Guidance on Exploration

SveMin

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Svemin is the national industry association for mines and for mineral and metal producers in Sweden, representing around 40 companies which employ 13,000 people in production, exploration and technology. Our member companies are active throughout the country, with the mines being mainly located in northern Sweden and Bergslagen.

Contents

APPENDICES:

Foreword

For anyone wanting to know more about exploration

This guidance is aimed at a broad readership. It may be read by prospectors, landowners and authorities who want to know about the rules that apply. It may also be read by anyone who is interested in knowing how exploration takes place in Sweden.

The guidance may be read as a whole, or only those sections and chapters that are of interest. In many places the text contains references to other sections that describe a certain aspect in more detail.

The guidance aims to ensure that exploration activities undertaken in Sweden maintain a high standard. It also aims to provide a good picture of what exploration is and what impact can be expected on the surrounding area as a result of the exploration. It contains a description of the process of exploration – the permits and decisions by authorities that may be required, and the communication with affected parties and the general public that may be needed.

In certain parts the guidance contains Svemin's recommendations as well as tips and experience. These are set apart from the main text, to show that they represent Svemin's opinion. In contrast to what is laid down in laws and other rules, recommendations and tips are not binding. They are based on experience and are included for support and as suggestions of how to approach various situations.

This document is based on two guidance documents produced previously by Svemin, *"Guidance for exploration in Sweden"* (2012) and *"Guidance to good environmental practice for exploration in protected areas"* (2007). These two guidance documents have now been merged and revised into the 2017 guidance.

In the course of the work, viewpoints have been gathered from the members of Svemin's Exploration Committee, from corporate lawyers at the member companies and from former Chief Mining Inspector Jan-Olof Hedström. The following individuals were part of the working group that contributed to the work on this guidance:

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Stockholm, July 2017

1. INTRODUCTION

1.1 About the guidance

This guidance is intended to be used by prospectors, landowners, administrative staff at authorities and others who need to be familiar with exploration and rules on land use, environmental protection and the work environment. It also provides useful information for anyone else who is interested in knowing how exploration takes place in Sweden.

The document provides guidance on the rules in force and on practice within the industry. This means that the content reflects the circumstances at the time it was written.[1] Rules and standards are always subject to change. This document should therefore not be regarded as an exhaustive description or interpretation of current law and practice. It is the responsibility of each prospector to make sure they are aware of the rules that apply.

The guidance also provides a number of commitments and recommendations that go beyond what is required by legislation and regulations from authorities, and which thus describe what may be considered to be best practice within the industry.

Svemin has adopted ethical rules that Svemin's member companies have undertaken to follow. The content of the guidance may be used as support for compliance with the ethical rules.

1.2 Exploration and mining

Exploration is needed in order to find recoverable mineral deposits that are of interest. Exploration is an activity that is necessary for a sustainable mining industry. This guidance does not deal with mining at all, but since mines and exploration are different parts of the same industry, there is reason to provide a brief introduction at the outset into how they fit together and what separates them.

The Swedish mining industry has a long and successful history. The mining operations that are currently conducted result not just from the fact that the Swedish bedrock is rich in valuable minerals, but also from companies that have developed a high level of expertise and efficiency in areas such as technology and environmental aspects. It takes a long time to develop a project that leads to the opening of a new mine. A fundamental requirement is that there are metals or other useful commodities in minerals or rocks that can be mined and recovered.

Exploration initiatives that result in a mine being opened are incredibly few in number. However, it may be noted that exploration also contributes to a general increase in information about and knowledge of Sweden's bedrock.

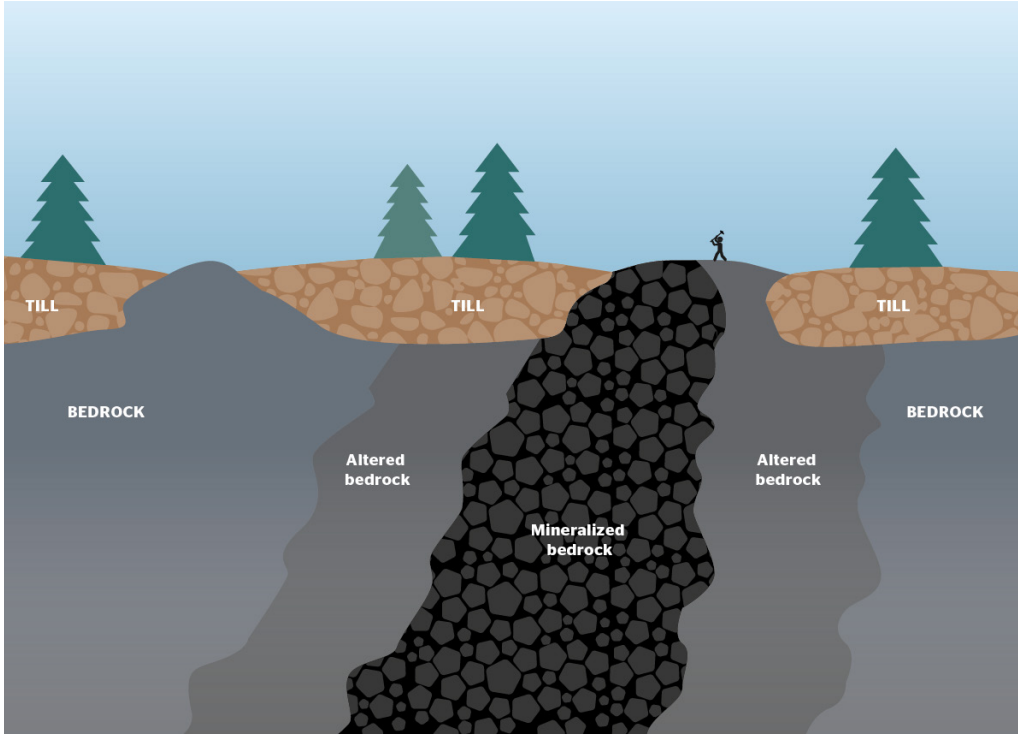
Both exploration and mining are highly resource-intensive. In both cases the activities inevitably involve taking a degree of financial risk. Where exploration is concerned, the risk may briefly be described as that of conducting capital-intensive operations where there may be uncertainty as to whether the operations will generate earnings. As regards mining, the risks may be summarised as firstly that it is an activity with a market that is global and cyclical, and that is difficult – if not impossible – for an individual mining company to influence. Secondly, the operations require both major investment and an in-depth permit approval procedure before the operations can begin and provide any income. Despite this, Sweden has a number of active mining and exploration companies conducting long-term and successful operations.

"Exploration involves temporary access to land and exploration permits are granted for a limited period of time.

1.3 Utilisation of land

Exploration and mines inevitably require land to require the use of land. Exploration involves temporary access to land and exploration permits are granted for a limited period

1 The description of exploration permits and plans of operations corresponds to the provisions of the Minerals Act following the amendments which entered into force on 1 August 2014. Earlier provisions are still applicable to exploration permits granted prior to this.



Exploration involves obtaining information about the bedrock. ILLUSTRATION: GEOPOOL

of time. The methods used do not typically leave behind any lasting or noticeable traces in the environment. Mines, in contrast, utilise land for a longer period – for obvious reasons – and have an inevitable impact on the place where the operations are conducted. Today, the environmental requirements are high and mining companies have devoted significant resources to meeting the requirements. The companies continually work actively to develop, improve and streamline their operations.

Mines provide society with metals and other important commodities. Metals are necessary components in most of what we need, use and take for granted in our daily lives. Metals are elements and can be recycled time after time. In order to achieve a high level of recycling, the products that contain metals must be developed. So far, demand for metals has been much higher than the amount provided by recycling and much higher than it is currently possible to recycle. The ability to utilise land for exploration and mining is such an important matter that it has been regulated separately. The Minerals Act (*Minerallagen*) aims to achieve effective and appropriate exploration, and by extension to be able to satisfy society's demand for various metals. In parallel with the Minerals Act, all the relevant environmental legislation is applied. The environmental legislation applies not just to exploration and mines, but is to ensure that land use and activities are carried out in an environmentally acceptable way regardless of the industry concerned.

There may be various interests that compete for the use of land along with the mining industry. As well as the utilisation by prospectors, landowners and the state that has ocurred historically, other interests are now also being asserted. These include public interests, such as the protection of the environment and natural assets, cultural heritage, reindeer husbandry and the Sami culture. There are also private interests and other industries that depend on land, such as tourism, reindeer herding industry and energy production.

2. DESCRIPTION OF EXPLORATION

2.1 Introduction

This chapter outlines the most commonly used methods of exploration. There may be other methods apart from those described, but the same general principles regarding impact on land and the environment apply as a starting point. The chapter begins with a general description that provides an introduction to what exploration is and what its purpose is. This is followed by a description of the methods commonly used in the various phases of exploration and, briefly, the impact that these may have on the surroundings.

2.2 General description of exploration

2.2.1 Purpose and society's need for exploration

Exploration is in the public interest. Knowledge is needed of what the bedrock is like and where there may be mineralisation containing valuable substances that are needed in society.

Exploration means looking for mineral deposits that are commercially exploitable. This is necessary in order to be able to supply society with the metals and minerals that are used and demanded daily. Exploration may be carried out on both state-owned and privately-owned land. The Minerals Act (Minerallagen) describes exploration – also known as prospecting – as *"work undertaken to prove the existence of a deposit of a concession mineral and to establish the probable economic value of the deposit and its character in other respects, to the extent that such work involves encroachment on the rights of either the owner of the land or a holder of other rights"*.

Exploration is also defined in the Swedish Ordinance on Waste from Extractive Industries (förordningen om utvinningsavfall) (2013:319) as:

> *"activities involving sampling, drilling, trenching or otherwise systematically searching for deposits of economic value, but excluding any works required for the development of such deposits, and any activities directly associated with an existing extractive operation"*.[2]

In summary, exploration involves acquiring knowledge of the geological conditions within an area. It is preliminary work and is performed regardless of whether or not it will eventually lead to the opening of a mine. Exploration is both costly and time-consuming since it needs to cover large areas. However, it does not result in the opening of a new mine other than in very few explored areas.

2.2.2 The various phases of exploration

Boulder tracing, geological mapping and geophysical surveys are *initial exploration methods* and are performed at an early stage. When an interesting deposit is discovered, it needs to be investigated in more detail. If mineralisation is found and it is of interest to continue exploring this, these explorations are followed up by *further exploration work*, which usually means drilling but may also involve an exploration trench. Drilling can be undertaken all year round, but in some areas – such as wetlands – the work can only be carried out during the winter months. Some methods benefit from being performed during the winter. They do not then leave traces on the ground in the same way as during the summer and accessibility can be better. However, cold and access to water are limiting factors that may make it impossible to undertake exploration in the winter. Once a mineral deposit has been identified and sampling of the deposit has produced positive results, *advanced exploration work* needs to be carried out in the form

"When an interesting deposit is discovered, it needs to be investigated in more detail.

2 The EU Directive on waste from extraction (Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries) defines exploration as "the search for mineral deposits of economic value, including sampling, bulk sampling, drilling and trenching, but excluding any work required for the development of such deposits, and any activities directly associated with an existing extractive operation".

In brief, the typical process in exploration is as follows:

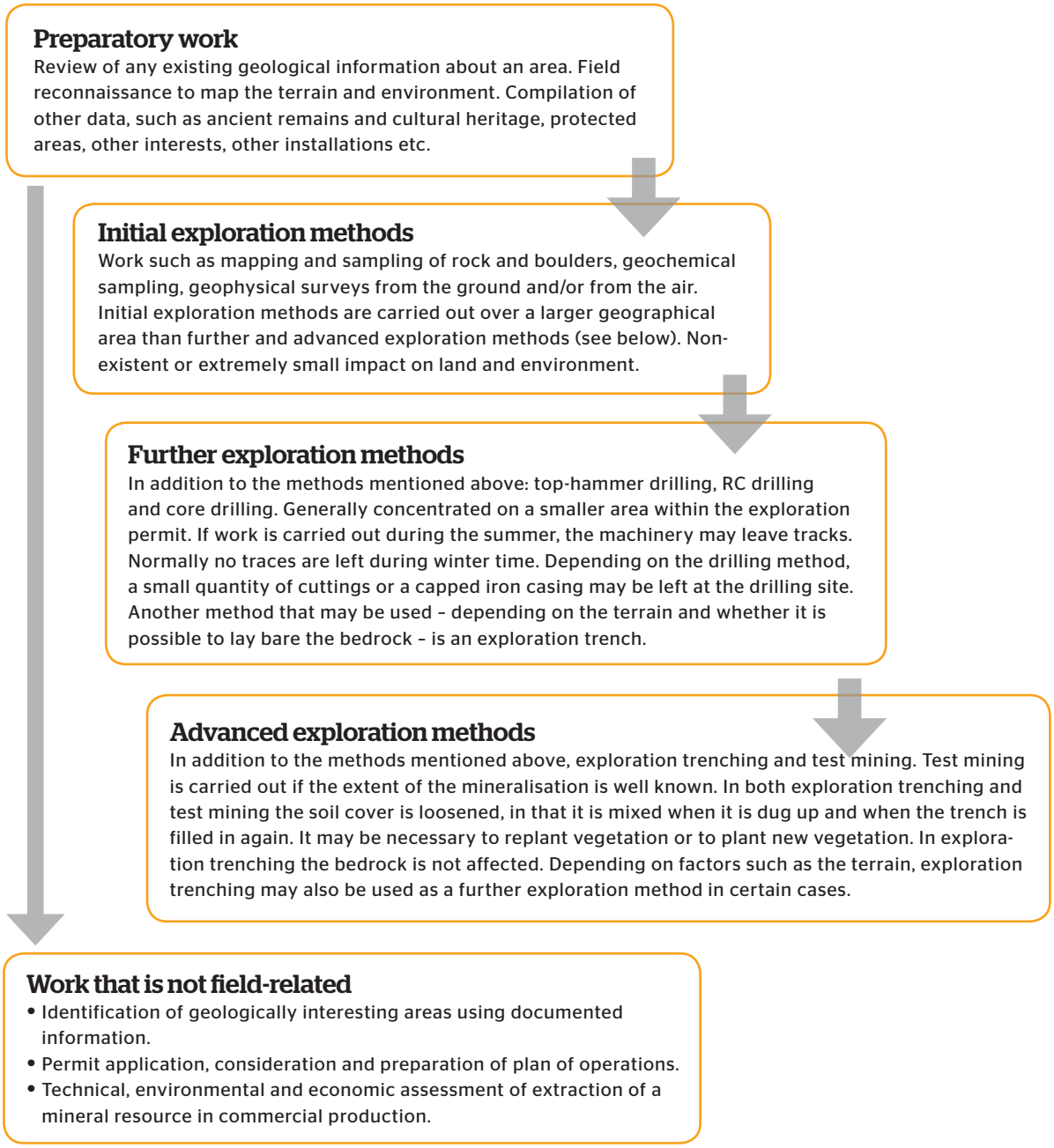


Figure 1: Diagram of how exploration is carried out.

of test mining. Test mining is a one-off activity that involves sampling a large volume of mineralised rock in order to be able to assess the technical concentration properties of the mineralisation.

The methods used in mineral exploration generally have only a small and temporary impact on the natural and cultural environment. The potential impact on the natural environment of exploration and of different exploration methods is described later in this chapter and also in Chapter 6. Briefly, the following potential consequences may conceivably occur:

- Felling of trees and impact on vegetation from off-road driving
- Temporary increase in noise and light levels
- Temporary impact on surface water and groundwater (drilling)

Which exploration method results in the least possible environmental impact will depend on the terrain of the exploration area and the thickness of the soil cover. At sites

Till sampling in the field. PHOTO: GEOPOOL

where the bedrock is laid bare, bedrock mapping is a common method. Often, however, the bedrock is not visible because it is covered with till deposits. Exploration methods such as till sampling and boulder tracing are then required, and these are most easily carried out during the bare ground season. Geophysical surveying on the ground or from the air (using an aircraft or helicopter) is a method used both in till-covered areas and in areas where there is bare rock. Some geophysical methods cannot be performed during the winter because of snow and ground frost, while others are more practical to undertake during the winter when accessibility across wetlands and lakes, for example, is better.

2.3 Initial exploration methods

2.3.1 Geochemical sampling

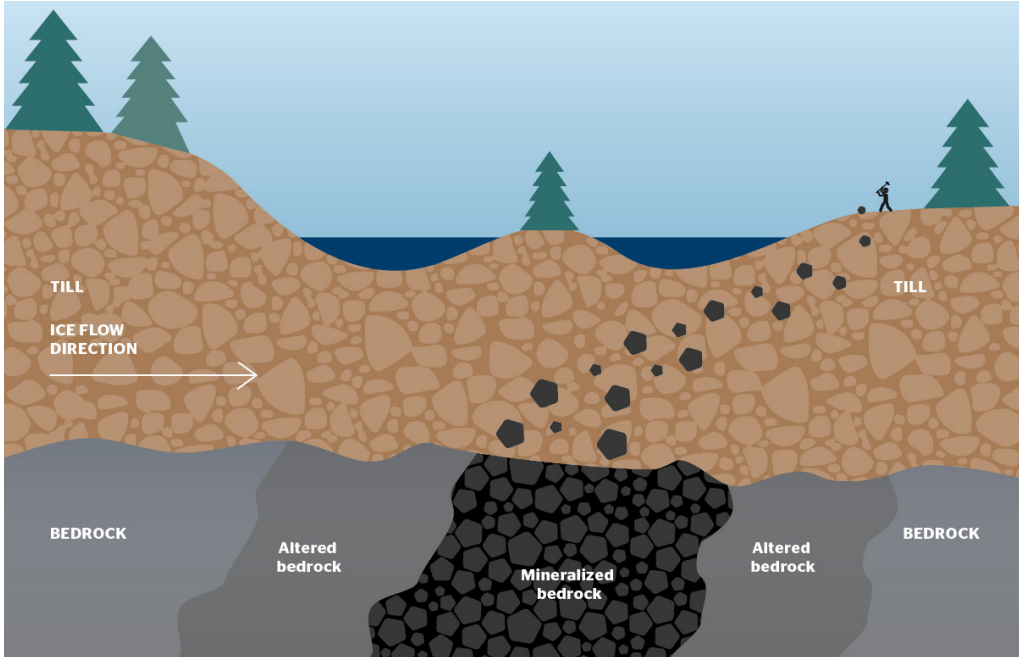
To a large extent, the bedrock is overlain by layers of soil. These layers of soil mostly consist of materials crushed and spread by glacial ice as it moved – mainly till of varying composition and size. Traces of minerals and metals from the bedrock can be found in the till. Till can be sampled in various ways: using a shovel or handheld drill (surface till), or using a tracked vehicle or vehicle-mounted drilling rig (basal till).

- When sampling using a *shovel*, a pit is dug in the ground until untouched mineral soil is reached – known as the C horizon. The mineral soil is sampled, the samples being generally around 500 grams in size. The hole dug is typically 0.5–1 m deep. The sample is collected in a sample bag and the pit is then backfilled with the excavated material.
- When sampling with a *handheld drill*, a small hole is drilled in the ground (approx. 5 cm in diameter) down to the desired depth, usually one to a few metres, after which the drilling is stopped and the sample is collected in a bag. The sampler, located at the bottom end of the drill rod, is what is known as a wet-sampler and captures the sample at the depth where drilling is stopped. The sample size is around 250 grams.
- *Basal till sampling* using a drilling rig is generally a further exploration method and is described below in 2.4.1 Top-hammer drilling.

> The mineral soil is sampled, the samples being generally around 500 grams in size.

2.3.2 Geological mapping and boulder tracing

To find mineralisations, studies of the bedrock and the types of rock that occur within it are required. In initial exploration work boulder tracing and geological mapping of



Boulder tracing on the ground surface. ILLUSTRATION: GEOPOOL

the bedrock are often among the first steps. The information is collected by geologists, geophysicists and field technicians through surveys in the field.

- *Boulder tracing* means searching for mineralised and geologically altered rocks (boulders). The boulders are mapped and those that are of geological interest are sampled using a hammer. The samples are then sent for chemical analysis of the metal content.
- *Geological mapping* means searching for outcrops in the terrain. The outcrops are mapped; samples (geological specimens) are taken from interesting outcrops using a hammer and sent for chemical analysis of the metal content. The geological information is then compiled in databases and on geological maps along with all the other available information, such as geophysics and geochemistry.

2.3.3 Geophysical surveys

Different types of rock give off different types of geophysical signals. These are measured in geophysical surveys, allowing areas of interest to be distinguished from those that are of less interest.

A general airborne geophysical survey is carried out from an aircraft or helicopter and allows mapping of the geology over large areas – often several hundred square kilometres. The results guide the prospector to sites with promising geological conditions.

Geophysical surveying on the ground is carried out when an area that is promising for exploration has been demarcated and scaled down from hundreds of square kilometres to a smaller area of square kilometres. The next operation is to map the physical characteristics of the bedrock using various types of portable equipment. The survey is performed in a grid, the distance between the survey lines generally varying between 40 and 200 metres and the distance between the survey points (along the survey lines) generally being between 5 and 50 metres. Usually, measurement and orientation are almost exclusively carried out using GPS (Global Positioning System) methods.

Those taking the measurements (survey technicians) cover the working area on foot, on skis or by snowmobile and measure the geophysical characteristics of the ground with various types of portable measuring equipment. Some survey methods require a long power cable to be placed out in the area being surveyed; in such cases this is done by feeding out the cable from a cable drum by snowmobile, all-terrain vehicle or on foot. The technicians then send the survey results to geophysicists for interpretation.

Tips and experience

Depending on the terrain conditions and survey metho the geophysical measurements may only be able to be taken at certain times of the year. For example, some survey methods cannot be performed in winter when the ground is frozen.

Geological mapping by sampling in the field. PHOTO: LKAB

2.3.4 Environmental consequences of initial exploration methods

Surface till sampling generally causes no damage. In some cases the till is cleared of vegetation, but only over a very small surface area (typically less than one square metre). Provided the pit is backfilled well, shovel sampling also has no impact on the external environment.

Geophysical ground surveys have little or no impact on the land and the environment. In densely forested areas sight-lines may sometimes need to be cleared along the line of measurement for practicality, but generally this is not required. The development of GPS technology has meant that staking out areas, and therefore clearing lines for this, are increasingly rare. Sometimes light all-terrain vehicles are used to carry out certain geophysical survey work. The use of such vehicles can sometimes cause driving-related damage to the ground, young forest and vegetation. Good planning of the work and careful driving of the vehicle when off road mean that such damage is usually very limited. Geophysical surveys carried out during the winter are not judged to have any impact on the ground because it is protected by snow-cover.

Boulder tracing and *geological mapping* generally have no impact on the land. In the case of geological mapping, it may be necessary to remove moss to expose outcrops and boulders. The moss is to be removed carefully and replaced after mapping has been carried out.

A more detailed description of precautions and any risks can be found in Chapter 6, Work environment and the external environment for field work.

> Geophysical ground surveys have little or no impact on the land and the environment.

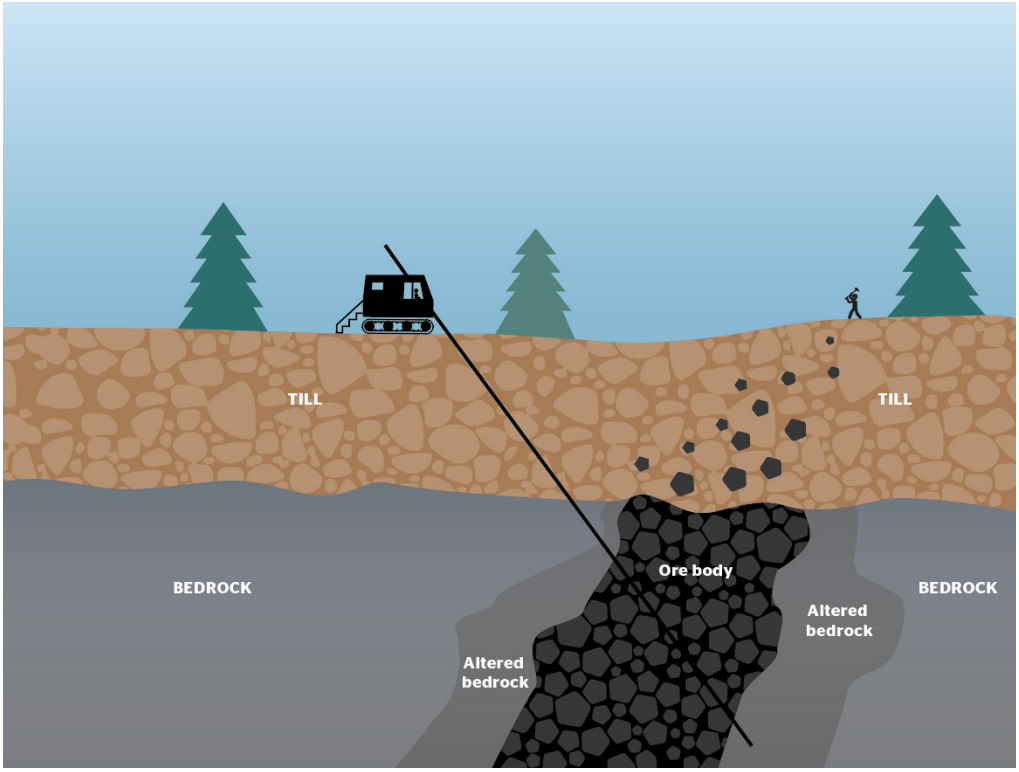


Diagram of exploration drilling. ILLUSTRATION: GEOPOOL

2.4 Further exploration methods

Once a geologically interesting area has been identified, sampling may be required to clarify the nature of the rock deep down. Sampling is carried out by investigating rock types, minerals, metal contents and rock conditions (cracks, faults etc.) using special drilling rigs. Since drilling is expensive, this step is only carried out following careful analysis of which sites need to be investigated by drilling. Drilling is normally carried out in a small, defined part of the exploration area (hectare-scale). The aim is to investigate anomalies discovered during initial exploration, so as to verify models and find the boundaries of the mineralisation.

The drilling rigs used vary in design and size. Although there are various sizes, manufacturers and types of drilling rigs, a few simple rules apply to most. The drilling rigs are almost always primarily diesel-powered. All the drilling rigs also have a secondary drive mechanism which is hydraulic. Typically, drilling rigs for top-hammer drilling are small and are transported to the site by tracked or all-terrain vehicles.

2.4.1 Top-hammer drilling

Top-hammer drilling – also known as percussion drilling or surface rock sampling – is carried out once an area of interest has been identified by means of geological mapping, geophysical surveys and/or boulder tracing. In top-hammer drilling, samples are taken from the soil layer, usually at a depth of 0–20 metres, above the solid rock. In addition, samples are normally also taken from the top surface of the rock. The soil samples and rock samples are placed in sample bags and transported away on light all-terrain vehicles in order to be sent for chemical analysis in a laboratory. The purpose of this type of sampling is to systematically investigate an area where there are indications of mineralisation in the bedrock. Top-hammer drilling and surface rock sampling are generally carried out along lines and, like core drilling (see below), are a relatively expensive method of exploration. The spacing


Top-hammer drilling site on marsh. PHOTO: BOLIDEN

between samples along the line usually ranges between 10 m and 400 m.

Elevated concentrations of interesting metals may result in more advanced further exploration work, usually core drilling. To carry out top-hammer drilling the drilling rigs are driven to the drilling site, often mounted on tracked or all-terrain vehicles. The best possible route – preferably on a hard substrate – is chosen for such transportation, in consultation with the landowner. For natural reasons, drilling in certain areas such as wetlands can only be carried out during the winter when the ground is frozen. Sometimes preparatory work is carried out along the transport route, such as packing snow using snowmobiles, a snow grooming machine, a tractor or tracked vehicle, before the drilling rig is transported to the site. In some cases trees may need to be felled to allow the drilling rig to get to the site.

2.4.2 Reverse circulation (RC) drilling

RC drilling is used when a larger sample quantity is desired, and most commonly when prospecting for gold. RC drilling is not particularly common as an exploration method in Sweden. The method uses compressed air to push rock fragments, known as rock chips or drill cuttings, up out of the hole while drilling. Usually the drill cuttings are collected in large sacks for each metre drilled. These samples can be mapped and a representative portion of the sample is then sent for analysis of its metal content.

RC drilling on frozen marsh. PHOTO: GEOPOOL

RC drilling is comparable with core drilling in terms of the size of the drilling rig and the stage of exploration at which it is performed. Normally, holes that are approx. 15 cm in diameter and up to 150 m deep are drilled. No water is needed to carry out this type of drilling from a technical point of view.

In terms of drilling technology, RC drilling is generally a more time-efficient and somewhat cheaper method than core drilling (see below). Due to the high cost of drilling, other exploration work is generally carried out in detail before RC drilling or core drilling is considered.

Tips and experience

Core drilling is used in advanced exploration projects and is performed in a limited part of the exploration area. Since core drilling is an expensive exploration method, the technology is only used once mineralisation has been identified by means of other methods, e.g. geological mapping or geophysical surveys.

2.4.3 Core drilling

Core drilling is generally performed as the final stage of exploration work, after a geologically interesting area has been identified using geological mapping, geophysical ground surveys and/or top-hammer drilling and surface rock sampling, and where this area needs to be investigated in more detail. Core drilling involves drilling out cores of rock using an annular diamond-tipped drill. The drill cuts out a core of rock that is generally around 5–8 cm in diameter.

A core drilling rig at work. PHOTO: GEOPOOL

The length of the drilled hole may vary from tens of metres to more than 1,000 m. When the core barrel is full, it is brought up and emptied. The drill cores are placed in special boxes and transported away by snowmobile and sled, by quad bike or other all-terrain vehicle to a collection point by a suitable road, from where they can be transported later for geological mapping and sampling by geologists. Mineralised parts of the drill core are sent to a laboratory for analysis of the chemical composition and content of any metals.

Core drilling is often performed using tracked machinery. The best possible route to the drilling site is generally determined in consultation with the landowner. In some

cases trees may need to be felled for the drilling rig to get through. For natural reasons, certain areas such as wetlands can only be drilled during the winter.

Water for cooling the drill bit can be taken from a nearby borehole or watercourse. If no water is available in the vicinity of the drilling site it may be necessary to transport water there in a tank.

Core drilling is an advanced but necessary method of exploration that is needed to enable geologists to carefully investigate a mineralisation in terms of geology and geochemistry and to assess its size and metal content.

2.4.4 Environmental consequences of further exploration methods

Finished drilling site immediately after work has been completed. PHOTO: BOLIDEN

The same drilling site three years later. PHOTO: BOLIDEN

The impact of the drilling work on the surrounding area is more or less comparable to that arising from off-road driving of forestry machinery. All-terrain vehicles primarily use existing routes to get to a drilling site. Sometimes a certain amount of tree felling is required in order to create a driving route. All off-road driving can result in some damage to the ground, but the damage can generally be limited by planning the timing of the exploration work and the terrain used. Drilling rigs for exploration drilling are generally diesel-powered and mounted on a tracked vehicle or a forestry tractor. The drilling inevitably involves a certain amount of noise. However, the noise can be restricted by using a silencer and/or screening.

Water from the drilling normally drains temporarily into the ground next to the drilling site. This may mean that some of the drill cuttings are left in the ground. In certain cases the work is carried out such that the drill cuttings are deposited in basins or containers by sedimentation, to minimise the drill cuttings left behind. The casing from the drilling is cut off just above (or below) the ground surface and capped.

By cleaning up and restoring the drilling site to the best possible condition after drilling a limited trace of activities is left behind. Typically there may be traces of driving routes, a small quantity of drill cuttings and a capped iron casing at the drilling site. If the work is planned and executed well, then apart from the capped casing only temporary traces are left behind, and these are often barely noticeable once some time has passed.

A more detailed description of precautions and any risks associated with the field work can be found in Chapter 6, Work environment and the external environment for field work.

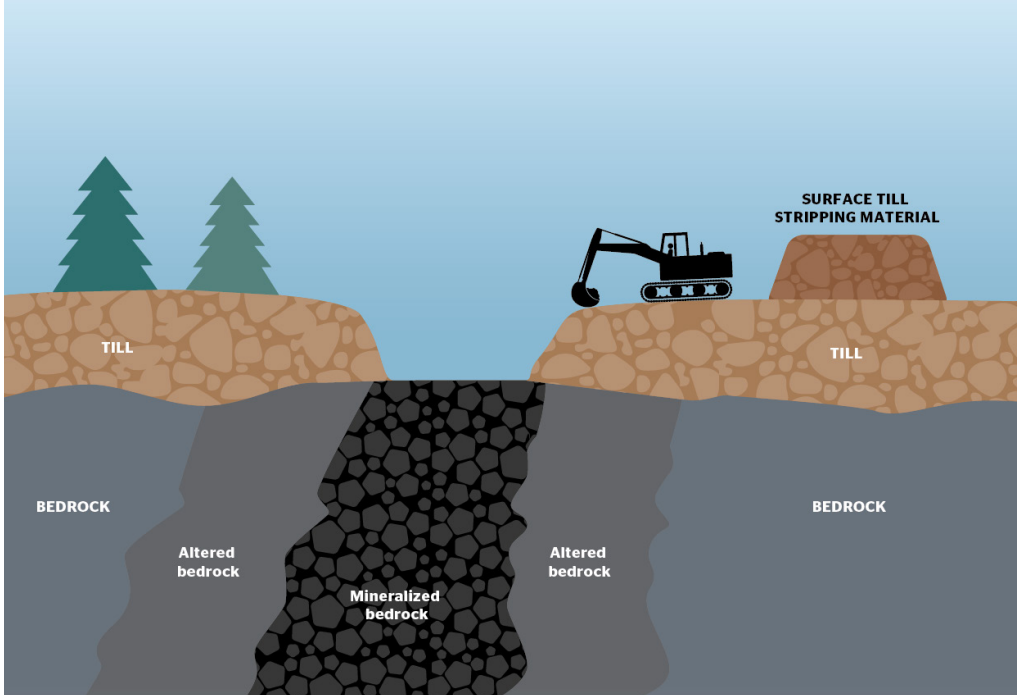
2.5 Advanced exploration methods

2.5.1 Exploration trenching

An exploration trench may be dug if there is a need to map a continuous larger area of the bedrock.[3] To get down to the surface of the bedrock it is necessary to remove the overlying soil cover – hence the term "trenching". Laying bare the bedrock reveals a surface that allows the bedrock to be mapped so as to get an idea of the structure and character of the bedrock and the mineralisation. At the same time, it allows repeated sampling of bedrock material for various types of measurements as well as geochemical analysis.

