibilities for re-use the oxygen produced by the hydrogen production process within the planned activities. The planned activities are not assessed adversely affect the achievement of the environmental objective.
	7. No Eutrophication 'The fertilizer content in soil and water shall not adversely affect human health, the conditions for biodiversity or the potential for all-round use of soil and water. The focus is on the environmental quality objective within a generation.'	The planned activities have an effective the best possible technology will be to be used. The planned activities does not involve any discharge of process water; or cooling water, this water will be reused in the business. Also the surface water will be partly used in activities, surface water from the least contaminated surfaces will be cleaned before emissions to the receiving waters of Lillträsket. Estimates carried out show that the contribution to the quantity of airborne nitrogen compounds to from the planned activity is small. The planned activities are not assessed adversely affect the achievement of the environmental objective.

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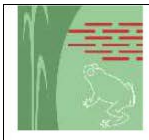
	Environmental objectives	Impact of planned activities
	**8. Living lakes and watercourses** "Lakes and watercourses should be ecologically sustainable and their varied habitats should be preserved. Natural productive capacity, biodiversity, cultural environmental values and the ecological and water-saving function of the landscape shall be preserved, while safeguarding outdoor recreational conditions.';	The planned activities have an efficient water treatment as the best possible technology will be used. The planned activities do not involve any discharge of process water or cooling water, this water will be reused in the operation. Even the surface water will be partly used in the operation, the surface water from the least polluted areas will be purified before discharge to the receiving limestone. The planned activities are not deemed to adversely affect the achievement of the environmental objective.
	**9. Good quality groundwater** "Groundwater shall provide a safe and sustainable supply of drinking water and shall contribute to a good habitat for plants and animals in lakes and watercourses. The focus is on achieving the environmental quality objective within a generation.'	H2GS will take protective measures to avoid and minimize the risk of spreading pollutants into groundwater. There is no groundwater reservoir near the planned activities. The construction of the activity involves a reduction in groundwater. The results of ongoing hydrogeological investigations will be used to calculate the area of impact in detail and to design protective measures. The planned activities are not deemed to adversely affect the achievement of the environmental objective.
	**11. Myller wetlands** "The ecological and water-saving function of wetlands in the landscape shall be maintained and valuable wetlands preserved for the future."	The meadow swamp and the area around them, which have been assessed as valuable frog habitats, have been planned in the zoning plan as natural land. H2GS activities are located so that they do not fall within this area. Purified stormwater from the business area will be led to Lillträsket. The design of the treatment plant has been calculated so that the discharge of surface water shall not cause a deterioration of the environmental quality standards in the Lörbäcken. The

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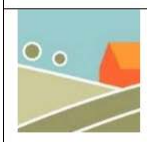
	Environmental objectives	Impact of planned activities
		activities are not assessed adversely affect the achievement of the environmental objective.
	12. Live forests 'The value of forests and forest land for protection of organic production while ensuring biodiversity	Locally, the planned activities an area of forest including an area identified as a key habitat is taken in claims.
	conservation and cultural environmental values and social values are safeguarded. The focus is:	The planned activities are not assessed adversely affect the achievement of the environmental objective.
	the environmental quality objective shall be achieved within generation.'	
	13. A rich cultivated landscape 'The value of the agricultural land production and food production shall while protecting the biological	The planned activities involve: the use of arable land. The intrusion into local agriculture can be regarded as: limited.
	diversity and cultural be preserved and strengthened.'	The planned activities do not involve: impact within the related landscaped cultivated landscape The roundup. Part of the activity However, it will be visible from the Lövronningen. The planned activities are not assessed adversely affect the achievement of the environmental objective.
	15. Good built environment 'Cities, agglomerations and other built-up environments shall constitute a good and healthy living environment	Location of the planned activities and the location of the buildings within area has been adapted to the contiguous national interest in cultural environmental conservation.
	and contribute to a local and global good environment. Natural and cultural values shall be taken exploiting and developing. Buildings and facilities shall be located and designed in an environmentally sound manner and long-term good land management; water and other resources are promoted. The focus is on the environmental quality objective within a generation.'	The planned activities involve: partial local recreational facilities disappears but with redrawing of the other ski trails and riding routes in the area are available some of them remain. Noise abatement will take place at the noise sources of the planned activity so that noise guidance values shall not be exceeded at the nearest living quarters.

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	Environmental objectives	Impact of planned activities
		With planned protection measures it is assessed the planned activities do not affect the achievement of the environmental objective.
	16. A rich plant and animal life "Biodiversity must be preserved and used in a sustainable way, for present and future generations. The species' habitats and ecosystems, as well as their functions and processes, shall be protected. Species must be able to survive in long-term viable populations with sufficient genetic variation. People should have access to a good natural and cultural environment with rich biodiversity, as a basis for health, quality of life and well-being."	Locally, the planned activities involve the use of a forest area including a designated key habitat. The meadow swamp and the area around them, which have been assessed as valuable frog habitats, have been planned in the zoning plan as natural land. H2GS activities have been placed so that they do not fall within this area. The planned installation is not deemed to adversely affect the achievement of the environmental objective.

