

VI. Strategies for preventing and mitigating the accumulated and residual impacts on the regional environmental system

VI.1 Grouping of the impacts in accordance with the proposed mitigation measures

Prevention and mitigation measures have been established according to the total number of impacts identified in the previous chapter. The prevention measures are focused on activities considered as low impact as a result of their temporary nature, duration, and/or magnitude.

In this sense and in a concrete manner, the activities assessed in the adjusted matrix (values -1 and -2) are mentioned in Table VI.1.1, unless the prevention measure forms part of the programs set up to manage the relevant impacts. An example of the above is the impact on the fauna during the phases for the preparation of the site, since the Protection Program proposed to oversee the management of this particular impact will take into account all phases of the project in which this environmental factor must be taken into consideration.

The impacts considered relevant are listed in Table VI.1.2. This extends to any impact which, due to its temporary nature, magnitude, size, duration, and probability of occurrence, may affect and disturb the dynamic balance (to varying degrees) of the environmental conditions in which certain types of organisms or life forms live and interact.

Table VI.1.1. Mitigation measures applicable to impacts of low significance

Project phase	Activity	Code of impact(s)	Environmental parameter affected	Timeframe	Mitigation measure
Construction	Construction of installations (base camp, heavy machinery building, concrete plant, containment dikes, etc.)	CO-001 to CO-002	The movement of materials during building work, as well as rain, can cause creepage of materials which would interrupt the activities	Low	Work program which includes actions to protect equipment from rain, as well as measures to protect stacks of materials
		CO-003 to CO-026	Generation of dust when operating equipment	Low	Not determined, depends on the activities carried out in the area of the mine, on the low wind speeds, the absence of human recipients in the proximity of the project, and the low water levels in the region to consider irrigation as a control option
		CO-027 to CO-042	Changes to the geomorphology due to slope leveling work required	Low	The measures to apply could be based on the Erosion Control Program established for the relevant impacts
		CO-043 to CO-058	Changes to the run-off pattern, which may carry materials to low-lying areas of the terrain	Low	The measures to apply could be based on the Erosion Control Program established for the relevant impacts
		CO-059 to CO-074	Changes to the permeability of the terrain due to the removal of a layer of soil, as well as cuts and backfills required	Low	The measures to apply could be based on the Erosion Control Program established for the relevant impacts
		CO-075 to CO-090	Changes to the type and composition of the soil due to cuts and backfills	Low	The measures to apply could be based on the Erosion Control Program established for the relevant impacts
		CO-123 to CO-138	Removal of the vegetal cover, including protected and endemic species	Low	The measures to apply could be based on the Vegetation Rescue and Transplant Program, determined for the relevant impacts
		CO-139 to CO-169	Destruction of habitat and fauna driven away	Low	The measures to apply could be based on the Fauna Protection Program, established for the relevant impacts
		CO-171 to CO-185	Destruction of habitat and fauna driven away, including protected and endemic species	Low	The measures to apply could be based on the Fauna Protection Program, established for the relevant impacts

Project phase	Activity	Code of impact(s)	Environmental parameter affected	Timeframe	Mitigation measure
Operation	Use of equipment and machinery, opening up cuts, transportation and storage of minerals, tailing dam	OP-001 to OP-003	The movement of materials during operations, as well as rain, can cause creepage of materials which would interrupt activities	Low	Operating procedure which includes actions to protect equipment from rain, as well as measures to protect stacks of materials, cuts, and backfills
	Opening of cuts, transportation, and storage of minerals	OP-004, OP-007 to OP-009	Generation of dust when operating equipment and the movement of materials	Low	Covering of roads with gypsum, equipment maintenance program
	Opening of cuts, transportation, and storage of minerals	OP-006	Generation of vehicle emissions	Low	Equipment maintenance program
	Tailing dam	OP-011	Water from the dam with few options for use due to its quality	Low	No mitigation measure is required, as seawater will be used and it will evaporate in the dam
	Wastewater	OP-012	Wastewater from the desalination plant (brine) and cooling water	Low	Not considered due to the relatively low amount generated and the modeling results
	Gas venting	OP-005	Air quality due to emissions of SO ₂	During stoppages and start-ups for the entire operating life of the project	Installation of equipment to check emissions
	Other emissions into the atmosphere generated during the process	OP-010	Air quality due to CO, CO ₂ , and NO _x emissions	Continually during the operating life of the project	Maintenance programs for all the emission-generating equipment

Table VI.1.1. Mitigation measures applicable to impacts of low significance (cont'd)

