Chapter 1: Project description

EIA Espejo de Tarapacá

Región de Tarapacá, Chile

July 2014

Prepared by:

Environmental management Consultants S. A
Father Mariano 103 Of. 307
7500499, Providencia, Chile
Phone: + 56 2 719 5600
Fax: + 56 2 235 1100
www.gac.cl

Index

1. Project description 20
1.1. Identification of the holder and Legal representative 20
1.1.1 Owner ID 20
1.1.2 Identification of the holder's Legal representative 21
1.1.3 Identification of the consultant 21
1.2. General background 21
1.2.1 Project name 24
1.2.2 Brief description of the project 24
1.1.1 Objective of the project 32
1.1.2 Typology of the project 32
1.1.2.1 Indication of non-modification of project or activity 33
1.1.2.2 Indication of the development of the project in stages 33
1.1.3 Estimated amount of investment 36
1.1.4 Project Lifetime 36
1.2. LocAlization of the project 36
1.2.1 Location of the project according to political-administrative division 36
1.2.2 Cartographic representation in Datum WGS84 38
1.2.3 Project surface 40
1.2.4 Access roads 41
1.2.5 Justification of location 44
1.3. Definition of the parts and physical works of the project 44
1.3.1 Submarine Sector 54
1.1.1.1 Underwater take-up and discharge works (submarine Sector) 56
1.1.2 Underground Sector 57
1.1.2.1 Inferior Tunnel Works 59
1.1.2.2 Works Cavern of Machines 61

1.1.1.1 Pique in pressure 67
1.1.1.2 Upper Tunnel Works 67
1.1.2 Sector Costa 68
1.1.2.1 Works area of operations 74
1.1.2.2 Desalination plant 76
1.1.2.3 Works Portals Costa 79
1.1.2.4 Equipment for the construction phaseCión 79
1.1.2.5 CampaseNto 83
1.1.2.6 Access Roads Sector Costa 85
1.1.2.7 Collection areas 86
1.1.2.8 Powder Keg (coastal Sector) 86
1.1.2.9 Power lines-Sector Costa 87
1.1.1 Plateau Sector 89
1.1.1.1 Reservoir 94
1.1.1.2 Intake and discharge reservoir (plateau Sector) 99
1.1.1.3 Portals Reservoir (Plateau Sector) 99
1.1.1.4 Area Control and Communication reservoir 100
1.1.1.5 Power lines (Plateau Sector) 100
1.1.1.6 Roads Sector Plateau 100
1.1.1.7 Collection areas 105
1.1.1.8 Reservoir Magazine 107
1.1.1.9 Reservoir Facility 110
1.1.2 Pampa Sector 110
1.1.2.1 High voltage power line (Sector Pampa section) 113
1.1.1.1 Service path high voltage electric transmission line (Pampa Sector) 123
1.1.1.2 Mobile Fronts of Works LAT (Pampa Sector) 123
1.2. Construction phase Description 123

1.2.1 Submarine Sector 123
1.2.1.1 Underwater Take and unload 124
1.2.2 Underground Sector 124
1.2.2.1 Construction tunnels, chimneys and windows 124
1.2.2.2 Trifurcaciones 125
1.2.2.3 Cave Construction of machines 126
1.2.2.4 Construction of Piques 126
1.2.2.5 Armoured tunnel construction 127
1.2.2.6 Electrical substation Construction 127
1.2.3 Sector Costa 128
1.2.3.1 Area of operations 128
1.2.3.2 Desalination plant 130
1.2.3.3 Portals Costa 130
1.2.3.4 Installing FaEna for the construction of the camp 130
1.2.3.5 Camp 130
1.2.3.6 Installation of work for the construction phase (Costa-San Marcos Sector) 131
1.2.3.7 Road construction Sector Costa 131
1.2.3.8 Collection areas 131
1.2.3.9 Powder keg 132
1.2.3.10 Installation of slaughter Caleta Rio Seco 132
1.2.4 Plateau Sector 132
1.2.4.1 Portals Reservoir 132
1.2.4.2 Construction roads, improvements, splices and By-Pass Plateau Sector 132
1.2.4.3 Intake and discharge Reservoir 133
1.2.4.4 Reservoir 133
1.2.4.5 Reservoir Facility 136
1.2.4.6 Collection areas of reservoir excavation Material 136

1.2.4.7 Powder keg 136
1.2.4.8 Control Panel and Reservoir communication 136
1.2.4.9 Medium Voltage electric transmission lines 137
1.2.5 Pampa Sector 137
1.2.5.1 High Voltage electric transmission line LAT 137
1.2.5.2 Service Road High Voltage line 137
1.2.5.3 Mobile Fronts working LAT 137
1.2.6 Estimated date and indication of the part, work or action establishing the beginning and end of the construction phase 138
1.2.7 Construction phase Schedule 138
1.2.8 Labor phase Construction 141
1.2.9 equipment, machinery, supplies and services in construction phase 142
1.2.9.1 Electricity 142
1.2.9.2 Water 142
1.2.9.3 Toilets 144
1.2.9.4 Fuel 144
1.2.9.5 Power 144
1.2.9.6 Accommodation 145
1.2.9.7 Personnel Transportation 145
1.1.1.1 Equipment and Machinery 146
1.1.1.2 Work fronts 148
1.1.1.3 Explosives 148
1.1.1.4 Concrete 149
1.1.1.5 Aggregates 149
1.1.1.6 Transportation of supplies, consumables and equipment 149
1.1.1.7 Chemical inputs 150
1.1.2 Location and amount of renewable natural resources to be extracted 151
1.1.3 Construction phase Emissions 151

1.1.3.1 Atmospheric emissions 151
1.1.3.2 Noise 152
1.1.3.3 Vibrations 154
1.1.4 Construction phase Waste 154
1.1.4.1 Household liquid Waste 154
1.1.4.2 Industrial liquid Waste 156
1.1.4.3 Solid waste 156
1.2. Description of the operation phase 158
1.2.1 Power generation 159
1.2.2 Filling the reservoir 164
1.2.3 Underground Sector 165
1.2.4 Sector Costa 165
1.2.5 Plateau Sector 166
1.2.6 Pampa Sector 166
1.2.6.1 High Voltage electric transmission line (LAT) 166
1.2.7 Estimated date and indication of the part, work or action that establishes the beginning and end of the phase 167
1.2.8 Operation Phase Schedule 168
1.2.9 Labor phase operation 169
1.2.10 Maintenance and conservation activities 169
1.2.11 Inputs and services in operation phase 169
1.2.11.1 Water resources 169
1.2.11.2 Power supply 169
1.2.11.3 Fuel 169
1.2.11.4 Drinking water 169
1.2.11.5 Transport 170
1.2.12 Products generated 170
1.2.13 Location and amount of renewable natural resources to be extracted 170

1.2.14 Phase-of-operation emissions 171
1.2.14.1 Atmospheric emissions 171
1.2.14.2 Noise 171
1.2.14.3 Vibrations 172
1.2.14.4 Electromagnetic fields 173
1.2.15 Phase-of-operation Waste 174
1.2.15.1 Liquid waste 174
1.2.15.2 Solid waste 175
1.3. Project activities in the closing and abandonment phase 176
1.3.1 Description of project activities in closing phase 178
1.3.1.1 Dismantle Project Infrastructure 178
1.3.1.2 Land restoration 178
1.3.1.3 Emissions prevention 179
1.3.1.4 Maintenance, conservation and SuperNecessary Visions 179
1.3.1.5 Other AcStrengthened 179

Table Index

1. Project description 20
1.1. Identification of the holder and Legal representative 20
1.1.1 Owner ID 20
1.1.2 Identification of the holder's Legal representative 21
1.1.3 Identification of the consultant 21
1.2. General background 21
1.2.1 Project name 24
1.2.2 Brief description of the project 24
1.1.1 Objective of the project 32
1.1.2 Typology of the project 32
1.1.2.1 Indication of non-modification of project or activity 33
1.1.2.2 Indication of the development of the project in stages 33
1.1.3 Estimated amount of investment 36
1.1.4 Project Lifetime 36
1.2. LocAlization of the project 36
1.2.1 Location of the project according to political-administrative division 36
1.2.2 Cartographic representation in Datum WGS84 38
1.2.3 Project surface 40
1.2.4 Access roads 41
1.2.5 Justification of location 44
1.3. Definition of the parts and physical works of the project 44
1.3.1 Submarine Sector 54
1.1.1.1 Underwater take-up and discharge works (submarine Sector) 56
1.1.2 Underground Sector 57
1.1.2.1 Inferior Tunnel Works 59
1.1.2.2 Works Cavern of Machines 61

1.1.1.1 Pique in pressure 67
1.1.1.2 Upper Tunnel Works 67
1.1.2 Sector Costa 68
1.1.2.1 Works area of operations 74
1.1.2.2 Desalination plant 76
1.1.2.3 Works Portals Costa 79
1.1.2.4 Equipment for the construction phaseCión 79
1.1.2.5 CampaseNto 83
1.1.2.6 Access Roads Sector Costa 85
1.1.2.7 Collection areas 86
1.1.2.8 Powder Keg (coastal Sector) 86
1.1.2.9 Power lines-Sector Costa 87
1.1.1 Plateau Sector 89
1.1.1.1 Reservoir 94
1.1.1.2 Intake and discharge reservoir (plateau Sector) 99
1.1.1.3 Portals Reservoir (Plateau Sector) 99
1.1.1.4 Area Control and Communication reservoir 100
1.1.1.5 Power lines (Plateau Sector) 100
1.1.1.6 Roads Sector Plateau 100
1.1.1.7 Collection areas 105
1.1.1.8 Reservoir Magazine 107
1.1.1.9 Reservoir Facility 110
1.1.2 Pampa Sector 110
1.1.2.1 High voltage power line (Sector Pampa section) 113
1.1.1.1 Service path high voltage electric transmission line (Pampa Sector) 123
1.1.1.2 Mobile Fronts of Works LAT (Pampa Sector) 123
1.2. Construction phase Description 123

1.2.1 Submarine Sector 123
1.2.1.1 Underwater Take and unload 124
1.2.2 Underground Sector 124
1.2.2.1 Construction tunnels, chimneys and windows 124
1.2.2.2 Trifurcaciones 125
1.2.2.3 Cave Construction of machines 126
1.2.2.4 Construction of Piques 126
1.2.2.5 Armoured tunnel construction 127
1.2.2.6 Electrical substation Construction 127
1.2.3 Sector Costa 128
1.2.3.1 Area of operations 128
1.2.3.2 Desalination plant 130
1.2.3.3 Portals Costa 130
1.2.3.4 Installing FaEna for the construction of the camp 130
1.2.3.5 Camp 130
1.2.3.6 Installation of work for the construction phase (Costa-San Marcos Sector) 131
1.2.3.7 Road construction Sector Costa 131
1.2.3.8 Collection areas 131
1.2.3.9 Powder keg 132
1.2.3.10 Installation of slaughter Caleta Rio Seco 132
1.2.4 Plateau Sector 132
1.2.4.1 Portals Reservoir 132
1.2.4.2 Construction roads, improvements, splices and By-Pass Plateau Sector 132
1.2.4.3 Intake and discharge Reservoir 133
1.2.4.4 Reservoir 133
1.2.4.5 Reservoir Facility 136
1.2.4.6 Collection areas of reservoir excavation Material 136

1.2.4.7 Powder keg 136
1.2.4.8 Control Panel and Reservoir communication 136
1.2.4.9 Medium Voltage electric transmission lines 137
1.2.5 Pampa Sector 137
1.2.5.1 High Voltage electric transmission line LAT 137
1.2.5.2 Service Road High Voltage line 137
1.2.5.3 Mobile Fronts working LAT 137
1.2.6 Estimated date and indication of the part, work or action establishing the beginning and end of the construction phase 138
1.2.7 Construction phase Schedule 138
1.2.8 Labor phase Construction 141
1.2.9 equipment, machinery, supplies and services in construction phase 142
1.2.9.1 Electricity 142
1.2.9.2 Water 142
1.2.9.3 Toilets 144
1.2.9.4 Fuel 144
1.2.9.5 Power 144
1.2.9.6 Accommodation 145
1.2.9.7 Personnel Transportation 145
1.1.1.1 Equipment and Machinery 146
1.1.1.2 Work fronts 148
1.1.1.3 Explosives 148
1.1.1.4 Concrete 149
1.1.1.5 Aggregates 149
1.1.1.6 Transportation of supplies, consumables and equipment 149
1.1.1.7 Chemical inputs 150
1.1.2 Location and amount of renewable natural resources to be extracted 151
1.1.3 Construction phase Emissions 151

1.1.3.1 Atmospheric emissions 151
1.1.3.2 Noise 152
1.1.3.3 Vibrations 154
1.1.4 Construction phase Waste 154
1.1.4.1 Household liquid Waste 154
1.1.4.2 Industrial liquid Waste 156
1.1.4.3 Solid waste 156
1.2. Description of the operation phase 158
1.2.1 Power generation 159
1.2.2 Filling the reservoir 164
1.2.3 Underground Sector 165
1.2.4 Sector Costa 165
1.2.5 Plateau Sector 166
1.2.6 Pampa Sector 166
1.2.6.1 High Voltage electric transmission line (LAT) 166
1.2.7 Estimated date and indication of the part, work or action that establishes the beginning and end of the phase 167
1.2.8 Operation Phase Schedule 168
1.2.9 Labor phase operation 169
1.2.10 Maintenance and conservation activities 169
1.2.11 Inputs and services in operation phase 169
1.2.11.1 Water resources 169
1.2.11.2 Power supply 169
1.2.11.3 Fuel 169
1.2.11.4 Drinking water 169
1.2.11.5 Transport 170
1.2.12 Products generated 170
1.2.13 Location and amount of renewable natural resources to be extracted 170

1.2.14 Phase-of-operation emissions 171
1.2.14.1 Atmospheric emissions 171
1.2.14.2 Noise 171
1.2.14.3 Vibrations 172
1.2.14.4 Electromagnetic fields 173
1.2.15 Phase-of-operation Waste 174
1.2.15.1 Liquid waste 174
1.2.15.2 Solid waste 175
1.3. Project activities in the closing and abandonment phase 176
1.3.1 Description of project activities in closing phase 178
1.3.1.1 Dismantle Project Infrastructure 178
1.3.1.2 Land restoration 178
1.3.1.3 Emissions prevention 179
1.3.1.4 Maintenance, conservation and SuperNecessary Visions 179
1.3.1.5 Other AcStrengthened 179

Figures index

1. Project description 20
1.1. Identification of the holder and Legal representative 20
1.1.1 Owner ID 20
1.1.2 Identification of the holder's Legal representative 21
1.1.3 Identification of the consultant 21
1.2. General background 21
1.2.1 Project name 24
1.2.2 Brief description of the project 24
1.1.1 Objective of the project 32
1.1.2 Typology of the project 32
1.1.2.1 Indication of non-modification of project or activity 33
1.1.2.2 Indication of the development of the project in stages 33
1.1.3 Estimated amount of investment 36
1.1.4 Project Lifetime 36
1.2. LocAlization of the project 36
1.2.1 Location of the project according to political-administrative division 36
1.2.2 Cartographic representation in Datum WGS84 38
1.2.3 Project surface 40
1.2.4 Access roads 41
1.2.5 Justification of location 44
1.3. Definition of the parts and physical works of the project 44
1.3.1 Submarine Sector 54
1.1.1.1 Underwater take-up and discharge works (submarine Sector) 56
1.1.2 Underground Sector 57
1.1.2.1 Inferior Tunnel Works 59
1.1.2.2 Works Cavern of Machines 61

1.1.1.1 Pique in pressure 67
1.1.1.2 Upper Tunnel Works 67
1.1.2 Sector Costa 68
1.1.2.1 Works area of operations 74
1.1.2.2 Desalination plant 76
1.1.2.3 Works Portals Costa 79
1.1.2.4 Equipment for the construction phaseCión 79
1.1.2.5 CampaseNto 83
1.1.2.6 Access Roads Sector Costa 85
1.1.2.7 Collection areas 86
1.1.2.8 Powder Keg (coastal Sector) 86
1.1.2.9 Power lines-Sector Costa 87
1.1.1 Plateau Sector 89
1.1.1.1 Reservoir 94
1.1.1.2 Intake and discharge reservoir (plateau Sector) 99
1.1.1.3 Portals Reservoir (Plateau Sector) 99
1.1.1.4 Area Control and Communication reservoir 100
1.1.1.5 Power lines (Plateau Sector) 100
1.1.1.6 Roads Sector Plateau 100
1.1.1.7 Collection areas 105
1.1.1.8 Reservoir Magazine 107
1.1.1.9 Reservoir Facility 110
1.1.2 Pampa Sector 110
1.1.2.1 High voltage power line (Sector Pampa section) 113
1.1.1.1 Service path high voltage electric transmission line (Pampa Sector) 123
1.1.1.2 Mobile Fronts of Works LAT (Pampa Sector) 123
1.2. Construction phase Description 123

1.2.1 Submarine Sector 123
1.2.1.1 Underwater Take and unload 124
1.2.2 Underground Sector 124
1.2.2.1 Construction tunnels, chimneys and windows 124
1.2.2.2 Trifurcaciones 125
1.2.2.3 Cave Construction of machines 126
1.2.2.4 Construction of Piques 126
1.2.2.5 Armoured tunnel construction 127
1.2.2.6 Electrical substation Construction 127
1.2.3 Sector Costa 128
1.2.3.1 Area of operations 128
1.2.3.2 Desalination plant 130
1.2.3.3 Portals Costa 130
1.2.3.4 Installing FaEna for the construction of the camp 130
1.2.3.5 Camp 130
1.2.3.6 Installation of work for the construction phase (Costa-San Marcos Sector) 131
1.2.3.7 Road construction Sector Costa 131
1.2.3.8 Collection areas 131
1.2.3.9 Powder keg 132
1.2.3.10 Installation of slaughter Caleta Rio Seco 132
1.2.4 Plateau Sector 132
1.2.4.1 Portals Reservoir 132
1.2.4.2 Construction roads, improvements, splices and By-Pass Plateau Sector 132
1.2.4.3 Intake and discharge Reservoir 133
1.2.4.4 Reservoir 133
1.2.4.5 Reservoir Facility 136
1.2.4.6 Collection areas of reservoir excavation Material 136

1.2.4.7 Powder keg 136
1.2.4.8 Control Panel and Reservoir communication 136
1.2.4.9 Medium Voltage electric transmission lines 137
1.2.5 Pampa Sector 137
1.2.5.1 High Voltage electric transmission line LAT 137
1.2.5.2 Service Road High Voltage line 137
1.2.5.3 Mobile Fronts working LAT 137
1.2.6 Estimated date and indication of the part, work or action establishing the beginning and end of the construction phase 138
1.2.7 Construction phase Schedule 138
1.2.8 Labor phase Construction 141
1.2.9 equipment, machinery, supplies and services in construction phase 142
1.2.9.1 Electricity 142
1.2.9.2 Water 142
1.2.9.3 Toilets 144
1.2.9.4 Fuel 144
1.2.9.5 Power 144
1.2.9.6 Accommodation 145
1.2.9.7 Personnel Transportation 145
1.1.1.1 Equipment and Machinery 146
1.1.1.2 Work fronts 148
1.1.1.3 Explosives 148
1.1.1.4 Concrete 149
1.1.1.5 Aggregates 149
1.1.1.6 Transportation of supplies, consumables and equipment 149
1.1.1.7 Chemical inputs 150
1.1.2 Location and amount of renewable natural resources to be extracted 151
1.1.3 Construction phase Emissions 151

1.1.3.1 Atmospheric emissions 151
1.1.3.2 Noise 152
1.1.3.3 Vibrations 154
1.1.4 Construction phase Waste 154
1.1.4.1 Household liquid Waste 154
1.1.4.2 Industrial liquid Waste 156
1.1.4.3 Solid waste 156
1.2. Description of the operation phase 158
1.2.1 Power generation 159
1.2.2 Filling the reservoir 164
1.2.3 Underground Sector 165
1.2.4 Sector Costa 165
1.2.5 Plateau Sector 166
1.2.6 Pampa Sector 166
1.2.6.1 High Voltage electric transmission line (LAT) 166
1.2.7 Estimated date and indication of the part, work or action that establishes the beginning and end of the phase 167
1.2.8 Operation Phase Schedule 168
1.2.9 Labor phase operation 169
1.2.10 Maintenance and conservation activities 169
1.2.11 Inputs and services in operation phase 169
1.2.11.1 Water resources 169
1.2.11.2 Power supply 169
1.2.11.3 Fuel 169
1.2.11.4 Drinking water 169
1.2.11.5 Transport 170
1.2.12 Products generated 170
1.2.13 Location and amount of renewable natural resources to be extracted 170

1.2.14 Phase-of-operation emissions 171
1.2.14.1 Atmospheric emissions 171
1.2.14.2 Noise 171
1.2.14.3 Vibrations 172
1.2.14.4 Electromagnetic fields 173
1.2.15 Phase-of-operation Waste 174
1.2.15.1 Liquid waste 174
1.2.15.2 Solid waste 175
1.3. Project activities in the closing and abandonment phase 176
1.3.1 Description of project activities in closing phase 178
1.3.1.1 Dismantle Project Infrastructure 178
1.3.1.2 Land restoration 178
1.3.1.3 Emissions prevention 179
1.3.1.4 Maintenance, conservation and SuperNecessary Visions 179
1.3.1.5 Other AcStrengthened 179

1. PROJECT DESCRIPTION

1.1. Identification of the holder and Legal representative

1.1.1 Owner ID

Name		Espejo de Tarapacá Spa
R.U.T.		76.351.165-5
Home		President Errázuriz 3943, Las condes
Phone		56-2-22286994

E mail		jacamus@valhallaenergy.cl

1.1.2 Identification of the holder's Legal representative

N ame		Juan Andrés Camus
R. U.T.		15.382.153-4
H ome		President Errázuriz 3943, Las condes
Ph one		56-2-22286994
E mail		jacamus@valhallaenergy.cl

1.1.3 Identification of the consultant

Name		Environmental Management Consultants S.A.
R.U.T.		78,174,910 – 9
Home		Father Mariano N ° 103, Office 307, Providencia.
Phone		7195625
Fax		2351100
Email		gac@gac.cl

Legal antecedents certifying the legal status to represent the holder are presented in annex 1.1, part legal antecedents of the appendix of the EIA.

1.2. General background

The Project Espejo de Tarapacá (the project) is a power generation project consisting of a reversible hydraulic pumping/generating Plant ("Pumped Storage Power Station"), located in the coastal sector of Caleta San Marcos, about 100 kilometers south of the city of Iquique, and its transmission system to connect to the SS/EE lakes of SING.

Given its characteristics, the project is registered within the so-called renewable energies. In fact, the general principle of operation of the plant considers pumping seawater during the day, using energy from solar power plants located in the vicinity of the trunk network of the large

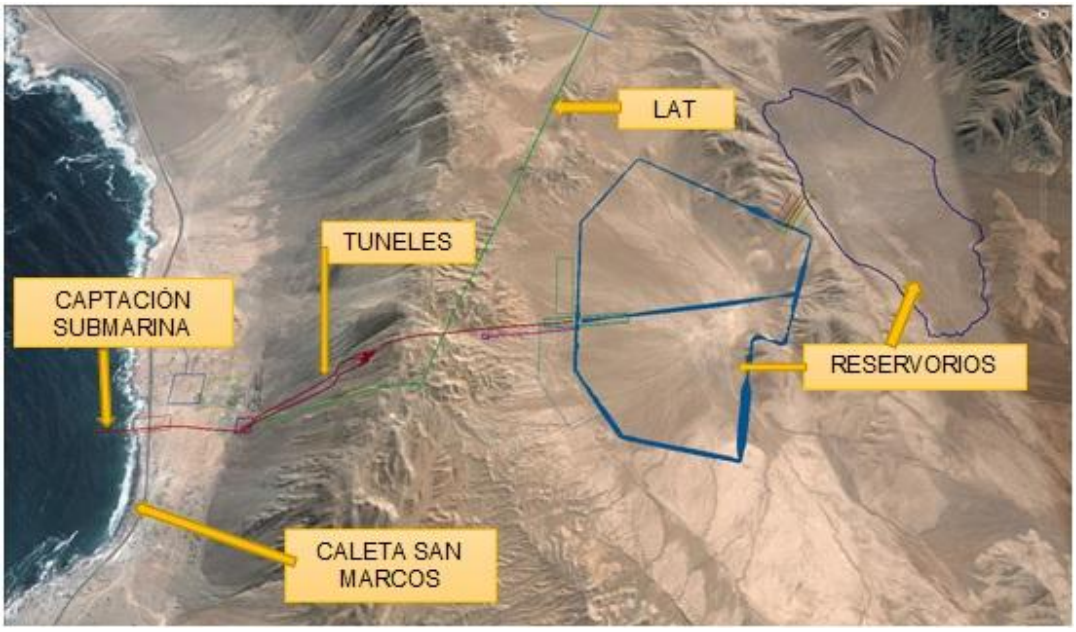
North interconnected system (SING), to Then, during the night, generate hydropower. In this way, a production is achieved that combines the solar energy during the day with the hydraulic energy during the night, guaranteeing a constant production that allows SatisAcer the energy demand of third parties.

To achieve this, it is envisaged the installation of reversible pumping equipment, housed in a cave of machines, those operating with solar energy, will elevate the seawater to a natural depression located in the upper plateau surrounding, and during the night, Operating in turbine mode, they will use the accumulated water in the upper plateau to generate energy, then returning it to the sea.

Both the sea water catchment system and the pipelines will be underground and bidirectional, i.e. the direction of the water flow depends if it is pumped or turbined, not requiring different works for each mode of operation.

The following figure shows an overview of the spatial location of the project.

Figure 1-1: Spatial view of the project.



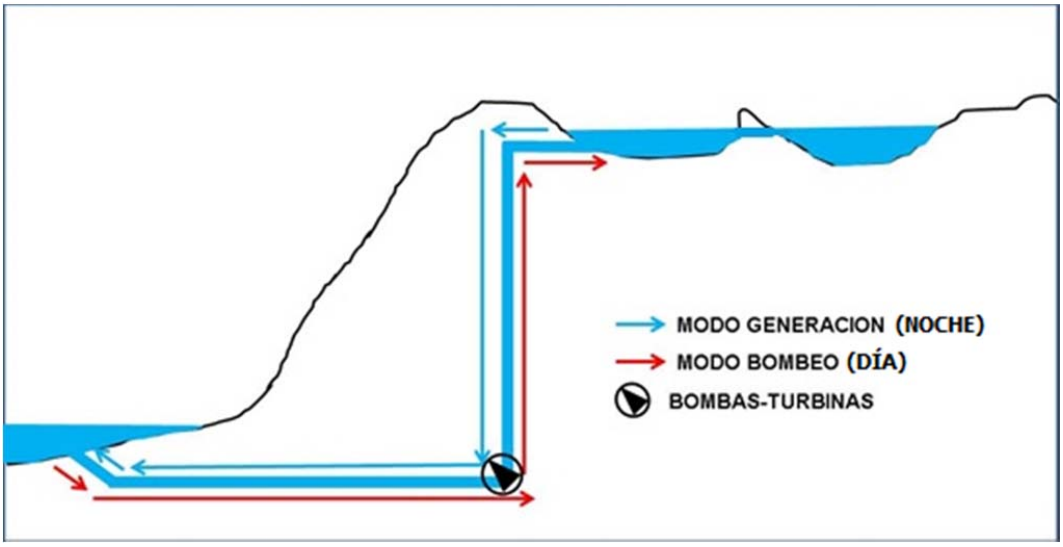
Source: Own Elaboration.

An installed power of 300 MW pumping and an installed power of up to 300 MW distributed in three hydraulic turbines reversible (pump/turbine) of 100 MW each. The energy produced, of 1.75 Gwh/average annual day, the large North interconnected system (SING) will be injected

into the Lagunas substation via a 220kV-double-circuit (LTE) high-voltage power transmission line and about 65 km long.

The following figure shows the general outline of the project's hydraulic operation.

Figure 1-2: Hydraulic diagram of the project Espejo de Tarapacá.



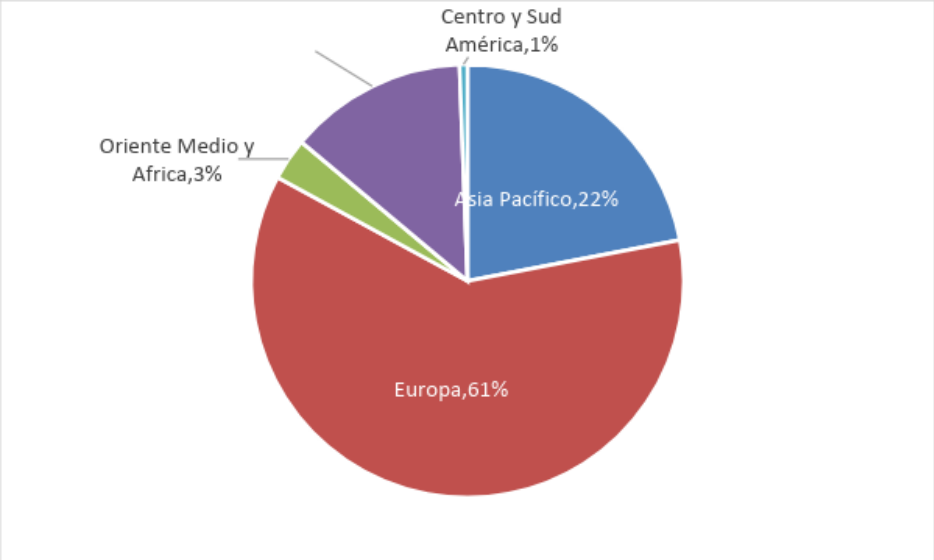
Source: Own Elaboration.

With regard to the evaluation of the project in the National Environmental impact assessment system, although in strict rigour this would be the first of its type to enter, it must be considered that it shares similar characteristics with components and concepts of other Projects that have been evaluated and qualified in the SEIA as they are, on the one hand, the hydroelectric plants and, on the other, the catchments and discharges of seawater.

Nevertheless, the projects of pump-generation have a vast experience at international level. As a reference, it can be mentioned that there are currently operating 510 hydraulic pumping plants, distributed in places like the United States, China, Japan and Europe, among others, being the oldest located in Switzerland, in the river Aare, which has been operational since the year 1908. In Japan, it operates a plant similar to the projected operation, as it also uses seawater for electricity generation.

The following figure shows the geographical distribution of the hydraulic pumping plants Active In the world.

Figure 1-3: Geographical distribution of the hydraulic pumping plants active in the world.



Source: Own Elaboration.

1.2.1 Project name

In accordance with the provisions of Law n º 19,300, Law of general Bases of the Environment (amended by Law n ° 20,417) and the DS N º 40/12 of the Ministry of the Environment, Espejo de Tarapacá Spa, enters the environmental impact Assessment System (SEIA), presenting to the environmental assessment Service the environmental impact study of the hydro-electric pumping plant project with seawater called "**Espejo de Tarapacá**", to be located in the region of Tarapacá.

1.2.2 Brief description of the project

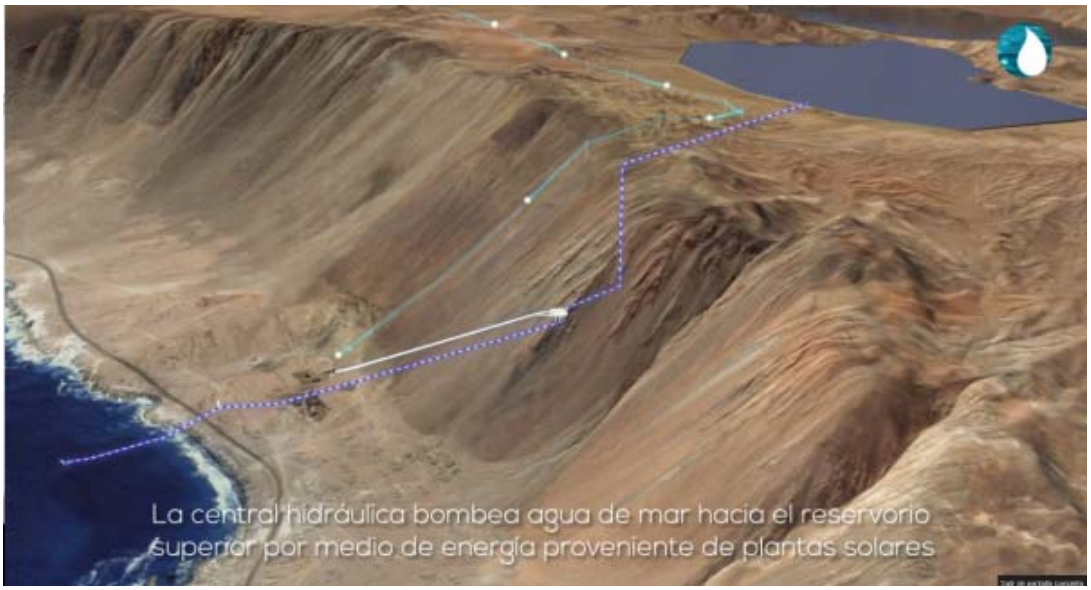
Espejo de Tarapacá Spa., hereinafter the headline, aims to carry out the project "Espejo de Tarapacá", which consists of a Reversible hydraulic plant, pump-generation, in the coastal sector of Caleta San Marcos, about 100 kilometers south of the city of Iquique, along with their respective Electric transmission line.

During the day, the project will pump seawater by means of pump-generation equipment, located in the Cave of machines, through underwater tunnels (marine socket) and underground (coast and Cliff) to a natural depression that will constitute a reservoir from Of the 585 M.A.S.L. where the extracted water will accumulate. Later, at night, the water accumulated in the reservoir will be driven by the same underground tunnels to the pump-generation equipment to generate

electricity, Restituyéndola finally to the sea. The operation considers the same point in the sea PWater intake and discharge effects.

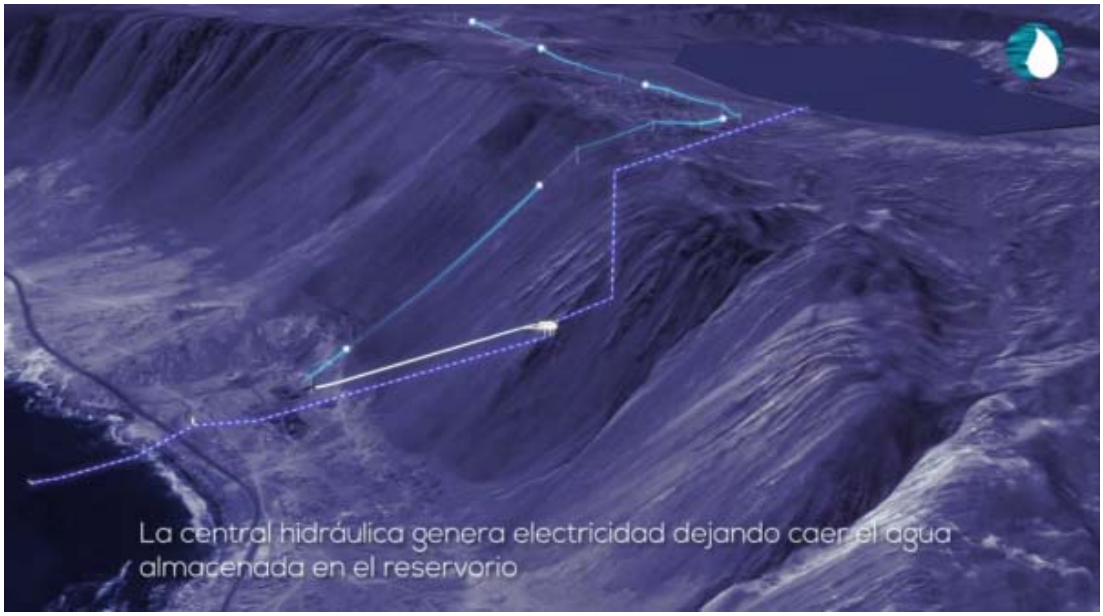
The following two figures show the operation diagrams of the plant during the day and during the night, respectively.

Figure 1-4: Central outline operation during the day.



Source: Own Elaboration.

Figure 1-5: Central outline operation overnight.



Source: Own Elaboration.

