

# Talga Graphene AB

# Vittangi Graphite-Graphene Project

**Tailings Options Study** 

Report 19 March 2019

## **Table of Contents**

| <u>1</u>          | OVERVIEW                                | 4  |
|-------------------|---|----|
| 1.1               | Scope                                   | 4  |
| <u>2</u> <u>F</u> | PROJECT DESCRIPTION                     | 5  |
| 1.2               | LOCATION                                | 5  |
| 1.3               | TENURE                                  | 6  |
| 2.1               | LAND OWNERSHIP                          | 6  |
| 2.2               | SITE CHARACTERISTICS                    | 7  |
| 2.2.1             | 1 Overview                              | 7  |
| 2.2.2             | 2 TOPOGRAPHY                            | 7  |
| 2.2.5             | 3 GEOLOGY                               | 8  |
| 2.2.4             |   | 10 |
| 2.2.5             | 5 SURFACE WATER                         | 10 |
| 2.2.0             | GROUNDWATER                             | 11 |
| <u>3</u> F        | PROJECT OVERVIEW                        | 12 |
| 3.1               | GENERAL                                 | 12 |
| 3.2               |   | 12 |
| 3.3               |   | 12 |
| 3.3.              | I PRE-STRIPPING                         | 12 |
| 222               | Z ORE MINNING<br>3 WASTE ROCK           | 12 |
| 3.3.2             |   | 13 |
| 3.3.5             | 5 ORE CUTTING                           | 13 |
| 3.3.6             | 6 CONCENTRATING                         | 13 |
| <u>4</u> 1        | TAILINGS                                | 14 |
| 4.1               | TAILINGS PRODUCTION                     | 14 |
| 4.2               | TAILINGS CHARACTERIZATION               | 14 |
| 4.2.1             | 1 ORE AND WASTE ROCK                    | 14 |
| 4.2.2             | 2 TAILINGS PROPERTIES                   | 15 |
| <u>5</u> ]        | TAILINGS MANAGEMENT                     | 18 |
| 5.1               | <b>O</b> VERALL OBJECTIVES              | 18 |
| 5.1.1             | 1 TAILINGS CONSIDERATIONS               | 18 |
| 5.2               | LAND-USE CONSIDERATIONS                 | 18 |
| 5.2.1             | 1 MINIMISE STORAGE AREA                 | 18 |
| 5.2.2             | 2 SITE SELECTION                        | 19 |
| 5.3               |   | 24 |
| 5.4               | CLOSURE CONSIDERATIONS                  | 24 |
| <u>6</u>          | SELECTION OF TAILINGS MANAGEMENT METHOD | 25 |
| 6.1               | Overview                                | 25 |
| 6.2               | THE NEED FOR NEW TSF                    | 25 |
| 6.3               | TSF LOCATION                            | 25 |
| 6.4               | ABOVE GROUND VS BELOW GROUND TSF        | 25 |
| 6.5               | WET VERSUS DRY TSF                      | 26 |

| <ul><li>6.6 STANDALONE TSF VS CO-DISPOSAL</li><li>6.7 DRY STACKING CONCEPT</li></ul> | 27<br>29 |
|--|----------|
| 7 TSF HAZARD REGISTER  | 30       |
| 8 TSF OPPORTUNITIES REGISTER   | 31       |

# 1 Overview

This paper describes the findings of the tailings options assessment study conducted as part of the Vittangi Graphite-Graphene Project (the Project) scoping and conceptual studies.

The Project is being developed by Talga Graphene AB, a wholly owned subsidiary of Talga Resources Ltd ("Talga"), a Perth based Australian Stock Exchange listed exploration and development company.

The objective of the Project is to sustainably develop the Vittangi graphite resource in an environmentally and social responsible manner that maximises returns to Talga shareholders. The resource development and on site concentration will generate tailings, which will be stored in a Tailings Storage Facility (TSF). The TSF may be a standalone structure or a facility at which the tailings are combined (co-disposed) with other materials.

Talga desires its mining and processing activities to leave a positive lasting environmental, economic, business and social legacy while achieving zero incidents, injuries and fatalities. Talga recognizes that TSFs containing uncontaminated and contaminated water, tailings and other mining, processing and metallurgical rejects pose one of the greatest risks in the mining industry and past failures of such facilities have had devastating impacts on people, infrastructure and environment, both within and outside the mine area. Therefore, the TSF is to be planned, designed, constructed, operated and closed on the basis of a robust and defensible engineering practices, in order to maintain societal, economic and environmental risks at acceptable levels and to prevent incidents and failures.

# 1.1 Scope

This report presents the options assessment and the selection of the preferred option for the tailings management through its life cycle from planning to closure.

# 2 **Project Description**

# 1.2 Location

The Nunasvaara South graphite deposit is in Kiruna Municipality, in north Sweden, 50 km east of the significant mining centre of Kiruna, in the Vittangi Project area (Figure 3). The Nunasvaara South deposit is located approximately 10 km west of the town of Vittangi.



Figure 2-1 Regional location

### 1.3 Tenure

The Nunasvaara South deposit is within Talga's exploration licence Nunasvaara No. 2 (Figure 2). This exploration licence is valid until 4 February 2022.



Figure 2-2 Vittangi tenements including Nunasvaara

## 2.1 Land ownership

There are numerous landholdings (freehold land) at and around the deposit (Figure 3). The major land uses in the area include forestry production, reindeer herding, hunting and fishing and recreation and tourism. Along the Torne river there are numerous summer (holiday) houses that are primarily used during the June to August period.



Figure 2-3 Properties at and around the mine location

## 2.2 Site characteristics

### 2.2.1 Overview

The site characteristics presented in this chapter were adopted from Sweco (2019).

### 2.2.2 Topography

The project area is dominated by two hills Hosiorinta and Nunasvaara that rise 50 m to 100 m above the lake Hosiojärvi at RL 290 m. The future open pits follow the eastern slopes of Hosiorinta (RL 350 m) in an arch shape as shown in Figure 2-4.

The area is undeveloped and mostly consisting of coniferous forest with elements of deciduous trees.

**Tailings Options Study** 



Figure 2-4 Project area orientation map (Sweco, 2019)

### 2.2.3 Geology

The geology of the project area comprises greenstones (basalt to andesite), metasediments (quartzite, slate, marble) and metadolerites that form part of Vittangi greenstone group and belongs to Paleoproterozoiska vulkanosedimentära domain in northern Sweden located on archaic subgrade (Lynch and Jörn Berger, 2013). The geological map, reproduced in Figure 2-5, shows numerous deformation zones and discontinuities intersecting the project site.