Table VI.1.2. Mitigation measures applicable to relevant impacts

Project phase	Activity	Code of impact(s)	Environmental parameter affected	Timeframe	Mitigation measure	Compensatory measure
Construction	Construction of installations (base camp, heavy machinery building, concrete plant, containment dikes, etc.)	CO-091 to CO-122	Abundance and diversity of vegetation as well as impact on protected and endemic species	Permanent	Vegetation Rescue and Transplant Program	Creation of a trust with CONANP (Mexican national commission of protected natural areas) to support the conservation activities of the El Vizcaíno Biosphere Reserve
	Building and upgrading of access roads	CO-170 and CO-186	Creation of barriers for the displacement of the fauna, affecting protected and endemic species	Permanent	Fauna Protection Plan Design of roads with protected crossings	
Operation	Opening cuts	OP-013	Change to the slope of the terrain	Permanent	Protection plan for the protection of erosion (soil recovery plan)	
		OP-014	Change to run-off patterns	Permanent		
		OP-016	Changes to the permeability of the soil due to the removal of a layer of soil	Permanent		
		OP-018	Removal of soil (change of type)	Permanent		
		OP-020	Removal of the vegetal cover (abundance)	Permanent	Vegetation Rescue and Transplant Program	
		OP-022	Selective removal of plant species (diversity)	Permanent		
		OP-024	Removal of protected or endemic plant species	Permanent		
		OP-026	Removal or driving away of fauna (abundance)	Permanent	Fauna Protection Plan	
		OP-028	Disruption to the movement of certain fauna species	Permanent		
OP-030	Some protected or endemic animal species may be eliminated or driven away	Permanent				

Project phase	Activity	Code of impact(s)	Environmental parameter affected	Timeframe	Mitigation measure	Compensatory measure
Operation	Tailing dam	OP-015	Change to the run-off patterns	Permanent	Protection plan for the protection of erosion (soil recovery plan)	Creation of a trust with CONANP (Mexican national commission of protected natural areas) to support the conservation activities of the El Vizcaíno Biosphere Reserve
		OP-017	Removal of soil (changes to the permeability, type, composition, and characteristics)	Permanent		
		OP-019				
		OP-021	Flooding of the tailing dam will prevent the re-colonization of vegetation and therefore reduce its abundance	Permanent	Vegetation Rescue and Transplant Program	
		OP-023	Flooding of the dam will cause specific habitats to disappear and therefore lead to a reduction in the diversity of vegetation, as well as the disappearance of protected and endemic plant species	Permanent		
		OP-025				
		OP-027	Removal or driving away of fauna (abundance)	Permanent	Fauna Protection Plan	
		OP-029	Disruption to the movement of certain fauna species	Permanent		
OP-031	Some protected or endemic animal species may be eliminated or driven away	Permanent				

Table VI.1.2. Mitigation measures applicable to relevant impacts (cont'd)

VI.2. Description of the strategy or system of mitigation measures

The proposed system of mitigation measures will form part of an Environmental Management Plan (EMP) set up to oversee the activities outlined in Tables VI.1.1 and VI 1.2; it will be further complemented by environmental educational activities and the monitoring of any of the project's activities with a potential impact on the environment.

It should be emphasized that the EMP and its constituent parts have not yet been established, as we are awaiting the decision on the Environmental Impact Statement and the finalization of the project's detailed engineering to determine the economic and human resources required, as the project has not yet fully taken shape (selection of suppliers, obtaining of manuals, compliance with specifications, etc.) nor have the costs involved been determined.

Notwithstanding the above, Appendices VIII.3.31 to VIII.3.36 present, for information purposes, the documents prepared for the prospecting phase of the mining project; these will be adapted and used as a basis for drafting those required for the operating phase.

The contents of the EMP will be as follows:

- Environmental Surveillance Plan (ESP)
- Additions to the Construction Works Program (CWP)
- Erosion Control Program (ECP)
- Vegetation Rescue, Transplant, and Reforestation Program (VRTaRP)
- Fauna Protection Program (FPP)

Each of the abovementioned points must include the following paragraphs:

- ❖ Distribution list
- ❖ Objectives
- ❖ Scope
- ❖ Human and economic resources required
- ❖ Definition of responsibilities
- ❖ Activities of managers
- ❖ Schedule of work
- ❖ Procedures to review and adjust the work
- ❖ Technical procedures (when applicable)

The proposed objective of each program is outlined in Table VI.2.1.

Table VI.2.1. Objectives, resources, and timings of the Environmental Management Plan and supporting documents.