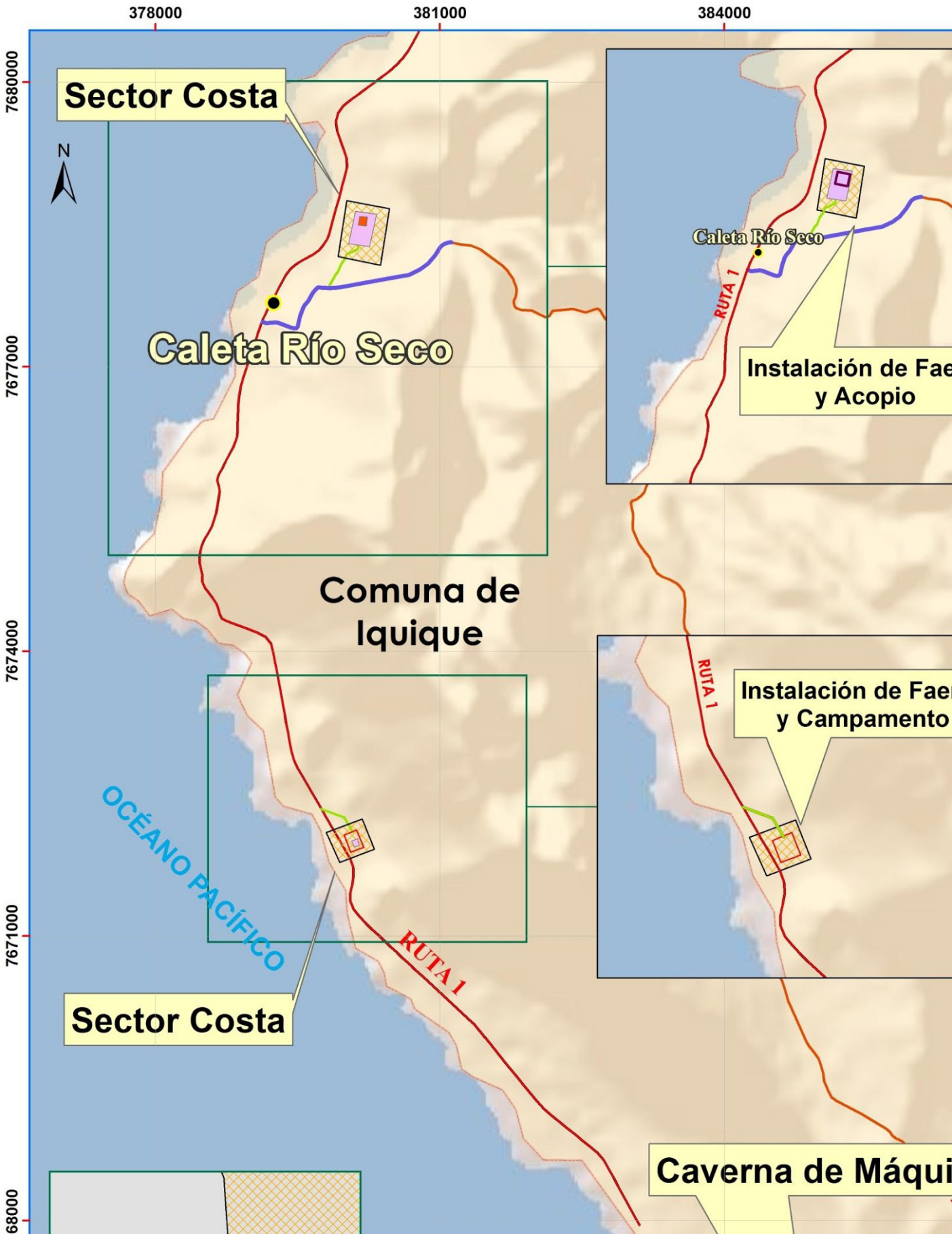
An installed power pump of 300 MW and an installed power of up to 300 MW is estimated. In the pumping scheme, the plant consumes 2.28 Gwh/day, average yearly, pumping on average a flow rate of 45 m^3/s for 8 hours, and in generation scheme will produce 1.75 Gwh/day, average yearly, unloading an average flow rate of 28 m^3/s. The energy will be injected into the interconnected system of the Grande Norte (SING), in the Lagunas substation, by means of a 65 km long high-voltage electrical transmission Line (LTE).

The project distinguishes 5 environmental sectors where the works necessary for their operation will be carried out, these are:

- Submarine Sector
- Underground Sector
- Sector Costa
- Plateau Sector
- Pampa Sector

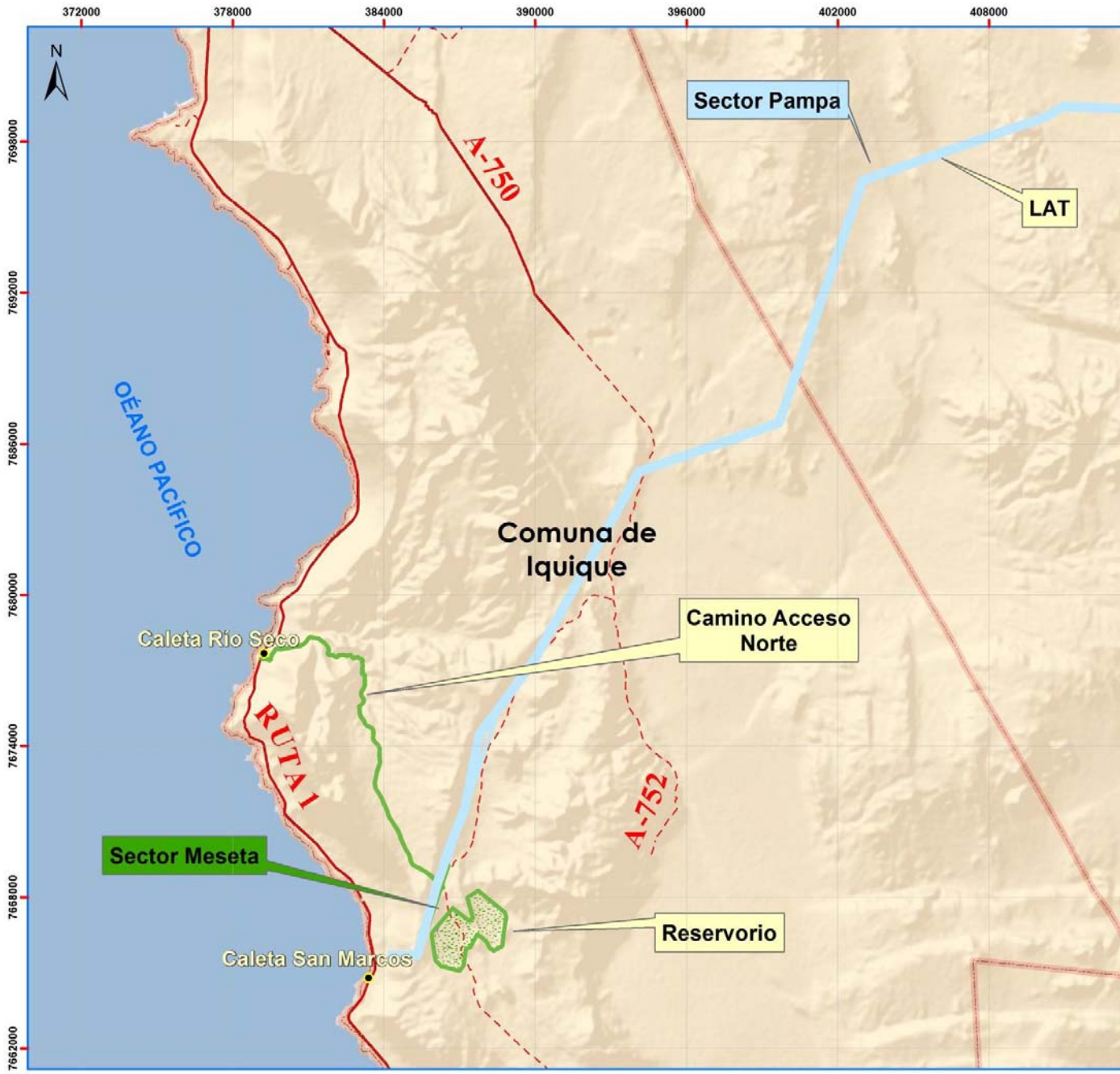
Figure 1-5 below shows the sectorization of the project for the submarine sector, the coastal sector and the underground sector. For its part, figure 1-6 illustrates the plateau and Pampa sectors.

Figure 1-6: Sectorization Project submarine sector, coastal sector, underground sector.


378000
381000
384000
7680000
7677000
7674000
7671000
Sector Costa
N
Caleta Río Seco
Caleta Río Seco
RUTA 1
Instalación de Fae
y Acopio
Comuna de
Iquique
RUTA 1
Instalación de Fae
y Campamento
OCÉANO PACÍFICO
RUTA 1
Sector Costa
Caverna de Máqui

Source: Own Elaboration.

Figure 1-7: Sectorization Project Plateau sector and Pampa sector.



Source: Own Elaboration.

1.1.1 Objective of the project

The main objective of the project is to store energy on a large scale, in an efficient and economical way. This allows the plant to be a contribution to the safety of the electrical system, to reduce eventually the volatility in the prices of the electricity, and to transform electricity from non-conventional renewable energies of intermittent nature, such as solar or wind energy, in constant electricity supply and 100% manageable.

A Reversible hydraulic power plant brings benefits and ExternalidAdes positive to an electrical system in general, and in particular to a system with low-flexible centrals and a slow capacity to react to contingencies, such as the large North interconnected system (SING). These highlights the speed and dispOnibilidad of the central against partial or total falls of the electrical system ("black heading"); Extreme speed of the plant to provide generation or release load of the electrical system ("reserve in turn"); Frequency and TENS regulationIon of the electrical system; and the possibility of reducing the volatility of spot prices of the electrical system, by means of the arbitration of prices by means of transfers Intertemporal of energy.

However, the most important attribute of this Central is Its capacity to viable large-scale entry of non-conventional renewable energies (NCRE) such as solar and wind, by means of its ability to transform, through the accumulation of water, energy of intermittent nature, in continuous energy24 hours a day, 7 days a week. The consequence of this is that it would allow, through a commercial integration of hydraulic generation and one (or more) plant (s) ncre (s) connected to SING, satisfy the requirements of GRA's dispatchNDEs customers-as electrical distribution companies or industrial companies in sectors such as the miner-and thus deliver domestic energy, clean, competitive, continuous and fixed price for 15 or more years, without hydrological variability or Exposure to international fossil fuel prices.

1.1.2 Typology of the project

In accordance with article 3 of DS No 40 of 30 October 2012, Ministry of the Environment, regulation of the environmental impact assessment system, the ProProject corresponds to the typology referred to in the letters:

High-voltage electrical transmission lines and their substations

B. 1. High-voltage electrical transmission lines are those lines that conduct electric power with A tension greater than twenty-three kilovolts (Kv)

B. 2. Substations of high-voltage electrical transmission lines are defined as those relating to one or more lines of electric power transport and which are intended to maintain the voltage at transport level.

C. Generating plantsEnergy level greater than 3 MW

1.1.2.1 Indication of non-modification of project or activity

According to article 12 of DS no 40/2012 already mentioned, Espejo de Tarapacá Spa, Project Holder, it comes to indicate that the project called The Espejo de Tarapacá SometGone to environmental evaluation through this environmental impact study, does not modify any project or activity previously submitted to the environmental impact assessment system.

1.1.2.2 Indication of the development of the project in stages

According to art. 14 of the Regulations of the SEIA (ds No. 40/2012, Ministry of the Environment), environmental impact studies should indicate explicitly whether their projects or activities will be developed in stages. In this case a brief description of the Such stages, indicating for each of them the objective and the reasons or circumstances on which it depends, as well as the associated works or actions and their estimated duration.

Since the project "Espejo de Tarapacá" foresees within its execution, the execution De a possible stage of power generation through a photovoltaic park, this section contains the information required by the SEIA regulation.

Objective of the stage

The objective of this stage is to develop a project of electricity generation based on large-scale non-conventional renewable energy from a photovoltaic solar plant with a capacity of 600 MW, in addition to the construction and operation of a high voltage line that will transport the energyA to the existing Laguna substation.

Of course, the development of this stage is conditioned to the economic characteristics of the electricity market indicate its viability, as explained below in this section. This stage is from inteRés for the development of the project Espejo de Tarapacá, since this project would take advantage of the possibility of pumping and storing part of this energy to satisfy its energetic requirements.

To its location, it should be noted that this Stage will be placed in the commune of Pozo Almonte, province of Tamarugal, Región de Tarapacá.

Finally, it is made present that the development of this stage will enter opportunely to the system of evaluation of environmental impact, in fulfillment of the Article 3 (b) and C) of the regulation of SEIA and art. 10 (b) and C) of law 19,300, which stipulates that the high-voltage transmission lines and their substations must be entered prior to the SEIA, as well as the generating power plants of energy greater than 3 MW, respectively. The form of entry of this stage will be through

an environmental impact study, which will contain a plan of environmental measures appropriate to take charge of the possible significant impacts that are generatedN at that stage.

Reasons or circumstances that depend on the stage

The dependence on the implementation of this stage lies in technical and economic considerations that are currently unpredictable and of which their development depends in the future, such as:

I. Do not have technical problems for the feasibility of connecting a solar park of great power in the lagoons (level of shorts, etc.),

Ii. Sufficient radiation levels to be able to produce a cost per Mwh Reduced solar power (e.g. lTo radiation in lagoons is significantly lower than in Maria Elena, 150 kilometers to the south) and

Iii. Connection point of the customer (s) for a power supply contract. If these are too far from the point of connection of gaps, it is Preferable to locate the solar plant in another node nearest the system.

In this way, in the event that the infeasibility of this stage of the project is finally determined, the holder will timely process the purchase of electric energy with a project presOr future, that allows to supply the energy requirements that it deserves.

Actions and associated works for the stage

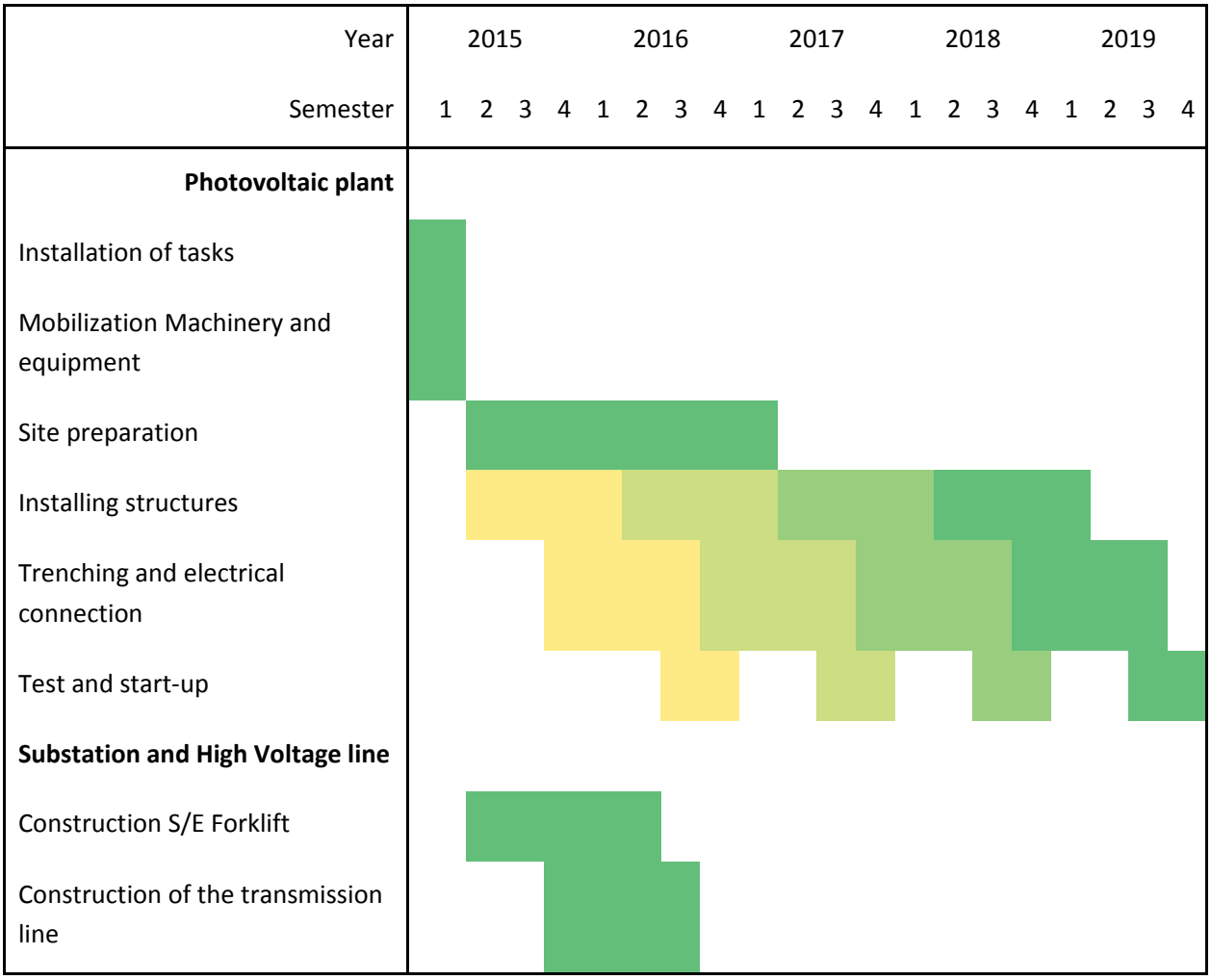
The activities envisaged for the **Construction phase** Of this stage, are the following:

- Habilitation of facilities of slaughter.
- Transport of machinery and materials to the project area.
- Assembly of panels.
- Construction of underground gutters.
- Substation construction.
- Construction of control room and operations.
- Connection and start-up.

For its part, the **Operation phase** Consider the following activities:

- Solar Park operation.
- Maintenance of modules and equipment.

Figure 1-8: Photovoltaic plant schedule.



Source: Self-elaboration

1.1.3 Estimated amount of investment

The estimated amount of the project's investment is USD $385 million.

1.1.4 Project Lifetime

The lifespan of the project is indefinite. For this will be carried out the maintenances and updates that are necessary to the installations to keep them in operation for an indefinite time, as it is realized in the section 1.7 of this chapter.

1.2. LocAlization of the project

1.2.1 Location of the project according to political-administrative division

The project will be located administratively in the communes of Iquique and Pozo Almonte, province of Iquique, Región de Tarapacá, approximately 100 km south of LA city of Iquique (Figure 1-9). The nearest towns are the Caleta San Marcos and the Caleta Rio Seco.

Table 1-1: Region, province and commune where the project is developed.

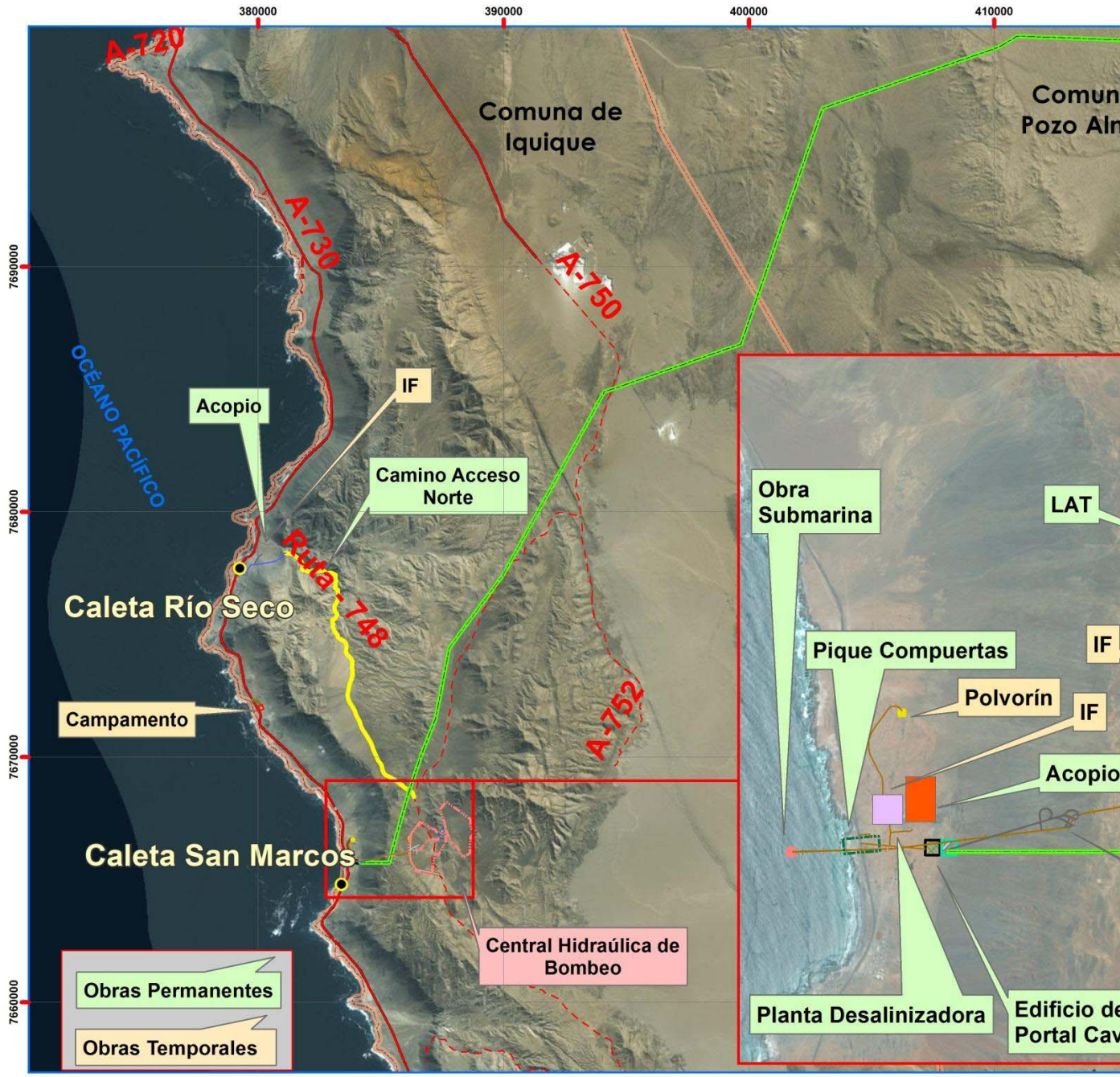
Region	Province	Commune
Tarapacá	Iquique	Iquique
		Pozo Almonte

Source: Elabortación Own.

In Chapter 11 of the EIA presents the analysis of the relationship of the project with the policies, plans and development programs currently in place at regional and communal level.

The following figure illustrates the location GEneral of the project.

Figure 1-9: General Project location.



Source: Self-elaboration

1.2.2 Cartographic representation in Datum WGS84

In annex 1.2 of the appendix to this EIA, the location plans are presented with the project works.

The following table presents the approximate coordinates of all the sectors considered by the project (in Annex 1.3 LA table of Coordinate Of the works of the project as a whole).

Table 1-2: Coordinates in Datum WGS84 U19.

Sector	Works	North	This
Submarine	Underwater Take and unload	7,665,687	383,105
Coast	Area of operations	7,665,715	384,055
	Desalination plant	7,665,705	383,692
	Portals Costa	7,665,716	384,166
	Camp	7,672,006	380,105
	Installation of work for the construction phase (Costa-San Marcos Sector)	7,665,973	383,753
	Gathering 4 (Sector Caleta San Marcos)	7,666,040	383,974
	Gunpowder Coast	7,666,619	383,850
	Dry River Operations Installation	7,678,456	380,183
	Collection 5 (dry River Sector)	7,678,520	380,218
Underground	Cavern of Machines	7,665,894	384,988
Plateau	Intake and discharge reservoir (approach channel)	7,666,154	386,227
	Reservoir	7,666,302	386,806
		7,667,093	388,122
	Reservoir Facility	7,666,648	386,104
	Gunpowder Magazine 1	7,666,002	385,666
	Gunpowder Magazine 2	7,665,973	383,741
	Gathering 1	7,667,308	386,862
	Gathering 2	7,665,205	386,782
	Gathering 3	7,665,616	386,182
Pampa	Lat	7,698,423	427,780
		7,698,514	424,782

		7,698,741	421,791
		7,698,969	418,800
		7,699,196	415,808
		7,699,321	412,811
		7,698,861	409,949
		7,697,879	407,114
		7,696,898	404,279
		7,694,897	402,464
		7,692,062	401,482
		7,689,227	400,501
		7,686,676	399,234
		7,685,686	396,402
		7,684,390	393,829
		7,681,765	392,377
		7,679,140	390,924
		7,676,587	389,359
		7,674,113	387,715
		7,671,188	387,075
		7,668,363	386,067
		7,665,688	385,102

Source: Own Elaboration.

1.2.3 Project surface

The areas approximated by sectors that will occupy the works of the project Espejo de Tarapacá are observed in the table below.

It is worth mentioning that they are not considered areas of circulation around these works.

Table 1-3: Total surfaces of surface works.

Sector	Works		Temporality	Surface (HA)
Submarine	Underwater Take and unload		Permanent	0.04
Coast	Area of operations		Permanent	2
	Desalination plant		Permanent	0.5
	Portals Costa		Permanent	0.02
	Installation of slaughter Construction Camp		Temporary	2.3
	Camp		Temporary	
	Installation of work for the construction phase (Costa-San Marcos Sector)		Temporary	4
	Access Roads Sector Costa	North Access Road (Caleta Rio Seco section)	Permanent	10
		Junction and Road to Camp	Temporary	0.2
		Splicing and road to sector Administration and Control Building	Temporary	0.25
		Route of service to the area and installation of the Dry River area and in the San Marcos sector	Temporary	0.1
		Road of service for the area of Pique floodgates in San Marcos	Temporary	0.1
		Road to Access Magazine	Temporary	0.4
	Area of collection sector administration and Control building		Permanent	6
	Gunpowder Coast		Temporary	0.09
	Medium Voltage Electric transmission line		Permanent	0.3
	High Voltage electric transmission line		Permanent	0.05
	Slaughtering plant Caleta Río Seco and collection		Temporary	10

Plateau	Portals Reservoir		Permanent	0.4
	Intake and discharge Reservoir		Permanent	0.5
	Perimeter Reservoir		Permanent	400
	Reservoir Facility		Temporary	4
	Areas of stockpiles		Permanent	22
	Reservoir Magazine		Temporary	0.18
	Roads Sector Plateau	North Access Road	Permanent	20
		Improvement Route A-752	Permanent	
		By-Pass Route A-752 – Reservoir	Permanent	
		Roads to work fronts	Temporary	2
		Roads from reservoir works to billets	Temporary	1.5
	Control Panel and Reservoir communication		Permanent	0.005
	Medium Voltage Line		Permanent	6
	High Voltage Line		Permanent	46
Pampa	Lat		Permanent	
	Service path high voltage electric transmission line		Permanent	
	Mobile Fronts working LAT		Temporary	0.1

Source: Own Elaboration.

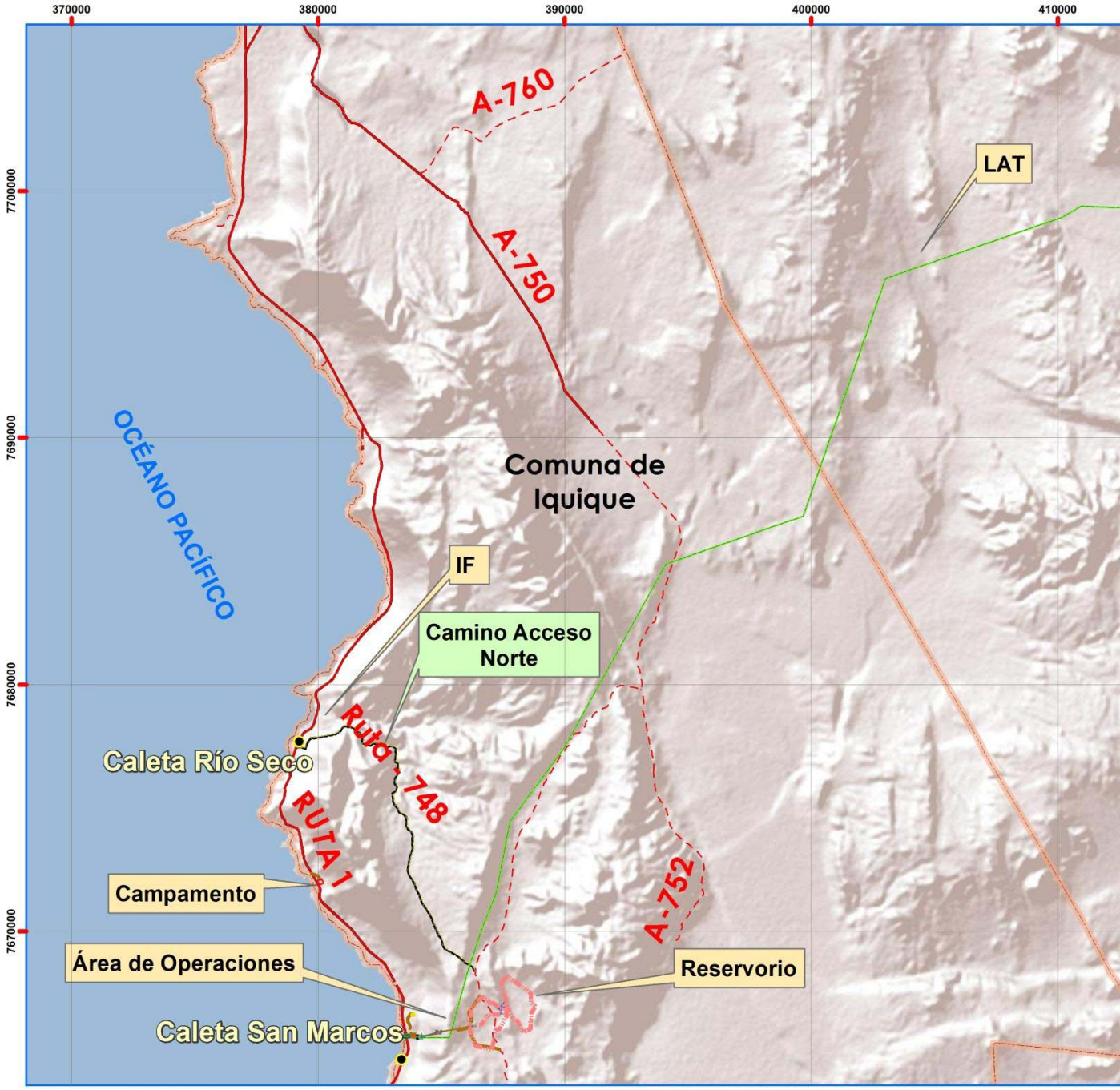
1.2.4 Access roads

Access to the project area will be carried out by the north of the facilities (Figure 1-10). The access road will connect with the route CH-1, asphalted, with the different sectors of the project. This is how, at the height of the river Sec CreekOr, splice with a new stretch of road that will lead to the installation of operations and dump of the sector and raise the coastal cliff, by a non-enrolled footprint (748) to join the route A-752. The projected road is about 15.5 km from the Which about 5 km will be on new road and the rest will be an improvement of an existing footprint. It will be of double carriageway, with folder of granular material and with an approximate width of 8 m (slopes of 3 m and berms of 1 m). In the reservoir sector, On the route A-752 will be built another new section of 5 km in replacement of the portion of this route that will be covered by the reservoir, with the same characteristics: double carriageway, with binder of granular material and with an approximate width of 8 m (p3 m Istas and 1 m berms).

Following the south of Rio Seco, the route CH-1 will be accessed to the camp sector, located approximately 7.5 km north of the Caleta San Marcos. Finally, the coastal sector of works near the Caleta S will be accessedMark the same route CH-1. The land in which the project will be developed belongs to the Ministry of National property and the application for its use is in process.

As long as this access path is not passable, COM will be usedor alternative route CH-1 to its crossroads with route A-750, approximately 50 km south of Iquique, continuing along the route a-750 to its crossroads with the route A-752 through which will reach the works of the project. The same will be done when Reasons of force majeure or safety reasons are not Can Transit through the path of access raised.

Figure 1-10: Access roads to the project.



Source: Self-elaboration

1.2.5 Justification of location

The location of the project has direct relation with the combination of natural conditions essential for the development of this project, namely:

- A coastal cliff that provides the necessary dimension differential for hydroelectric generation.
- A natural depression of the terrain that allows the materialization of a reservoir.
- Proximity to the sea that allows the water resources to be taken and discharged.
- Shallow rock on the seabed that allows underground construction.

1.3. Definition of the parts and physical works of the project

Permanent works

The permanent works are constituted by a system of reservoirs, which take advantage of the natural depressions of the terrain, its ring-roads, its connection by means of a system of channels, tunnels and bites with the equipment of pumps/turbines, lAs works of sea water intake/discharge, the electric Sub station and the high voltage electric transmission line. In addition, they include the Central administration and Control Building, tunnels and access galleries, power lines Medium voltage, access roads, sewage treatment plant, seawater desalination plant and a modification of the path of an existing route.

A concise description of the permanent works of the project is given below, Following the route from the reservoir area to the discharge to the sea. It should be kept in mind that, as already noted, several of these works have a dual character, exercising functions of adduction or discharge works according to the SENtido of the water flow during the pumping and generation phases.

- Reservoirs

The reservoirs consist of two basins or natural depressions (east Reservoir and West Reservoir), located on a plateau at about 585 m high, about 166 has the first and 208 has the second, adding a capacity of storageMaximum level of approximately 54 million cubic meters of water, considering its maximum operating height of 608.5 m.

Both basins will be interconnected via a connection channel of approximately 275 m in length and 7.5 m wide at its base, the It is divided, in turn, into two branches, North and south, of 216 m and 300 m long, respectively, in order to allow independently feeding the two portions, reservoir

Nor-Poniente, of 81 ha of surface and the South West Reservoir, of 127 hA surface area, in which the West Reservoir is subdivided.

In order to avoid water seepage, reservoirs will be coated with a highly waterproof bituminous membrane of a minimum thickness of 2.5 Mm.

Reservoirs Orient and PonyYou will be surrounded in all its perimeter by two Earths of about 6 km of length each one, of a variable height of up to 12 m and a width in its crowning of 6 m.

Also, the West Reservoir will be divided into two parts (North and south) by a dividing parapet of about 1,350 m in length, 4 m wide in its coronation, which will allow to deal with the maintenance of both areas separately without compromising the operation of the plant.

In the reservoir Nor-PonientE is also consulted the construction of a drainage channel of 133 m long and 5 m of basal width.

- Adducts

The system of drive/adduction of the plant will be composed of tunnels and holes dug in rock that will allow to lead the water From the reservoirs to the generation equipment and vice versa.

The water in the north and South reservoirs will be conducted by means of 500 m and 350 m long approximation channels, respectively, and a basal width of 10 m, which bindsn When you arrive at a work of take conformed by a concrete structure that will house 4 floodgates of 5 m wide and 3 m high. After the work of Toma, the water is driven by a common channel of about 135 m of length until the tunnel of discharge/ADUSuperior Suction.

The upper Drive/adduct tunnel is started in a concrete portal and will have an approximate excavation cross section of 30 m^2, a slope of about 13% and an approximate length of 885 m, measured between the portal and The pressure bite. With a basal width between 5.4 m and 5.8 m and a height also between 5.4 m and 5.8 m, it will be reinforced with supporting elements of different characteristics, depending on the quality and natural support capacity of the rock. Additionally, both in the first 30 m, in which it will be excavated in soil, and in the areas where the conditions of the rock require it, is covered inside with concrete, leaving always a section of water runoff of 5 m in diameter.

El Pique En pressure, arranged in vertical form, will have 4.9 m in diameter and about 502 m in length and shall lead the waters from the upper Drive/adduction tunnel towards the lower drive/adduct tunnel and, through it, towards the bin turbines.Adas in the House of machines. In pumping mode, these pipes will allow seawater to be driven to reservoirs.

Immediately before the start of the pressure bite, the construction of a balance chimney is contemplated, consisting of a Vertical pique of 4.9 m in diameter and 103 m long, covered inside with projected concrete, preceded by a gallery of an approximate cross section of 20 m^2, an

approximate inclination of 13% and about 535 m long hasTa surface. Both works are intended to absorb the abrupt changes in water pressure that occurred during the phenomena Transcientes Of the operation of the plant, produced by shots and rejects of sudden load of the system. The gallery, In addition, it allows to have an additional working front for the construction of the chimney of equilibrium.

At the foot of the Pique, in which the excavation of a stone trap is envisaged, the lower drive/adduction tunnel is initiated, which will have a primEr stretch of about 37 m of length, 5.4 m of basal width and 5.4 m of Height with section arc of Half point, without shield of steel and reinforced with elements of support of different characteristics, depending on the quality and capacity of supporting of The Rock. It will follow a second section with internal armour of steel of 3.25 m in diameter of approximately 80 m of length, which is divided, to about 38 m before the axis of the cave of machines, in three branches of adduction of 3.6 m of basal width and 3.6 m high, with a half-point arch section, internally shielded by a steel pipe of 2.0 m in diameter, which leads towards the three pumps/turbines. Driven by water, the turbines power generators of 100 MW each.

At the exit of the Cave of machines, the water is evacuated by three branches of discharge constituted by tunnels of half point of a basal width of 4.2, armoured the first 46.5 m with a steel pipe of 2.75 m of diameter inteAnd that, approximately 95 m from the axis of the cavern, converge in a tunnel of take/discharge of about 1,830 m of length, of 5 m of basal width and 6 m of height with section Arch of Half point. That tunnel, fortified in areas where lTo the quality of the rock so requires, it continues beyond the line of beach under the seabed, to finish in the work of submarine take/discharge, located approximately to 15.5 m under the level of the sea and approximately to 340 m of the coast. This work It is constituted by a ring of concrete of 1 m of height, 16 m of outer diameter anchored on the rock of the seabed and surrounded side and superficially by a grating of 5 cm of opening between bars and supported on a series of pillars DE Marine Bronze.

