



Espejo
de **Tarapacá**

Chapter 7: Mitigation, Repair and Compensation measures Plan EIA Espejo de Tarapacá Region of Tarapacá Chile

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7. MITIGATION, REPARATION AND COMPENSATION MEASURES PLAN

7.1. Introduction

The project of hydro-pumping plant with seawater "Espejo de Tarapacá" (hereinafter, the project) It will be located in the communes of Iquique and Pozo Almonte, province of Iquique, Region of Tarapacá, approximately 100 km south of the city of Iquique. The nearest towns are the River Seco Cove, next to a project path and 14 km further south, Caleta San Marcos, located at 500 m from the project.

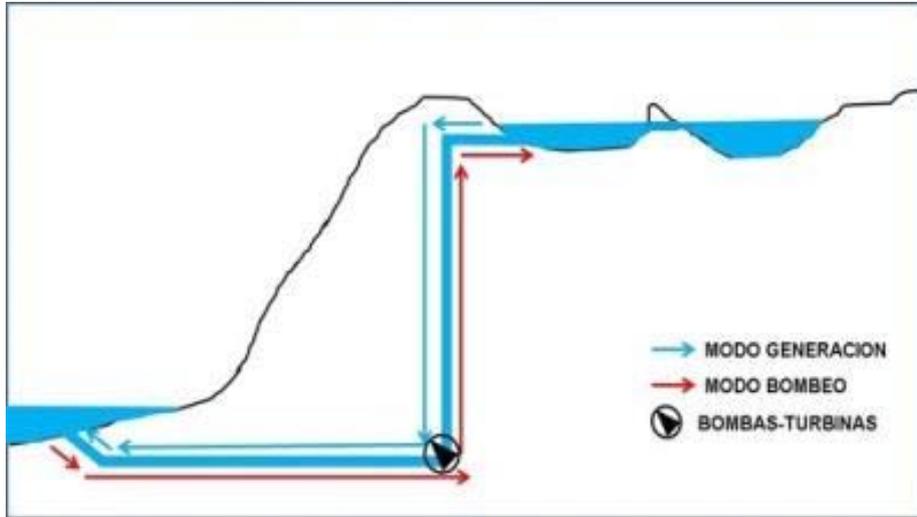
The project consists of the installation and operation of a reversible hydraulic plant, i.e. the same machines function as pumps in a sense of water circulation or as turbines in the other direction, are the modes pumping and generation respectively. Likewise, regardless of the mode of operation in which the plant is operating, the same surface works, the water canalizations, the underground and the submarine will be used.

The installed power will be 300 MW and It will have three reversible hydraulic turbines of the Francis type of 100 MW each.

In its operation, during the day it'll pump seawater through Pumping Equipment-generation Which will be carried through a tunnel to Natural concavities located at 585 M.A.S.L. These concavities will be covered by a bituminous membrane and the reservoir of seawater to be generated will have an area of approximately 375 ha, at an approximate height of 609 M.A.S.L. This reservoir will accumulate seawater pumped during the day. Then, during the night, the plant will operate in generation mode, the accumulated water in the reservoir will flow by gravity towards the sea, taking advantage of the height between the coastal border and the plateau, going through the same pump-generation equipment, this time to generate Electricity

The point of intake and discharge of water in the sea is the same, since the plant is reversible and will use the same works and machines for the circulation of seawater in pumping mode and in generation mode. All these works are in the commune of Iquique.

The following figure presents a diagram that charts the reversible operation mode of this control unit.