Figure 2-5 Geological map (Lynch and Joern Berger, 2013)

The soils type and thickness varies significantly across the project area and the surface soil map is provide in Figure 2-6.

At Hosiorinta hill, the bedrock daylights or it is covered with a thin layer of moraine. In low-lying areas, the soils are deeper and comprise peat and moraine.

Southeast of Lake Hosiojärvi are glacial and fluvial deposits consisting of clayey sand and gravel. Further south of Hosiorinta are sandy and gravelly materials with strands of glacial structure from higher to lower terrain. Occasional glacial relicts also occur in a northerly direction while most are directed to the south. Further south and along the River Torne are glacial sediments.



#### Figure 2-6 Soil Map (Sweco, 2019)

### 2.2.4 Climate

The annual precipitation at the project area is about 500 mm with about 45% in the form of snow that normally covers the area from October to April.

Average annual temperature is about -1°C, the maximum monthly average temperature is about 12°C in July and the coldest month is January with a monthly average temperature of about -14°C.

The mean annual evaporation varies between 200 mm and 300 mm, which account for approximately 50% of the mean annual precipitation.

### 2.2.5 Surface water

The main water feature of the project area is Lake Hosiojärvi, which collects streamflow from numerous watercourses from the surrounding hills. Water from the lake drains through a small stream that runs in the north-east direction to enter a larger system of streams, which forms a tributary of the Torne River as shown in Figure 2-7.



Figure 2-7 Water courses map (Sweco, 2019)

### 2.2.6 Groundwater

There are no recognized groundwater bodies in the immediate vicinity of the project area and the nearest groundwater aquifer is located on the south side of the Torne River about 2 kilometers southwest of Hosiorinta. Local groundwater is present in bedrock fractures and other discontinuities.

A groundwater study completed by Sweco (2019) concluded that there is limited interaction of local groundwater in the bedrock and surface water collected in Lake Hosiojärvi. Lake Hosiojärvi is considered fully dependent on the surface water inflow from the surrounding hills.

# 3 **Project Overview**

### 3.1 General

Talga is currently carrying out a comprehensive feasibility study that includes several investigations. The main design and scope of the planned activities are described below.

The planned activities include mining in an open pit with two different processes, block mining and convention drilling/blasting. These will respectively be subject to cutting and concentration processes on site. The materials produced from these processing facilities will supply material to downstream processing facilities producing battery anode and graphene products to supply various markets. The mine will have flexibility to enable the production of graphite concentrate and graphite slabs in quantities to meet market demands.

Infrastructure and facilities will need to be developed for the operations. Existing roads and infrastructure will be used as far as possible. An industrial area will be set up with the necessary facilities. The location of the industrial area and other facilities will be determined on the basis of environmental, social and economic aspects. Processing is planned to be undertaken all year round but mining only in part of the year.

# 3.2 Ore Resource

The Nunasvaara South deposit is part of the Nunasvaara graphite resource which is currently the highest grade JORC or NI43-101 compliant graphite resource in the world (Total resource 12.3Mt @ 25.5% graphite) and is a declared deposit of national interest by the Swedish Geological Survey (SGU).

| Deposit          | Resource Category | Tonnes     | C <sub>g</sub> (%) | Contained Graphite (tonnes) |
|------------------|-------------------|------------|--------------------|-----------------------------|
| Nunasvaara South | Indicated         | 8,900,000  | 25.0               | 2,225,000                   |
|                  | Inferred          | 1,500,000  | 23.5               | 345,000                     |
| Total            |                   | 10,400,000 | 24.8               | 2,579,200                   |

#### Table 1 Nunasvaara South Mineral Resource Estimate (17% Cg lower cut-off, April 2017)

## 3.3 Mining

### 3.3.1 Pre-stripping

Harvestable and salvageable timber will be harvested from site prior to clearing. Topsoil and rock will be stripped separately and stored for future rehabilitation purposes.

Till, although thin in the higher elevations, is likely to be utilised for both construction purposes and for future rehabilitation purposes, subject to ongoing testwork and characterisation.

### 3.3.2 Ore Mining

Graphite ore is planned to be mined up to 100,000 tonnes per annum from the Nunasvaara South deposit. Over a 25-year life of mine up to 2.5 million tonnes of ore is expected to be mined. Approximately 7.5 million tonnes of waste rock is expected to be mined.

The Talma Sameby reindeer herding impact assessment has identified that mining activities could be and are planned to be undertaken in a manner such that potential impacts to reindeer winter grazing activities are minimised. The most important grazing period for the Nunasvaara area is during January and February each year. Talga proposes that no ore mining and waste rock mining operations will be undertaken during this period, January and February.

Conventional drill and blast mining will be utilised for mining waste rock and for mining most ore to feed the concentrator. Each blast will be subject to its own design to minimise fly rock generation and fracture of non-target in situ ore. Rock and ore will be mined via conventional excavator and truck operations,

with ore placed at a run of mine (ROM) stockpile and waste rock placed at the waste management facility.

The block mining method employs cutting devices to cut the in-situ ore into blocks. While the size of these facilities is subject to ongoing feasibility and optimisation, it is currently expected that these facilities will be able to produce up to 10,000 tonnes per annum of ore blocks. Mined ore blocks will be delivered to a block store facility for cutting.

Two methods are being considered for block mining: a wet wire-cut method; and a dry chainsaw cut method.

### 3.3.3 Waste Rock

Waste rock and low-grade ore generated will be removed and stockpiled initially outside of the mine pit. As the mine develops and sufficient operational space is available within the pit, waste rock will be placed within a waste management facility within the pit enabling progressive rehabilitation as mining progresses.

Waste rock tonnages to be produced are subject to ongoing planning and optimisation studies. Current estimates indicate waste rock generated in the range of 100,000-500,000 tonnes per annum, up to approximately 7.5 million tonnes in total over the 25 year life of mine, however this quantity may decrease. As the waste rock is known to become acid generating over time it will be placed in a lined, engineered facility from which drainage water can be collected for treatment. Waste rock mineral consists mainly of silicates (including plagioclases, marialites, and tremolites) and non-recoverable graphite. Nearby alkaline rocks (dolomite) will be investigated for as a source of acidity neutralisation in the overall waste management facility design and as part of the closure and rehabilitation strategy. Location and design of the waste rock facility is currently under investigation.