Immediately under the work of Toma Marina is consulted a widening in the tunnel of take/discharge of 35 m of length to allow to receive and to contain the material of the stopper of rock which is Leave During the execution of the Des TunnelWhich is then excavated with the Norwegian shot method.

On its journey, on land and approximately 280 m from the coast, inland, the tunnel of Take/unload ascends until reaching a high point, approximately 30 m from the Surface, place from which the pit of floodgates is developed, vertical excavation of section ellipsoidal of 5 m x 8 m. In this pique are lodged the sliding floodgates (StoplogsThat allow to avoid the entry of the seawater to the TúneL discharge when required for maintenance or other reasons.

Complemented the adducts and works mentioned above, approximately to 105 m downstream of the axis of the cave of machines and perpendicular to the tunnel of discharge, is contemplated the construction of a chimney of hydro-pneumatic equilibrium, consisting of aA cavern of approximately 152 m of length, 5 m of basal width and 6 m of height, with section Arch of Half point.

In the entrance points of each of the tunnels, galleries and Windows is consulted the construction of Access portals, works of concreteThat allow the stability of the soil and to protect the access of the fall of surface rocks or earth.

- Cavern of Machines

The Cave of machines, of 14 m of maximum width, 62 m of length and 29 m of height, is excavated to a PRofundidad approximately 620 m below the surface, about 1,570 m from the coast, whose lower elevation is located at approximately 50 m below sea level. Inside there is the house of machines, building structured in four levels. The Superi levelOr is the Main floor or mounting yard, accessed through the Access tunnel. The following three levels, generator floor, turbine floor and valve floor, House engine/generator equipment, pumps/turbines and valves, re.

Reversible pumps/turbines will be of a single stage to privilege the efficiency of the set estimated at 90%.

The motors/generators will be of synchronous type, outgoing poles and their winding cooled by air-water exchangers, with their output in 12 KV.

A closed-circuit cooling water system is also considered to have aMa water-water-based seawater exchanger as cooling source.

Immediately before the entrance to each turbine, it is envisaged the installation of a ball valve that allows hydraulic isolation of the adduction system, as ALREdedor of 38 m downstream of it a butterfly valve is installed, lodged in a valve-hole, which allows to isolate it hydraulically from the tunnel of take/discharge.

- Transformers Cavern

The Transformers cavern is located in a way toTootles to the cave-machines, at a distance of 38 m downstream from it. It is formed by an excavation of 62 m long, 6.5 m wide and 14 m high, and three additional excavations, each 8 m wide, 12 m high and 12 m long, Attached to it, and which will house each of the power transformers to which the respective motor/generator is connected. Power transformers will be of conventional design, oil insulated, water cooled and connected to the S/E GIS Through encapsulated bars.

From the Transformers cavern are developed three cable galleries, 4 m wide and high and a length of about 20 m, which communicates with the cavern of machines and that house cables, switches and OTElectrical equipment to transport the generated energy to the transformers.

- Electrical substation (S/E)

In the upper part of the Transformers cavern, the installation of a GIS-type encapsulated electrical substation is planned.

- Windows, galleries or access tunnels

Both in order to have access to the underground works during the operation phase of the plant and to allow the entry/exit of their equipment, as to have working fronts during their construction, is envisaged the CConstruction of different tunnels or galleries, namely:

a) Tunnel of access to the cave of machines, of approximately 833 m of total length, section Arch half point of 5 m of basal width and 6 m of height, with section of arc of Half point, and that allows access to the cavern of Transformers, to the Cavern of Machines and, by means of a gallery of the same section and of about 140 m of length, to the lower drive/adduction tunnel and to the pressure bite. In order to isolate it hydraulically during the period of operation of the plant, it is envisaged the construction of A cap of about 14 m in length, with a steel shield of 3.35 m in diameter and a hatch Metal. Its Portal is located in the coastal sector, about 600 m from the coastal route CH-1.
b) Gallery to tunnel take/download and PIque of sluices, of approximately 100 m of length, 5 m of width and 6 m of height, with section of arc of Half point, and by which it is possible to accede to the tunnel of take/discharge to 10 m upstream of the base of the scuttle of floodgates.

- Transmission line Electrical High Voltage (LAT) and connection to substation gaps

The generated energy will be evacuated from the Central by means of a LAT that starts in the S/E GIS, runs through high voltage cables, duly protected, by the tunnel of access to the CaVerna of machines and, after leaving to the surface in the Portal, ascends the coastal cliff supported in towers of metallic structure, to continue later by the upper Plateau and the Pampa until arriving at the Sub station lagoons of the system IntertonLarge North Ectado (SING), to which it will connect. The total estimated length of the LAT is 65 km, will be double circuit, will have a nominal voltage of 220 Kv and a nominal transmission capacity of 300 MVA.

The work of connection to the SUBESTACIon lagoons will be the responsibility of the company that owns the transmission backbone network of SING.

- Buildings, patios and wineries

Adjacent to the portal of the tunnel of access to the cave of machines will be built the administration and Control building from which the operation of the plant is carried out and controlled.

This building will have an area of about 330 m^2, will be 2 floors, with reinforced concrete structure and interior partition and house the operation and control room of the Central, offices, meeting room and services.

Next to it will be built the workshop and cellar building in which to locateWarehouses for spare parts, the tool and general electrical equipment, and a diesel generator set of 500 Kva necessary to allow the "black matches" of the plant in cases of a general fall of the electrical service (black Out) on The SING.

Distributed between the two buildings there will be parking lots for light and heavy equipment.

Adjacent to the workshop and cellar building will maintain a home and industrial waste yard of 2 m long and 3 m wide, duly fenced, and A warehouse of temporary collection of hazardous wastes of 2 m long and 2 m wide to maintain the residues produced during the operation of the plant until its removal and disposal in an authorized place.

It also provides for the empowerment of al for the storage of the oil that will require the diesel generator of starting in black before indicated.

- Potable Water supply system (desalination plant)

For the supply of potable water both during the construction period cDuring the period of operation of the plant, it is consulted the construction of a Sea water desalination plant, which will be located next to the gates. This plant has a maximum production capacity of 5 L/s and will occupy one I knewApproximate rficie of 120 m^2. A certain percentage of this flow may be made available to the community of San Marcos, which is the responsibility of the production, distribution and disinfection costs, as is realized in chapter 15 of COmpromisos volunteers.

- Wastewater Treatment Plant

The project considers the construction of a modular type wastewater treatment Plant (PTAS) for the administration and Control building, of type activated sludges with aeration Extended, of a variable capacity that allows adjusting to the changes in the staffing.

- Medium Voltage electric transmission lines

From the existing electrical distribution line, in front of the locality of Rio Seco, a Medium voltage line, en 23 Kv, up to the sector of the construction work of the upper Adduction tunnel, with an approximate length of 20 km which will supply both the electrical energy required both during the

building of the works in the area of the Plateau as the energy necessary to operate the floodgates of the take-up work during the operation of the plant.

It also envisages the construction of a line of medium voltage, in 23 KvFrom the same existing distribution line to the buildingCIO of administration and Control and even the portals of the tunnel access to the cavern and to the pike of floodgates, in Caleta San Marcos, with an estimated total length of 1 km.

- By-Pass Route A-752

Since the reservoir will flood a portion of the route to-752, it is envisaged the construction of a By-Pass of approximately 5 km of length, in replacement of the portion of this route compromised by the reservoir, which will have double carriageway of 3 m per track more berms of 1 m of width and folder of material Granular.

- Access and Maintenance roads

For access to the reservoir area is planned the construction of a road, North Access Road, which will connect the route CH-1, in the vicinity of the Caleta Rio Seco, with a footprint ExisTente, which will be improved, and which raises the coastal cliff to join with route A-752.

Thus, this road will take approximately 16 km, of which the first 5 km will be constituted by a new road and the remaining 11 km will be an improvement of an existing footprint. It will be of double carriageway, with folder of granular material and with an anCho approximate of 8 m (slopes of 3 m and berms of 1 m).

It also envisages the construction of an access road of about 1,000 m from the route CH-1, in front of the Caleta San Marcos, until the building of administration and Control and the Portal of the tunnel of Access to the cavern of machines, the construction of a road of about 200 m to the portal of the gallery of access to the gate and a path of about 150 m to the curb of the scuttle of floodgates. In the area of the plateau, it is anticipated The construction of 4 short sections totaling 1,100 m of roads that, starting at the By-Pass From the route A-752, they end up in the portal of the equilibrium chimney, the parapet of the south-west Reservoir and the portal of the upper Adduction tunnel.

For LA construction and subsequent maintenance of the LAT is consulted the construction of a road of about 65 km long, which will largely go within the security strip of that line, and runs from a point close to the work of taking the Upper Adduction tunnel up to the Lagunas substation.

- Billets

Both the material coming mainly from the excavation of tunnels, galleries, caverns and pikes, known as "Marina", as the non-reusable surplus originated in The excavation of surface works (roads, canals, slaughter facilities and others) will be deposited in marine stocks located at sites enabled for the purpose in the following places:

a) Dry River Sector, of approximately 1 ha, aproximadamentE to 1,200 m of the North access road.
b) Sector adjacent to the San Marcos administration and Control building of approximately 6 ha.
c) Storage 1 located north of the West Reservoir, approximately 4.4 ha.
d) Collection 2 located south of the West Reservoir, of approximately 6 ha.
e) Collection 3 located to the east of the West Reservoir, approximately 12 ha.

Temporary works

Among the temporary works required for the construction of the works, the following are mainly distinguished:

- Construction roads

In order to have access to the areas in which the project works are to be built, the construction of the service roads detailed in the following table is envisaged:

Table 1-4: Construction roads.

Origin	Destination	Length m
Route CH-1, 6.5 km south of Caleta Rio Seco	Camp contractor, 7.5 km north Caleta San Marcos	100
North Access Road	Collection	1,100
Access Tunnel Portal access road	Operations installation, in Caleta San Marcos	100
Installation of Operations Caleta San Marcos	Powder keg	900
By Pass Route A-752	Powder keg	500

Source: Own Elaboration.

- Construction Staff Camp

It is consulted the construction of a camp for the lodging of up to 500 people during the construction of the Central, which will be located to 7.5 km to the north of the Caleta San Marcos, to the east of the route CH-1, occupying an approximate area of 4 hTo.

The camp will count on offices, recreation area, accommodation building, first aid room, casino, hygienic services, water supply system by tank trucks, storage area and waste management,

Estacionamienvehicles; Bodegas of tools and personal protective equipment and a modular wastewater treatment plant.

- Contractor fixed-Task facility

Construction of four areas for fixed-task facilities is plannedS of the contractors. The first one will be located in the sector of Caleta San Marcos, approximately at a distance of 300 m of the route CH-1 and that uses a surface of 4 ha; The second in the reservoir sector Nor-Poniente at about 300 m north of POrtal of access of the Adduction tunnel, occupying also an area of approximately 4 ha; The third, about 1,200 m from the North access road in the dry river sector that will use an approximate area of 1 ha and the fourth, near the sector of CaMpamento for contractor staff, temporarily occupying a portion of the 4 ha land that will use the construction staff camp.

The first two slaughter facilities will have offices, bathrooms and exchange room; Dining BodEgas and workshops; Concrete plant; Fuel ponds; Fuel dispatch pump; Material storage yards and warehouses; Equipment washing area; Patio collection of aggregates for concrete; Wastewater Treatment Plant; EstanqUEs de Water (for potable and industrial water); Yard of industrial waste and hazardous waste; Equipment maintenance Workshops; Parking lots.

The third, will be endowed with offices; Parking Chemical baths; Wineries for materials; Home and industrial waste yard and two fuel tanks with a capacity of 2,000, 1 L each.

The fourth, to be used for the construction of the camp, will have administrative offices, chemical baths, wineries for AlMacenar of materials, drums for domestic waste, yard for construction waste, parking lots and areas for the temporary storage of materials and equipment for construction.

- Work fronts

The project also consults the Enabling different fronts of work in which some facilities will be available type Container Equipped with Office, chemical baths and areas for the collection of materials and/or equipment.

Such facilities will be enabled in the areas of the portals of Tunnels (adduction tunnel, chimney of upper equilibrium, access gallery pique of floodgates and tunnel of access of Machines cavern) and in the zone of the channel of connection of the reservoirs East and west

In the case of the work fronts you runOperating to the high voltage transmission line and the road that will join Rio Seco with the route A-752, mobile installations will be implemented to be relocated depending on the progress of the works. They will be equipped with Office, chemical baths, drinking water Supplied by drums, storage room for domestic and industrial waste,

containers for storing hazardous waste, parking for light and heavy vehicles and storage area for construction materials.

- PoLvorines

For the safekeeping and dispatch of the explosives used in the excavations, the construction of up to 3 polvorines in land of 900 m is planned.^{2} of surface, duly fenced, to take care of the works in the area of the coast and in Lto the Plateau area. The first one will be located about 500 m north of the Caleta San Marcos slaughter plant and at 400 m of the CH-1 route; The second, about 400 m to the Nor-west of the portal of the Adduction tunnel and at 300 m from the By-Pass Route A-752 And the third in the south third of the south-west Reservoir at about 400 m from the ByPass.

- Medium Voltage electric transmission lines (LMT)

For the electric supply of the camp, slaughter facilities and working fronts for the construction is PRevé the construction of the following medium voltage power lines, in 23 Kv, with their corresponding transformers, connected to the distribution line of the Local concessionaire that runs parallel to the route CH-1 and the line of media tensionN to be built towards the West Reservoir:

a) About 100 m for the feeding of the camp of the contractors.
b) A total of about 1,400 m, from the existing line to the installation of operations, the administration and Control building, the curb of the floodgates, the portals of the tunnel of access to the cavern and the gallery of access to the entrance to the gateS, in Caleta San Marcos.
c) About 1,100 m to feed the installation of operations in the dry river sector, which will be developed parallel to the respective service path.
d) About 1,000 m that goes from the medium tension line that will feed the sector of the West Reservoir to the portal of the gallery of the chimney of equilibrium and to the portal of the Tunnel of discharge/adduction Superior.

As mentioned beforeRmente, the project will be described by environmental sectors:

- Submarine Sector
- Underground Sector
- Sector Costa
- Plateau Sector
- Pampa Sector

1.3.1 Submarine Sector

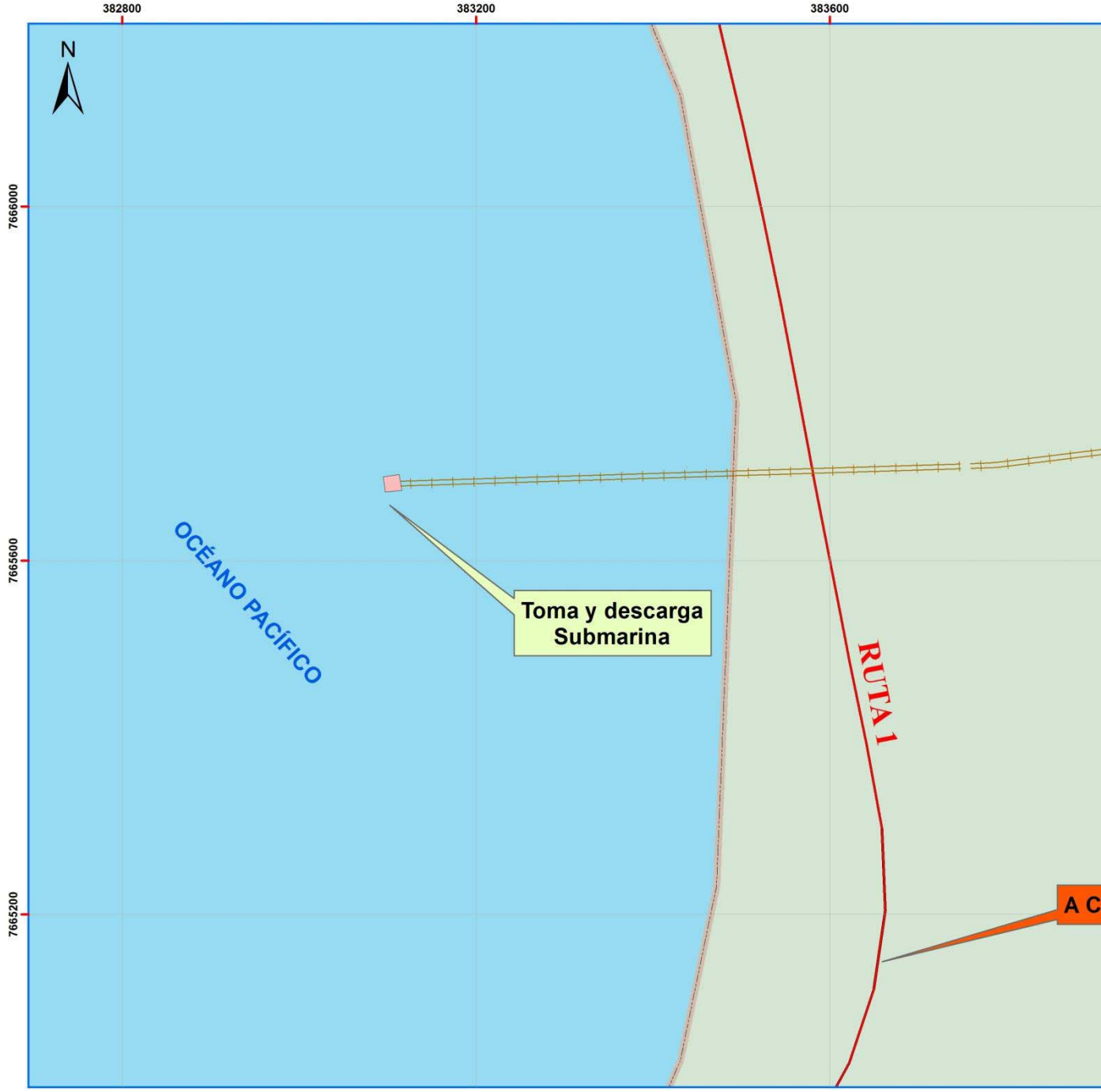
The main works of the submarine Sector and their respective parts are listed below in table 1-5.

Table 1-5: List of works submarine Sector.

List of Works		Temporality	Surface reference
Works	**Detail of Works**		
Underwater Take and unload	Underwater Take and unload	Permanent	Caleta San Marcos

Source: Own Elaboration.

Figure 1-11: Referential location of works submarine Sector.



Source: Self-elaboration

1.1.1.1 Underwater take-up and discharge works (submarine Sector)

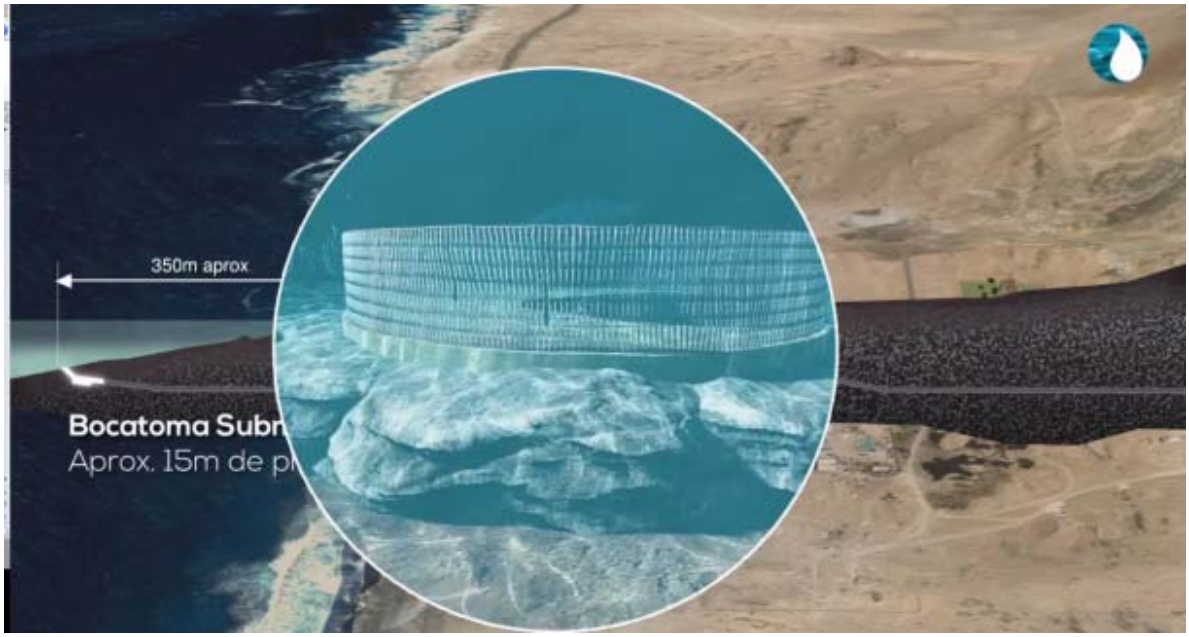
i. Underwater Take and unload

The work of taking and discharge submarine is located approximately to-15.5 M.A.S.L. and has a structure that surrounds it with a diameter 16 m, total height 6 m, solid cover of 10 m in diameter and the rest is grating to reach the 16 m diameter of the cage. The base has 1 m of concrete and on that a grating of 5 m of height with plates of 1 cm each one to 5 cm of distance. Its location coincides with a sea-bottom sector that corresponds to quite a couple of rock outcroppings which allows the construction of the project in an underground form. From this work, you take the waterTo be transported to the reservoir through a pumping system during the day and through this one, the discharge is made to the sea to generate electricity, during the night.

The intake that will surface to the underwater bottom from the lower tunnel, is located to 340 m of the coast and has a diameter of 5 m, approximately.

The following figure 1-12 illustrates the work of underwater taking and unloading**.**

Figure 1-12: Submarine shooting and discharge work.



Source: Own Elaboration.

1.1.2 Underground Sector

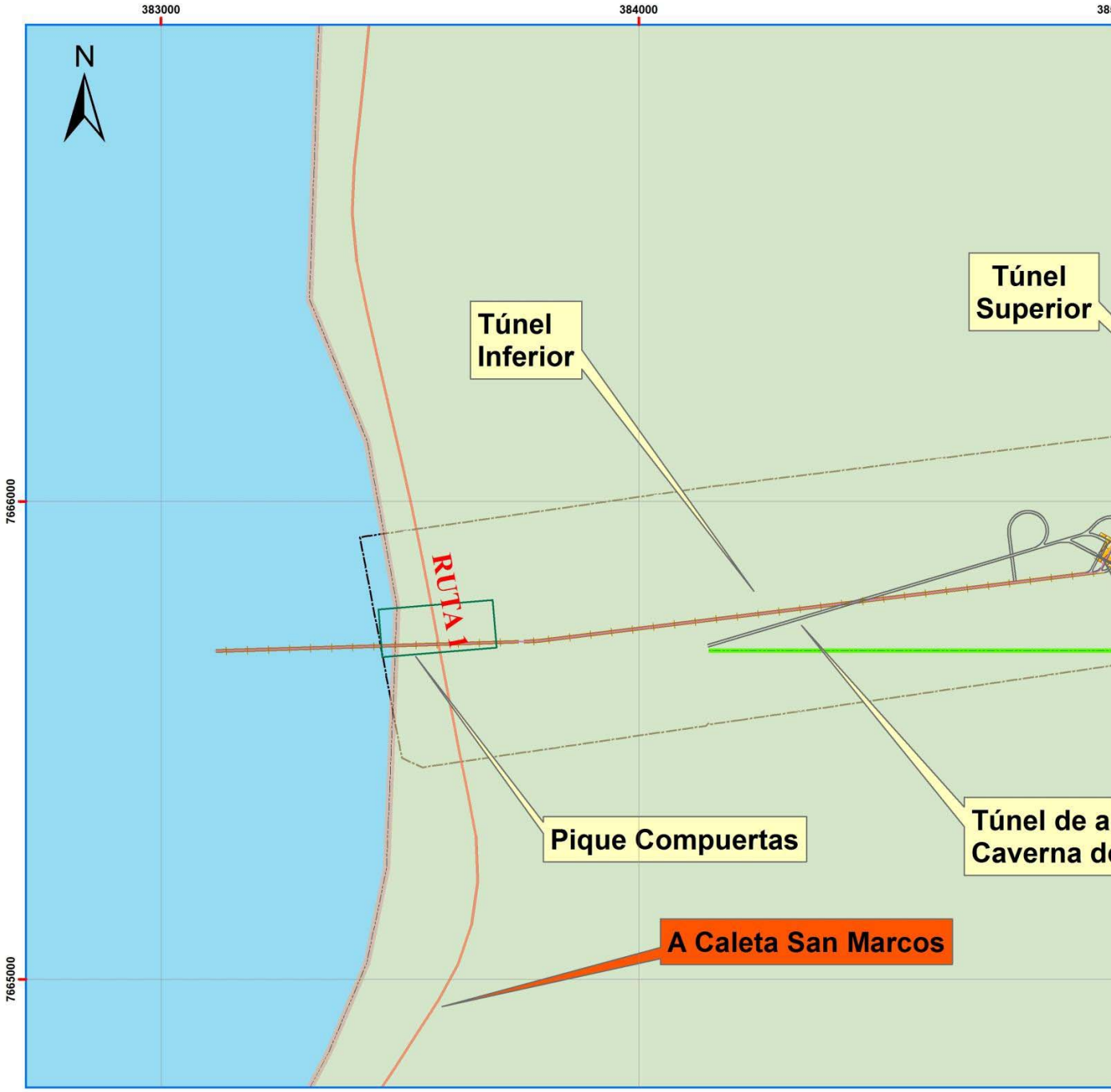
Table 1-6: List of Works underground Sector.

List of Works		Temporality
Works	**Detail of Works**	
Lower Tunnel	Lower Tunnel	Permanent
	Lower Tunnel floodgates	Permanent
	Lower Tunnel Gate Access window	Permanent
	Lower balance chimney	Permanent
Cavern of Machines	Cavern of Machines	Permanent
	Trifurcaciones	Permanent
	Transformers Cavern	Permanent
	Electrical substation	Permanent
	Tunnel access to the caverns of machines	Permanent
	High Voltage Line	Permanent
Pique in pressure	Pique in pressure	Permanent
Upper Tunnel	Shielded or pressurized tunnel	Permanent
	Upper Balance Chimney	Permanent
	Upper Tunnel	Permanent

Source: Own Elaboration.

The following figure shows the referential location of the works in the underground Sector.

Figure 1-13: Referential location of works underground Sector.



Source: Self-elaboration

1.1.2.1 Inferior Tunnel Works

i. Lower Tunnel

Because the lower tunnel is in an area of low internal pressures and that the quality of the rock allows it, it is generally contemplated not to cover this tunnel with molded concrete. The maintenance of the excavation will be of permanent action and are designed for the lifetime of the project.

The lower tunnel is approximately 1830 m long and consists of 7 sections.

The first section is under the work of taking and unloading, and has an inclination of 71 ° and an approximate length of 35 m. This first section is achieved through the constructive method "Norwegian shooting", which aims to fly the rocky cap and connect the inside of the tunnel with the exit to the sea, through controlled thunder. In the elbow that joins the first two sections of the lower tunnel, mentioned above, the stone trap will be located, consisting of a cavity that aims to receive the rock fragments from the seabed that will be released to the RealiArse the submarine connection by means of a controlled thunder, so as not to obstruct the lower tunnel and to allow the adequate entry and exit of water for the pumping and generation, respectively.

Because the lower tunnel is in an area of low internal pressures and that the quality of the rock allows it, it is generally contemplated not to cover this tunnel with molded concrete. The maintenance of the excavation will be of permanent action and are designed for the lifetime of the project.

The main characteristics of each section of the lower tunnel are shown in table 1-7 below.

Table 1-7 features sections of Tunnel Lower.

Stretch	Inclination (%)	Length (m)
1 (*)	71	35
2	16	81
3	0.2	114
4	10	396
5 (* *)	0.5	22
6	10	390
7	0.1	792

(*) Departure to the sea; (**) Pique Gate

Source: Own Elaboration.

Figure 1-12 shows the outline of the lower or unloading tunnel.

Figure 1-14: Lower tunnel or discharge diagram.

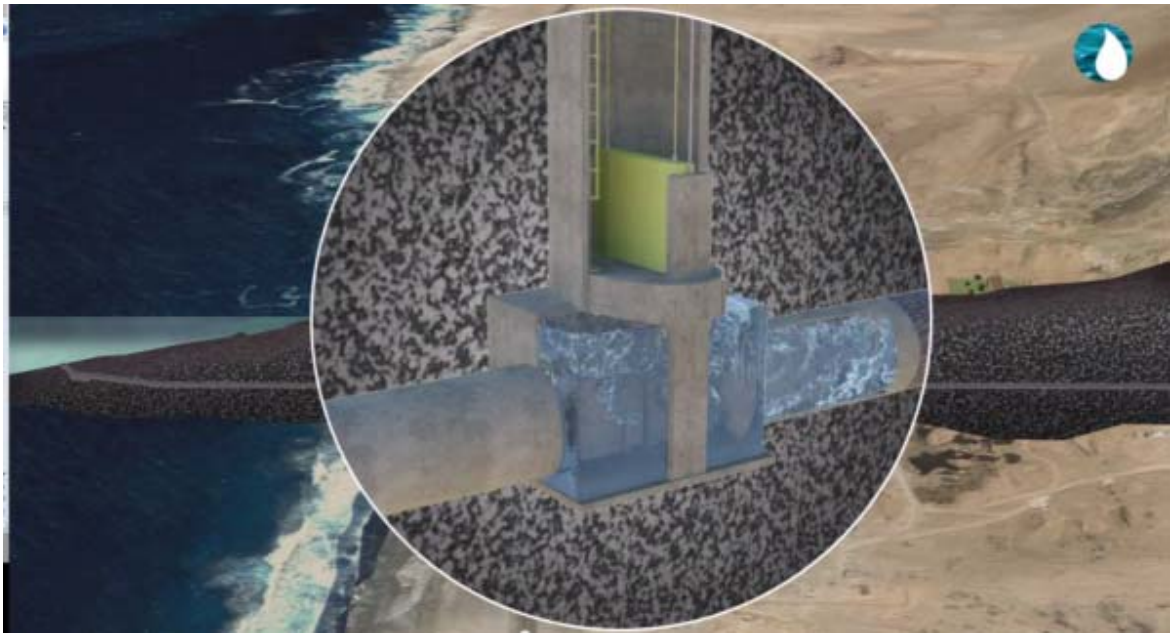
Source: Uht Own.

ii. Lower Tunnel floodgates

The damping of floodgates has as function to allow the closing of the type floodgates Stoplog That open and close to control the passage of water through this tunnel.

The pique is vertical, of section ellipsoidal of 5 x 8 m, starts on the surface at the elevation 20 M.A.S.L. and has a total height of approximately 30 m.

Figure 1-15: Diagram Pique lower tunnel floodgates.



Source: Own Elaboration.

iii. Lower Tunnel Gate Access window

The project envisages as a complement to execute the construction of the Inferior tunnel, to make a window (access) in the zone of Gate Pique. This construction window is developed from the surface until it reaches the lower tunnel, to the east of the floodgates. In its first section it has an entrance portal (open excavation with structure to contain the ground) from where a tunnel of 16 m is started.^{2} of nominal section.

iv. Lower balance chimney

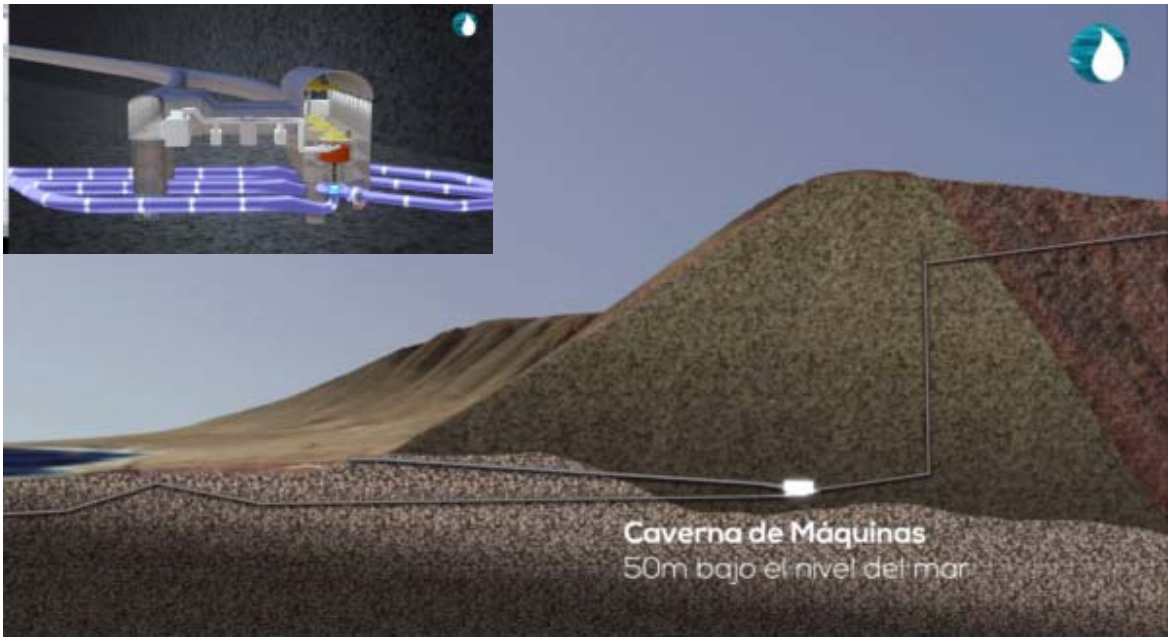
This work is intended to absorb the phenomena Transcientes Of the operation of the plants (outlets and rejects of load) and consists of a blind tunnel constructed from the lower tunnel, with a length of 152 m, a diameter of 5 m, 6 meters of height and an approximate slope of 13%. This chimney will be of hydro-pneumatic type, with a design volume of 300 m^{3} Useful That will use compressors to replenish air leaks and is located about 50 m west of the cavern of machines.

1.1.2.2 Works Cavern of Machines

i. Cavern of Machines

The Cave of machines has as function to contain in its interior the equipment of generation (or pumping) corresponding to the turbines-generators; adduction shutoff valves and all auxiliary equipment.

Figure 1-16: Cavern location scheme of machines.



Source: Own Elaboration.

Inside the cavern is the structured machine house at the following levels:

- Main floor
- Generators floor
- Turbine floor
- Valve Floor

The cross section of the cavern is of circular arches in the vault and of flat walls. The dimensions are: 13 m wide at the level of the flat walls and 14 m in the vault area, the maximum digging height is 29 m (between the zenith of the vault and the more level Low in the diffuser), and an approximate length of 62 m. Tunnels or auxiliary galleries will be built to access these works.

Pump turbines will be *Francis* Reversible single-stage to privilege the efficiency of the whole, which is estimated at 90%, typical value for units whose operation make it constant flow and close to the optimum flow in which efficiency is the maximum, and with variations in load height does not relieve Efore, as is the case of these units, in that this will not vary beyond +/-2%.

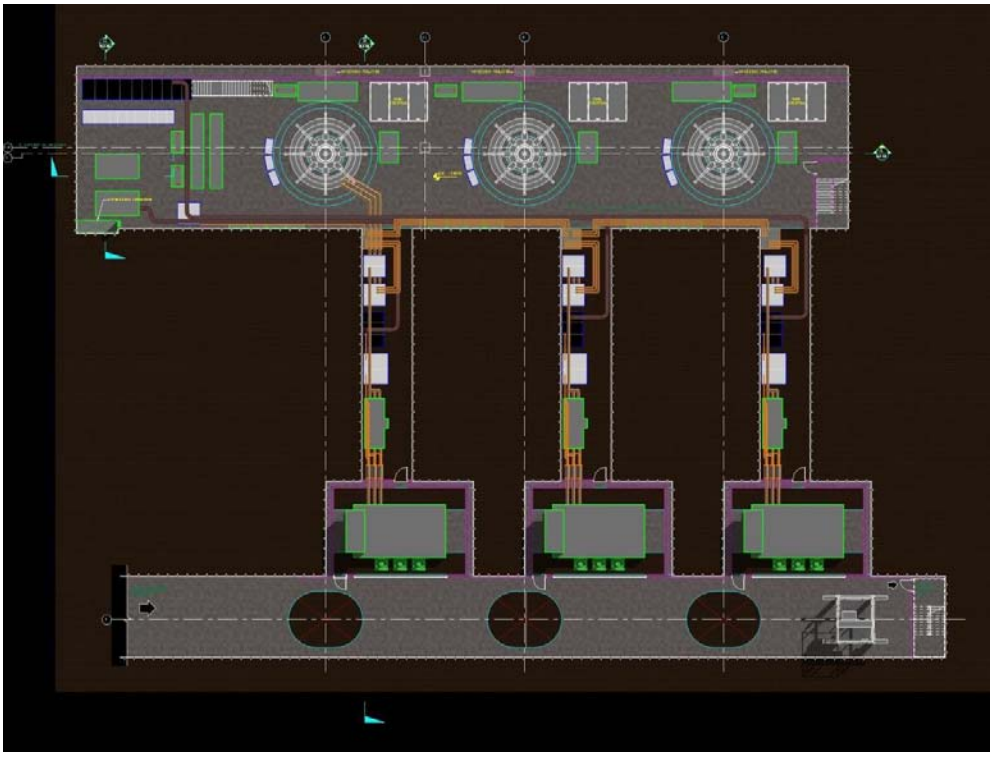
The generator motor will be of synchronous type, outgoing poles and its winding cooled by air-water exchangers, with its output in 12 KV.

