Amended and Restated NI 43-101 Technical Report

Preliminary Economic Assessment for Penco Module Project

Penco, Biobio Region, Chile

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Important Notice

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1 SUMMARY

1.1 Introduction

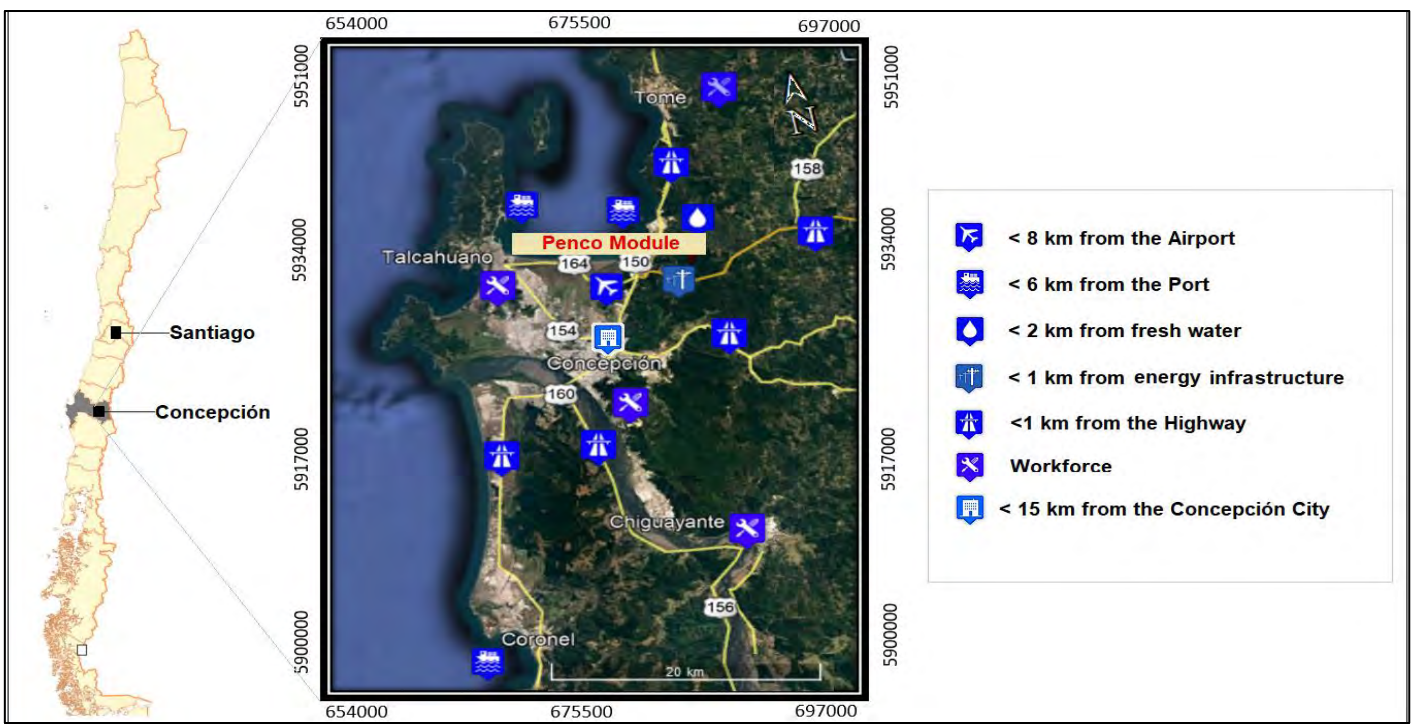
Ausenco was commissioned to complete a preliminary economic assessment (PEA) for the Penco Module located in the Biobio Region, in Chile, which is owned by REE UNO SpA, focused on the exploration and production of Rare Earth Carbonates at the Penco Module (the 'Project'). Ausenco has prepared this technical report in accordance with the guidelines provided in National Instrument 43-101 – *Standards of Disclosure for Mineral Projects* (NI 43- 101). Readers are cautioned that the PEA is preliminary in nature. It includes inferred Mineral Resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized.

1.2 Property description

1.2.1 Project Location

The Penco Module is located in the boundaries of the Penco and Concepcion districts, in the Biobio Region of Chile as shown in Figure 1-1. The majority of the deposits within the project are located in the Penco district.

Figure 1-1: Project Location



Note: prepared by Aclara,2021

1.2.2 Project Ownership

REE Uno SpA is a capital company incorporated as a corporation by shares (sociedad por acciones) in accordance with articles 424 to 446 of the Code of Commerce of the Republic of Chile. REE Uno SpA is the unique holder and owner of the Penco Module. Currently, REE Uno SpA has a single shareholder: Hochschild Mining Holding Limited.