Example of exploration trench. PHOTO: GEOPOOL

3 Exploration trenching may also take place at an earlier stage, under further exploration methods, in order to map the character of the bedrock before drilling, for example.



Digging a trench in order to study the bedrock. ILLUSTRATION: GEOPOOL

Where relevant, an exploration trench is generally dug at a stage when mineralisation has been found and needs to be mapped further on the surface of the ground in order to get more detailed information and in order to be better able to understand at a later stage the information obtained through drilling. Exploration trenches vary greatly in length – anything from 5-metre to more than 500-metre. The trench is usually at least 1–5 metres wide, but may have a width of up to 40–50 metres.

Exploration trenches are most common in areas where the soil cover is relatively thin and dry. Dry conditions are needed, otherwise the trench will fill with water – making mapping more difficult. If the soil cover is thick, it may be difficult to excavate right down to the bedrock. Exploration trenches are therefore not dug if the soil layer is too thick or too close to wetlands.

As a method of exploration, exploration trenches require a lot of planning and preparation since they are executed in several stages. Trees that need to be felled should be dealt with as agreed with the landowner. The site must be chosen to allow room for both the trench itself and the mass of cleared soil, unless this is to be transported elsewhere. Once the preparatory work is complete, the bedrock is laid bare using an excavator. When the bedrock has been revealed it is usually rinsed with water to make it as visible as possible. The bare bedrock can then be mapped, sampled and surveyed.

Once the investigations are complete, the exploration trench can either be left open or filled in again. If the trench is to be filled, it is usually backfilled first with boulders and stones and then with soil. Finally, the vegetation that has been able to be preserved is replanted. By agreement with the landowner the area may be replanted with seeds or young trees. If the location of the trench is surrounded by forest, it is often left to replant naturally.

Before an exploration trench is dug the work should be notified to the supervisory authority for consultation – see Chapter 5 Permits for exploration.

> Before an exploration trench is dug the work should be notified to the supervisory authority for consultation.

2.5.2 Test mining

Test mining is not counted as mining, but instead forms part of the exploration phase. It is a one-off procedure in which a larger amount of mineralisation is sampled in order to evaluate its technical concentration properties. When the exploration work has progressed sufficiently far for test mining to be considered, the extent of the mineralisation at the ground surface is well known. Test mining must be carried out where the minera-

lisation is representative, but also at a site where test mining is technically feasible and a site that is suitable taking into consideration the surrounding environment.

The work involved is comparable to that described for exploration trenches, but in addition parts of the bedrock will need to be blasted loose in order to be transported away and investigated further. The amount of rock blasted out in test mining depends on a number of factors and is decided from case to case. The material may be taken from one place or from a number of places, depending on the internal variations and spread of the mineralisation.


PHOTO: GEOPOOL

Blasting preparations prior to test mining.

The ground area that needs to be utilised to access a suitable test quantity will depend on the sample quantity required, the accessibility of the mineralisation that is of interest for test concentration and in some cases the thickness of the till cover.

A permit under the Environmental Code is required in order to carry out test mining (in addition to the exploration permit and plan of operations) – see Chapter 5 Permits for exploration.

2.5.3 Environmental consequences of advanced exploration methods

In advanced exploration work various types of machinery and equipment are used, including chainsaws, forestry machinery and excavators. In test mining dumpers or trucks are also used to transport soil and rock material.

Exploration trenches do not impact the bedrock. When the trench is backfilled the soil is loosened and mixed up, but the till cover is not otherwise affected. However, the vegetation at the site is impacted. If the exploration trench is long it is common for the trench not to be straight, but instead to curve a little in order to minimise the impact on nature.

The soil clearing carried out for exploration trenching means that it takes longer for the site to recover compared with drilling. Immediately after an exploration trench has been backfilled the material used for backfilling can sometimes form an embankment, which in most cases settles over time. Topographically, there is no significant difference before and after an exploration trench has been made.


PHOTO: GEOPOOL

Back-filled exploration trench immediately after work was completed.

While the trenches are open they must be fenced off and clearly marked to avoid accidents. If the soil cover is sufficiently deep as to give rise to a significant difference in level, the ends of the trenches should be slanted so that animals can get up out of the trenches.

In test mining, a factor that impacts the environment is that bedrock is taken away from the area. Replacement material may therefore be needed to fill in the resulting pit. Since the extent and impact of test mining may vary greatly from area to area, the environmental consequences must be specifically considered in each individual case. For example, there may be disruption in the form of noise, dust, impact on groundwater, from transportation etc. This is considered in connection with the permit for the work and is regulated in the permit under the Environmental Code that is required in order to carry out the activities.

3. LAND USE AND REGULATION OF ACCESS TO LAND

3.1 Contents

Below is an outline description of various kinds of land use that it may be good to be aware of in connection with exploration. Those who own or otherwise have the right to use the land may be property owners or holders of special rights according to the Minerals Act. The chapter begins with a brief description of why a property investigation and a list of affected parties are required. This is followed by a general description of land use that is based on:

- Rights of ownership, rights of use and joint property units
- Reindeer herding and reindeer husbandry
- Public purposes such as the right of public access, nature conservation etc.

Marsh in Norrland, in the north of Sweden – a nature reserve. PHOTO: LKAB

3.2 Introduction

Exploration often means that the prospector is given the right to look for mineral deposits on land belonging to others. Anyone wishing to undertake exploration must find out who owns and uses or has other rights to use the land in question. The prospector must also find out what uses land is put to in the area which might be affected. This must be done before starting exploration work.

Once an exploration permit has been granted, before the work is started a plan of operations must be served to owners of the properties where the exploration work is to be undertaken and also to holders of special rights who are affected. Holders of "*special rights to property*" means those who have "*rights of use, easements, reindeer herding rights and rights to electric power and similar rights*" associated with properties affected by the exploration work. The term "*affected parties*" is a collective term that is not defined in the Minerals Act. It comprises persons who are affected more distinctly by the exploration work and who in certain respects are covered by specific rules.

A party wishing to carry out exploration also needs to find out whether there are protected natural and cultural environments requiring special approval, permits or exemption in order for the exploration to be undertaken. In certain places (which are specifically listed in the Minerals Act) exploration can only be carried out with permission from the county administrative board or Chief Mining Inspector – see Chapter 5 Permits for exploration.

3.3 Property investigation and list of affected parties

Under the Minerals Ordinance, the application for an exploration permit must include "*particulars of the properties affected by the application, together with the names and addresses of the property owners and of other affected parties known to the applicant*". Certain administrative operations (such as service of the plan of operations and notification that the exploration work has ended) require a knowledge of who is affected by the planned measures. The plan of operations, for example, must contain – among other things – a map showing property boundaries and real estate designations. Ownership circumstances and other things relating to the exploration area will change over time. The property investigation and list of affected parties therefore need to be kept updated and checked regularly so that the content is correct. It is possible to find out who owns a property or who holds a "registered right of use" via the cadastral register (the "Real Estate Register").[4] The Real Estate Register and the real estate maps kept up to date by Lantmäteriet (the Swedish mapping, cadastral and land registration authority) can also be used to find out whether there are joint property units in the exploration area.

3.3.1 Affected parties

Which affected parties are to be regarded as being known to the prospector is not expressly stated in the Minerals Act. Neither does it state to what extent the prospector is obliged to find this out. In case law, affected parties have been regarded as being known to the applicant if they are holders of rights that are registered in the Real Estate Register (for example, easements and wayleaves). Sami reindeer herding districts (*sameby*) that are affected are also affected parties. Known affected parties also include rights holders of which the prospector has become aware by other means, for example holders of rights of use such as leases, tenancies, felling rights or hunting rights that the property owner has notified to the prospector, if their ability to exercise their right is affected by the exploration work.

4 The register is administered by Lantmäteriet: https://www.lantmateriet.se/en/Real-Property/Property-information-/real-property-register/

Svemin recommends

Regarding which affected parties and rights holders are "known"

Property owners and holders of special rights are often the same as those regarded as being known affected parties. In order for these persons to be entitled to receive the plan of operations, their right must be actually affected by the exploration work.

Svemin assesses that generally this is only required if the ownership of a property is unclear. In such cases the prospector should notify Bergsstaten (the Mining Inspectorate of Sweden) of the research it has carried out and what, if anything, is unclear.

Property owners, as well as certain rights of use and joint properties, are known because they are stated in the Real Estate Register or on real estate maps. Information concerning which reindeer herding districts may be affected by the work can be obtained from the Sami Parliament. Together, this information is sufficient in most cases.

Svemin assesses that the list of affected parties need not contain details of affected parties (such as holders of rights of use) if this requires property owners or others to voluntarily provide the necessary information. It is only if the prospector has nonetheless obtained knowledge of these affected parties that they need to be stated as known affected parties.

In addition to the information found in the Real Estate Register and in real estate maps, the prospector may sometimes need to contact Lantmäteriet to check whether there is any further information of significance for the property investigation.

Svemin recommends that it may be appropriate to ask property owners affected whether there are any holders of rights of use associated with the property that should be contacted. To the extent that such information has been provided, it must be included in the list of affected parties because it is then known to the prospector.

3.3.2 Holders of special rights

According to Chapter 17 Section 1 of the Minerals Act, "*'special rights' to a property shall mean rights of use, easements, reindeer herding rights, rights to electric power and similar rights*". The rights covered are derived from the legislation on expropriation and the Swedish Land Code (*jordabalken*).[5] Rights of use may include leases, easements, hunting and fishing rights, felling rights and agreements on nature conservation.

3.4 Land use that is associated with ownership rights or right of use

3.4.1 Ownership rights

Ownership rights provide a natural starting point in discussions concerning land use. Right of ownership of land is associated with real estate, which is defined as follows in Chapter 1 Section 1 of the Swedish Land Code (*jordabalken*): "*Real estate is land. This is divided into property units.*" The property may also have belonging to it a certain area of water (or part of an area of water) as well as accessories in the form of, for example, buildings, fencing, pipelines and trees. To find out who owns a certain property, access is needed to the Real Estate Register – a service that can be purchased from, for example, Lantmäteriet or private providers (see 3.3 Property investigation).

Rights of ownership have a strong legal position since it is laid down in Sweden's constitution that: "*The property of every individual shall be so guaranteed that no one may be compelled by expropriation or other such disposition to surrender property to the public institutions or to a private subject, or tolerate restriction by the public institutions of the use of land or buildings, other than where necessary to satisfy pressing public interests*" (Chapter 2 Section 15 first paragraph, form of government). The right (following a decision by an authority) to undertake exploration work on land belonging to others is an application of the exception, since exploration is so strongly in the public interest that the preconditions laid down in the constitution for interference in the rights of landowners are deemed to be satisfied.[6] It is in the public interest that Sweden, as a result of its geological conditions, is able to contribute to satisfying the growing global demand for metals, while at the same time increasing the degree of recycling.[7] Exploration and mapping of the country's mineral deposits are essential for this and are therefore of such a pressing public interest that to a certain extent this takes precedence over individual ownership rights.

Ownership rights to land include the ability to conduct certain types of activities associated with the property, such as forestry, hunting and fishing, or otherwise being able to use the property for various purposes. Such activities may be of greater or lesser significance in the context of exploration. The right to undertake these activities may be granted by the property owner to another party (see 3.4.3 Rights of use). Sami reindeer herders also have certain hunting rights during the part of the year when reindeer herding takes place in the area (see 3.5 Reindeer herding – land use with both private and public interests).

An elk hunter on the look-out. PHOTO: BOLIDEN

Forested land is often used for the production of various timber products. It is the property owner that is responsible for management and cultivation of the forest unless the owner has given this right to another person (see 3.4.3 Rights of use). Certain forest owners have chosen to certify their forests and there may then be special rules on how the forestry is to be conducted. Compensation for felled trees is described in more detail in 7.4.1.4 Damaged and felled trees.

Forest land is sometimes used for nature conservation purposes by setting aside areas as nature reserves,

5 SOU 2012:73, pp. 128 f.
6 Government bill 2004/05:40 p. 31.
7 Government bill 2004/05:40 p. 31.

habitat protection areas or under nature conservation agreements. It is important that the person who wishes to undertake exploration is aware of whether or not the forest is protected because if so, exemption or a special permit may be required in order to carry out the exploration work (see also below, including 3.6.2.2 Natural and cultural environments with special area protection under Chapter 7 of the Environmental Code).

3.4.2 Unclear ownership

Sometimes it is unclear who owns a certain property. If so, this can be clarified by an ownership rights adjudication taking the form of a cadastral procedure. This is done on the initiative of Lantmäteriet or it may be ordered by a county administrative board, and is thus not something that the prospector does. If the ownership is uncertain based on what is stated in the Real Estate Register, the prospector should contact Lantmäteriet to check whether there is further information that may be of significance for the property investigation and if so, inform Bergsstaten of this.

3.4.3 Rights of use

The owner of a particular piece of land (the property owner) has the option to allow others to use or benefit from all or part of the land or its assets. An example of the latter is rights of use in the form of the landowner granting forestry or hunting rights to another person. Alternatively, an easement or lease may be granted for the land, allowing it to be used for various purposes. According to the wording of the legislation, a lease is "*the grant of land for use in return for a consideration*" and this type of concession is always for a limited period of time. Further provisions that impose certain limits on how a lease agreement can be entered into, how long it lasts for and what may be regulated or what must unconditionally apply can be found in Chapters 8 to 11 of the Land Code (*jordabalken*).

Nature conservation agreements are a special type of right of use through which the property owner undertakes to allow or tolerate actions or restrictions within a certain area for nature conservation purposes. Nature conservation agreements can only be entered into between the property owner and the state or a municipality.

An *easement* is a way of regulating rights between two properties and may be granted "*if calculated to promote appropriate land use*". By this is meant that the owner of one property is given the right to enjoy or otherwise utilise in a certain way a part of the second property, or something which belongs to this. It is thus a matter of achieving a better use of land overall within two properties. An easement may be created by an agreement (contractual easement) or through a decision by an authority in the form of a cadastral procedure (official easement). Easements are usually not limited in time. Through a special provision it is possible to grant an easement between a property and a mine property,[8] this then being a special case compared with the general rule that an easement must apply between two properties. An easement in favour of a mining property can only be formed by means of a contractual easement, not an official easement.

3.4.4 Joint property units, private roads and shared facilities

Joint property units means land belonging jointly to more than one property. It can also refer to an easement or another right belonging jointly to more than one property.

A *shared facility* is a facility that is common to more than one property and which serves purposes of permanent importance to these properties. Examples of shared facilities include private roads and parking areas. To execute and run the shared facility, the participating properties form a special association – a joint property association.

A person wishing to carry out exploration needs to be aware of the existence of joint property units and any shared facilities affected by the planned work. Joint property

"Nature conservation agreements can only be entered into between the property owner and the state or a municipality.

8 The term "mine property" is not defined in the legislation, but in this context is assumed to be the land utilised for the mine operations (probably the land indicated in accordance with the Minerals Act), which does not necessarily follow the boundaries of the property divisions.

units may either be managed directly by the owners of the properties which share the joint property unit (management by owners) or by a joint property association (management by association). In the case of management by owners, the owners jointly decide on affairs relating to the joint property unit. In the case of management by association, the joint property association is a separate legal entity that can enter into agreements and which in certain cases is to be served with documents for matters that affect the association – see 5.2.4.5 Service of and challenges to the plan of operations.

Information concerning the joint property units that exist within the exploration area is often shown on Lantmäteriet's real estate maps. However, the information on the real estate maps is not always sufficient and in order to find out who represents the joint property unit, or which properties are included, further information may need to be sought in the form of a property ownership list/investigation that is requested from Lantmäteriet. If the joint property unit is represented by a joint property association, a register excerpt containing information can be requested from the Joint Property Register, which is kept by Lantmäteriet.

Reindeer on the mountain. PHOTO: LKAB

3.5 Reindeer herding – land use with both private and public interests

3.5.1 General

Reindeer herding is a type of land use that serves both the public interest and the interests of private individuals. In both cases the land is used for the reindeer's needs.

Reindeer husbandry as a private interest refers to some Sami people who herd reindeer either wholly or partly for subsistence. From this perspective, there are economic interests that the party wishing to undertake exploration may impact and therefore needs to take into account, just as in the case of other industries where some other operation may be impacted or disrupted by the exploration work. A special circumstance in this context is that Sami reindeer herders have no choice but to practise their reindeer herding within certain areas – see more in 3.5.2 Reindeer herding areas.

Reindeer husbandry and reindeer herding are a fundamental part of Sami culture and Sami traditions. Reindeer herding is thus also in the public interest. This is clear from the Swedish constitution (form of government), which states that the Sami people's right to herd reindeer is regulated in law and that the ability of the Sami people to maintain and develop their own cultural and social life is to be promoted. In addition, the provisions on management in the Environmental Code state that areas that are important for reindeer husbandry can be of national interest. A further public interest is that as grazing animals, the reindeer fulfil ecological functions and are part of the country's natural and cultural assets.

Prior to exploration it is important to be aware both of how Sami land use is regulated in general (see 3.5.2 Reindeer herding areas) and how it is run at local level in the reindeer herding districts affected (see Chapter 4 Communication, consultation and collaboration).

"Prior to exploration it is important to be aware both of how Sami land use is regulated in general and how it is run at local level in the reindeer herding districts affected.

3.5.2 Reindeer herding areas

Under the Reindeer Husbandry Act, a person of Sami origin may use land and water to sustain themselves and their reindeer (reindeer herding rights). Reindeer herding rights accrue to the Sami population and may be exercised by members of a Sami reindeer herding district (*sameby*). There are three types of reindeer herding district: mountain, forest and concession districts.

A reindeer herding district is a legal entity (or an economic and administrative association) which, under the Reindeer Husbandry Act, is allowed to practise reindeer herding within a certain defined area (*"reindeer herding area"*). A Sami person who wishes to herd reindeer must therefore be a member of a reindeer herding district. It is the members of the reindeer herding district who decided who is and is not allowed to be a member.

In Sweden, areas where reindeer herding takes place make up nearly half of the country's area. Reindeer herding is practised on both public and private land. The reindeer herding areas are divided into year-round lands and winter pastures, and each reindeer herding district has the right to use specially designated areas for its reindeer. These areas are determined by the Sami Parliament.

The year-round lands are:

- The "lappmark" of Norrbotten and Västerbotten counties; partly above the limit of cultivation and partly below this limit on land where forest reindeer herding of old was conducted during the spring, summer or autumn (and the land either belongs to the state or belonged to the state as of 30 June 1992 [crown land] or is reindeer grazing land).
- The reindeer grazing mountains in Jämtland county.
- The areas of Jämtland and Dalarna counties (which belonged to the state as of 30 June 1992 and were specially granted for reindeer grazing).

The winter grazing lands that may be used during the period 1 October – 30 April are:

- Other parts of the "lappmark" area below the limit of cultivation (cf. year-round lands).
- Districts outside the "lappmark" areas and the reindeer grazing mountains where reindeer herding of old was conducted at certain times of the year.

The winter grazing period may be extended following a decision by the county administrative board. The county administrative board also decides the maximum number of reindeer that may be kept within the area of a certain reindeer herding district.

As mentioned above, reindeer herding rights are a "special right" under the Minerals Act. This means that anyone wishing to undertake exploration must, among other things, serve their plan of operations to the reindeer herding district affected by the planned work. It may also be necessary to consult with the reindeer herding district concerned in order to avoid disruption to the reindeer herding where possible (see 4.4.3 Reindeer husbandry). Contact persons for the reindeer herding districts (generally the chairman of the reindeer herding district) are stated on the website of the Sami Parliament.

In order to reduce disruption to reindeer herding where necessary and possible, it is important that the person wishing to undertake exploration is aware of how reindeer herding is practised within the area where the exploration is to be carried out (see 4.4.3 Reindeer husbandry). Under the Reindeer Husbandry Act fines may be imposed on anyone who deliberately or negligently closes off migration routes for reindeer or takes actions that impede the movement of the reindeer, frightens or otherwise unsettles reindeer, drives away reindeer without authorisation or prevents them from grazing in an area where reindeer herding is permitted.

3.6 Use of land for various purposes in the public interest

3.6.1 Right of public access

The right of public access gives every person a constitutional right to access nature, regardless of who owns the land. The more detailed definition of what the right of public

access includes is not stated in any specific provision, but instead is ultimately defined by provisions of criminal law and provisions of legislation on damages relating to protection from detriment and encroachment on private life and to compensation for damage to property. It is thus provisions concerning what you are not allowed to do on land belonging to others that define what is permitted under the right of public access. The limits are not always entirely clear. However, the right of public access does not provide any express right to carry out exploration work.

Under the Environmental Code there is a general obligation on any person exercising the right to public access or otherwise spending time in nature to show consideration and care in this connection. The Minerals Act sets out a general requirement for exploration work to be performed in such a way as to cause the least possible damage to and encroachment on the property of others and the natural and cultural environment. The prerequisites for obtaining an exploration permit are described in 5.2.1 Exploration permits.

Right of public access and exploration

The Minerals Act states that exploration (except in a few specifically stated cases that are based on an exploitation concession or ownership of property) may only be undertaken by a party holding an exploration permit. According to the preliminary work for the Minerals Act, however, only actions that involve encroachment on the rights of the property owner or another rights holder – for example, in the form of damage to the ground – are considered to be exploration work as defined by the Act.[9] Thus a limit can be distinguished here as regards what is permitted under the right of public access. However, it is not always obvious what exploration work may be undertaken on the basis of the right of public access and an exploration permit should always be applied for when an area has been identified as being of interest for further investigation. Notwithstanding this, certain initial operations may need to be carried out in order to be able to apply for an exploration permit in the first place. This might include, for example, initial exploration work that only involves one or more individuals moving around the terrain on foot or on skis and with equipment that is carried by hand or on the back rather than being left in place. Such preparatory work is often known as "searching" in order to distinguish it from exploration based on an exploration permit.

3.6.2 Land use that is regulated by provisions on nature conservation etc.

3.6.2.1 Introduction

An area or a property may be covered by various public plans and provisions regulating the use of land and water. Such plans and provisions include, for example, local plans, provisions concerning nature conservation,[10] the existence of ancient remains and/or built heritage and plans for road construction. Anyone wishing to undertake exploration must be aware of the applicable rules concerning use of the land within the exploration area and in certain cases must apply for special permits, exemptions or consents. Chapter 5 Permits for exploration contains more information on the permits etc. that may be needed in order to carry out exploration work.

Various types of area protection are described below and these may sometimes be relevant or otherwise be good to be aware of in conjunction with exploration. The list does not claim to be exhaustive, but includes the most common types of protection.

In addition to the types of protection described below, in certain cases consent is needed from the Chief Mining Inspector or county administrative board in order to carry out the exploration work (see 5.2.4.4 Requirements of special consent in certain cases).

Only in national parks is exploration expressly prohibited.

9 Cf. Government bill 1988/89:92, p. 85.

10 Here "nature conservation provisions" is used as an overall term for various types of provisions aimed at protecting the natural environment.

3.6.2.2 Natural and cultural environments with special area protection under Chapter 7 of the Environmental Code

Nature conservation takes many different forms, with different restrictions on land use. These types of protection mean that valuable environments or vulnerable species are protected where they are found or where there are good conditions for them to develop. The value of the areas as habitats for plants and animals is often the main reason for the protection. Areas are also often protected for the purpose of safeguarding cultural heritage assets as well as areas of value for recreation and outdoor life. Only in national parks is exploration expressly prohibited. In certain other cases special exemption or exceptions from certain protective provisions may be needed (see below and Chapter 5 Permits for exploration).

The types of area protection described in Chapter 7 of the Environmental Code that are considered as having the greatest impact on the ability to obtain a permit for mining and that may sometimes be of significance in conjunction with exploration are:

National parks (Chapter 7 Sections 2–3 Environmental Code)

National parks are established for the purpose of preserving a large contiguous area in its natural state or essentially unchanged. The national parks are to be cared for and managed in accordance with the purposes for which they were established. National parks may refer to areas of land and water, and these must be owned by the state. It is the Government which, following consent from Parliament, declares an area to be a national park. The Swedish Environmental Protection Agency and the county administrative board concerned are jointly responsible for the decision basis and planning of the national parks.

According to Chapter 3 Section 6 of the Minerals Act, exploration work may not take place within a national park or an area which a central government authority has requested to be designated as a national park.

Nature reserves and cultural reserves (Chapter 7 Sections 4–9 Environmental Code)

Nature reserves make up the largest percentage (both in number and in area) of protected nature in Sweden[11]. According to the Swedish Environmental Protection Agency, 75 percent of the mountainous area of the country has been designated as nature reserves. An area of land or water may be declared a nature reserve for the purpose of preserving biological diversity, protecting and preserving valuable natural environments, or satisfying the need of areas for outdoor recreation. The purpose may also be to protect, restore or establish valuable natural environments or habitats for species worthy of preservation.

Cultural reserves are designated for the purpose of preserving valuable cultural landscapes or environments. The provisions applicable to nature reserves are largely also applicable to cultural reserves. Sometimes the border between cultural reserve and a nature reserve is fluid; a cultural environment may include a natural environment worthy of protection, and vice versa.

A decision to designate an area as a nature reserve is taken by the county admi-

Brook in Natura 2000 area. PHOTO: BOLIDEN

11 Protection in the form of Natura 2000 is (according to the Swedish Environmental Protection Agency's statistics for 2014) greater than that of nature reserves, both in number and in area (http://www.naturvardsver-ket.se/Sa-mar-miljon/Statistik-A-O/Skyddad-natur/)

nistrative board or municipality, and the area may encompass both private land and land in public ownership. A decision to designate an area as a nature reserve is associated with restrictions on the right to use land and water areas as needed in order to achieve the aim of the reserve. The protection provisions are "tailored" to each reserve and vary greatly depending on the motives behind the establishment of the reserve. It is common for measures that affect the ground to be prohibited, along with damage to or disturbance of flora and fauna. If there are special reasons for doing so, the county administrative board or municipality may grant exemption from provisions that they have passed for a nature reserve.

Exploration is not prohibited in nature reserves and cultural reserves, but under Chapter 3 Section 6 of the Minerals Act exploration work must not be carried out in contravention of regulations that have been passed for the reserve in question.

Natura 2000 (Chapter 7 Sections 27–29b Environmental Code)

Natura 2000 is a network of areas within the EU containing species and/or habitats that are valuable from an EU perspective. The Natura 2000 areas are designated based on two EU Directives (the Birds Directive and the Habitats Directive)[12]. The EU Directives list 170 habitats and a total of around 900 species of plants and animals that are of special value. The purpose of the network is to preserve biodiversity within Europe.
Each Natura 2000 area must have a conservation plan, which details which types of nature (habitats) and species can be found within the area concerned, what area the types of nature cover, the objective for the area and the species, the measures that may be needed to achieve these goals, what might damage the area and the species and how it is intended to follow up the achievement of the goals. The Swedish Environmental Protection Agency's map tool "*Protected nature*" states which Swedish areas are included and why these have been selected.[13]

Natura 2000 does not generally mean that existing land use must be stopped, but the threshold for the impact that will be tolerated is low. In each individual case where actions may impact the environment in a Natura 2000 area (irrespective of whether the actions take place within or outside of the designated Natura 2000 area), an assessment must be made as to whether or not to allow the planned actions to be taken.

Actions or activities that may significantly impact the environment in a Natura 2000 area require a special permit. The examination of whether to grant a Natura 2000 permit can be very extensive and time-consuming. In most cases this is examined by the county administrative board where the area affected is located. When applying for a permit for test mining the issue of a Natura 2000 permit may be considered at the same time (see 5.3.4.9 Permits for test mining).

Habitat protection areas (Chapter 7 Sections 11–11b Environmental Code)

Habitat protection areas are small land and water areas with characteristics that make them valuable habitats for species of plants or animals that are endangered or particularly worthy of protection. Certain areas have general protection through the Area Protection Regulation[14], e.g. avenues and stone walls in agricultural land, while other times a decision is made in the individual case. Activities or measures that are liable to damage the natural environment must not be undertaken in habitat protection areas. The county administrative board may grant exemption from this prohibition if there are special reasons for doing so.

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12 The official designations of the Directives are Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, and Council Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds.

13 See the Swedish Environmental Protection Agency website: http://naturvardsverket.se/sv/Sa-mar-miljon/Kartor/Kartverktyget-Skyddad-natur/.

14 Ordinance (1998:1252) on Area Protection under the Environmental Code etc. (*Förordning (1998:1252) om områdesskydd enligt miljöbalken m.m.*)

Water protection areas (Chapter 7 Sections 21–22 Environmental Code)
A land or water area may be designated a water protection area for the purpose of protecting surface water or groundwater. The decision to establish a water protection area is made by the county administrative board or municipality. The municipality or the county administrative board may also issue rules imposing restrictions on the right to dispose of property in the area, as necessary in order to fulfil the purpose of the area. In special circumstances exemptions may be granted from the rules issued for a water protection area.
Rules that apply to a water protection area may include, for example, a ban on the handling of petroleum products or other chemicals, on the transport of dangerous goods, on excavation and on catchment.[15] Even if the rules apply only to properties within the water protection area, activities outside the water protection area may also need to be conducted with consideration for the effects on groundwater or surface water in the surrounding area.[16]

Other types of protection

National interests (Chapters 3–4 Environmental Code)
National interests are geographical areas that have been designated as such because they contain nationally important assets and qualities.[17] The term national interest is

15 See Government bill 1997/98:45 part 2, p. 94.
16 See Government bill 1997/98:45 part 2, p. 94
17 For more information see e.g. the website of the Swedish National Board of Housing, Building and Planning: www.boverket.se.

Tips and experience concerning valuable substances and materials of national interest

The Environmental Code (Chapter 3 Section 7) states:

Land and water areas that contain valuable substances or materials shall, to the extent possible, be protected against measures that may be prejudicial to their extraction.

Areas that contain deposits of substances or materials of national interest shall be protected against measures referred to in the first paragraph."

It is the Geological Survey of Sweden (*Statens Geologiska Undersökning – SGU*) that decides which areas containing particularly valuable minerals are of national interest. Its website (map viewer, "Mineral deposits of national interest") details which areas contain deposits of national interest. In order to define areas that contain minerals of national interest, SGU may require information and documentation concerning the deposit from prospectors that have carried out exploration work in the area.

SGU bases the designation of areas of national interest that contain valuable substances and materials on the following criteria (all of the criteria must be met):

1 the substance or material must be of great significance for society's needs,

2 the substance or material has particularly valuable characteristics, and

3. the area containing the deposit of the substance or material has been well defined, investigated and documented.

SGU defines the areas in detail by entering the national interest on a map with its coordinates. This requires geological documentary material about the deposit and possibly also information concerning production and material characteristics. SGU's proposed designation of a national interest is referred to the relevant county administrative board and to Boverket (the National Board of Housing, Building and Planning). Following the referral process and any adjustments to the proposal, SGU then makes a decision on the matter. Areas of national interest are not permanent, but rather may be revised based on new knowledge.

An area of national interest has no practical significance except in the case of new or changed land use, since a defined claim of national interest (according to Chapter 3 of the Environmental Code) has no actual legal effect unless a decision concerning the national interest is made by a court, a government authority, the Government or a municipality. Example of this include decisions by Bergsstaten (the Mining Inspectorate of Sweden) concerning exploitation concessions under the Minerals Act.

SOURCE: SGU AND BOVERKET WEBSITES (WWW.SGU.SE AND WWW.BOVERKET.SE)

used in two different cases. Firstly, for areas decided on by Parliament that are expressly listed (Chapter 4 Environmental Code), including large parts of the coast and mountain areas (with special protection for what are known as the unbroken mountain areas).[18] Riksintressen kan också pekas ut för ett antal särskilt angivna ändamål (3 kap. miljöbalken). Exempel på det är bland annat naturvård, friluftsliv och rennäring – eller att området innehåller värdefulla ämnen eller material.

Riksintressen ska beaktas och redovisas i den kommunala översiktsplaneringen. Länsstyrelsen ska ta de initiativ som behövs för att det i arbetet med miljökonsekvensbeskrivningar och i planerings- och beslutsprocesser tas hänsyn till 3 och 4 kap. miljöbalken.[19] The initiatives are to be taken as early as possible in the processes. When Chapters 3 and 4 of the Environmental Code are to be applied in the consideration of a case or matter (for example, in the case of an application for a permit for an environmentally hazardous activity under the Environmental Code or an application for an exploitation concession under the Minerals Act), the county administrative board must specifically work to promote the satisfaction of national interests.[20] If an area is of national interest for various purposes (see Chapter 3 Environmental Code) which are incompatible, the interests must be weighed up giving priority to the purpose or purposes that are most likely to promote sustainable management of land, water and the physical environment in general (Chapter 3 Section 10 Environmental Code).

Where exploration is concerned, it should be noted that within unbroken mountain areas (Chapter 4 Environmental Code) exploration work may not be carried out without special consent from the county administrative board (Chapter 4 Section 1 second paragraph Environmental Code).

World Heritage

World Heritage means a cultural or natural monument that is so valuable that it is of interest to all of humanity. The World Heritage List is based on the UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage (the "World Heritage Convention"), which was adopted in 1972. Sweden became a signatory to the Convention in 1985. Countries that are signatories to the Convention may nominate objects (in Sweden via the Swedish Environmental Protection Agency (*Naturvårdsverket*) and the Swedish National Heritage Board (*Riksantikvarieämbetet*)) and the World Heritage Committee then makes a decision on which to include in the World Heritage List. Sweden currently has 15 World Heritage sites, three of which are deemed to be of outstanding natural value: the Laponian Area in Lapland, the High Coast of Sweden on the Gulf of Bothnia and the Agricultural Landscape of Southern Öland.[21]

The fact that an object/area has been designated a World Heritage site does not give it any specific legal protection under Swedish legislation. However, through the World Heritage Convention Sweden has undertaken to look after and preserve important cultural and natural heritage within its own territory.[22] Areas that are World Heritage sites may also receive formal protection in other ways. One example is the Laponian Area World Heritage site, which contains both national parks and nature reserves and which must be managed and maintained according to the maintenance plan and the regulations that apply to the parks and reserves as well as according to the management plan produced for the Laponian Area in accordance with the UN agency UNESCO.[23]

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18 As regards the areas that Parliament has decided are of national interest (Chapter 4 Environmental Code), it may be mentioned here that this does not prevent the extraction of deposits of substances or materials that are of national interest if there are special reasons for doing so.