### 3.3.4 Ore Crushing

Broken graphite ore will be crushed to a suitable size for feed into the concentrator. Crushing will be undertaken either at the ROM or, as the pit develops, within the pit subject to operational requirements. Crushing may be an all year round activity, if undertaken at the ROM.

### 3.3.5 Ore Cutting

The mined ore blocks will be cut into smaller ore slabs at a cutting facility that will operate all year round. The cuttings generated from this facility will be blended with crushed ore as feed to the concentrator.

### 3.3.6 Concentrating

Crushed bulk ore will be concentrated via a conventional two stage flotation circuit at the concentrator. Crushed ore will be ground in a ball mill and feed into the rougher flotation units. Graphitic material from this stage will be reground to a finer size before entering the cleaner flotation units. Tailings will be generated from both flotation units. A portion of the process water will be recovered and reused within the concentrator. Make up water will be required as a portion of the process water will be discharged to the process water treatment facility, to reduce the concentration of accumulating chemicals.

Graphite concentrate will be dewatered and packed for delivery to the Anode plant. Excess water will be treated prior to discharge from site.

# 4 Tailings

# 4.1 Tailings production

The tailings management strategy, presented in this report, outlines the method of generation, transporting, depositing, storing and permanent retention of the tailings generated in the concentrating (flotation) process.

At a production rate of 100,000 tonnes per annum tpa (dry) the Concentrator operations will generate on average 70,000 tpa tailings from roughing flotation and cleaning flotation. Similarly to the waste rock (Section 4.2.1), the tailings are also expected to be acid generating in time. The average ratio of the waste rock to tailings over the life of mine is approximately 4:1.

The tailings from the crushing and flotation circuit will be generated in a form of slurry before thickening and further processing.

# 4.2 Tailings characterization

### 4.2.1 Ore and waste rock

Elemental characterisation of the ore has been undertaken at typically 2 metre intervals from 19 drill holes resulting in 473 samples analysed.

The preliminary test results indicated highly variable content of sulphur and trace metals across the ore body as summarised in Table 2.

| Element | As    | Cd  | Cr  | Cu    | Ni  | Zn    | S   |
|---------|-------|-----|-----|-------|-----|-------|-----|
| Unit    | ppm   | Ppm | Ppm | Ppm   | ppm | ppm   | %   |
| Min     | 0     | 0   | 8   | 41    | 3   | 0     | 0,2 |
| Median  | 3     | 0   | 178 | 310   | 191 | 5     | 2,6 |
| Max     | 1,575 | 50  | 381 | 3,050 | 645 | 7,740 | 9,0 |

 Table 2
 Abundance and range of selected elements in Nunasvaara South ore.

An initial acid rock generation testwork has been undertaken on eight historical ore samples. All ore samples tested were found to be potentially acid forming (PAF) and all, but one, samples were potentially acid forming – short lag (PAF-SL). Importantly, most samples had CO3-C values less than 0.01% and the two that had CO3-C values at around 0,5% were inferred to contain siderites meaning the CO3-C present is ineffective for circum-neutral buffering under unsaturated conditions. The initial testwork also found circum-neutral ore samples had water-extract-Se values up to approximately 150  $\mu$ g/L, and water-extract-Ni concentrations within the multi-mg/L range.

The initial acid generation tests were completed on samples, which could have been exposed to the environment for extensive period time. Therefore, the short PAF-SL potential indicated by the initial testing was not considered to be representative and more detailed acid generation tests were completed during mid 2018 to early 2019 (kinetic testing).

The more detailed assessment of the acid generation potential of the ore has focused on a waste rock deposit several hundred meters east of the trial mining area. It was assumed that the waste deposit was a result of trial mining performed by LKAB during the 1970's. Waste materials in the deposit should then have been exposed to air and water for approximately 40 years. This material was assumed to represent a scenario, in which the waste rock had been left exposed and naturally weathered.

Three test pits were dug by hand in the waste deposit down to around 700 mm. Two composite samples were collected from each test pit; one representing relatively fresh material and one consisting of mainly fine, residual soil. Simple shake tests were also performed in the field using the solid material (around 2 kg material and 4 liters of water) to obtain an indication about the already generated acidity. pH and electrical conductivity were measured using a hand-held field instrument after 24 hours.

In addition to the samples from the waste deposit at the trial mining area some composite samples (as chip samples) were also sampled from waste piles in the northern part of the concession area Nunasvaara South.

Four composite samples, for large kinetic testing were selected from already available drilled cores. The sampling represented the four ore types proposed to be mined. The composite samples were sized in a jaw crusher before being placed into plastic containers. The weathering process was promoted by exposing the samples to dry and moist air for ½ week each. Distilled water was added to the samples on weekly basis to maintain moist conditions before sampling. Sampling was performed by adding distilled water corresponding to L/S 0.1 each week. After one hour added water was drained and collected for chemical analysis.

Samples from the field work was analysed for elemental content by ALS. Composite samples from the large kinetic tests were sent for analysis with respect to acid-base accounting (ABA), total element concentrations and mineralogy. Leachates from the large kinetic tests were analysed for pH, electrical conductivity, alkalinity, sulfate and element concentrations.

From the shake tests performed on the material from the old waste deposit it is clear that acid production was either ongoing or had ceased with an average pH around 4. pH was also generally lower in the fine material indicating the presence of secondary weathering products from the original waste rock and not only overburden. Electrical conductivity was rather low, indicating that the current acid generation has peaked or is rather low or even has stopped.

The acid-base-accounting test results demonstrated that three of the composite samples (HGW, Sgr and FW) were potentially acid generating while one sample (Dyke) was not. The test results confirmed the acid generating potential of the ore determined in earlier work by Campbell (2018).

Ongoing large kinetic tests do show acid generation after around 17 weeks from the Sgr sample. Sulfate analysis indicate a sulfide oxidation rate (SOR) of between 18 and 32 mg SO4 2-/kg/week. Preliminary elemental analysis of the leachates indicate that cobalt, nickel and copper are possible problematic elements, also at circum neutral pH. Element concentrations will be determined in all leachates from the initial 20 weeks.

There is still no acid generation from the FW and HGW samples after 20 weeks of testing. It must, however, be noted that 20 weeks are to be considered a very short time period in order to determine when acid will be formed. The ongoing kinetic study indicate that the evolution of acid drainage might not be as fast as has been indicated by earlier laboratory studies.