1.2.3 Mineral Tenure, Surface Rights, Water Rights, Royalties and Agreements

REE UNO SpA owns 451,585 hectares of mining rights, distributed in the Maule, Ñuble, Biobio and Araucania Regions. These mining rights consist of exploitation concessions and exploration concessions.

The Penco Module, owned by REE Uno SpA, covers a surface area of approximately 600 hectares. The mineral holding properties of REE Uno SpA currently, between constituted and in process, correspond to 1,554 exploration concessions and 48 exploitation concessions; covering a total area of 451,585 hectares.

The project currently has sufficient surface rights acquired to support construction and development of the planned mining related infrastructure. At the Report effective date, the terms and the compensation of a mining land use easement were agreed with the owner of the Luna extraction area's surface rights. This land use easement covers and ensures all the hectares of the Luna extraction area; and the land use easement is valid over all the lifetime of the Project. This mining easement is in the drafting process.

REE Uno SpA holds water rights that meet the projected water requirements of the Project.

There are no third-party royalties, back-in rights, payments, or other encumbrances associated with the Project.

1.3 Geology and Mineralization

The Project covers an area of 6 km x 3 km, located in the Coastal Range in the Biobio Region in central-southern Chile and is hosted in a carboniferous granitoid batholith complex intruding the eastern metamorphic basement series. Four main rock complexes are recognized: Metapelites (Paleozoic basement), Eastern Concepcion Plutonic Complex (oldest intrusion, east of the project), Penco Granitoid Complex (host of REE-rich ore bodies) and the Quartz-Diorite (youngest intrusion). Locally, REE anomalies were detected through soil analysis, using a portable XRF in roadcut exposures. These findings were better defined by a radiometric flight, NanoTEM and LIDAR topography, confirming that the garnet-bearing granitoid (GG) is strongly correlated with the radiometric anomaly of thorium (Th).

These rocks have the development of an extensive and deeply weathered regolith (+/- 40 m). This regolith contains abundant clay minerals that were locally enriched with REE in the favorable horizons. Aclara carried out a geochemical program in the zone that found significant yttrium (Y), cerium (Ce) and thorium (Th) anomalies.

The regolith profile developed clay minerals with capacity for cation adsorption. Of them, the GG is the source of the REE mineralization and is the richest in exchangeable REE. Other lithologies such as the biotite-bearing diorite (DRT) and metapelites (MP) contain decreasing levels of exchangeable REE, based on proximity to the GG, due to secondary enrichment of REE-rich fluids sourced from the GG following lateral migration under specific geochemical conditions (pH, alteration). Thus, mineralization depends on GG weathering intensity and topography (flatter relief allows for thicker regolith profiles and preserves ore bodies).

The Penco regolith profile is up to 35 m thick and comprises, from the bottom up (Figure 7-5): Unaltered bedrock (Horizon D), transitional zone (Horizon C2), semi-weathered zone (Horizon C1), completely weathered zone (Horizon B), pedolith and topsoil (Horizon A).

The regolith profile is identified as the biotite-bearing diorite (DRT), metapelite (MP) and garnet-bearing granitoid (GG), the latter was used ahead as the model. Apart from core logging, geochemistry (major elements and total REE), mineralogy, pH, and exchangeable REE with ammonium sulfate were used to define the geologic units.

In this type of regolith deposit, typical hydrothermal alterations and structures do not seem to be useful for the definition of mineralization units as they do not seem to control the occurrence.

1.4 History

1.4.1 Ownership History

From 2012 to 2018 Minera BioLantánidos (MBL) was owned (94%) by a Chilean private fund controlled by a private equity firm named Minería Activa (MA).

Hochschild Mining (HM) invested, during 2018 and 2019, for a 6.2% equity stake with an increase ownership option. Finalizing 2019, HM took full ownership acquiring the remaining 93.8% stake.

During the month of August, 2021, REE Uno SpA -the Chilean company holding 100% of the Project started to implement a change in the trading name of the Project, from BioLantánidos to Penco Module. REE Uno SpA continues being the legal owner of all the Project's assets and rights and this is only a change in the commercial brand of the Project vis-a-vis its stakeholders, which has no legal impact in any of the Project's activities and pending processes. REE Uno SpA has started the registration of the relevant trademarks, logos and internet domain names to be associated with the use of the new commercial brand, both in Chile and Canada.

1.4.2 Exploration History

In 2012, MBL started an exploration program in the Penco area following an Ion Adsorption Clay model for Lanthanides, with focus in the migmatites and the pegmatites of the coastal batholith, leading to the discovery of the peraluminous granite of Penco.

High rare earth anomalies were detected in 2014 in outcrops, slopes by new roads involving radiometric flights, NanoTEM, Lidar topography, and surface sample ICP analysis. This sampling confirmed that the Garnet Granite (peraluminous granite, GG) is strongly correlated to the Th anomaly. In early 2015, concentrate samples using a pilot plant located in the Project were produced.