19 See Section 3 first paragraph of the Ordinance on Management of Land and Water Areas (*förordning (1998:896) om hushållning med mark- och vattenområden*).

20 See Section 3 first paragraph of the Ordinance on Management of Land and Water Areas (*förordning (1998:896) om hushållning med mark- och vattenområden*).

21 See the Swedish Environmental Protection Agency website: http://swedishepa.se under Enjoying nature/Protected areas/World heritages

22 See the Swedish National Heritage Board website: http://www.raa.se/om-riksantikvarieambetet/fragor-svar/varldsarv/

23 See Section 3 of the Ordinance on the Laponian Area (*Laponiaförordning (2011:840)*).

4. COMMUNICATION, CONSULTATION AND COLLABORATION

4.1 Introduction

The general public is not always particularly knowledgeable about exploration and mining. These activities are sometimes confused – often with the result that exploration is believed to involve greater encroachment and impact than is the case. For geographical reasons there may be differences in knowledge between areas where exploration and mining activities take place and perhaps have been undertaken for a long time, and areas where such activity is uncommon.

4.2 Need for information concerning planned exploration work

Gaps in knowledge can result in people becoming concerned about planned exploration work. Sometimes exploration is equated with the idea that a mine is going to be opened in the location, which is far from certain. It may therefore be good for the sake of both the project and the local population for the prospector to provide clear and relevant information in good time concerning what an exploration permit involves, what exploration work is to be carried out and what kind of impact it will have on the surrounding area.

The people who need to be informed may vary from project to project. Those who are directly affected need to find out how they will be impacted by the exploration work. Information about this is included in the plan of operations. Sometimes people who live outside the exploration area or the general public in the municipality concerned may need to be informed, in order to reduce the risk of misunderstandings and concerns. If so, they must be specially informed through voluntary initiatives.

4.3 Consultation prior to exploration

The Minerals Act contains no specific provisions regarding consultation prior to exploration. Other than the contact made by the prospector in conjunction with production of the plan of operations (see 5.2.4.6), the information and dialogue that occur are based on voluntary initiatives by the prospector. Consultation only becomes mandatory if a permit under the Environmental Code will be applied for in order to mine a deposit (test mining or extraction).[24]

Consultation prior to exploration. PHOTO: BOLIDEN

24 Consultation is only mandatory if applying for a permit under the Environmental Code, in which case an environmental impact assessment must be prepared. In conjunction with the preparation of the environmental impact assessment the applicant must consult with authorities, individuals and the public affected. For a more detailed description of the consultation procedure associated with an application for an environmental permit, refer to the guidance from SGU and the Swedish Environmental Protection Agency concerning the consideration of mining activities (see SGU website https://www.sgu.se)

Svemin recommends

Voluntary initiatives promote good dialogue

In finding out about the site the prospector shows respect for the parties and interests affected, and this is also likely to facilitate implementation. Good relationships and collaboration with those affected enables the project to be adapted more to the local stakeholders' needs and land use.

A functioning forum for information about planned and current exploration activities may in some cases be decisive for how a project develops. Since exploration is an activity that is tied to a particular place, it is important that it is accepted locally. Transparency and information form the basis of trust. In many cases a reciprocal exchange of information is also needed, since the prospector may need to know about local circumstances that are significant for the planning and execution of the exploration work.

Svemin recommends that in every project the prospector considers what kind of dialogue and voluntary consultation are needed. The time at which information initiatives may be needed and the extent of these can vary from project to project. Simple field work – such as mapping of bedrock, till sampling or geophysical surveys – involve only limited encroachment, which may perhaps reduce the need for information. More extensive exploration work may increase disruption and thus also the need for information to be provided.

4.4 Special interests and activities to be taken into consideration

Described below is how a number of different interests may conceivably be affected by the exploration work and what the prospector may need to think about for these particular groups. The list is not exhaustive. It is also important to realise that the degree of impact may vary from case to case, depending on the circumstances and the interest concerned.

4.4.1 Property owners

Reasons for owning land can vary greatly. Some property owners may live entirely or partly on what the land yields through forestry or agriculture. It may be a family property that has been owned by the family for many generations and is kept for emotional or historical reasons. Some people acquire property in order to gain access to land on which to pursue their recreational interests, such as hunting and fishing. Others acquire property mainly for financial reasons, possibly speculative.

What most property owners have in common is that there is often both an interest in and an emotional bond with the forest and land owned. It is important that a prospector who is temporarily using another person's land respects and shows an understanding of what the land concerned means to its owners.

4.4.2 Those living nearby

Most people consider the environment where they live – whether it is their main home or a holiday home – to be important. Activities that impact this environment can sometimes be perceived as disturbing even if the actual disturbance – in the form of noise and transport, for example – is kept within prescribed limits or is within the bounds of usual activity in the area. The exploration work may sometimes cause concern that the living environment will be impacted more permanently should a mine eventually be opened in the vicinity. Informing people that the work is for a limited period of time and why it is being carried out, as well as details of any special measures or considerations planned in order to limit disruption, may increase acceptance of the impact of the work.

In the case of exploration work, it may be helpful to have a dialogue with those living nearby and if possible to adapt the activities so as to minimise disturbance. For example, this might involve adjusting the times at which noisy work is carried out, the choice of transport routes and avoiding disruptive operations during the evenings, at night and at weekends.

4.4.3 Reindeer husbandry

Reindeer are migratory herd animals, which means that the reindeer herds migrate between different pastures according to the time of year. Reindeer herders are dependent on access to and the functioning of their pastures in order to carry on their husbandry. Mountain reindeer herding districts move reindeer between bare mountain and forest land according to season, and this may involve long migration routes. Forest reindeer herding districts move reindeer within forest land and the migration is slower and rarely as wide-ranging as that of a mountain reindeer herding district. Concession reindeer herding districts practise reindeer herding on the basis of a special permit and the reindeer are often kept stationary within a particular area.

Initial exploration activities that are carried out on foot, such as boulder tracing and mapping, generally have no significant consequences for reindeer herding. Certain more extensive exploration such as airborne surveys can frighten the reindeer, disrupting their grazing and causing additional work for the reindeer herders who have to gather together and move the reindeer.

Vehicles such as snowmobiles or quad bikes are generally used for geophysical surveys in the field, e.g. for laying out cable. Cable laid out in the terrain presents some risk to reindeer in that they could snare their antlers in the cable, which could cause the animals considerable suffering should it occur. In the case of drilling work and associated transport, there is noise from drilling rigs and transport vehicles which may present a certain risk of impact in the form of disruption of grazing and reindeer moving out of the area.

The use of snowmobiles can leave tracks in the snow that the reindeer follow. This can in turn cause additional work for the reindeer herders, who have to monitor and gather together reindeer that have wandered off from the herd or from the planned migration route. Similarly, small paths ploughed may result in the reindeer following these and ending up on the wrong track or on more heavily trafficked roads where there is a risk that they will be hit by a vehicle.

Although exploration usually involves limited encroachment, there are sometimes appreciable consequences if the reindeer herding is affected simultaneously from different directions. To start with, the disruption that specific exploration work causes to reindeer herding will depend on the time of year at which the work is carried out and whether it affects a particularly sensitive area such as calving land, migration paths or important winter pastures. The consequences can sometimes be worsened through natural causes such as predators or if there are difficult weather conditions and/or if ice forms on the pastures. Since reindeer herding requires large areas, there is a risk of it being affected by multiple different activities that utilise land such as forestry, wind power, tourism and mining.

As well as causing additional work, circumstances that disrupt reindeer herding can also have negative effects on the reindeer herders socially and in their work environment. Even the risk of new activities being established in the reindeer herding area – which may be how exploration is perceived – can cause concern and uncertainty. The overall picture of the district's lands being gradually exploited can cause worry and questions about the future.

In the case of more extensive exploration work, it is helpful to specifically inform reindeer herding districts and if possible adapt the activities so as to minimise any disruption to reindeer herding. Maintaining dialogue and insight into how the reindeer herding district uses the area improves the prospector's ability to make adjustments to the exploration, for example as regards the time at which it is carried out, planning of driving routes etc.

4.4.4 Holders of hunting and fishing rights

Recreational interests of various kinds are very important to most people. Many set aside part of their annual leave in order to be able to take special opportunities to hunt or fish, for example. Those who are disturbed by exploration activities at such

> It might be appropriate to refrain from certain operations during the initial part of the elk hunting season in particular.

times may find even a small amount of disruption a major irritation.

As far as possible, a prospector should try to identify and consult with holders of rights of use and adapt the activities to take account of their point of view. For example, it might be appropriate to refrain from certain operations during the initial part of the elk hunting season in particular, or during other particularly sensitive periods.

4.4.5 Municipalities

Exploration in itself does not affect the municipal planning process in any particular respect, but if the exploration were to result in the eventual opening of a mine then the situation changes. The establishment of mining operations brings very significant issues for a municipality. The operations create jobs, but also a need for housing, social services and infrastructure which in turn need to be planned and financed. A mine also utilises land and has a certain impact on the surrounding environment. In the case of more advanced exploration work, it may be a good idea to keep the municipality informed of how the exploration work is developing and about the timetable for any further work and investigations.

4.4.6 Roads

The Swedish road network is made up of public roads and private roads. Public roads are managed by the national government or the municipality and are divided into European highways (prefix E before the road number), national highways (numbered 1–99), county roads (numbered 100–499) and other public roads (numbered over 500).

For exploration work within 30 metres of a public road, consent is required from the Chief Mining Inspector (see 5.2.4.4 Requirements of special consent in certain cases). The prospector may also need to get in contact with the Swedish Transport Administration (Trafikverket) to provide information about the work.

Private roads make up the majority of Sweden's road network. In the case of private roads it is the road maintainer that has legal liability. The road maintainer for private roads is either a property owner or an association of property owners and others who own the land where the road is located. Examples of such associations include road societies, joint road property units and joint property associations formed for the purpose of managing a private road (see 3.4.4 Joint property units, private roads and shared facilities). If the exploration work requires the use of a private road, the road maintainer will be informed by virtue of the fact that the road maintainer is also a property owner (or a joint property unit) that is served with the plan of operations.

In the case of exploration work there is sometimes a need to transport heavy vehicles and for recurring transport in an area. It is important to maintain a good dialogue with the road maintainer and to take into consideration the load-bearing capacity of the road. Should damage be caused to the road, this must be compensated by the prospector in the way agreed between the road maintainer and the prospector: either by the damage being repaired, or through financial compensation to the road maintainer.

4.5 Mandatory communication of the exploration permit and plan of operations

When a prospector has been granted an exploration permit, Bergsstaten sends a copy of the permit to all the landowners and holders of special rights who are affected. The prospector is not itself obliged to provide information on planned exploration works until service of the plan of operations, which can sometimes be a relatively long time after the exploration permit was granted.

Under the Minerals Act, the exploration work must not be started until the plan of operations has become valid (see 5.2.4.6 Valid plan of operations). The plan of operations becomes valid after the property owners and holders of special rights who are affected have received the plan of operations in writing and have had a certain period of time in which to contribute their views on, or challenge, the plan of operations.

4.6 Voluntary dialogue

Building trust takes both time and resources. Right at an early stage the prospector should get an idea of the communication and collaboration needed and the resources that this may be expected to demand.

Questions may arise among those affected in the period between the affected property owners and holders of special rights receiving a copy of the exploration permit and the time when they are served with the prospector's plan of operations. The individuals and/or groups in respect of which the prospector may need to voluntarily take the initiative for early dialogue are those who are directly affected, such as landowners, those living nearby (both permanent residents and those with holiday homes), holders of hunting and fishing rights and Sami reindeer herding districts. Sometimes information and/or communication may also be needed with a wider circle, such as local interest groups/associations, enterprises, the general public, local authorities and decision-makers, as well as the media.

Since the dialogue is voluntary, there are no requirements regarding how it is to be conducted. Sometimes small-scale communication is the right level and in other cases large meetings may be better suited to the purpose. For a personal and detailed dialogue it may sometimes be appropriate to visit those who are most affected by the exploration work in their home environment to inform them about what is planned in the area. In the case of large groups different forums are required, such as the prospector inviting people to information meetings or holding "open days" for anyone interested.

In many cases it is useful or necessary to combine different ways of passing on information. Written information in the form of newsletters or advertisements in a local newspaper are often practical ways of passing on information to lots of people. Reportage in the local newspaper or on local radio may supplement this and quickly provide information to a wide circle of people.

Svemin recommends

Broad participation – and be sure to document agreements

It can be a good idea to give interested parties an opportunity to meet representatives of both the exploration company and the contractors engaged, so that they can get information and ask questions. It is a good idea to have at least two people from the prospector's side attending the meetings held. A good tip is to have a geologist or someone else who is familiar with the execution of the project take part, so that questions can be answered. If needed, field visits can be a good way to show what is going on.

Viewpoints, suggestions and ideas should be noted down, even though the consultation is not a formal requirement. **Svemin recommends** above all that all agreements made are recorded in writing and signed by both parties.

4.7 Dialogue means two-way communication

Open, honest dialogue is important for a successful project. The prospector needs not only to provide information, but also to get the thoughts and suggestions of those who are affected. The more directly affected someone's rights or interests are, the more important it is for the prospector to find out exactly in what ways they are affected. Listening, understanding and taking other interests into consideration as far as possible increases the chances of trust, acceptance and successfully executed exploration work.

4.8 What information needs to be communicated?

The information that needs to be communicated varies depending on who the recipient is. Below are suggestions of information that may be relevant for the prospector to communicate to various interested parties. The level of detail and the content may need to be more or less detailed than is suggested below, depending on who is receiving the information. It is important to make clear what is general information and what is information specific to the project in question.

Suggestions of information that may need to be provided:

- Presentation of the prospecting company and the activities that the company conducts.
- The difference between exploration and mining. You may also need to explain that exploration is a time- and resource-intensive activity that is in the public interest and that few projects are developed into a mine.
- Description of the project concerned. Why is this project of interest? What metals are being explored for and are of interest in the area? What exploration methods may be relevant for the project in question?
- Exploration methods and how it is planned to carry out the work in the field.
- Future steps in the project: what happens afterwards? In conjunction with this it may be good to clarify the obligations that the prospector has to provide information and consult on the project, or any commitments that will be made voluntarily.
- The prospector's right to carry out the exploration work and the financial responsibilities that come with this right, i.e. that the prospector is liable to pay compensation for any damage to land and property and the requirements of the Minerals Act regarding financial security in order to undertake exploration work.
- The permits required for exploration and mining respectively and the authorities which issue the permits (including Bergsstaten, the county administrative board and the Land and Environment Court). It may also be good to explain that all activities are regulated by both minerals legislation and environmental legislation, and to say something about the various permit processes.
- Society's demand for metals, preferably with examples of what the substances relevant to this exploration are used for.
- Say something about how metals are produced, i.e. the chain of steps leading from exploration to mining, concentration, processing and use.
- Recycling of metals (the extent to which it occurs, percentage recycled relative to demand for the resource etc.).
- Factors that affect how an exploration project develops; for example, that the market is cyclical and is determined by – among other things – global market prices for metals.
- Name and contact details of the prospecting company and its contact persons.
- Contact details of the authorities responsible for questions concerning exploration and mining (primarily Bergsstaten and the Geological Survey of Sweden (SGU)).

5. PERMITS FOR EXPLORATION

5.1 Introduction

This chapter provides firstly a description of exploration permits and plans of operations in accordance with the Minerals Act, with tips for things that may be good to know when applying for an exploration permit and preparing a plan of operations. This is followed by a review with examples of other permits and exemption applications that may sometimes be relevant.

Under the Minerals Act, a person wishing to undertake exploration requires an exploration permit and a valid plan of operations. The Minerals Act is applied in parallel with other legislation, including various types of provisions on environmental protection. This means that having an exploration permit and a plan of operations does not necessarily mean that the exploration work is permitted. A person planning to carry out exploration work must find out which other permits, exemptions and/or approvals may be needed for the area that is to be explored.

In addition to an exploration permit and plan of operations, the following may sometimes be needed:

- exemption from the ban on off-road driving under the Off-road Driving Act (*terrängkörningslagen*)
- notification for consultation in accordance with Chapter 12 Section 6 of the Environmental Code
- permission to disturb ancient remains in accordance with the Heritage Conservation Act (*kulturmiljölagen*)
- exemption from regulations applicable to nature reserves
- exemption or consent under various provisions concerning species protection and/or nature conservation
- permission for test mining

This list does not claim to be complete. To find out what is applicable in the individual case, refer to the relevant legislation and in the event of uncertainty contact the authority responsible.

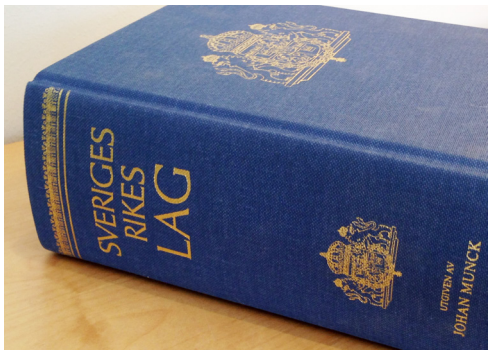
5.2 Permits etc. under the Minerals Act

The text below is based on an exploration permit for a *concession mineral*.[25] Below is a description of what an exploration permit means, the application procedure involved and plans of operations. Tips are also given for things that might be good to think about. References to relevant provisions in the Minerals Act have generally not been included in this section since the whole text is based on what is required under the Minerals Act and the Minerals Ordinance. In cases where there are no clear rules, the text has been supplemented with Svemin's recommendations.

5.2.1 Exploration permits

5.2.1.1 Simple works without an exploration permit

Any person whatsoever is permitted to undertake exploration work in its simplest form through the right of public access (see 3.6.1 Right of public access). Examples of this include boulder tracing or simple geophysical surveys carried out on foot or on skis. These types of simple exploration work do not involve instruments or other equipment being set out and left on the ground; rather they involve one or more people moving through the terrain with equipment carried by hand or on the back. According



Anyone wishing to undertake exploration needs to be aware of the permits and approvals needed.
PHOTO: SVEMIN

25 The minerals that are concession minerals are listed in Chapter 1 Section 1 of the Minerals Act.

Svemin recommends

If ownership is unclear

Sometimes it is unclear who owns a particular property. **Svemin recommends** that if ownership is uncertain, the prospector should contact Lantmäteriet (the Swedish mapping, cadastral and land registration authority) to check whether there is any further information that may be of significance for the property investigation. It may also be good to inform Bergsstaten (the Mining Inspectorate of Sweden) of the investigations that have been carried out in conjunction with the property investigation and of anything that remains unclear.

to the preliminary work for the Minerals Act, only actions that involve encroachment on the rights of property owner or other rights holders – for example, in the form of damage to the ground – are considered to be exploration work as defined by the Act.[26] However, a certain amount of caution should be applied when deciding the limits of what represents exploration work, and a person wishing to undertake exploration work other than what falls within normal recreational activities should always apply for an exploration permit and draw up a plan of operations.

5.2.1.2 Requirement of exploration permit

Under the Minerals Act, exploration may only be undertaken by the holder of an exploration permit. There are exceptions from the permit requirement for property owners (or others who have the consent of the property owner) and holders of an exploitation concession.[27] Moreover, the exemption only applies if the area in question is not covered by an exploration permit or exploitation concession granted to another party in accordance with the Minerals Act. Anyone who undertakes exploration work in contravention of the provisions concerning the requirement of an exploration permit or exploitation concession or who commences exploration work without having first provided the necessary financial security (see 5.2.3 Financial security) may be found criminally liable and may be fined or imprisoned for up to six months.

5.2.1.3 Scope of the permit

An exploration permit is valid for a particular area which, under the Minerals Act, may not be greater than the area that the prospector is assumed to be able to explore in an appropriate way. A holder of an exploration permit has the sole right to undertake exploration work within the area and has a preferential right to an exploitation concession for the minerals covered by the exploration permit. The permit provides entitlement to use roads to and within the area to the extent required. Following special permission from the Chief Mining Inspector, the permit holder may also utilise land to construct any road to and within the area that is necessary. The purpose of the rules on explora-

26 Cf. Government bill 1988/89:92, p. 85.

27 The exemption for holders of exploitation concessions applies provided that the exploration planned relates to minerals covered by the concession.

Tips and experience

The term "other affected parties known" could mean, for example, joint property units in the exploration area or rights of use that are entered in the Real Estate Register. Information about property owners and registered rights of use can be found in the Real Estate Register. The joint property units that exist within the exploration area are shown on Lantmäteriet's real estate maps. Sometimes further information on joint property units may need to be sought in what is known as a list of property owners or in an excerpt from the Joint Property Register, both of which can be requested from Lantmäteriet (see 3.2.3 Joint property units, private roads and shared facilities).

tion permits is to ensure that appropriate and active exploration is carried out in places where there are indications of interesting mineral deposits.

5.2.2 Application for exploration permit

5.2.2.1 Content of the application

The application for an exploration permit must be made in writing and submitted to the Chief Mining Inspector. Chapter 1 Section 1 of the Minerals Ordinance states what an application for an exploration permit must contain (1992:285). An application form can be downloaded from the Bergsstaten website.[28] In addition to details of the applicant, the application must state which concession minerals the application relates to and the area that the application covers. If the proposed exploration area includes areas where exploration is not permitted (existing or proposed national parks) or which require special consent from the county administrative board or Chief Mining Inspector (see 5.2.4.4 Requirements of special consent in certain cases), this must be stated by the applicant in the application.

The application shall include a list of those who own properties and other parties affected by the application that are known to the applicant – known as the property investigation and list of affected parties (see 3.4.2 Unclear ownership).

In the application the applicant shall state the circumstances that suggest that the exploration will find deposits of concession minerals, a proposed name for the exploration area and a description of the impact of the planned activities on public and private interests, as well as the measures judged to be necessary in order to protect public interests and private rights.[29] Finally, the applicant for an exploration permit shall state whether other exploration permits or exploitation concessions have been granted within the area or such have existed during the past 12 months. If so, a waiting period applies ("prohibition year") before a new exploration permit can be granted. Alternatively, the person wishing to undertake exploration must apply for exemption from the prohibition year.

5.2.2.2 Processing and application fee

Before the Chief Mining Inspector makes a decision, the relevant county administrative board, municipality and (if a reindeer herding area is affected) the Sami Parliament must be given opportunity to express an opinion. The Chief Mining Inspector must also send notification of the application to the affected property owners and holders of special rights. For each application for an exploration permit the applicant must pay an application fee. In addition, the applicant must pay an exploration fee for each exploration permit granted. Both fees must be paid in advance, in conjunction with the application being submitted. The level of the fees depends on the size of the area covered by the application/permit and increases as the size of the area increases.

5.2.2.3 Decisions on exploration permits

Under the Minerals Act, an exploration permit is to be granted if there is reason to assume that exploration in the area may find deposits of concession minerals and if the applicant meets the basic requirements stated in the Minerals Act. Conditions shall be attached to decisions on exploration permits as required to protect public interests and private rights. The permit shall also contain conditions stating that the permit holder must furnish financial security for compensation relating to any damage or encroachment that the exploration work may cause (see 5.2.3 Financial security). An exploration permit may be transferred to another party with the consent of the Chief Mining Inspector.

The Chief Mining Inspector shall send copies of the exploration permit granted and a map of the area to the relevant county administrative board, municipality and – if the

28 See https://www.sgu.se/en/mining-inspectorate/prospecting-process/forms/

29 Private rights means rights associated with individuals (physical or legal persons) and which follow from, for example, right of ownership, right of use or the right to conduct a certain activity (see Chapter 4).

exploration permit relates to areas used for reindeer herding – the Sami Parliament. A copy of the permit and map are also sent to the affected property owners and other known affected parties.

The permit is effective for three years from the date of the decision and, upon special application, may be extended on three different occasions such that it is effective for a maximum of fifteen years. As shown below (see Figure 2), the cost of an exploration permit increases both with time and with the size of the area.

The first extension is for a maximum of three years and is granted if appropriate exploration has been carried out within the area, or if the permit holder provides acceptable reasons for why exploration work has not been able to be carried out and is also able to demonstrate that the area will be explored within the additional period applied for. Provisions concerning what an application for extension must contain can be found in Section 1 first paragraph of the Minerals Ordinance.

The permit may be extended a second time, in this case for a further four years. Such an extension may be granted if the permit holder can show that there are *special reasons* for this. The preliminary work for the provision gives examples such as a dispute concerning exploitation rights, a lengthy work stoppage, a natural disaster or something

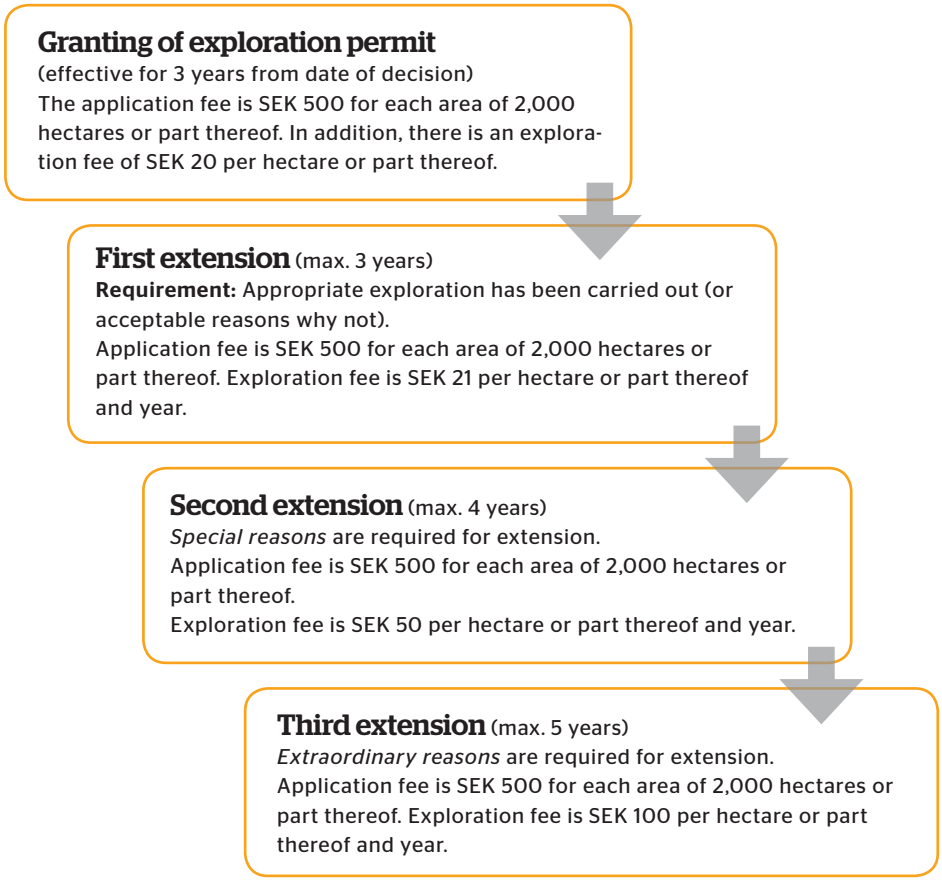


Figure 2: Diagram of periods of validity – and fees for – exploration permits and extended periods of validity for exploration permits. The fees stated are those applicable at the time this guidance was revised (2017). Since the cost increases with the size of the area and with each extension, the prospector has a financial incentive to carry out the exploration work as efficiently and expediently as possible and in an area that is not unnecessarily large. The fact that it is not a matter of course that an extension will be granted is a further incentive.

related to the nature of the deposit or particular natural circumstances.[30]

In order to extend the permit a further time thereafter there must be *extraordinary reasons*. These might be, for example, that significant exploration work has been carried out in the area and that continued exploration is likely to lead to the granting of an exploitation concession. The provision is intended to be used in exceptional cases. [31]

5.2.3 Financial security

5.2.3.1 Provisions of the Minerals Act

Damage or encroachment on the rights of affected parties (affected property owners and holders of special rights) that is caused by the exploration work is to be compensated by the holder of the exploration permit. The prospector must make an assessment of the level of any damage or encroachment resulting from the exploration work. The estimate of the level of possible damage (for example, to forest, to the ground and to roads) and the form of financial security are to be stated in the plan of operations (see 5.2.4.1 Content of the plan of operations). The financial security must be in place before the exploration work may be commenced. Examples of how a claims settlement may be calculated can be found in **Appendix 8** (*Example claims settlement letter*) and **Appendix 8A** (*Example claims settlement form*).

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30 Government bill 1997/98:47 pp. 10 f. and Government bill 1974/32 p. 155. These examples were clarified in a memo from Bergsstaten (20 August 2003, rev. 9 March 2005), which states firstly that the circumstances must be beyond the prospector's control and which adds – among other things – the following examples of what may be regarded as special reasons:
- *"A mineralisation has been found with concentrations that indicate that an application for an exploitation concession may be considered, but further exploration over a limited period is required in order to be able to make a final decision on whether extraction is likely to be economically viable.*
- *A probable ore has been found, but the procedure for an EIA and the requirements of other documents mean that additional time is needed in order to be able to submit an application for an exploitation concession.*
- *The exploration work was delayed considerably by appeals against the decision on the exploration permit and drawn-out processing of matters relating to consent for exploration work.*
- *The soil layers covering the bedrock are very thick. In addition, the till is hard-packed and large-bouldered. […] The risk of damage to the ground and the rules of the Off-road Driving Act have meant that the work can only be carried out during the winter. The stated natural circumstances are exceptional. These circumstances – when taken together, in any event – ought to be regarded as special reasons for extending the permit."*

31 Government bill 1997/98:47, p. 22. The preliminary work states that "*The possibility of a further extension is thus open only to prospectors which – possibly in view of the nature of the deposit – had special reasons for obtaining a second extension of the exploration permit and which subsequently, for some reason, were unable to complete the work within the exploration period. It is not possible to state generally what is to be regarded as significant work; instead this must be considered in the individual case."*

Tips and experience

The financial security is there to guarantee compensation for any financial loss in the form of the affected party's property having reduced in value or compensation for restricting the use of the land for other purposes as a result of the exploration work. The financial security shall correspond to the damage/encroachment that is expected to be able to arise. The industry provides certain recommended levels of compensation that may form a basis for assessment of the level of security, but it should be noted that circumstances in the individual case may provide reason to depart from the recommendations (see Chapter 7 Compensation for damage and encroachment).

The financial security is usually deposited in one of the following ways: (A) in a blocked account made available by Bergsstaten, (B) a bank guarantee issued for the purpose, or (C) in a bank account belonging to the company that is blocked such that only Bergsstaten is able to access the funds deposited. In the latter case the account must not be time-limited in a way that jeopardises the security.

The security may be repaid (or otherwise ended) following application to Bergsstaten. Naturally, this is dependent on there no longer being a valid plan of operations. The prospector should also be able to show that any claims have been settled with the affected parties concerned. Often the prospector will leave an existing security in place for future work that is planned.

Once the valid plan of operations has been sent to Bergsstaten it is up to the authority to check that financial security has been deposited in accordance with what is stated in the plan of operations (see below, 5.2.4.6 Valid plan of operations). If an affected party does not approve the security provided, the level of the security may be considered by the county administrative board.

5.2.3.2 Other damage

Any spills, emissions or pollution in conjunction with the exploration work shall be remedied by the prospector, or by another party that caused the contamination (the contractor). This liability arises under Chapter 2 Section 8 and Chapter 10 of the Environmental Code and is independent of the level of the financial security (see 6.6.7.8 In the event of pollution: preparedness, dealing with spills and action).

5.2.4 Plan of operations

The exploration work may only be carried out in accordance with a valid plan of operations.[32] The plan of operations is to be drawn up by the permit holder and must be written in Swedish. In certain cases the plan of operations may need to be translated into Finnish, Meänkieli or Sami (see 5.2.4.1 Content of the plan of operations), but it is the Swedish text that is the official version.

5.2.4.1 Content of the plan of operations

A detailed description of what a plan of operations must contain can be found in Chapter 3 Section 5 of the Minerals Act.[33]

32 A plan of operations becomes valid either when nobody has challenged the plan of operations within the prescribed period, or when the applicant has reached agreement with any parties that challenged to the plan of operations, or when the Chief Mining Inspector has confirmed the plan of operations at the applicant's request.

33 The provisions concerning the content of plans of operations apply to exploration permits (including extensions thereof) granted after 1 August 2014. Older provisions still apply to exploration permits granted prior to this date.

Svemin recommends

Concerning the period of validity of the plan of operations

The plan of operations shall describe the exploration work and the various operations that are planned to be performed. How long the plan of operations is to apply for must be decided from case to case depending on the work to be performed and, for example, which seasonally dependent circumstances may affect the performance of the work. Experience suggests that a plan of operations is usually valid for around 6–18 months, corresponding to the time for all the exploration work in the area planned in that period.

Svemin recommends that the plan of operations is designed to correspond to the time required for the exploration work and that it is not assumed to be valid for the same period as the exploration permit. The plan of operations shall describe the work planned. It is important not to put constraints on how the work is carried out by stating unnecessary details in the description of the work, since this could result in a new plan of operations being needed in the course of the work. For example, it should be sufficient simply to give an approximate idea of the number of holes to be drilled, as well as when (and for how long) the work will be carried out. If there are changes to the planned work (compared with what was described in the plan of operations), a new plan of operations is required.

In the case of minor changes, for example that the drilling will start later than planned (but still within the framework of what was described in the plan of operations), **Svemin recommends** that the prospector inform the affected parties or property owners affected by the change. However, a new plan of operations is not then required.