Altogether it is clear that waste rock from Nunasvaara South will eventually generate acid rock drainage. Acid-base-accounting indicate a significant acid generating potential and the samples from the old waste deposit was acid. It is, however, hard to predict exactly when the acid will form.

There is a risk that, at least the ore samples (Sgr), can react spontaneously with added explosives prior to ignition. This means that there is a risk for premature detonation during blasting. It also means that there is a risk for spontaneous combustion of waste rock containing high concentrations of graphite. Waste piles allowing for convective flow of air should therefore be avoided.

The tailings will be generated as part of the processing, whereby the acid forming minerals present in the ore are retained in the tailings. Therefore, the acid forming characteristics of the ore samples (Sgr) are considered conservatively indicative of the tailings.

### 4.2.2 Tailings Properties

Two tailings stream are generated at the Concentrator floatation circuits. These are the rougher flotation tailings (RFT) and cleaning flotation tailings (CFT).

A series of geotechnical and mineralogical tests were conducted on samples of rougher and cleaning floatation tailings, which were generated in the pilot concentrator. All tests were conducted on raw materials without adding flocculants.

The laboratory test results indicated that the RFT comprise low plasticity Sandy Clays (CL) while the CFT comprise high plasticity Sandy Silts (MH). As can be seen in Figure 4-1 and grading characteristics of the tailings are similar except for the particles smaller than 0.01 mm.



### Figure 4-1 Particle Size Distribution test resutls





Figure 4-2 Atterberg limits test results

The Standard Maximum Dry Density (SMDD) showed that the MDD and Optimum Moisture Content (OMC) of the CFT and RFT samples were 1.21 t/m<sup>3</sup> at 43% and 1.21 t/m<sup>3</sup> at 22%, respectively.

The column settling tests indicated that the untreated CFT are staying in suspension and the settlement, measured by an increase in dry density, was only 4% after 10 days. The RFT settled much faster and the dry density increased by more than 50% in 22 hours.

The 1D consolidation tests indicated that the CFT has typical consolidation characteristics for high plasticity silts. The consolidation tests also confirmed a very low permeability of the CFT which was measured to be in the order of  $10^{-9}$  to  $10^{-10}$  m/s.

The mineralogical tests results (Figure 4-3) indicated that silicates are the dominating minerals in the tailings. The RFT contains approximately 12% Fe-Sulphides, while the CFT samples contained only 1.4% of Fe-Sulphides. The CFT was also found to contain approximately 33% of Ceria-zirconia, which was not found in the RFT sample.

The dominating abundance of the Ceria-zirconia minerals in the CFT sample was confirmed to be associated with the grinding media that contaminated the tailings sample. Therefore, the CFT sample and the associated test results are not considered to be representative of the CFT. As a result the geotechnical parameters of the CFT stream remain uncertain and must be investigated in the next stage of the project.



Figure 4-3 Grouped Mineral Abundance (by weight)

# 5 Tailings management

# 5.1 Overall objectives

In order to minimise the potential environmental and social impact of the tailings generation, transport and disposal, while maximising the project benefits, Talga established the following key objectives for the tailings management strategy:

- a) **Tailings:** mimimise tailings production, explore potential use for tailings as a by-product including the potential of keeping the different tailings streams separate or no,t as well as minimise the harmful potential of the tailings
- b) Land-use: minimise the area required for tailings storage as well as minimise the effect on site specific constraints
- c) **Risks**: minimise the potential for uncontrolled release of tailings or tailings leachate during and post operation (ie during production and closure phases)
- d) **Closure**: allow for long-term stable post-operation (closure) conditions

The selection of the most suitable tailings management technique is driven by the optimal combination of the above tailings management objectives under the project-specific conditions and constraints.

The acid forming potential, confirmed by field and laboratory tests, was identified as the primary risk for the tailings management are discussed in more detail later.

### 5.1.1 Tailings considerations

#### Minimise tailings production

Talga has explored the possibility of concentrators tailings to be utilised as a by-product for another production or construction process. Options that have been identified include, use as a silicate based media in concrete production and separation of pyrite minerals for supply to pyrite market. Ongoing feasibility studies will further evaluate the potential for these and other beneficial uses for tailings materials.

### Minimise harmful potential

As outlined in Section 4.2.1, the tailings are considered to be long lag acid forming.

To examine the feasibility of 'desulphurising' the tailings, magnetic separation testing was performed on the rougher tailings. The magnetic separation was confirmed to be successful in reducing the sulphur content from 1.6% to 0.63%. Further testwork is planned to demonstrate the effectiveness of removing sulphide containing minerals within the tailings streams to  $\leq 0.3\%$  sulphur.

Based on the comparatively lower content of Fe-Sulphide in the CFT (Section 4.2.2), it may be feasible to treat this finer tailings with acid neutralising medium and thus reducing the risk of acid generation. This opportunity will be further explored in the next stages of the project.

## 5.2 Land-use considerations

### 5.2.1 Minimise storage area

In order to minimise the area affected by tailings management the area/areas of the storage facility/facilities is/are minimised. This can be done by increasing the storage height and/or in combination with maximising the tailings stored dry density. Tailings density is a result from densification, by thickening or filtration, of tailings before deposition and/or by deposition method where compaction of filtered tailings normally results in highest densities and sub aqueous deposition in the lowest. The choice of method can, however, not only be related to minimising the footprint of the storage facility, as the other objectives has to be considered as well. Closure probably being the most critical aspect.

### 5.2.2 Site Selection

A constraints mapping based approach has been used to explore the most appropriate location for a TSF. Constraints have been mapped by Tailings Consultants Scandinavia (TCS) in order to explore potential locations for a Tailings Storage Facility (TSF) for permanent disposal of tailings.

The site constraints mapping was conducted at three different scales with 100 km, 50 km and 10 km radius from the location of the mine. The site constraints study considered land ownership type, heritage and environmental constraints as well as the local topography and catchment areas. The priority of the constraints has been evaluated on a three-level scale;

- 1. TSF is not possible, i.e. "no-go zone"
- 2. TSF may be possible, i.e. "zone to be avoided"
- 3. TSF is possible, "possible zone"

The constraints considered as part of the mapping are summarized in Table 2.