To start each unit in the pump mode, it is considered a smooth matcher to minimize its impact on the SING. This splitter will have a bypass switch so that the motor can be synchronized to the mains.

Figure 1-17: Main floor cavern of machines.

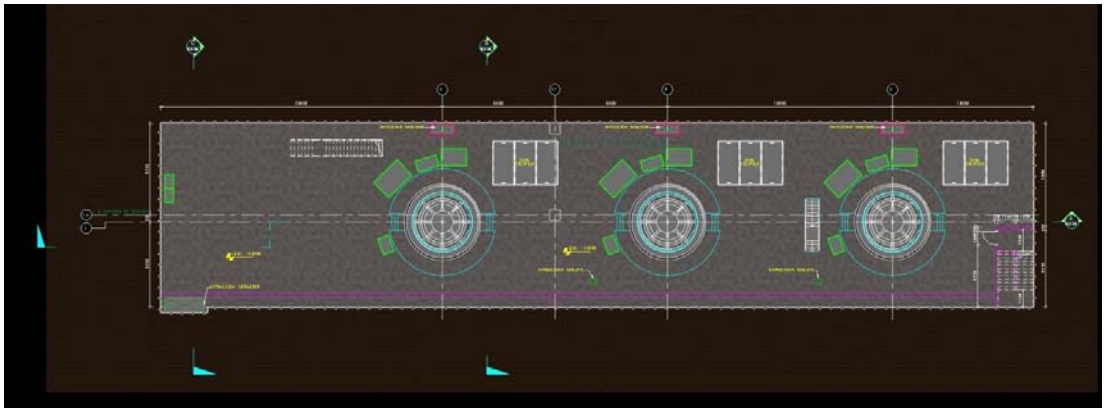
Source: Own Elaboration.

Figure 1-18: Floor Generators cavern machines.



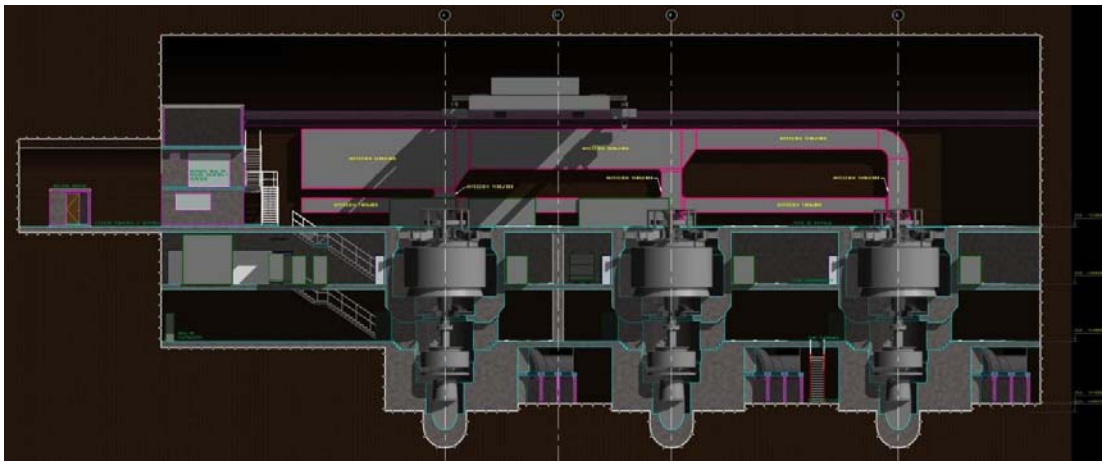
Source: Own Elaboration.

Figure 1-19: Floor turbines cave machines.



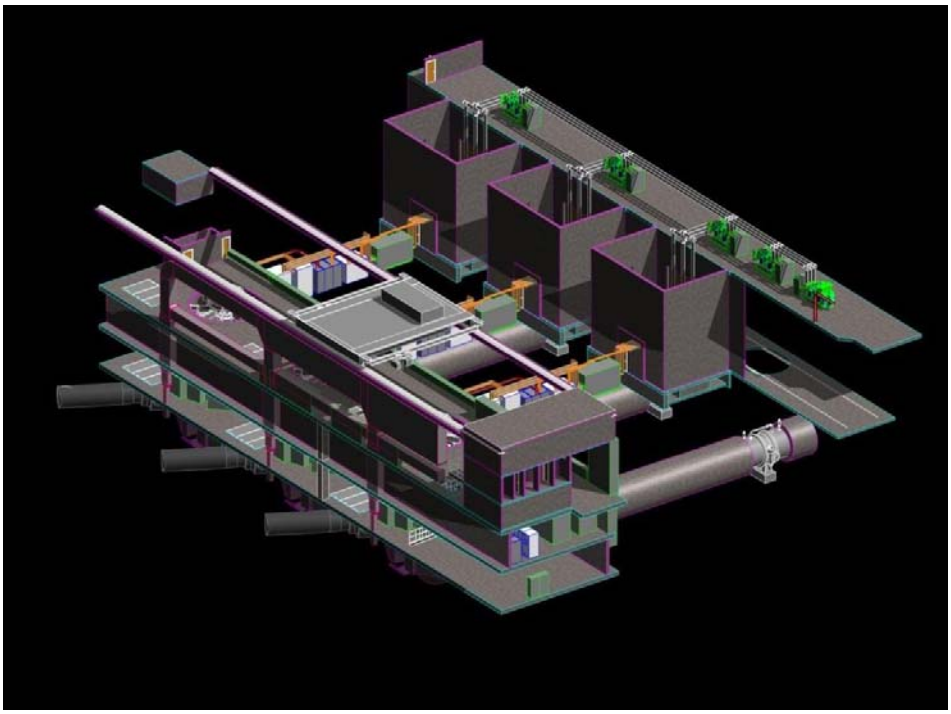
Source: Own Elaboration.

Figure 1-20: General Scheme pump-turbine.



Source: Own Elaboration.

Figure 1-21: General Outline of the Machine cavern.



Source: Own Elaboration.

The Cave of machines will also house the project's GIS substation.

The lower tunnel when you get to the cave of machines is divided into three to deliver the collected flow To each of the following turbines/pumps. The lower tunnel butterfly valves allow the hydraulic isolation of the generation or pumping units. The valves are located in the valve shaft that is located between the Transformers cavern and the TLower Únel.

i. Trifurcaciones

These elements divide in three the runoff that comes from the lower tunnel, and then continue towards the cave of machines in three branches. Upstream of the cavern of machines There is also a trifurcación that re-joins the Flow to move to a single shielded tunnel that is already part of the upper tunnel. These trifurcaciones are armoured in steel with the following characteristics:

- Lower or unloading branches: three (3) and lead the waters from the cavern of machines Down to the lower tunnel. Each one of them is a pipe of 2.75 m of inner diameter, in the area armoured with steel. The length of each one of them is 64 m, 75 m and 86 m for units 1, 2 and 3 respectively.
- Upper or adducting branches: There are three (3) the adduction branches, each one of them is a steel pipe of 2 m of inner diameter with steel armour, they start in the Trifurcación and ends when entering the machine Cavern, the lengths of each one of them is of 36 M, 33 m and 30 m for units 1, 2 and 3 respectively.

ii. Transformers Cavern

The three (3) main Transformers will be inside a cavern separated from the main cavern, constituted by the following parts: Cavern of access of the Transformers, lateral caverns where the Transformers SSEE and the G are locatedAlerías of cables.

The cavern of access to the Transformers is a tunnel of 62 m long, 6.5 m wide and 14 m high, located in parallel to the cavern of machines and at a distance of it of 38 m.

Transformers ' Enclosures have ALREdedor of 8 m wide, 12 m high and 12 m long (depth). They are located in an orthogonal way to the cavern of Access.

Cable Galleries Communicate the cavern of machines with the Transformers cavern. Each one is 4 m wide, 4 tall and 20 m long.

iii. Electrical substation

An underground GIS-type compact SSEE located in the Superi part is plannedOr of the cavern of Transformers, essentially for environmental reasons (visual impact) and for reasons of operation and maintenance (salinity and humidity present in the coastal border). They have selected this type of facilities as they are quite mInvasive Enos from the visual point of view that the SSEE open on the surface.

iv. Tunnel access to the cavern of machines

The access tunnel is the means of entering the cave of machines and the other underground works where the Equipe will be installedof the plant. From the inside, the construction galleries that go to the lower tunnel and part of the pressure bite are born.

This 833 m long tunnel starts on the outside, in the access portal, advances eastwards with a pendientE descending from 8.4%, and to 765 m approximately from the entrance bifurcates towards the cave of machines and towards the cavern of Transformers.

The cross section of the tunnel is a half point arch with flat walls, the inner width is 5 m and LAt a height of 6 m. During the construction phase will be used to access to build the machine Cavern, the Transformers Cavern and part of the lower tunnel.

v. High Voltage line (underground section)

From the Transformers cavern comes out to the ExteriOr the first kilometer of the LAT considered by the project.

1.1.1.1 Pique in pressure

i. Pique in pressure

It corresponds to an underground vertical work where the water will circulate under pressure for the generation of energy. It is about 502 m long and 4.9 m in diameter, connects the upper tunnel with the shielded tunnel. Its construction considers a ReveStimiento with concrete. Unless the geotechnical conditions of the rock, found during excavation so advise, are not expected to be steel-shielded. of requiring shielding by particular geological conditions, the space between the ShieldSteel and the excavation will be filled with concrete.

1.1.1.2 Upper Tunnel Works

i. Shielded or pressurized tunnel

The armoured tunnel is located immediately after the cave of machines towards the pressure sting, has an approximate length of 180 m, with A 13% inclination. This tunnel has 3 sections, which are detailed below:

- First section: 3.6 m wide; 3.6 m high; 2 m diameter of armoured steel pipe; Concrete filling.
- Second section: 5.4 m wide; 5.4 m high; 3.25 m diameter of armoured steel pipe; Concrete filling.
- Third section: 5.4 m wide; 5.4 m high; 5 m pipe diameter; Maintenance according to ground quality.

ii. Upper Balance Chimney

In the Case of the chimney of equilibrium of the upper tunnel, unlike the lower tunnel this has a vertical stretch of about 103 m which departs from the upper tunnel at a point close to the encounter of that tunnel with the pressure pique and then It continues for approximately 535 m with an inclined section in approximately 13% that surfaces to the surface. The diameter of the upper-equilibrium chimney is about 4.9 m.

iii. Upper Tunnel

It corresponds to the tunnel that connects the pressure bite with the reservoir, with an approximate inclination of 13% and a length of about 886 m. Its approximate section is 25 m^2, with 5.6 m of height (floor to key) and 5 m of width approx.

At the end POBefore the pressure is pressed, the connection with the upper balance chimney will be located.

1.1.2 Sector Costa

The coastal Sector corresponds to the area where most of the project's transitory installations are located. The above for contemplating Mainly the camp and much of the slaughter facilities of the different working fronts.

The works and parts of this Sector are detailed in table 1-8.

Table 1-8: List of works Sector Costa.

List of Works		Temporality	Surface reference
Works	**Detail of Works**		
Area of operations	Administration and Control Building	Permanent	Caleta San

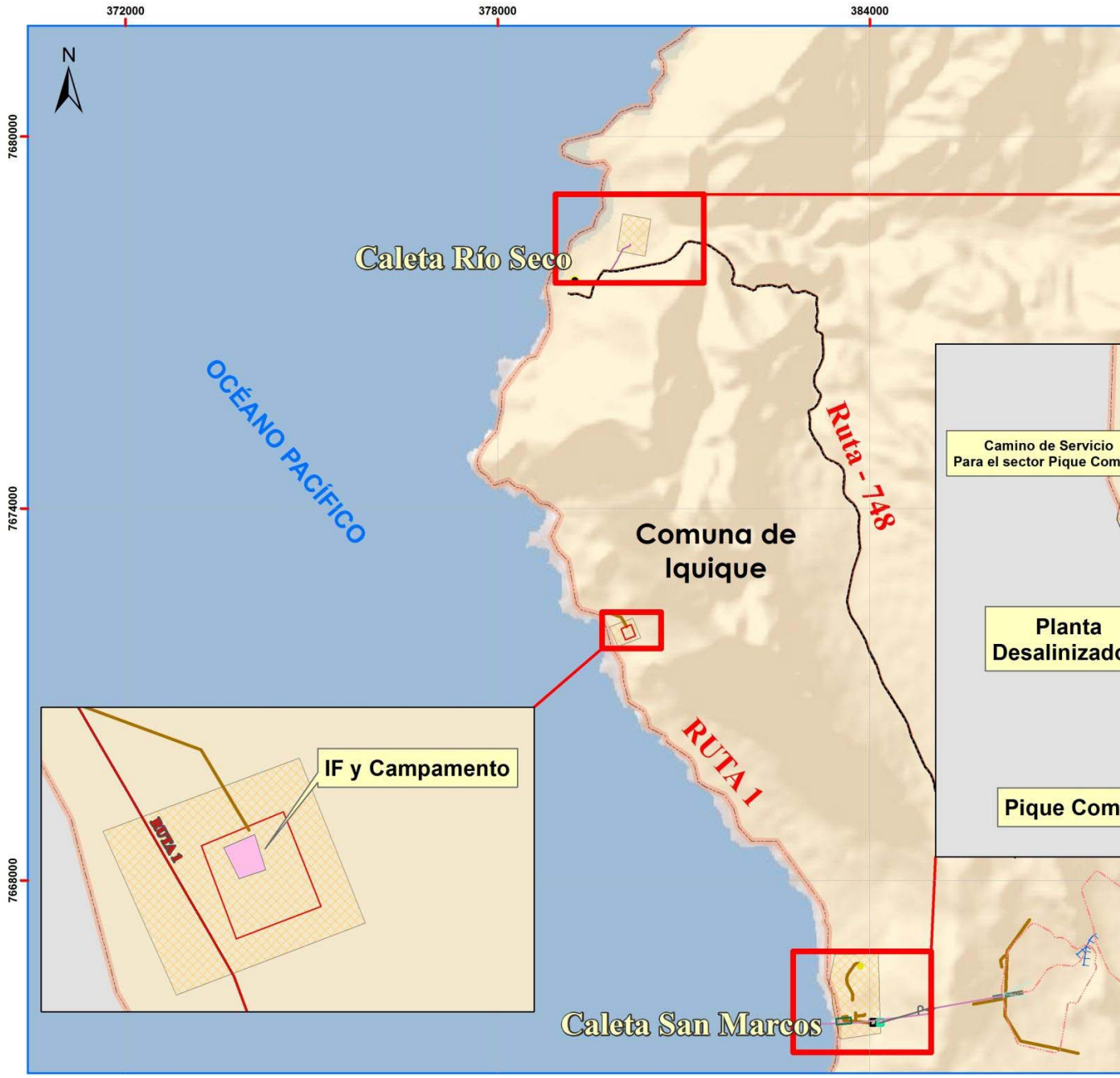
	Workshop building, warehouse and diesel group	Permanent	Marcos
	Parking lots	Permanent	
	Industrial waste yard and warehouse for temporary collection of hazardous waste	Permanent	
	Wastewater Treatment Plant (PTAS)	Permanent	
Desalination plant	Potable Water supply system	Permanent	Caleta San Marcos
Portals Costa	Portal of the Access window to the gate	Permanent	Caleta San Marcos
	Surface work Pique of floodgates	Permanent	
	Portal tunnel access to the cavern of machines	Permanent	
Installation of work for the construction phase	Offices	Temporary	Caleta San Marcos and Caleta Rio Seco (smaller size)
	Dining room	Temporary	
	Bathrooms	Temporary	
	Exchange Room	Temporary	
	Potable Water supply system	Temporary	
	Fuel storage	Temporary	
	Warehouse for temporary storage of hazardous waste	Temporary	
	Domestic waste yard and construction	Temporary	
	Industrial Waste Yard	Temporary	
	Minor Maintenance Workshop	Temporary	
	Warehouse for electromechanical equipment	Temporary	
	Parking and warehouse for machinery and equipment	Temporary	
	Material Storage Area	Temporary	
	Concrete Plant	Temporary	
	Truck washing industry Mixer	Temporary	
Camp	Offices	Temporary	Entre Caleta Rio Seco and Caleta San Marcos
	Recreation Area	Temporary	
	Accommodation Building	Temporary	

	First Aid Room	Temporary	
	Casino	Temporary	
	Bathrooms and showers	Temporary	
	Potable Water supply system	Temporary	
	Waste storage and management	Temporary	
	Parking	Temporary	
	Wineries	Temporary	
	Wastewater Treatment Plant (PTAS)	Temporary	
Access Roads Sector Costa	North Access Road (Caleta Rio Seco section)	Permanent	Caleta Rio Seco
	Junction and Road to Camp	Temporary	Entre Caleta Rio Seco and Caleta San Marcos
	Splicy Road to administration and Control building sector	Temporary	Caleta San Marcos
	Route of service to the area and installation of the Dry River area and in the San Marcos sector	Temporary	
	Road of service for the area of Pique floodgates in San Marcos	Temporary	
	Road to Access Magazine	Temporary	
Areas of stockpiles	Areas of excavation Material and marine excavation of underground and surface works	Permanent	Caleta San Marcos and Caleta Rio Seco
Powder keg	Gunpowder Coast	Temporary	Caleta San Marcos
Power lines	Line medium voltage Supply main operation and operations area	Permanent	Caleta San Marcos
	Middle Line voltage Supply camp	Permanent	Entre Caleta Rio Seco and Caleta San Marcos

	Middle line tension Road North Access	Permanent	Caleta Rio Seco
	High Voltage line of the project Espejo de Tarapacá	Permanent	Caleta San Marcos

Source: Own Elaboration.

Figure 1-22: Referential location of works Sector Costa.



Source: Own Elaboration.

1.1.2.1 Works area of operations

The area of operations is near the Caleta San Marcos and corresponds to the area where the surface and permanent works for the operation of the project will take place. These works are the building Dand administration and Control, the maintenance workshop, the plant Treatment of sewage and the first works of elevation of LAT. It is worth mentioning that in this sector the access to the cavern of Machines is located.

Figure 1-23 shows a Outline of the operations area.

Figure 1-23: Area of operations scheme and access to the cavern of machines.

Source: Own Elaboration.

i. Administration and Control Building

The operation of the plant is planned to be carried out from an administration and Control building located adjacent to the portal of the tunnel of access to the cave of machines, in the coastal sector near the Caleta San Marcos.

The building of administrationN and Control will have an approximate surface of 330 m^2, it will be of 2 floors, with concrete structure and armed with interior partition. In it will be the operation and control room of the central, offices, meeting rooms and services.

ii. Workshop Building, BHe and Diesel group

On one side of the administration and Control building you will find the workshop and cellar building where we will locate warehouses for spare parts, tool storage, general electrical equipment, diesel equipment of 500 Kva. This equiPO is to allow departure in "black" of the central in cases of black Out (Service drop). This building will be built on the basis of a metallic structure and cladding without insulation.

iii. Parking lots

Parking lots will be located at a Cosof the administration and Control building. They will be designed for light vehicles and to a lesser extent for heavy vehicles. In the workshop and warehouse sector there will be parking lots for larger vehicles.

iv. Industrial waste yard and a warehouseTemporary copy of hazardous waste

Low amounts of industrial and/or hazardous waste could be generated during the operation phase following minor maintenance works. To manage them you will have an industrial waste yard of 2 X 3 m fenced and a temporary storage warehouse of hazardous waste of 2 x 2 M. Both will be close to the workshop building, winery and diesel group described above. No treatment will be made in place, your withdrawal and disposition will be againstWith a duly authorized third party.

v. Wastewater Treatment Plant (PTAS) – Operations area

For the treatment of wastewater, the project considers the habilitation of a modular treatment plant type Ecojet or similar, which tIt will rat the water served by means of a biological process of activated sludge. This type of plants abate dissolved solids, which implies a high efficiency of elimination of organic matter; are aerobically functioning, do not generate bad smells, are small-sized plants; and generate a reduced volume of sludge.

Basically, the PTAS presents the following stages:

- Pre-Treatment: in which large and non-degradable solids are separate;
- Aeration: In which organic matter is degraded;
- Sedimentation: stage in which it gives place to a crystalline and odorless effluent;
- Disinfection: Normally chlorine-based, for the elimination of pathogenic elements; And
- Statement: in which It eliminates residual chlorine by means of sodium sulfite tablets, thus obtaining a harmless effluent for the environment.

The PTAS will operate 24 hours a day, all the days of the year during the required period and the treated water shall meet the parMicrobiological Ámetros of water quality standard for irrigation (Nch 1,333).

As for the sludge generated by the pesetas, they will comply with the provisions of DS N ° 4 of sludge, therefore they shall be withdrawn by an authorized pits clean company parTo be taken to final disposition.

1.1.2.2 Desalination plant

The potable water supply system, both for construction and operation, will be constituted by a desalination plant.

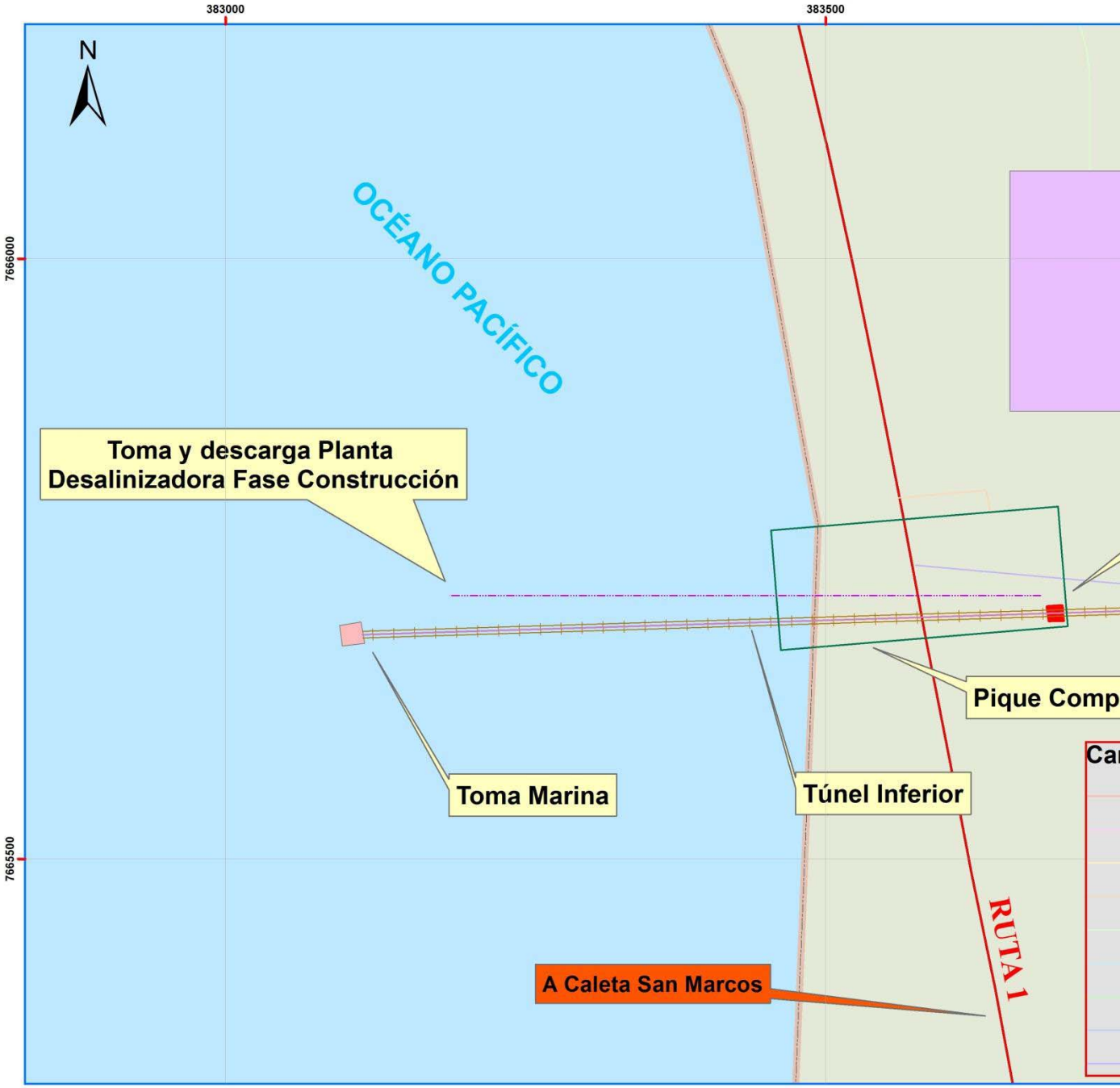
During the *Construction phase*, a GE is estimated5 L/S of desalinated water. The requirements will be given by the construction works and the camp. It is important to add that while the lower tunnel and the take-up work are not implemented, the plant will work by capturing water with a MAFlexible 3-inch diameter from the sea and the rejection water will be returned to the sea by another hose of similar characteristics, outside the coastal Protection Zone (ZPL).

In the case that during the construction phase you reach reqUerir more water, due to a specific work, this will be acquired from duly authorized suppliers, being able to be stored in the ponds available in the facilities of slaughter envisaged for the Sector coast (close to Caleta San Marcos) and SEctor Plateau (Reservoir area), which are described in the section 1.4.3.4 (Facilities for construction phase). Or they can be stored in containers that will be installed on the work fronts that require it.

During the *Ope phaseRation*, and once the works of inferior tunnel and work of Toma are executed, the desalination plant will be able to function as definitive work, taking and discharging water through the aforementioned works. During this phase the plant will generate 2.75 L/s of Desalinated water, approximately, thus satisfying the demand for this phase, particularly for the activities carried out in the sector of the administration and Control building.

Figure 1-23 shows the location of the Desalini plantZadora.

Figure 1-24: Location desalination plant.



Source: Self-elaboration

1.1.2.3 Works Portals Costa

Given the existence of underground works, in the coastal Sector, different accesses to these works are considered. These accesses are called portals and are listed below.

i. Surface work Pique of floodgates

The surface work of the floodgates, consists of a work designed to store, place and remove the maintenance floodgates of the sliding type (Stop-log). This work is located Located In the coastal Sector, between the Cave of machines and the work of taking and unloading, and allow isolating the cavern of machines from the sea, in the lower tunnel.

ii. Portal of the Access window to the gate

This portal consists of a structural support of the terrain, located in the window of access to the Pique of CompUertas. It will be 6 m high and 5 m wide, which will allow the entry of machinery, equipment and work materials, as well as vehicles and workers to the underground works of that sector. The portal will have a concrete containment structure.

iii. PoRtal of the tunnel access to the cavern of machines

This work, of concrete, begins the tunnel of access to the cavern of machines. This portal will be 6 m high and 5 m wide and by it access machines, equipment, vehicles and workers. Includes the OBRAs they will allow to install the high voltage electrical cables that go from the substation (S/E) underground electrical (GIS) to the surface and to the high voltage towers.

The pique will have the shape of an ellipse of 5 x 8 m and a depth of aLrededor of 30 m from the surface, to be able to accommodate the guides of the maintenance Gate of 5 x 6 m (width by high). The gate will be operated by a crane truck, which will reach the access road to this work.

During the construction phaseIt is envisaged to use the pique, as construction access for the lower tunnel. On the other hand during the operation phase, the desalination plant ducts will access the lower tunnel for this work.

1.1.2.4 Equipment for the construction phaseCión

The project considers four slaughter facilities, three of which are located in the Costa sector. The first is the facility that allows the construction of the camp and is considered for a short period of approximately 9 Months. The other facility of slaughter that is considered in the sector Costa and close to Caleta Rio Seco is also temporary and It is in order to support the construction of the North access road described later in the section 1.4.3.6 numeral I. And that serves To connect

the works of the Costa sector with the plateau sector and in particular the works associated with the reservoir. This task facility also has a limited temporality to the construction of the road.

The other two operations facilities, the CUAles will be required during the whole construction phase, will be located near Caleta San Marcos (very close to where will be located much of the construction activities of the coastal sector) and in the plateau sector (close to the works of REservorio).

The following describes the facilities for slaughter:

i. Main task facility (near Caleta San Marcos)

The project considers the use of a slaughter facility that will be kept in service during the entire construction period of the works. Its location is envisaged on a surface of 4 ha at a distance of approximately 250 m, from where the building of administration and Control will be built.

In this facility only construction will be built for purposes strictly Operational and construction of works, welfare or feeding staff.

It will comply with all the current regulations that apply to the design, construction, maintenance and operation of its facilities, including the supply of potable water, pEnvironmental protection against fire, sewers, electrical networks, sanitation and public safety.

A 100 diesel equipment is considered Kva For this task facility.

The minimum infrastructure to consider includes:

- *Offices*

They will have the capacity to house all the administrative personnel of the contractor companies and the proprietor.

- *Dining room*

It will have a dining room where food is supplied to the staff by means of catering service.

- *Bathrooms*

Chemicals baths will be countedAs stipulated in DS No. 594. Until the wastewater treatment plant begins to operate, these baths will be eliminated and the restrooms connected to the sewer system will be used.

- *Exchange Room*

This place is destinedOr for the change of workers ' work clothes and to keep their Pertencias.

- *Potable Water supply system*

The drinking water will be supplied by means of drums in a first phase until the desalination plant is operating.Dora.

- *Fuel storage*

It will be supplied by trucks and deposited in two fixed ponds of 2000 L each. The floor of the place will be waterproofed with a geotextile and spill containment system to avoid soil contamination.

- *Warehouse for temporary storage of hazardous waste*

The warehouse will be located in the waste yard and comply with all the requirements established by the DS N ° 148. This wine cellar will be closed, with a roof, with waterproof flooring and with the security cards at the entrance.

- *Domestic Waste yardS and construction*

The waste will be stored and separated in a specially-equipped patio.

- *Industrial Waste Yard*

The waste will be stored and separated in this yard and then transferred to be deposited in a lugAuthorized AR.

- *Minor Maintenance Workshop*

Will have a Radier Concrete and metallic roof; It will carry out all the maintenance of the machinery, equipment and vehicles of the tasks.

- *Warehouse for electromechanical equipment*

The winery will be locatedIt gives close to the maintenance workshop and it will store all the electromechanical equipment required by the project.

- *Parking and warehouse for machinery and equipment*

The equipment will be stored in a covered shed depending on the type of machinery and will be separated from the parking of light vehicles.

- *Material Storage Area*

A controlled sector will be stored and when its nature requires it will be In a closed, covered warehouse and controlled access.

- *Concrete Plant*

The slaughter facility considers a modular concrete plant, as it will use concrete and *Shotcrete* To build part of the works of the coast and underground sectors (portal, lower chimney, eventual supports in tunnels, Cave of machines, pique of floodgates, buildings). A production of 30,000 m is estimated^3.

This amount represents an approximate need of 28,500 Ton Gravel, 19,500 ton of sand, 10,500 ton of cement and 15,000 m^3 of water. The concrete plant will be 20 to 30 m^3/hour, with silo or concrete cellar and 20 m water pond^3. For the transfer of concrete from this plant to the different fronts, there will be enough trucks Mixers (5 to 6) Size compatible with tunnel access.

This plant will have a crusher machine that is isolated to minimize noise emissions.

- *Truck washing industry Mixer*

The batteries of the trucks will be washed and the MaterIal will go to some decanting pools. Once the material is already dried, it will be transferred as industrial waste by an authorized third party to an authorized disposal site.

ii. Installation of Slaughter road access North – Caleta Rio Seco

CercAno a la Caleta Rio Seco is considered a minor facility. Like the facility of slaughter described in the previous point, it will have offices, parking lots, chemical baths, warehouses to store construction supplies and Patio De Household and industrial waste, corresponding to the construction of the first section of the North access road and to a medium voltage line that will connect the coastal Sector with the plateau to feed electricity during the construction Works in the reservoir. This line is described in the section 1.4.4.5 numeral i.

Also considered a 100 diesel equipment Kva For this task facility.

The minimum infrastructure to consider includes:

- *Office*

will be of modular type and will be usedor by Contractor personnel.

- *Parking*

It will have parking for light vehicles.

- *Waste yard*

It will have a small patio to store domestic and industrial waste separately. These wastes will be removed daily and will be transferred to the waste yards of the coastal Sector facility.

- *Fuel tank*

COntará with two ponds with a capacity of 2000 liters each to supply vehicles and machinery.

iii. Installation of work for the construction camp

The project will have a temporary facility to build the camp. This installwill be modular and have administrative offices, chemical baths, as stipulated by the DS N ° 594, warehouses for storage of materials, drums for household waste, yard for construction waste, EstacionamiEnts, temporary storage of materials and equipment for construction and will receive the power from the LTE existing in the sector.

The path of access to the slaughter facility will be a splice from the CH-1 route that will be used postRmente to allow access to the camp.

This facility of operations considers:

- *Office*

It will be of modular type and will be used by contractor personnel.

- *Parking*

It will have parking for light vehicles.

- *Waste yard*

will have uN Small yard to store domestic and industrial waste separately. These wastes will be removed daily and will be transferred to the waste yards of the coastal Sector facility.

- *Fuel tank*

Will count with dos ponds with a capacity of 2000 liters each to supply vehicles and machinery.

- *Generator Diesel*

A 100 diesel equipment is considered Kva For this task facility.

It is worth mentioning that the time for the materialization of the camp has been considered in 6 months.

iv. Installation of slaughter in the plateau Sector

This facility of slaughters is described in section 0 later, associated with the works of the plateau Sector.

1.1.2.5 CampaseNto

The project includes a permanent camp during the construction phase, where the workers spend the night. This camp will be located 7.5 km north of Caleta San Marcos on the east side of Route CH-1. For the location area Of the camp has been considered an area of 4 ha, to accommodate about 250 people on average and about 500 people in the Peak Construction of the project.

The facilities considered in the project camp are as follows:

i. OfficeAs

These offices will be eligible for camp and contractor management staff if you required.

ii. Recreation Area

The camp will have recreation spaces for the workers. You will have a covered room and also a LUOutdoor gar.

iii. Accommodation Building

The accommodation building will be of a modular type, with the capacity to accommodate all the staff on duty.

iv. First Aid Room

The project will have a first aid room in charge of a paramedic, is in operation 24 hours a day.

v. Casino

It corresponds to the place where the food will be prepared for the workers of the tasks and the camp. In it will be served LTo food for the workers who are in the camp.

vi. Bathrooms and showers

The camp will have bathrooms and showers enough to provide service to the occupants.

vii. Potable Water supply system

The supply of potable water will be through fixed ponds that will be filled by tank trucks from the desalination plant. Until it is operating, the supply of potable water will be carried out using jerry cans for consumption HuHand and trucks cisterns, of a third certificate, for the basic services.

viii. Waste storage and management

The storage and management of waste will be carried out to one side of the camp in a certain area for this. Waste sWere separated and taken to final destination by an authorized third party. In this sector only household waste will be generated.

ix. Parking

Parking lots will be for minor vehicles, vans, minibuses, buses and to a lesser extent for machinery And they will be demarcated.

x. Wineries

The camp will feature wineries for the storage of workers ' tools and personal protective equipment.

It will also have a storage space for camp maintenance materials.

xi. PlaNTA of Wastewater Treatment (PTAS)-Camping

For the treatment of wastewater, the project considers the habilitation of a modular treatment plant type Ecojet or similar as described in the section 1.4.3.1 numeral v.

The PTAS will operate 24 hours a day, all days of the year during the required period and the treated water shall comply with the microbiological parameters of the water quality standard for irrigation (Nch 1,333).

As for the sludge generated in the PTAS, it compliesRán with the provisions of the DS N ° 4 of sludge, and will be removed by a clean pit company authorized to be taken to final disposition.

1.1.2.6 Access Roads Sector Costa

The sectors described above require all of short stretches of roads To access them, which mostly splice with the CH-1.

In addition, in the Costa sector is born the road of North Access, which leads from the coastal sector to the reservoir of the project, which is located on the plateau on the coastal cliff. It should be noted that a proposal for a convention to carry out all the road work related to this project was entered before the Directorate of Highways of the region.

These roads will also be used for the construction and maintenance of the LMT.

Below is a brief description of these roads present in the coastal Sector:

i. North Access road (Sector Costa section)

This section corresponds to the first 2.5 km from the route CH-1 towards the coastal cliff, where the North access road begins. This route will connect the route CH-1 with the route A-752, which starting from the coast has an approximate length of 15.3 Km in total, will be made up of 5 km of new road (projected) and the rest will be an improvement of an existing road. This route will be double carriageway with granular material and a width of approximately 8 m, considering slopes of 3 m and berms of 1 m.

The duration of the construction of this route has been considered of 9 months, using machinery of the type backhoes, Bulldozer, graders and trucks that will move the material removed to the corresponding collection area. CoupleFor road leveling purposes the same material will be used Extracted In the construction of the works.