The following environmental objectives are deemed not to be affected by the planned activities:

Protective ozone

layer Safe radiation

environment

Sea in balance and living coast and

archipelago

12.2 Global sustainability goals

In 2015, the United Nations agreed on a new Agenda 2030 with 17 comprehensive global sustainable development goals that point to a comprehensive and necessary global transformation. Sustainable development means reducing the negative impact on nature and human health in the long term and includes dimensions; social, ecological and economic sustainability. An assessment of the planned activities against the relevant global sustainability targets has been made. The relevant objectives and a short justification for the assessment are set out in Table 21. The overall assessment is visualized in Sweco's Sustainability Solar ™ (Figure 12-1).

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Table 21 Summary description of the impact of the planned activities on the global sustainability objectives

Sustainability objectives and milestones	Assessment
 **3.9 Reduce disease and death rates from harmful chemicals and pollutants**	**The planned activity involves a completely new plant using the best available manufacturing and purification technologies. The burden of harmful chemicals and the pollution and contamination of air, water and soil are therefore considerably smaller than from traditional steelworks.**
 **6.3 Improving water quality and sanitation and increasing reuse** **6.4 Improving water use and security**	**The planned activities have efficient water use and purification, when the best possible technology will be used. The planned activities do not involve any discharge of process water or cooling water, this water will be reused in the operation. Even the surface water will be partly used in the operation, the surface water from the least polluted areas will be treated before discharge to the recipient.**
 **7.3 Doubling the increase in energy efficiency**	**The planned activities are energy intensive, mainly in the form of electricity. Building the plant from scratch means that solutions for optimal energy use will be installed. It will also be possible to use energy externally, for example, through the residual heat generated.**
8.4 Improving resource efficiency in consumption and production	**The planned activities help break the link between economic growth and environmental degradation by driving the development of the steel industry towards becoming more low-carbon.**

 **9.2 Promoting inclusive and sustainable industrialization** **9.4 Upgrade all industry and infrastructure for increased sustainability**	**The planned activities involve many jobs in sustainable industry.** **The plant uses the most environmentally friendly technologies available and thus drives the development towards a more sustainable steel industry globally.**
 **11.4 Protecting the world's cultural and natural heritage**	**The location of the planned activities and the location of the buildings within the area of activity has been adapted to the neighboring national interest in cultural environmental conservation.**
12.4 Responsible management of chemicals and waste **12.5. Significantly reduce waste**	**The planned activities will apply methods for the storage and handling of chemicals and waste that ensure that any spillage and leakage will not have negative consequences for human health and the environment.** **H2GS will work actively to reduce waste by preventing, reducing, reusing and recycling waste. For example, scrap from H2GS customers will be reused in steel production. The levels of dioxin and mercury in the waste gases from the scrap melting process will be kept to a minimum by carbon injection. H2GS also explores the potential for reuse of the oxygen produced in hydrogen production within the planned activity.**

 **15.2 Promote sustainable forest management, stop deforestation and the restoration of depleted forests** **15.5 Protecting biodiversity and natural habitats**	**Locally, the planned activities involve: area of forest including a designated area as a key habitat.**

The following sustainability objectives are deemed not to be affected by the planned activities (gray "cake pieces" in the sustainability sun in Figure 12-1); no poverty, no hunger, good education for all, gender equality, reducing inequality, combating climate change, the sea and marine resources, peaceful and inclusive societies, and implementation and global partnership.

Figure 12-1 Overall assessment of the Global Sustainability Goals in Sweco's SustainabilityTM. Gray "cake pieces" in the Sustainability Sun are targets that are not judged to be affected by the operation.

13 Environmental permit process and consultations carried out

13.1 Consultation

A demarcation consultation under Chapter 6, Section 29 of the Environmental Code has been conducted in April/May 2021 with the County Administrative Board in Norrbotten County, Boden Municipality, Luleå Municipality, government authorities, especially affected individuals as well as with a wider public and organizations that can be assumed to be affected by the activity or measure. An additional consultation was carried out in October/November 2021 in view of, among other things, the adjustment of the planned location of the plant, which has led to a partial change of circumstances.

Since the planned activities under the Environmental Assessment Regulation (2017:966) can always be assumed to have significant environmental effects, no study consultation has been held.

These activities are covered by the Act on the Prevention and Control of the Consequences of Serious Chemical Accidents (Seveso Act), which is why the consultation also covered the prevention and limitation of serious chemical accidents resulting from the activities in accordance with Chapter 6, Paragraph 29(2) of the Environmental Code.

The consultation process is described in the Consultation Report (Annex B1).

13.2. Decisions on significant environmental impacts

The activity sought shall always be presumed to have a significant environmental impact under the Environmental Assessment Regulation.

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15 Compliance with the competence requirement

This EIA and its subinvestigations are prepared by the consulting company Sweco Sverige AB on behalf of H2GS. The following persons were primarily responsible for the preparation of this EIA:

Åsa Duell - Coordination and author. long-standing experience in the development of environmental impact assessments for various types of environmentally hazardous activities;

Ann-Sofie Hultsved - Writer. Long-standing experience of environmental work in industries.

Linn Arvidsson - Quality Review. Long-standing experience in contract management of major licensing processes and development of industrial and energy activities.

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