# Table 2 Summary of considered constraints (presented both in Swedish and English) as well as source and which area (radius) they are relevant including constraints priority.

| Constraints |                                     |   |  |    | Area/radius km |     |  |
|-------------|-------------------------------------|---|--|----|----------------|-----|--|
|             | Swedish                             | English   | Source   | 10 | 50             | 100 |  |
| 2           | Riksintresse<br>rennäring           | National interest<br>Reindeer Husbandry               | Geodatakatalogen Länsstyrelserna<br>https://ext-<br>geodatakatalog.lansstyrelsen.se/GeodataKat<br>alogen | Х  | Х              | Х   |  |
| 3           | Rennäring (div.<br>ej riksintresse) | Reindeer Husbandry<br>(not of national interest)<br>1 | _"-  | х  | Х              | х   |  |
| 3           | Riksintresse<br>kulturmiljövård     | National Interest<br>Cultural Heritage                | _"_  |    | Х              | Х   |  |
| 3           | Riksintresse<br>Frilutsliv          | National Interest<br>Recreation / Outdoor<br>values   | _"-  | х  | Х              | х   |  |
| 2           | VISS sjöar                          | VISS lakes  | _"_  | Х  | Х              | Х   |  |
| 2           | VISS vattendrag                     | VISS waterways  | _"_  | Х  | Х              | Х   |  |
| 2           | VISS<br>grundvatten                 | VISS groundwater                                      | _"_  | х  | х              | Х   |  |
| 2           | Vattenskydds-<br>område             | Water protection areas                                | _"-  | Х  | х              | Х   |  |
| 1           | Naturreservat                       | Nature Reserves                                       | _"_  |    | Х              | Х   |  |
| 1           | Nationalparker                      | National Parks  | _"_  |    |                | Х   |  |
| 1           | Natura 2000 SCI                     | Natura 2000 Habitats<br>directive                     | _"_  | Х  | Х              | Х   |  |
| 1           | Natura 2000<br>SPA                  | Natura 2000 Birds<br>directive                        | _"_  | Х  | Х              | Х   |  |
| 3           | Försvarsområde                      | Military Areas  | www.geodata.se   | Х  | Х              | Х   |  |
| 3           | Kraftledning                        | Power line  | Svenska Kraftnät<br><i>www.svk.se</i>  |    |                | х   |  |
| 3           | Vägar                               | Roads   | www.Lantmäteriet.se  | х  | Х              | Х   |  |

<sup>1</sup> Reindeer Husbandry not of National Interest includes different kind of; grazing lands and land-use, like strategic areas, calving land, season land.

Figure 5-1 show the 100 km radius, which shows that the region is covered by different constraints areas. To the north and west of the mine site, beyond the 10km radius are large nature reserves. Throughout the whole 100 km radius are there are Nature 2000 areas (specifically the Torne River system), VISS water courses and streams as well as reindeer herding paths. From this perspective, no significantly better locations were found within the 100 km radius area.

A number of existing disturbed areas were examined at desktop level for their suitability for tailings storage. None of the sites identified were found to be suitable to progress further into the feasibility studies. Table 3 lists the sites examined and describes the advantages and constraints that limited further exploration of the suitability of the sites.

| Table 3 | Existing disturbed areas that were examined for suitability to provide a site for |
|---------|---|
|         | Nunasvaara South tailings.  |

| Site Name                       | Current<br>owner | Current use  | Advantages   | Constraints  |
|---------------------------------|------------------|--|--|--|
| Mertainen                       | LKAB             | Iron ore mine, currently<br>mothballed   | Disturbed site. Within 50km<br>of site   | No sulphide minerals on site.<br>Not permitted for storage of<br>acid generating tailings<br>material. Variation to existing<br>(LKAB) environmental permit<br>required.<br>Adjacent to high value<br>conservation wetlands<br>(Nature reserve). |
| Masugnsbyn                      | LKAB             | Dolomite mine, currently in<br>production.<br>Several years mine life left in<br>existing pit. | Disturbed site. Within 50 km<br>of site.<br>Mine pit is within<br>dolomite/limestone geology<br>(acidic leachate would<br>neutralised) | Current active mining<br>operation. Not permitted for<br>storage of acid generating<br>tailings material. Variation to<br>existing (LKAB)<br>environmental permit<br>required.   |
| Construction<br>material quarry | Unknown          | Small unrehabilitated quarry<br>close to E45, near<br>Svappavaara.                             | Disturbed site. Within 50 km of site.  | Too small for life of mine tailings material   |
| Construction<br>material quarry | Unknown          | Unrehabilitated quarry in<br>moraine south of Lake<br>Hosiojarvi.                              | At the mine site location.   | Existing pit is within sandy and porous materials.   |



# Figure 5-1 Map showing all the constraints considered as well as the areas (radius) investigated

NATIONAL PARKS

NATIONALPARKER

Figure 5-2 and Figure 5-3 shows the key constraints maps for the 50 and 10 km radius circles, respectively. No significantly advantageous areas for the TSF were identified outside the 10 km radius. The area within 10 km from the mine side does not include National interest of cultural heritage and Nature reserves and hence was identified as the most prospective area for the TSF location. Therefore, the area directly surrounding the mine site was further assessed in terms of the potential TSF location.



| RIKSINTRESSE RENNÄRING<br>RIKSINTRESSE KULTURMILIÖVÅRD<br>FRILUFTSLIV | NATIONAL INTEREST REINDEER HUSBANDRY<br>NATIONAL INTEREST CULTURAL HERITAGE<br>NATIONAL INTEREST RECREATION/<br>OUTDOOR VALUES |
|---|--|
| VISS SJÖAR  | VISS LAKES   |
| VISS VATTENDRAG   | VISS WATERWAYS   |
| VISS GRUNDVATTEN  | VISS GROUNDWATER   |
| VATTENSKYDDSOMRÅDE  | WATER PROTECTION AREAS   |
| NATURA 2000 SCI   | NATURA 2000 HABITATS DIRECTIVE   |
| NATURA 2000 SPA   | NATURA 2000 BIRDS DIRECTIVE  |
| VÄGAR   | ROADS  |
| FÖRSVARSOMRÅDE  | MILITARY AREAS   |
| RENNÄRING EJ RIKSINTRESSE   | REINDEER HUSBANDRY NOT<br>OF NATIONAL INTEREST   |
| NATURRESERVAT   | NATURE RESERVES  |







NATIONAL INTEREST REINDEER HUSBANDRY NATIONAL INTEREST RECREATION/ OUTDOOR VALUES VISS LAKES VISS WATERWAYS VISS GROUNDWATER WATER PROTECTION AREAS NATURA 2000 HABITATS DIRECTIVE NATURA 2000 BIRDS DIRECTIVE ROADS MILITARY AREAS

RENNÄRING EJ RIKSINTRESSE

REINDEER HUSBANDRY NOT OF NATIONAL INTEREST

#### Figure 5-3 Map showing the area of 10km radius with applicable constraints

The main constraints identified within the 10 km circle around the mine are:

- Natura 2000 protected areas,
- National interest Reindeer husbandry,
- National interest recreation/outdoor values and National interest conservation (which are overlapping areas and as such not shown on the above Figures)
- VISS waterways, and
- Public roads.

