Chapter 9: Monitoring Plan for Environmental Variables EIA Espejo de Tarapacá

Region of Tarapacá, Chile

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Index

Table Index

Figures index

9. ENVIRONMENTAL VARIABLES MONITORING PLAN

9.1. Introduction

The project of hydro-pumping plant with seawater "Espejo de Tarapacá" 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.

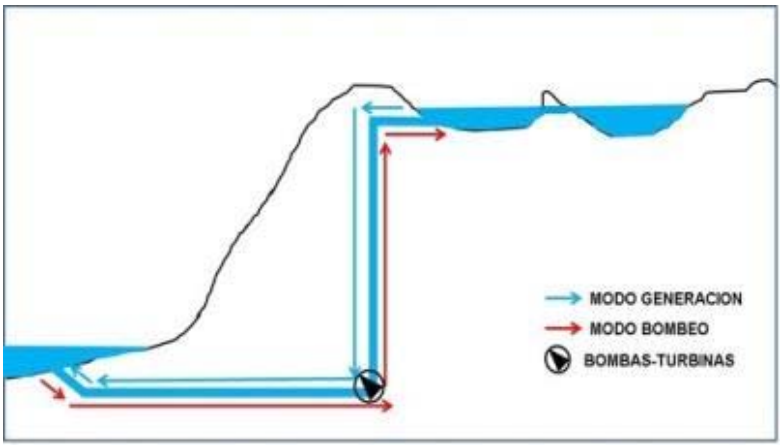
The installed power will be 300 MW and It will have three reversible hydraulic turbines of the Francis type of 100 MW each.

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 9-1. Representation of Reversible operation: pumping/generating.