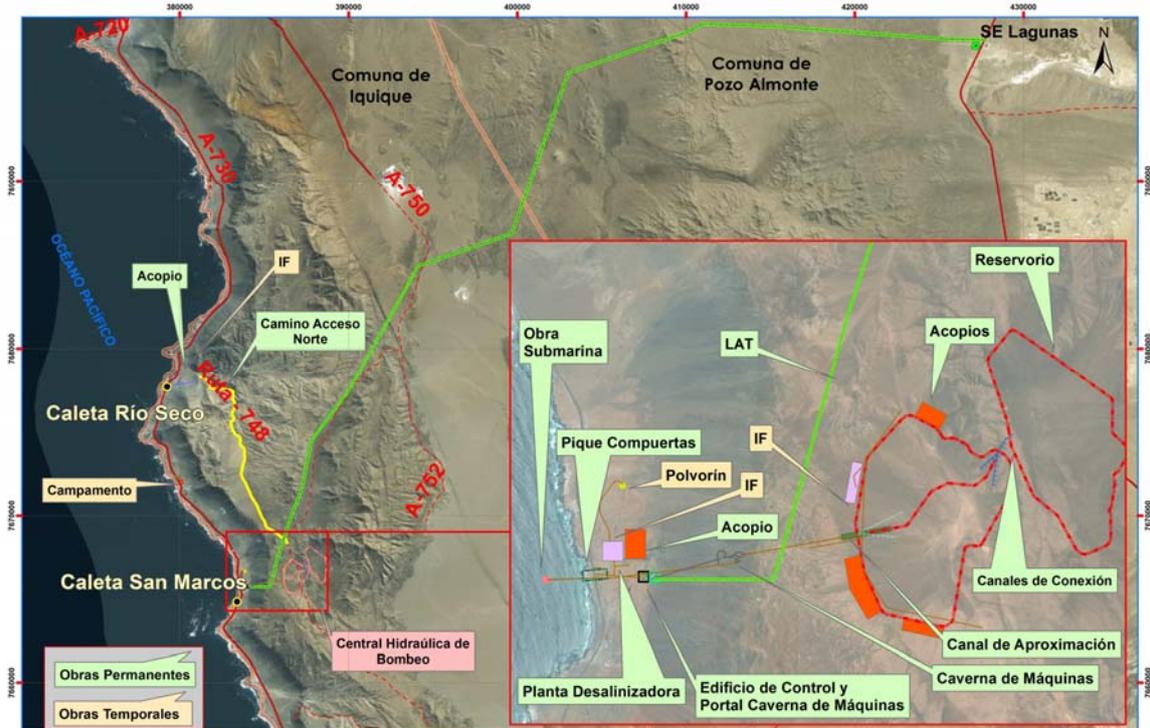
Figure 7-1: Representation of the Operation reversible: pumping/generation

Source: Self-elaboration

An annual average generation of 1.75 is estimated Gwh/day which will inject electricity into the existing Lagunas substation of the large North interconnected system (SING) by means of a 65 km long electrical transmission line (LAT). The last 35 km approximately, of LAT are in the commune of Pozo Almonte.

In the following figure you can see the location of the works of the project.

Figure 7-2: Works of the project



Source: Self-elaboration

In accordance with the provisions of The Article 18 Letter I) and article 97 Of D. S N ° 40/12, Regulation of the SEIA, In This chapter is delivered Mitigació 's Plan of measuresN, repair and/or compensation of project "Espejo de Tarapacá". Here, it is They will describe and justify, Based on the results of the prediction and evaluation of environmental impacts, the measures To be adopted For Delete, minimize reStop, restore or compensate for environmental impacts Adverse Generated by the activities of the project.

According to the foregoing, this chapter considers:

1. Measures Environmental mitigation; They aim to avoid or diminish the adverse effects of the project or activity, whatever their execution phase.
2. MEasures Restoration or Repair Environmental They are intended to replace one or more of the components or elements of the environment at a quality similar to that before the Impact on that component Or Element, in case of not being possible, to restore its basic properties.

3. Measures compensation Environmental Tlenen by purpose to produce or generate an effect Alternative positive and Equivalent To an identified adverse effect, that it is not possible to mitigate or repair.

The following are the measures of mitigation, reparation and/or compensation for all those impacts that as indicated in chapter 4 of this EIA: "Prediction and Environmental evaluation impacts "were rated as significant, for better clarity, in The Table 7-1, it is Present the impacts With Your Qualifying, the affected component and the project stage.

Table 7-1: Identification of components with significant Impact

Phase	Component	Impact	Environmenta I impact Value	Importance of impact
Construction	Fauna	Involvement of the nesting area Of <i>Oceanodroma Markhami</i>	-72	Significant
Construction	Fauna	Loss of specimens from the reptile group In a state of conservation (<i>Liolaemus Stolzmanni</i> And <i>Phyllodactylus Gerrhopygus</i>)	-45	Significant
Construction	Archaeology	Archaeological sites Intervention	-48	Significant
Construction	Paleontology	Partial intervention of fossil levels	-57.6	Significant

Source: Self-elaboration

7.2. Environmental mitigation measures Plan

7.2.1 Fauna

The adverse effects that the project will generate on the fauna component say related to the impact of the 'area Of Nesting In the Golondrina De Mar Negra (*Oceanodroma Markhami*) During the construction, specifically in the North access road sector, near the dry river, so the associated measure will be designed to prevent and/or Minimize This impact. On the other hand there will be a significant impact on the Species Of Reptilels *Liolaemus Stolzmanni* And *Phyllodactylus Gerrhopygus* Translated into the loss of copies during the construction phase of the project, in the work reservoir, Whose measure will be the rescue and relocation of the Species. Below is the detail of each of the measures.