In addition, the project will build joints and roads, such as:

ii. Junction and Road to Camp

This access road connects the route CH-1 with the Campamentor for construction.

iii. Splicing and road to administration and Control building Sector

This road is the one that gives access from the route CH-1 to the following works:

- Wastewater Treatment Plant
- Administration and Control Building
- Mantenc WorkshopIon
- Tunnel access to the cavern of machines

iv. Route of service to the area of operations and installation of the Dry River area in the San Marcos Sector

This service path allows access to the area of operations and installation of the Dry River area from the new North access road.

v. Service path for the hatchery area in San Marcos

It is the way to the entrance to the sector of floodgates and the desalination plant, born of the route CH-1.

vi. Road to Access Magazine

The road of service to access to magazine goes from the installation of slaughter to that point, has about 750 m long.

1.1.2.7 Collection areas

In the coastal sector there are two billets, one corresponding to the material extracted for the construction of the new section of road of North Access in the sector of dry river and another in the sector of the building of ADMIAdministration and Control, which will receive the material extracted from surface and underground works of the sector.

The first one considers a surface of 2 ha and the second a surface of 6 ha.

It is contemplated to deposit the material in terraces of 5 m high with ES2 m.

1.1.2.8 Powder Keg (coastal Sector)

Explosives, detonators, retarders and related materials will be stored in a powder keg with the capacity to meet the requirements of the project.

To store the explosives that will be used during the Phase of construction of the project, the magazine of the Costa Sector will be located to 500 m of the nearest facilities, it has been considered to install it in a field of 900 m².

1.1.2.9 Power lines-Sector Costa

It is considered the construction of 4 electric liness in the Costa Sector. These lines are:

- Line medium voltage Supply main operation and operations area
- Middle Line voltage Supply camp
- Line medium Voltage Road access North-Reservoir
- High Voltage Line

All lines consider construction and maintenance roads.

i. Line medium voltage Supply main operation and operations area

It is considered to feed the area of operations an electrical line of medium voltage (LMT). This one, is UBIcará in the coastal area of works near the Caleta San Marcos, the line will have A surface length of 1.5 km starting from its connection to the existing network (parallel to Route CH-1). This line will supply energy to the desalination plant, The operating area and the Operation facility. This line Continues Through the access tunnel to the machine cave. The 500 team Kva, for the black game, will connect to this same line.

Figure 1-25: LTE connection to administration and Control building.

Source: Self-elaboration

i. Middle Line voltage Supply camp

The camp will be supplied with electricity through a connection to the existing electrical line running parallel to Route CH-1.

ii. Line medium Voltage Road access North-Reservoir

Since this line will be developed mainly in the plateau sector, this is described in the section 1.4.4.5 numeral I..

iii. High Voltage Line

Since this line will be developed mainly in the Pampa sector, this is described in the section 1.4.5.1.

1.1.1 Plateau Sector

The plateau sector mainly corresponds to the area where the water reserves will be located and, therefore, where all the works associated with the canalization of the reservoir will take place.

The following table 1-9 shows the works and parts of the plateau sector, and then describes each of them.

Table 1-9: List of Works Plateau Sector.

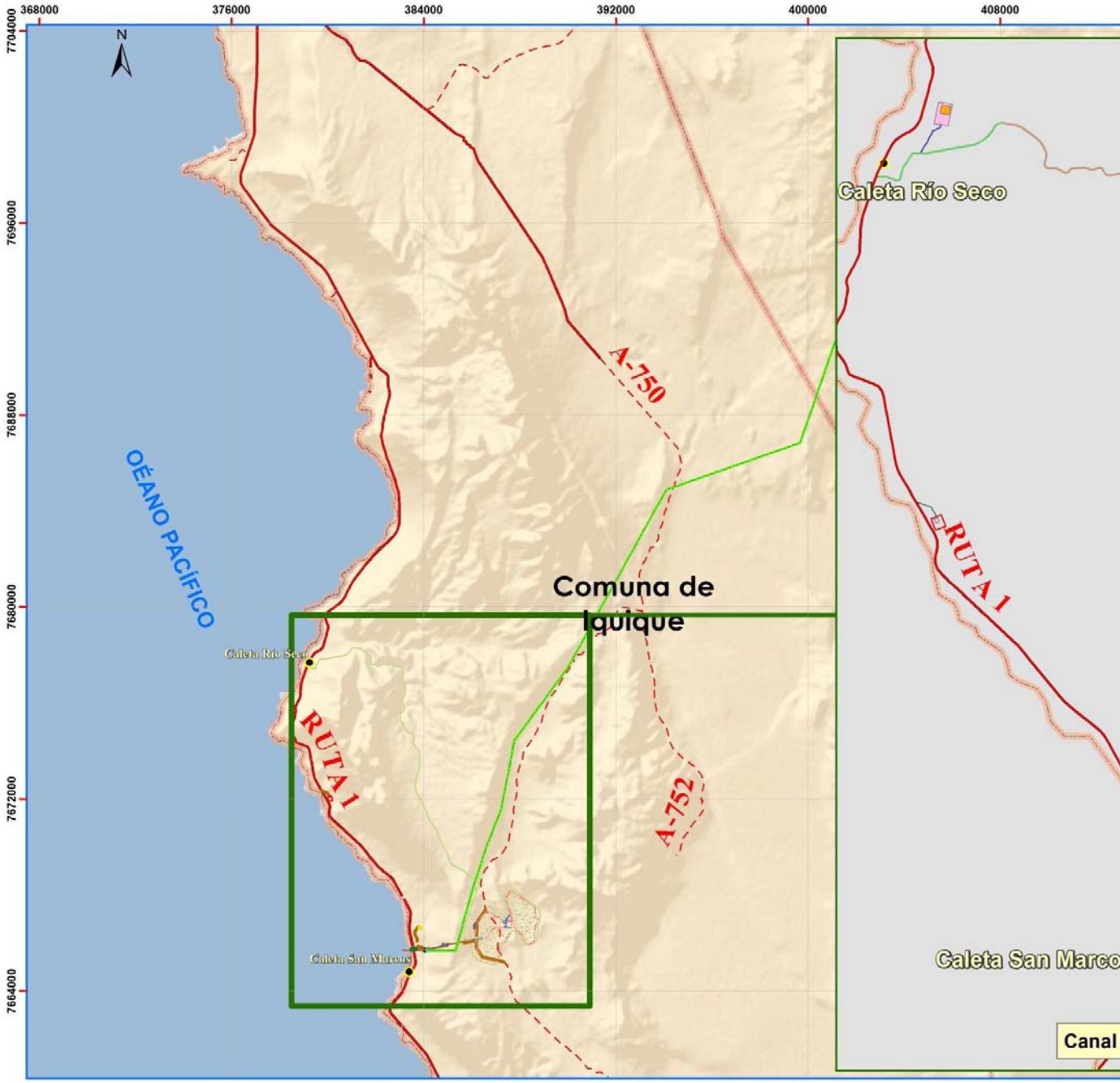
List of Works		Temporality	Surface reference
Works	**Detail of Works**		
Reservoir	Reservoir Waterproofing Membrane cover	Permanent	Reservoir
	Exterior and Divider Pretile	Permanent	
	Basin Connection Channel	Permanent	
	Drain Channel	Permanent	
	North Sector Splice West Reservoir	Permanent	
Intake and discharge Reservoir	Reservoir Pipeline Works	Permanent	Reservoir
	Approach channels	Permanent	
Portals Reservoir	Upper Tunnel Portal	Permanent	Reservoir

	Road of service to the portal Superior Tunnel	Permanent	
	Portal Chimney of Upper equilibrium	Permanent	
	Way of service to the chimney of equilibrium	Permanent	
Reservoir Facility	Offices	Temporary	Reservoir
	Dining room	Temporary	
	Bathrooms and changing rooms	Temporary	
	Potable Water supply system	Temporary	
	Fuel storage	Temporary	
	Warehouse for temporary storage of hazardous waste	Temporary	
	Domestic waste yard and construction	Temporary	
	Industrial Waste Yard	Temporary	
	Minor Maintenance Workshop	Temporary	
	Parking and warehouse for machinery and equipment	Temporary	
	Material Storage Area	Temporary	
	Concrete Plant	Temporary	
	Truck washing industry Mixer	Temporary	
	Medium voltage and transformer electric transmission line	Permanent	
Collection areas of reservoir excavation material	Gathering 1	Permanent	Reservoir
	Gathering 2	Permanent	
	Gathering 3	Permanent	
	Service path to the reservoir area	Temporary	
Powder keg	Reservoir Magazine	Temporary	Reservoir
Roads Sector	North Access Road	Permanent	Reservoir

Plateau	Improvement Route A-752	Permanent	
	By-Pass Route A-752 – Reservoir	Permanent	
	Roads to work fronts	Temporary	
	Roads from reservoir works to billets	Temporary	
Area Control and Communication reservoir	Control Panel	Permanent	Approach Channel
Lmt	Access and Maintenance path	Permanent	Reservoir
Lat	Maintenance Road	Permanent	Reservoir

Source: Own Elaboration.

Figure 1-26: Referential location of Works Plateau Sector.



Source: Self-elaboration

1.1.1.1 Reservoir

The reservoir will correspond to two natural basins of the sector, both United By constructing a connecting channel. This is located 1 km from the east of the rocky cliff of the coastal border, at a height of approximately 584 M.A.S.L.. Its surface is approximately 375 ha and its lowest point or level corresponds to 582 M.A.S.L.

Then in table 1-10, the volumes of the reservoir are indicated, depending on their different states.

Table 1-10: Reservoir volumes.

Description	Cota (M.A.S.L.)	Volume (M^3)	Surface (HA)
Permanent volume	595	12 million	201
Base volume	595-601	15 million	286
Volume normal operation	601 – 608.5	25 million	375

Source: Own Elaboration.

As mentioned, the reservoir consists of 2 natural watersheds, which will be called: West Reservoir and Eastern Reservoir.

The West Reservoir, for its part, has 2 sub-sectors to be called: Reservoir Nor-West and south-west reservoir both divided by the work called *"Parapet dividing reservoir Poniente".*

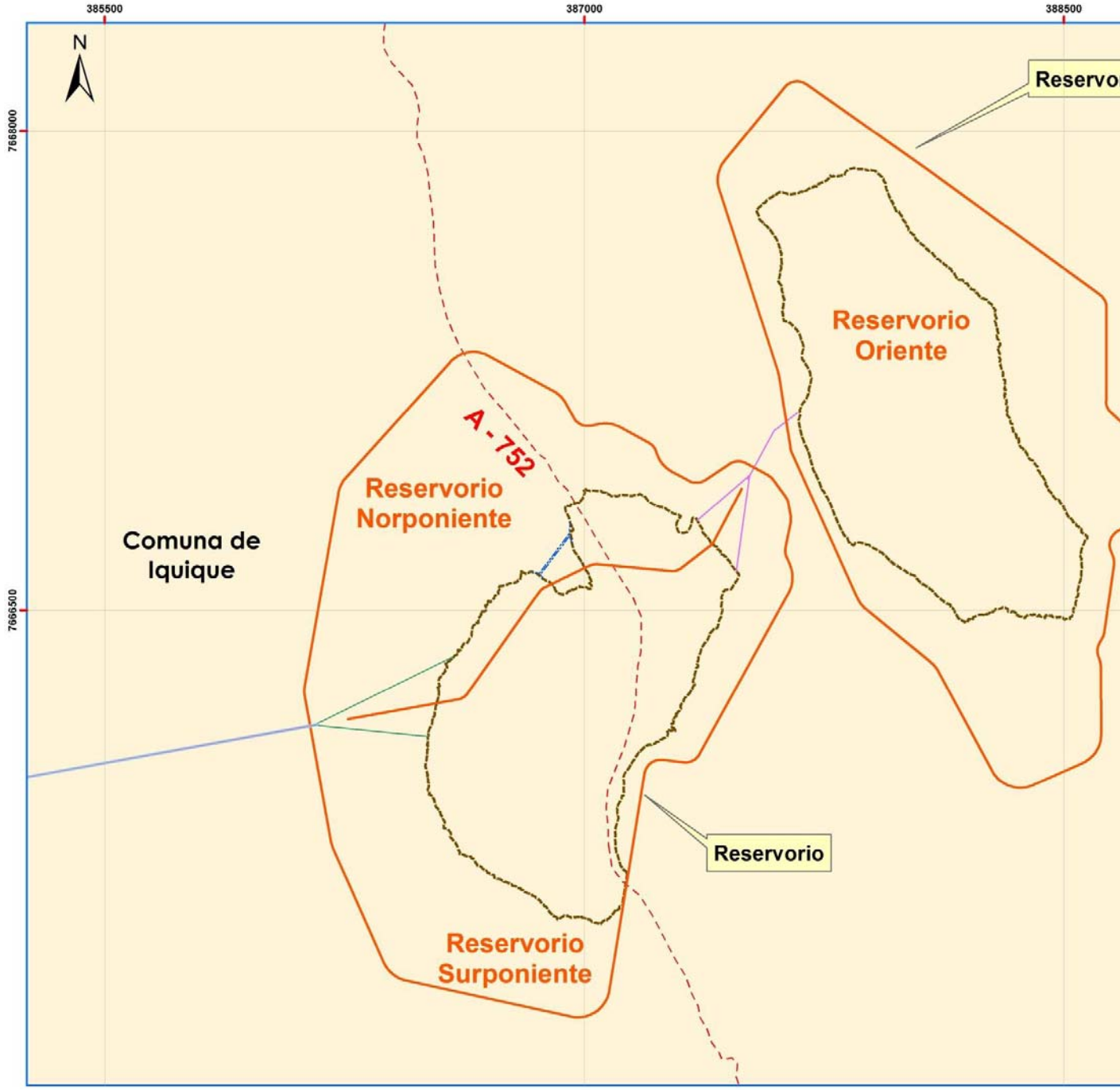
The following in the table shows the characteristics of each of the parts that constitutes the reservoir.

Table 1-11: Reservoir dimension.

Basins	Sub-Basins	Surface (HA)
East Reservoir	does not present	166.14
West Reservoir	Nor-Poniente	81.37
	South-West	126.74
Total Reservoir		374.25

Source: Own Elaboration.

Figure 1-27: Reservoir.



Source: Self-elaboration

i. Reservoir Waterproofing Membrane cover

The reservoir will be covered with a membrane (request from the community of San Marcos) which has safety certification for potable water storage.

As for the infiltration of the Geomembrane, it is understood that due to the nature of its composition and layer of bitumen, these have a high impermeability. As a reference, the following parameters are presented.

Bituminous membrane:

- Minimum membrane thickness 2.5 mm
- Minimum elasticity 30%
- Resistance to Punching Static: Greater than 2.7 Kn
- Component: Sand, Bitumen elastomer (or modified synthetic), non-woven polyester, glass veil, anti-roots film.
- "Carpet" Cloth Dimensions: Min 4 m x 80 m

Figure 1-28: bituminous membrane.

Source: Own Elaboration.

ii. Exterior and dividing Pretile

- Exterior or Edge Pretile

This work consists of pretile land, built with material from borrowing and the excavations of the sector, its purpose is to provide a regular limit for the flood zone, will serve as a membrane anchorage for the waterproofing of the Reservoir and will serve as a roadside of the reservoir, is designed to complete the confinement of the East and West reservoirs. The crowning elevation of these works shall be 610 M.A.S.L. and They will have a crowning width of 6 m and a variable

height up to 12 m. The length of these parapets is 6 km for the West Reservoir and 5.6 km for the East Reservoir.

- Parapet Divider Reservoir or Central

As mentioned above, the West Reservoir will be divided into two sub-reservoirs. This division will be done by the construction of this parapet. It has been considered to build this parapet of land by borrowing surpluses from excavations and tunnels or purchased from an authorized third party. Its crowning height shall be equal to 601 M.A.S.L., it shall have a width of 4 m and will cover an extension of 1600 m From the approach channel from where the seawater arrives through the upper tunnel to the connecting channel, which as its name indicates connects the West Reservoir with the East Reservoir.

- Roads on perimeter pretile

The project considers a way over the reservoir Pretile for circulation during the operation phase. You will have restricted access for project personnel. The road will be 6 m wide.

iii. Basin Connection Channel

It contemplates a horizontal channel excavated at the height 602 M.A.S.L., of 7.5 m of basal width, 275 m of approximately length and slopes of cut 1:2 (H: V) for excavation and filling 2:3 (H:V) the parapet. According to the information obtained from the studies carried out through seismic refraction, it is generally expected that this work will be excavated mostly in medium-fractured rock so there will be no need to protect its slopes with some type of coating.

A STOP log structure is included in the connection channel, consisting of a structure containing a set of 2 emergency floodgates with a rectangular section of 5 m high and 3 m wide.

Additionally this work contemplates a dividing wall, so as to continue with the parapet of the approach channel, this in order to operate the plant with only one open door at the time required to work with one of the sub-reservoirs of the sector Poniente (North or south).

In the West Reservoir this channel is divided into two approximation channels that fall from the altitude 601 to the height 592 M.A.S.L.

iv. Drain Channel

It is located in the North section of the West Reservoir and its function is to connect 2 sectors that are isolated under the altitude 601 M.A.S.L. to maintain the water flow. This channel will have a waterproof membrane. It will have about 133 m long, 5 m wide and a maximum of 4 m of depth approximately.

1.1.1.2 Intake and discharge reservoir (plateau Sector)

i. Channeling the reservoir

This work is the one that connects the upper tunnel with the reservoir. The work of taking and unloading coincides with the layout of the exterior parapet and consists of a structure that contains a set of 4 emergency floodgates of rectangular section of 5 m high and 3 m wide. The location of these floodgates has been envisaged in the horizontal zone of the approach channel, so as to minimise the size of the work and to allow the construction of an emergency access ramp between the shooting work and the entrance portal of the upper tunnel. .

In addition, in the direction from the portal of the upper tunnel towards the reservoir, it is envisaged the construction of a dividing wall that gives continuity to the parapet that divides in two parts the western basin of the reservoir. The purpose of this work is to be able to operate the plant with only 2 open floodgates and using only one of the parts of the West Basin, when the water level is placed under the height 600 M.A.S.L. of the reservoir.

ii. Approach channels

They are two in the Western basin of the reservoir and are connected to the work of taking and unloading the reservoir.

These works correspond to 2 channels of approximately 500 and 350 m long each one, which connect the sub-reservoirs north and south of the West Reservoir with the work of Toma. These channels begin at elevation 592 M.A.S.L. up to connect to the connection channel at the height 601 M.A.S.L.; They have a basal width of 10 m and lateral slopes of cut 1:2 (H: V) Excavation and filling 2:3 (H:V) the parapet. Downstream of the work of Toma, the channels are remelted in one only in a horizontal stretch of approximately 76 m and continues after about 56 m with a maximum slope of 13% until reaching the height 584 M.A.S.L. where the portal of Adduction is located.

1.1.1.3 Portals Reservoir (Plateau Sector)

As in the coastal sector, in the plateau sector there are portals that allow access to certain underground works. In this case the portals of the plateau Sector are as follows:

i. Upper Tunnel Portal

This Portal is the structure of entrance to the upper tunnel that leads the water to and from the reservoir in the upper part of the underground works. It is located after the work of taking the reservoir. It is about 25 m long and 10 meters wide.

ii. Portal Chimney of Upper equilibrium

The balance chimney Portal is the concrete structure that supports the ground at the point where the balance chimney reaches the surface.

1.1.1.4 Area Control and Communication reservoir

i. Control Panel

It consists of a closed Panel of local control for the operation phase, will be used to monitor the operation parameters of the plant and will have a camera to observe the sector of the Portal of the upper tunnel from the administration and control building . The signals will be transmitted via optical fiber installed in the medium and/or high voltage transmission lines.

1.1.1.5 Power lines (Plateau Sector)

In the plateau sector it will be possible to verify the existence of 2 electrical lines one that has the purpose of feeding of electric energy the constructive activities of the plateau sector during the construction phase and the first kilometers of the line of high tension that It will connect the project with the sub-station gaps during the operation phase.

i. Line of medium Voltage road access North-Reservoir

From the existing line that goes parallel to the CH-1, near Rio Seco a new line of medium voltage will be mounted that will go in the vicinity of the North access road to the sector of the reservoir to feed the construction works and will be maintained during the operation for in Ergizar the Control Panel. A branch of this line will feed the facility of the North access road to be dismantled once the operation phase is over.

ii. High Voltage Line

Since this line is developed mainly in Sector Pampa, its description is in the section 1.1.1.1.

1.1.1.6 Roads Sector Plateau

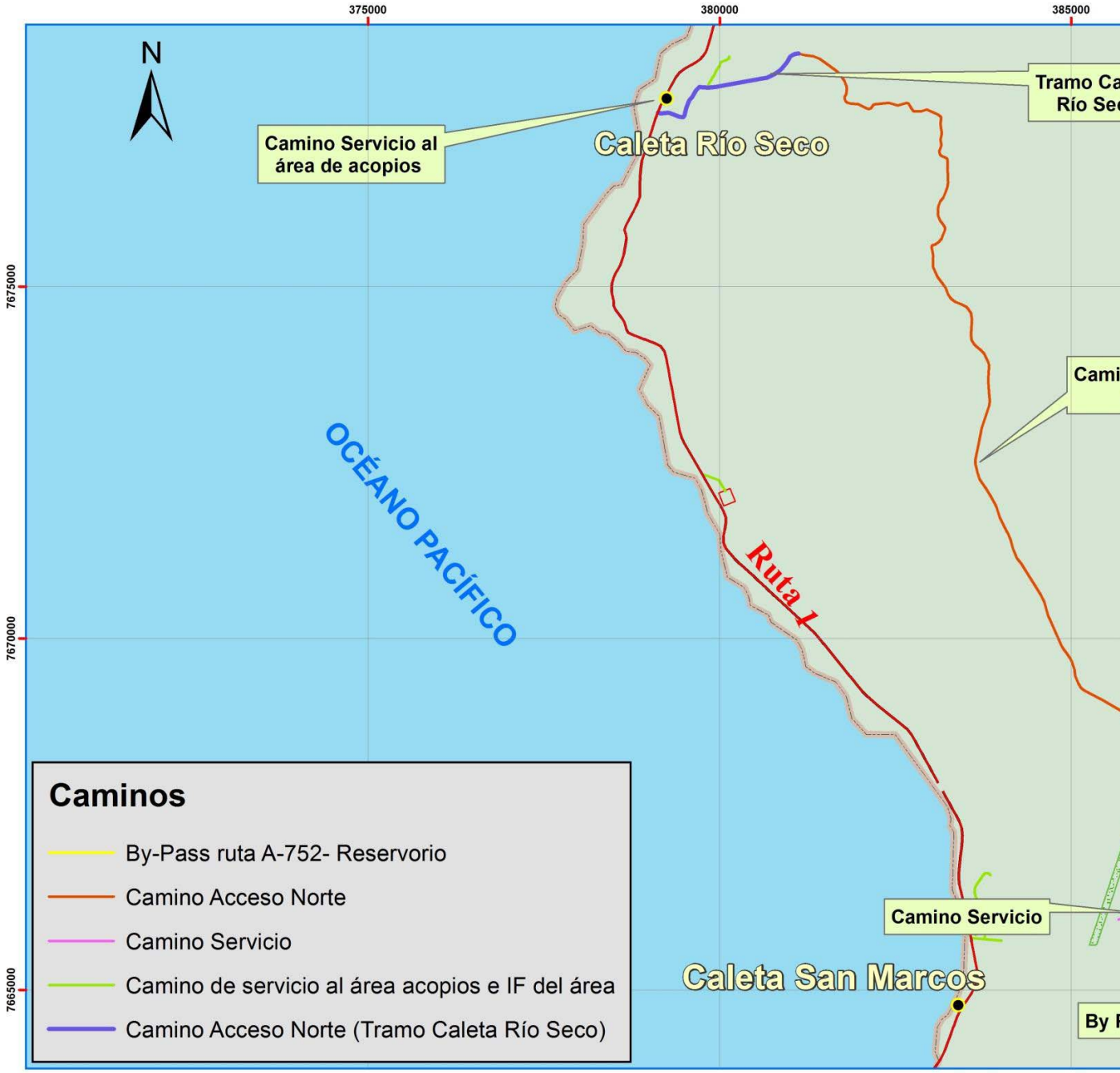
For the interconnection of the works that are located the plateaus Sector there are several access roads, which are then described below.

Approximately 50 km south of Iquique is the existing junction that links the route CH-1 with the A-750, it will be used prior to the construction of the North Access, to locate the facilities of the reservoir and as a safety alternative to transport During the construction and operation of the project.

The access to the plateau Sector is considered to be carried out both by the current junction of the route CH-1 with the A-750 and by the new road North access.

These roads will also be used for the construction and maintenance of the LMT.

Figure 1-29: Roads Sector Plateau.



Source: Own Elaboration.

i. North Access Road

This route connects the route CH-1 with the route A-752 to 85 km approximately to the south of Iquique, close to Rio Seco. It has an approximate length of 16 km, composed by 5 km of New road (projected) and the rest will be an improvement of an existing road. This route will be double carriageway with granular material and a width of 8 m, considering slopes of 3 m and berms of 1 m.

ii. Improvement Route A-752

This section will be about 0.7 km, starts at the junction of the road access North with the route A-752 and ends in the junction with the By-Pass Route A-752. The road will be improved for public transit and the project. This route will be double carriageway with granular material and a width of 8 m, considering tracks of 3 m and berms of 1 m in order to avoid emissions.

iii. By-Pass Route A-752-Reservoir

This road has an approximate length of 5 km. Since part of the path will be flooded by water, as it coincides with the reservoir, it is considered a deviation from this route to the west in the reservoir sector.

This plot will be double carriageway, with a granular material folder and with a width of 8 m, it has been considered a duration of 6 months for its construction.

iv. Roads to work fronts

The road to work fronts will be taking advantage of existing footprints.

v. Roads from reservoir works to billets

The billets, described in the section 1.4.4.7, will be distributed to the north, south and west of the West Reservoir to access them, the terrain will be compacted, enabling a road for the displacement of trucks and construction machinery.

vi. Road of service to the Portal Superior tunnel

It is the road that unites the facility of slaughter of the plateau Sector with the Portal of the upper tunnel.

vii. Way of service to the chimney of equilibrium

It is the path of access to the chimney of equilibrium, will unite the installation of slaughter with the portal of this work.

viii. Junction and Road North Sector Reservoir West

It is considered a splice and road from route A-752 to the northern sector of the West Reservoir. In this sector a new section of the route A-752 will be carried out, with the same Standard: A granular material folder with an approximate width of 8 m (3 m tracks and 1 m berms).

A proposal for a convention to carry out all the road work related to this project was entered before the Directorate of Highways of the region

ix. Road of construction and maintenance line of high tension (plateau Sector)

Along the high voltage line a maintenance path is developed, which will be the same used for the construction of the line. This road as well as the line is described in the Pampa Sector.

1.1.1.7 Collection areas

As mentioned earlier during the construction period of the works have been considered different sectors of stock of excavations of the reservoir of the different fronts of work. All the billets will be built in terraces of 5 m of height and 2 m of step, it is estimated that with two terraces will be sufficient.

The material of the works of the superficial and subterranean works will be reused for other works of the project to the extent that its quality is adequate, in the beginning will be used as filling for the pretile of the reservoir..

The location and the area considered for these billets are as follows:

i. Gathering 1

The collection n ° 1 will be located to the north of the West Reservoir, will have an area of 4.4 ha.

ii. Gathering 2

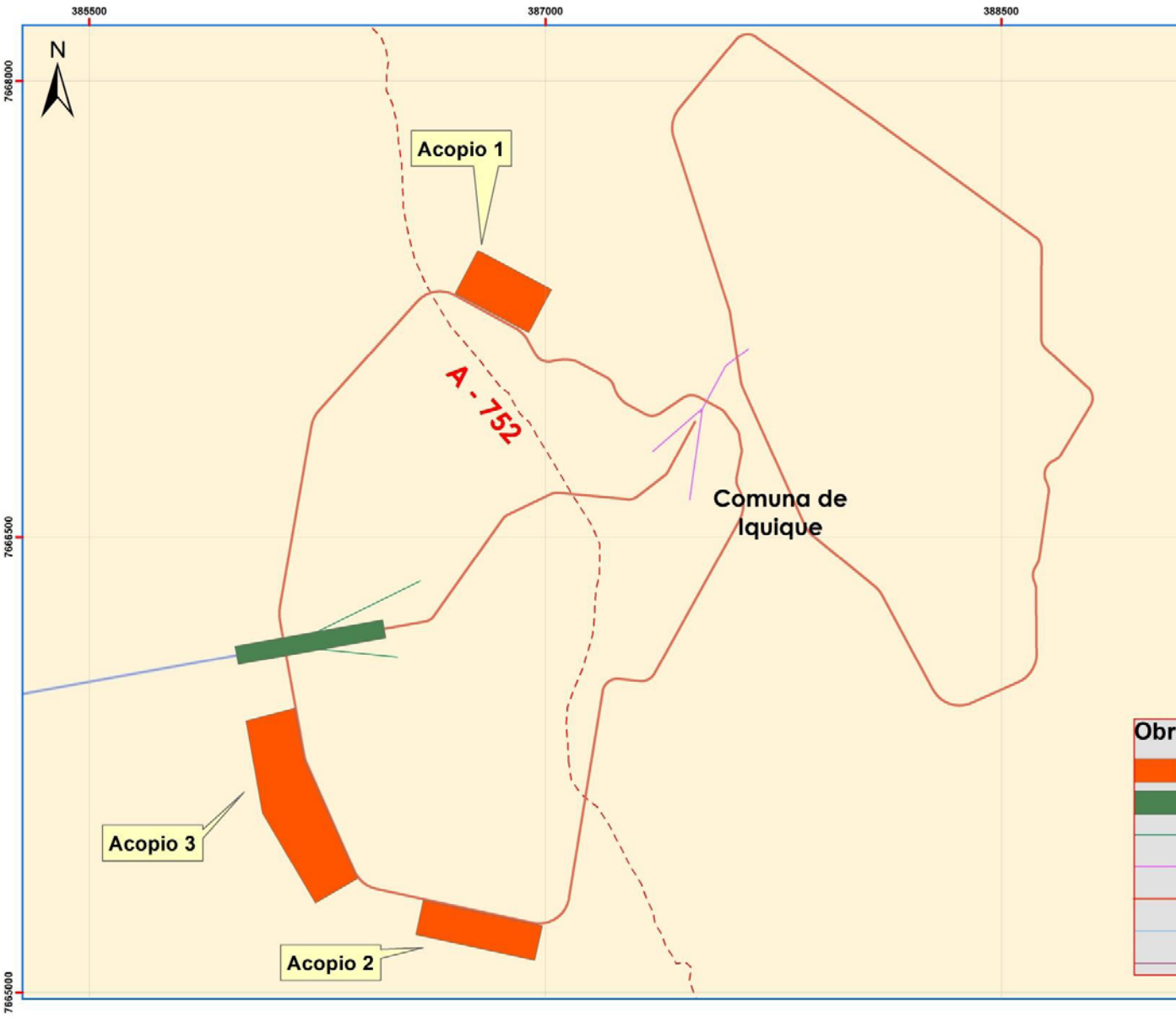
The collection N ° 2 will be located south of the West Reservoir, it will have an area of 4.6 ha.

iii. Gathering 3

The collection N ° 3 will be located to the east of the West Reservoir, will have an area of 11 ha.

The following figure shows the location of the proposed billets.

Figure 1-30: Location of the billets.

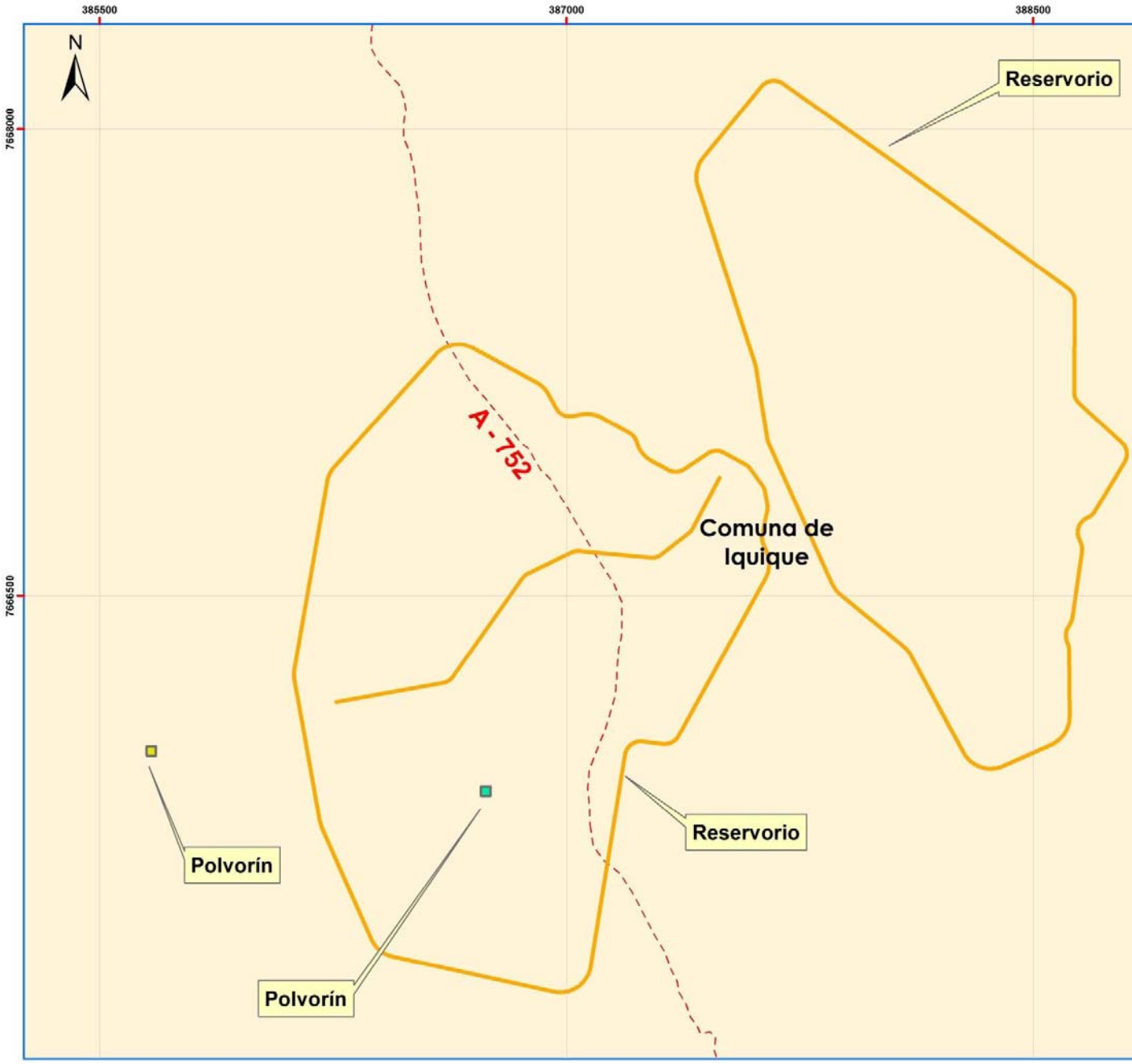


Source: Own Elaboration.

1.1.1.8 Reservoir Magazine

To store the explosives that will be used during the construction phase of the project, two Polvorines are considered in the plateau Sector, one will be located in the cliff and the other located in the south-west Reservoir. Both will be located 500 m from the nearest active facilities and located within a surface of 900 m².

Figure 1-31: Location Polvorines.



Source: Own Elaboration.

1.1.1.9 Reservoir Facility

The reservoir facility will have the same characteristics as those described in the section 1.4.3.4 (Installation of operations for the construction phase), with the exception of the warehouse for electromechanical groups.

is considered a team Diesel of 100 Kva For this task facility.

The dry material of waste washing truck Mixer It can be used as a filler for the reservoir pretile.

1.1.2 Pampa Sector

In the PAMPA sector will take place, mainly all those works associated with the Line High-voltage project.