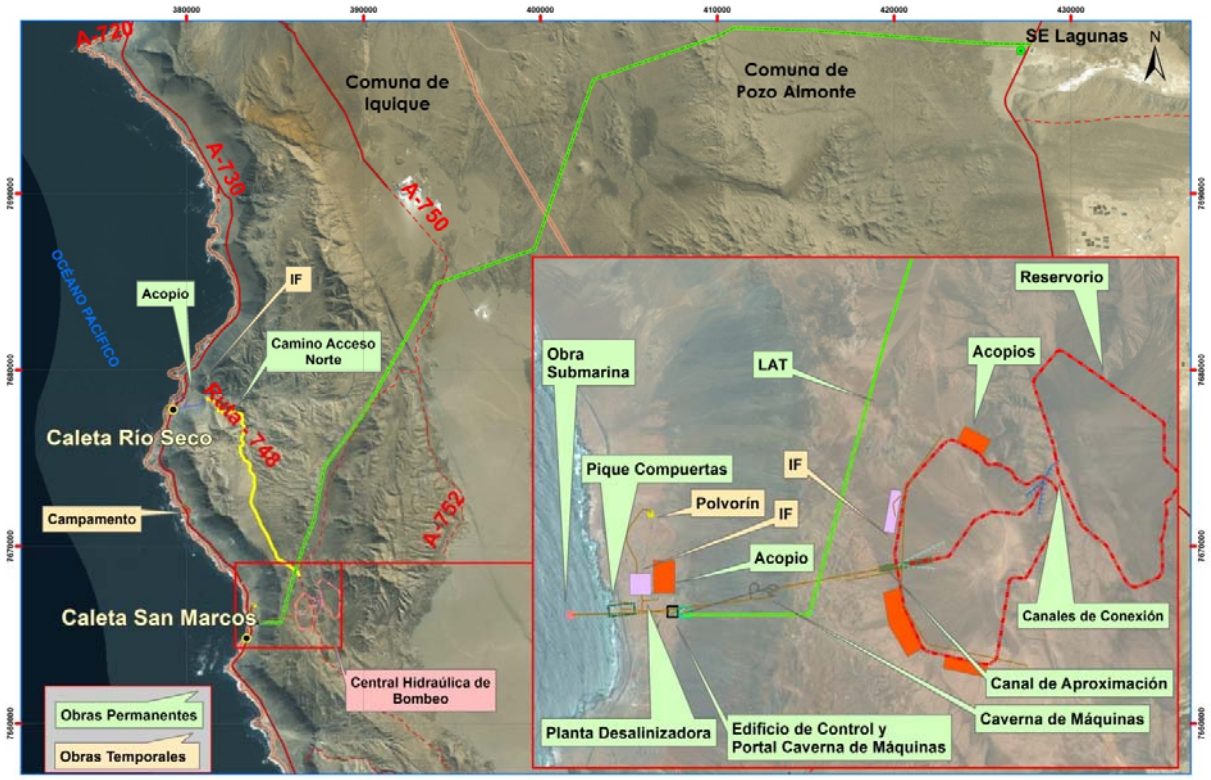


Source: Self-elaboration

An annual average generation of 1.75 GWh/day is estimated to inject electricity into the existing Lagunas substation of the large North interconnected system (SING) by means of a 65 km long power 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 9-2. Works of the project



Source: Self-elaboration

As presented in the chapters of this EIA, the project Espejo de Tarapacá will generate effects or present characteristics that necessitate the implementation of monitoring measures or environmental monitoring. This way, and This chapter is given the environmental monitoring Plan in accordance with the provisions of Law No. 19,300, article 12 letter F, amended by Law 20,417 and in DS No. 40/2013 regulations of the Environmental Impact Assessment System (RSEIA), articles 18 letter K , and to the provisions of paragraph 3 of title VI.

9.2. Objectives

The main purpose of this plan is to define the actions and activities that will be necessary in order to verify the effectiveness of the measures proposed in the plan of measures of mitigation, reparation and/or compensation (Chapter 7 of the EIA), to guarantee the Compliance with current regulations. Thus, through its implementation it will be possible to verify that the environmental factors that are relevant to the project evolve as predicted or if it is necessary to

implement additional measures. On the other hand, this chapter incorporates the follow-up to the marine environment which, despite not being associated with any significant impact, is considered a relevant environmental variable.

9.3. Environmental monitoring measures

The project Espejo de Tarapacá considers environmental monitoring programs for the environmental variables that will be significantly affected, in addition to volunteer monitoring of the marine environment.

Among the environmental variables Estimates need to be monitored during the construction and operation stages of the project according to the Impact Assessment (Chapter 4 of the EIA), are:

- Fauna
- Historical and Cultural heritage.

On the other hand, a voluntary follow-up plan is proposed on the marine environment

9.4. Environmental Variables Monitoring Plan

9.4.1 Fauna

The following are the tracking tabs for the fauna component associated with the Measures:

Table 9-1: Tracking measure: Restriction of the INicio of the Construction of the access road in North in area where HAllaon RThese of the Specie Swallow MAr NEgra

Project phase	Construction
Environmental component	Fauna: Black Sea Swallow *Oceanodroma Markhami*. Environmental Factor: Site of interest
Associated Environmental impact	Affecting the Area of nesting of *Oceanodroma Markhami*
Associated Measure	Restriction of the beginning of the construction of the project between the months of July and December where, according to existing bibliography regarding the species *Oceanodroma Markhami*, it would be the nesting season. Moreover, in addition to the foregoing, a wildlife specialist will conduct a field supervision of the section of the North access road in order to free the area to intervene.
Checkpoint Location	The monitoring sites will correspond to the North access road in the section near Caleta Rio Seco, site where the nesting site was discovered
Parameters to be used to characterize the state or evolution of the environmental factor	The parameters to be monitored will be the presence of nests of *Oceanodroma Markhami* or signs of Nesting, such as Remnants of Eggs Pens, feces, in the north Access sector in the section near Caleta Rio Seco Where the baseline clues were found. The information collected during the monitoring will be analyzed to avoid intervening in the activity of nesting of the species in the sector.
Limits allowed or committed	The receipt of 100% of the nests identified in the route.
Measuring Duration and frequency	The monitoring will be yearly During all the years of the construction period of the project, between the months of July and December. At the end of it will be assessed according to the results obtained, And as indicated by the authority, if it is pertinent to continue with the follow up during the operation phase
method to use or follow-up actions	The study area will be searched for signs of Nesting, such as feathers, feces, footprints and nests. Once identified, its occurrence will be spatially delimited and sampling quadrants of 6 m x 6 m, in which they will be counted Any Nests, following the methodology used by Torres-Mura & Lemus (2013).
Deadline and frequency of reporting	An annual report will be sent to the SMA with copy to SAG with the

Project phase	Construction
	monitoring report after thirty days of completion of the tour.