Table 7-2: Measure: Home Construction Of the North access road (Swallow of MAr NEgra).

Measure: Restriction of the start of The construction Of the North access road In the area where remains were found Of the Black Sea swallow species (<i>Oceanodroma Markhami</i>)	
Project phase	Construction
Environmental component	Fauna
Environmental impact	Involvement of the nesting area Of the Black Sea Swallow (<i>Oceanodroma Markhami</i>). Construction will develop a path whose work can have an impact on nesting sites Identified in the baseline.
Objective	Avoid or Minimize The affectation of nests The species <i>Oceanodroma Markhami</i> With respect to the works of the project and where they were found.
Description and justification	<p>The application of a measure intended to prevent the involvement of a nesting area of this species is required, since On the occasion of the Evaluation of impacts (Section 4.7.8, chap. 4) This impact was anticipated and assessed as significant.</p> <p>The measure consists of Restrict the commencement of construction of the North access road in The sectors where the Remnants of Nests of <i>Oceanodroma Markhami</i>, in the following sense: construction will not begin In those areas During the nesting stage. Once the nesting is over Is Will carry out the construction Of those sections of road And When it's finished, Is Used On a continuous For the development of the project.</p>
Place, form and opportunity of implementation	<p>To achieve the goal Before Fixed, andL Start of the Construction of the access road from Rio Seco, in the nesting sectors identified on the baseline, will be made Between December And June of the first year of construction, Outside the nesting period.</p> <p>In addition, in advance To the construction of the road of North Access In the sections corresponding to Where Nest remains were identified, an S will be carried outUpervisión In the field For a specialFauna list in order to free the area to intervene. The The area's release implies that A professional ReRun The sector Pedestrian form and low veilCidad In search of nests Of <i>Oceanodroma Markhami</i>. If the Presence of nests With Black Swallow De Mar The competent authority shall be informed.</p>
Compliance indicator	Report Site release for construction start Presented Into the Superintendence of the environment (hereinafter, SMA) With Copy to

	SAG, With the report Of the activities carried out In the Wake of field supervision. This report will be forwarded Within the month following the release of the area.
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Source: Self-elaboration

Table 7-3: Measure: Rescue and Relocation Plan.

Measure: Rescue and relocation Plan for species <i>Liolaemus Stolzmanni</i> And <i>Phyllodactylus Gerrhopygus</i>	
Project phase	Construction
Environmental component	Fauna
Environmental impact	Loss of specimens from the reptile group In category of Conservation Corresponding <i>To the species Liolaemus Stolzmanni</i> And <i>Phyllodactylus Gerrhopygus</i> .
Objective	The loss of copies by relocation in an area that will not be intervened by the execution of the Project, so Avoid the loss of specimens And the deterioration of local populations.
Description and justification	The present "Plan of RSearch and Relocalizacion "consists of translocating individuals from The Species Previously identified by considering their Low mobility In relation to construction activities. The specimens will be rescued in the sectors where they were found From the area that will be intervened by the works of the Project to sectors that will not be. For these purposes, chapter 10 presents the technical and formal contents for the granting of PAS 146 for the hunting or capture of animals of protected species (Section 10.14).
Place, form and opportunity of implementation	<p>The catches will be carried out in the area of the reservoir, In the sectors where the baseline findings were made.</p> <p>Its implementation will consist in the active search of specimens in their potential shelters. The captured specimens will be kept in captivity, TRANSPand finally liberated.</p> <p>The catches will be carried out by a team with experience in wildlife management, led by a professional specialist in the field. In order to decrease the probability of recolonization, these will be carried out in a near-time to the intervention of the area to be released. For the same reason, the rescue will be by sectors according to the construction program.</p> <p>The activities shall be carried out after obtaining the catch permit granted by the competent authority.</p> <p>The methodology for determining the area Rescue in the reservoir And how to carry out the rescue and relocation is presented Regarding the presentation of the technical and formal contents</p>

	necessary for the PASM 146 (Section 10.14, chap. 10).
Compliance indicator	Obtaining The authorization Awarded To For the Agricultural and Livestock Service (from now on, SAG) and later Compliance Report Sent to The SMA, with Copy to SAG That will be presented to the SMA within the 60 days following the completion of each rescue.

Source: Self-elaboration

7.2.2 Archaeology

The project considers the Intervention of archaeological sites in the project area, the associated measures are described below.

Table 7-4: Measure: Informative signage.