## 5.3 Risks considerations

Uncontrolled release from tailings facilities can be divided into two general categories;

- instant catastrophic release, such as failure of the tailings impoundment; or
- small but ongoing release, such as acid mine drainage or dust generation on the tailings surface.

Minimising the risk of the impoundment failure will be achieved by sound design of the facility in accordance with the modern engineering practice where allowance is made for extreme loading conditions including flooding and earthquake. Construction and operation are equally important for design in order to reduce risk associated with the TSF. Construction would be completed by a competent and experienced contractor and full-time on-site supervision by an experienced engineer familiar with the design.

The consequences of a potential TSF failure can also be limited by factors such as minimising the height of the structure as well as minimising the amount of water stored with the tailings. This can be achieved by dewatering (filtration) of the tailings prior to deposition and/or by decanting water released from the deposited tailings as well as providing drainage for the on-going consolidation of the deposited tailings.

To minimise seepage from the facility, the TSF will include drainage and seepage collection systems as well as seepage barriers.

The TSF will designed to prevent dust emissions by providing suitable cover, applying dust control agents and limiting exposed tailings surfaces.

### 5.4 Closure considerations

One of the objectives of the TSF design is the ability for progressive closure. This consideration is relevant due to the acid generation potential of the tailings and prolonged exposure of the deposited tailing to oxygen will trigger generation of acids. The progressive closure of the TSF will reduce the capital requirements for closure at the cessation of production and will allow for an environmentally responsible and safe unplanned closure of the facility, if required.

The closure of the TSF will ensure that all acid generating materials are encapsulated and ingress of water and oxygen is prevented.

# 6 Selection of tailings management method

## 6.1 Overview

The selection of the preferred tailings management method was based on a series of key decisions made throughout the course of this project. The key considerations and decisions were as follows:

- 1) Is a new facility need?
- 2) If a new facility was required, should it be constructed at the mine site?
- 3) if a new facility was required, should it be constructed above or below ground?
- 4) If a new facility was required, should it be a "wet" storage facility or a dry stacked tailings facility?
- 5) If a new facility was required, should it be integrated with other mine waste storage?

The decision making process is indicated in Figure 6-1 and the decision making points are further discussed below.

# 6.2 The need for new TSF

Talga considered a number of tailings deposition option including deposition into an existing dolomite pit (at Masugnsbyn) and existing non-operating mine (Mertainen) both operated by others.

Because of the significant acid forming potential and the associated permitting that would impact other parties as well as the logistical and legal issues, Talga considered it unfeasible to dispose of the tailings into facilities operated by others.

Similarly the deposition into an existing pit was also found unfeasible due to timing, permitting, legal and commercial aspects. Therefore, Talga decided that a new TSF is required for the project.

# 6.3 TSF location

The constraints mapping study, presented in Section Error! Reference source not found., concluded that storing the tailings outside the Project area would not be advantageous. Therefore, Talga decided that the preferred location for the new TSF is at and near the mining area.

# 6.4 Above ground vs below ground TSF

Both above ground and below ground TSF options were considered. The below ground deposition at the project could be possible either into the mined pit(s) or into the existing lake Hosiojärvi.

Tailings deposition into lake Hosiojärvi was considered unfeasible due to the direct environmental impact onto the lake and the uncertain seepage paths from the lake that could lead to contamination outside the lake area. The lake bed and shores would have to be investigated and a seepage barrier liner would most likely be required to limit the risk of uncontrolled seepage from the lake. Similarly, the overflow structure (dam) would need to be engineered and constructed to the level of a conventional dam. Therefore, the deposition into the existing lake would unlikely provide any benefits to the project and was not further considered as an option for the tailings storage.

Deposition of tailings into mined pit would not be possible in the initial stages of the project when no mined out pits are available. In addition, most of the pit shells are not fully enclosed and an engineered confining structure would be required to contain the tailings within. Finally, the Swedish legislation prohibits actions that would sterilize or impede access to ore deposits. From this perspective, it is uncertain whether approval for in-pit deposition would be granted by the Mining Inspectorate.

#### Therefore, Talga decided that the new TSF at the project site would be an above ground facility.

It is noted that the in-pit deposition option in the later stages of the project when a suitable pit may become available will be further considered as an opportunity in the next stage of the project and it is captured in the opportunity register (Section 8).

# 6.5 Wet versus dry TSF

In order to achieve the tailings management objectives, Talga considered a wide range of above ground tailings deposition strategies including thickened tailings discharge, paste tailings deposition, tailings codisposal and tailings filtration.

Due to the significant acid forming potential of the generated tailings (Section 4.2), the acid leachate generation was found to present the most critical aspect of the tailings management. Acid leachate generation also applies to mine waste management.

Uncontrolled generation of acid leachates from the tailings storage is not acceptable and therefore the conditions that would allow for the tailings oxidation and acid leachate generation must be prevented. This is typically achieved by isolating the reactive tailings either within a NAF (non acid forming) material (tailings encapsulation) or within a water body (subaqueous disposal) or a combination of thereof.

The kinetic testing completed to date indicated that the tailings are unlikely to be PAF-SL. Therefore, the tailings could be potentially exposed to the environment for several months without the risk of acid leachate being generated, which provides flexibility in terms the initial tailings management before the reactive tailings are isolated.

For the tailings encapsulation, it is frequently beneficial to filter the tailings such that they can be handled similarly to the PAF mine waste and the NAF material used for the encapsulation. In other words the filtered tailings would be dry-stacked as conventional soil in a storage facility.

In the subaqueous tailings option, the tailings could be discharged into the water body in any form and the tailings storage area could also be used for disposal of the acid generating mine waste.

The principal options for tailings management along with their key advantages and disadvantages are summarised in Table 4. Based on the studies completed to date, **Talga selected the dry-stack option as the preferred option for tailings management** and it is further discussed Section 6.7.