In addition to details of the permit holder, the plan of operations must contain the following information:

- name and contact details of the permit holder;
- a description of the nature of a plan of operations and information that those affected by the plan of operations have the opportunity to influence its contents by challenging it;
- information about the exploration work planned and a timetable for the work;
- map (with property boundaries) showing where exploration work will be carried out;
- assessment of whether/how the work may be assumed to affect public interests and private rights;
- information on when any challenges to the contents of the plan of operations must be received by the permit holder (challenges are to be made in writing within three weeks of the plan of operations being served on the party that wishes to challenge the content), and the consequences if no challenge is made;
- information that, if they so request, those affected are entitled to be notified when work on the property to which their rights relate will begin;
- information about the permits or notifications under other legislation that the permit holder already holds, has applied for or intends to apply for in connection with the exploration work; and
- an assessment of the extent of the damage or encroachment that will be caused by the exploration work, information on how any damage or encroachment will be dealt with, and information about the financial security provided by the permit holder in respect of this.

Bergsstaten does not have a ready-made form for plans of operations, as in the case of applications for exploration permits. Examples of the presentation of a plan of operations, what form receipt of service may take and how consent to the exploration works can be worded can be found in **Appendix 1** (*Plan of operations etc.*). The same appendix also contains examples of what a map might look like that shows where various planned exploration work will be carried out.

5.2.4.2 Adaptation to current land use

As regards the account of the work and the timetable for the work, the plan of operations is to be adapted to the current land use in the area where the exploration work is to be undertaken. This may mean, for example, making adjustments so that noisy work results in as little disturbance as possible (see 6.6 External environment – risks and preventive work during exploration in the field). Where relevant, the plan of operations shall also describe any water operations that will be undertaken (see 5.3.4.10 Water use and 6.6.8 Need for water and assessment of the consequences of extracting water).

5.2.4.3 Translation of the plan of operations

If the exploration work is to be undertaken in an area where Finnish, Meänkieli or Sami languages are national minority languages, the prospector shall provide a translated plan of operations if this is requested.[34] Only property owners and holders of special rights in the area concerned may request such translation. A request for translation shall be in writing and submitted to the permit holder within 10 days of the date when the property owner or holder of special rights was provided with the decision on the exploration permit.

34 This means where exploration work is to be undertaken in an area that fully or partly coincides with the language's administrative area according to Section 6 of the Act on National Minorities and Minority Languages (*lagen (2009:724) om nationella minoriteter och minoritetsspråk*).

Svemin recommends

Contact Bergsstaten

To find out when the decision was served on the party requesting translation the prospector may need to contact Bergsstaten and ask whether any request for translation was received within the time limit. **Svemin recommends** that when contacting Bergsstaten, the prospector also asks whether there is any property owner or holder of special rights that has not yet been served with a copy of the exploration permit, since the time limit for requesting translation of the plan of operations will not yet have started for that person.

5.2.4.4 Requirement of special consent in certain cases

In certain cases the surrounding circumstances are such that special consent is required from an authority in order to undertake exploration work (Chapter 3 Sections 6–7 Minerals Act).

Special consent is required from the *county administrative board* if it is planned that the exploration work will take place:

- within 200 metres of a protected installation,[35]
- within a churchyard or other burial ground, or
- in an area that is an unbroken mountain area (unbroken mountain areas are defined in Chapter 4 Section 5 of the Environmental Code).

Among other things, special consent from the *Chief Mining Inspector* is required (the list below is not exhaustive):

- for exploration work within 30 metres of a public highway (or the planned course of such a highway), railway, airport or canal, or
- where exploration work is planned within 200 metres of a dwelling, church, power station or other industrial plant etc., and
- for exploration within an area covered by a local plan or area regulations[36]

35 A protected installation means a building, facility or area that requires enhanced protection from certain types of serious threats or incidents. The decision to protect an installation means that unauthorised persons are not permitted access to the protected installation. The Government or the authority determined by the Government may decide on matters concerning protected installations (Section 18 of the Essential Installations (Protection) Act (*skyddslagen (2010:305)*). Pursuant to the Government's right to delegate, the Armed Forces and the county administrative board in the county where the protected installation is situated may also make decisions concerning protected installations (Sections 2 and 3 of the Essential Installations (Protection) Ordinance (*skyddsförordningen (2010:523)*).

36 A local plan is a legally binding document adopted by the municipality. The local plan gives detailed instructions regarding how the land in the area concerned may be used. Area regulations are used to regulate land use in certain respects within the areas that are not covered by a local plan. Area regulations can be used by the municipality in various ways; for example, to regulate the basic outline of how the land may be used, to satisfy a national interest as described in Chapters 3–4 of the Environmental Code or to secure the purpose of the municipality's general development plan.

Tips and experience

In practice, service generally means that the plan of operations is sent by post along with a receipt of service, or by registered post, to the property owners and holders of special rights who are affected. It is important that the receipt of service clearly states which plan of operations the receipt relates to. There should also be opportunity to approve the plan of operations and/or to challenge it directly with the receipt of service (see example receipt of service in Appendix 1 Plan of operations etc.).

Holders of rights of use means primarily persons holding such rights of use as are registe red in the Real Estate Register. There may also be rights granted/holders of rights of use who are not recorded in the Real Estate Register, but which the property owner has informed the prospector of (see 3.2.2 Holders of special rights). As regards reindeer husbandry specifically, all reindeer herding is associated with Sami reindeer herding districts. Sami reindeer herding districts are legal entities and service to holders of reindeer herding rights may take place by serving the plan of operations on the Sami reindeer herding district (usually the chairman of the district). Contact details for the country's reindeer herding districts can be found on the website of the Sami Parliament.

As regards exploration work within 200 metres of a dwelling, church, power station or industrial plant, the work may be undertaken if those affected (owners and holders of rights of use, such as tenants) allow it. Consent in such cases can for example be obtained in conjunction with sending out the plan of operations by specifically asking those affected. As regards exploration work in areas covered by a local plan or area regulations, the Chief Mining Inspector must obtain a statement from the municipality concerned. As a general rule, the Chief Mining Inspector must not allow the work to be undertaken in contravention of the plan/regulations, but minor deviations may be permitted if this is not contrary to the purpose of the plan or regulations. In all these cases the Chief Mining Inspector may attach conditions to the consent regarding how the work is to be performed.

A person applying for an exploration permit shall state in the application whether within the intended exploration area there are areas covered by the provisions concerning the requirement of special consent.

5.2.4.5 Service of and challenges to the plan of operations

In order for the plan of operations to be valid, it must be served on the owners of the properties where the work is to be undertaken and on holders of special rights who are affected (see next paragraph).[37] The purpose is to ensure that those affected by the exploration work have received information about the planned exploration work and that they have had opportunity to influence the performance of the work as needed and where possible. An example of the format of a receipt of service can be found in Appendix 1 (Plan of operations etc.).

Chapter 17 Section 1 of the Minerals Act defines the term "*special rights to a property*" as "*rights of use, easements, reindeer herding rights, rights to electric power and similar rights*". Reindeer herding rights are special rights accruing to the Sami people as laid down in more detail in the Reindeer Herding Act (*rennäringslagen*) (see 3.5.2 Reindeer herding areas).

Usually, service is effected by sending the plan of operations to those affected. In exceptional cases what is known as service by publication may be used.[38] If so, this is done via the county administrative board which, upon application, makes a decision as to whether the conditions for service by publication are met.[39]

Legal entities (for example, companies and organisations) are served with the plan primarily by the plan of operations being received by someone authorised to represent the legal entity. If there is more than one authorised person, one person is sufficient. In the case of the estates of deceased persons, in the first instance the plan shall be served on the person who represents the estate – often the estate administrator. The plan may be served on joint property units and members of associations by contacting the convening board member or administrator, who in turn informs the other co-owners or members.

Persons who use land through the right of public access, for example for picking berries or mushrooms or for other recreational activities, are not affected parties within the meaning of the Minerals Act but instead are regarded as the general public. The prospector has no obligation to inform the general public about the exploration work or to adapt it to the public's wishes.

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37 Bergsstaten's website provides instructions concerning how a plan of operations is to be served: https://www.sgu.se/ Global/Bergsstaten/delgivning-av-arbetsplaner-121001.pdf

38 These exceptional cases include, for example, that the person sought has no known abode, that the abode is known but that it may be assumed that the person sought has gone away or is in hiding, or that the number of people to be served is so large that the cost of service would be disproportion to its purpose.

39 Provisions concerning service are contained primarily in the Service of Documents Act (*delgivningslagen (SFS 2010:1932)*) – see, among others, Sections 9–10 and 47–51.

Svemin recommends

Agreements should be documented

If the work is undertaken on the basis of agreements between the prospector and property owners or holders of special rights, **Svemin recommends** that these agreements are documented in writing. Written agreements reduce the risk of misunderstandings and facilitate any subsequent discussions concerning damage or other financial settlements.

Important to bear in mind!
Exploration work may only be undertaken in accordance with a valid plan of operations. If changes need to be made to the planned exploration work compared with what was described in the plan of operations, then a new plan of operations must be drawn up as described above.

5.2.4.6 Valid plan of operations

The plan of operations does not become valid until the property owners and holders of special rights who are affected have received the plan of operations in writing and have had three weeks in which to contribute their views or challenge the plan of operations. The plan of operations becomes valid if no challenges are brought within the three-week period. This period commences on the day that the recipient was served with the plan of operations, which is stated in the receipt of service. The plan of operations also becomes valid if the permit holder reaches agreement with the party that has challenged the plan. If agreement cannot be reached, the permit holder may request that the Chief Mining Inspector confirms the plan of operations.[40] In the event of such confirmation the Chief Mining Inspector may notify the conditions needed in order to protect public interests and private rights and in order to prevent or limit detriment caused by the work.

The valid plan of operations is to be sent (by the permit holder) to the Chief Mining Inspector, the county administrative board, the municipality and, where relevant, the Sami Parliament.

5.2.4.7 Notification of the start and end of exploration work

If a property owner or holder of special rights who is affected by the exploration work so requests, the permit holder shall send written notification of the date on which the work will start on the property in question (i.e. the property that the person owns or with which the rights are associated). The request for specific notification is to be made in writing and must be received by the permit holder within three weeks of service of the plan of operations. The notification is to be sent at least one week before the exploration work starts and must be written in Swedish. If the plan of operations contains information concerning when the exploration work will start on a particular property, the prospector need not send a separate notification to the person whose rights the information relates to (cf. Chapter 3 Section 5e of the Minerals Act).

When the exploration work is complete, the permit holder is to send notification to all the affected property owners and holders of special rights. The notification must be in writing and must be written in Swedish.

40 A form for requesting confirmation ("examination") can be found on Bergsstaten's website: http://www.sgu.se/bergssta-ten/prospektering/blanketter/

Svemin recommends

Contact with holders of hunting rights

If the exploration work will be undertaken during a hunting season (which is particularly important to bear in mind if the plan of operations will be effective for a relatively long time), **Svemin recommends** that, to be on the safe side, the prospector contacts those who have hunting rights in the area. However, this assumes that the prospector knows who holds hunting rights. Information concerning who has hunting rights can usually be provided by the property owner, since the hunting rights belong to the property. The property owner may grant hunting rights to others (the Real Estate Register does not list those with hunting rights as rights of use).

The hunting rights may also be held by multiple members of a game conservation area association and by Sami people in accordance with the Reindeer Husbandry Act (*rennäringslagen*). The county administrative board may sometimes need to be contacted to get information on the hunting and game conservation areas that exist in the area.

5.3 Other permits, approvals and exemptions

5.3.1 General

5.3.1.1 Introduction

Anyone wishing to undertake exploration must find out the rules and any other permit requirements that may apply to the exploration work in the area where the work is to be undertaken in addition to the requirement for an exploration permit and a valid plan of operations. Various types of permits and/or approval and exemption applications that may sometimes be relevant are described below.

The permits, approvals, exemptions etc. that may be needed depend on the circumstances in the area where the exploration work is to be undertaken. To a great extent, information concerning where there are, for example, protected areas, cultural heritage, species that need special consideration or other area-specific information of significance can be obtained from various authorities' websites (for example, the relevant county administrative board or municipality, the Swedish Environmental Protection Agency, the Swedish Forest Agency, the Swedish National Heritage Board, the Geological Survey of Sweden (SGU), Lantmäteriet, the Swedish Species Information Centre (*ArtDatabanken*) and the Swedish Species Observation System (*Artportalen*)). Some of the information is downloadable, but not all.

5.3.1.2 Processing times

The processing time for various notifications and applications may vary. An important starting point for anyone wishing to undertake exploration is that all applications and notifications that are required for the activities must be made in good time before the intended start date of the activity. The procedure is always in writing and the documentation that must be appended depends on what the matter concerns and the prevailing circumstances in the area in question. If there is sensitive nature, for example, a description may be required of the natural conditions and whether/how these may be affected by the exploration work. If the responsible authority considers the documentation to be insufficient to make a decision, it may request supplementary documentation from the applicant – in which case, the processing time will be extended. If exploration work is planned in areas of particular natural or cultural value, it might be a good idea to allow for a longer schedule because of the processing time if examination by an authority is required and to expect that any conditions or restrictions may mean that the work has to be undertaken at a particular time of year.

In summary, it is important to plan the activities in good time. The timetable should be set with a margin and should include processing times for the matters with the various authorities of at least 1–2 months for any approvals, decisions or permits that may be needed before the works are allowed to start.

5.3.1.3 Penalty provisions

Any person who pursues an activity or takes some other action without having obtained the necessary exemption or permit, or without submitting a notification as required by

Svemin recommends

Check that the information is current

The fact that information about the same thing can be obtained from different authorities means that sometimes it is uncertain whether the information is current/up-to-date. There is no responsibility for the authorities to coordinate this. The industry is driving the issue of the desirability of having only one authority responsible for providing all the information relating to different types of area protection and for maps and other information to be downloadable in compatible layers/systems. In the absence of a uniform system, anyone who wants to undertake exploration and others who are affected by the rules may seek information from the various sources that are available. **Svemin recommends** that the prospector checks that the details are current with the authority that is responsible for the matter in question.

the provisions of the Environmental Code (for example, a 12:6 notification or permit for test mining) may be prosecuted for an unauthorized environmental activity (Chapter 29 Section 4 Environmental Code). The penalty may be a term of imprisonment for up to two years. The same shall apply to failure to comply with a condition or a provision attached to a decision concerning permissibility, approval or exemption, or starting an activity or action without complying with a specified time period.

It may also be an offence to undertake an activity or take action that damages, or may damage, the natural environment or protected natural assets of a habitat protection area, nature reserve and/or cultural reserve, ancient remains etc. or which infringes a provision passed in order to protect these types of areas.

5.3.2 Off-road Driving Act

5.3.2.1 Definitions

Driving a motorised vehicle off-road on bare ground and in certain cases also on snow-covered ground is banned throughout the country (Section 1 of the Off-road Driving Act (*terrängkörningslagen (1975:1313)*). The extent of the ban is described below. The term *motorised vehicle* means virtually all kinds of vehicles powered by a motor or an engine.[41] In an exploration context this might apply to, for example, cars, forestry tractors, tracked vehicles, excavators, snowmobiles and all-terrain vehicles. The term "*off-road*" refers to almost all natural land – not just forest and soil.[42] The provisions thus apply to forest, mountains and marsh, as well as for example fields, meadows, pasture, parkland, paths and hiking trails. Regarding the definition of *bare ground*, everything that involves the vehicle coming into contact with the ground, i.e. if the snow covering is so shallow or the snow is so loose that the vehicle comes into contact with the ground, is counted as driving on bare ground.[43]

PHOTO: BOLIDEN

An exemption from the off-road driving ban is normally required in order to drive off-road.

There are penalties for such offences and any person who deliberately or carelessly does so may be fined (Section 4 of the Off-road Driving Act (*terrängkörningslagen*)).

5.3.2.2 Off-road driving ban

The ban on off-road *driving covers driving on bare ground, on snow-covered forest land with recently planted or young trees and on snow-covered agricultural land*. Regarding forest land, the ban applies if it is not obvious that the driving can take place without any risk of damage to the forest (Section 1 (2) of the Off-road Driving Act (*terrängkörningslagen*)). The ban on driving on snow-covered forest land with recently planted or young trees applies where the average height of the forest above the snow cover is less than two metres (Section 4 Off-road Driving Ordinance (*terrängkörningsförordningen* (1978:594)). The ban on driving off-road in mountain areas applies in the areas stated in the Off-road Driving Ordinance and a more detailed description of the boundaries of the mountain areas and provisions for the areas is available from the county administrative board (see Section 4 and the appendices to the Ordinance). In the mountain areas where off-road driving is banned, only public snowmobile trails can exist unless the county administrative board has granted special exemption (Section 4 third paragraph Off-road Driving Ordinance). A public snowmobile trail is a marked winter trail where the county administrative board or municipality is responsible for maintenance of the trail and where off-road snowmobiles may be driven when the ground is snow-covered (Section 8 Off-road Driving Ordinance).

41 See among other things pp. 18 f. of the Swedish Environmental Protection Agency's handbook 2005:1, "Terrängkörning. Handbok med allmänna råd till terrängkörningslagen och terrängkörningsförordningen" ("Off-road Driving: Handbook containing general advice on the Off-road Driving Act and the Off-road Driving Ordinance").

42 See p. 19 of Swedish Environmental Protection Agency handbook 2005:1, as above.

43 See p. 18 of Swedish Environmental Protection Agency handbook 2005:1, as above.

5.3.2.3 Exceptions to the ban

If there are special circumstances, the county administrative board may set out general exceptions or decide to grant an *exemption* from the ban in *certain individual cases*. Such exemptions are aimed at the applicant and may relate to a certain specific occasion, area, arrangement, activity or person and usually has conditions attached.[44]

According to the general guidance from the Swedish Environmental Protection Agency on the Off-road Driving Act and the Off-road Driving Ordinance (*terrängkörningslagen and terrängkörningsförordningen* (2005:1)), ore exploration may be a special circumstance in which exemption can be given from the ban, but exemption should not be given for driving within protected *areas*. In the general guidance it is generally stated that exemption should not be given if there is a risk of the driving causing significant damage to the ground or vegetation, damage or disruption of significance for fauna or its habitats or for recreational life, reindeer husbandry or those living nearby. The general guidance is not legally binding, but may provide a certain amount of guidance to the decision-making authority.

The prospector must itself find out what applies and apply for exemption if necessary. A party that has been exempted from the ban may in certain cases by obliged to produce the decision (or otherwise show that an exception has been allowed) when requested to do so by a nature conservation officer or a police officer.

Tips and experience concerning driving on sensitive ground

Off-road driving in sensitive nature should be limited or avoided if possible, but if it is unavoidable then the prospector must find out the precautions that may need to be taken and describe these in its application for exemption. When driving on sensitive ground, special precautions may be needed (see 6.5.4), such as reinforcing driving routes with brushwood or snow. In other cases the most appropriate precaution may be to only drive in winter time, on well- frozen ground. Good advice is to always allow plenty of time and to prepare the application for exemption well, so that the exploration work can be carried out on schedule.

5.3.2.4 Content of the application

According to the handbook issued by the Swedish Environmental Protection Agency, an application for exemption from the ban on off-road driving should be made in writing and contain the following documentation in order for the county administrative board to be able to assess the consequences of the driving[45]:

- description of the nature and extent of the activity
- details of special circumstances on which the applicant is basing its application for exemption
- type of vehicle and its environmental performance
- when driving will take place
- map with driving route/area marked

An application for exemption from the ban on off-road driving can often be made on preprinted forms that are usually provided by the county administrative boards. In addition to what is stated above, it may also be a good idea for the applicant to describe the measures planned to reduce the impact (including restoration following driving damage).

5.3.3 Ancient remains and cultural heritage

5.3.3.1 Prohibition on disturbing ancient remains etc.

Under Chapter 2 Section 6 of the Heritage Conservation Act (*kulturmiljölagen* (1988:950)) the following is prohibited, except with permission: to disturb, remove,

44 See p. 37 of Swedish Environmental Protection Agency handbook 2005:1, as above.

45 See p. 44 of Swedish Environmental Protection Agency handbook 2005:1, as above.

Svemin recommends

Concerning the content of the application

Experience suggests that certain county administrative boards accept one application for exemption from the ban on off-road driving per exploration permit, while others demand separate applications for different occasions. **Svemin recommends** that, as far as possible, the prospector states where within the area off-road driving may be required. Cutting down the areas where off-road driving may be required is likely to reduce the risk of a long processing period.

Svemin recommends that the prospector also states in the application for exemption if it is planned that driving will take place on sensitive ground (for example watercourses, wetlands or in areas with sensitive species or habitats) and if so, at what time of year it is planned that this will take place. The more sensitive the ground affected, the more detailed the descriptions may need to be and the smaller the areas covered by the application will need to be, since otherwise there is a risk that the application will take a long time to process. It may also be a good idea for the prospector to contact the property owners and/or holders of special rights before preparing the application for exemption in order to discuss what they consider to be suitable driving routes.

excavate, cover over or, by building development, planting or in any other way, to alter or damage ancient remains. What *ancient remains* are is defined in Chapter 2 Section 1 of the Heritage Conservation Act and may include remains of homes, settlements and workplaces, old bridges, routes and boundary markings, and places of assembly for the administration of justice, cult activities etc. The list here is not exhaustive and it should be noted that the surrounding ground that is needed in order to preserve the remains in a significant way forms part of the ancient remains ("*ancient remains area*").

Information about ancient remains and cultural heritage can be sought from a map database service ("*Fornsök*") on the Swedish National Heritage Board website.[46]

Prospectors need to be aware that anyone who intends to implement a "work undertaking" should contact the county administrative board in good time to ascertain whether any ancient remains may be affected by the undertaking and if so, consult with the county administrative board as soon as possible (Section 10 Heritage Conservation Act). Moreover, if ancient remains are found during digging or other work, the work having an impact on the ancient remains must immediately be stopped and the person leading the work must notify this immediately to the county administrative board.

5.3.3.2 Ancient finds

Ancient finds are objects that have no owner when found and that are discovered in or near ancient remains and are connected with them, or that are found in other circumstances and are presumed to date from before 1850 (Chapter 2 Section 3 Heritage Conservation Act (*kulturmiljölagen*)). Anyone discovering an *ancient find* is to report the find without delay to the county administrative board or to the Swedish Police Authority (Chapter 2 Section 5 Heritage Conservation Act).

46 See the Swedish National Heritage Board (*Riksantikvariatämbetet*) website: http://www.raa.se/hitta-information/fornsok-fmis/?utm_ source=startsida&utm_medium=snabblank&utm_campaign=ux-test

Tips and experience regarding cultural heritage

In the case of exploration work it may be that as well as ancient remains, more recent cultural heritage remains are found. It may be a matter of remains and traces that are not classed as ancient remains, such as charcoal stacks, cairns, tar piles, paths, building foundations etc. Information about known cultural heritage can be found in the Swedish National Heritage Board's "*Fornsök*" database and in the Swedish Forest Agency's map service "*Skogens pärlor*" ("Pearls of the Forest"). Information may also be available from the relevant county administrative board. Even if such remains are not classified as ancient remains, the exploration work may need to be planned and executed so as to avoid damaging them.

5.3.4 Permits, exemptions etc. under the Environmental Code and associated ordinances

5.3.4.1 General rules of consideration

In addition to formal requirements of permits, notifications etc. it is important to be aware that the general rules of consideration set out in the Environmental Code apply to anyone pursuing an activity or taking a measure that is not of negligible significance for the environment (Chapter 2 Environmental Code). Among other things, the general rules of consideration contain general requirements that persons who pursue an activity or take a measure must have a knowledge of the impact of the activity on the environment and must implement protective measures or comply with restrictions as necessary in order to prevent, hinder or combat damage or detriment to the environment as a result of the activity or measure – irrespective of whether or not a permit is required for the activity (Chapter 2 Sections 2–3 Environmental Code). The general rules of consideration also state that persons who have caused damage or detriment to the environment shall be responsible for remedying it (Chapter 2 Section 8 Environmental Code).[47] In connection with the consideration of permits, approvals and exemptions under the Environmental Code, persons who pursue an activity must be able to show that the general rules of consideration have been complied with (Chapter 2 Section 1 Environmental Code).

5.3.4.2 Consultation in accordance with Chapter 12 Section 6 of the Environmental Code

The exploration work, or parts of the work, may in certain cases need to be notified to the supervisory authority for consultation (in connection with exploration, usually the county administrative board). Notice of consultation shall be made if a planned activity for which a permit or notification is not required under other provisions of the Environmental Code may have a *significant impact on the natural environment* (Chapter 12 Section 6 Environmental Code). In order words, this may need to be done for exploration work (not including test mining), for example, under the Minerals Act.
As regards exploration, consultation with the supervisory authority is mandatory for exploration within unbroken mountain areas (Section 7b of the Ordinance on Notice of Consultation (*Förordning (1998:904) om anmälan för samråd*). Unbroken mountain areas are classified as a national interest under Chapter 4 of the Environmental Code (see 3.6.2.3 Other types of protection). For other exploration the requirement of mandatory notice of consultation does not apply. In the general guidance from the Swedish Environmental Protection Agency on notices of consultation it is stated that "*exploration work under an exploration permit pursuant to the Minerals Act (1991:45) which encroaches on the natural environment, e.g. work routes, clearing of vegetation, drilling or felling of trees, should be notified for consultation*".[48] The general guidance is not legally binding, but rather provides recommendations on how the rules are to be applied.

The duty of consultation set out in Chapter 12 Section 6 of the Environmental Code also applies within the areas that are not protected natural areas. The Swedish Environmental Protection Agency has issued general guidance on the application of the provisions concerning notice of consultation and there is also a handbook on the notice of consultation.[49] If the prospector is uncertain whether or not notice of consultation is required (or about the content of the notice), the county administrative board should be contacted to discuss this.

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47 In this case it refers to environmental damage in the form of polluted land or water areas, groundwater etc. that may cause damage or detriment to human health or the environment (cf. Chapter 10 Section 1 Environmental Code).

48 See p. 4 of NFS 2001:15, the Swedish Environmental Protection Agency's general guidance on notice of consultation pursuant to Chapter 12 Section 6 of the Environmental Code ("*Naturvårdsverkets allmänna råd om anmälan för samråd enligt 12 kap. 6 § miljöbalken*")..

49 Swedish Environmental Protection Agency administrative provisions NFS 2001:15, as above, and Swedish Environmental Protection Agency handbook 2006:1, "Notice of consultation pursuant to Chapter 12 Section 6 of the Environmental Code" ("*Anmälan för samråd enligt 12 kap. 6 § miljöbalken*").

Tips and experience concerning the need for notice of consultation

What is to be considered as a significant change in the natural environment may sometimes be difficult to determine and depends not only on the action that is to be taken, but also on the sensitivity of the area. The prospector therefore needs to obtain sufficient documentation about the area in order to assess whether the planned work must be notified for consultation. One tip is to check what information is available on the relevant county administrative board's website, in the WebbGIS map service or in the Swedish Species Observation System (*Artportalen*). There are also a number of recommendations in the Swedish Environmental Protection Agency's general guidance (NFS 2001:15) and handbook (2006:1).

To enable the prospector to get a good idea of the impact that the planned measures may have on the natural environment, it may be a good idea to visit the area in advance so that the natural environment can be inspected and documented. One tip is to document with photos or perhaps take video of the natural environment. The conclusion of the inspections of the area may be that notice of consultation is not required. Even if the prospector assesses that notice of consultation is not required, the basis for this assessment should be documented and kept in case questions should arise at a later date.

5.3.4.2.1 Content of the notice of consultation

According to the Swedish Environmental Protection Agency's general guidance, how comprehensive a notice must be should depend, among other things, on the activity's expected impact on the natural environment, the magnitude of the activity and the sensitivity of the area concerned.[50] It is usually possible to submit the notice of consultation on the county administrative board website using the county administrative board's e service.

As a starting point, the notice of consultation shall be in writing and shall include a map, a description of the planned activity/action and details of property owners and holders of rights of use who are affected by the activity or action (Section 8 of the Ordinance on Notice of Consultation (*förordning om anmälan för samråd*)).

Any protective measures planned should also be described in the notice. According to the Swedish Environmental Protection Agency's general guidance, the starting point should be that the party undertaking the activity must itself suggest suitable precautions for and restrictions on the activity to protect the natural environment in accordance with the rules of consideration in Chapter 2 of the Environmental Code. If needed, the supervisory authority should conduct a dialogue with the party undertaking the activity in order to discuss the precautions or adjustments that may be appropriate. The protective measures needed will vary for natural reasons, depending on the work that is to be carried out, the natural environment affected and the time of year at which the work will be undertaken. If the protective measures are not judged to be sufficient, then following the notice of consultation the supervisory authority may decide to impose further restrictions or protective measures (see below).

50 See p. 7 of NFS 2001:15, as above.

Svemin recommends

Content of the notice of consultation

The documentation that should be included in the notice of consultation will vary from case to case. The level of detail required varies depending on the character of the natural environment and the natural assets that are present or may be expected there. For a forest environment, for example, the age and character of the forest should be described. One starting point is that the greater the value or the more sensitive the land, the more precise the description may need to be. A good idea is to attach any photos. It may be helpful to provide other relevant information in a format such as GIS. **Svemin recommends** also that the plan of operations is appended to the notice of consultation. This gives the supervisory authority a description of where and when the planned exploration work is to be undertaken, the driving routes that will be used and where drilling and surveying will be carried out.

Tips and experience – concerning the environmental impact assessment in particular

The notice shall also "*to the extent required in the individual case*" contain an environmental impact assessment in accordance with Chapter 6 of the Environmental Code. The Swedish Environmental Protection Agency's general guidance states: *"In the assessment of whether an [environmental impact assessment] is required in a case concerning notice of consultation according to the Environmental Code (12:6), special consideration should be given to whether the activity or action is extensive, difficult to assess, of great public interest or concerns areas where the natural environment is particularly sensitive."* The Swedish Environmental Protection Agency's handbook further states: "*The supervisory authority will decide when an EIA is required in a case according to 12:6 EC. The requirement of an EIA should be used discerningly and only when justified from an environmental perspective. Most cases as described in 12:6 have such a limited environmental impact that an EIA should not be relevant. However, even a minor operation or activity may have such a great environmental impact that an EIA is required.*" The handbook (p. 28) also states that that if the supervisory authority requests an environmental impact assessment, this should be done in a separate decision.

The County Administrative Board for Västerbotten has produced a detailed folder concerning what a notice of consultation relating to exploration is to contain. This folder is available on the County Administrative Board's website.[51]

5.3.4.2.2 Performance of actions that have been notified for consultation

An activity or action that must be notified for consultation may be commenced no earlier than six weeks after the notification was made, unless the supervisory authority allows otherwise (Chapter 12 Section 6, third paragraph Environmental Code). In many cases the supervisory authority will have no objection to the activity or action notified for consultation. The authority should then inform the operator of this in writing.[52] Sometimes the processing takes longer. If the supervisory authority wishes to decide to issue orders, or to prohibit the activity, before the six-week period has elapsed, the authority should inform the operator.[53] If the prospector has not received notice otherwise, the activity may start once the six weeks have passed.

The supervisory authority may decide to impose conditions or restrictions to combat damage to the natural environment or, if this is not considered sufficient, the activity may be prohibited (Chapter 12 Section 6 fourth paragraph Environmental Code). Any decision by the supervisory authority following a notice of consultation can be appealed to the Land and Environment Court (Chapter 19 Section 1 third paragraph Environmental Code). Failure to give notice of consultation may mean that commencing or undertaking an activity or actions that should have been notified for consultation is an offence of unauthorised environmental activity (Chapter 29 Section 4 (g) Environmental Code).

51 See http://www.lansstyrelsen.se/vasterbotten/SiteCollectionDocuments/Sv/miljo-och-klimat/verksamheter-med-miljopaverkan/Ingrepp%20i%20naturen/AnsokanAnmalan_prospektering_MT.pdf

52 See p. 2 of NFS 2001:15, as above.

53 See pp. 28–29 of Swedish Environmental Protection Agency handbook 2006:1, as above.

Tips and experience concerning the EIA in the notice of consultation

Svemin's assessment, based on experience of the environmental impact that exploration work typically has on the surroundings, is that a formal environmental impact assessment is rarely needed for the majority of the exploration work undertaken. In most cases a description of the natural environment affected, the impact that the planned activity will have on the surroundings and the preventive measures that will be taken to minimise damage or negative impact on the natural environment are sufficient.

5.3.4.3 Nature reserves and cultural reserves

Special regulations apply to nature reserves and cultural reserves, the content of which is determined based on what is needed for the reserve in question. The regulations contain the restrictions on the right to use land and water areas that are needed in order to achieve the aim of the reserve, and therefore vary depending on the motivation behind the establishment of the reserve.

Undertaking exploration work in a nature reserve or cultural reserve is not prohibited, but the work must not be undertaken in contravention of regulations issued for the reserve in question (Chapter 3 Section 6 Minerals Act). If exploration is to be undertaken in a nature reserve, the prospector therefore needs to find out which regulations apply and which natural and cultural assets are protected, in order to avoid damaging these.

The county administrative board or the municipality may *rescind* decisions concerning nature reserves/cultural reserves if there are extraordinary reasons for doing so. The county administrative board or the municipality may also, if there are special reasons for doing so, grant exemption from the regulations that apply to a nature reserve (Chapter 7 Section 7 Environmental Code). A decision to withdraw protection or grant an exemption from the rules on reserves may only be taken if reasonable compensation is made in the nature reserve or in some other area for the encroachment on the natural asset.

An application for exemption from the rules on reserves must be made in writing and include a map.[54] According to the same provision, the application shall also contain an environmental impact assessment "*to the extent required in the individual case*". If it is uncertain whether an environmental impact assessment is required, it may be appropriate to have a dialogue about the matter with the decision-making authority (the county administrative board or municipality). Sometimes there are forms on the websites of the county administrative boards that can be completed as an application for exemption.

Any person who causes damage or a risk of damage or other detriment to the environmental assets that are intended to be protected in a nature reserve or cultural reserve shall be liable to a fine or a term of imprisonment not exceeding two years for the offence of causing environmental disturbance (Chapter 29 Section 2 (3) Environmental Code). Any person who contravenes a regulation or provision that was issued for the protection or a nature reserve or cultural reserve shall be liable to a fine for the offence of negligently causing environmental disturbance (Chapter 29 Section 2a Environmental Code).

5.3.4.4 Habitat protection areas

Habitat protection areas may be established for small land or water areas which, because of their particular characteristics, constitute valuable habitats for endangered animal and plant species or are otherwise particularly worthy of protection (Chapter 7 Section 11 Environmental Code and certain provisions in the Ordinance on Area Protection under the Environmental Code etc. (*förordningen (1998:1252) om områdesskydd enligt miljöbalken m.m.*)).