Measure: Signage Informative and guard and fencing in the cases indicating	
Project phase	Construction
Environmental component	Archaeology
Environmental Factor	Archaeological heritage
Objective	To preserve the historical cultural heritage present in the area of influence of the project
Description and justification	<p>The measure consists In installing a signage that reports on the finding with an identification, warning about their legal protection.</p> <p>Additionally, En cases where the findings are less than 30 m from the works, the finding will be close. The fences will be maintained during the entire construction phase of the The work close to finding And they will be withdrawn after that stage. High stability, visibility and contrast materials will be used to manufacture fencing.</p> <p>The justification for this measure is based on informing and educating to foster the care of cultural heritage.</p>
Place, form and opportunity of implementation	<p>This measure will take place during the construction stage in the coastal, plateau and Pampa sectors of the project where the findings are located.</p> <p>Prior to the start of the construction phase of the project, informational signage will be installed on the troop footprints..</p> <p>Shelter signage will be installed near the cemetery Of the Dry river sector And to the evidence of the passage of the old railway in order to ensure its preservation because of its historical interest. Prior to its installation, the proposal of this signage will be sent to the Council of National Monuments (hereinafter, CMN).</p> <p>For the fencing, a demarcation will be made of the proper emplacement of fencing and fences, so that their installation does not constitute a threat to the points of patrimonial interest.</p> <p>The installation of signage and fencing will be carried out on the following findings 6, 11, 12, 13, 16, 17, 22 and 23 (see Annex 3.1 baseline)</p>

Compliance indicator	Photographic record of the existence of the signage and fencing in the foreseen sector and report of activities To the SMA, Submitted within the 60 days following the completion of the commitment, With copy to the CMN.
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Source: Self-elaboration

Table 7-5: Measure: Archaeological Management Plan.

Measure: Archaeological Management Plan	
Project phase	Construction
Environmental component	Archaeology
Environmental Factor	Archaeological heritage
Objective	To preserve the historical cultural heritage present in the area of influence of the project.
Description and justification	<p>The archaeological management Plan covers those necessary measures to be made before the inescapable impact on one of the archaeological sites identified in the baseline.</p> <p>Depending on the findings made at the camp site, this Plan considers a probe and archaeological rescue of the findings. The archaeological rescue will be implemented with an expanded excavation on the archaeological site in order to rescue the vulnerable material and prevent its deterioration, ensuring the protection of the material in a definitive deposit (academic institution or museum), in Conformity to what determines the Cmn. According to the provisions of the LEY n ° 17,288, any archaeological site before an imminent affectation of its state and preservation must be communicated to the CMN to determine the measures proceeding of rescue and conservation.</p>
Place, form and opportunity of implementation	<p>The management Plan will be applied for site number 19 (see Nexus 3.1 of the baseline chapter) prior to the start of the execution of the construction stage of the Camp of the Project. For these purposes, chapter 10 is accompanied by the technical and formal contents for the granting of PAS 132 (Section 10.6).</p> <p>Once the RCA is obtained, PARA Implement the QLAN will manage the permits of excavation with the CMN to implement first an archaeological probe, in a network of 12 boreholes of 50 x 50 CM distributed in an area of 3 ha, corresponding to the area where the</p>

	<p>camp will be located.</p> <p>Then you get up'sn the Any Findings and materials collected will be catalogued and packed for later delivery to a deposit Museal Authorized by CMN.</p>
Compliance indicator	<p>INforme End of activities Referred to the SMA, with Copy to CmnWithin 90 days following the end of the field activities and The Preparation of the findings for delivery. , The report It will give an account of the work done, the results of these and the final destination of the materials collected.</p>

Source: Self-elaboration

Table 7-6: Measure: Permanent Archaeological Monitoring.

Measure: Permanent Archaeological Monitoring	
Project phase	Construction
Environmental component	Archaeology
Environmental Factor	Archaeological heritage
Objective	Avoid impacts on unforeseen archaeological remains and identification of eventual findings Subsurface Not detected in previous stages.
Description and justification	<p>This measure is aimed at avoiding impacts on archaeological remains that could exist under the surface and that are detected during the realization of Earth movements or other similar works. Or another part, the monitoring will allow to assure the good state of conservation of the protective fences-indicators of the archaeological sites that will be installed before the beginning of the construction of the works in the corresponding sector.</p> <p>Monitoring will also ensure that project works do not affect the sites identified on the baseline that are close to the project's works, especially during the displacement of people Related to the project,, Machinery Involved in the construction, minor vehicles Used by the project, among other field activities corresponding to the construction phase of the project.</p>
Place, form and opportunity of Implementation	QTo carry out the monitoring Permanent indicated, there will be a Specialist archaeologist during the entire construction phase of the Project. If archaeological material is identified during these activities, the relevant authorities will be notified and appropriate rescue and

	mitigation measures will be implemented in accordance with the CMN.
Compliance indicator	Reports midterm and report End of the Owner of the project, accompanying in each case the archaeologist's technical report, referred to the SMA with copy to CMN The final report will be delivered Within 60 days After the construction phase has been completed, the Sma And with a copy of the CMN.