The key drivers of this decision were the risk of failure of the wet tailings containment, comparable higher risk of seepage, unfeasibility of progressive rehabilitation and closure and the potential lack of construction materials for the dam. As a result of the tailings dam failure in Brazil in January 2019, which follows successive tailings dam failures in the industry over the past century, it was also considered that the social and environmental acceptability of a new wet storage facility could be significantly more difficult compared to a dry-stack facility.

#### Table 4 High level comparison of deposition otpions

|                           | Advantages   | Disadvantages  |
|---------------------------|--|--|
| Dry stacking              | Can be co-disposed with mine waste<br>Can be progressively rehabilitated<br>Increased water recovery and allow for<br>higher rate of raise due to the higher<br>tailings density<br>Minimise the risk of flooding of<br>downstream areas<br>Prevents pipe freezes and frosting<br>problem that wet tailings impoundments<br>encounter<br>Comparatively simple and lower capital<br>requirement for closure | Requires tailings dewatering (filtration)<br>with high capital and operating costs<br>Performance of the filters depends on<br>the consistency of the tailings<br>Tailings filtration requires highly skilled<br>operators<br>Dry stacking of fine grained tailings<br>requires construction of a robust outer<br>shell  |
| Wet tailings<br>discharge | Does not require filtration and would have<br>lower capital and operating costs<br>Can accommodate variable tailings feeds<br>Simple to operate  | Requires confining structure (dam), that<br>would present a long term liability<br>After recent failures, wet storage<br>facilities may be seen as presenting<br>unacceptable risks<br>Low water recovery depending on water<br>management<br>Pipe freezes and frosting issues at the<br>impoundment<br>Increased likelihood of seepage from the<br>facility<br>Does not allow for progressive<br>rehabilitation<br>Hich closure capital costs |

## 6.6 Standalone TSF vs Co-disposal

The acid leachate generation properties of the tailings are also exhibited by a large portion of the mine waste (waste rock). Therefore, it was considered beneficial to co-dispose of the tailings and mine waste in a common stockpile.

Due to the nature of the tailings (Section 4.2), the outer shell of the standalone dry-stack would require reinforcement from structurally sound rockfill and earthfill. Handling of the tailings filter cake without mixing with coarser material may also be difficult. In addition, a standalone tailings dry-stack, compared to a co-disposal facility, would constitute additional area requiring management of acid leachate.

# Based on the above considerations, Talga Resource selected a co-disposal of tailings with mine waste as the preferred tailings deposition method for the project.

The co-disposal concept is outlined in Section 6.7 and will be further developed and refined in the next stages of the project.

| Construct ne                        | WIJF!             | 7                               |                        |  |                     |                                  |                   |
|-------------------------------------|-------------------|---------------------------------|------------------------|--|---------------------|----------------------------------|-------------------|
| NO                                  | YES               | ~                               |                        |  |                     |                                  |                   |
| Utilise existing dolomite pits      | NEW TSF IS NEEDED |                                 |                        |  |                     |                                  |                   |
| - unsuitable timeline               |                   |                                 |                        |  |                     |                                  |                   |
| - permitting issues                 |                   |                                 |                        |  |                     |                                  |                   |
| - legal & commercial issues         |                   |                                 |                        |  |                     |                                  |                   |
| - naulage cost                      |                   | Construct TSE at th             | ne project area ?      |  |                     |                                  |                   |
| - permitting issues                 |                   |                                 |                        | 1  |                     |                                  |                   |
| - legal & commercial issues         |                   | NO                              | YES                    | ~  |                     |                                  |                   |
| - haulage cost                      |                   | Constrains mapping did not find | NEW ISFAI PROJECT SITE |  |                     |                                  |                   |
| Send tailings offshore              |                   | any advantage of remote TSF     |                        |  |                     |                                  |                   |
| - politically&socially unacceptable |                   |                                 |                        |  |                     |                                  |                   |
|                                     |                   |                                 |                        | Construct above gro                            | ound facility ?     |                                  |                   |
|                                     |                   |                                 |                        | NO   | YES                 | 1                                |                   |
|                                     |                   |                                 |                        | Utilise mined out pit                          | NEW ABOVE GROUND    |                                  |                   |
|                                     |                   |                                 |                        | - unfeasible due to pit shape                  | TSF AT PROJECT SITE |                                  |                   |
|                                     |                   |                                 |                        | <ul> <li>unsuitable mining schedule</li> </ul> |                     |                                  |                   |
|                                     |                   |                                 |                        | Utilise existing lake                          |                     |                                  |                   |
|                                     |                   |                                 |                        | <ul> <li>environmental impact</li> </ul>       |                     |                                  | 6                 |
|                                     |                   |                                 |                        | - still requires a dam                         |                     | Construct dry                    | facility ?        |
|                                     |                   |                                 |                        |  |                     | NO                               | YES               |
|                                     |                   |                                 |                        |  |                     | Construct conventional wet       | NEW ABOVE GROU    |
|                                     |                   |                                 |                        |  |                     | storage TSF                      | DRY STACK FACILIT |
|                                     |                   |                                 |                        |  |                     | - need for dam(s)                |                   |
|                                     |                   |                                 |                        |  |                     | - higher risk of failure         |                   |
|                                     |                   |                                 |                        |  |                     | - higher seepage                 |                   |
|                                     |                   |                                 |                        |  |                     | - perceived to pose unacceptable |                   |
|                                     |                   |                                 |                        |  |                     | risk                             |                   |
|                                     |                   |                                 |                        |  |                     |                                  |                   |
|                                     |                   |                                 |                        |  |                     |                                  |                   |

Figure 6-1 Decision making diagram



### Co-dispose with mine waste?

#### NO

### )

- Standalone TSF - need for reinforced shells
- difficulty in constructing
- additional are with AMD issues
- additional are with AIVID ISS

| <br>YES              |
|----------------------|
| NEW ABOVE GROUND     |
| CO-DISPOSAL FACILITY |
| AT PROJECT SITE      |

# 6.7 Dry stacking concept

Dry stacking of tailing will require the following key components:

- Tailings thickener
- Tailings filtration plant
- Dry circuit for tailings deposition

The tailings thickener would be required to increase the solids content of the tailings before entering the filter plant. The very low settling rate of CFT (Section 4.2.2) confirms that flocculants will be needed to increase the thickener performance. It is likely that a conventional high rate thickener will be sufficient.

The geotechnical test completed as part of this study (Section 4.2) indicated that the tailings comprise fine-grained low plasticity clays and high plasticity silts. Therefore, the conventional filter pressing would most likely be the preferred method of filtration. A high-pressure vacuum disc filtration may also be considered for the RFT because of their comparable lower plasticity. Depending on further thickening and filtration testing, the tailings stream can be either combined or filtered and stockpiled separately.