Habitat protection may be generally applicable to certain specially designated areas or phenomena, or established for the areas in *individual cases*. Examples of general habitat protection include springs, wetlands, and ponds on agricultural land.[55] Examples of habitats which may be designated as habitat protection areas following a special decision by the Swedish Forest Agency are old natural forests, ravine forests and small watercourses and ponds with surrounding land.[56] Examples of habitats that may be con-

54 See Section 23 of the Ordinance on Area Protection under the Environmental Code etc. (*förordningen (1998:1252) om områdesskydd enligt miljöbalken m.m.*).

55 These habitat protection areas are decided by the Government and are listed in Appendix 1 to the Ordinance on Area Protection under the Environmental Code etc. (*förordningen (1998:1252) om områdesskydd enligt miljöbalken m.m.*) (see Chapter 7 Section 11 Environmental Code and Section 5 of the Ordinance on Area Protection).

56 This type of habitat protection area is decided by the Swedish Forest Agency or the relevant municipality (see Sections 6 and 7a of the Ordinance on Area Protection).

sidered to need protection through a special decision by the *county administrative board* include natural watercourses, screes and rocky slopes, and natural waterfalls and rapids with their surrounding land.[57]

Within a habitat protection area it is not permitted to pursue activities or take actions that may damage the natural environment (Chapter 7 Section 11 second paragraph Environmental Code). Under the same provision, exemption from the prohibition may be granted in individual cases in special circumstances. The county administrative board considers the matter of exemption from general habitat protection regulations and matters relating to the habitat protection areas designated by the county administrative board.[58] Exemption for other habitat protection areas is decided by the authority or municipality that awarded the area habitat protection.[59] Any person who pursues an activity or takes some other action that may damage the natural environment shall be liable to a fine or a term of imprisonment not exceeding two years for the offence of causing environmental disturbance (Chapter 29 Section 2 first paragraph Environmental Code). Any person who contravenes a regulation or provision on habitat protection shall be liable to a fine for the offence of negligently causing environmental disturbance (Chapter 29 Section 2a Environmental Code).

5.3.4.5 Species protection

In Sweden there are a large number of plants and animals that are protected through species protection. In addition, all wild birds are protected species. The reason for granting protection may be that the species is endangered because it is attractive to collectors or hunters, or that it is quite simply too rare – either in Sweden or within the EU, or both. The protection may apply generally or in certain parts of the country.

5.3.4.5.1 Legal regulation

The species protection provisions are based on national species protection provisions, international commitments and on two EU Directives, known as the Habitats Directive and the Birds Directive.[60] The EU Directives were implemented through provisions in the Environmental Code, in the Ordinance on Species Protection (*artskyddsförordningen* (2007:845)) and in the Ordinance on Area Provisions (*förordningen om områdesbestämmelser* (1998:1252)).

The Ordinance on Species Protection states, among other things, that the deliberate killing or capture of birds and animals and the deliberate disturbance of birds and animals, particularly during their mating, rearing, overwintering and migration periods, is prohibited (Section 4).[61] The Swedish Environmental Protection Agency has listed when these periods occur for certain species. Killing, harming or capturing reptiles, amphibians and invertebrates is also prohibited (Section 6). Where plants are concerned (including vascular plants, mosses, lavas, fungi and algae), among other things disturbing certain plants in the areas where they are naturally found is prohibited (Section 7).[62] In other cases picking, digging up or otherwise removing or harming specimens of the plants is prohibited (Section 8)[63]. The latter are species that are protected nationally

57 This type of habitat protection area is decided by the county administrative board in the county concerned or the relevant municipality (see Sections 7–7a of the Ordinance on Area Protection under the Environmental Code etc.).

58 See Section 5 second paragraph of the Ordinance on Area Protection under the Environmental Code etc. (*förordningen om områdesskydd enligt miljöbalken m.m.*).

59 See Chapter 7 Section 11 second paragraph of the Environmental Code.

60 Council Directive 92/43/EEC and Council Directive 79/409/EEC.

61 As regards animals, the prohibition in Section 4 applies to species of animals living wild which have been marked N in Appendix 1 to the Ordinance on Species Protection (Species requiring strict protection under the Habitats Directive; the species are listed in Annex 4 to the Habitats Directive) or n (Species requiring strict protection under national Swedish legislation or as a result of an international commitment, i.e. the species is not listed in Annex 4 to the Habitats Directive).

62 Applies to plant species marked N in Annex 1 to the Habitats Directive.

63 Applies to plant species stated in Annex 2 to the Habitats Directive, i.e. which are protected under national provisions but not under EU legislation.

Different species vary in sensitivity to the same disturbance, which is to be taken into consideration for protective measures.

under the Ordinance on Species Protection (*artskyddsförordningen*) (Section 8), and in the case of this prohibition deliberate action is not a prerequisite (cf. Section 4). The provisions prohibit the picking, digging up or other removal or harming of specimens of the plants and the removal or damaging of seeds or other parts.

Since the provisions on species protection take the form of prohibitions, if an activity is to be permitted it is essential that it is not in contravention of the prohibitions listed. Application of the provisions on species protection can be seen as a more precise specification of the general rules of consideration in the second chapter of the Environmental Code. They may therefore be of significance when assessing whether an activity has a location that is acceptable.[64] In order for a planned activity to be carried out, protective measures or adjustments to the activity may sometimes be required so that it does not conflict with the prohibitions in the Ordinance on Species Protection. Such commitments and measures may be weighed up in the assessment and may mean that consideration of exemption under the Ordinance on Species Protection is not required.[65]

5.3.4.5.2 Exemption from prohibitions in the Ordinance on Species Protection

Exemption from the prohibitions can be granted in individual cases and in certain circumstances (Sections 14–15 Ordinance on Species Protection (*artskyddsförordningen*)). The application for exemption will be considered by the county administrative board and the circumstances which allow exemption to be granted will depend on whether the species is protected under EU legislation or (only) through national species protection (Sections 14–15 Ordinance on Species Protection). Infringement of the provisions may be an *offence against species protection* resulting in a fine or imprisonment for up to two years (Chapter 29 Section 2b Environmental Code).

5.3.4.5.3 Application and case law

The purpose of the provisions on species and habitat protection is to ensure biodiversity by preserving naturally occurring habitats as well as the wild flora and fauna, so as to maintain or restore a favourable conservation status.[66]

The term **"favourable conservation status"** is fundamental and has been summarised in case law as "*the sum of the factors that impact a habitat and its typical species and which can, in the long term, impact their natural spread, structure and function as well as the typical species' long-term survival*".[67] The full Swedish legal definition can be found in the Ordinance on Species Protection (Section 16 third and fourth paragraphs).

The Ordinance on Species Protection is applied against the background of the aims of the underlying EU Directives. Case law by both the European Court of Justice and the Swedish courts may need to be taken into consideration. Case law is still being developed and sometimes there is no clear guidance to turn to.

The term **"deliberate" capture, killing or disturbance** of animals has been considered by the Land and Environment Court of Appeal in some cases that can provide a certain amount of guidance: "Deliberate" acts are acts carried out by a person who knows, in the light of current legislation for the species concerned, and the general information aimed at the general public, that his act is likely to cause harm to a species of animal, but endeavours to cause this harm, or at least consciously accepts the foreseeable result of the act". [68]

The term **"disturb"** is not defined in either the Habitats Directive or the Ordinance on Species Protection. In case law it has been stated that different species vary in sensitivity

64 See, for example, the rulings by the Land and Environment Court of 3 Feb 2016 in case M2114-15 and of 25 Jan 2016 in case M11317-14 and MÖD 2013:13.

65 MÖD 2013:13, MÖD 2014:47 and Land and Environment Court rulings of 3 Feb 2016 in case M2114-15 and of 25 Jan 2016 in case M11317-14.

66 See Swedish Environmental Protection Agency handbook 2009:2, "Handbok för artskyddsförordningen, Del 1 – Fridlysning och dispenser" ("Handbook for the Ordinance on Species Protection, Part 1 – Species protection and exemptions"), 2009, p. 13.

67 See e.g. Land and Environment Court of Appeal ruling of 3 Feb 2016 in case M2114-15 (Norrviken Gardens).

68 MÖD 2014:47 and MÖD 2015:3.

to the same disturbance, which is to be taken into consideration for protective measures.[69]

Regarding the **protection of breeding sites and resting places**, the Land and Environment Court of Appeal has pronounced that: "*The aim of the prohibition is to protect the ecological functionality of the breeding site and resting places. Such areas must not be harmed or destroyed by human activity, so that they can continue to offer what is required if a certain species of animal is to rest or breed successfully. It is further stated in the* [*European Commission's: our note*] *guidance document that such breeding sites and resting places must also be protected when they are not being used if there is a reasonable likelihood that the species in question will continue to use these places*". [70] Even gradual deterioration may mean that the area loses its function for the species in question.

Regarding **protective measures to avoid impermissible impact** on a species, the Land and Environment Court of Appeal has stated that it is possible to regard a measure as a protective measure even if it is not taken directly at the site that is being exploited; for example, if it is taken in connection with a breeding site within the area of the local population.[71] A protective measure could be, for example, expanding the site or creating new habitats at or with a direct functional link to a site for breeding and rest which counters the loss of parts of the site. According to the Court, the essential thing in connection with a planned protective measure is that following exploitation there must still be access to breeding sites within the core area that are at least equal in size and quality. According to the Court, such an approach may be deemed to comply with the overall aim of the Habitats Directive concerning biodiversity and restoring a favourable conservation status for populations of species of wild animals and plants.

Where the **nationally protected species** are concerned, the Land and Environment Court of Appeal has found that the issue of exemption from species protection is also relevant in cases where plants are removed or damaged as a result of an exploitation enterprise. At the same time, the Court stated that in the case of activities where the aim is obviously other than to remove or damage protected plants, it is reasonable that a certain risk of impact on the conservation status of the protected species is required in order to trigger the prohibitions in Section 8 of the Ordinance on Species Protection.[72]

5.3.5.4 Exploration and species protection

Minerals exploration and forest measures such as clearance, pruning and felling are listed in the Swedish Environmental Protection Agency's handbook on species protection as activities that may be affected by the provisions on species protection.[73] The degree of sensitivity depends on the species and environments that occur in the area.

Before the work is started, the prospector needs to find out whether there are any protected species that may be harmed or destroyed by the planned measures. It is possible to search electronically for information concerning species in the Swedish Species Observation System (*Artportalen*) or in the Swedish Forest Agency's map service "Pearls of the Forest" (*Skogens pärlor*). If there is considered to be a risk of harm to protected species in the exploration area, the prospector needs to consider what protective measures can be taken to avoid or limit harm and disturbance. If harm to or disturbance of protected species cannot be avoided sufficiently to avoid impermissible harm/disturbance/impact, exemption must be sought. In the event of uncertainty, contact the county administrative board for a dialogue.

69 See Land and Environment Court of Appeal ruling of 8 Dec 2015 in case M6960-14.

70 See Land and Environment Court of Appeal ruling of 3 Feb 2016 in case M2114-15.

71 See Land and Environment Court of Appeal ruling of 25 Jan 2016 in case M11317-14.

72 See Land and Environment Court of Appeal ruling of 25 Jan 2016 in case M11317-14.

73 See Appendix 19 to Swedish Environmental Protection Agency handbook 2009:2, as above.

Tips and experience concerning exemption from species protection

As regards exploration, it may be that the scope of the exploration work and the time of year at which it is undertaken are of significance for whether or not it will cause impermissible harm to or disturbance of protected species. Here there is a risk of impermissible disturbance, it may be sufficient to change the time at which or the way in which the actions are taken so that harm or disturbance that would otherwise have required exemption does not occur.

As regards the risk of harm to species growing or living in a soil horizon, if they are known then these places can be avoided by changing the route in order to bypass them. Sometimes it may be possible to move the drilling site instead. Another protective measure might be to carry out the work during the winter when the ground is frozen and covered with snow.

Svemin recommends

Field surveys

The prospector needs to know whether there are protected species in the area to be explored. Some information can be found in the Swedish Species Information Centre (*ArtDatabanken*), the Swedish Species Observation System (*Artportalen*) or from the relevant county administrative board. Field surveys may also be required.

If there are or there is reason to assume that there are protected species in the area that is to be explored, **Svemin recommends** that: the prospector carries out field surveys in advance, for example at planned drilling sites and on planned driving routes. This will give the prospector a better knowledge of whether there are protected species at these sites and how the work might be able to be adapted in order to reduce the risk of disruption/harm. One measure might for example be to adjust a driving route to avoid harming a protected species. This may need to be marked out on the terrain using tape, for example.

5.3.4.6 Red-listed species

Red-listing is a way to chart the occurrence of species that are threatened or critically endangered, or which have otherwise reduced in numbers in a concerning way. The system began to be developed by the global conservation organisation the *International Union for Conservation of Nature* (IUCN) more than 50 years ago and is now applied in many countries. Work to chart species and to categorise them according to the Red List is based on internationally accepted criteria from the IUCN. The Red List contains the following categories, based on risk assessment for the area in question:

- Regionally Extinct (RE)
- Critically Endangered (CR)
- Endangered (EN)
- Vulnerable (VU)
- Near Threatened (NT)
- Least Concern (LC): species in this category are not red-listed

The Red List is updated continually. In Sweden it is the Swedish University of Agricultural Sciences (*Sveriges Lantbruksuniversitet* – SLU) which produces the Swedish Red list via the Swedish Species Information Centre (*ArtDatabanken*), and it is the Swedish Environmental Protection Agency and the Swedish Agency for Marine and Water Management (*Havs- och vattenmyndigheten*) which confirm the list.[74] The Red List has no legal status. It can be used, for example, as documentation for prioritising conservation based on the conservation status of species that need special attention. The occurrence of red-listed species may send a signal that the area needs to be inventorised in advance

74 See SLU: http://www.artdatabanken.se/en/the-red-list/?menu=open. The most recent list was published in April 2015 and is the fourth Swedish Red List. It can be downloaded or ordered from the Swedish Species Information Centre (*ArtDatabanken*).

and that a degree of caution and protective measures are required when undertaking the exploration work (see also 5.3.4.5 Species protection).

5.3.4.7 Natura 2000

Natura 2000 is a network within the EU for achieving protection for certain types of nature that are particularly worthy of protection. Information concerning the areas that have been designated as Natura 2000 areas in Sweden, and why they were chosen, is available via a digital map service provided by the Swedish Environmental Protection Agency.[75]

The Swedish provisions concerning Natura 2000 areas are found mainly in Chapter 7 of the Environmental Code. Special permission is required to conduct activities or take actions than may significantly impact the environment in a Natura 2000 area (Chapter 7 Section 28a Environmental Code). Permission may only be given if the activity or action (alone or together with other ongoing or planned activities/actions) cannot damage the habitat(s) that are intended to be protected in the area (Chapter 7 Section 28b Environmental Code). The provisions are applicable to activities/actions both within the Natural 2000 area and outside of it.

Svemin recommends

Natura 2000 areas in the vicinity of the exploration area

The exploration work normally has limited impact on its surroundings. Svemin is not aware of any case in which Natura 2000 permission has been required in order to undertake exploration. **Svemin recommends** that the prospector nonetheless finds out whether there are any Natura 2000 areas within, or in the vicinity of, the exploration area. This information may be needed in order to get an idea at an early stage of the existence of nature protection which may be of significance for any future extraction in the area. The Natura 2000 areas may also be home to protected species which the prospector needs to be aware of right from the exploration stage (see 5.3.4.5 Species protection and 5.3.4.6 Red-listed species).

5.3.4.8 Exemption for water protection areas

Groundwater and surface water resources may be protected as water protection areas (Chapter 7 Section 21 Environmental Code). A decisions to establish a water protection area may be accompanied by provisions concerning restrictions on the right to dispose of property within the area. Exemption from such provisions may be granted in special circumstances (Chapter 7 Section 22 Environmental Code). Exemption must be compatible with the aim of the provision or prohibition.[76]

5.3.4.9 Permits for test mining

Test mining is needed so that the prospector can find out more about the character of the material and its suitability for technical processing. Test mining is not carried out in all exploration – and if it is, this happens at a relatively late stage in the exploration (see 2.5.2 Test mining).

Test mining is a type of exploration work and is thus covered by exploration permits (or exploitation concessions) granted. Just as for other exploration work, a valid plan of operations is required before the test mining can begin. Test mining also requires a *special permit under the Environmental Code*, as stated in Chapter 4 Section 15 of the Ordinance on Environmental Impact Assessments (*miljöprövningsförordningen* (2013:251)). Applications for permits are made to the county administrative board's EIA delegation.[77]

> Test mining is needed so that the prospector can find out more about the character of the material and its suitability for technical processing.

75 See the Swedish Environmental Protection Agency website: http://naturvardsverket.se/sv/Sa-mar-miljon/Kartor/Kartverktyget-Skyddad-natur/

76 See Government bill 1997/98:45 part 2, p. 98.

77 There are currently 12 environmental review delegations and these are linked to certain county administrative boards. Which county administrative boards have an environmental review delegation and which review areas these respective environmental review delegations are responsible for is set out in the Ordinance on Environmental Review Delegations (*förordningen (2011:1237) om miljöprövningsdelegationer*).

The process of consideration and what an application for a permit for test mining must contain are regulated in the Environmental Code. In general, it can be said that the applicant must describe the planned activity, state the quantity intended to be mined, the impact that the test mining will have on the surroundings and the precautions that the applicant intends to take in order to limit or prevent negative environmental impact. The application must also include, among other things, an environmental impact statement and a technical description, as well as proposals for how the activity will be monitored and checked (Chapter 22 Section 1 first paragraph Environmental Code). According to new provisions on how environmental impact is to be assessed, the party applying for permission to carry out an environmentally hazardous activity that may be assumed to have a significant environmental impact (including test mining) is to carry out a specific environmental assessment. The specific environmental assessment means that the party that intends to undertake the activity a) consults on how an environmental impact statement is to be delimited (boundary consultation), b) produces an environmental impact statement, and c) submits the environmental impact statement to the party considering the matter of the permit. The party considering the matter of the permit must a) give opportunity for viewpoints on the environmental impact statement, and b) conclude the environmental assessment. The boundary consultation is to take place before the work on the environmental impact statement. The party that intends to undertake the activity shall consult on the activity's location, scope and design, the environmental effects that the activity may be assumed to have or resulting from external events, and the content and presentation of the environmental impact statement. The boundary consultation shall take place with the county administrative board, the supervisory authority and the individuals who may be assumed to be particularly affected by the activity and with the other state authorities, the municipalities and the public that may be assumed to be affected by the activity or measure.[78]

The environmental impact statement must contain:[79]

1. Details of the activity's or action's location, design, scope and other characteristics that may be of significance for the environmental assessment,
2. Details of alternative solutions to the activity or action,
3. Details of the current environmental circumstances before the activity is started or the action is taken, and how these circumstances are expected to develop if the activity is not started or the action is not taken,
4. Identification, description and assessment of the environmental effects that the activity or action may be assumed to involve in itself or as a result of external events,
5. Details of the measures planned in order to prevent, impede, combat or remedy the negative environmental effects,
6. Details of the measures planned in order to avoid non-compliance with an environmental quality standard as described in Chapter 5, if such details are relevant taking into consideration the nature and scope of the activity,
7. A non-technical summary of 1–6, and
8. An account of the consultations that have taken place and what emerged in the consultations.

Once the application for a permit has been submitted, the rest of the process takes place in writing. The applicant may be ordered to supplement the application if the environmental review delegation considers that there are any shortcomings. During the written procedure, authorities and others are given opportunity to comment on the application and to put forward their views on the planned activity. The application procedure ends with the environmental review delegation deciding whether to grant a permit or reject the application. If a permit is granted it usually has certain conditions attached concer-

78 Concerning environmental assessments see among other things Section 20 and Sections 28–30 of (the new) Chapter 6 of the Environmental Code, effective from 1 Jan 2018.

79 See Section 35 of (the new) Chapter 6 of the Environmental Code, effective from 1 Jan 2018.

ning how the activity may be conducted, with a view to limiting any negative impact on the surroundings.

The decision of the environmental review delegation may be appealed to the Land and Environment Court (Chapter 19 Section 3 third paragraph Environmental Code). The parties that have the right to appeal are stated in Chapter 16 Section 12 of the Environmental Code. In brief, it can be said that the right accrues to both the applicant and the individuals who are directly affected by the decision, if the decision went against the person concerned. In addition, the supervisory authority and certain other authorities (including the Swedish Environmental Protection Agency and the county administrative board) are entitled to be parties in the case and to appeal, for example, decisions on permits (Chapter 22 Section 6 Environmental Code).

Further information on the process of considering a permit in accordance with the Environmental Code can be found in the Geological Survey of Sweden's handbook on guidance for the consideration of mining activities (*SGU handbok Vägledning för prövning av gruvverksamhet*).[80]

5.3.4.10 Water use

Described below are certain special rules that apply to the use of water. The presentation in this section aims to provide a general description of the rules in force.

In many cases the extraction of water for exploration drilling and other water activities in conjunction with exploration work tends to be so limited in extent that there is no obligation to obtain a permit for or to notify water activities. The description below therefore does not go into detail concerning how to apply for a permit or notify an activity, or how provisions concerning water activities are to be interpreted and applied.

Pumping cooling water from brook to rig. PHOTO: LKAB

5.3.4.10.1 Use of water in exploration

Cooling water is usually required in conjunction with exploration drilling (see 2.4 Further exploration methods and 6.6.8 Need for water and assessment of the consequences of extracting water). For example, the intention may be to take the water from a nearby lake or brook, a trench, a spring or a previous borehole that carries water. Just as for other measures, any extraction of water must be described in the plan of operations (see below, 5.3.4.10.3 Right of disposition for water operations).

Before the work starts the prospector needs to decide whether the exploration work will involve extraction of water that requires a permit or notification as a water operation or water catchment.

5.3.4.10.2 Definitions in the legislation

The Environmental Code contains special provisions concerning water operations and measures involving water. Water operations is a legal term and is defined in Chapter 11 Section 3 of the Environmental Code.

Water operations means:

1. *the construction, alteration, repair and removal of water structures in water areas,*
2. *filling and piling in water areas,*
3. *the removal of water from water areas,*
4. *digging, blasting and cleaning up in water areas,*
5. *other measures in water areas whose purpose is to change the depth or position of the water,*
6. *the diversion of groundwater and the erection of structures for this purpose,*
7. *recharging in order to increase the volume of groundwater, as well as the erection of structures and other measures for this purpose, or*

80 The guidance can be downloaded from the SGU website: https://www.sgu.se/

8. *measures undertaken to drain land.*

A *water area* shall mean "*an area that is covered with water at the highest anticipated water level*".

In the context of exploration, it is mainly "*the removal of water from water areas*" (point 3 above) that is relevant. This covers cases where water needs to be taken from a lake or brook.

5.3.4.10.3 Right of disposition for water operations

In order to be allowed to conduct water operations, the water at the place where the water operations are to be conducted must be at the party's disposition (Chapter 2 Section 1 of the Act on Special Provisions concerning Water Operations (*lag (1998:812) med särskilda bestämmelser om vattenverksamhet*). The legal starting point is that it is the property owner that has the right of disposition over water on their property. Other parties may reach agreement with the property owner concerning having the water at their disposition, or in certain cases may have a statutory right of disposition (Chapter 2 Section 1 of the Act on Special Provisions concerning Water Operations).

If the prospector needs to take measures that involve water operations in conjunction with the exploration work, a right of disposition must be obtained for through the fact that the measures have been described in a plan of operations that has become valid (see 5.3.4.6 Valid plan of operations). In this case the extraction site for surface water or groundwater needs to be described in the plan of operations with sufficient precision that the extraction point(s) is(are) clear to the property owners concerned. Alternatively, right of disposition must be obtained by agreement with the property owner.

5.3.4.10.4 Permit and notification obligations for water operations

As a general starting point, water operations may only be undertaken if the benefits from the point of view of public and private interests outweigh the associated costs and inconvenience. [81] As regards the impact on the public interest, it is stated in the preliminary work for the regulation that "*the encroachment shall be required to involve fairly significant inconvenience in order for the enterprise* [*i.e. the water operations – our comment*] *to be deemed impermissible*".[82]

The general rule is that a permit is required in order to undertake water operations.

Instead of applying for a permit, in certain cases it is sufficient to notify a planned water operation (Chapter 11 Section 9a Environmental Code). The notification procedure was introduced in 2005 as a simpler and more flexible procedure to supplement the permit obligation. The possibility of notification rather than applying for a permit applies to certain measures that are specifically listed.[83] The decisive factors include how large a bottom area is affected by the measures or how great a volume of water is to be diverted. As regards the limits for notifiable diversion, it is stated that:

> *"Instead of the permit obligation set out in Chapter 11 Section 9 of the Environmental Code, a water operation may not be commenced until it has been notified to the supervisory authority, if the operation involves* [....]
>
> 9. *the diversion of a maximum of 600 cubic metres of surface water per 24 hours from a watercourse, but no more than 100,000 cubic metres per year, or the construction of structures for this,*
> 10. *the diversion of a maximum of 1,000 cubic metres of surface water per 24 hours from a water area other than a watercourse, but no more than 200,000 cubic metres per year, or the construction of structures for this,*
>
> [...]

81 The provisions concerning permit obligations and what is known as the "benefit requirement" for water operations are contained in Chapter 11 of the Environmental Code.

82 Government bill 1981/82:130, pp. 97 f.

83 Se Section 19 of the Ordinance on Water Operations etc. (förordning (1998:1388) om vattenverksamhet m.m.).

12. *changes to a notified water operation as per 1–10, or*
13. *changes to a water operation which has been examined for permit purposes, if the change is a notifiable operation as described in 1–10."*

The volume of water that is to be diverted is a parameter when considering whether or not the rule concerning exemption from the permit or notification obligation is applicable (see Svemin recommends – next box). If a permit is required, the water operations must not be commenced until the required permit has been obtained. If the operations are notifiable, they may not be commenced until at least eight weeks have passed from the notification being made, unless the supervisory authority determines otherwise (Chapter 11 Section 9b, third paragraph Environmental Code).

Notification of water operations is made to the supervisory authority, which is normally the county administrative board. Applications for permits for water operations are made to the Land and Environment Court. These procedures are not described in more detail here.

5.3.4.10.5 Exemption from permit and notification obligations

In certain circumstances neither a permit nor notification is required for water operations (Chapter 11 Section 12 Environmental Code). The conditions for exemption are the same regardless of whether the obligation is for a permit or notification. Exemption from the permit obligation applies where "*public or private interests are manifestly not harmed by the impact of water operations on water conditions*". This usually means the depth or situation of the water. The party asserting that the conditions for exemption from permit/notification obligations are met bears the burden of proof that this is the case. The required evidence must be strong and, together with the fact that the water operations must manifestly not cause any harm, this means that the permit obligations can largely encompass all kinds of water operations of any significance.[84]

84 See Government bill 1997/98:45 part 2, p. 134.

Svemin recommends

Concerning assessment of any permit or notification obligations

Whether a permit (or notification) is required for the measures is a question that the prospector may need to address in the individual case. The decisive thing in this assessment is the impact of the operations/measures on the water conditions.

It is not possible to state generally when a permit/notification is needed or when the conditions for exemption are met. However, based on experience it can be said that extraction of water in connection with exploration drilling rarely has any significant impact. In other words, water extraction and other water operations in connection with exploration often fall within the scope of exemption. It may also be the case that permit/notification obligations can be avoided through the use of protective measures and/or the choice of site, so that the impact that water extraction would otherwise have had on the water conditions can be minimised.

Svemin is of the opinion that there are various starting points for assessment of any impact. One important factor, of course, is the volume of water diverted (relative to the volume of water in and around the extraction site) and the flows to and from the extraction site. The impact of the extraction on the water conditions may vary depending on whether it is groundwater or surface water that is extracted.

If the exploration work requires significant or long-lasting extraction of water, **Svemin recommends** that a more detailed assessment is made of the hydrogeological conditions and the impact that the diversion may have. Since any impact must be assessed in the individual case, it is not possible to provide a more precise description of how detailed the assessment needs to be. This must simply be decided after assessing any impact of the operations on the water conditions.

5.3.4.11 Waste

In the case of all waste, the owner of the waste is obliged to ensure that it is dealt with in a manner that is acceptable as regards health and the environment (Chapter 15 Section 5a Environmental Code). Littering is prohibited and is a criminal offence (Chapter 29 Section 7 Environmental Code).

As regards exploration, it is taken as read that the prospector will not leave behind packaging, residual material, worn out or used equipment, oils, chemicals etc. but instead will ensure that all such waste is disposed of correctly.

As regards "general" waste that arises through consumption, wear or damage, there are various rules and established systems for dealing with this. However, special rules apply to waste from extraction (see below).

5.3.4.11.1 Definitions and general starting points

Just as for practically all other operations, exploration gives rise to a certain amount of waste. Waste is defined as "*any object or substance which the holder disposes of or intends or is required to dispose of*" (Chapter 15 Section 1 first paragraph Environmental Code). There are special regulations concerning waste from extraction, which in turn are based on the general definition of waste.[85]

Included in waste from extraction is waste arising as a direct consequence of exploration (for example, drill cuttings). In this context exploration is defined in legal terms as "*activities involving sampling, drilling, trenching or otherwise systematically searching for a deposit that has economic value, but not activities required to develop extraction of such a deposit and not activities directly associated with an existing extraction operation*" (Section 2 of the Ordinance on Waste from Extraction (utvinningsavfallsförordningen)).

5.3.4.11.2 Extraction waste from exploration

The primary exploration activity that may give rise to waste from extraction is drilling. The waste from drilling is mainly dry or wet (sludge) in the form of drill cuttings (rock residue) from diamond drilling, hammer drilling or RC drilling. A description of how this can be dealt with or disposed of is given below – see 6.6.9 Disposal of drill cuttings. Waste from extraction may also include residues of drill cores or scrapped samples. Cooling water from drilling may also be regarded as waste and if it contains residues of oil or other chemicals, it may be regarded as hazardous waste (see 5.3.4.11.5 Hazardous waste from exploration). By definition, cooling water is also "wastewater" as described in Chapter 9 Section 2 point 2 of the Environmental Code.[86] In general, wastewater is to be diverted away and treated or processed in some other way such that there is no detriment to human health or the environment (Chapter 9 Section 7 Environmental Code). However, there are no permit or notification obligations for discharges of cooling water from exploration.

Example of drill cuttings at a site where drilling has been completed.
PHOTO: BOLIDEN

Waste arising in conjunction with test mining is not described in more detail here, since the disposal of such waste is regulated in the permit under the Environmental Code that is required in order to undertake test mining – see 5.3.4.9 Permits for test mining.

85 Provisions regulating waste from extraction can be found in the Ordinance on Waste from Extraction (*förordning (2013:319) om utvinningsavfall*).

86 All cooling water is covered, including cooling water from the operation of technical equipment – see Government bill 1997/98:45 part 2, p. 108.

5.3.4.11.3 Provisions concerning the disposal of waste from extraction

Any person who in their operations gives rise to or processes waste from extraction shall, among other things (Section 22 of the Ordinance on Waste from Extraction (*förordning (2013:319) om utvinningsavfall*):

- take waste prevention measures;
- encourage appropriate recycling of the waste; and
- dispose of the waste in a manner that is safe for human health and the environment in the short and long term

Piles or accumulations of waste from extraction (solid or liquid) from exploration that is not hazardous waste constitute an "*extraction waste facility*" if the site is used for stockpiling or accumulating waste for a period of more than three years (Section 9 first paragraph point 3 of the Ordinance on Waste from Extraction (*förordning (2013:319) om utvinningsavfall*)). Since waste from exploration activities is rarely if ever stored for so long, provisions on extraction waste facilities are not described further here.

5.3.4.11.4 Waste management plan and characterisation of the waste

The person conducting an activity that gives rise to waste from extraction must have a *waste management plan*. The Ordinance on Waste from Extraction provides no exemption for exploration activities, so a waste management plan must also be prepared for extraction waste arising as a result of exploration.

In brief, a waste management plan is a description of the waste from extraction that is caused by the activity and how this waste will be disposed of (Sections 23–24 Ordinance on Waste from Extraction (*förordning (2013:319) om utvinningsavfall*)).

Among other things, the waste management plan shall state which activity or measure gives rise to the waste from extraction and how the waste will be dealt with. The plan must contain details of the volume of waste from extraction that it is estimated will arise or be dealt with in the activity, and a description of the measures that are planned in order to avoid the waste polluting the air, surface water and groundwater. The plan must also describe how the detrimental effects of the waste from extraction will be prevented or reduced by taking into consideration its disposal right from the early design of the activity. The waste management plan must also contain documentation of the characterisation (see below) of the waste from extraction that arises or is processed in the activity and an account of how the disposal of such waste may have a harmful impact on human health and the environment.

The prospector shall (in addition to preparing a waste management plan) characterise the waste from extraction that arises or is processed in the activity (Sections 30–36 of the Ordinance on Waste from Extraction (*förordning (2013:319) om utvinningsavfall*)). The characterisation shall be documented and shall contain, among other things, a general description of the background to and overall information concerning the exploration, information about the geological conditions[87] at the site that are of significance for identifying the waste from extraction, a description of the waste from extraction that may arise in the course of the exploration and the total volume of waste that may arise, any dangerous properties and whether the waste is hazardous waste (see 5.3.4.11.5 Hazardous waste from exploration), as well as how the waste is to be disposed of. For each type of waste the documentation shall also include information concerning the waste's

87 Under Section 32 of the Ordinance on Waste from Extraction (*förordning (2013:319) om utvinningsavfall*) the characterisation must include "*[…] information concerning*
1. chemical, mineralogical and other characteristics of the surrounding rocks, as well as any hydrothermal alteration of both mineralised rock and other parts of the surrounding rock,
2. nature of deposit and the size and geometry of the deposit,
3. mineralisation typology, their chemistry and mineralogy, as well as density, porosity, particle size distribution, water content and other physical properties,
4. chemistry and mineralogy, density, porosity, particle size distribution, water content and other physical properties for gangue minerals present and hydrothermal newly-formed minerals, and
5. weathering and supergene alteration from a chemical and mineralogical point of view."

chemical and mineralogical properties in the short and the long term, and concerning any additives and residues in the waste.