Source: Self-elaboration

Table 7-7: Measure: Cultural Heritage Care Training.

Measure: Training in the care of cultural heritage	
Project phase	Construction
Environmental component	Archaeology
Environmental Factor	Archaeological heritage
Objective	Avoid impacts on unforeseen archaeological remains and impart general knowledge about the archaeological heritage that exists in the area of activity.
Description and justification	It will consist of inductive and educational lectures on the archaeological findings present in the project area and its due protection, to all those people who Work on building Project works. These talks will also present the procedures that workers should follow in case of finding a new finding.
Place, form and opportunity of implementation	These talks will take place during the entire construction stage of the project, every 6 months. The talks dictated by an archaeologist In person or through videos or similar technologies.
Compliance indicator	Attendance Registration to induction talks Archaeological and evaluation. The registration will be in the office of the proprietor.

Source: Self-elaboration

7.2.3 Paleontology

The project considers the Partial intervention of fossil levels in the area of Project. LAssociated measures are described below.

Table 7-8: Measure: Paleontological rescue Plan.

Measure: Paleontological Rescue Plan	
Project phase	Construction
Environmental component	Paleontology
Environmental Factor	Paleontological Heritage
Objective	Of the existing paleontological heritage in the area of the Project.
Description and justification	<p>Given the existence With marine and continental invertebrates in the area of the Project, Could be at risk The integrity of the fossils present in the area (Coquina levels Quaternary)Both collection and direct damage by the transit of civil servants and excavation and land removal works.</p> <p>Due to the foregoing, a plan will be made to rescue the paleontological heritage that considers the collection of significant samples In order to Make of a catalogue of samples and their inclusion in the collection or museum indicating the CMN.</p> <p>For these purposes, chapter 10 (Section 10.7) presents the technical and formal contents for the granting of PAS 132, to make excavations of archaeological, anthropological and paleontological type.</p>
Place, form and opportunity of implementation	<p>The rescue of the paleontological patrimony will be realized before the beginning of the execution of the construction works Of the sectors with findings, For the following sites:</p> <ul style="list-style-type: none"> • Remains of Quaternary terrestrial gastropods On high levels of gravel Hospice: a) 385964 E, 7666096 S; b) 383793 E, 7665886 S; c) 386055 E, 7665878 S; d) 381749m E, 7677978 S. • Remains of Quaternary marine invertebrates presumably from the so-called littoral deposits: E) 389880 E, 7665930 S; f) 383971 E, 7665991 S; g) 383793 E, 7665886 S; h) 380425 E, 7678207 S; i) 380376 E, 7678067 S; j) 380159 E, 7672120 S. indicated on the baseline. <p>The QLAN includes collection of significant samples by specialists, with the respective geographical positioning and stratigraphic,</p>

	curing of the samples paleontological collected in laboratory, preparation of a catalogue of samples and their inclusion in the Collection or museum that indicates the CMN, the elaboration of a rescue report including the treatment and specific management of objects of paleontological character, in consideration of all the environmental regulations in force in Chile and the contextualization of the findings in The taxonomic and stratigraphic area.
Compliance indicator	Request for appropriate authorisations and submission of report of compliance to the Sma, with CMN copy, Within 60 days After The construction phase.

Source: Self-elaboration

Table 7-9: Measure: Talks of Promotion of Paleontological Heritage.

Measure: Talks to promote the valuation of the paleontological heritage	
Project phase	Construction
Environmental component	Paleontology
Environmental Factor	Paleontological Heritage
Objective	To promote the valuation of the paleontological heritage.
Description and justification	It will consist of inductive and educational lectures on the paleontological findings present in the project area and its due protection, to all those people To work on the construction of the project's works. These talks will also present the procedures that workers should follow in case of finding a new finding.
Place, form and opportunity of implementation	These talks will take place during the entire construction stage of the project, every six months. The talks beingThey are dictated by a paleontologist, in person or through videos or similar technologies.
Compliance indicator	Maintenance of REgistro of assistance to induction talks Paleontological. The registration will be in the office of the proprietor.

Source: Self-elaboration

7.3. Plan of measures of environmental repair

The project does not Considered Repair measures.

7.4. Plan of measures of environmental compensation

The project does not Considered Measures of Compensation.