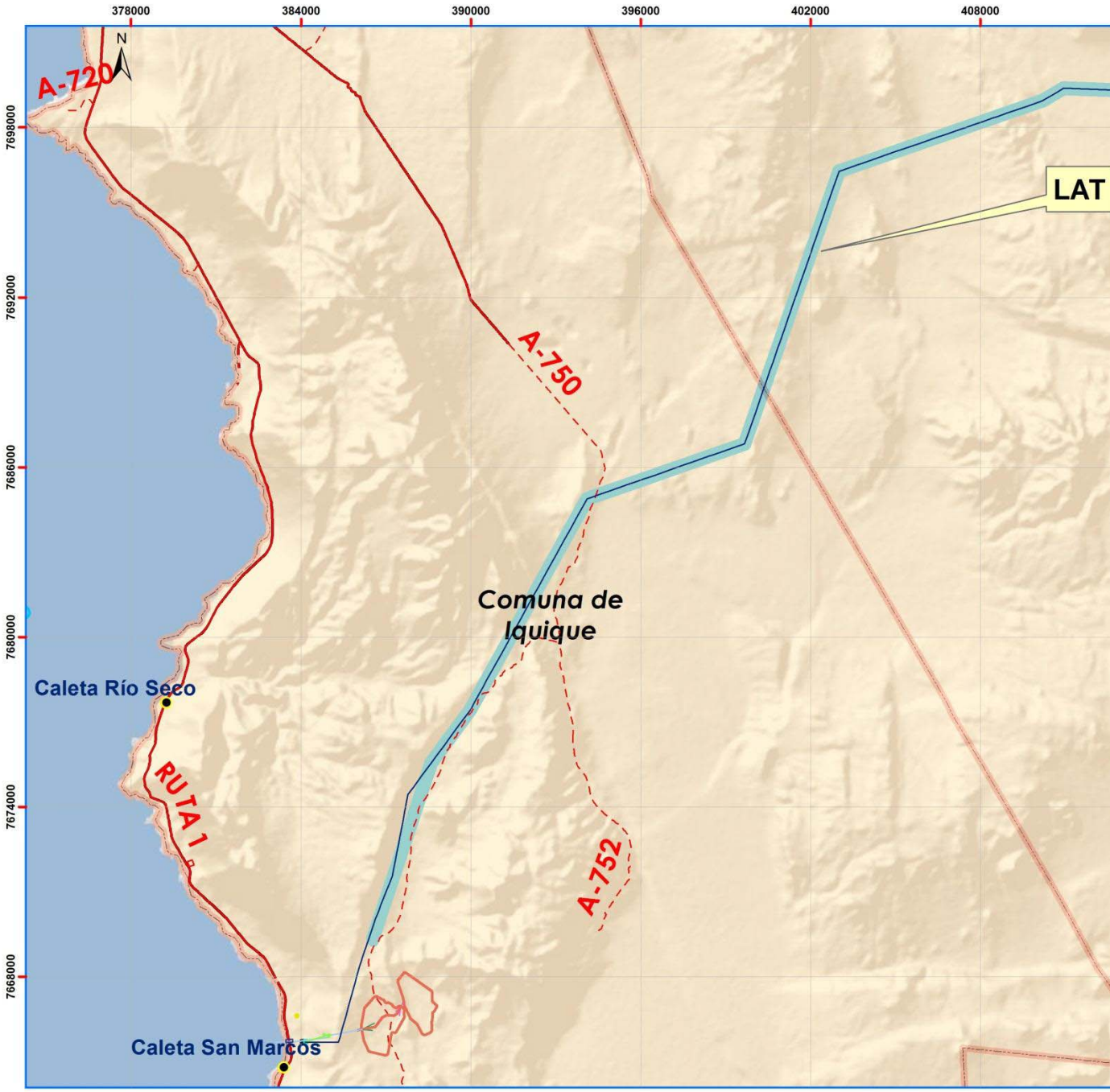
The following table 1-12 shows the works and parts of the Pampa sector, and then describes each of them.

Table 1-12: List of works Pampa Sector.

List of Works		Temporality	Surface reference
Works	**Details of Works**		
High Voltage Line	High Voltage Line	Permanent	Lagoons-Reservoir substation
Service path high voltage electric transmission line	Service path high voltage electric transmission line	Permanent	
Mobile Fronts working LAT	Offices	Temporary	Lat
	Bathrooms	Temporary	
	Potable Water supply system	Temporary	
	Waste storage site	Temporary	
	Containers for storing hazardous waste	Temporary	
	Parking	Temporary	
	Material Storage Area	Temporary	

Source: Own Elaboration.

Figure 1-32: Referential location of works Pampa Sector.



Source: Own Elaboration.

1.1.2.1 High voltage power line (Sector Pampa section)

LAT has a development of 65 km through the communes of Iquique and Pozo Almonte. It starts in the S/E underground GIS projected for Espejo de Tarapacá, it comes to the surface by the tunnel portal of access to the cavern of machines specifically by a portico (this work is to change the cables that come through the tunnel to the type of cable that will be used for The aerial LAT), is supported by two towers from where it rises the coastal cliff and continues along the plateau and the Pampa until reaching the S/E lagoons of the interconnected system of the large north, SING.

The arrival point to the cliff is approximately at the UTM coordinates 7,666,727 N – 386,121 E, at a height close to 615 M.A.S.L. and ends at the S/E UTM coordinate lagoons 7,698,221 n – 427,843 E, at an approximate height of 950 M.A.S.L., located in the commune D E Pozo Almonte Region of Tarapacá. In the final stretch, 600 meters approximately before S/E Lagunas, it is planned for a next stage a sectional substation for the connection of a future photovoltaic energy project. For this reason, the last 600 m of the line will be with two conductors per phase.

The highest point of the transmission line is approximately 1,095 M.A.S.L. The LAT will be double circuit, will have a nominal voltage of 220 Kv and a nominal transmission capacity of 300 MVA.

The LAT will have 202 towers along the path, have a strip of servitude defined for each vain.

The main conductor to be used in LAT is a conductor AAAC TOPAZ, whose main characteristics are summarized in the table below.

Table 1-13: Characteristics of the Conductor TOPAZ.

Item	Feature
Type	Aaac
Code Name	Topaz
Cross section	673.7 mm^2
Number of wires	61
Driver diameter	33.8 mm
Nominal weight of the driver	1863 kg/km
Break load	18,300 kg
Modulus of elasticity	6250 kg/mm^2

Temperature coefficient	23 x 10^{-06} (1/°c)

Source: Own Elaboration.

The LAT uses a cable of guard type OPGW in all the line, whose characteristics are summarized in the following table.

Table 1-14: Features of the OPGW guard Cable.

Item	Feature
Type	Opgw
Number of fibers	24
Cross section	96.26 mm ²
Diameter	13.4 mm
Nominal weight	0.535 kg/m
Break load	8,354 kg
Modulus of elasticity	15,392 Give/mm ²
Temperature coefficient	12.4 x 10^{-06} (1/°c)

Source: Own Elaboration.

Cushions will be installed on all line extension for AAAC-TOPAZ conductors, to minimize the oscillations of the Subvain, dampen wind vibrations and maintain the stability of the drivers. For OPGW guard cables, type shock absorbers will be installed Stockbridge.

Figure 1-33: Type shock absorber Stockbridge.

Source: Own Elaboration.

The transmission line structures will be double circuit, metallic, lattice, Retort and hot-dip galvanized steel. The family of proposed structures are suspension type S220, Anchorage type A220 and R220 type finish. The characteristic of each type of structure is shown in the following detail:

Table 1-15: Characteristics of the suspension structure.

Item	Feature
Type of Tower	Suspension
Denomination	S220B + 3
Features	Metal suspension structure, lattice and Self supporting, with vertical disposition of conductors. For normal deflection angles of 1 ° and maximum 5 º.
Lower Crosshead Height	22.28 m
Total Height Tower	39.08 m
Spreaders	Triangular
Material	Hot-dip galvanized steel.

Source: Own Elaboration.

Table 1-16: Characteristics of the anchorage structure.

Item	Feature
Type of Tower	Anchor
Denomination	A220C + 0, A220D + 0
Features	Metal anchor structure, lattice and Self supporting, with vertical disposition of conductors. For deflection angles from 0 ° to 30 ° or from 30th to 60 ° as appropriate.
Lower Crosshead Height	19.93 m, 19.30 m
Total Height Tower	38.89 m, 37.44 m
Spreaders	Triangular and Rectangular respectively
Material	Hot-dip galvanized steel.

Source: Own Elaboration.

Table 1-17: Characteristics of the anchorage-finish structure.

Item	Feature
Type of Tower	Auction
Denomination	R220B + 0
Features	Anchor structure – Metal finish, lattice and Self supporting, with vertical disposition of conductors. For angles in Anchorage from 60 º to 90 º and finishing from 0 º to 30 º.
Lower Crosshead Height	19.30 m
Total Height Tower	37.64 m
Spreaders	Rectangular
Material	Hot-dip galvanized steel.

Source: Own Elaboration.

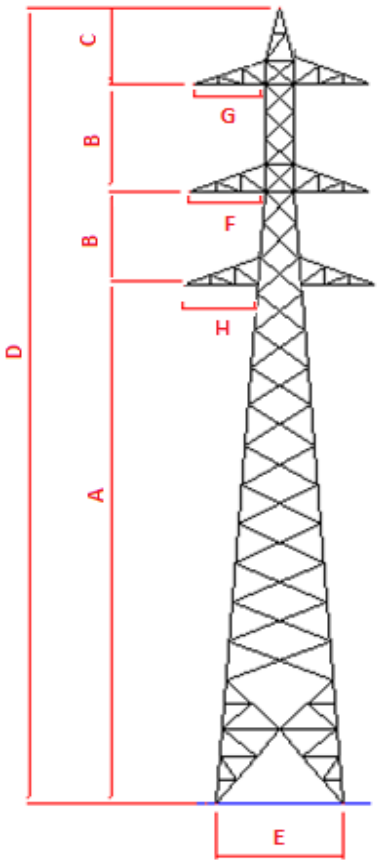
Table 1-18: Special structure characteristics.

Item	Feature
Type of Tower	Special
Denomination	Go-up; Go-down
Features	Metal anchor structure, lattice and Self supporting, with horizontal layout of conductors. It is used to raise the coastal cliff.
Lower Crosshead Height	50 m; 40 m
Total Height Tower	53.5 m; 43.5 m
Spreaders	Rectangular
Material	Hot-dip galvanized steel.

Source: Own Elaboration.

The dimensions of the structures are shown in table 1-19 associated with figure 1-34. The dimensions of each of them are expressed in millimeters.

Figure 1-34: Structure geometry.



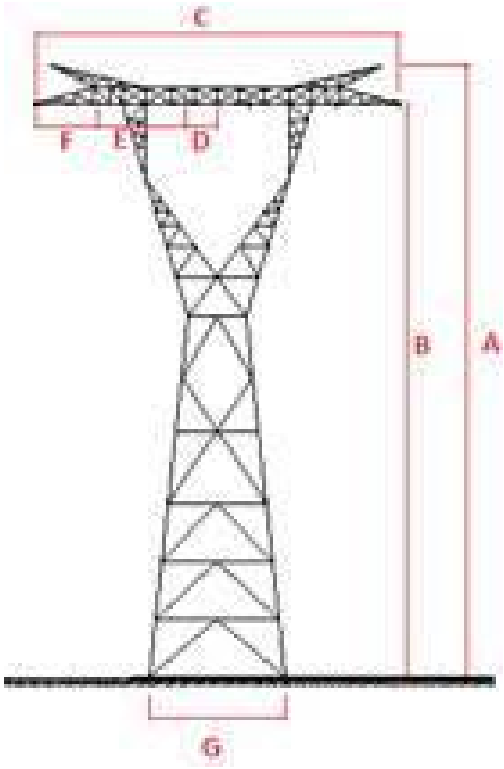
Source: Own Elaboration.

Table 1-19: Dimensions for different types of structures.

Type of structures	Dimensions (mm)							
Structure type	To	B	C	D	E	F	G	H
S220B + 3 HT = 39,08 with 4 legs ± 0	22,280	6,200	4,400	39,080	3,959	4,650	3,350	4,100
A220C + 0 HT = 38,89 with 4 legs ± 0	19,930	5,800	7,360	38,890	6,270	4,150	3,610	3,850
A220D + 0 HT = 37,44 with 4 legs ± 0	19,300	5,800	6,540	37,440	6,062	3,450	2,950	3,150
R220B + 0 HT = 37,64 with 4 legs ± 0	19,300	5,800	6,740	37,640	6,062	3,565	3,065	3,200

Source: Own Elaboration.

Figure 1-35: Geometry of special structures.



Source: Own Elaboration.

Table 1-20: Special structural dimensions.

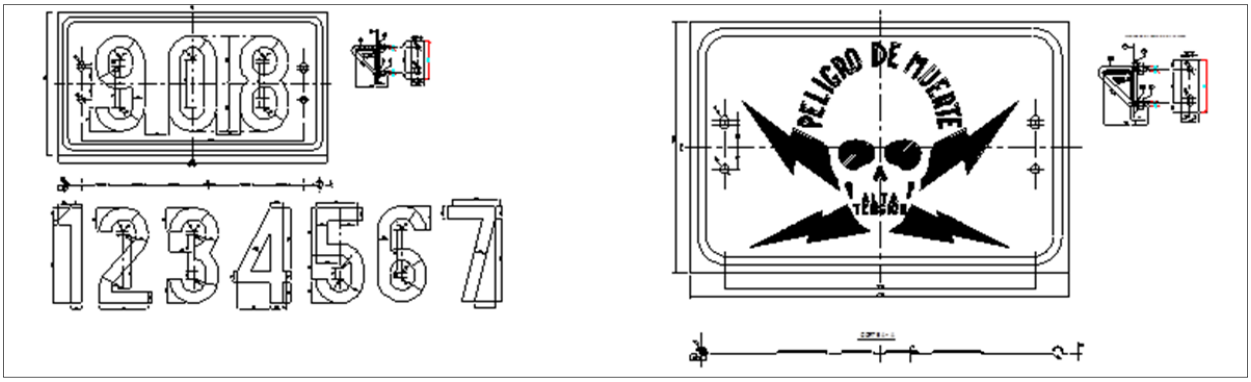
Type of structures	Dimensions (mm)						
Structure type	To	B	C	D	E	F	G
Go-up; HT = 53.5	53,500	50,000	33,500	3,250	7,000	6,500	9,000
VT-down; HT = 43.5	43,500	40,000	33,500	3,250	7,000	6,500	9,000

Source: Own Elaboration.

The structures projected for the LTE will have the following accessories.

- Number plates
- Death-hazard plates

Figure 1-36: Number plates and danger of death.



Source: Own Elaboration.

For the isolation of LTE, glass (above the polymer) will preferably be used with the following recommendations:

- Number of insulators suspension chain: 16
- N º Insulators chain Anchorage: 17
- Leakage distance insulator chain suspension: 9,255 mm
- Spacing in air industrial frequency : 0.90 m
- Air spacing manoeuvre: 2.00 m
- Minimum length of insulator chain: 3.2 m

Table 1-21: Insulator characteristics.

Item	Feature
Insulator Material	Tempered Glass
Insulator Type	Fog
Minimum nominal diameter	330 mm
Nominal step	170 mm
Minimum leakage distance Insulator	555 mm
Coupling type	Ball and Kneecap (Ball and socket) size 16 mm A, for suspension and anchorage chains, according to IEC 120.
Residual mechanical resistance suspension insulator	168 Kn
Mechanical resistance residual insulator of anchorage	210 Kn

Source: Own Elaboration.

All insulators will have a zinc golilla.

The minimum permissible distances of the drivers to the ground measured vertically in meters, as set out in the NSEG standard. 5 E.N. 71 "Regulation of electro facilitiesRich of strong currents "will be as follows:

Table 1-22: Minimum distances from the driver to the ground.

Transit characteristics	Distance
Non-passable regions with no agricultural activity (mountains, hills and waterways)	7.32 m
In crossing of secondary or unpaved roads.	7.82 m
Passable regions (localities, main roads, and public squares)	7.82 m

Source: Own Elaboration.

The conductors are designed to maintain a minimum horizontal distance to the constructions, as established by the standard NSEG. 5 E.N. 71 Art. 109.2 "Regulation of electrical installations of strong currents", which is calculated according to the following ECUACIon:

Distance between driver and constructions = 2.5 + 0.01 x VKv)

Given the nominal voltage of the 220 line Kv, the minimum horizontal distance between the driver and the constructions will be of 4.92 meters, plus the deviation of the conductors by effect DThe wind, with a minimum inclination of the chains of 33.23 °.

As set out in standard NSEG 5 en. 71 Art. 106.2 "regulation of strong currents" in article 106, the separation between phases at the center of the span for conductors of sections greater than 33 mm^2 And in the absence of an overload on ice, it will be calculated MEdiante the following expression:

$$D_{FF} = 0{,}2\sqrt{f} + \frac{kV}{130}$$

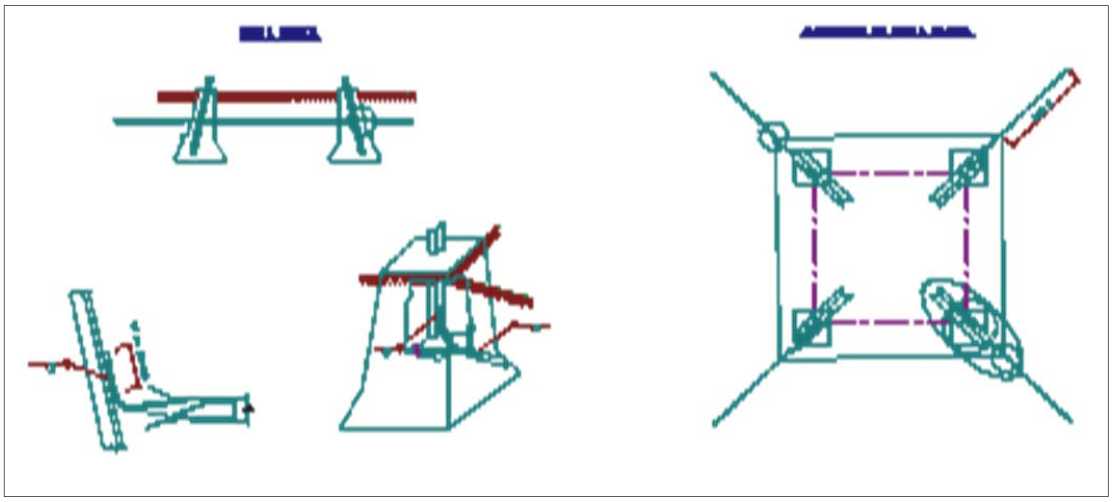
Where:

D_{FF} : Separation between required phases, in meters
f : Arrow at maximum temperature of the driver, in meters
kV : line voltage between phases, in KV

All structures carry at leastA permanent grounding, and the maximum ground-resistance value is such as to allow normal operation of the protections.

The grounding mesh of each of the structures will be with galvanized steel plate and the small ones withEction between the ground mesh and the structure, will be by electric welding to the Stub of each leg of the structure. The grounding mesh shall be located at least 600 mm ± 50mm below ground level. When digging should be done on rock, the trench depth will be 20mm ± 5mm in the rock.

Figure 1-37: Diagram type of meshes grounded.



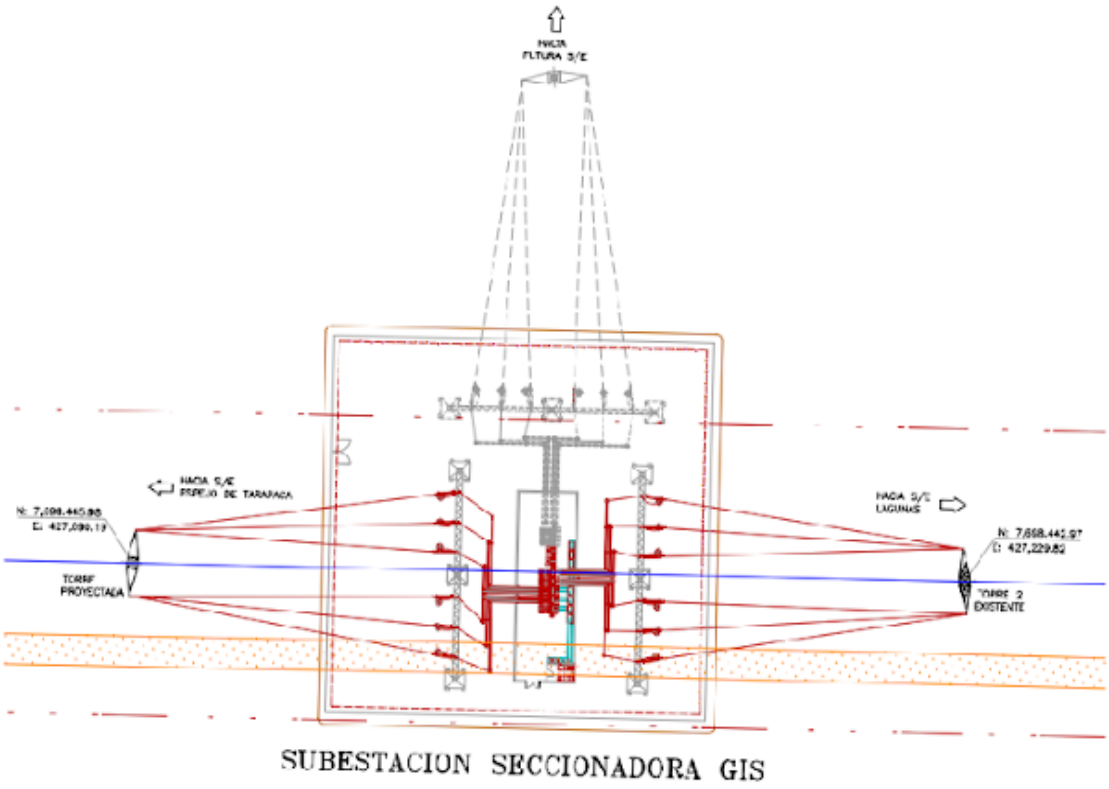
Source: Own Elaboration.

The estimation of the surface of the LAT is composed by the paths access to the towers which covers a itsPerficie of 0.7 has approximately that will be the actually intervened with excavations, fillings and foundations for the supports of the 202 towers (36 m^2 By 202 Torres). The path of service of LAT will cover a surface of 26 ha.

i. Substation sectionLoves

Between the third and fourth tower before the connection to the S/E Lagunas is foreseen for the future the construction of a S/E type sectioning GIS that contemplates six positions. Its location and site, as indicated in Figure 1-38, and its withConstruction is part of another stage of the project.

Figure 1-38: Future Disposal S/E disconnecting.



Source: Own Elaboration.

1.1.1.1 Service path high voltage electric transmission line (Pampa Sector)

The way of service to be used by the LAT will be the same road used for the construction and is about 67 km with an average width of 3.5 m.

1.1.1.2 Mobile Fronts of Works LAT (Pampa Sector)

The deployment of Mó work fronts is consideredVile according to the advancement of the construction of LAT.

Within its facilities it considers:

ii. Office

It will be of modular type and will be used by contractor personnel.

iii. Bathrooms

Chemical baths will be counted as stipulated in the DS N ° 594.

iv. Ab systemAstecimiento Drinking water

Drinking water for drinking will be supplied by means of drums.

v. Waste storage site

It will have a place for the storage of domestic and industrial waste, in a separate and orderly way.

vi. Containers for storing hazardous waste

They will be stored in containers duly labelled and transferred periodically to the slaughter plant of the plateau Sector.

vii. Parking lots

It will have parking lots for light and heavy vehiclesS

viii. Material Storage Area

It will have a sector to store construction materials of LAT.

1.2. Construction phase Description

1.2.1 Submarine Sector

In this sector will be carried out the works associated to the work of taking and downloading of Seawater, and whose construction methods and details are detailed below.

1.2.1.1 Underwater Take and unload

For the construction of the works associated to the taking and discharge of seawater, a perforation will be carried out in the seabed by means of the usefulIzation of the constructive method called *"Norwegian shot",* Which is to build the exit of the tunnel from inside the tunnel dynamiting the last section. The material that will originate from the blasting shall fall into the tunnel in a expresam cavity.Entity made for that purpose, so as to keep the tunnel clear. When the explosion is carried out, the seawater will enter along with the material to the lower tunnel of the project.

In order to avoid the entry of fish or any other element present in the area, It will install the take/unload work. A period of 6 months is estimated for installation and assembly.

It should be remembered that this work performs a double function, by day is the water intake that is pumped to the reservoir and during the generation of electricity in hours Of the night is the work of water discharge to the sea.

The dimensions of the work consider the contact speed with the marine environment, the direction of the water flows, the depth of entry of the light and the different layers of the water column in the Sector. The concrete ring will be anchored to the rock bottom and the gate will be mounted with 1 cm plates separated by 5 cm. To support the top cover, a special structure will be installed between the outlet/discharge mouth and the ring on this cover. The lid will be surrounded by a grid arranged horizontally until it covers the entire structure, i.e. up to 16 m in diameter.

All the Elements The Constitution Of this work will be Prefabreicados and transported by sea to the site for sor subsequent assembly by divers specialized in these tasks.

1.2.2 Underground Sector

In the underground sector will take place all those works associated with the Adduction tunnel and its parts, and are located under the coastal plain until the cliff.

1.2.2.1 Construction tunnels, chimneys and windows

The underground Sector considers the construction of the following tunnels, chimneys and windows:

- Lower Tunnel

- Lower Tunnel Gate Access window
- Lower balance chimney
- Tunnels or auxiliary galleries
- Tunnel access to the cavern of machines
- Armoured tunnel
- Upper Balance Chimney
- Upper Tunnel

The construction of these works will begin with the excavation in rock, be executed by the system *Drill & Blast* Using conventional underground mining equipment on tires.

For the excavations and maintenance, the following materials are systematically used: explosives, rock bolts, steel-mesh or fi-reinforced projected concreteBras, Norwegian frames or reticular steel frames. will eventually be used Marchiavantis (consisting of standing or injected steel bars), umbrellas of self-piercing or pipe bolts, injections of consolidation and/or waterproofing.

Is It includes the use of at least the following types of equipment:

- Jumbos for The perforations.
- Chargers and trucks for the loading and transport of the Navy.
- Mobile platforms for the installation of bolts and frames.
- Trucks Mixer For the transport of the projected concrete.
- Machines Shotcreteras.
- Concrete pumps.

The normal construction cycle includes the following sequential activities:

- Drilling
- Loading of explosives
- Shot
- Ventilation
- Geological mapping
- Wedging
- Support

As support elements, ventilation, lighting, water pipes and air-ducting equipment are required.

1.2.2.2 Trifurcaciones

The Trifurcaciones, which will allow during the operation to divide the capture of seawater in 3 runoffs, COnsistirá In steel armoured structures with the following characteristics:

- Lower or unloading branches: three (3) and lead the waters from the cave of machines to the lower tunnel. Each one of them is a pipe of 2.75 m in diameter Inside, in the steel-shielded area. The length of each one of them is 64 m, 75 m and 86 m for units 1, 2 and 3 respectively.
- Upper branches or adduction: There are three (3) branches of adduction, each of which is a pipe of ACEro of 2 m of inner diameter with steel shield, start in the Trifurcación and ends when entering the cavern of Machine, the lengths of each of them is 36 m, 33 m and 30 m for units 1, 2 and 3 respectively

1.2.2.3 Cave Construction of machines

The underground Sector considers the construction of the Cave of machines and the works described in the section 1.4.2.2.

The cavern will be dug with the method of *Drill Blast*, in the same way as the tunnels described in the previous section.

The entrance to the building will be through the tunnel access to the cavern and once you reach the cave area, you will advance down and digging in banks to complete the height of the cavern.

1.2.2.4 Construction of Piques

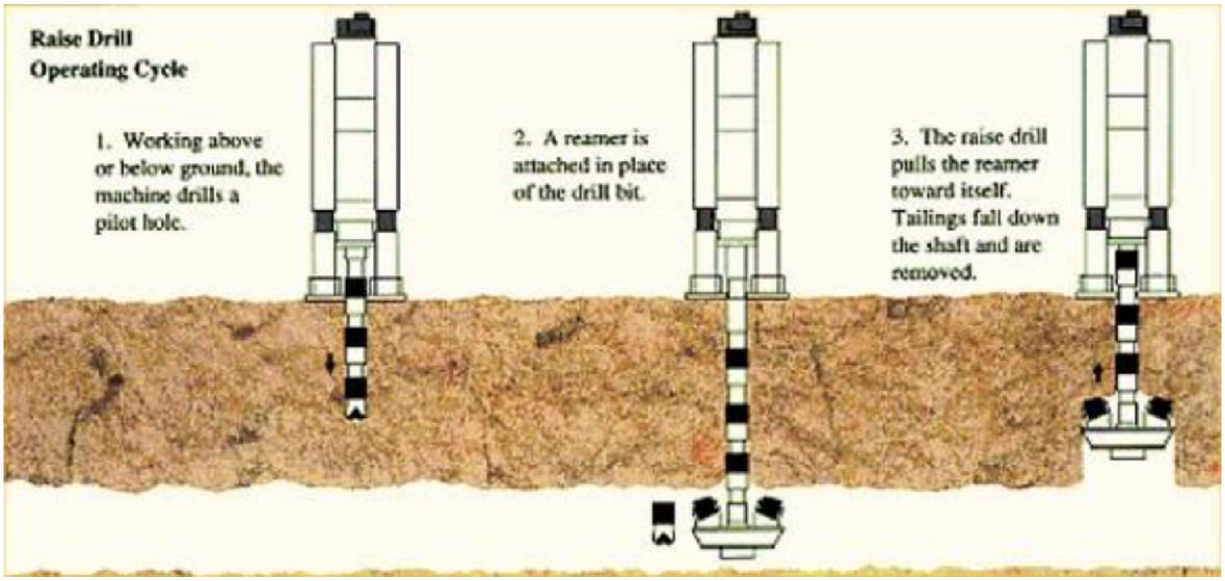
The underground Sector considers the construction of the following bites:

- Lower Tunnel floodgates
- Pique in pressure
- Top balance Chimney Chop

The lower tunnel floodgates will be dug using the conventional drilling and blasting method (D&B drill and BlastVertically excavated sequentially, starting with a minor initial perforation, which It will widen from top to bottom, extracting the navy through the lower tunnel.

The pressure bite will be built once the upper tunnel has been excavated to the high point of the pike, where the equipment will be installed Raise Borer That will run, first InstanciA, pilot drilling at all its height to the low point in the area of the elbow arriving at the cavern. Once excavation of the cave access Tunnel is completed with the tunnel or auxiliary gallery up to this point, the reamer will be hooked at 4.2 m in diameter, proceeding to finish the perforation from bottom to top, via successive expansions.

Figure 1-39: Constructive method Rase Boring.



1.2.2.5 Armoured tunnel construction

The armoured tunnel will be constructed in a similar way as described for the construction of the other tunnels. It is approximately 120 m long, located between the pressure and the cave of machines. The maintenance will be carried out according to the quality Of the terrain can be concrete or concrete and steel shield. It is estimated that concrete and steel shielding will be used Mainly.

1.2.2.6 Electrical substation Construction

Considering that the electrical substation is of the GIS type, this equipment requiere very little space and will be installed in the upper part of the Transformers cavern, which will be built according to the method described above.

1.2.3 Sector Costa

The coast sector contemplates most of the works and actions associated with the InstaRelations superficial, both temporary and permanent project. The construction activities of each of them are described below.

1.2.3.1 Area of operations

i. Administration and Control Building

This work is located on the surface close to San Marcos Cove. The main structure is reinforced concrete in situ in walls, beams, pillars, chains, slabs and foundations that will have a maximum depth of 1.5 m under the natural terrain. In the manufacture of reinforced concrete in situ is UsageThe following materials:

- Aggregates (gravel, sand)
- Cement
- Water
- Additives
- Wood or metal moulds

It is also considered the placement of steel reinforcement bars that will be stored in the task. The contractor may opt to supply the already folded bars or perform bending and eventual cutting of the rods in a safe place D(e) The installation of operations in the coastal sector of San Marcos.

Externally, the administration and Control building has a ventilated façade in its western view, with galvanized panel side cladding and Prepainted. Inside it has light dividing partitions with fire resistance F-30, PuertOutdoor steel and simple aluminum windows and Thermal, false ceilings and ceramic and vinyl paving.

ii. Workshop building, warehouse and diesel group

The workshop building will have a metal structure, a concrete slab and will be completely covered and closed. The surface will be 260 m^2.

This workshop comprises a warehouse with an area of 18 m^2, it also has a warehouse to store resDangerous Iduos (2 x 2 m) and a yard for storing industrial waste (2 x 2 m).

In the Far east of this building will be located the enclosure for the diesel emergency group.

iii. Parking lots

For the location of the parking lots (alrededor 12) Light vehicles will make some minor ground movements in order to match the terrain. The divisions of each parking lot will be demarcated with color paint. The entire parking area, as well as the road is ArRibo To these, it will be asphalted.

iv. Industrial waste yard and warehouse for temporary collection of hazardous waste

The non-hazardous industrial waste yard will be located on the side of the slaughter plant and will have an area of 500 m^2. BeFenced by a metal mesh throughout its perimeter and will have a controlled access door.

The following considerations shall be taken for the proper collection of hazardous waste:

- There will be a place specially built for the warehouseTransient amiento of hazardous waste, which is designed and located in such a way that the possibility of an emergency does not endanger people, the environment and their own facilities.
- This place will be a closed enclosure with BastIdores and steel mesh of 2.20 m high, which will have a floor of Radier of cement with spill-catching pit for oils. The roof will be covered with zinc plates that cover the entire enclosure and must protrude at least 30 cm, andn All sides.
- The sectors of temporary collection of hazardous waste will be signposted according to type of waste, that is: batteries, oils, lubricants and fats.
- It will install at least a multi-purpose extinguisher ABC of 10 kg plus a kit AntiderraI.
- Entry into the area will be kept closed and controlled by authorized personnel.
- An inventory control will be carried out for both the income and the exits of hazardous waste.
- The corresponding safety sheets will be counted.

The frequency of removal of hazardous wastes will depend on the amount generated and the issuance of the permits necessary to remove the waste to its final destination. Hazardous waste will be removed and finally arranged by some EMAuthorized dam to whom will be hired the service of transfer and final disposition. In order to maintain control over the transport and disposal of hazardous waste, a chain of custody shall be implemented, requiring proof of disposition DE waste in authorized facilities.

v. Wastewater Treatment Plant (PTAS)

The sewage treatment plant is of modular type, for it will be carried out minor earth movements to install the modules.

vi. Trans linesMedium Voltage Electrical Mission

The medium voltage electric transmission lines will have poles of 11.5 m height. The excavation for the installation of the Poles will have a depth of 2 m.

1.2.3.2 Desalination plant

The construction of the plant DesAlinizadora will begin to level the ground to obtain a stable surface where 3 metallic containers of the maritime type and 2 filters are installed. The containers and filters will be anchored to the ground and considered as a ground mesh as protectionN. The ducts that allow their operation (capture, discharge and distribution of drinking water) will also be installed.

The desalination plant covers approximately 120 m^2.

1.2.3.3 Portals Costa

The Costa Sector considers the construction of the following portals:

- Portal of the Access window to the gate
- Portal tunnel access to the cavern of machines

The portals will have the same construction characteristics, this means that they will be concrete, trucks will be used Mixer, metal and/or wood moulds and Enfierradura. Explosives will also be used for construction.

1.2.3.4 Installing FaEna for the construction of the camp

The facility for the construction of the camp will be on wooden foundations (support blocks) or concrete or similar and will mount the infrastructure consisting mainly of adapted containersYou. materials, equipment and structures will be transported by truck. Some works will require the use of cranes and heavy equipment.

1.2.3.5 Camp

The camp will have an infrastructure based on a prefabricated wood system and/or metal modules.ICOS, container type. They will be assembly structures in the field, adapted to the needs of space and use. A period of 5 months is estimated for its construction.

1.2.3.6 Installation of work for the construction phase (Costa-San Marcos Sector)

The facility Construction will be constructed in the same way as described in the section 1.5.3.4. (Installation of work for camp construction). This facility will also have a concrete plant and be of greater dimensions to that ofScrita in the section mentioned.

1.2.3.7 Road construction Sector Costa

The coast Sector considers the construction of the following roads and joints:

- North Access Road (Caleta Rio Seco section)
- Junction and Road to Camp
- Junction and road to sector administration and Control building, workshop and access to the tunnel access to the cavern of machines
- Service roads to the area of the Dry River area and the San Marcos sector
- Service path for the Division managerA de Pique floodgates
- Road to Access Magazine

It is worth mentioning that at the beginning of the construction phase the roads that will be used by the project will be enabled. The design has considered to privilege existing footprints, in such a way of minTo raise the ground intervention. All roads will have the same form of construction.

The main activities will consist of Earth movements and compaction; In the case of the road North Access and the network of secondary roads of character PERmanente will proceed to the application of Bischofita, other similar material or humidification. Finally, the corresponding signage will be installed according to the current regulation.

It is considered the use of a conventional equipment for the execution ofTwo permanent and provisional paths, composed of backhoe shovels, Bulldozer, front loader, hopper trucks, graders, rollers, selection tape, service trucks and fuel. In case this machinery is not sufficient To open the tracks of the road, occasionally the use of explosives is contemplated. It is generally considered to obtain the material for the embankments from the lateral excavations and the eventual excess of cuts will be deposited laterally as SobreancHos of the platform. In the same way that the roads in the project area are currently being made.

1.2.3.8 Collection areas

The excavation material collection sector will receive the material transported in hopper trucks that will transport it from the points of excavation to the billets. The billets will be moistened

periodically. It is considered to be built in terraces of 5 m Height, with berm of 10 m and slope 1:1. Stability memory is attached in annex 1.4.

1.2.3.9 Powder keg

For the construction of the magazine is considered the levelling of the ground, digging, filling, construction of foundations and Radier To then implement a Perimeter closure. The waste generated will be arranged according to the current regulations.

1.2.3.10 Installation of slaughter Caleta Rio Seco

The slaughtering plant of the Caleta Río Seco will be built in the same way as described in the section 1.5.3.4. (Installation of work for the camp construction).

Mobile working fronts will be considered for all works according to the progress in their construction.

1.2.4 Plateau Sector

In this sector, all the works and/or actions associated with the reservoir and its Conditioning. Each of the construction activities is described below.

1.2.4.1 Portals Reservoir

As mentioned in the section 1.5.3.3 (portals Costa) All portals will be built in the same way, in this case the tunnel portal Superior and Portal chimney of superior equilibrium.