Activity	Objective	Resources involved	Timetable for its implementation
Environmental Management Plan	To ensure the coherency of all plans and programs included	Requires the implementation of an Environmental Manager responsible for its application	After the document is approved and the impact decision issued until the monitoring activities are completed, after the Abandonment Plan
Environmental Management System	To ensure compliance with legal provisions with regards to the environment To define the activities required to comply with legal provisions and the managers responsible for carrying out such actions To establish compliance indicators, the frequency of measurements, reporting formats, and protection guidelines To set up procedures to handle any contingencies with a potential environmental impact	In addition to the Environmental Manager, at least two deputies are required to provide the necessary support, with a least two vehicles This staff will be responsible for controlling and managing the environmental compliance procedures	From two months before starting the preparation of the site until the completion of the project
Additions to the Construction Works Program (CWP)	To define the checks required for the various building activities with an environmental impact	After adjusting the scope, only monitoring by the Environmental Manager and support personnel will be required, as well as the collaboration of the subcontractors and the applicant's own personnel in completing the logbooks	During the preparation of the site and construction phase
Erosion Control Program (ECP)	Using a methodological guide, measures will be imposed to control erosion, and will be applied during the construction of civil engineering work	After adjusting the scope, only monitoring by the Environmental Manager and support personnel will be required, as well as the collaboration of the subcontractors and the applicant's own personnel in completing the logbooks	During the preparation of the site and construction phase
Vegetation Rescue, Transplant, and Reforestation Program (VRTaRP)	To locate and rescue floral species capable of surviving To plan, set up, and operate a nursery to supply the species required to reforest the affected areas	Requires the services of a specialist, and at least four technicians, each supported by four laborers	Intermittent. Their presence is required for removing the vegetation, for the acclimatization, and subsequent transplanting, in addition to looking after the nursery
Fauna Protection Program (FPP)	To locate and rescue any reptiles and small mammals (possibly birds) before the preparation of the site. Relocate to other areas, under the supervision of the Reserve's management	Requires the services of one mammal specialist and one reptile specialist, and at least three technicians, each supported by three laborers	Intermittent. Their presence is required for capturing and releasing the specimens encountered

Each of the aforementioned programs, i.e. those considered as mitigation, compensatory, or support measures, will be developed and submitted for authorization, after the project has received approval in terms of its environmental impact. This action is justified due to the time and costs involved, as the preparation of the measures, attending planning meetings, and obtaining the approval of the Reserve's management requires a considerable investment.

The fundamental aspects of the plans are outlined below:

VI.2.1. Construction phase

In accordance with activities in the project zone, the main impacts to be mitigated are:

VI.2.1.1. Air quality

Regarding emissions into the atmosphere such as solid particles (dust) during the upgrading of roads and areas, and the formation of dust clouds as a result of the passage of vehicles, even though this is considered as a temporary and localized impact, resolution is complex due to the scarcity of water in the region. However, during the construction, the gypsum found at the site will be used to cover the roads needed to transport the minerals from the mines to the smelting plant.

In addition, with regard to vehicles with internal combustion engines emitting gases when operating, a preventative maintenance program will be set up for such vehicles and any building equipment.

The preventative maintenance program must include, though not exhaustively:

- a) An inventory of the units allowed to circulate within the site, as well as
- b) A timeline for the scheduled maintenance carried out on these units; both for vehicles belonging to the applicant and those belonging to any subcontractors
- c) A logbook can be supplied showing the consumption of fuel, irrespective of whether or not the fuel is supplied outside the site; the purpose of the log is to give an idea of the amount of pollutants generated during the phase, as well as to act as an indicator

This program will be integrated when establishing the detailed engineering for the project.

VI.2.1.2. Removal of vegetation

The major impact will be on the vegetation and, in this sense, the preventative measure will focus on its controlled removal; for this reason, a Vegetation Rescue and Transplant Program will be implemented based on the program established for the prospecting phase; this program is included in this EIS as Appendix VIII.3.33. This program will focus on the protected species and those not yet included in NOM-059-SEMARNAT-2001 (norm for the identification of species or populations of wild flora and fauna at risk in the Mexican Republic) that have a certain esthetic or cultural value, i.e. the cactus *Pachycereus pringlei*.

The program must be carried out in coordination with the Reserve Management, in order to optimize the resources obtained as successfully as possible for the transplanting.

Due to the size of the project, this activity will require the most resources, both on an economic and human level. An extremely assertive plan is required, as the activities will take several years, in keeping with the filling of the tailing dam.