The waste management plan is to be sent to the supervisory authority, which in this context is usually the municipality (Section 27 of the Ordinance on Waste from Extraction together with Section 31 of the Ordinance on Environmental Supervision (*miljötillsynsförordningen*, 2011:13) and Chapter 26 Section 3 second paragraph of the Environmental Code). The supervisory authority shall examine whether the plan meets the requirements set out in the Ordinance on Waste from Extraction. If the waste management plan is inadequate, the operator will be ordered to remedy the deficiencies (Sections 27–28 Ordinance on Waste from Extraction (*förordning (2013:319) om utvinningsavfall*)).

Svemin recommends

Waste management plan and categorisation

This guidance provides only a summary of the content of the provisions concerning the waste management plan and categorisation. The content has been adapted to take into consideration what is considered relevant in an exploration context. Naturally, in the individual case this may need to be checked by the prospector.

The provisions concerning waste plans and characterisation are fairly extensive. This is because the provisions cover extraction waste from both exploration and mining. There are great differences as regards the generation and extent of waste from exploration compared with mining, but this is not reflected in the provisions.

Svemin's opinion as regards the content and boundaries of both the waste management plan and the documentation of characterisation in conjunction with exploration is that the starting point must be the purpose of the provisions, which is to show that there is knowledge of the kinds of waste arising from the activity and that the waste will be dealt with in a way that does not cause environmental damage in the long or short term. The volume and type of extraction waste arising from exploration is typically so limited and modest in nature that extensive accounts of either characterisation or disposal are scarcely required.

5.3.4.11.5 Hazardous waste from exploration

The Ordinance on Waste states which waste is regarded as hazardous waste (Section 3 of the Ordinance on Waste (*avfallsförordning (2011:927)*) and Appendix 4 to the Ordinance on Waste. Hazardous waste may need to be managed and disposed of with a certain amount of caution and is therefore covered by special rules. For example, hazardous waste must not be mixed or diluted with other types of hazardous waste, other waste, or with other substances or materials (Section 16 Ordinance on Waste).

In Appendix 4 to the Ordinance on Waste there is a waste category (code 01) for "*Waste from exploration, surface and underground mining and from physical and chemical processing of minerals*". Within this category there is a separate group for "*Drilling sludge and other drilling waste*" (code 0105) and in some specifically listed cases this is stated as being hazardous waste.[88]

Whether or not drilling waste is hazardous waste depends on whether it contains substances which mean that it is considered to have harmful properties, or that it contains certain specific hazardous substances. According to the provisions, "*other drilling waste*" is not considered to be hazardous waste.[89] However, "*drilling sludge and other drilling waste containing oil*" is regarded as hazardous waste (code 010505, Appendix 4

88 Drilling sludge and other drilling waste is regarded as **hazardous waste** if:
1. the content of hazardous substances in the waste means that under Section 11b of the Ordinance on Waste it has one or more hazardous characteristics, or
2. the waste contains polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F), DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl) ethane), chlordane, hexachlorocyclohexane (including lindane), dieldrin, endrin, heptachlor, hexachlorobenzene, chlordecone, aldrin, pentachlorobenzene, mirex, toxaphene, hexabromobiphenyl or PCBs exceeding the concentration limits stated in Annex IV to Regulation (EC) No 850/2004.

89 The list of the waste categories drilling sludge and other drilling waste can be found under 01 05 in Appendix 4 to the Ordinance on Waste (*avfallsförordningen* (2011:927)).

to the Ordinance on Waste). Similarly, "*drilling sludge and other drilling waste containing hazardous substances*" is also regarded as hazardous waste (code 010506, Appendix 4 to the Ordinance on Waste). All waste from extraction must be disposed of in a manner that is safe for human health and the environment in both the short and the long term (cf. Section 22 point 8 of the Ordinance on Waste from Extraction).

5.3.4.11.6 Polluting waste – disclosure obligations and liability for remedial measures

Oil residues and spent or leftover chemicals are regarded as waste (i.e. not as waste from extraction) and must be disposed of in an appropriate manner. If such residues (or other substances) are spilt or otherwise leak out and risk polluting land, surface water or groundwater, the prospector (or the contractor) must immediately take action to limit the discharge.

Should pollution occur that could cause damage or detriment to human health or the environment, the prospector must inform the supervisory authority (Chapter 10 Section 11 Environmental Code), which may be the municipality or the county administrative board.[90] This disclosure obligation is subject to criminal sanctions (Chapter 29 Section 5 point 3 Environmental Code). Exemption from the obligation to inform the supervisory authority applies only if the pollution is insignificant and thus lacks significance as a risk factor for humans or the environment.[91]

The prospector or contractor that has caused pollution that could cause damage or detriment to human health or the environment is obliged to undertake or pay for the remedial action required in order to prevent, block or counter the damage or detriment to human health or the environment. In certain cases, remedial action for pollution may require the action to be first notified to the supervisory authority (Section 28 of the Ordinance on Environmentally Harmful Activities and the Protection of Health (*förordning (1998:899) om miljöfarlig verksamhet och hälsoskydd*).[92]

Suggested protective measures and a description of risks associated with the handling of oil and chemicals are described in 6.6.7 Chemicals, oils and fuels.

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90 The supervisory authority for pollution in connection with exploration is the municipality, since exploration is not an activity requiring a permit under the Environmental Code and associated ordinances (see Chapter 2 Section 31 point 3 compared with Chapter 2 Section 29 point 3 of the Ordinance on Environmental Supervision (*miljötillsynsförordningen, SFS 2011:13*)). However, if the activity (which caused the pollution) was covered by what is known as 12:6 consultation, then it is the county administrative board that is the supervisory authority, unless the county administrative board has transferred supervisory responsibility to the municipality (see Chapter 2 Section 8 point 9 and Chapter 1 Section 18 of the Ordinance on Environmental Supervision (*miljötillsynsförordningen*).

91 See Government bill 1997/98:45 part 2, p. 123.

92 The provision concerned states: "*Taking remedial action following harmful pollution in a land or water area, in groundwater, a building or a structure as described in Chapter 10 of the Environmental Code without notifying the supervisory authority is prohibited if the action may involve an increased risk of spreading or exposure of the pollution and this risk is not deemed minor.*"

Svemin recommends

Concerning responsibility and delegation of responsibility

According to the provisions of the Ordinance on Waste from Extraction, it is "the person who in their operations gives rise to or processes waste from extraction" that is responsible for taking waste prevention measures, preparing a waste management plan etc. **Svemin assesses** that as a starting point this is the responsibility of the prospector, in its capacity as the holder of the permit and the party that determines how the work is undertaken.

Since it is common for work in the field to be undertaken by contractors engaged by the prospector, **Svemin recommends** that the prospector's responsibilities and obligations relating to waste management are clearly set out so that the contractor is aware of what needs to be done. If any part of the responsibility is delegated to a contractor, it must be clear what has been delegated and the contractor must be given sufficient powers to be able to act independently so as to fullfill this responsibility.

Where relevant, **Svemin recommends** that the prospector monitors that delegated tasks have been carried out in a satisfactory manner. It is important to have clear and continuous dialogue between the client and the contractor so that matters can be resolved between them as needed.

Tips and experience concerning waste management

The rules concerning how waste and waste from extraction are to be managed and disposed of are extensive. A large amount of this is common sense, such as that littering is not permitted and that the waste arising must be dealt with correctly.

As a prospector it is important to be aware that there are special provisions on waste from extraction and that some waste from exploration may be hazardous waste. Drilling residues and water that do not contain oils or hazardous substances, or substances with dangerous properties, are not hazardous waste within the meaning of the law. The boundary between hazardous and non-hazardous waste is not particularly clear, since the definition of hazardous waste is a legal definition that is based on references to various provisions. The content of these provisions thus needs to be checked in order to find out whether the waste is hazardous waste. Svemin recommends that in the event of uncertainty the prospector contacts the supervisory authority to find out how the waste in question is to be dealt with.

Once the exploration work is complete, the site is to be left in good condition. Drilling residues that are not hazardous waste are often left next to the drilling site. This can work well, without causing any lasting negative impact on the environment. However, the volume and spread of drill cuttings can vary. Even if drill cuttings left behind do not result in any negative impact on nature, in certain cases it may still be appropriate to collect up drill cuttings in order to leave the site tidy. It is up to the prospector to use its discretion and do what is needed to leave the site in an acceptable state.

For a detailed description of dealing with drill cuttings, chemicals etc. – see 6.6.7 Chemicals, oils and fuels and 6.6.9 Drill cuttings.

6. WORK ENVIRONMENT AND EXTERNAL ENVIRONMENT FOR FIELD WORK

6.1 Introduction

6.1.1 Content of this chapter

This chapter describes how the prospector and any contractors engaged can work to plan and execute the works in the field well, as regards both the work environment and environmental protection (the external environment). The content of the chapter is based on experience and good examples from Svemin's member companies.

Naturally, the conditions in which the work is undertaken will vary from time to time. The advice provided here may need to be adapted to the individual case. An assessment must always be made of the risks that the planned exploration works may entail, regardless of the exploration method. Highlighting risks and working actively on preventive measures allows the risk of both accidents at work and the impact on the natural environment to be minimised.

6.1.2 Exploration work in the field

The exploration methods usually used are described in Chapter 2 and are not developed further in this chapter. The methods may be summarised as:

a) **Initial exploration methods** (geological mapping and boulder tracing, geochemical sampling and geophysical surveys)
b) **Further exploration methods** (top-hammer drilling, RC drilling and core drilling)
c) **Advanced exploration methods** (exploration trenches and test mining)

This chapter focuses on exploration work in which machinery is used (primarily geophysical surveys and drilling work), and among other things looks at:

- Regulations on the work environment and external environment (section 2)
- Systematic environmental and work environment management (section 3)
- Administrative preparations in advance of exploration works in the field (section 4)
- External environment – risks and preventive work for exploration in the field (section 5)
- Drilling on ice (section 6)
- Restoration measures etc. (section 7)
- Work environment (section 8)
- Check lists and recommendations (section 9)

Exploration in sight. PHOTO: GEOPOOL

6.2 Regulations on the work environment and external environment

6.2.1 General

Undertaking exploration work in the field requires a certain amount of knowledge of the current legislation and rules concerning the work to be undertaken. It is not uncommon for the prospector to engage consultants – for example, to draw up plans of operations and permit applications – and contractors – to carry out exploration work such as geophysical surveys and drilling work. In many cases these contractors have a good knowledge of the applicable rules in their own area. However, in most cases it is the holder of the exploration permit that has the ultimate responsibility and must keep checks on the rules in force.

Since the holder of the exploration permit (the prospector) is ultimately responsible for the exploration work, the prospector must ensure that the rules are complied with – regardless of who performs the work. All the operators involved must be aware of the permits and other rules that apply to the work that they have been engaged to carry out. The prospector may need to inform and impose requirements on contractors and other operators relating to their work on the work environment as well as the external environment.

6.2.2 Work environment legislation

The basis of work environment legislation is formed by the Work Environment Act (*arbetsmiljölagen*, SFS 1977:1160) and the Work Environment Ordinance (arbetsmiljöförordningen, SFS 1977:1166). The Work Environment Act and the Work Environment Ordinance apply to all enterprises, regardless of industry. These statutes are supplemented by a great many regulations concerning the work environment and apply to various types of work. The regulations are passed by the Swedish Work Environment Authority (*Arbetsmiljöverket*), which is the authority responsible for work environment matters. The regulations are designated by the Swedish Work Environment Authority with the prefix AFS (AFS = *Arbetsmiljöverkets Författningssamling*, meaning the Statute Book of the Swedish Work Environment Authority) followed by the year of issue and serial number of the regulation. The regulations are available on the Swedish Work Environment Authority's website.[93]

The level of detail in work environment legislation increases from the general provisions of the Work Environment Act to regulating the conditions of certain activities in detail in the Swedish Work Environment Authority's regulations. In total there are around 80 different AFS regulations, of which some are generally applicable and others are aimed at specific industries or activities. The regulation Systematic Work Environment Management (AFS 2001:1), for example, is generally applicable and is to be applied by all employers. Anyone who hires in labour is equated with an employer.[94] For mines and prospecting companies there is also a specific regulation entitled *Rock and Mine Work* (*Berg- och gruvarbete*) (AFS 2010:01).

The following can be stated regarding contractors. In a work environment context, a contractor is often an employer that undertakes work for another person.[95] The contractor may have multiple employees, but there are also contractors that are sole proprietors. As an employer, the contractor is responsible for systematic work environment management (see below – 6.4 Systematic environmental and work environment management) for its personnel, irrespective of where they carry out work.[96]

6.2.3 Environmental legislation

Environmental legislation is based on the Environmental Code (SFS 1998:808). The content and scope of the Environmental Code are considerably broader than those of the Work Environment Act.

Among other things, the Environmental Code contains general rules of consideration (Chapter 2) that apply to everyone that undertakes an activity or takes a measure that is not of negligible significance in the individual case. The general rules of consideration form the basis of various requirements that may be made of an enterprise. Among other things, persons who pursue an activity must "*possess the knowledge that is necessary in view of the nature and scope of the activity or measure to protect human health and the environment against damage or detriment*" (Chapter 2 Section 2 Environmental Code).

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93 See http://www.av.se/agochratt/afs/

94 See Section 1, AFS 2001:1 (the Swedish Work Environment Authority's provisions on Systematic Work Environment Management).

95 See p. 19 of the Swedish Work Environment Authority's guidance "*Arbetsmiljöansvar – för personal som är inhyrd eller arbetar på tillfälliga arbetsplatser (H432)*" ["Work environment responsibility – for personnel hired in or working temporarily at a location"].

96 See p. 19 of the Swedish Work Environment Authority's guidance H432, as above.

Persons who pursue an activity must also "*implement protective measures, comply with restrictions and take any other precautions that are necessary in order to prevent, hinder or combat damage or detriment to human health or the environment as a result of the activity or measure. For the same reason, the best possible technology shall be used in connection with professional activities*" (Chapter 2 Section 3 first paragraph Environmental Code). A person applying for a permit, approval, exemption etc. under the Environmental Code must be able to show that the obligations set out in the general rules of consideration are being satisfied. The general rules of consideration apply to the extent that compliance with the rules cannot be deemed unreasonable. In this assessment of reasonableness, particular importance is to be attached to the benefits of protective measures and other precautions in relation to their cost (Chapter 2 Section 7 first paragraph Environmental Code).

> The Environmental Code is applied in parallel with other legislation such as the Minerals Act.

6.2.3.1 Environmental legislation and the Minerals Act — parallel regulations

The Environmental Code is applied in parallel with other legislation such as the Minerals Act. This means that prospectors need to be aware not only of the provisions of the Minerals Act, but also of which provisions of the Environmental Code – and of ordinances and regulations issued by authorities pursuant to the Code – are applicable to the planned activity.

Alongside the Environmental Code, the Minerals Act also contains a general provision on environmental protection – namely that exploration work shall be carried out in such a way as to cause the least possible damage to and encroachment on any other person's property and the natural and cultural environment (Chapter 3 Section 3 fourth paragraph Minerals Act). Moreover, an exploration permit shall have attached to it the conditions necessary to protect public interests or private rights (Chapter 2 Section 10 Minerals Act). If the prospector engages contractors or others to carry out field work, these persons must be informed of the environmental considerations and any special restrictions – for example, those imposed by conditions or other decisions by authorities – that apply to the planned work.

6.3 Environmental training in the industry

On its own initiative, the industry is in the process of producing web-based training for those working on exploration in the field. The training will be aimed at work associated with exploration drilling. The content of the training aims to increase knowledge of environmental considerations associated with exploration. More information will be available on the Svemin website (www.svemin.se) once the material is complete.

6.4 Systematic environmental and work environment management

6.4.1 General approach

Systematic work means including environmental and work environment matters as a natural part of the operations. Systematic environmental and work environment management is a *method* that aims to ensure that planning, management and control of the operations take place in such a way that environmental and work environment requirements are continually taken into consideration in the operations. Clear policies for the environment and work environment can be important documents for clarifying the company's aims and providing a basis for follow-up and development of the work. Both prospecting enterprises and contractors that undertake field work associated with exploration must have systematic environmental and work environment management (see the Swedish Work Environment Authority's provisions on Systematic Work Environment Management (*Systematiskt Arbetsmiljöarbete*, AFS 2001:1). As regards environmental protection, general provisions can be found in Chapter 26 Section 19 of the Environmental Code.

Below are examples of routines and recommendations that should be applied in order to meet the requirements of systematic work environment management and to ensure good environmental work when undertaking exploration in the field.

> This systematic work can prevent not only accidents but also environmental damage, near-misses and risks.

6.4.2 Safety and environmental inspections

Safety and environmental inspections are a good way to check that the workplace is being kept in good order and is safe, that protective equipment is in place and is being used, that chemicals are stored correctly, that equipment is in good condition, that decontamination equipment is present and that no risks have arisen. During the inspection checks are also made that the enterprise is complying with the permits and any conditions that apply, and that any agreements with affected landowners and holders of special rights are being complied with. The inspections are to be carried out regularly – which could be once a month or at other intervals, as appropriate. During the inspection it may be a good idea to use a check list and to record any non-compliances found, so that they are documented and can then be followed up. For exploration work undertaken by a contractor it is helpful for the client and contractor to coordinate this so that both parties take part in the inspections. It is the employer that is responsible for work environment safety inspections being carried out, but other employees are expected to take part. A template for safety and environmental inspections can be found as an example in **Appendix 2** (*Safety and environmental inspections*).

6.4.3 Risk management

Risk management is an important part of systematic environmental and work environment management. Among other things, risk management involves assessing potential risks in order to identify risky circumstances before they result in an accident or ill-health or have an undesirable environmental impact. The Swedish Work Environment Authority's provisions on Systematic Work Environment Management (*Systematiskt Arbetsmiljöarbete*, AFS 2001:1) and regulations on Rock and Mine Work (*Berg- och gruvarbete*, AFS 2010: 1) states that risks are to be investigated and analysed, and that this must be documented. Equally important is to analyse potential environmental risks. It is important to carry out new risk assessments when changes are planned or made to the activities. For example, the establishment of a new drilling site, replacement or modification of machinery, introduction of new chemicals or other situations involving new or changed circumstances.

In brief, the process for risk assessment may be described as: **Identify** – **Assess** – **Manage**. Templates for risk assessment and more information concerning risk assessment can be found in e.g. the brochure "Systematiskt Arbetsmiljöarbete – Gruvindustrin" ["Systematic Work Environment Management – Mining Industry"], which can be ordered from Prevent, www.prevent.se.

Appendix 3 (*Risk management*) contains a more detailed description of risk management, and this is also supplemented with check lists and templates in **Appendices 3A–3C** (*3A: Examples of risks in exploration work, 3B: Risk assessment for exploration projects and 3C: Risk assessment for work equipment according to AFS 2006:4*).

6.4.4 Deviation management

Many of the accidents that happen are often preceded by a near-miss or risk. Deviation management involves documenting – within the operations and within the organisation – deviations and risks that are discovered, and using this knowledge to make systematic improvements. This systematic work can prevent not only accidents but also environmental damage, near-misses and risks. As part of this systematic work, there is to be a routine describing how deviations are to be reported. The routine must also describe how a deviation or risk is to be dealt with. For incidents that have occurred there must be descriptions stating whether an investigation is required into what happened and who is responsible for the next steps in the process. The aim of having routines for reporting and managing deviations is to prevent risks or near-misses from leading to accidents or incidents. It is therefore important that deviations are reported and that this is done promptly.

6.4.5 Work environment culture, attitudes and taking responsibility

Systematic work environment and environmental management works best when everyone participates and takes responsibility. This means not just clients and contractors, but also the individuals carrying out the work. It is important for management to visit the site regularly and ensure that rules are being complied with and that the work environment is good. At the same time, each individual has a responsibility of their own to show consideration, report flaws and actively comply with laws, rules and instructions. Having the right attitude is a constructive way to prevent ill-health, accidents and negative impact on the environment.

Well-functioning work environment and environmental management means that personnel performing the work:

- are aware of the risks of the work to be performed,
- participate in and carry out risk assessments,
- are aware of how risks, near-misses and accidents are to be reported and ensure that this is done,
- know how to act in an emergency,
- have access to relevant information,
- take care that the work to be carried out is communicated clearly and descriptively,
- are competent to carry out the work,
- have access to and use personal safety equipment, and
- have access to information from safety and environmental inspections and can follow up any need for measures arising from these.

6.5 Administrative preparations for exploration work in the field

6.5.1 Information on the permits etc. for the exploration work

Before the exploration work starts, all the necessary permits and approvals etc. must have been obtained and there must also be a valid plan of operations (see Chapter 5, Permits for exploration). Below are some examples and recommendations of things to think about ahead of the field work. Appendix 4 (*Check list prior to exploration*) contains examples of what may need to be checked and which permits, exemptions etc. may be needed before the exploration work starts. Appendix 4 merely provides examples and makes no claim to be complete or to describe what is always required.

To find out what interests and what natural and cultural assets are present in the area, it is recommended that the person wishing to undertake exploration investigates whether there is any *documented protection of nature or cultural heritage* in the exploration area (see 5.3 Other permits, approvals and exemptions). Field visits may also need to be made before applying for the necessary permits or exemptions, in order to assess the character of the exploration area (natural and cultural environment) and in order to be able to plan any precautions that may be required. If special notification, exemption or similar is required (other than an exploration permit and a plan of operations) it is important to plan ahead, since processing times by the authorities can vary.

It is important to plan carefully before starting field work.. PHOTO: GEOPOOL

6.5.2 Communication with affected parties

Before the exploration work is started it can sometimes be a good idea for the holder of the exploration permit to contact landowners and others who may be directly affected

by the work in order to ensure that no misunderstandings have arisen concerning what is going on. This recommendation is additional to the fact that there must be a valid plan of operations. The reason is that plans of operations can sometimes be extensive and valid for a relatively long period of time (see Chapter 4, Communication, consultation and collaboration).

6.5.3 Coordination and division of responsibility

Coordination responsibility for the work environment is regulated in Chapter 3 Section 7d of the Work Environment Act (*arbetsmiljölagen*) and, among other things, involves a person being designated as being responsible for coordination.[97] It is common for the party that wishes to undertake exploration to engage contractors to carry out the exploration work in the field. In such cases the division of responsibility as regards work environment matters and matters concerning the external environment may need to be clarified as early as the procurement stage. Sometimes the prospector engages a number of different contractors on the same exploration project, and in this case the division of responsibility between these contractors also needs to be clarified.

6.5.3.1 Start-up meeting

The party that holds the exploration permit has overall responsibility and should arrange a start-up meeting before the exploration work is begun. The start-up meeting is held in order to inform all those involved in the project of what applies to the specific assignment and what they need to be aware of about the area. This may be, for example, the content of permits and agreements, the need for precautions, the communication format, planning of meetings, documentation of the work etc. If the exploration work will continue for a long period it is recommended that meetings are held regularly to keep all those involved informed of the course of the project.

An example is given below of what a start-up meeting ahead of exploration drilling might include. The meeting should be attended by representative(s) of the client (prospector) as well as, for example, project managers, geologists and/or field technicians. The contractors who are to work in the field should participate with personnel representing all functions.

As an example, here are some suggested topics that the meeting might deal with:

1. Permits and conditions etc. for the performance of the activities

- Information about the exploration permit and review of valid plan of operations.
- Review of special conditions/provisions/decisions regulating the performance of the work, such as the content of an off-road driving exemption, decisions following notice of consultation in accordance with Chapter 12 Section 6 of the Environmental Code etc.
- Review of any special circumstances or considerations that apply to the execution of the work as a result of agreements with affected landowners and holders of special rights. This might include, for example, route suggestions from property owners or agreements concerning the felling of trees, the disposal of felled trees or other matters.
- How it will be ensured that provisions and commitments are complied with.

97 This provision is worded as follows (2 Nov 2015): "If a permanent place of business is a shared workplace for several businesses, the party that is in control of the workplace is responsible for the coordination of work environment issues. If a ship is a shared workplace for several businesses, the shipowner is responsible for such coordination. However, if a ship has been taken into a shipyard in Sweden, the party responsible for operating the shipyard is responsible for such coordination. The responsibility for coordination of safety measures required for the loading or unloading of a ship in a Swedish port rests with the employer responsible for this work. The responsibility for coordination set forth in the first paragraph can be transferred to a party conducting activities at the workplace or, where the loading or unloading of a ship in a Swedish port is concerned, at the port, or the shipowner. With regard to shared workplaces other than those referred to in the first paragraph, those who are conducting activities there may agree that one of them will be responsible for such coordination. This does not apply in the case of workplaces for building or civil engineering works."

2. Environmental issues

- Are there ancient remains in the area? Need for protective measures in order to avoid damage?
- Are there special natural assets to take into consideration (habitats, vulnerable wetlands and watercourses, nature reserves etc.)? Need for protective measures, taping off or other measures in order to avoid damage?
- Planning of driving routes. Need for field visits before the work is commenced? Need for preventive measures to combat ground damage?
- Are there cables in the ground and/or power lines in the area around the drilling site?
- Where is the water supply coming from? Are there any decisions by authorities or agreements regulating this?
- Instructions for dealing with drill cuttings and other waste disposal. Content of the waste disposal plan and any need to collect and remove drill cuttings.

3. Reporting

- Nomination of a person responsible for documenting work environment deviations and to whom these are to be reported.
- Nomination of a person responsible for documenting incidents impacting the environment and to whom these are to be reported.
- Nomination of a person responsible for reporting deviations and incidents (work environment and external environment) that are to be notified to an authority (for example, the county administrative board, the Swedish Work Environment Authority or the municipality).

4. Preventive work (work environment and environmental protection)

- Division of responsibility for implementation, documentation and follow-up of risk assessments.
- Division of responsibility for safety and environmental inspections. Who convenes meetings and who should attend?
- Nomination of person responsible for coordination.

5. Other

- Any special training requirements for participating personnel (e.g. hot work, cardiopulmonary resuscitation (CPR) etc.)
- Any special safety provisions to be applied (for example, the client's own policy on the work environment or environmental protection) over and above what is stated in permits, provisions etc.
- Agreements concerning the need for and planning of project meetings. Decision on who is to convene meetings.

6. Project folder

- Review of the "project folder" where documentation that should be present at the workplace is compiled. For example, the folder should contain copies of permits, plans of operations, maps, information concerning natural and cultural environments worthy of special protection, routines, check lists etc. and information concerning where the project folder is to be accessible (for example, in the drilling rig).
- Personnel working at the drilling site should sign to show that they have noted the documentation in the project folder.

For further support regarding planning and control ahead of drilling, establishment of a new drilling site and decommissioning of a drilling site, as well as examples of what a project folder should contain, see **Appendix 5** (*Planning prior to drilling and establishment of a new drilling site*) and **Appendix 5A** (*Check list – Planning prior to drilling and establishment of a new drilling site*).

Careful preparation prevents risks and facilitates the work. PHOTO: LKAB

6.6 External environment – risks and preventive work for exploration in the field

6.6.1 Content of the section

Below are examples of possible risks that may occur in exploration work. Suggestions are also given of preventive measures that may need to be taken to reduce the risk of accidents.

The focus of this section is on initial and further exploration work such as geophysical surveys, till sampling, cutting sampling and drilling. The chapter does not deal with the exploration methods of test trenches and test mining, the reason being that test trenches usually require notice of consultation in accordance with Chapter 12 Section 6 of the Environmental Code and test mining always requires a permit under the Environmental Code (see 5.3.4.2 Consultation in accordance with Chapter 12 Section 6 of the Environmental Code and 5.4.3.9 Permits for test mining).

6.6.2 Preventive measures in general

Both the prospector (permit holder) and contractors engaged must undertake the exploration in an environmentally acceptable manner and take reasonable measures to avoid adverse environmental impact. The prospector therefore needs to be aware of any measures that risk causing damage to the environment, so that preventive measures can be taken.

The landowners and holders of special rights affected receive information about the work through the plan of operations. Sometimes it may be expedient to also inform the public and others who are not directly affected about current work and its timetable along with contact details of a responsible person – for example, on a notice board, at a car park or at a drilling site.

6.6.3 Survey cables

In geophysical surveys, cables are placed on the ground – sometimes over relatively large areas. The surveys may be in progress for a short period or for longer. If surveying is taking place in areas frequented by people, it may be a good idea to clearly mark the cables (using tape, for example) and/or set out information boards. If the survey cables are to be left in place for more than a brief period, they need to be checked regularly to ensure that no animals have become ensnared in the cables.

6.6.4 Transport by road and off-road

Geophysical surveys, till sampling, cutting sampling and drilling all involve vehicle transport, such as all-terrain vehicles, snowmobiles and drilling rigs. Transport is needed both when carrying out the work and to transport machinery to and from the site. Transport takes place both along country roads and off-road. For exploration in forested areas there are sometimes forestry tracks that can be used, but it is not unusual for there to be no roads. When new driving routes need to be established in forest and off-road this must be planned in advance so as to limit encroachment and damage as far as possible.

Transport off-road often requires exemption from the ban on off-road driving (see 5.3.2 Off-road Driving Act). This provides a right to drive where this is otherwise prohibited and may involve conditions concerning how driving takes place in the specific area.

To reduce damage from off-road driving, good planning is needed (see 6.6.5 Valuable natural and cultural environments). It may be a good idea to study and evaluate different routes in advance by means of maps and field inspections. Existing routes, tracks and other old driving routes should primarily be used. If possible, the entire driving route should be inspected in the field in advance to evaluate any risks and difficulties along the route.

On snow-covered ground exemption is not required if it is expected that driving can take place without damage to the ground or vegetation. Even if the ground is snow-covered, driving in recently planted or young forest where the average height above the snow cover is less than two metres is prohibited unless it is clear that the driving can take place with no risk of damage to the forest (Section 1 first paragraph (2) Off-road Driving Act (*terrängkörningslagen*) and Section 4 Off-road Driving Ordinance (*terrängkörningsförordningen*)). Driving routes in winter time should therefore be planned so that they do not pass through recently planted or young forest if this can be avoided. If exploration work has to be undertaken in such an area, all driving must take place with the utmost care, in accordance with any exemption and if necessary in consultation with property owners.

The next section describes some useful things to think about as regards exploration work in relation to valuable natural and cultural environments. Some of these aspects may be good to be aware of when planning and carrying out transport, such as considerations when choosing driving routes and protective/restoration measures to reduce impact on sensitive natural and cultural environments as well as damage to the ground and forest.

6.6.5 Valuable natural and cultural environments

In the exploration area there may be valuable natural and cultural environments which need to be given special consideration when undertaking exploration work. Sometimes the nature in the area may be specially protected by decisions based on law or other provisions. This may mean that special permits or exemptions are required in order to carry out the exploration work – see 5.3 Other permits, approvals and exemptions.

Natural environments may be high in biodiversity and may be valuable even if they are not formally protected. Forested land, for example, often has wetlands and damp sections or other areas that are sometimes protected or classed as key habitats, but not always. Another example is “nature value trees”, which may be valuable because they contribute to biodiversity. These might include old bushy trees (living or dead, upright or fallen over), trees where birds’ nests are found, hollow trees or large-branched trees with a flat crown. Other things that may need particular consideration include the nests of birds of prey, pits and dens.

In addition to nature worthy of protection, there may be ancient remains or other cultural heritage in the areas where exploration is planned. Ancient remains must not be damaged (see 5.3.3 Ancient remains and cultural heritage). Valuable cultural heritage such as old building foundations, cairns, trapping pits and similar are relatively common and can be of value. If they were not previously known, they will not be recorded or listed in databases or on maps.

“If possible, the entire driving route should be inspected in the field in advance to evaluate any risks and difficulties along the route.

Tips and experience when working in sensitive areas or by sensitive objects

The following things are good to think about and may reduce the impact of the exploration:

- Consider whether there is a need for site-specific instructions. Sometimes required precautions are laid down as conditions in decisions on permits, approvals or exemptions. Where relevant, copies of decisions etc. should be available to everyone working on the project, including at the drilling site, for example in a project folder.
- Maps on which known valuable natural and cultural assets are marked must be available to all personnel concerned to facilitate planning and avoid misunderstandings.
- When planning driving routes and work, if possible consideration should be given to valuable natural and cultural assets, nature value trees, protected species or species worthy of protection, wetlands and particularly valuable environments so that damage can be avoided.
- If possible, driving routes should bypass sensitive sections. If so, it may be good to mark the route with tape or to cordon off sensitive objects.
- If it is assessed that damage will be caused to species worthy of protection or protected environments one alternative may be to investigate whether the time at which drilling takes place can be changed so as to reduce the impact.
- In difficult situations consideration may need to be given to whether it is possible to change the site of the drilled hole somewhat in order to avoid felling valuable trees or impacting valuable environments.

6.6.5.1 Forest assets

The trees growing in forestry land where timber is produced are typically of high financial value. Since at least some tree felling is often required in order to carry out the exploration work, for example in order to establish driving routes, such financial aspects need to be taken into consideration. Felling a few trees can impact the value of the forest because trees that grow up in the gaps arising will not manage to catch up with the surrounding forest. The gaps can therefore reduce the financial value of the forest (regarding compensation see Chapter 7 Compensation for damage and encroachment).

If possible, it is best to agree what is to be done with felled trees with the property owner in advance. Felled trees should generally be left behind so that the landowner can choose whether to leave them or to deal with the timber. If the exploration work results in more trees being felled than can be left behind according to the provisions of the Swedish Forestry Act (*skogsvårdslagen*) concerning the risk of insect attack, the prospector must arrange for these to be transported away and for the timber to be disposed of, unless agreed otherwise with the landowner.

Sometimes existing forestry tracks need to be used to get to the exploration site. In this case it is important to show consideration and to minimise damage to the tracks as far as possible. Damaged tracks must normally be compensated or repaired by the prospector.

6.6.5.2 Load-bearing capacity of the ground

Driving off-road can involve a risk of damage to the underlying surface. The damage that may arise from exploration work is comparable to the tracks left by forestry machinery. It is the characteristics of the ground (soil cover and hydrological conditions) that determine its load-bearing capacity. This is significant for how sensitive the ground is and what kind of transport it is suitable for or will cope with. Hard till copes with heavy and repeated transport better than fine-grained, sometimes moist soils or peat.

Often the load-bearing capacity is better on higher ground because it is usually drier and firmer than lower ground.