1.2.4.2 Construction roads, improvements, splices and By-Pass Plateau Sector

The plateau Sector is considered to be the construction of the following roads, improvements, splices and By-Pass:

- Way of service to the Upper Tunnel Portal
- Way of service to the chimney of equilibrium
- Junction and Road North Sector Reservoir West
- Service path to the reservoir area
- North Access Road
- Improvement Route A-752
- By-Pass Route A-752 – Reservoir
- Roads to work fronts
- Roads from reservoir works to billets

- Roadside of the reservoir
- Access road and Maintenance LMT
- LAT Maintenance Road

All these works will be built as described in the section 1.5.3.7 (construction of roads Sector coast).

1.2.4.3 Intake and discharge Reservoir

The construction of this work will use the machinery of the type backhoes and trucks that afterThey will be given the material removed to the areas of the area considered for this work, or it may be used for the reservoir Pretile. In case of presence of rock, and if necessary, explosives will be used.

1.2.4.4 Reservoir

The reservoir corresponds To the two natural basins of the sector that will be joined by the construction of a connecting channel, and that will be used for the storage of seawater. For its insulation of the soil, as well as to avoid seepage, the res will be waterproofedErvorio with a bituminous membrane.

The three fundamental parts of the reservoir for the construction phase are:

- Waterproofing membrane Cover
- Exterior and dividing Pretile
- Channel Construction

Each of them is described below.

i. Reservoir Waterproofing Membrane cover

It is envisaged to install a waterproof membrane of the bituminous type or similar in the whole surface of the reservoir. The installation will be done in stages, starting with the West Reservoir in the northern sector, following the southern sector and ending in the ReservOrio Oriente.

The following are general actions and activities for your installation:

- Escarpment or cleaning of the ground of foundation, removal of Skittles and Destone surface of larger pieces.
- Compaction of the entire surface.
- Compac FillingIn the most depressed and matching sectors in order to achieve smooth support for the Geomembrane.

The indicated configuration will be permanently verified on site by professional specialist in this field.

After the site is prepared, as indicated in the previous point, the bituminous membrane is placed. As indicated for the preparation of the site, the bituminous membrane installation activities will be rigorously verified by profsIonal Specialist.

It is important to mention that the Geomembrane It will have a thickness and a weight that can give resistance to the wind, preventing it from being lifted by eventual gusts and therefore does not require or requires less ballast to keep it In place.

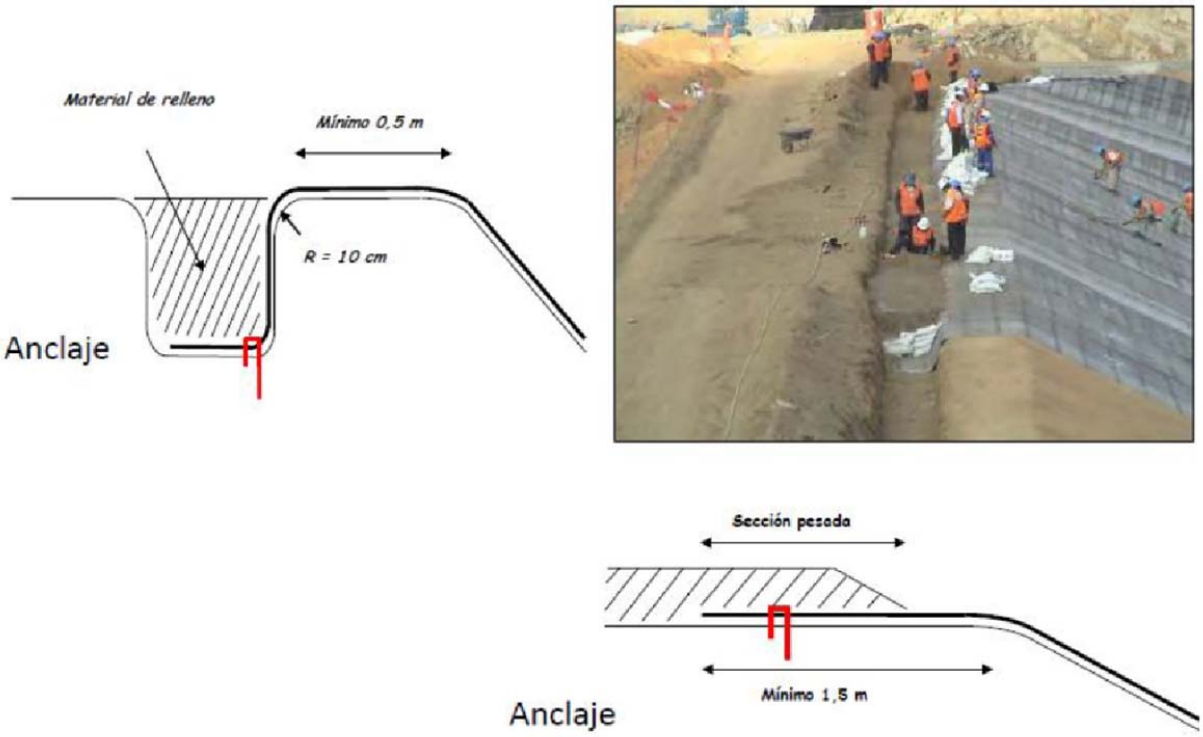
The Geomembrane Bituminous is little vulnerable to mechanical damage during transport and installation, product of its greater resistance to tension-tear.

The Geomembrane It will be installed in strips, according to the specified width and length, PARtiendo from the lower sectors to the higher sectors. The different strips of this membrane will overlap sufficiently to be welded, according to the technical specifications of the supplier and installer.

The welding of the Geomembrane BitUminosa is made by way of a conventional propane welding and a roller to press on the overlap, which does not produce voltage, being under the risk of welding failure.

The anchorage to be carried out at the edges of the reservoir (pretile), or biIn, in intermediate locations if necessary, is the "anchor trenching" method as shown below.

Figure 1-40: Anchoring Geomembrane.



The Geomembrane Bituminous has the following characteristics:

- Support and pressure that allow people to walk over them, in addition to the passage of light vehicles, avoiding spinning on it.
- It is extremely resistant to oxidation and UV rays thanks to the polyester geotextile that is inside the bitumen layer and thus is protected from inclement weather.
- It is more resistant to perforation than membranes of other materials, as it is considered "self-healing" for small holes thanks to the visco-elastic nature of the bitumen, which restores its impermeability.
- In the case of identifying some fissure can be repaired under water, without needing to Empty the reservoir.

ii. Exterior and dividing Pretile

The parapets will be built using backhoe shovels, graders, hopper truck and Bulldozer. The material of loan for the construction of the Pretile, will come from the material of the excavations and Earth movements of the works superFiciales and underground of the reservoir sector.

If necessary, material purchased from an authorized third party shall be used.

iii. Channel Construction

The plateau Sector considers the construction of the following channels:

- Basin Connection Channel
- Drain Channel
- Approach channels

To carry out the materialization of this work will be used machinery of the type backhoes and the respective trucks that move the material removed to the areas of collection considered. It is important to mention that the use of of explosives, every time you are in the presence of rock.

For the approximation channels it is considered to make fillings to proceed with the civil works.

1.2.4.5 Reservoir Facility

The reservoir facility will be built from the same foRMA as described in the section 1.5.3.4 (Installation of farm construction camp). This facility also has a concrete plant and will be of greater dimensions to that described in the section mentioned, being similar to the INSTALACWork ion of the coastal Sector of San Marcos.

1.2.4.6 Collection areas of reservoir excavation Material

The billets will be constructed as described in the section 1.5.3.8 (collection areas).

1.2.4.7 Powder keg

The powder keg will be built as described in the sectionIte 1.5.3.9 (Powder Keg).

1.2.4.8 Control Panel and Reservoir communication

This electric room, Control Panel and Reservoir communication will be of modular type and inside will be installed meters and indicators of status of the parameters of operation that Monitored. The room will house only the equipment and see review visits by Part of the central operators. You will get the energy from a medium voltage line to be built and communicate with the surveillance camera of the Sector. You will have a perimeter closure to protect your facilities.

1.2.4.9 Medium Voltage electric transmission lines

The construction of the LMT will be built as described in the section 1.5.3.1 numeral VI.

1.2.5 Pampa Sector

In the Pampa sector is considered to build the line of electrical transmission of high voltage (LAT), this line is born from the substation considered by the project in the underground Sector, in the cavern of machines.

Then it comes to the surface in the Sector Costa San Marcos. See Descricpión In Secor Coast.

From the edge of the coastal cliff, plateau sector, this line will pass to the Pampa sector through 202 towers until reaching the existing Lagunas substation.

1.2.5.1 High Voltage electric transmission line LAT

It is considered the assembly of the metal structures, which will be made by mobile working fronts. In general, the foundations of the structures will be of reinforced concrete. When the terrain and the design of the line it Allow, Anchorage It will be done with the same material of the excavations. In cases where it is not possible to use concrete foundations, as is the case of the firm rock, special foundations are used.

- Concrete Foundations:

This type of foundation is used GenEralmente in angle and mooring towers and for all special structures that require great resistance.

- Rock Anchor:

In cases where the tower is located in places where there is firm rock, it is possible to use the same rock for the anchorage of the Tower.

1.2.5.2 Service Road High Voltage line

The road of service for the LAT will be built as described in the section 1.5.3.7 (Roads of Access Sector coast) and it is worth noting that this same road later serves for the maintenance of LTo line.

1.2.5.3 Mobile Fronts working LAT

For the installation of the movable fronts will be used graders, when it is necessary to match the ground and trucks feathers to carry out the transfer of the containers that will be used as office, lYou baths and containers for the storage of hazardous waste.

1.2.6 Estimated date and indication of the part, work or action establishing the beginning and end of the construction phase

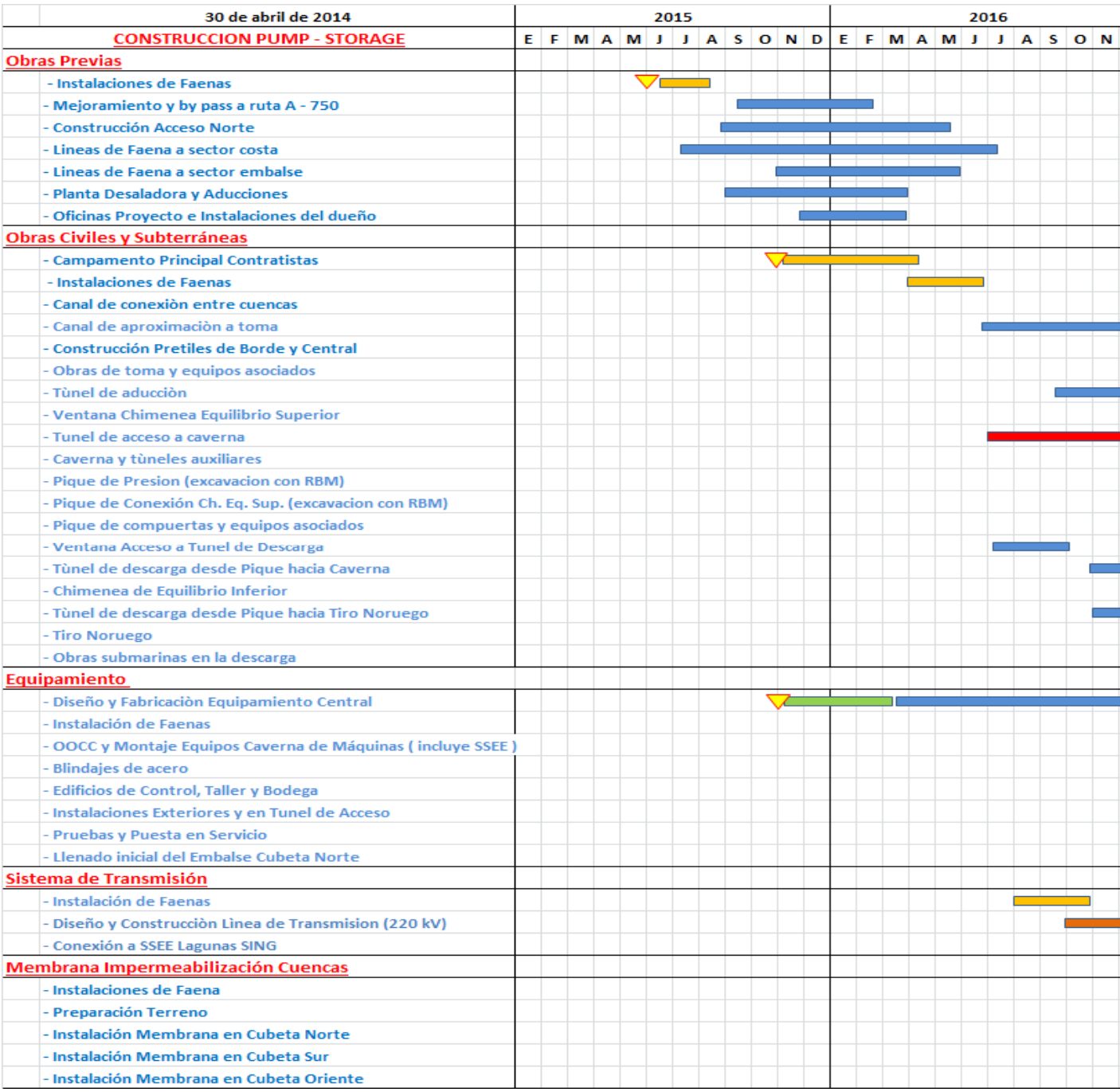
The start date of the construction phase is estimated at the end of the Of the year 2015, with the construction of the facility of slaughter of the coast Sector near to Rio Seco, this will be once obtained the resolution of favorable environmental qualification and the sectorial permits necessary for the construction of the works. LA final work of the construction phase will be the installation of the waterproofing membrane of the basin east of the reservoir.

1.2.7 Construction phase Schedule

The construction phase will be extended for an approximate period of 43 months, in the QThe EU will materialize the construction of all project works, including slaughter facilities, access roads, camps, power lines, offices, and other temporary construction support works.

The following figure presents The construction schedule of the works.

Figure 1-41: Project execution schedule.



Source: Own Elaboration.

1.2.8 Labor phase Construction

A variable amount of labor will be used during the construction of the plant over time. Such manpower is composed of supervisors, area chiefs, Prevention of risk, foremen, mechanics, electrics, day laborers, miners, bricklayers, carpenters, etc.

The Endowment Maxim of Workers will be of 750 people, with an average utilization of 375 people, mainly of qualified workforce.

Table 1-23: Labor phase construction.

Year	Months												Total
	E	F	M	To	M	J	J	To	S	Or	N	D	
2015	0	0	0	60	100	100	130	130	182	240	280	280	General Total
	0	0	0	40	70	70	90	90	120	160	190	190	Total Camp
2016	280	280	280	280	350	400	500	500	500	600	600	600	General Total
	190	190	190	190	230	270	340	340	340	410	410	410	Total Camp
2017	700	750	750	750	750	750	750	750	750	600	520	460	General Total
	450	500	500	500	500	500	500	500	500	410	350	310	Total Camp
2018	460	460	400	350	300	275	275	275	220	220	160	130	General Total
	310	310	280	240	200	180	180	180	150	150	100	80	Total Camp
2019	120	110	100	80	0	0	0	0	0	0	0	0	General Total
	80	70	65	60	0	0	0	0	0	0	0	0	Total Camp

Source: Own Elaboration.

The execution of the works will be contracted to specialized companies in each one of the works of the project, which must have professionals and technicians of different degrees of specialization and qualification. The hiring of a hand of Local work, of the communes of Iquique and Pozo Almonte, for all those activities that do not require a particular technical specialization. To this end, appropriate instructions will be established in the project's construction contracts.

From AcuerTo the needs of the project and respecting the labour legislation in force, during the development of the works will be worked from Monday to Sunday in shift system, 3 shifts for underground works and 1 shift for surface works.

The personL will be required mostly during the construction of tunnels, machinery Cavern, exterior works, among others.

It is estimated that the following services will be contracted externally:

- Personnel transportation.
- Rental and maintenance of light vehicles.
- Extraction of solid waste (domestic and industrial).
- Collection, treatment and final disposal of domestic liquid waste.
- Fuel supply systems
- Maintenance of heavy equipment.
- SSystem surveillance.
- Food Services
- Provision of borrowing material for specific locations
- Hotel Service for the camp

1.2.9 equipment, machinery, supplies and services in construction phase

1.2.9.1 Electricity

For the facilities of slaughter and the camp of the coast Sector it will be considered the utilization of the existing distribution line in the zone that is parallel to the route CH-1, connecting to it. For the installation of reservoir operations, the connection will involve the construction of a line of approximately 20 km.

As backup equipment is considered generators for the facilities of slaughters of 100 Kva.

1.2.9.2 Water

i. Drinking water

In the camp area drinking water will come from The desalination plant which considers an approximate collection of 10 L/s of seawater, which will be subjected to pre-treatment, filtering and reverse osmosis processes, generating a maximum flow of approximately 5 L/s of desalinated water.

While the PlantA desalination plant is not operating the supply will be contracted with authorized suppliers (drums).

The potable water system will have a capacity to supply a maximum of 500 people, with autonomy of one day. These lawsuits have been estimatedDo considering a consumption rate of 150 L/person/day.

To meet this demand, two metal ponds of 50 and 75 m³ of dimensions 4 x 4 and 5.5 x 4 (D x H), respectively, have been estimated. The first located near the Caleta San Marcos, and the Second in the camp. The pond located in Caleta San Marcos will be supplied by a pipe from the desalination plant and the camp pond will be supplied by tank trucks.

On the other hand, in all the temporary installationsAles and working fronts, shall be provided with drinking water for consumption through sealed drums, labelled and with a key system for normal use, which will be acquired from different companies authorized by the health care and that have the Valid authorization resolution.

ii. Industrial Water

It is considered to use water for the equipment of the concrete plants and the equipment of underground works.

200,000 L/day is considered in each front (6 fronts in total), except for when it is workingNdo at Raise Boring Machine (RBM) in front of upper tunnel which increases water consumption to 500,000 L/day.

In the case of RBM are required: clean and fresh water 100 L/min- Drilling Water, and 160 L/min for Cooling - Cooling Water). Whereas the machine operates 20 Hrs Daily, for the RBM are required 300,000 L/Day.

The excavation program considers that the RBM is delayed advances at a rate of 125 m/month therefore operates for 4 months for the pressure and 1 month for the Pique of the chimney.

Considering all of the above:

- 1.2 million l/day (all fronts, when not operating RBM)
- 1.5 million L/day (all fronts, when operating RBM).

Of this total maximum demand, close to 18 L/s, is considered to satisfy it in the following way:

- Reuse
- Plant Desalination
- Purchase to authorized third party

Additionally, it is considered to reuse the treated water from the wastewater treatment plant, which will treat the effluents of domestic waters (10 m^3/day). The treated water, which will comply with the irrigation standard Nch 1.333/87, will be stored in a pond of 40 m^3 For later use in the activities as concrete and moistening of roads.

1.2.9.3 Toilets

Hi Services will be installedGiénicos in a quantity proportional to the number of workers per turn, the waste generated will be withdrawn by authorized companies according to article 23 and 24 of the DS N ° 594 that will contract the owner of the project.

1.2.9.4 Fuel

To estimate the demand for COMbustible, it has been considered the Peak of construction and the effective times of use of the machinery with what has been estimated a consumption of 5,500 L/day. In order to have a minimum autonomy of 2 days in the work to satisfy this demand is contemplated Having ponds Metal With a total capacity of 12,000 liters. The fuel will be purchased from authorized third parties who will ship it in trucks to the site of the works.

These ponds will also be used PA fuelRA Diesel Generator sets of 100 Kva Located in each work installation, in emergency cases of the electrical system.

The number of ponds considered for each slaughtering facility is shown below:

- Installation of the slaughter Sector Coast near Caleta San Marcos (2 ponds of 2000 Lts each)
- Installation of slaughter near Caleta Rio Seco (2 ponds of 2000 Lts each)
- Installation of Slaughter Plateau Sector near to Reservoir (2 ponds of 2000 Lts each)

In summary you will have a total of 6 ponds for the storage of fuel. Once the North access road is complete and the slaughter facility near the Rio Seco Creek is dismantled, the 2 ponds will be moved to the instalRemaining operations, 1 pond for each slaughtering facility.

1.2.9.5 Power

It is considered to enable casinos in the camp to cater to all workers in the rotary system.

On the other hand, it is considered the habilitation of canteens in the slaughter facilities with capacity to serve a maximum of 200 people per turn in the facilities of operations sector Costa San Marcos and Plateau sector reservoir and possibly a lesser number of people in the facilities of operations cosTa Dry River and camp. The food will be provided by the company that manages the casino or by an external restaurant service contracted or local company authorized by the health authority in the vicinity of these points.

1.2.9.6 Accommodation

For The accommodation the staff will have the facilities of the camp of the project which has a maximum capacity for 500 people.

1.2.9.7 Personnel Transportation

The daily transport of the personnel to the work fronts and installation of slaughter is reAlizará by means of buses, minibuses and vans whose frequency of travel will be associated to the beginning and end of each working day.

Table 1-24: Transport of personnel phase construction in buses.

Year	Buses 40 passengers Iquique Camp	Buses 40 PASajeros Camp Caleta	Buses 40 passengers Camp Reservoir
	Total Annual Trips		
2015	144	-	840
2016	536	480	2760
2017	912	1380	5220
2018	360	660	1980
2019	40	-	300

Source: Own Elaboration.

Table 1-25: Transport of personnel phase construction in Mini-buses.

Year	Mini Buses 12 passengers Iquique Camp	Mini Buses 12 passengers Camp Caleta	Mini Buses 12 passengers Camp Reservoir	Mini Buses 12 passengers Access road
	Total Annual Trips			
2015	72	780	60	480
2016	184	1140	960	540
2017	160	600	1260	-
2018	136	180	540	-
2019	16	240	180	-

Source: Own Elaboration.

1.1.1.1 Equipment and Machinery

As regards the quantity of equipment and machinery to be used on average during the construction of surface and underground works, it can be estimated according to the following table per general item:

Table 1-26: quantity of machinery required.

Machinery	Total
Concrete Pump	8
Bulldozer	12
Tank Trucks	8
Fuel truck	5
Service Truck	2
Flat Trucks	4
Truck Mixer	10
Hopper Trucks	32
Front Loader	4
Selection tape	3
Crane	6
Jumbo	6
Motor graders	10
Mototraillas	8
Shovel Schaeff	6
Backhoe	14
Rollers compactors	6
Scoop	24
Shotcretera	10
Track Drill	4
Rbm	1
Diesel compressors	10
INJECTION PUMPS	3
Concrete Plant	2
Crusher	2
Power line Tensioner	4
Backup generator	4
Fans (in tunnels)	6

Source: Own Elaboration.

1.1.1.2 Work fronts

The project considers mobile working fronts for the construction of the superficial works, underground and for the construction of the LAT, on the other hand there will be fixed work fronts for the underground works.

The work fronts will count Or some of the following items: With offices, sufficient chemical baths and waste storage site, which will be periodically removed and transferred to the waste yards considered in the slaughter facilities.

by the Construction mode It is considered possible to install more than one working front in parallel for the same sector.

1.1.1.3 Explosives

Explosives shall be used, after corresponding sectoral authorisation, for the execution of the excavation of underground works (tunnels, windows, galleries, caverns and stings) and for the removal of rocky substrates in duly justified cases Technically in areas of difficult excavation with conventional machinery.

In order to carry out this project, the use of stable explosives is preferred as Anfos or others which will be handled by highly trained personnelAnd with its registers of programmer calculista and/or manipulator of explosives (as appropriate) a day issued by the DGMN (Directorate General of National Mobilization), situation that must be verified before the realization of the calculation, placement and Thunder respectively. The specialized company will provide all the elements, machinery, vehicles, materials and infrastructure for the storage, transport and handling of explosives by own means; This includes Polvorines autoCurly, transport-enabled vehicles and qualified personnel.

For the execution of works with explosives, the holder shall require contractors through the basis of the contract, which is carried out exclusively by qualified personnel.

CoupleFor all purposes of the project, it shall not be accepted that the contractor has or maintains explosives, initiators, wicks or others in any of the enclosures considered in the project, other than the authorized polvorines.

Considering a total of aproximadameNte 173,220 m^3 From rock to dig and estimating 2.8 m^3 ANFO to perform blasting are considered approximately 485,000 kg of explosives To make the thunder of the Underground works. For the case of emulsion is considered 2.2 kg/m^3, for EXCAvar 173,220 m^3 Of rock, therefore it is considered approximately 382,000 kg of explosive.

Eventually, it may be necessary to blasting on the roads, if it is possible to find material that cannot be mechanically removed.

1.1.1.4 Concrete

is considered for The underground works and their accesses a total of 32,000 m^3 (Consider an over 19% excavation) Of projected concrete of support, cladding and pavements in the approximately 6,000 meters of tunnel and considered piques.

In the case of the Cavern of machines are estimated 4400 m^3 of concrete. Includes slab, walls, roof of different levels and 30% losses.

In the case of asphalts, they are considered 1,000 m^3 Asphalt, which will be used to pave the tunnel access to the cavernA of machines and the path of access to this from the route CH1.

1.1.1.5 Aggregates

For the construction of the works of the project there is the need to have aggregates for the preparation of concretes and structural fillings. All this material will be acquired from PROveedores close to the project that have the sectoral and environmental permits to carry out these tasks. Together with this, there will be sites for the temporary collection of aggregates, for each front of Work, and will be collected temporarily in each Working front for later use.

Estimated to be required around 16,000 m^3 Gravel plus 11,000 m^3 of sand in the coast zone and 19,000 m^3 Gravel plus 13,000 M^3 of sand in the reservoir area, reaching a total of 59,000 m^3 From ÁridYou. It is worth mentioning that a large part of the material removed by surface and underground works is expected to be reused. In the case of requiring it, you may purchase material from an authorized third party.

1.1.1.6 Transportation of supplies, consumables and equipment

The TranspoRTE of supplies (hardware, insulators, cables, metallic structures, tunnels shields, electro-mechanical equipment, etc.) and inputs (water, fuels, concrete, aggregates, food, etc.), towards the respective installation of slaughter and the fronts of TRAwill be done mainly through existing public roads, by existing footprints and paths and Access footprints to be enabled (approach footprint), used for these effects, mostly vans and flat trucks, which will count With all the security elements and comply with the provisions on the transport of supplies indicated by the current legislation and technical review to date.

All the pieces that make up the structures will be transported in trucks, from the PATThe gathering up to each front of work or to a place as close as possible to each front.

Any vehicle to be used in the project will comply with the provisions of the Traffic Law (Law No. 18,290), i.e.: of the good condition, operation, requirement of technical revisions, of current gases and permits of circulation to the day.

The transportation of thes necessary supplies for the project will be carried out with the loading sections of the trucks covered with a tarp, so as to prevent the dispersion of dust in the air.

1.1.1.7 Chemical inputs

The chemical inputs estimated for the construction phase of the Project are detailed in the following table.

Table 1-27: Chemical inputs phase construction.

Input	Amount	Unit
Diluents	4.65	L/month
Degreasers	4.65	L/month
Oils and Fats	12,480	L/month
Hydraulic Oils	8,320	L/month
Antisol	2.79	L/month
Mold release	4.65	L/month
Paints (water based)	0.52	Gallons of paint

Source: Own Elaboration.

1.1.2 Location and amount of renewable natural resources to be extracted

Also, the project requires seawater, although in low quantities (of 10 L/s to deliver 5 L/s of potable water) at this stage for the supply of potable water through the desalination plant. However, it does not consider exploiting or Extract other types of renewable natural resources in the construction phase.

1.1.3 Construction phase Emissions

1.1.3.1 Atmospheric emissions

In this phase, material emissions would be recorded Particulate and gases from the combustion of engines of the Machinery and equipment. Material emissions Particulate They are mainly due to land movements and activities related to construction of works and roads.

From the foregoing, the following mitigation measures are released:

- Moistening of roads in the process of mixing and transfer of materials.
- Sealing of truck bodies to prevent material falling.
- Installation of short-wind nets in the operations
- Maintenance of machinery and vehicles speed Control in Tasks

The following indicators shall be considered to verify compliance:

- A program of control and periodic measurements of the operating state of the motor will be establishedIs.
- There will be a registration of vehicles with technical data, and support of last maintenance,
- There will be a registration of assistance from inductions to construction personnel on previously exposed measures.

Table 1-28: Total emissions phase of construction.

Activity	Mp_{10}	$Mp_{2.5}$	Co	No_X	SO_2	Hc
Ground movement	103.40	22.49	-	-	-	-
Vehicular Traffic	2866.37	304.44	166.11	630.89	-	36.60
Combustion machinery	153.45	153.45	515.02	1900.22	0.00	199.45
Backup generators	19.81	19.81	60.02	277.94	18.48	-
Lte	0.09	0.01	-	-	-	-
Total	**3143.13**	**500.20**	**741.15**	**2809.06**	**18.48**	**236.06**

Source: Own Elaboration.

The calculation memory of these emissions is presented in annex 1.5.

These emissions are unimportant in terms of magnitude, have temporary character and limited duration while the construction of the project lasts.

1.1.3.2 Noise

In the case of noise generated by machinery and installations of the project, non-compliance with the regulations was identified, specifically in points 6, 7 and 8 (see table 1-29), during the construction phase of the project. The above should be princIpalmente to the activities carried out by the construction of the access road that will link the route A-752 with the route CH-1. In order to reduce the acoustic impact generated during this phase on the receptors of the river Seco Cove, it should be Apply a simultaneous operation restriction to the machinery involved in the work fronts associated with the construction of access roads, for which noise in the receivers will be monitored and when it is close to the standard limit, It will reduce the activity of the machines.

On the other hand, a modular acoustic barrier of at least 3.6 m in height and with a length of 10 m must be implemented to the machinery which is performing work in the vicinity of points 6, 7 and 8 (dry river).

Considering the application of these control measures, it was verified by modeling that the phase of operation of the project will not derive in normative noncompliance, since the projected sound inmision levels are located under the thresholds that areAblece the MMA DS 38/11.

Table 1-29: Location and description of measuring points.

Point	Description	Height [m]	Effective use	UTM coordinates Datum WGS 84 Spindle 19K	
				This	North
1	2-storey house located on the east side of Route 1, Caleta San Marcos.	1.5-4.0	Residential	383662	7665487
2	1-storey house located on the east side of Route 1, Caleta San Marcos.	1.5	Residential	383728	7665116
3	2-storey house located on the east side of Route 1, Caleta San Marcos.	1, 5-4.0	Residential	383656	7664989
4	1-floor apartment located on the west side of Route 1, Caleta San Marcos.	1.5	Residential	383331	7664795
5	Offices and workshop owned by Mina Ternardita, Km 33 Approx Route A-750.	1.5	Industrial	396028	7683437
6	Caleta Rio Seco Cemetery.	1.5	Cult	379784	7677750
7	One-storey apartment, upper sector Caleta Rio Seco.	1.5	Residential	379455	7677542
8	1-storey house, located in low area of Caleta Rio Seco.	1.5	Residential	379295	7677568

Note: coordinates obtained in terrain.

In relation to the evaluation of the noise generated by blasting, which was evaluated based on the American Standard *Measurement Procedures For The Enforcement, Chapter I: Illinois Pollution Control Board, Part 910, Title 35: Environmental Protection, Subtitle H: Noise Of 35 Ill. Adm. Code 900 & 901,* It was determined that the levels are below the limits reWe are commended by the American regulations at all the points of evaluation considered. The topography of the sector, together with the considerable distances presented by the tasks with the points, allows the acoustic energy to dissipate in great MedIda.

In addition, projections were carried out for thundering events executed in the Costa Sector. The projected vibration levels were compared with the recommended values for buildings of normal construction defined in the norm AleMana DIN 4150:1999, observing that these are below the range recommended by the regulation. The foregoing allows to conclude that the vibrations generated by blasting activities will not generate damage to the evaluated buildings.

Cabe points outA that in the event of blasting superficial, the project will be coordinated with the community and police to perform in daytime.

Finally, the noise levels generated by vehicular traffic were evaluated based on what is defined in the Regulations of the Swiss Confederation OPB N º 814.14, determining that for the operation phase will not exceed the proposed maximums.

Based on the analysis made, it is feasible to conclude that the project "*Espejo de Tarapacá*", there will be no negative effects Vibrations in the community near it.

Table 1-30: Evaluation According to DS N º 38 of the MMA. Conditioning phase. Daytime period.

Point	Projected pressure level [DB (A)]. Exclusive contribution	Maximum Allowed NPC [DB (A)]. Daytime period (07:00 – 21:00)	Evaluation according to DS N º 38 of the MMA.
1	53	62	Meets
2	47	53	Meets
3	45	60	Meets
4	42	62	Meets
5	26	48	Meets
6	42	46	Meets
7	47	48	Meets
8	43	52	Meets

Source: Noise report.

1.1.3.3 Vibrations

During the construction phase there will be vibrations inherent to this activity. The activities that could possibly be perceived are those related to the beginning of the underground works. However, these are sporadic and not are considered significant.

1.1.4 Construction phase Waste

1.1.4.1 Household liquid Waste

The liquid waste generated during the construction phase corresponds mainly to household waste. The following table presents The quality of sanitary effluents generated in each facility of slaughter and camps.

The estimated quality of sanitary effluents is presented in table 1-31.

Table 1-31: Quality sanitary effluent.

Parameter	Unit	Value
Oils and Fats	mg/L	60
Bod5	MgO2/L	250
Total phosphorus	mg/L	5
Ammoniacal nitrogen	mg/L	50
Ph	-	6 – 8
Power Foam	Mm	5
Sedimentary solids	mg/L	220
Coliforms Fecal	NMP/100 Ml	1.6 x 105

Source: Characteristic values of domestic wastewater corresponding to 100 inhabitants, D. D. 609/1998, "establishes emission standard for the regulation of pollutants associated with the discharges of liquid industrial waste to systems of AlcantaRillado ".

In the case of the camp, particular sewage systems are contemplated for the collection of wastewaters connected to wastewater treatment plants (PTA) to meet the monthly maximum of work personnel considering aA water endowment of 150 L/person/day. Such a system will be implemented both for the installation of main tasks and in the facility of reservoir slaughter. Sanitary effluents will be treated in such a way that they meet the quality of Nch 1,333 of. 1978 and stored in a pond of 40 m^3 To be used in road humidification. Semiannually, a report will be sent to monitor effluents from the treatment plants to health care and be from the Tarapacá region.

In mobile working fronts, intermediate wineries and work facilities for the construction of the electric lines and roads, chemical baths will be available.

The number of chemical baths to be installed shall comply with the provisions of the DS N ° 594/99 of the Ministry of Health, "Regulation on basic sanitary and environmental conditions in the workplace". Two chemical bath maintenances are made a week.

The service of the installation and maintenance of the chemical baths beContracted to companies authorized by the corresponding health care. These companies will be in charge of the supply, operation of the baths, as well as the waste generated by them, product of their cleaning. To ensure the CumplimSlow of these requirements, the holder will require the delivery of the resolution proving the authorization to operate and the current contract with the Local sanitary enterprise for disposal of waste. In addition to the above, a system of Registration and control of the maintenance and final disposition of the waste generated by them, in order to

demonstrate that the final disposition will be carried out in an authorized place. In general terms, the registration system shall consider:

- Date of removal of waste generated by chemical baths;
- Number of bathrooms;
- Company responsible for the removal of waste generated from bathrooms;
- Estimated amount of waste generated and withdrawn; And
- Place of destination and final disposition of the ResIduos.

In the chapter 10 Plan of compliance with applicable environmental legislation, the background is accompanied by the granting of the mixed sectoral environmental permit of Article 138 of the DS MMA N ° 40/12.

1.1.4.2 Industrial liquid Waste

The waste Industrial fluids to be generated during the construction phase, correspond to washing water from the canoes of the trucks Mixer and other construction equipment (20 m^3/month) associated with the 2 concrete plants located in the installations D(e) Operations contemplated in the coastal sector and the plateau sector.

For these liquid industrial wastes, a waterproofed swimming pool will be enabled, where the water will be evaporated and part of it will be recovered for use in the SiguPin male XLR Washing a truck's canoe. Cement with a lower water percentage (after 24 hours or more) is removed from the pool as a non-hazardous waste.

The requirements associated with the application of the mixed environmental permit for the management of ResiIndustrial liquid duos are indicated in chapter 10 of this EIA.

1.1.4.3 Solid waste

i. Domestic solid waste

All household wastes will be accumulated in the slaughter facilities and from there they will be transferred to authorized places for their final disposition.

The waste generated on the work fronts will be collected in pref garbage bagsErentemente "biodegradable" or in closed containers, to be transported from its origin to the places of collection in the facilities of slaughters. In all facilities There will be an area destined for temporary collection inPlastic or metal, duly labeled and covered.

These residues will be transported to places authorized by the respective health care, with a frequency of once a week in normal conditions and 2 times per week in conditions of maximum generation, so as to avoid the accumulation of garbage in the slaughter.

The generation of these wastes will be directly proportional to the amount of labour, that is to say, considering a maximum endowment of 500 people and a generation of 1 Kg per person A day, a waste generation of 500 kg daily is estimated.