Source: Self-elaboration

9.4.2 Historical and Cultural Heritage

The following are the follow-up sheets for the archaeology component associated with these measures, respectively:

- Installation of information and shelter signage
- Archaeological Management Plan
- Permanent Archaeological Monitoring
- Cultural Heritage Care Training
- Paleontological Rescue Plan

Table 9-2: Monitoring measure: Installation of information and shelter signage

Project phase	Construction
Environmental component	Archaeology
Associated Impact	Archaeological sites Intervention
Associated Measure	Installation of information and shelter signage
Checkpoint Location	The installation of signage and fencing will be carried out on the following findings 6, 11, 12, 13, 16, 17, 22 and 23
Parameters to be used to characterize the state or evolution of the environmental factor	Presence of signage at each control point and conservation status of the same
Limits allowed or committed	Maintain and replenish During the construction period The total information Applying and installed Backup
Measuring Duration and frequency	The inspection of or Specialists will be held once a month during the entire

Project phase	Construction
	construction phase.
method to use or follow-up actions	Visual inspection and photographic registration will be carried out with monitoring reports, with respect to the state of conservation of the signage. In case of repositioning of signage, the action will be recorded in the report.
Deadline and frequency of reporting	A monthly report will be made of the state of the signage which will be sent once a year to the SMA with copy to CMN during the construction phase of the project.

Source: Self-elaboration

Table 9-3: Monitoring measure: Archaeological Management Plan

Project phase	Pre-construction phase
Environmental component	Archaeology
Associated Impact	Archaeological sites Intervention
Associated Measure	Archaeological Management Plan
Checkpoint Location	The management Plan will be applied to the site number 19
Parameters to be used to characterize the state or evolution of the environmental factor	Archaeological rescue Transfer
Limits allowed or committed	In case of collection, rescue and transfer: 80% of the material remains original state.
Measuring Duration and frequency	The follow-up of those findings that derive from the CMN or another that the body has to be carried out once the measure is completed.
method to use or follow-up actions	For the collection, rescue and transfer a professional archaeologist

Project phase	Pre-construction phase
	specialist in the subject will review the final state of the finding compared to the state defined in the baseline.
Deadline and frequency of reporting	Only report with results and final destination proof of the raised materials sent to the SMA with copy to CMN 30 days after the materials have final destination

Source: Self-elaboration

Table 9-4: Monitoring measure: Permanent archaeological monitoring

Project phase	Construction
Environmental component	Archaeology
Associated Impact	Archaeological sites Intervention
Associated Measure	Permanent Archaeological Monitoring
Checkpoint Location	On the archaeological findings detected in the baseline of the project In any new archaeological finds In areas where excavations and/or earth movements are carried out.
Parameters to be used to characterize the state or evolution of the environmental factor	Conservation status of each archaeological site registered on the baseline Existence of New Archaeological finds
Limits allowed or committed	Non-alteration of identified sites is compromised And when it is not possible, a rescue proposal will be made to the CMN.
Measuring Duration and frequency	The inspection of the specialists in protected historical and cultural heritage will be carried out monthly, while excavation and ground preparation activities are undertaken for the installation of the project's works. In the case of the progress register of works involving excavations, this will be carried out daily by the personnel of the work.
method to use or follow-up actions	Profession The archaeologist and the staff of the work, Coordinate a monitoring which will be through visual inspection at the checkpoints.

Deadline and frequency of reporting	Quarterly reports will be compiled in an annual report that will be sent to the SMA with copy to CMN after 60 days of elaboration of the last quarterly report. If during the excavation or earthmoving activities, the presence of archaeological contexts is recorded, it will be communicated within the Following 10 days, by report to the Council of National Monuments.

Source: Self-elaboration

Table 9-5. Monitoring measure: Paleontological Rescue Plan

Project phase	Pre-construction phase
Environmental component	Paleontology
Associated Impact	Partial intervention of fossil levels
Associated Measure	Paleontological Rescue Plan
Checkpoint Location	• Remainders of Quaternary terrestrial gastropods in levels of the high hospice gravels: 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.
Parameters to be used to characterize the state or evolution of the environmental factor	Paleontological Rescue
Limits allowed or committed	It will avoid the affectation of the paleontological sites.
Measuring Duration and frequency	The rescue of the paleontological patrimony will be realized before the beginning of the execution of the construction works to affect them.
method to use or follow-up actions	Professional paleontologist and the work, coordinate a monitoring which will be through visual inspection at the checkpoints.
Deadline and frequency of reporting	A single rescue report that includes the treatment and specific management of objects of paleontological character, in consideration of all the environmental regulations in force in Chile and the contextualisation of the findings in the taxonomic and stratigraphic field., Inside DE The 90 days after the rescue was made. The report will be sent to the SMA with copy to CMN.