Substantial precipitation can rapidly change the load-bearing capacity of the ground during the bare ground season. In northern Sweden the ground is mostly frozen during the winter half of the year, which means that the load-bearing capacity is good. Mild and rainy autumns and early snow before the ground has properly frozen may make conditions worse, however.

During the bare ground season transport across wetlands should be avoided altogether. Transport in such areas should take place only when the ground is frozen, since otherwise the ground may be damaged. It should be noted that the load-bearing capa-

Svemin recommends

Before work in forested land

The following recommendations and preventive measures can reduce the risk of both misunderstandings and unnecessary damage:

- Before choosing driving routes in forested land the property owner should be contacted and given opportunity to present their views.
- Before felling trees, the prospector should agree with the landowner (or whoever else has felling rights) on how the felled trees will be dealt with and compensated.
- If possible, consideration should be given to the views given in connection with the plan of operations for the exploration work. The party carrying out field work in the project must be informed of such views and of any agreements that have been made.
- Often existing roads need to be used by the prospector for transport and for heavy vehicles. Contact should always be made with holders of road rights or authorised representatives of the road association before small access roads (which are often privately owned roads) are used.
- If old driving routes and paths are used, they must be restored so that they are accessible again.
- In connection with loosening of frozen ground, if possible the prospector should avoid using roads that are clearly likely to be damaged.
- The shortest driving route to the drilling site is not always the best option. Instead a longer route may sometimes need to be taken, for example taking into consideration the load-bearing capacity of the ground and which trees and the number of trees that need to be felled.
- If there are options, trees with a lower financial value (for example, small trees and trees that have not grown straight) should be felled in the first instance.
- When felling, trees and bush wood should be cut off as close to the ground surface as possible to avoid sharp stumps sticking up after the clearance.
- It is a good idea to photograph and document the current conditions along driving routes and at drilling sites before the work is started.

city during the winter may vary from year to year depending on temperature, precipitation and the depth to which the ground is frozen.

The ground damage that may arise from exploration work is compaction of the substrate and/or damage to ground vegetation. This can result in poorer growth of trees and the spread of root rot, particularly among fir trees. Erosion damage can also occur if water from precipitation and snow melt collects and runs into off-road wheel tracks.

If the load-bearing capacity of the ground is poor, machinery could get stuck. Should this occur and rescue measures are needed to free the machinery, it is important that a risk analysis is carried out first. Careful consideration must be given to the rescue method and to the consequences thereof. It may also be necessary for the client (prospector) to be informed by any contractors and to give approval before the measures are taken. If the load-bearing capacity of the ground is poor, there is a risk that the rescue operation will cause more damage unless the work has been well thought out and prepared for. There should always be established routines for action and communication in the event of machinery getting stuck.

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During the bare ground season transport across wetlands should be avoided altogether. Transport in such areas should take place only when the ground is frozen, since otherwise the ground may be damaged. It should be noted that the load-bearing capacity during the winter may vary from year to year depending on temperature, precipitation and the depth to which the ground is frozen.

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Tips and experience for avoiding the risk of ground damage

The following recommendations and preventive measures may reduce the risk of ground damage or limit the extent of the damage:

- The load-bearing capacity of the ground must be checked and assessed before machinery is transported off-road.
- If possible, avoid establishing driving routes across moist ground and sections with a low load-bearing capacity.
- If there is no choice but to drive across wetlands or in moist areas. it may be necessary for transport to take place during the winter when the ground is likely to be frozen solid.
- In the winter the depth to which the ground in wetlands is frozen should be checked (for example, using a skewer, axe or ice drill). Checks may need to be carried out at close intervals to ensure that the ground will still bear the load.
- The depth to which the ground is frozen solid should be measured continually or at least upon changes in the weather, since the depth to which it is frozen and its load-bearing capacity may change.
- If the load-bearing capacity of the route is assessed to be poor measures need to be taken:
  - In forested land the route can be reinforced with brushwood, slats or logs.
  - In winter driving routes may need to be packed preventively with snow, using small tracked vehicles or snowmobiles. Snow packing should preferably be carried out in good time before transporting in machinery.
- Driving routes should be inspected and risk-assessed continually, in both summer and winter. If the load-bearing capacity of the planned driving route deteriorates, measures should be taken. If it is assessed that significant driving damage will arise, it may be appropriate to use an alternative route.
- If possible, limit the number of journeys. Repeated driving in the same place can leave deep tracks that need to be repaired.

PHOTO: LEIF JOUGDA

A log bridge can be constructed to allow a brook or ditch to be crossed.

6.6.5.3 Crossing a brook or ditch

Crossing a ditch or small watercourse always involves certain risks, both in summer and in winter. For example, if no measures are taken the watercourse may be damaged by the crossing and there is a risk of machinery becoming stuck. Damage to banks and bottoms can result in collapse, erosion, clouding and sediment transportation. In the worst case, this could have adverse effects on fish and other aquatic organisms.

Svemin recommends

Before crossing small watercourses

The following preventive measures are recommended when crossing a brook or ditch in order to minimise the risk of impact:

- A risk assessment should always be carried out in conjunction with the planning of a brook or ditch crossing.
- If there is any doubt as to when and how the crossing can take place, the supervisory authority (county administrative board) should be contacted.
- Avoid driving in watercourses or on wetlands during the bare ground season.
- Use existing bridges or choose a suitable crossing point with care so that the bottom is left undisturbed as far as possible.
- If necessary and where possible, technical aids may need to be employed – such as mats or a log bridge. Such installations must be removed at latest when the work is complete.
- In winter crossing of frozen watercourses can be facilitated by packing with snow. However, packed snow can cause flooding during the snow melt and should therefore be removed once the work is complete and before the snow melts.

6.6.5.4 Power lines and pylons

Pylons, power lines and cables in the ground can sometimes cause problems for exploration work. If it is suspected that there are lines or pylons (that may be a cause for concern) this should be checked in advance to avoid problems. If there is any doubt concerning the risks that may arise, power line routes should be avoided or the risks thoroughly investigated before the routes are used, in order to reduce the risk of accidents. However, it must be pointed out that power line routes can make excellent transport routes if the cables are high up.

6.6.5.5 Recreation and outdoor life

Certain nature areas are used for outdoor life, for example exercise circuits, ski tracks, walking paths or hiking trails. Forested land is also used seasonally for hunting and fishing. When undertaking exploration work it may be a good idea to give consideration to this where possible if the work is to be undertaken during periods that may significantly disrupt such recreational activities.

Svemin recommends

Disruption to hunting and outdoor life

The following recommendations for preventive measures may be appropriate in order to reduce disruption of recreational activities and outdoor life:

- Avoid establishing transport routes along known areas for outdoor activities, such as along hiking trails and exercise circuits.
- If possible, avoid work during intensive hunting periods (for example, the first week of the elk hunting season), partly so as to show consideration but also for safety reasons.

6.6.5.6 Reindeer herding

In areas where reindeer herding takes place when the exploration work is to be undertaken precautions may need to be taken to avoid disruption to reindeer herding (see 4.4.3 Reindeer husbandry). Transport and engine noise are examples of things that may be disruptive, because they can disturb the reindeer's peaceful grazing and if things go badly, can scatter the reindeer herd. Driving routes in snow can also cause problems because the tracks are often easier to walk in, which can make the reindeer move along an undesired path. If the animals follow snowmobile tracks in the wrong direction it can cause additional work for the reindeer herders because they have to follow and collect up reindeer that have split off from the rest of the herd.

Svemin recommends

To avoid disrupting reindeer herding

The following recommendations may reduce the impact on reindeer husbandry conducted in the areas where the exploration work is in progress or is to be undertaken:

- If possible, the views of the reindeer herding district affected – as expressed in conjunction with preparation of the plan of operations – are to be taken into consideration.
- Where relevant, those carrying out field work must be informed of viewpoints and of any agreements that may affect how the work is carried out. For example, the choice of driving routes, a desire for drilling to stop when reindeer are being moved past, requests for communication concerning certain operations etc.
- To reduce the risk of negative impact on reindeer herding, it is a good idea to plan the exploration works for times of year when it will disturb reindeer herding as little as possible. However, this may be prevented if authorities have imposed conditions or other restrictions in order to avoid damage to the natural environment.
- When survey cables are placed out they are to be placed as close to the ground as possible and subjected to supervision or regular checks so that reindeer and other animals do not get snared by the cables and injured.

6.6.6 Noise

Noise is an undesired sound and in some areas noise can be perceived as disturbing. Noise is also an aspect of the work environment that must be considered. Drilling personnel who spend time in a noisy environment, for example, must use approved hearing protection. Both drilling and geophysical surveys by aircraft or helicopter cause noise in the areas where the work is undertaken. A noise risk assessment should be carried out before noisy exploration work is carried out – i.e. an investigation of whether there are surrounding environments or activities that may be disturbed by noise from the operations. For example, there may be neighbouring settlements, farm animals or areas where reindeer are herded.

In spring 2015 the Swedish Environmental Protection Agency published new guidance on noise from industry and other operations.[98] The guidance is intended to be applied to environmentally hazardous operations that cause noise outdoors. Exploration drilling may be regarded as being among the types of operations intended. The guidance of the Swedish Environmental Protection Agency is not legally binding, but can form a starting point for assessing the extent to which noise from operations should be prevented or limited. In areas where noise may be perceived as disturbing, the prospector (or contractor) should ensure that the noise from the operations at the nearest adjacent settlement does not exceed the Swedish Environmental Protection Agency's guidelines (see below). The guide values are intended to be applied at dwellings, among other places, and apply outdoors by the facade, in outdoor spaces and other areas where people spend time in the vicinity of their homes.

Equivalent sound level, LAeq8h			**Maximum sound level, LAFmax** (on a few occasions)
Daytime 06.00–18.00	Evenings 18.00–22.00 as well as Sundays and holidays Daytime 06.00–18.00	Nights 22.00–06.00	Nights 22.00–06.00
50 dBA	45 dBA	40 dBA	55 dBA

Figure 3: Guide values for sound levels. Source: Swedish Environmental Protection Agency "*Vägledning om industri- och annat verksamhetsbuller*" ["Guidance on noise from industry and other operations"], Report 6538.

98 The guidance "*Vägledning om industri- och annat verksamhetsbuller*" ["Guidance on noise from industry and other operations"], Report 6538, can be downloaded from the Swedish Environmental Protection Agency website: www.naturvardsverket.se

Tips and experience for limiting noise

To reduce noise, the following precautions can be taken:

- Avoid having machines running at idle.
- Position generators and other noise sources away from the drilling site (or the place where the noise needs to be limited).
- Use noise reduction mats.
- Embed diesel engines in sound-insulating units
- In the vicinity of dwellings and other sensitive places drilling may need to be restricted to certain times of day in order to minimise noise disturbance.

6.6.7 Chemicals, oils and fuels

6.6.7.1 Fuels and chemicals in general

The storage and handling of chemicals, oils and fuels always involves certain risks. These must therefore be dealt with in such a way as to avoid any detrimental impact on health or the environment. The rules that apply are outlined below. Also described are some conceivable risks involved in handling chemicals, oils and fuels during exploration work in the field, as well as examples of preventive measures that are recommended in order to reduce the risk of accidents and spills.

6.6.7.2 At the drilling site

Drilling work requires fuel for machinery and transport vehicles. Usually, hydraulic oils are also needed, and sometimes also other chemicals. For more extensive work tanks are usually used to store fuel, often placed by adjoining roads or at a storage site. In such cases, fuel may be transported from the tank to the drilling rig by all-terrain vehicle or snowmobile.

Since drilling rigs are hydraulically equipped, the oil in the machinery needs to be changed at regular intervals. If this is done in the field, any risks involved in the handling of oils and oil changes need to be identified and prevented (see below).

In connection with drilling, drilling chemicals are sometimes used to seal cracks in drilled holes and in certain cases to reduce friction. Any residues of drilling chemicals must be collected up and disposed of.

If there are alternatives, in the first instance oils and chemicals that are kind to the environment are to be used – for example, products that are readily biodegradable or which otherwise meet environmental requirements. Experts at SP Technical Research Institute of Sweden (*SP Sveriges Tekniska Forskningsinstitut*), now part of RISE[99], have reviewed products meeting the environmental requirements set out in Swedish standard SS 15 54 34 – see the RISE website: "Hydraulvätskor – Krav och provningsmetoder" ["Hydraulic Fluids – Requirements and Test Methods"]. For contractors it is important to check that all chemicals used are approved by the client before being used in the workplace.

At the drilling site there should be a chemicals list, including (where relevant) safety data sheets (which should not be more than two years old) for the chemicals present at the site. Safety data sheets include information concerning the chemicals' dangerous properties, handling and storage, toxicological effects, measures in the event of accidental discharge, how they are to be disposed of etc.

Safety data sheets are to be provided by the company that releases the chemical product onto the market. Not all chemicals are required to have a safety data sheet, but chemical products that are classified as hazardous and that have been provided for professional use must have a safety data sheet. These must be provided free of charge, at latest when the product is first delivered. After updating safety data sheets for hazar-

99 RISE stands for Research Institutes of Sweden and is the result of a merger between Innventia, SP and Swedish ICT.

dous products the supplier must provide updated sheets to all professional customers to which the supplier has supplied the product over the past 12 months.[100]

6.6.7.3 General rules of consideration

According to the Environmental Code's general rules of consideration (the precautionary principle – see Chapter 2 Section 3 Environmental Code), a person who handles chemicals must implement protective measures and take any other precautions that are necessary in order to prevent, hinder or combat damage or detriment to human health or the environment as a result of the activity or measure.

Where possible, persons who pursue an activity shall avoid using chemical products that may involve risks to human health or the environment if products that are assumed to be less dangerous can be used instead (the product choice principle, Chapter 2 Section 4 Environmental Code).

According to the polluter pays principle (Chapter 2 Section 8 and Chapter 10 Section 4 Environmental Code), persons who have caused pollution that may cause damage or detriment to human health or the environment are responsible for remedying it to the extent reasonable in order to prevent, hinder or combat subsequent damage or detriment to human health or the environment (see 6.6.7.8 In the event of pollution: preparedness, dealing with spills and action). The liability exists until the pollution has been remedied such that there are no longer any risks to the environment or health.[101]

6.6.7.4 Chemicals

Swedish provisions on chemicals are largely based on EU legislation – principally the REACH Regulation, which is directly applicable in Sweden.[102] The regulations on chemicals are extensive and those who want to study them in more detail can read more on the website of the Swedish Chemicals Agency (*Kemikalieinspektionen* – KEMI) or contact the authority.[103] A company that uses the substances and preparations in an industrial process or in the exercise of a profession, but which does not supply it to other users, is known as the "end-user" and falls within the REACH Regulation's legal definition of a "downstream user" (Article 3.13). The Swedish Chemicals Agency describes an "end-user" as the person who "stores and uses chemical products, control agents or goods in a professional capacity without selling them on".[104] The responsibility of end-users of chemical products mainly involves reading and following the product information that is to be provided with chemical products, usually in the form of labelling on the packaging and in safety data sheets for the products. The product information contains information on any dangers associated with the product and describes its safe handling. In addition to these generally applicable provisions, it may be the case that the prospector (or client) has internal procedures for approving the use of chemicals. Where relevant, the prospector/client therefore needs to inform any contractors of the rules that apply.

> "The product information contains information on any dangers associated with the product and describes its safe handling.

6.6.7.5 Measures to limit serious chemical accidents

Under the Act on Measures to Prevent and Limit the Consequences of Serious Chemical Accidents (*lag (1999:381) om åtgärder för att förebygga och begränsa följderna av allvarliga kemikalieolyckor*), an operator must prevent the risks of serious chemical accidents. Where a serious chemical accident has occurred, an operator is obliged to limit the consequences for human health and the environment (Section 6). The Act is only applicable

100 See the Swedish Chemicals Agency website: https://www.kemi.se/en/prio-start/chemicals-in-practical-use/safety-data-sheets?_t_id=1B2M2Y8AsgTpgAmY7PhCfg%3d%3d&_t_q=data+sheets&_t_tags=language%3aen%2c siteid%3a007c9c4c-b88f-48f7-bbdc-5e78eb262090&_t_ip=88.97.52.72&_t_hit.id=KemI_Web_Models_Pages_Prio_PrioArticlePage/_5c0be1c5-fdca-458f-9f3f-0aab98645431_en&_t_hit.pos=1

101 The Swedish statute of limitations (*preskriptionslagen*) is not applicable to liability for remedying pollution damage – see Chapter 10 Section 8 Environmental Code).

102 Regulation (EU) No 1907/2006 of the European Parliament and of the Council of 18 December 2006.

103 See www.kemi.se

104 See http://www.kemi.se/vagledning-for/foretag/slutanvandare

to activities in which certain hazardous substances are present. The activities are classified as having lower or higher requirements depending on the hazardous substances referred to and the quantities in which they occur (Section 3). What is counted as a hazardous substance, and the limits for low and high requirements respectively, are stated in the Ordinance on Measures to Prevent and Limit the Consequences of Serious Chemical Accidents (*förordning (2015:236) om åtgärder för att förebygga och begränsa följderna av allvarliga kemikalieolyckor*). Activities that are covered by the Act shall be notified in writing to the county administrative board before they are commenced (Section 7).

According to Section 4 (2), the Act is not applicable to the handling of hazardous substances that is covered by the Transport of Dangerous Goods Act (*lagen (2006:263) om transport av farligt gods*) and which takes place outside the enterprise (see 6.6.7.7 Transport of dangerous goods).

6.6.7.6 Permit obligations for flammable substances

Under Section 16 of the Flammables and Explosives Act (*lag (2010:1011) om brandfarliga och explosiva varor*), persons who handle, transfer, import or export explosive goods and persons who deal with flammable goods professionally or in large quantities must have a permit for this. Matters concerning permits for handling flammables are examined by the municipality where the handling is to take place (Section 17 of the above Act). What is considered to be a "large quantity" (and thus requires a permit) is described in the handbook issued by the Swedish Civil Contingencies Agency (*Myndigheten för samhällsskydd och beredskap – MSB*) entitled "*Tillstånd till hantering av brandfarliga gaser och vätskor*" ["Permits for handling flammable gases and fluids"] (October 2013), which is available on the MSB website. The handbook states, among other things, that it is the person who handles the flammables that must have a permit.[105] In the case of an enterprise, the permit must cover the whole of the enterprise's handling; in other words, it cannot be split up for different individuals or departments. It is also stated that it is not uncommon for a permit holder to transfer handling to another party, who in which case is the party that needs to have a permit.[106]

The quantities that may be handled without a permit are stated in the MSB handbook (see below). Handling flammable gases and liquids in professional non-public activities without exceeding any of the following quantities is exempt from requiring a permit.[107] By "public activity" is meant "handling in an enterprise to which the general public has access".[108]

Svemin recommends

Concerning preparedness for preventing chemical accidents

The provisions concerning measures to limit serious chemical accidents are mentioned in the guidance for information. In connection with exploration, the quantities of chemicals handled are never large enough for the provisions concerning measures to limit serious chemical accidents to apply. Nonetheless, it is recommended that all prospectors that handle chemicals do so in accordance with the intentions of the Act, i.e. such that the risk of chemical accidents is prevented.

In other respects the Environmental Code's general rules of consideration apply. According to the precautionary principle, if there is reason to assume that an activity or measure may result in damage or detriment to human health or the environment then the operator must take the protective measures, comply with the restrictions and take the other precautions needed in order to prevent, hinder or combat damage to human health or the environment as a result of the activity or measure (Chapter 2 Section 3).

105 See p. 6 of the handbook. It is the legal entity that has actual and legal control over the enterprise that must have the permit, i.e. the entity that is actually and legally able to directly determine its handling.

106 See page 6 of MSB handbook "*Tillstånd till hantering av brandfarliga gaser och vätskor*" ["Permits for handling flammable gases and fluids"] (October 2013).

107 See Chapter 2 Section 3 of the Swedish Civil Contingencies Agency's provisions on permits for handling flammable gases and liquids (*MSB:s föreskrifter om tillstånd till hantering av brandfarliga gaser och vätskor*) (MSBFS 2013:3).

108 See Chapter 1 Section 3 of MSBFS 2013:3 and p. 8 of the MSB handbook.

Handling	Volume (litres)			
	Flammable gases	Extremely flammable or flammable aerosols	Flammable liquids with a flash point of up to 60 °C	Flammable liquids with flash point higher than 60 °C up to and including 100 °C[1]
Professional[2] public activity	Indoor: 2 Outdoor[3]: 60	100	100	10,000
Professional non-public activity, indoor	250	500	500	10,000
Professional non-public activity, outdoor[4]	1,000	3,000	3,000	50,000
Non-professional handling[5]	LPG: 60 Other gases: 10	100	100	10,000

1 Also includes gas oils, diesel and light heating oils with a flash point of 55–60 °C.
2 Professional means all handing that is not private, e.g. also by associations and voluntary organisations.
3 This applies provided that the consumption also takes place outdoors.
4 Outdoor also includes buried cisterns and pipelines.
5 This includes only private handling.

Figure 4: The table and its contents have been taken from the handbook issued by the Swedish Civil Contingencies Agency (*Myndigheten för samhällsskydd och beredskap* – MSB) entitled "*Tillstånd till hantering av brandfarliga gaser och vätskor*" ["Permits for handling flammable gases and fluids"] (October 2013).

6.6.7.7 Transport of dangerous goods

In general, the party transporting dangerous goods or handing over dangerous goods to another party for transport must take the protective measures and other precautions needed in order to prevent, hinder and limit damage to life, health, the environment or property caused by the hazardous properties of the goods during their transportation or through unauthorised procedures involving the goods during transport on land. It is then particularly important that the means of transport, packaging and other transport arrangements used are suitable for transporting dangerous goods.[109] Dangerous goods may be transported only on the terms and under the conditions stated in the Transport of Dangerous Goods Act (*lagen (2006:263) om transport av farligt gods*) and in the provisions passed pursuant to the Act (Section 2 second paragraph).

Dangerous goods means substances and objects which, because of their chemical or physical characteristics, may cause damage to life, health, the environment or property during transport.[110] Dangerous goods may, for example, have explosive, flammable, toxic, radioactive or corrosive properties. Examples of dangerous goods include petrol, diesel, LPG, sulphuric acid, arsenic and water pollutants. The term *transport of dangerous goods* encompasses more than just movement by means of various modes of transport. Loading and unloading, as well as such storage and handling of dangerous goods as is associated with transport, are also included. However, movement that takes place only within an area where the manufacture, storage or consumption of dangerous goods takes place is not considered to be transport of dangerous goods.

Under Section 2 of the Transport of Dangerous Goods Act (*lagen (2006:263) om transport av farligt gods*), the party transporting dangerous goods or handing over dangerous goods to another party for transport must take the protective measures and other precautions needed in order to prevent, hinder and limit damage to life, health, the environment or property caused by the hazardous properties of the goods during their transportation or through unauthorised procedures involving the goods during transport on land. It is then particularly important that the means of transport, packaging and other

109 See Section 2 of the Transport of Dangerous Goods Act (*lag (2006:263) om transport av farligt gods*).

110 The information in the whole of this paragraph has been taken from the handbook issued by the Swedish Civil Contingencies Agency entitled "*Transport av farligt gods, Väg och järnväg 2017/2018*" ["Transport of Dangerous Goods: Road and Rail 2017/2018"], page 10.

Tips and experience for limiting the risks involved in handling chemicals

The storage of fuels, oils and chemicals may involve a certain risk of leakage from containers, cans or tanks. The following recommendations and instructions must or should be complied with for risk prevention purposes:

- Transport and storage of fuels must take place in ADR-approved tanks in accordance with the more detailed regulations in ADR-S. Note also any provisions concerning labelling and inspection of tanks.
- Containers of fuel, oil and other chemicals must be correctly labelled.
- For preventive purposes daily inspection and checks are to be carried out on all storage, drilling rigs and other equipment (for example, checking hydraulic hoses, pumps, motors, generators, tanks and containers); see also Appendix 6 (Environmental control for drilling site) and Appendix 6A (Check list – Environmental control for drilling site). Faults discovered should be remedied as soon as possible.
- All handling (such as refilling, refuelling or transport) of fuel, oil or chemicals must be carried out with care so that no spillages into the natural environment occur. Drip trays, spill trays or waste collecting trays can be used, for example.
- Should a leak occur in hoses or machinery, measures must be taken immediately to prevent oil, fuel or other chemicals from reaching the ground.
- Decontamination equipment must always be present where oils, fuels and chemicals are stored.
- Any spill or leak that has reached the ground must be cleaned up immediately if possible (see 6.5.7.7 In the event of pollution: preparedness, dealing with spills and action).
- Ensure that safety data sheets are available and that those handling chemicals know where to find the safety data sheet.
- All storage should take place at a safe distance from watercourses. At least 30 metres is recommended.
- Storage (does not apply to ADR-approved tanks) should take place on a spill tray or in a bound vessel with an impenetrable bottom that is designed to collect the contents of a tank or container in the event of a leak or other accidental spillage.
- The storage site or collecting tank should have a roof, or alternatively be placed in a larger container or a cabinet that protects the storage from precipitation.
- Drills, electrical units, water heaters and other equipment containing fuel or oil may need to be placed and/or stored on an oil-absorbent cloth or spill tray.
- A check should be made as to whether there are any restrictions imposed by regulations safeguarding water protection areas.

transport arrangements used are suitable for transporting dangerous goods. Dangerous goods may be transported only on the terms and under the conditions stated in this Act and in the provisions passed pursuant to the Act.

The transport of dangerous goods in Sweden by road and off-road is regulated in detail in regulations generally known as ADR-S.[111] The regulations contain, among other things, "specific national provisions on the transport of dangerous goods by road and off-road". The provisions of ADR-S are highly detailed and are not reproduced in more detail here. It is up to the party transporting the substances that may be classified as dangerous goods to find out the rules that apply in the case in question.

6.6.7.8 In the event of pollution: preparedness, dealing with spills and action

Should a spill or leak occur, it is important to be prepared. Even if there are no formal requirements, it may still be good to have a contingency plan that describes both preventive work and how any spills are to be dealt with. Documented routines often reduce the consequences of an accident.

Preventive equipment that may be good to have on hand *include:*

- Fire extinguishers
- Decontamination equipment (e.g. oilcloth, absorbents, boom, shovel and plastic bags)
- Documented action plan (contingency plan)
- Alarm list/contact details of the rescue services, supervisor, client, etc.

> "Documented routines often reduce the consequences of an accident.

111 ADR-S 2017: The Swedish Civil Contingencies Agency's provisions on the transport of dangerous goods by road and off-road (*föreskrifter om transport av farligt gods på väg och i terräng*, MSBFS 2016:8). The provisions can be downloaded from or ordered via the website of the Swedish Civil Contingencies Agency (*Myndigheten för samhällsskydd och beredskap* – MSB) (https://www.msb.se/)

Decontamination measures *may involve, among other things:*

- Spilt fuels, oils or chemicals must be collected up immediately if possible
- Incidents must be reported to supervisors and the client (permit holder)
- The supervisory authority must be informed of spills, leaks and other discharges that could constitute pollution (discharges that may involve damage or detriment to human health or the environment).
- Contaminated materials and absorption materials must be disposed of correctly.
- Avoid using chemicals to dissolve oils and other spills unless this is expressly prescribed in the safety data sheet.
- Decontamination work may need to be preceded by a special notification to the supervisory authority – see below.

6.6.7.9 Liability for discharges and spills

Any person who deliberately or negligently causes a substance to be discharged into the ground, water or air which typically or in the individual case involves or may involve

a) harm to human health or detriment to flora and fauna that is not inconsiderable
b) other significant detriment to the environment

may be fined or imprisoned for up to two years for environmental offences (Chapter 29 Section 1 Environmental Code). Both deliberate and negligent acts may result in liability. How the discharge occurred is not significant, since the criminal act is that someone (the perpetrator) causes a substance to be discharged that typically (or in the individual case) results in (or may involve) harmful pollution or significant detriment.[112] BBoth active and passive actions can result in liability.[113] Should pollution occur that may result in damage or detriment to human health or the environment, the prospector or contractor is obliged to inform the supervisory authority (Chapter 10 Section 11 Environmental Code). Notification is compulsory unless the pollution is insignificant or presents no risk to humans or the environment.[114] There are criminal sanctions associated with such compulsory notification and a person who fails to notify the supervisory authority may be convicted of the offence of obstruction of environmental control (Chapter 29 Section 5 (3) Environmental Code).

PHOTO: LKAB

One precaution might be to place an adsorbent mat where spills may occur.

Persons who have caused pollution that may result in damage or detriment to human health or the environment shall, to the extent reasonable, carry out or pay for any after-treatment measures that are necessary in order to prevent, hinder or combat subsequent damage or detriment to human health or the environment (Chapter 10 Sections 2 and 4 Environmental Code). The after-treatment may consist of decontamination measures, among other things, but also subsequent checks and sampling to check that the measures have had the desired effect. Depending on how the pollution was caused and how liability is divided between prospector and contractor, either the prospector or the contractor, or both together, may be liable for the after-treatment (Chapter 10 Section 6 Environmental Code). There is no limitation period for the liability; instead the liability exists for as long as the damage persists (Chapter 10 Section 8 Environmental Code).

It is important to be aware that after-treatment measures such as decontamination

112 See Government bill 2005/06:182, p. 141.
113 See Government bill 2005/06:182, p. 141.
114 See Government bill 1997/98:45 part 2, p. 123.

may be prohibited until they have been notified to the supervisory authority (see Section 28 of the Ordinance on Environmentally Harmful Activities and Health Protection (*förordning (1998:899) om miljöfarlig verksamhet och hälsoskydd*)). This applies to action taken following pollution in a land or water area, in groundwater, a building or a structure if the action may involve an increased risk of spreading or exposure of the pollution and this risk is not deemed minor. [115] If it is difficult to decide whether the actions require notification, it may be a good idea to contact the supervisory authority for a dialogue on the matter. Failure to notify the action may lead to prosecution and penalties for the offence of unauthorised environmental activity (Chapter 29 Section 4 first paragraph (b) Environmental Code).

6.6.7.10 Environmental consequences of a spill or leakage

A discharge that causes pollution may have adverse environmental effects and be costly to remedy. In unfortunate cases, ground pollution may reach and pollute groundwater and perhaps even wells. More extensive pollution that reaches brooks and lakes may have an adverse impact on animal and plant life within a wider area.

Svemin recommends

Environmental impact assessment of water extraction

Exploration drilling varies in extent. Sometimes only a few holes are drilled, and sometimes the drilling continues for a lengthy period. The holes drilled also vary in depth. An environmental impact assessment may be needed to assess the impact that the planned extraction of water from a proposed extraction point will have. It is suggested that the following factors are included in the impact analysis:

- The capacity of the water pump and the estimated water consumption (e.g. in litres per minute).
- For how long drilling will continue and whether the same extraction point will be used for all the holes drilled.
- Calculation – at least approximately – of the watercourse's water balance (lake), i.e. inflow relative to outflow, or flow (brook).
- In the case of very significant extraction it may be necessary to assess how the total water volume of the watercourse will be affected by the planned extraction of water.

6.6.8 Need for water and assessment of the consequences of extracting water

When carrying out exploration drilling, and particularly diamond-tipped drilling, cooling water is needed to cool the drill bit. Such water can be taken from a lake, a watercourse or from previously drilled holes and pumped to the drilling rig through pipelines. If there is no cooling water available in the vicinity of the drilling site it may need to be transported there in a tank.

Water from a lake or a watercourse is pumped to the drilling rig via a hose or pipeline. The pump is usually powered by an electrical unit. Fuel is often transported to the unit by quad bike or snowmobile. All handling and transport of fuels should also take place in accordance with the recommendations in 6.5.7 Chemicals, oils and fuels.

Pumping water from natural watercourses can sometimes have a local effect on the water level and also on the water supply downstream in the water system. The impact that arises will depend on the quantity of water extracted in relation to the hydrological conditions in the watercourse. If the watercourse is small relative to the quantity pumped, and there are no natural inflows or if there is little run-off coming into the watercourse, the extraction of water may in certain cases have a more significant impact on the water level at the extraction point. In other cases, however, the impact is minor or non-existent. When extracting groundwater there may be a risk that individual wells are affected if the extraction results in a lowering of the groundwater table to an extent that has consequences.

115 See Section 28 of the Ordinance on Environmentally Harmful Activities and Health Protection (*förordning (1998:899) om miljöfarlig verksamhet och hälsoskydd*).

Mobile basin for sedimentation of drill cuttings. PHOTO: LKAB

If the extraction of water will continue for a long period or is otherwise of such extent that it may have an impact on public or private interests, an assessment needs to be made of whether the extraction of water requires a permit or notification (see 5.3.4.10 Water use). If there is uncertainty concerning the effects of extracting water and any permit/notification obligation, the county administrative board should be contacted for a dialogue.

6.6.9 Disposal of drill cuttings

Cuttings – finely ground rock material – arise when carrying out top-hammer drilling, RC drilling or diamond drilling. Drill cuttings are waste from extraction and special rules apply to the handling and disposal of such waste (see 5.3.4.11 Waste).

In top-hammer drilling and RC drilling the cuttings are driven through the drilled hole up to the surface using compressed air. In diamond drilling the cuttings are transported to the surface with the cooling water. In both cases the cuttings end up on the ground unless they are collected up. The quantity of cuttings formed depends on the

Svemin recommends

Drill cuttings

Drill cuttings can sometimes have certain adverse effects if left in the surroundings. Even if they do not cause any damage, the drilling site may look messy if there are large quantities. In the case of diamond drilling the cuttings are mixed with water and can cause clouding if they end up in watercourses.

The following measures are recommended in order to reduce the risk of impact from drill cuttings:

- Avoid draining drilling fluid into any watercourse.
- The drilling fluid should be directed so that the drill cuttings are drained into the ground before the water reaches a watercourse or lake.
- Use a sedimentation tank to collect up drill cuttings if the drilling site is in a sensitive area, for example if there are watercourses or lakes very close to the drilling site or if the drill cuttings are expected to contain environmentally hazardous substances (see 5.3.4.11 Waste). The tank should be large enough for the drill cuttings to be able to sediment out.
- A sedimentation tank may also need to be used if the drilling will generate large quantities of cuttings, or if no cuttings whatsoever should be left at the drilling site for other reasons.
- Drill cuttings may only be placed in landfill in consultation with the client (permit holder).