It is worth emphasizing that the company has extensive experience in rescuing and transplanting local species, through the programs presented during the final phase of the prospecting program.

VI.2.1.3. Erosion Control Program

The activities requiring the removal of soil during the construction phase are:

- Digging access roads to the cuts and tunnels
- Preparing the terrain for the civil engineering works
- Cuts and backfills for the civil engineering work, laying lines
- Construction of the curtain for the tailing dam
- Installation of pipes to deposit sludge in the tailing dam

The soil management program will be generally applied to all mining work. As the removal must be accompanied by the subsequent storage of the soil removed. These layers of soil will be stored in previously designated areas requiring maintenance to prevent losses; the purpose is to reuse the soil when the site is restored, or when backfilling other areas as the mining work progresses.

In general, removing soil may cause erosion and, for this reason, a program to arrest any erosion must be implemented. In this sense, temporary storage areas for the upper layer of soil recovered must be designated and adapted, in order to prevent losses due to erosion.

VI.2.1.4. Fauna Protection Plan

The fauna in the area presents a low level of diversity, as human activity over the last 100 years has driven it away; the impact of the construction and operating phases of the mining on the fauna is therefore considered to be minimal.

Any fauna that has not permanently fled from the operating area of the mining project and the area of influence of the roads could be affected, or could even be at risk of dying.

For the integral and effective protection of the fauna a protection plan must be proposed.

Under the scope of this program, the rescue operations mainly concern the reptiles located in the area covered by the tailing dam. In this sense, the plan, in addition to describing positions and responsibilities, must also include a description of the various collection methods; furthermore, some recommendations must be provided to limit the impact and facilitate the secure re-installation of the fauna at new sites. As part of this document, Appendix VIII 3.34 includes the Fauna Protection Plan established for the prospecting phase, which will be adapted for the operating phase.

The sole purpose of the fauna relocation programs is to return the fauna to its natural habitat. Whatever the species, attempts must be made to limit, or completely avoid, the time spent in captivity. It is recognized that a permit is required to capture and transport the fauna for its relocation; this permit must be obtained from SEMARNAT (Mexican environment and natural resources department) through the Mexican Wildlife Office.

VI.2.2. Operating phase

VI.2.2.1. Air quality

It is estimated that as a result of the process for obtaining sulphuric acid, several gases such as SO₂ may be emitted through the chimney. A simulation model has been established in view of this situation and is presented as Appendix VIII.3.17; this model can be used to set up a monitoring program consisting of the continual measurement of SOx concentrations in the chimney, to ensure compliance with regulations. A representative sample of the gases will be diverted to an analytical instrument connected online to the plant's control system. The resulting concentrations will be assessed by the operator in order to make any adjustments required.

The concentration of sulphuric acid mist in the gas discharged will be periodically measured using an instrument connected online. The readings will be sent to the plant's control system, in particular during start-ups when it is most likely that these concentration readings will fluctuate. This information will be used to make any adjustments required to comply with the provisions stipulated in NOM-039-SEMARNAT-1993. Likewise, the immediate proximity of the plant will be periodically surveyed to identify or rule out any potential impact on the color or state of the surrounding vegetation.

Moreover, the logbook used for monitoring and the corresponding analyses attesting to compliance with the atmospheric emission regulations will be sent to the Ministry annually.

Furthermore, internal combustion vehicles emit gases when operating; therefore the preventative maintenance program for vehicles and equipment will apply.

Regarding the potential emissions of solid particles (dust) when vehicles are moving along the roads, it has already been mentioned that these roads are to be coated with gypsum from the quarries to prevent dust clouds.

The production of electrical energy by burning fossil fuels will also result in the emission of combustion gases. In this case, making adjustments and the maintenance program for the equipment will also suffice for preventing any excessive and uncontrolled emissions of gases. The monitoring process will be set up according to NOM-085-SEMARNAT-1994 and the corresponding reports presented.

VI.2.2.2. Water quality

The sea water used for cooling purposes will be discharged into the sea and, despite the fact that the simulation has shown that the temperature will be dissipated within a few meters, a distribution pipe will be installed to prevent the water from being discharged in a single location and reduce any localized rise in the water temperature.

In addition, a monitoring program will be implemented to determine the consequences of the emission at the location where the water is discharged into the sea. The monitoring procedure will be limited to checking the temperature of the sea water around the distribution pipe using four buoys, each located at a cardinal point, to measure the temperature at a minimum of three different depths over an area with a radius of 20 m around the pipe or any other improved monitoring procedure applied as a result of the final design of the diffuser. This procedure is required to provide documental proof of the emissions, and to prevent any potential claims lodged against the company as a result of normal variations of the squid fishing grounds.