On the other hand, the sludge generated from the wastewater treatment Plant (PTAS), considering a maximum endowment of 500 workers and a generation rate of 0.88 kg LODor by M^3 of treated water, a generation of 1980 kg sludge/month from PTAS is estimated.

The requirements associated with the application of the mixed environmental permit for the management of domestic solid waste are indicated in chapter 10 of this EIA.

ii. Non-hazardous industrial solid waste

Non-hazardous industrial waste (DESPWood spreads, reels, irons, cables, etc.), due to their characteristics, will be stored neatly in the yard of stockpiling of non-hazardous waste until shipment to final destination, which depends on its potential recycling.

The volume of waste generated by the remains of unused inputs depends on the contractor's procedures, so their volume is variable. The waste will be classified and subsequently marketed through different auto companiesCurly to recycle and/or recover the different types of waste.

The irons will be deposited in containers and selected those that are recyclable to be delivered to an authorized and certified company that dedicates to the recycling of FierRo. With respect to the wood generated in the field, it will be selected according to its possibility of reuse. It will be gathered in an orderly and packed form for later use in the work, the remainder can be donated to locals or to the workers of the PROyecto.

The estimation of non-hazardous solid waste to be generated during the construction phase of the project Correspond At 9.2 ton/month.

iii. Hazardous Industrial Solid Waste

The hazardous industrial waste generated by the projectThey will flow to oils, lubricants, greases, batteries, empty paint drums, printer toner, brushes, batteries, oil filters, contaminated gloves, etc.

The hazardous industrial waste to be generated will be stored in Bodegas de las InstalacWork ions specially built for this purpose, as indicated by the

DS N º 148/2003 of the Ministry of Health. These will be stored in drums duly labeled and sealed, in a place specially enabled for a temporary collection isIn the slaughter facilities in compliance with all the relevant legislation.

The following provisions shall be adopted for the proper collection of hazardous waste:

- A place specially constructed for the temporary storage of hazardous waste will be available, which will be designed and located in such a way that in the face of the possibility of an emergency it does not endanger the people, the environment and the inStalaciones own.
- This place will be a closed enclosure with frames and steel mesh of 2.20 m high, which shall have a Radier Concrete with a spill-catching pit for oils. The roof will be covered, with zinc plates, which cover tOdo the enclosure and it will protrude at least 30 cm, on all sides.
- The sectors of temporary collection of hazardous waste will be signposted according to type of waste, that is: batteries, oils, lubricants and fats.
- It will install at least one ExtiNtor multipurpose ABC of 10 kg plus a bucket of sand.
- The entrance to the area will be kept closed with padlock and whose key will be used only by the authorized personnel to make incomes and expenses of supplies.
- Inventory Control will be taken asFor income such as hazardous waste discharges.
- The corresponding safety sheets will be counted.

The frequency of removal of hazardous wastes will depend on the amount generated and the issuance of the permits required for REtirar the waste to its final destination. Hazardous waste will be finally arranged by an authorized company to whom the transfer service and final disposition will be hired. To maintain control over the transport and disposition of thes hazardous wastes a chain of custody will be implemented, requiring proof of disposal of waste in authorized facilities.

It is estimated that approximately 0.95 tons/month of this type of waste will be generated.

Regarding the InstalacIons necessary only for the construction phase, these will be removed to the extent that they are not going to continue being used and the land in which they were installed will be cleaned and as far as possible will be assimilated to the morphology of the place For To reduce the footprint of the intervention carried out by the project.

1.2. Description of the operation phase

The complete operation and maintenance organization of the plant will be carried out from the Control building, and has been estimated at 50 people (includingL Personnel of the legal,

commercial, finance and administration areas of the company), 20 of which would be subject to shifts.

Before the start of the operation, there will be tests of the equipment and the overall operation of all the Parts of the plant. According to the schedule this phase will last 3 months approximately.

1.2.1 Power generation

The project will capture seawater during the day through a work of underwater capture, this work is connected to the lower tunnel where the water will be led to the cave of machines. In the cavern of machines will be found the teams of Pump-generation, with their respective transformers and valves, are 3 units of Francis type each with capacity of 100 MW of power, both in pumping mode and generation.

Then the water will be pumped through the pressure bite to the Upper tunnel, the water will reach the reservoir by the final work of the upper tunnel called the approach channel.

Later, during the night, the water accumulated in the reservoir will be returned to the sea, by gravity, using the same works and equipments that were used for the recruitment and pumping, at this stage the water passing through the pump-generation equipment makes these equipment now act as turbines, generating energy.

The project will connect to the large North interconnected system ("SING"), whose operation is coordinated by the respective economic cargo Dispatch centre ("CDEC").

In accordance with the provisions of the General Electrical Services Act (D.F.L. N ° 4/20.018) and the regulation on structure, operation and financeIamiento of the economic Cargo dispatch centres (DS No. 291/2008, Ministry of Economy, Promotion and reconstruction) this organism can order the project holder to generate a certain power at a certain time in order to satisfy the Demand, according to SING's requirements. This means that the project will be able to operate within the range of 0 MW to 300 MW, according to the instructions for coordinating the operation that emanating from the directions of the CDEC.

As the instructionCDEC's coordination depends on the conditions of the electricity market in a certain time, it is not possible to anticipate that office. Therefore, the average of 150MW was considered as the standard operation of the project.

Without prejudice to this, a cont-Inuación are exposed the cases of generation to maximum power (300MW) that will be analyzed in the most unfavorable conditions environmentally, that is, when the differentials of temperature, salinity and solids in suspension could be higher. Of ESTe mode, with the results obtained for these scenarios of operation will be able to define and propose the measures of the case, considering that the discharge of the project is located

approximately to 343 m of the coast: outside of the zone of protection littoral, according He realizes in Chapter 10, section 10.2.2 of the EIA.

The exceptional cases correspond to operate 24 hours continuous or even for 9.7 days in generation mode.

The work for the capture and restitution of seawater is the same.

The energy requiredDa for the pumping of water will come from a photovoltaic park, as indicated in the section 1.2.4.2 ("Indication of the development of the project by stages") of this chapter. The development of this stage, to this date, is uncertain and is conditioned(a) that economic characteristics of the electricity market indicate their viability, as explained therein.

The generated energy will be transmitted by a high voltage line that is born in the underground substation (GIS) Espejo de Tarapacá and ends in The Lagunas substation (existing), in which the SING is connected.

Considering a maximum generation capacity of 300MW, the operating scheme in typical summer and winter days, as can be seen in table 1-32, estimates that 45 m will be pumped^3/s, and to be used in a flow rate of 28 m^3/s to generate. This means that the generation in normal operation corresponds to a power of 150 MW.

Table 1-32: Simplified operation scheme on typical days of Summer and winter.

Time	Pumping (-) Generation (+) (MW)	
	Summer	Winter
0	+ 150	+ 150
1	+ 150	+ 150
2	+ 150	+ 150
3	+ 150	+ 150
4	+ 150	+ 150
5	+ 150	+ 150
6	0	+ 150
7	0	0
8	-300	-100
9	-300	-200
10	-300	-200

11	-300	-200
12	-300	-200
13	-300	-200
14	-300	-200
15	-300	-200
16	-200	-200
17	0	0
18	0	+ 150
19	+ 100	+ 150
20	+ 150	+ 150
21	+ 150	+ 150
22	+ 150	+ 150
23	+ 150	+ 150

Source: Own Elaboration.

Another way to present the normal operation of the plant is through Of the flows that circulate. The following table shows the average time values for all the months of the year.

Table 1-33: Average flow rate Normal operating hours (m^3/s).

Time	Jan	Feb	Sea	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Prom.
0	28	28	28	28	28	28	28	28	28	28	28	28	**28**
1	28	28	28	28	28	28	28	28	28	28	28	28	**28**
2	28	28	28	28	28	28	28	28	28	28	28	28	**28**
3	28	28	28	28	28	28	28	28	28	28	28	28	**28**
4	28	28	28	28	28	28	28	28	28	28	28	28	**28**
5	28	28	28	28	28	28	28	28	28	28	28	28	**28**
6	14	14	14	14	14	14	14	14	14	14	14	14	**14**
7	0	0	0	0	-15	-15	-15	-15	-15	-15	-15	-15	**-10**
8	-15	-15	-15	-15	-30	-30	-30	-30	-30	-30	-30	-30	**-25**
9	-30	-30	-30	-30	-30	-30	-30	-30	-45	-45	-45	-45	**-35**

10	-45	-30	-30	-30	-30	-30	-30	-30	-45	-45	-45	-45	**-36**
11	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	**-45**
12	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	**-45**
13	-45	-45	-45	-30	-30	-30	-30	-30	-45	-45	-45	-45	**-39**
14	-45	-45	-30	-30	-30	-30	-30	-30	-45	-45	-45	-45	**-38**
15	-45	-30	-30	-30	-30	-30	-30	-30	-45	-45	-45	-45	**-36**
16	-30	-15	-15	-15	-15	-15	-15	-15	-30	-30	-30	-30	**-21**
17	-15	0	0	0	0	0	0	0	-15	-15	-15	-15	**-6**
18	14	14	14	14	14	14	14	14	14	14	14	18	**14**
19	28	28	28	28	28	28	28	28	28	28	28	28	**28**
20	28	28	28	28	28	28	28	28	28	28	28	28	**28**
21	28	28	28	28	28	28	28	28	28	28	28	28	**28**
22	28	28	28	28	28	28	28	28	28	28	28	28	**28**
23	28	28	28	28	28	28	28	28	28	28	28	28	**28**

Source: Own Elaboration.

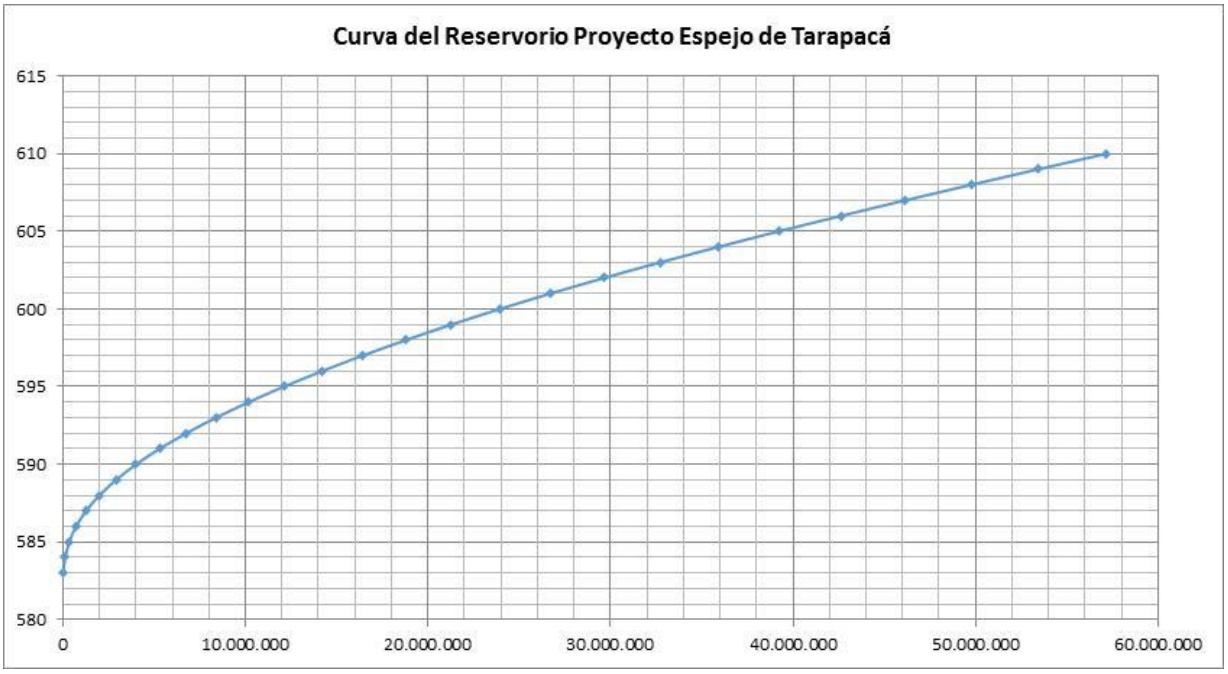
In this table the positive values correspond to the values of the flows used for power generation and the negative values correspond to the flow values in pumping mode.

It is possible that at times when the system Required, whether due to failures of other power plants or instabilities in frequency, the operating levels must be reduced during pumping hours, or the generation level increased, giving rise to operating modes EXCEPCIonales. In this last scenario, the hydroelectric generation could use its maximum capacity of 300 MW.

This condition of the way of operating the reservoir, in the sense that it is to be expected that this Renew 100% of the water reservoir at least 1 veZ a year, is reinforced by the behavior that has had the SING in recent years.

The following figure shows the accumulated volume in the reservoir by elevation level, the maximum level of the reservoir in operation will be between the dimension 608 and 609 M.a.s.l.

Figure 1-42: Reservoir dimensions (dimension vs M^3).



Source: Own Elaboration.

It is expected that the normal operation of the plant involves renewing most of the usable water volume of the reservoir during the year.

Figure 1-43: Reservoir curve.

Source: Own Elaboration.

1.2.2 Filling the reservoir

As described in the previous section, the filling of the reservoir follows the following structure:

Table 1-34: Reservoir filling

Time (days)	Level
1	Filling the reservoir Nor-Poniente (NP) 585 m-592 m
5	Filling NP 592 m-600 m (2.5 MMm^3)
40	Central testing with NP Reservoir only
10	Filling of the south-west Reservoir (SP) at 596 m (+ 4MMm^3) and NP is also depressed at 596 m.
20	Filling to the dimension 600 m (+ 5.5 MMm^3) in NP and SP
30	Filling of the West Reservoir (NP + SP together) at 608.5 m (+ 17 MMm^3)
15	Filling the east reservoir up to 592 m (+ 4MMm^3) with a reduced flow rate of 5m^3/s.
30	11.1 MMm Trasvasije Hidden^3 From P to O to equalize levels to 602 m so that both function as a single reservoir
60 or more	Gradual filling of the entire reservoir up to a height of 608.5 m.

Source: Own Elaboration.

Filling the reservoir Nor-Poniente is estimated to take 6 days to the altitude 600 M.A.S.L. Operation tests will then be performed for 40 days. Having fulfilled the test stage the filling of the West Reservoir will last 60 days reaching La Cota 608.5 M.A.S.L. On the other hand, the filling of the East Reservoir, up to the altitude 602 M.A.S.L., will take 45 days. Finally the filling of the entire reservoir up to the height 608.5 M.A.S.L. will require at least 60 days more.

1.2.3 Underground Sector

The Works SUbterráneas will have a first inspection after one year of operation, an opportunity for the tunnel system to be emptied. If no problems are detected in this first inspection, the following will take place at the age of 5, the SubsiguiAt the age of 10 years, then when they meet another 15 years, to finally make them routinely every 10 years. If problems are detected after the first inspection, the following inspection after the adjustments will be made at 1 year.

The time of emptying, inspection and subsequent filling of the tunnel system is estimated in one week, to which it is necessary to add the cleaning times or repairs that are needed according to the faults that are detected.

On the other hand, the manMaintenance of the generation equipment of the three units will be made alternately for each unit, with a scheduled unavailability of 15 days per year for each one of them.

The maintenance will be in charge of professionals especially CalifiFor that purpose.

1.2.4 Sector Costa

The control and monitoring of the plant will be carried out from the controlling building. The potable water supply and the wastewater treatment system will be the same as for the construction phase.

In The Costa Sector will maintain the administration and Control Building, workshop and warehouse, desalination plant, wastewater treatment plant. From this sector will be handled and monitored the operation of the plant, the levels of the reservoir and the FUncionamiento of the Control Panel. The monitoring of the reservoir levels will allow to program the operation and to identify possible abnormal situations in its variation.

Drinking water supply and wastewater treatment system It will be the same used for the construction phase.

1.2.5 Plateau Sector

The reservoir will be filled through the underground tunnels through which the water circulates from the sea, with the upper tunnel being the work by which the seawater arrives at the reservoir. Operation parameters of the reservoir will be monitored.

The control Panel located in this sector will be able to monitor the central and the reservoir.

1.2.6 Pampa Sector

1.2.6.1 High Voltage electric transmission line (LAT)

Electric power transmission is not An operation involving some specific direct action beyond having the line in good condition. The following describes the maintenance activities of LAT:

- Basic Preventative Maintenance

Consider routes with 2 Or 3 people, one or DAt times a year, visual inspection of drivers, structures and components of suspension and anchorage. This does not use any major equipment, possibly personal safety equipment, hand tools and remote measuring equipment.

- MantenimiProgrammed Corrective

This maintenance is of a smaller wingspan, based on anomalies detected in the pedestrian inspection. There is use of minor mechanical equipment and a small group of people called Brigades (4 Or 5 people per work area) They work mainly in height (structures), without affecting the terrain where the line is installed. Each brigade will attend a work area, usually see up to three zones. It should be noted that for this type of installations must be made At least two corrective maintenances scheduled over the course of 1 year.

- Maintenance against failure

It corresponds to the repair of the installations, after failures that compromise the transmission of energy. Its size depends on the AnomalíAs produced. This maintenance is done with short-term programming, after the fault is produced and usually involves a structure or a sector of the line.

- Maintenance of the friction of the bonded band

In general, for a LAT it must be carried out at least once a year the friction of the band of servitude making a pruning of all the resprouted trees that do not comply with the electrical distance with respect to the conductors established in the standard. Dice That there are no trees in the area that have a large size, it is not planned to carry out this activity.

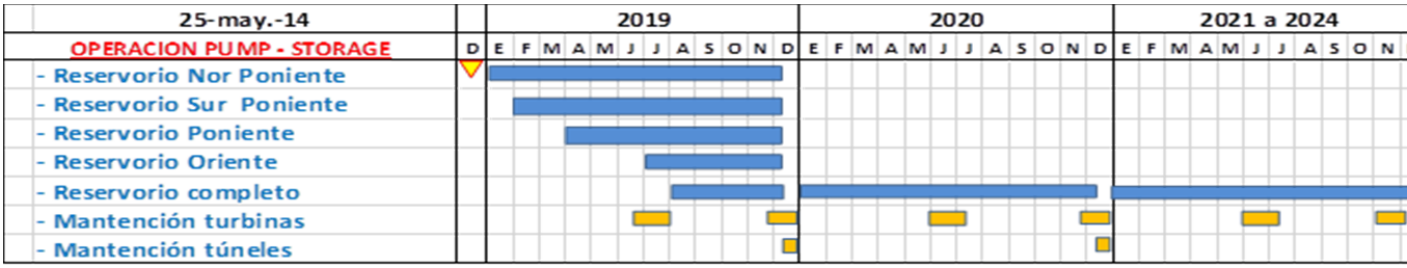
1.2.7 Estimated date and indication of the part, work or action that establishes the beginning and end of the phase

The start of the project operation is estimated OcurRirá the month of December 2018, after 3.5 years of commencement of construction. The project will begin operation after the operation tests, when you start using the reservoir NorWest.

On the other hand, given that the lifespan of the projectCTO is considered limitless to the extent that the maintenance, renovations and upgrades necessary for this purpose are made to the installations and works of the same, it is not considered a formal term of the operation phase. Yet in the CAsOr to proceed with the closure and abandonment of the project, the holder will obtain the environmental authorisations that result and will process the other sectoral authorisations that are applicable.

1.2.8 Operation Phase Schedule

Figure 1-44: Schedule phase of operation.



Source: Own Elaboration.

1.2.9 Labor phase operation

During the operation of the plant, it is estimated that the personnel responsible for the different works of the project will be separate by teams of specialized workers. On average, the workers considered for this phase will be 30, divided into three TurWe work. Eventually, and for the preventive maintenance of the plant the maximum of workers will be of 50 people.

1.2.10 Maintenance and conservation activities

The maintenances, which will be carried out periodically, will be carried out by personL trained for the activities.

A visual inspection of the mouths of the hydraulic tunnels will be carried out as safety monitoring. This work will take place every 2 months during the first year and then semiannually.

The maintenance can be cargOr a contractor, where it can be more than one company that performs these functions depending on their specializations.

1.2.11 Inputs and services in operation phase

1.2.11.1 Water resources

The main input will be sea water for the purpose of generatingEnergy. The description is located in the section 1.6.13.

1.2.11.2 Power supply

The facilities for the operation of the plant will have direct power from the installations of the project.

1.2.11.3 Fuel

For this phase it is considered to enabletion of a pond for the storage of fuels in the project facilities for the diesel engine of starting in black in cases of emergency in the SING.

1.2.11.4 Drinking water

During this phase the water consumption considers drinking water for the jobsAjadores at In Administration and Control building, as well as water supply for restrooms and services. This resource will be obtained from the potable water supply system of the project, which includes the desalination plant.

The plant considers An approximate uptake of 5 L/s of seawater, which will undergo pre-treatment, filtering and reverse osmosis processes, generating a final maximum flow of approximately 2.75 L/s of desalinated water.

Along with the above, during the Operació phaseN, it is envisaged the habilitation of particular systems of sewerage that is detailed in the chapter 10 sectorial environmental permits, PAS 138 phase of operation.

1.2.11.5 Transport

During the operation phase, vans and minibuses will be available for transport of personnel and only in cases of maintenance will be used a truck for the transport of parts or instrumental.

The average vehicular flow estimated for the transport of mateEquipment and personnel towards the project area will be:

Table 1-35: Transport flow phase of operation.

Vehicle	Frequency
Trucks	1 Veh/month
Light vehicles	5 Veh/day

Source: Own Elaboration.

1.2.12 Products generated

The project corresponds to a productive activity of electric energy that will produce 1.75 Gwh/annual average day.

1.2.13 Location and amount of renewable natural resources to be extracted

The project for the operation of the hydro-electric plant for pumping, It will require a maximum adduction of 45 m^3/s Seawater (8 hours per day on average), which will be pumped only during daylight hours, then returned to sea. It should be remembered that the pumped water will be restored to the sea when the projector operate in generation mode, at a rate of 28 m^3/s. Average hourly rates for each month of the year are Presented In table 1-33.

Likewise, during the operation phase, seawater will be required to obtain potable water through a DESA plantA pollinator. The above will allow drinking water to be supplied to the stage's own facilities, and Like this Provide basic services and human consumption.

The desalination plant, will operate consuming approximately 5 L/s of seawater, and generateDo 2.75 L/s of desalinated water.

1.2.14 Phase-of-operation emissions

1.2.14.1 Atmospheric emissions

The project does not consider significant emissions in the operation phase of the same, because the only emissions generated correspond to those products of the maintenance and repair work of the plant. These are isolated jobs, low frequency and generally require a small amount of staff. Transport activities related to the project do not Genen Significant estimates.

Table 1-36: Total emissions phase of operation.

Activity	MP10 (Ton)	MP 2.5 ton	CO (Ton)	NOX (Ton)	SO2 (Ton)	HC (Ton)
Vehicular Traffic	11.49	2.21	0.04	2.81	-	0.02
Generator games in Black	6.26	6.07	49.10	214.62	0.36	-
Total	**17.75**	**8.28**	**49.13**	**217.43**	**0.36**	**0.02**

Source: Own Elaboration.

1.2.14.2 Noise

They are not identified during the operation phase, impact-generating activities on these environmental components, except for the uninterrupted operation of the machine cave equipment.

To dimension these effects has been made a EvaluacióN of the noise that would eventually be generated by the activities carried out by the project, depending on the levels established by the DS N º 38 for rural areas. The results of this study are presented in chapter 4 of this EIA, whereinvolves that the operation phase will be met with the maximum levels allowed in the receivers closest to the project without the need to implement noise control measures.

The following tables perform the evaluation of the noise generated by Durant(e) The operation phase of the project, specifically the operation of the LTE.

Table 1-37: Evaluation According to DS N º 38 of the MMA. Operation phase. Daytime period.

Point	Projected pressure level [DB (A)]. Exclusive contribution	Maximum Allowed NPC [DB (A)]. Daytime period (07:00 – 21:00)	Evaluation according to DS N º 38 of the MMA.

5	1	48	Meets

Source: Noise report.

Table 1-38: Evaluation According to DS N ° 38 of the MMA. Operation phase. Night period.

Point	Projected pressure level [DB (A)]. Exclusive contribution	Maximum Allowed NPC [DB (A)]. Nocturnal period (21:00 – 07:00)	Evaluation according to DS N ° 38 of the MMA.
5	1	39	Meets

Source: Noise report.

From the previous tables it is observed that the noise levels generated during the operation phase of the project are below the norm, fulfilling in full the recommended values during the daytime and night periods.

In the IFNext table evaluates the noise levels generated by vehicular traffic in the receivers associated with the transport route, for the period of exploitation of the project.

Table 1-39: Noise assessment According to OPB 814.41. Operation phase. Conveys flowR. Daytime period.

Point	Sensitivity	Projected level [DB (A)]	Inmision limit Value [DB (A)]. Daytime period (06:00 – 22:00 Hrs)	Observation
6	Iii	38	65	Under standard
7	Iii	39	65	Under standard
8	Iii	36	65	Under standard

Source: noise-making.

From the table above, it is observed that within the daytime period, the level of noise generated by the vehicular flow associated with the operation phase, is below the limit values of inmision defined according to the stipulated in the normativeVA Switzerland, in all the points of evaluation affecting the transit of vehicles of the project.

1.2.14.3 Vibrations

Vibrations are not envisaged during the operation phase.

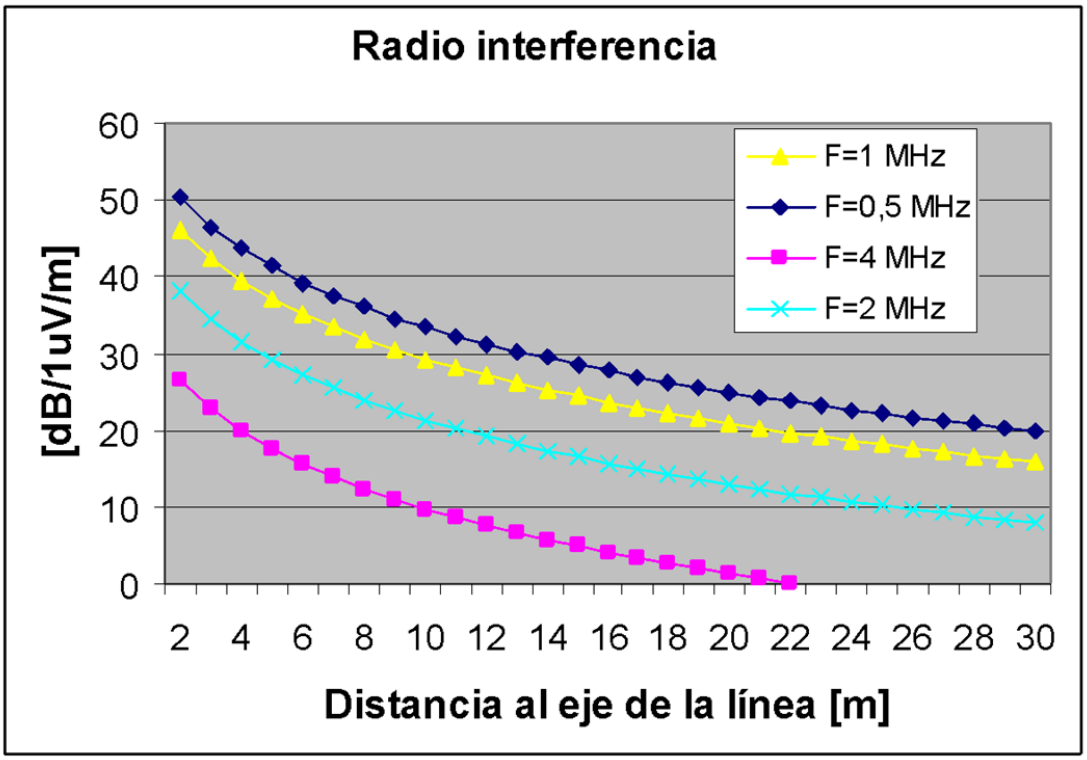
1.2.14.4 Electromagnetic fields

The Camper Electromagnetic was measured in the project-sensitive receptors, for this, measurements were made in Caleta San Marcos and Río Seco (see annex 1.6).

As a conclusion of this study you can say Quee The line of 23 Kv Generates interference fromBido to the Corona phenomenon, but of a much lower intensity than the limit established by international regulation, so that it does not generally represent a problem for communications.

The interference effect is present in fog situation or LLUvia, and according to the evaluation, if the receiver is located very close to the line, less than 10 m, and the received signal is weak (receiver far from transmitter source), depending in addition to the frequency of the signal: low frequencies can be affected (freConsequences amplitude modulated or AM radio), but the effect is much lower for frequency modulated (FM radios, analogue television) and negligible for digital communication.

Figure 1-45: Radio interference at different frequencies, depending on the DistancThe.



Source: Electromagnetism report.

1.2.15 Phase-of-operation Waste

1.2.15.1 Liquid waste

The liquid waste during the operation phase corresponds to the wastewater generated in the Control building and will be treated in the PTAS will be withdrawn by an authorized third party. It is considered a drinking water consumption rate of 150 L/PERsona/day, with 30 days worked per month, whose residual rate is given by 100% of the water consumed. With a Peak of 50 workers.

In addition it is considered as waste the brine rejection of the desalination plant, which in its maximum capacity of OperatIon, generates 18,000 m^3/month. This brine will be ready to sea through the work of taking and unloading.

Table 1-40: Brine characteristics.

Contaminant	Unit	Expression	Maximum permissible limit	Adduction	Backwash	desalinated water	Salt water	Discharge to the Sea
								PTOI
Oils and Fats	mg/L	A and G	150	0	0	0	0	0.00
Aluminum	mg/L	To	10	< 0.5	< 0.5	0	< 1	< 0.5
Arsenic	mg/L	As	0.5	0.004	0.004	0	0.00664	0.007
Cadmium	mg/L	Cd	0.5	0.046	0.046	0	0.07636	0.075
Cyanide	mg/L	Cn-	1	< 0.05	< 0.05	0		< 0.05
Copper	mg/L	Cu	3	0.03	0.03	0	0.0525	0.05
Index of phenol	mg/L	Phenols	1	< 0.001	< 0.001	0		< 0.001
Chrome Hexavalent	mg/L	Cr + 6	0.5	< 0.006	< 0.006	0		< 0.006
Chrome	mg/L	Cr	10	< 0.5	< 0.5	0		< 0.5
Tin	mg/L	Sn	1	< 0.05	< 0.05	0		< 0.05
Fluoride	mg/L	F	6	0.89	0.89	0.01	1.5575	1.55
Total hydrocarbons	mg/L	Hct	20	0	0	0	0	0.00
Hydrocarbons Volatile	mg/L	Hc	2	0	0	0	0	0.000
Manganese	mg/L	Mn	4	0.03	0.03	0	0.0525	0.05

Mercury	mg/L	Hg	0.02	< 0.0001	< 0.0001	0		< 0.0001
Molybdenum	mg/L	Mo	0.5	< 0.01	< 0.01	0		< 0.01
Nickel	mg/L	Or	4	< 0.05	< 0.05	0		< 0.05
Ph			5.5-9.0	7.5-8.0	7.5-8.0	6.0-7.0	7.7-8.2	7.7-8.2
Lead	mg/L	Pb	1	0.2	0.2	0	0.35	0.35
Saam	mg/L	Saa m	15	0	0	0	0	0
Selenium	mg/L	Is	0.03	< 0.001	< 0.001	0	< 0.001	< 0.001
Sedimentary solids	mg/L /h	S. Sed	20	0	0	0	0	0
Total Suspended solids	mg/L	S.s.	300	25	1500	0	1	75
Total solids Disuetos	mg/L	Std	Na	35154	35154	240	58369	58369
Conductivity	US/c m	Cond	Na	51670	51670	495	79869	79869
Temperature	° C	T	Na	17	17	17	17	17
Sulfur	mg/L	S2	5	< 0.05	< 0.05	0	< 0.05	< 0.05
Zinc	mg/L	Zn	5	< 0.01	< 0.01	0	< 0.01	< 0.01

Source: Own Elaboration.

1.2.15.2 Solid waste

i. Domestic solid waste

During the operation phase, domestic solid waste will be generated, which will be removed by a specialized company authorized to perform these tasks, at least once a week to be arranged in an approved site for this.

The domestic solid waste generated during the operation phase will be stored in containers with ad hoc lids. The content accumulated in these containers will be transported to an authorized landfill. The withdrawal will be done at least uA time per week, but in the course of the operation a period in accordance with the production of waste can be defined.

The generation of these wastes will be directly proportional to the amount of labour, that is to say, considering a amountn Maximum of 50 people and a generation of 1 kg per person a day, a generation of 50 kg waste is estimated daily.

On the other hand, the sludge generated from the wastewater treatment Plant (PTAS), considering a maximum endowment of 50 worksAnd a generation rate of 0.88 kg sludge per m^3 of treated water, a generation of 198 kg sludge/month from PTAS is estimated. These will be periodically withdrawn by an authorized company.

ii. Non-hazardous industrial solid waste

The ResiNon-hazardous industrial duos in the operation phase will correspond to waste generated from maintenance activities, such as iron, wood residues, cables, etc. Considering the magnitude of the activities, it is feasible to envisage a generation of 200 kg/month.

All these wastes will be segregated at the origin and shipped to the yard of non-hazardous waste for storage, favoring the recycling of these and that fraction not feasible to recycle will be sent to final disposition to site AUTOrizado by authorized company, with a frequency of once a month.

iii. Hazardous Industrial Solid Waste

The types of hazardous solid waste expected to be generated correspond to used oils and lubricants, oiled rags, fluorescent tubesis used, etc. A generation of 200 kg/month is estimated. These wastes will be segregated at the origin and sent to be temporarily stored in the warehouse of hazardous waste, being finally arranged by an authorized company to whom it is CoNtratará the transfer service and final disposition, with a withdrawal frequency that will not exceed 6 months.

1.3. Project activities in the closing and abandonment phase

The useful life of a hydroelectric plant is considered limitless, so the project does not envisage abandonment phase itself, but rather a maintenance, which includes, improvements of equipment or processes, or just matching adjustments with CambiTechnology, where the equipment will be refurbished and modernized every so long.

Together with the hiring of the workforce, the activities considered in the closing and abandonment phase are the dismantling or closing of the following works:

- Underwater Take and unload
- Hydraulic plant
- Power transmission lines
- Desalination plant
- Reservoir

For the above will be made The following activities:

- Road maintenance
- Solid Waste Management
- Liquid Waste ManagementS
- Transport of inputs, waste and personnel

1.3.1 Description of project activities in closing phase

1.3.1.1 Dismantle Project Infrastructure

The project facilities and temporary installations required for closure will be dismantledThe areas affected directly and surrounding areas will be cleaned, returned the intervening areas as close as possible to the original condition; Using as far as possible the plant land from the escarpment made prior to The construction of the temporary installations.

Containers will be removed and workshops, salvage yards, warehouses, etc. will be dismantled. All waste materials will be removed from the construction phase, to be transported and disposed of in authorized locations of the communes closest to EStas facilities. In addition, the equipment and machinery used in the work will be removed.

The work fronts will be closed and abandoned environmentally at the end of the construction phase of the project. To do this:

- Any element will be removed and residue left on the work fronts.
- The removal of portals installed on roads and other lines belonging to third parties shall be carried out.
- The removal of surplus materials, waste and debris from areas Been intervened by the tasks, which will be sent to the different places of collection of waste arranged in the temporary installations.
- The surfaces where the mobile fronts were working and temporary installations were returned, LOr as similar as possible to the original state and prior to the beginning of the works, as appropriate.
- Access to underground works will be closed.

1.3.1.2 Land restoration

Once the facilities have been removed, activities will be carried out for REstaurar the original surface. These activities involve the removal or coating of concrete structures, as foundations of temporary constructions.

Thorough cleaning of the entire layout of the works will be carried out, verifying that In the work areas there are no traces of any kind of residue.

1.3.1.3 Emissions prevention

During the closing work, machinery and vehicles will be used with maintenance and revisions per day, as well as moistening roads that will eventually be used and that is necessary by the conditions of the terrain.

1.3.1.4 Maintenance, conservation and SuperNecessary Visions

Because they are not considered closing measures requiring Monitoring Post-closing (since there are no environmental components that could be affected), there will be no maintenance, conservation and/or supervision activities.

1.3.1.5 Other AcStrengthened

Whereas the project includes other facilities of the activity, such as tunnels UndergroundDuring the closing phase, other activities will be carried out in addition to those already indicated in the previous headings.

respect of CUpper Tunnel losure, the only identified risk is associated with uncontrolled ingress of people into the tunnels. Therefore, during the closing phase, the entrances of the tunnels will be closed, by means of a grating, mesh or Gate, with proper signage, in such a way as to prevent access.

In the case of the reservoir it will be indicated by means of signage the danger that can mean to cross the limits of the contour profiles.

Annexes Index

Annex 1.1: Legal background

Annex 1.2: Location plan with Project works

Annex 1.3: Coordinate table

Annex 1.4: Storage stability Memory

Annex 1.5: Emissions estimation

Annex 1.6: Electromagnetic field