Source: Self-elaboration

9.5. Voluntary follow-up Plan

9.5.1 Marine environment

The follow-up for the marine medium component is presented in detail in annex 9.1 of this chapter.

Table 9-6. Follow-up: Water quality component. Construction phase

Project phase	Construction
Environmental component	Water quality
Associated Impact	Alteration of the quality of the sea waters
Checkpoint Location	ASP1 points to the ASP10 characterized in baseline (see Appendix 9.1 of the EIA)
Parameters to be used to characterize the state or evolution of the environmental factor	Chlorophyll "a", total hydrocarbons, fats and oil, turbidity, transparency, conductivity, sedimentable solids, total suspended solids, PH, sulphates, chloride, total organic matter, BOD5, alkalinity, fecal coliforms, chromium, nickel, iron, Lead, arsenic, mercury, selenium, cadmium, manganese, vanadium and zinc. Profiles of temperature, salinity and dissolved oxygen
Limits allowed or committed	The results will be analyzed with those obtained during the baseline at the same sampling stations. With the exception of the construction of the underwater work whose activities will be limited and punctual, during the construction phase no significant or measurable impacts are expected so they do not compromise limits.
Measuring Duration and frequency	Semester during construction
method to use or follow-up actions	Direct sampling with Niskin bottles at surface level and background for temperature, salinity and dissolved oxygen profiles the measurement will be direct with French probe
Deadline and frequency of reporting	Every six months, 30 days later of the sampling. The report will be sent to the SMA with copy to Sernapesca and maritime governance.

Source: Self-elaboration

Table 9-7. Follow-up: subtidal sediment quality component. Construction phase

Project phase	Construction
Environmental component	Subtidal Sediment Quality
Associated Impact	Alteration of the physical chemical properties of marine sediments.
Checkpoint Location	ASP1 points to the ASP10 characterized in baseline
Parameters to be used to characterize the state or evolution of the environmental factor	Chromium, nickel, iron, lead, arsenic, mercury, selenium, cadmium, manganese, vanadium and zinc, sulfate, potential REdox, organic matter and particle size
Limits allowed or committed	The results will be analyzed with those obtained during the baseline at the same sampling stations. With the exception of the construction of the underwater work whose activities will be limited and punctual, during the construction phase no significant or measurable impacts are expected so they do not compromise limits.
Measuring Duration and frequency	Semester during construction.
method to use or follow-up actions	Dredger Van Veen and/or semi-autonomous scuba diving
Deadline and frequency of reporting	Every six months, 30 days After sampling. The report will be sent to the SMA with copy to Sernapesca and maritime governance.

Source: Self-elaboration

Table 9-8. Follow-up: Quality component of intertidal sediment. Construction phase

Project phase	Construction
Environmental component	intertidal sediment Quality
Associated Impact	Alteration of the physical chemical properties of marine sediments.
Checkpoint Location	intertidal stations Soft bottom: II1 to II8.
Parameters to be used to characterize the state or evolution of the environmental factor	Chromium, nickel, iron, lead, arsenic, mercury, selenium, cadmium, manganese, vanadium and zinc, sulfate, potential Redox, organic matter and particle size
Limits allowed or committed	The results will be analyzed with those obtained during the baseline at the same sampling stations. With the exception of the construction of the underwater work whose activities will be limited and punctual, during the construction phase no significant or measurable impacts are expected so they do not compromise limits.
Measuring Duration and frequency	Semester during construction
method to use or follow-up actions	Dredger Van Veen and/or semi-autonomous scuba diving
Deadline and frequency of reporting	Every six months, 30 days after sampling. The report will be sent to the SMA with copy to Sernapesca and Maritime Governorate.