Regarding the potential formation of areas of still water in the tailing dam, the Fauna Protection Plan must monitor the physical state of the fauna that visits the dam and, even though it has been established that no salty water has been consumed, this fact must be recorded. If necessary, measures will be adopted to keep the fauna away from the area of still water in the tailing dam whilst it is operating until the said fauna has gone away.

VI.2.2.3. Removal of vegetation

The vegetation in the area with cuts and the tailing dam will be totally removed and, for this purpose, the program outlined for the construction phase will be followed.

VI.2.2.4. Erosion Control Program

The soil present in the area with cuts and the tailing dam will be totally removed, applying the program outlined for the construction phase; the work will consist of storing and preserving the superficial layers of the soil.

VI.2.2.5. Fauna Protection Plan

The fauna present in the area of the project (especially) the cuts and the tailing dam, will flee and, any remaining, will be moved to locations where they can be preserved; therefore, the program mentioned in the construction phase will be followed.

VI.2.2.6. Modification of the landscape

Cutting down the vegetation, removing the soil, and displacing materials will severely change the landscape. Obviously, work of this nature will produce a different landscape to the current one, as it will have no vegetation and will have been excavated. Even though the area has been affected by previous mining work, the new mining will result in an additional loss of vegetation and soil.

The changed landscape will be obvious in the areas with cuts, the tailing dam and, to a lesser extent, the roads. As the characteristic vegetation, which must be removed, has a prolonged life cycle, the time required for regeneration will also be lengthy. For this purpose, restoration work will be carried out at the same time as the mining operations in the areas where minerals have been extracted.

Again, the consequence of the loss of vegetation will be a loss of habitat for the fauna.

Whilst the tailing dam is operational, the loss of landscape is accompanied by a loss of terrain and the formation of features that differ completely from any previously existing in the area.

However, the corrective measures will be applied as and when the cuts come to the end of their operational life, and will continue with the tailing dam.

VI.2.2.7. Support for the local economy

During the entire mining project a range of support is required such as: skilled labor, competent suppliers, excellent relations with the community, and a good perception of the company from the local and regional communities and the state.

This support can be obtained via the following programs:

- Development program for local suppliers
- Training program for the personnel employed
- Environmental education program
- Community communication program
- Mutual assistance program with the municipal government and other companies, for handling contingencies

The development program for the local suppliers acknowledges the need to acquire some tools within the community of Santa Rosalía; therefore, the aforementioned program will start by determining which supplies can be acquired locally, thereby providing an impetus to the economy of the region.

As innovative technology will be used on the installations, the personnel taken on will require training; ideally, the personnel employed will be from Santa Rosalía.

The environmental education program for the community will also be linked to developing collaborations with the local population, emphasizing activities to take care of the environment and increasing the community's awareness of the importance of the area where they live.

The aim of the community communications program is to establish lines of communication between the applicant and the community to avoid situations of conflict due to poor communications or the interference of persons or associations from outside the community.

Finally, a mutual assistance program will be set up in order to determine any risks existing in the region as a result of the presence of industries and the possibility of natural or normal phenomena occurring in the community (fire), in order to establish a cooperation system to take actions whenever an emergency situation occurs.

VI.3. Residual impacts

The acknowledged residual impact is the impact on the surface of the land. This impact is most visible through the creation of the tailing dam as, at the end of its operational life, it will leave a plateau over 250 meters above sea level, where previously there had only been occasional small streams and intermittent creeks.

In addition, another residual impact will be changes to the topography due to the potential sinking that may occur due to the collapse of the underground workings located extremely close to the surface (< 40 m in depth), as well as a result of the cuts and their subsequent backfilling and reforestation, which means that it is impossible to leave the topography in a state completely identical to the one encountered prior to the mining work; however, it is believed that the differences in the topography caused by the subsidence of the ground will NOT be perceptible without the use of topographical instruments.

It will only be possible to compensate for the artificial landscape through reforestation in other naturally protected areas; for this reason, it is recommended that any actions are approved by the authorities of the Natural Protected Area in order to determine the resources required. Therefore, a trust fund will be set up with an amount yet to be determined; the allocation of funds from this trust will be supervised by a technical board including representatives of the Reserve Management, the National Commission of Protected Natural Areas, the Federal Environmental Protection Agency and the applicant company.