Svemin recommends

Before drilling on ice

If drilling on ice is to be undertaken, preventive measures must be planned with care and precision so as to avoid any risk of workplace accidents or environmental damage. The following recommendations may be good to bear in mind:

- A detailed risk assessment is needed as regards any environmental and work environment risks.
- Coordination responsibility and the division of responsibility must be clearly set out.
- Take preventive measures to avoid the risk of drowning.
- Be alert to the need for knowledge of the ice's characteristics and load-bearing capacity, transport routes across the ice, appropriate transport speed, etc.
- For planning and before implementing road-building, supervision, operation and precautions on the ice, some guidance is available in the report by the Swedish Work Environment Authority entitled "Isvägar i skogsbruket" ["Ice Roads in Forestry"], Report 2003:1.
- For the handling of chemicals, oils and fuels at least the same recommendations apply as are stated in 6.6.8 Chemicals, oils and fuels. Check whether there are local regulations that are significant for the handling of chemicals and fuels.
- Any spillage or leakage of fuels, oils and chemicals must be cleaned up immediately if possible. Be aware that the supervisory authority may need to be contacted before any decontamination measures are carried out (see 6.6.7.9 Liability for discharges and spills).
- No chemicals, fuels or oils should be stored on the ice. The storage/collection point should be placed on land.
- As far as possible, drill cuttings should be collected up and not left at the drilling site (on the ice).
- Casings left behind should be cut off so close to the bottom that they do not present any risk of harm to animals or to bathers and boat traffic during the summer.
- Once drilling is complete, the drilling site should be cleaned and left in good condition (see 6.8 Environmental protection – after-treatment and restoration measures).

width and depth of the holes drilled. The usual lengths for percussion or diamond drilling generally do not generate particularly large quantities of cuttings. In the case of RC drilling, however, there can be more considerable quantities of cuttings since the hole diameter is often up to 100–150 mm. To collect cuttings the RC rig must be equipped with some kind of collecting device.

6.7 Drilling on ice

Drilling on ice occurs in a few cases. Such drilling may be associated with both work environment risks and environmental risks and must therefore be planned carefully. Constructing roads, driving or drilling on ice requires special knowledge since the load-bearing capacity of the ice can change within a short time. A drilling rig that is set up on the ice may affect the load-bearing capacity of the ice through the heat and vibrations coming from the drill. Moreover, wind and other weather as well as movements in the water under the ice can change the conditions, and thus the risk picture, in a relatively short time.

Since fuel and oil are handled during drilling work, the risk of spillage or oil leakage from the drilling rig – both onto the ice and into the water – cannot be excluded. Fine-grained drill cuttings, if not collected up and disposed of, could cause clouding in the watercourse when the ice melts.

6.8 Environmental protection – after-treatment and restoration measures

Under the Environmental Code littering is prohibited in places to which the public has access (Chapter 15 Section 26 Environmental Code). Moreover, the Minerals Act states that exploration work is to be carried out in such a way as to cause the least possible damage to and encroachment on any other person's property and the natural and cultural environment (Chapter 3 Section 3 fourth paragraph Minerals Act). Once the work is complete, the site must therefore be cleaned and restored in an appropriate way.

Below are some recommendations for how sampling sites can be restored to what is in many cases an almost unchanged state.

6.8.1 Simple field work

In the course of geological surveys and when sampling outcrops or boulders the prospector may sometimes need to remove moss. In this event the moss layer should be carefully moved aside so that it can be replaced in its original position immediately after sampling.

In till sampling all pits dug are backfilled with the original material as soon as the sampling is complete.

6.8.2 Stakes and markings in the field

For geophysical surveys or when surveying drilling sites, stakes are sometimes used as markers. Permanent stakes (that are left behind) should be avoided or kept to a minimum. If possible, the stakes should always be removed once exploration is complete.

Marker tape is often used in exploration work, for example to mark out driving routes, surveyed areas and drilling sites. The tape used should be biodegradable and should preferably be removed once work is complete.

6.8.3 Survey cables

Survey cables used in geophysical surveys should be gathered up as soon as possible once surveying is complete to avoid animals or people becoming ensnared by the cables.

6.8.4 Ground damage from off-road driving

In certain cases off-road driving can cause damage to the ground that needs to be repaired. When repairing damage to forest land, consideration should be given to the choice of method. A lot of damage is so limited in extent that it can be remedied with a shovel and rake. It is not always appropriate to use heavy vehicles for such measures since there is then a risk of the forest floor being damaged further.

Repairs should be considered in these cases, among others:

- Damage directly next to watercourses. The damage should be remedied to reduce the risk of erosion and impact on the watercourse. Driving tracks, for example, can be removed by carefully backfilling the tracks close to the watercourse.
- Driving damage in forest land should be repaired by backfilling and levelling deep tracks. If possible, vegetation should also be restored.
- Damage to ancient remains must be notified immediately to the county administrative board, which will make decisions on any measures (see 5.5.5 Ancient remains and cultural heritage).

Sealed drill casings in wetland after drilling is complete. PHOTO: LKAB

6.8.5 Drilling work

Upon completion of the drilling work, the after-treatment and restoration measures described below are recommended. The need for measures will vary from case to case.

- Drilling sites, storage areas and transport routes must be tidied up and left in a state that is as untouched as possible. All rubbish, waste, residual products and surplus materials are to be removed once the work is complete.
- Any felling and damage is to be reported to the client (permit holder) for any future claims settlement with landowners and/or affected parties.
- Once the work has been completed, the drilling contractor should carry out an inspection of the drilling site together with the client. The inspection should take place on bare ground so as to be able to check the tidying up and any damage.

- Casings that are left behind should be cut off close to the ground surface and be provided with a firmly seated cap. The capped casing needs to be short enough that there is no risk of animals and people being harmed (by stumbling or impact) and no risk of damage to snowmobiles or forest machinery.
- Drilled holes that leak water must be sealed in accordance with the client's (permit holder's) instructions.
- Driving damage shall be repaired as far as possible (see 6.8.4 Ground damage from off-road driving).

Once the work is complete, the client needs to compile documentation of any damage that has occurred as a result of the exploration work carried out and should submit a proposal for compensation to the property owners or holders of special rights who are affected (see Chapter 7 Compensation for damage and encroachment).

6.9 Work environment

6.9.1 General information

Exploration work in the field, particularly the use of heavy machinery such as when drilling, involves a number of processes and operations with an increased level of risk. The temporary and often remotely located workplaces mean that extra requirements may need to be made as regards the work environment. To comply with the prevailing rules on the work environment, operations must be charted and work environment risks analysed and minimised through systematic work environment management.[116]

The vision for work environment management presented by GRAMKO (*Gruvornas arbetsmiljökommitté*, the work environment committee for the mining industry) is described as follows:

"The mining industry's work on health and safety shall be a world-class example within Swedish primary industry. The industry shall be characterised by healthy companies with a good safety culture, where cooperation between employer and employee is an important aspect and each individual takes responsibility and is highly committed. Work environment management shall focus on the interaction between humans, technology and the organisation. This shall lead to workplaces that are free from accidents and work-related ill-health."

6.9.2 Risks and risk prevention

To a great extent, risks can be avoided by being identified and analysed in advance so that preventive measures can be taken. Below are examples of various risks that may be associated with exploration work and what can be done to reduce the risks.

6.9.2.1 Preventive work in general

Training

In order to be permitted to carry out certain operations, personnel may be required to have completed special training. For example, a client may require everyone who performs tasks to have completed specific training on the work environment. One example is web-based training organised by SSG (Standard Solutions Group AB) which results in a pass or fail.

Personnel performing operations where there is risk of fire shall have completed training in hot work. In the case of work that involves heating or sparking and that may involve a fire risk ("hot work"), for example, many insurance companies in Sweden require the work to be carried out by a certified hot worker and a person to be nominated as being responsible for permits.[117] Training for certification in hot work includes aspects such as how to carry out welding and other hot work so as to minimise the risk of fire. The training also includes handling fire equipment. This training, along with in-

"Personnel performing operations where there is risk of fire shall have completed training in hot work.

116 See among other things Chapter 3 Sections 2 and 2a of the Work Environment Act (*arbetsmiljölagen*) and Sections 2 and 3 of AFS 2001:1 (the Swedish Work Environment Authority's provisions on Systematic Work Environment Management).

117 See e.g. the website of Brandskyddsföreningen, the Swedish Fire Protection Association: https://www.hetaarbeten.se/sv/om-heta-arbeten/

Appropriate personal protective equipment goes without saying for all field work. PHOTO: LKAB

formation on the relevant fire risk in the forest and on land, reduces the risk of welding work generating a forest fire.

The most common courses that may need to be completed in order to perform operations within exploration in the field are:

- Training in the work environment and safety (for example, via SSG which provides interactive training)
- Hot work
- Cardiopulmonary resuscitation (CPR) and first aid
- Chainsaws
- Loader/forklift licence
- Quad bike

Personal protective equipment

The requirement of personal protective equipment varies depending on the operations to be performed. Among other things, it is required for tree felling, maintenance work (such as welding and grinding) and for riding quad bikes or snowmobiles. The requirements may also vary between different clients and contractors. However, there is a minimum standard that tends to be always required, namely:

- Helmet with chin strap
- Hearing protection
- Safety shoes/boots with steel toecap
- High visibility workwear
- Safety goggles
- Helmet lamp

Other safety equipment

At the drilling site the following equipment should always be easily accessible and well labelled:

- First aid
- Eyewash
- Fire extinguishers (at least one 6 kg powder extinguisher on each unit)
- Safety goggles/visor
- Lumberjack equipment (trousers, gloves, helmet with visor and approved footwear)
- Fall protection

It may be a good idea to cordon off the drilling site and place information signs around it stating that access is prohibited and that personal protective equipment is required if entering the area.

6.9.2.2 Risks of and preparations for field work

Communication and routines in an emergency

Exploration work is often carried out in remote locations and it is therefore of the greatest importance that at the drilling site, or in its immediate vicinity, there is access to secure communication. In most cases, regular mobile phones do the job. However, it is important that this is checked when a new drilling site is established. If there is no mobile coverage then a satellite phone or other alarm equipment will need to be present at the workplace.

It is important that it is stated clearly who is to be contacted in the event of an accident. To make it easier for the emergency services to get to the site in the event of an accident it is a good idea to place signs at forks in the road and to use tape to indicate the way to the drilling site. Personnel present in the field should to be able to state the site's coordinates.

Solo working

When working solo there is increased risk of an accident in certain cases, and the consequences may be greater. It is of the greatest importance that the means of communication works. If solo working is undertaken, there must be clear instructions for ensuring communication. For example, it may be a good idea to have a routine stating that communication must be made at regular intervals and that measures will be taken if contact is not made at the appointed time (see below).

Weather protection

During exploration in the field, personnel are exposed to varying and sometimes difficult weather conditions. Wet and cold cause discomfort and may sometimes put personnel at risk. Drilling rigs used for long drilling missions should have some type of built-in and heated workplace (drill shed) where the personnel are protected from the weather. Certain work must always be carried out outdoors, however, so clothing and footwear must be appropriate for this. Thunderstorms and strong winds, for example, can dramatically affect work conditions and personnel may need to seek shelter. In very dry ground conditions the workplace should be kept under constant supervision and caution must be exercised so as to avoid ground fires.

Fire

If operations that involve a risk of fire are to be undertaken, there must be personnel on site who are trained in hot work (see 6.8.2.1 Preventive work in general). Current information concerning fire risks in nature is available from the fire risk forecast issued by the Swedish Meteorological and Hydrological Institute (SMHI).[118] If there is a risk of forest fires, great care must be taken. In this event the lighting of fires is often prohibited by the municipality or the county administrative board. This should always be checked before undertaking operations that involve a risk of fire. When using a diamond drill there must always be a powder extinguisher of sufficient capacity present.[119]

Slipping and stumbling

Exploration work in the field involves working on surfaces that may be uneven, wet, icy or snowy. Combined with the need to carry and move equipment, this means that there is a high risk of slipping and stumbling. To reduce the risk the following recommendations should be followed:

- Footpaths and workplaces are to be kept clean, dry and preferably well-lit
- De-icers (sand or salt) are to be available during the winter season

118 Read more at: http://www.smhi.se/kunskapsbanken/meteorologi/brandriskprognoser-1.4821

119 A parallel may be drawn with what is laid down in Chapter 2 Section 2 of the Accident Prevention Act (*lag (2003:778) om skydd mot olyckor*): "Owners or holders of rights of use for buildings or other facilities shall, to the extent reasonable, provide equipment for extinguishing fires and for saving lives in the event of a fire or other accident and take such other measures as are needed in order to prevent fires and to prevent or limit damage resulting from fires."

> Great care must be taken when transporting across frozen watercourses since the load-bearing capacity of the ice may have been weakened.

- The site is to be kept in good order: ensure that no hoses or other items are lying in the way on footpaths and work surfaces
- Use appropriate footwear

Heavy lifting

Exploration work in the field may include operations that involve manual and mechanical heavy lifting. To avoid injuries in *manual* lifting it is important to bear in mind:

- Proper lifting technique
- Use lifting aids
- Work rotation

In the case of *mechanical* lifting, the following is to be observed:

- Trained and competent personnel
- Approved and inspected lifting equipment
- Good communication
- Barriers

Heavy vehicles

Exploration drilling usually means that heavy vehicles are used for transporting the drilling equipment to and from the site and for transporting drilling equipment in the field. Loading and unloading involve heavy lifting that is associated with certain risks. Transport of equipment to and from the site should preferably be carried out by professional personnel with training and experience. It is also important that the communication is clear. For transporting drilling equipment in the field, various types of carriers and vehicles are used which may be either wheeled or tracked. These are often driven across difficult terrain. It is important that the personnel concerned have a documented good knowledge of the machinery and are aware of the risks that may be associated with its use.

Heavy machinery that gets stuck off-road can cause damage to the ground as well as personal injury. When planning driving routes it is a good idea for risk assessments to be carried out in consultation between the client (permit holder) and any contractors. If needed, the necessary measures should be taken to minimise the risk of damage. Great care must be taken when transporting across frozen watercourses since the load-bearing capacity of the ice may have been weakened and it is important that any risks are noted and prevented (see 6.6 Drilling on ice).

Rotating parts and moving machine parts

When drilling it is mainly the drill string and the rotation unit that constitute a danger on the rig. The client and/or contractor is/are responsible for there being appropriate protection and for this being used. Signs and other warning symbols must be undamaged and clear. To avoid anyone being injured by the starting or operation of a machine, some type of Break/Secure routine is needed. In the case of diamond drilling rigs, the provisions relating to the use of work equipment (*Användning av arbetsutrustning*, AFS 2006:04) and to machinery (*Maskiner*, AFS 2008:03) apply, which means among other things that protection must be fitted over moving parts of the machinery.

Working at heights

Drilling rigs are sometimes equipped with a mast, at the top of which one or more pulleys are located for hoses and cables. It may be that these need to be adjusted or repaired, in which case drilling personnel have to climb the mast. It is important that there is the right equipment for this. Examples of equipment that may be needed include a well-secured ladder, fixed iron rungs and personal fall protection.

6.9.3 Personnel facilities

Next to the workplace there must be access to personnel facilities, e.g. for the storage of home clothes, storage/drying of workwear (if needed) and for breaks.[120]

6.10 Check lists and recommendations

To assist with work on risks and preventive measures the guidance includes a number of check lists and templates in the form of appendices – see the list below.

- **Appendix 2:** Safety and environmental inspections
- **Appendix 3:** Risk management
- **Appendix 3A:** Examples of risks in exploration works
- **Appendix 3B:** Risk assessment for drilling project
- **Appendix 3C:** Risk assessment for work equipment according to AFS 2006:4
- **Appendix 4:** Check list prior to exploration
- **Appendix 5:** Planning prior to drilling and establishment of a new drilling site
- **Appendix 5A:** Check list – Planning prior to drilling and establishment of a new drilling site
- **Appendix 6:** Environmental control of the drilling site
- **Appendix 6A:** Check list – Environmental control of the drilling site

In addition, the brochure from Prevent entitled "*Bättre arbetsmiljö Gruvindustrin*" ["Better Work Environment: Mining Industry"] is recommended, and has a section on drilling safety.[121]

120 See Chapter 2 Section 8 of the Work Environment Act (*arbetsmiljölagen*) and the Swedish Work Environment Authority's regulations on the design of workplaces and general guidance on the application of the provisions (*föreskrifter om arbetsplatsens utformning samt allmänna råd om tillämpningen av föreskrifterna*, AFS 2009:2).

121 http://www.prevent.se/

7. COMPENSATION FOR DAMAGE AND ENCROACHMENT

7.1 Introduction

Exploration work is undertaken all year round using the equipment and machinery needed. Wherever possible, exploration is to be adapted so as to have the minimum possible impact on the environment and other current land use.[122] Good planning and dialogue with landowners and holders of special rights, both before the work and if necessary while the work is in progress, can be very important for minimising damage and encroachment. The damage and encroachment that may nonetheless arise is to be compensated by the prospector.

7.2 What does the law say about compensation?

Damage and/or encroachment that has arisen in the course of exploration work is to be compensated by the holder of the exploration permit (Chapter 7 Section 1 Minerals Act). Under the compensation principle set out in the Minerals Act, landowners and affected parties are to be indemnified for any damage and encroachment caused by the exploration work. However, no compensation is paid to landowners for the prospector's right to be on the property or for the use of roads.

Any damage or encroachment is normally compensated when the work has been completed, since it is generally only then that the extent of the damage/encroachment can be assessed.

Any disputes which arise in respect of compensation for damage or encroachment by exploration work are considered by the Chief Mining Inspector (Chapter 8 Section 8 Minerals Act). The decision may be appealed to the land and environment court in whose area the land to which the dispute relates, or the greater part thereof, is situated (Chapter 16 Section 1 Minerals Act).

7.3 The prospector's obligations

The exploration work is to be carried out in accordance with a valid plan of operations (Chapter 3 Section 5 Minerals Act). Moreover, the Minerals Act states that the work is to be carried out in such a way as to cause the least possible damage to and encroachment on any other person's property and the natural and cultural environment (Chapter 3 Section 3 fourth paragraph Minerals Act). Roads within and leading to the exploration area may be used and, following permission from the Chief Mining Inspector, the prospector may utilise land and other spaces to build any necessary road (Chapter 3 Section 3 second paragraph Minerals Act).

The plan of operations must contain an assessment of the extent of damage or encroachment that the exploration work will involve, how this will be settled and details of the financial security that the permit holder is providing for this (Chapter 3 Section 5 second paragraph (9) Minerals Act). Most commonly, the financial security provided by the permit holder is deposited in a blocked account under the control of Bergsstaten (the Mining Inspectorate of Sweden). Bank guarantees are another alternative. The security must be in place before the exploration work is begun (Chapter 3 Section 3 third paragraph Minerals Act). If the financial security is not approved by the party in whose favour it is furnished, the security shall be considered by the county administrative board (Chapter 17 Section 2 Minerals Act).

> "The starting point is that work that does not involve damage or encroachment does not provide a basis for compensation either.

7.4 Recommendations concerning compensation

7.4.1 Recommended compensation model

The exploration industry has elaborated an effective compensation model that can be used for compensating damage and encroachment. When applying the model it must

122 See Chapter 3 Section 3 fourth paragraph of the Minerals Act.

be adapted to the circumstances in the individual case, since the exploration work may encompass different types of work with varying impact and in environments of varying sensitivity. The model is described more below. **Appendix 7** (*Template claims settlement form*) contains a template for how compensation for damaged trees can be calculated according to the industry's standard model.

7.4.2 Exploration that does not provide a basis for compensation

The starting point is that work that does not involve damage or encroachment does not provide a basis for compensation either. Examples of work that does not typically cause damage or encroachment include boulder tracing and simple field work on foot in the summer and on skis or by snowmobile in the winter. Whether encroachment provides entitlement to compensation must be assessed from case to case, but a reasonable starting point should be whether the work involved any real restriction on the landowners' right to use their land (cf. Government bill 1988/89:92, p. 108 and Government bill 1974/32:92, pp. 157 f.).

Driving damage on road without drainage. PHOTO: GEOPOOL

PHOTO: GEOPOOL

The same road after restoration, grading and backfilling.

7.4.3 Damaged roads and off-road driving damage

Exploration work in which heavy machinery is used, such as drilling, can sometimes cause damage to roads, forest or off-road that provides grounds for compensation. Some examples are given below.

Road damage: Damage to roads can be compensated financially at an amount equal to the cost of remedying the damage. On smaller roads an alternative to financial compensation may be for the prospector to instead make good the damage, for example with a grader and/or by gravelling the road. How any damage to larger roads is to be compensated or made good must be assessed from case to case.

Ground damage: The question of whether compensation is relevant for driving tracks or off-road tracks is based on the damage that may arise as a result of these. For example, there may be driving damage in the form of compaction of ground which in turn affects the moistness of the ground or results in damage to root systems that impacts the growth of the tree. The extent of the damage may vary from case to case depending on the weight of the vehicle, the load-bearing capacity of the ground, the type of forest and the time of year at which the work is undertaken. Damage arising from driving tracks can sometimes be difficult to assess and it may be that the extent of the damage is only apparent subsequently.

An alternative to financial compensation for off-road driving damage is for the damage to be appropriately remedied, as mentioned above. If this takes place, it is to be done by agreement with the property owner and care is to be taken to ensure that further damage does not arise.

Svemin recommends

Proposed compensation for drilling sites and driving routes

Drilling sites: There should be a general compensation amount per drilling site. This compensation includes compensation for ground damage that has arisen at the site such as driving tracks, compaction of ground and casings left behind. An appropriate level is SEK 600 per drilling site in the case of core drilling and RC drilling, and SEK 200 per drilling site in the case of top-hammer drilling.

Driving routes after use by heavy vehicles (e.g. drilling rigs): Compensation should always be paid irrespective of whether or not there is visible damage. It should make no difference whether the work was undertaken in the summer or in the winter. An appropriate level of compensation is SEK 2 per metre of driving route.

Driving routes used in summer by light all-terrain vehicles (for example, quad bikes): If wheel tracks have been left, these should be compensated at SEK 2 per metre of driving route.

Driving routes that are used for snowmobiles in winter: Such driving rarely damages the ground and in most cases does not provide a basis for compensation.

7.4.4 Damaged and felled trees

Trees felled or damaged as a result of the exploration work are to be compensated. The level of compensation may vary from case to case depending on the extent of the damage, the type of ground and type of forest, the time of year, etc. It is also important to be aware that timber prices can vary depending on whereabouts in the country the forest is located. It is therefore a matter of finding out the current prices in the area where the exploration work is being undertaken. Current timber prices can be obtained from the major forestry companies, for example.[123]

An example of a completed calculation of compensation for damage and a covering letter concerning compensation can be found in **Appendix 8** (*Example claims settlement letter*) and **Appendix 8A** (*Example claims settlement form*). Note that the prices stated in the completed example are assumed prices and that in reality these must be adjusted in accordance with the prices that apply in the location and at the time in question.

Trees felled in connection with exploration. PHOTO: BOLIDEN

Bark damage by machinery.

PHOTO: BOLIDEN

7.4.5 Disruption to or other additional work for current land use

Normally no compensation is paid for the time which property owners and others entitled to compensation spend on discussing and reaching agreements concerning the plan

123 See for example: **Norra Group (Norra Skogsägarna)**: http://www.norra.se/verksamhet/skogochvirke/Saljavirke/Documents/ Virkesprislista_norrbotten_inl.pdf **Södra skogsägarna**: https://www.sodra.com/sv/skog/skogligatjanster/priser-och-affarsinformation/virkespriser/ **Stora Enso**: https://storaensoskog.se/category/skogsnara/slutavverkning-skogsnara/ **Billerud-Korsnäs**: https://www.billerudkorsnas.se/skog/salja-virke **SCA** (**in Norrland**): http://www.sca. com/sv/skog/salja-virke/prislistor/ **Holmen**: https://www.holmen.com/sv/skog/salja-virke/ **Sveaskog**: http://www.sveaskog.se/skogsagare/salja-virke-och-biobransle-till-oss/priser/

Svemin recommends

Compensation for damaged or felled trees

Felled or upended trees that are merchantable timber (timber that can be processed economically, at least of the quality grade pulpwood) that is 8 cm or larger in diameter at breast height should normally be compensated (see Appendix 7, Template claims settlement form). Trees that are compensated should always be documented in terms of number, tree type and girth.

Bark damage to trees should be compensated. As a basis for calculating the compensation the tree's diameter is measured. In the case of firs, the full timber value of the tree is compensated because of the risk of root rot as a result of the damage. Pine trees and broad-leaved trees should be compensated at half the timber value.

Damaged young forest over 1.3 metres tall should be compensated as if it meets the minimum requirement for merchantable timber (see above, Felled or upended trees). What is regarded as young forest is decided based on the girth of the tree relative to its height. Trees that are compensated (more than 8 cm in diameter) should always be documented as regards the number and girth.

Damaged recently planted trees that are less than 1.3 m tall are compensated according to the following principle. The area of land affected is calculated and compensation is paid at an amount corresponding to the regeneration cost plus a supplement for loss of growth for the area in question. The regeneration cost can vary between SEK 5,000 and SEK 20,000 per hectare depending on where in the country you are.

of operations. However, in special situations where the parties concerned need to take part in extra meetings – for example, if they are more tangibly affected by disruption, or if they have been caused substantial additional work as a result of the exploration work – there may be grounds for a certain amount of compensation.

7.4.6 Compensation in other cases

Types of damage other than those described above may need to be compensated and it is not possible to provide a complete list. For example, there may be damage in the form of torn down electricity cables, uncovered buried cables or other adverse effects on assets belonging to the landowner or other affected parties.

7.4.7 Additional compensation

In addition to the compensation that damage and/or encroachment that has occurred is valued at, a supplement of 25% is often applied as voluntary compensation by the permit holder in order to adjust the level of compensation to the level applied in the case of expropriation. Svemin recommends that this voluntary compensation principle on supplements is followed.

7.5 Documentation and inspection

All planned driving routes, storage sites and water extraction points should be visited and documented in advance. The documentation should particularly be based on the parameters described above and that (may) provide a basis for compensation. It is recommended that all such sites are photographed or videoed before the work is started, preferably together with the property owner.

In order to be able to assess the extent of any damage and the compensation that should be paid, it is important that damage and encroachment are documented in conjunction with each exploration initiative. This should be done as soon as possible after the damage/encroachment is discovered and/or after the work has been completed. Once the work has been completed, a field inspection should be carried out when the ground is bare in order to be able to see and document any damage. In certain cases the exploration work continues for a long period and in such cases it may be expedient to document damage/encroachment in several stages. The prospector should inform and invite the property owner or other affected party who is entitled to compensation

Svemin recommends

Compensation for tangible additional work

Extra meetings: If an affected party is involved more than just by attending regular meetings, a certain amount of compensation may sometimes be paid. Whether or not such participation should be compensated must be assessed from case to case.

Disruption of existing land use: In the first instance it is recommended that preventive measures are taken as far as possible to reduce the disruption. Examples of disruption of existing land use may include, for example, a reindeer herding district that is affected by noticeable disruption of reindeer herding as a result of the drilling work. In such cases there may sometimes be reason to pay compensation. Regarding possible compensation for disruption of existing land use, it is recommended that before the work is started the parties agree on what disruption provides a basis for compensation and what must be tolerated without compensation.

Hunting associations whose hunting is disrupted may possibly be entitled to compensation. This is very unusual and if paid, it is usually a matter of manifest disruption – such as if the hunt was not able to take place at all, and this was exclusively due to the exploration.

in good time before the inspection is to take place. If the property owner/affected party wishes, it may be appropriate to meet before the inspection date to provide information and open up a dialogue.

7.6 Calculation of compensation and communication of proposed compensation

7.6.1 Calculation of compensation

The prospector shall calculate compensation for the damage that has arisen and been documented, and it is suggested that this is done in accordance with the recommendations described above.

Compensation for felled and damaged trees, off-road driving routes and ground damage at drilling sites, for example, can be calculated using a spreadsheet in Excel format provided by Svemin (see **Appendix 7,** *Template claims settlement form*). The spreadsheet is also available on the Svemin website (http://www.svemin.se/). An example of a completed spreadsheet and a covering letter for this can be found in **Appendix 8** (*Example claims settlement letter*) and **Appendix 8A** (*Example claims settlement form*). Note that since compensation for felled and damaged trees is to be based on market timber prices, the prices stated in the completed example of a spreadsheet need to be adjusted so that the right compensation is paid in accordance with the prices that apply in the location and at the time in question.

7.6.2 Communication of proposed compensation

The proposed compensation communicated to those entitled to compensation should contain clear information concerning what the compensation relates to and an explanation of the damage that is regarded as forming a basis for compensation, so that the damage can be checked in the field by the party entitled to compensation. Below are recommendations for the information that should be included in the compensation proposal sent out.

If the compensation is to be paid to owners of a jointly owned property, to a society or if the party entitled to compensation is an association (for example, a reindeer herding district), the person authorised to receive the compensation and how it is to be paid must be ascertained in advance. It is important that the compensation is paid correctly, for example to the respective joint owners or to a joint account.

If no reply is received after sending out a compensation proposal, the prospector should make contact again to discuss the compensation proposal and how the matter of compensation is to be resolved. All this should be documented.

Svemin recommends

Content of compensation proposal

- A description of the exploration work to which the compensation relates and when this was carried out. If appropriate, a description of the exploration method used.
- As regards ground damage, a map should be appended showing property boundaries and where the exploration work was carried out; for example drilling sites, driving routes, etc.
- A description of the damage and/or encroachments found and how it is proposed that these be compensated. As regards off-road driving damage and compensation for tree felling, it is suggested that Svemin's spreadsheet as mentioned above is used to calculate compensation, along with an explanation of how trees are compensated by number based on current timber prices etc.
- An enquiry as to the details required in order for the payment to be able to be made (account number etc.).
- Space for acknowledging receipt, with the name of both the party paying the compensation and the recipient (the property owner, or a party that is otherwise entitled to compensation), with space for approving the amount of proposed compensation and for stating the place and date.

7.7 Archiving

All documentation of the calculation of compensation, including documentation and agreements both before and after the work is completed, should be drawn up in writing and archived in case questions from property owners, holders of special rights or authorities arise at a later stage.

7.8 Tax issues

Compensation to landowners as a result of damage and encroachment from exploration work may relate to damage to forests, roads and ground, among other things, but also to disruption to a business operated on the property by the property owner or holder of special rights. Any tax effects of the compensation need to be considered in conjunction with any payment of compensation. This guidance cannot reproduce the rules in tax legislation in full, and the persons paying and receiving compensation respectively must find out what applies in the individual case. Certain brief general information on the tax consequences of compensation for damage and encroachment is given below. In the event of uncertainty or questions concerning possible tax effects, the Swedish Tax Agency (*Skatteverket*) should always be contacted.

In general, tax liability applies to physical persons and legal entities, with the starting point that physical persons must among other things pay tax on earned income (income from employment and from self-employment) and on capital income, and legal entities must pay income tax on business income.[124] However, certain compensation is tax-exempt; for example, insurance compensation and other compensation for loss of assets or similar.[125] As regards tax aspects, the provisions may vary depending on whether the income is attributable to a private residential property or a commercial property.[126] In addition to tax on income from employment, capital, self-employment or business operations, value-added tax (VAT) must also be paid for "sales within Sweden of goods or services that are taxable and are made by a taxable person".[127]

Information concerning taxation of compensation for ground encroachment etc. can be found in the Swedish Tax Agency's document with ref. no. 131 52594-15/1152, "Beskattning av ersättning för markintrång m.m." ["Taxation of compensation for ground encroachment etc."] that can be read on the Swedish Tax Agency's website:

> "Any tax effects of the compensation need to be considered in conjunction with each payment of compensation.

124 See Chapter 1 Section 3 of the Income Tax Act (*inkomstskattelagen*, 1999:1229).

125 See Chapter 8 Section 22 of the Income Tax Act (*inkomstskattelagen*). Note the second paragraph of the provision, which states among other things that the tax exemption does not apply to the extent that the compensation relates to business assets or relates in any other way to business income or expense.

126 A private residential property refers to properties containing a small house (family house or holiday home) in which you or a party related to you live. A commercial property means a property that is not a private residential property.

127 See Section 1 of the Value Added Tax Act (*mervärdesskattelag*, 1994:200).

http://www.skatteverket.se/omoss/om-skatteverket/rapporterremissvarskrivelser/skrivelser/2015/skrivelser2015/1315259415 1152.5.d5e04db14b6fef2c864dba.html

Regarding exploration damage, the Swedish Tax Agency states the following[128] (our italics):

> **"Exploration damage**
> *In the case of exploration work for mineral deposits, the landowner receives compensation for the damage and encroachment caused by the work. This may be damage to forest, roads and land, but also disruption of business activities conducted on the property by the property owner or rights holders. Such compensation for damage, unconnected to the sale of land, is considered income from business operations.*
> *Value-added tax: The compensation is to be regarded as damages which is outside the scope of value-added tax unless it relates to sold forest."*

According to the Swedish Tax Agency, compensation for "premature felling" on a commercial property is income from business operations.[129] As regards value-added tax, however, compensation for "premature felling" is regarded as damages, which are outside the scope of VAT. However, any compensation for forest or felling rights that have been sold is to be recognised in the accounts and VAT is payable on this.[130]

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128 See Swedish Tax Agency document "Beskattning av ersättning för markintrång m.m." ["Taxation of compensation for ground encroachment etc."], ref. no. 131 52594-15/1152

129 See Swedish Tax Agency brochure "Beskattning av ersättning för markintrång m.m." ["Taxation of compensation for ground encroachment etc."], pp. 5 f. (http://www.skatteverket. se/foretagorganisationer/blanketterbroschyrer/broschyrer/info/254.4.70ac421612e2a997f85800049043.html)

130 See page 6 of Swedish Tax Agency brochure "Beskattning av ersättning för markintrång m.m." (as above).

NOTES

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Svemin is the national industry association for mines and for mineral and metal producers in Sweden, representing around 40 companies which employ 13,000 people in production, exploration and technology. Our member companies are active throughout the country, with the mines being mainly located in northern Sweden and Bergslagen.

SveMin

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