Source: Self-elaboration

Table 9-9. Follow-up: benthic communities. Construction phase

Project phase	Construction
Environmental component	Benthic communities
Associated Impact	Alteration of benthic communities (Intertidal hard-bottom epibiota, soft-bottomed intertidal polybentos, subtidal background Epibiota, Ichthyofaunay, subtidal Sedimentary-fund fauna)
Checkpoint Location	Subtidal Hard Bottom: es-2 to ES-7, plus two control stations (ES-CN and ES-CS). Soft-bottom intertidal: II1 to II8. Rocky intertidal: ID-1 to ID-6, plus control stations ID-CN and ID-CS. Subtidal infauna: ASP-1 to ASP-10.
Parameters to be used to characterize the state or evolution of the environmental factor	Ecological indices (Specific diversity, equity indices and species richnesses). Estimation of the AMBI index (AZTI's Marine BioticIndex, Borja et al. 2012). ABC curves. Analysis of classification by stations (cluster) and analysis of sorting by stations.
Limits allowed or committed	The results will be analyzed with those obtained during the baseline at the same sampling stations. With the exception of the construction of the underwater work whose activities will be limited and punctual, during the construction phase no significant or measurable impacts are expected so they do not compromise limits.
Measuring Duration and frequency	Semester during construction
method to use or follow-up actions	Subtidal environment: dredger Van Veen and semi-autonomous diving intertidal environment: Direct evaluation.
Deadline and frequency of reporting	Every six months, 30 days after sampling. The report will be sent to the SMA with copy to Sernapesca and Maritime Governorate.

Source: Self-elaboration

Table 9-10. Follow-up to the planktonic communities. Construction phase

Project phase	Construction
Environmental component	Planktonic communities
Associated Impact	Planktonic Biomass loss
Checkpoint Location	1 (Start transect 1) 2 (end Transect 1) 3 (Start Transect 2) 4 (End Transect 2) 5 (Start Transect 3) 6 (end Transect 3) 7 (Start Transect 4) 8 (end Transect 4) 9 (Start transect 5) 10 (end Transect 5) 11 (Start transect 6) 12 (Fin transect 6)

Parameters to be used to characterize the state or evolution of the environmental factor	**Planktonic Communities:** Phytoplankton composition and Abundance Variability in vertical distribution Diversity **Zooplankton (includes Ichthyoplankton)** Richness of Species Or number of taxa, Abundance Numerical, specific diversity, Pielou uniformity, hierarchical classification analysis using the Bray-Curtis similarity index as a community association coefficient
Limits allowed or committed	The results will be analyzed with those obtained during the baseline at the same sampling stations. With the exception of the construction of the underwater work whose activities will be limited and punctual, during the construction phase no significant or measurable impacts are expected so they do not compromise limits.
Measuring Duration and frequency	Semester during construction
method to use or follow-up actions	Niskin bottles and Fito and zoo nets, on a superficial and deep level.
Deadline and frequency of reporting	Every six months, 30 days after sampling. The report will be sent to the SMA with copy to Sernapesca and Maritime Governorate.

Source: Self-elaboration

Table 9-11. Water quality monitoring for dispersion model verification (T and OD). Operation phase

Project phase	Operation
Environmental component	Water quality
Associated Impact	Alteration of the quality of the sea waters
Checkpoint Location	Stations arranged by circling the discharge in a radial sampling approximately 10 and 50 meters from the discharge focus.
Parameters to be used to characterize the state or evolution of the environmental factor	Temperature/Dissolved oxygen
Limits allowed or committed	Results will be compared with those obtained during the baseline and the construction stage At the same sampling stations. A range of variation will be tolerated as observed in the marine environment prior to operation. The relevant parameters were compared with table 5 of the DS 90/2000 of MINSEGPRES.
Measuring Duration and frequency	Quarterly during the first 2 years of the operation phase. Semiannually during the remainder of the operation.
method to use or follow-up actions	Direct measurement French probe
Deadline and frequency of reporting	Every six months, 30 days after sampling. The report will be sent to the SMA with copy to Sernapesca and Maritime Governorate.