The filter cake would be collected and then transported to the dry stack facility for permanent storage. Due to the very fine-grained nature of the tailings, the outer shells of the dry stack would need to be constructed from a more competent material.

Co-disposal of tailings and mine waste would be beneficial because the mine waste could be used as a structural fill supporting the fine-grained tailings within. As most of the mine waste is also acid generating (Section 4.2.1), the co-disposal system would integrate the management of acid forming waste.

To avoid differential settlement with the associate issues (uneven deformation, cracking, instability, etc.) it would be beneficial to mix the filter cake with the mine waste. Alternatively, the mine waste stacking could form cells into for a separate tailings deposition. The positive ratio of mine waste to tailings (4:1) provide considerable flexibility in terms of the material dry stack construction.

The dry stack will be constructed with a seepage barrier at its based combined with a drainage and seepage recovery system. The outer shells of the dry stack will be progressively closed using non-acid forming (NAF) materials. Golder (2019) report indicates that suitable low permeability NAF materials can be sourced locally from the naturally occurring till. To further limit an uncontrolled seepage from the facility the NAF materials may be mixed with bentonite.

The bottom underdrainage system will be placed above the low permeability barrier (formed by soil bentonite mix) to collect water released from the dry stack area during the consolidation process. Water collected from the underdrainage system will be returned to a wastewater treatment plant prior to storage within the process water supply system.

Surface drainage will be collected at designated location of the co-disposal area and returned to a wastewater treatment plant. A separate surface water drainage system will divert local watercourses around the dry-stack area to prevent their contamination and the need for additional water treatment.

The outer shells of the dry-stack area will be progressively covered with NAF (potentially treated with bentonite) to encapsulate the acid generating mine waste and tailings. To allow for the progressive closure the outer shells of the dry-stack will be constructed with a 1V in 3H slope.

The closure of the dry stack will be a conventional dome encapsulation to prevent ingress of surface water into the facility. This will be combined with a permanent surface water diversion around the facility. The closure plan and construction will allow for the on-going consolidation and deformation of the stockpile.

A surveillance system will be established to monitor the co disposal area performance and stability. This system will include monitoring of pore water pressures within the facility, seepage detection and recovery system and monitoring of the facility deformation. The monitoring system will allow for an early intervention should the co-disposal stockpile does not meet the performance expectations.

# 7 TSF Hazard Register

| Hazard  | Description  | Potential Impact   | Mitigation options  |
|---|--|--|---|
| Varying tailings<br>properties over time                          | Reliability and<br>productivity of tailings<br>filtration can be<br>severely affected by<br>tailings properties<br>outside the envelope<br>for which the filtration<br>system was designed | Loss of efficiency of<br>tailings filters and the<br>need for additional<br>and/or different filter<br>units.                              | Testing of tailings<br>samples<br>representative of the<br>ore types to be mined<br>throughout the life of<br>mine.                                       |
| Unknown tailings<br>properties                                    | The CFT sample<br>tested in this study<br>was not representative   | Inability to predict<br>tailings behaviour,<br>select appropriate<br>tailings filtration<br>method and design the<br>dry-stack             | Further testing of representative tailings samples  |
| Insufficient volume of capping materials                          | The co-disposal area<br>will need to be fully<br>encapsulated by inert<br>materials. Currently<br>there is limited<br>knowledge of the inert<br>materials types and<br>volume.             | Inability to<br>demonstrate the TSF<br>concept in the<br>documentation<br>supporting the mining<br>application.                            | Additional testing of<br>insitu material at the<br>mine site.<br>Geophysical survey to<br>map the depth of soil<br>material at site.                      |
| Differential behaviour<br>of tailings in the co-<br>disposal area | Differential settlement<br>caused by different<br>mine waste and<br>tailings properties can<br>compromise the co-<br>disposal<br>encapsulation.  | Oxidation of tailings<br>and mine waste and<br>generation of acid<br>drainage  | Further testing of<br>representative tailings<br>samples and modelling<br>of the co-disposal<br>deformations eliminate<br>the differential<br>settlement. |
| Unknown foundation<br>conditions at the co-<br>disposal area      | Unknown strength and<br>permeability<br>characteristics of<br>materials supporting<br>the drystack.  | Inability to design the<br>seepage controls,<br>drainage works and<br>confirm the stability<br>and deformation of the<br>co-disposal area. | Targeted geotechnical<br>investigation at the co-<br>disposal area.   |

# 8 TSF Opportunities Register

| Opportunity                                | Description  | Benefits  | Next steps  |
|--|--|---|---|
| Separating<br>tailings streams             | RFT and CFT tailings<br>stream can be kept<br>separated.   | RFT may be dewatered using<br>different and cheaper<br>technique than the CFT. This<br>would reduce the size of the<br>filters for the CFT.   | Testing different<br>dewatering methods<br>for the CFT and RFT.   |
| Neutralising<br>CFT stream                 | The CFT contain much<br>less Fe-sulphides than<br>the RFT and the CFT<br>stream could be<br>neutralised.                                     | The CFT can be treated with<br>acid neutralising media to<br>reduce the acid forming<br>potential. The treated tailings<br>could form a part of the<br>encapsulation system and thus<br>reduce the costs.   | Testing the acid<br>neutralisation options<br>for CFT.  |
| Treating<br>tailings with<br>pozzolans     | The tailings streams<br>are high in siliceous<br>materials and mixing<br>with pozzolans could<br>induce cementitious<br>properties           | The tailings may be able to<br>reacted either with fly ash<br>wastes from local sources or<br>naturally occurring<br>dolomite/limestone material to<br>become hardsetting. The<br>potential is that this could<br>improve the geotechnical<br>and/or geochemical stability of<br>the tailings facility. | Screen local<br>pozzolanic materials<br>and test the<br>effectiveness of these<br>materials in inducing<br>cementitious<br>properties in tailings |
| In-pit<br>deposition into<br>mined out pit | The mining schedule<br>indicates that a<br>potentially suitable pit<br>will be mined out in the<br>second decade of the<br>mining operations | In-pit deposition frequently<br>presents a comparatively<br>cheaper tailings deposition<br>option.  | Confirm the mine<br>schedule and clarify<br>whether the in-pit<br>deposition could be<br>allowed by the<br>Swedish authorities                    |