Source: Self-elaboration

Table 9-12. Monitoring: Water quality for verification of dispersion model (current direction). Operation phase

Project phase	Operation
Environmental component	Water quality
Associated Impact	Alteration of the quality of the sea waters
Checkpoint Location	The pen approximation vector will be established by following 3 Lagrangian shunt elements released at the discharge point at a depth similar to that of the intake
Parameters to be used to characterize the state or evolution of the environmental factor	Direction of the current at the point of discharge to the marine receiver body.
Limits allowed or committed	The results will be compared with those obtained during the baseline and the construction stage at the same sampling stations. A range of variation will be tolerated as observed in the marine environment prior to operation. The relevant parameters were compared with table 5 of the DS 90/2000 of MINSEGPRES.
Measuring Duration and frequency	Quarterly during the first 2 years of the operation phase. Semiannually during the remainder of the operation.
method to use or follow-up actions	Lagrangian shunts
Deadline and frequency of reporting	Every six months, 30 days after sampling. The report will be sent to the SMA with copy to Sernapesca and Maritime Governorate.

Source: Self-elaboration

Table 9-13: Follow-up: Water quality. Operation phase

Project phase	Operation
Environmental component	Water quality
Associated Impact	Alteration of the quality of the sea waters
Checkpoint Location	ASP1 points to the ASP10 characterized in baseline
Parameters to be used to characterize the state or evolution of the environmental factor	Chlorophyll "A", Feopigmentos, nitrate, nitrite, phosphate, total hydrocarbons, fats and oil, turbidity, transparency, conductivity, sedimentable solids, total suspended solids, residual free chlorine, PH, sulphates, chloride, total organic matter, BOD5, alkalinity, fecal coliforms, chromium, nickel, iron, lead, arsenic, mercury, selenium, cadmium, manganese, vanadium and zinc. Profiles of temperature, salinity and dissolved oxygen
Limits allowed or committed	The results will be compared with those obtained during the baseline and the construction stage at the same sampling stations. A range of variation will be tolerated as observed in the marine environment prior to operation. The relevant parameters were compared with table 5 of the DS 90/2000 of MINSEGPRES.
Measuring Duration and frequency	Quarterly during the first 2 years of the operation phase. Semiannually during the remainder of the operation.
method to use or follow-up actions	Direct sampling with Niskin bottles at surface level and background for temperature, salinity and dissolved oxygen profiles the measurement will be direct with French probe
Deadline and frequency of reporting	Every six months, 30 days after sampling. The report will be sent to the SMA with copy to Sernapesca and Maritime Governorate.

Source: Self-elaboration

Table 9-14. Follow-up: Quality of subtidal sediment. Operation phase

Project phase	Operation
Environmental component	Subtidal Sediment Quality
Associated Impact	Alteration of the physical chemical properties of marine sediments.
Checkpoint Location	ASP1 points to the ASP10 Characterized in baseline
Parameters to be used to characterize the state or evolution of the environmental factor	Chromium, nickel, iron, lead, arsenic, mercury, selenium, cadmium, manganese, vanadium and zinc, sulfate, Redox potential, organic matter and particle size
Limits allowed or committed	The results will be compared with those obtained during the baseline and the construction stage at the same sampling stations. A range of variation will be tolerated as observed in the marine environment prior to operation.
Measuring Duration and frequency	Quarterly during the first 2 years of the operation phase. Semiannually during the remainder of the operation.
method to use or follow-up actions	Dredger Van Veen and/or semi-autonomous scuba diving
Deadline and frequency of reporting	Every six months, 30 days after sampling. The report will be sent to the SMA with copy to Sernapesca and Maritime Governorate.

Source: Self-elaboration

Table 9-15. Follow-up: Quality of intertidal sediment. Operation phase

Project phase	Operation
Environmental component	intertidal sediment Quality
Associated Impact	Alteration of the physical chemical properties of marine sediments.
Checkpoint Location	intertidal stations Soft bottom: II1 to II8.
Parameters to be used to characterize the state or evolution of the environmental factor	Chromium, nickel, iron, lead, arsenic, mercury, selenium, cadmium, manganese, vanadium and zinc, sulfate, Redox potential, organic matter and particle size
Limits allowed or committed	The results will be compared with those obtained during the baseline and the construction stage at the same sampling stations. A range of variation will be tolerated as observed in the marine environment prior to operation.
Measuring Duration and frequency	Quarterly during the first 2 years of the operation phase. Semiannually during the remainder of the operation.
method to use or follow-up actions	Dredger Van Veen and/or semi-autonomous scuba diving
Deadline and frequency of reporting	Every six months, 30 days after sampling. The report will be sent to the SMA with copy to Sernapesca and Maritime Governorate.

Source: Self-elaboration

Table 9-16. Follow-up: benthic communities. Operation phase

Project phase	Operation
Environmental component	Benthic communities
Associated Impact	Alteration of benthic communities (Intertidal hard-bottom epibiota, soft-bottomed intertidal polybentos, subtidal background Epibiota, Ichthyofaunay, subtidal Sedimentary-fund fauna)
Checkpoint Location	Subtidal Hard Bottom: es-2 to ES-7, plus two control stations (ES-CN and ES-CS). Soft-bottom intertidal: II1 to II8. intertidal Rocky: ID-1 to ID-6, more stations control ID-CN E ID-CS. Subtidal infauna: ASP-1 to ASP-10.
Parameters to be used to characterize the state or evolution of the environmental factor	Ecological indices (Specific diversity, equity indices and species richnesses). Estimation of the AMBI index (AZTI's Marine BioticIndex, Borja et al. 2012). ABC curves. Analysis of classification by stations (cluster) and analysis of sorting by stations.
Limits allowed or committed	The results will be compared with those obtained during the baseline and the construction stage at the same sampling stations. A range of variation will be tolerated as observed in the marine environment prior to operation.
Measuring Duration and frequency	Quarterly during the first 2 years of the operation phase. Semiannually during the remainder of the operation.
method to use or follow-up actions	Subtidal environment: dredger Van Veen and semi-autonomous diving intertidal environment: Direct evaluation.
Deadline and frequency of reporting	Every six months, 30 days after sampling. The report will be sent to the SMA with copy to Sernapesca and Maritime Governorate.

Source: Self-elaboration

9.5.2 Reservoir

Table 9-17. Monitoring: Water quality in the reservoir. Operation phase

Project phase	Operation
Environmental component	Water's deity in the Reservoir
Associated Impact	Alteration of physical, chemical or biological parameters.
Checkpoint Location	9 Water quality monitoring points will be used in the water column In the reservoir. 5 in the West Reservoir and 4 in the East Reservoir.
Parameters to be used to characterize the state or evolution of the environmental factor	Fluorescence of chlorophyll "a" TUrbidez, transparency, conductivity, sedimentable solids, total suspended solids, PH, Nitrates, phosphates, Sulphates, chloride, total organic matter, BOD5, alkalinitySilica In the water. Profiles of temperature, salinity and dissolved oxygen. Water Color Sediment Register Phytoplankton composition
Limits allowed or committed	The obtained values will be used as information of analysis of the water of the reservoir and for the contingency Plan of the reservoir. The modeled parameters will be compared to the data obtained. The relevant parameters were compared with table 5 of the DS 90/2000 of MINSEGPRES.
Measuring Duration and frequency	Monthly During the first 2 years of the operation phase. Semiannually during the remainder of the operation.
method to use or follow-up actions	Direct sampling with Niskin bottles at surface level and background for profiles of temperature, salinity and dissolved oxygen the measurement will be direct with French probe. Niskin bottles and phytoplankton nets, superficial and deep. Dredger Van Veen and/or semi-autonomous scuba diving.
Deadline and frequency of reporting	Every six months, 30 days after Finished The sampling. The report will be sent to the SMA.

Source: Elaboration Own

Table 9-18. Monitoring: Reservoir surveillance. Operation phase

Project phase	Operation
Environmental component	Meteorology
Associated Impact	Alteration of physical, chemical or biological parameters Water Reservoir.
Checkpoint Location	Is It will measure meteorological parameters at a point in the reservoir.
Parameters to be used to characterize the state or evolution of the environmental factor	Wind Temperature Radiation Evaporation
Limits allowed or committed	The obtained values will be used as information of analysis of the water of the reservoir. The modeled parameters will be compared to the data obtained.
Measuring Duration and frequency	On a continuous During The first two years of the operation phase. For one month on a half-yearly basis For the remainder of the operation.
method to use or follow-up actions	Weather station.
Deadline and frequency of reporting	60 Days later The first and second year measurements are finished. 30 days after the measurements have been made from the third year onwards. The report will be sent to the SMA.

Source: Elaboration