Also in 2014, MBL started sonic drills for the saprolite, without water injection or additives. In September 2014, a second sonic machine was introduced concluding the program in June 2015. The program completed 4,888 m in 166 sonic drill-holes and 1,171 m in 11 diamond drill-holes. During this period, Marisol, Alexandra, Victoria (Norte and Sur), Luna, and Maite were the defined orebodies. In August 2015 MBL started a new phase completing 3,239 meters with 125 sonic drill holes. The last phase, in 2017-2018, completed 5,522 meters in 176 sonic drill holes.

In 2020, MBL undertook a drill program to characterize the mineralogy, analyse the REE-total and REE exchangeable for a new updated resource model and estimation drilling 6,486 m in 220 sonic drill holes. In December 2020-March 2021, a new brownfield and infill campaign was executed with a total of 6,418 m in 259 sonic drill holes to extend the known mineralized orebodies, totalling 6,700 samples.

1.5 Exploration

HREE anomalies were detected analyzing soil geochemistry with Y, Ce, and Th readings using a portable XRF in roadcut exposures. These findings were subsequently tested by radiometric flight and NanoTEM, confirming a strong correlation between the garnet-bearing granitoid (GG) and a radiometric Th anomaly. In 2014, a drilling program was carried out, including 4,888 m in 166 sonic drill holes and 1,171 m in 11 diamond drill holes; and additional campaigns were carried out completing 3,239 m in 125 sonic drill holes during 2015; and 5,522 m in 176 sonic drill holes during 2017-2018.

In 2020-2021, BioLantánidos completed a drilling infill-exploration campaign to characterize the mineralogy and establish a new geological domain with a resource estimation of the Maite, Victoria (Norte and Sur), Luna and Alexandra orebodies, totaling 12,909 m in 479 sonic drill holes. Based on this database, geological domains for the four orebodies were determined.

The geological characteristics of the area show good possibilities of finding more prospects of this type. Geochemical maps show other anomalies to the NE and the geological environment to the north and south of the Project is very similar. Thus, exploration must prioritize looking for more GG occurrences in this belt.

1.6 Drilling and Sampling

The sonic drilling generates high frequency vibrations at approximately 150 Hz. These waves reduce the friction in the drilling bit, that prevent clay from sticking to the bit. This improves drilling speed, making it faster than traditional methods.

It is necessary to completely remove the drilling column until reaching the drilling barrel, where the sample is retained, in order to retrieve it. Then, with the help of sonic vibration plus pneumatic pressure, the sample is expelled from the interior of the drilling barrel and deposited inside a polyethylene sleeve previously installed on the outside of the barrel. Occasionally, it is necessary to inject pressurized water. The drilling diameter of 4½" inches were used, which generated between 15 and 20 kg of samples per 2-meter interval.

All drills were vertical and the diameter of the cores are 3.25 inches (8.25 cm). Cores were recovered in 1-2 m intervals and encased in plastic bags. The average sample length was 2 m except for limits between geological horizons or structures taking a 1 m sample. The drills where be about 30-40 m in depth (ranging between 10 and 50 m). The cores were logged, photographed and mapped, and split lengthwise manually. The minimum sample mass required to adequately produce samples that represent the core's original granulometric distribution were taken into account for the sampling and preparation protocol and QA/QC structure.

In general, the drills are in good condition and validate the correct transcription of grades from the certificates to the database. Ausenco reviewed portions of the certificates, finding no errors. Likewise, during the field visit, the logs were partially inspected, verifying that they are representative of what was observed in the cores of each of the sectors.

Additionally, the protocols for handling, logging, sampling and QA/QC of the sonic drilling samples have a sufficient level of detail, concluding that the processes are appropriate. Regarding the handling of the data obtained during the aforementioned processes, the manual use of the software for the administration of the database and the QA/QC (GEMM) has a good level of detail, concluding that it allows a safe and secure handling of data.

1.7 Data Verification

The exploration and production work completed by Aclara is conducted using documented procedures and involved verification and validation of exploration and production data, prior to consideration for geological modelling and Mineral

Resource estimation. During drilling, experienced geologists implemented industry standard measures designed to ensure the consistency and reliability of the exploration data.

Quality control failures are investigated and appropriate actions are taken when necessary, including requesting re-assaying of certain batches of samples.

The first visit was conducted on December 03 to December 04, 2020 by Luis Oviedo P. Geo. and Francisco Castillo P. Eng., both qualified persons as defined by National Instrument 43-101. The second site visit on July 28, 2021 was to verify the work produced by the new drilling program. The main change with this campaign was the quality of the resource with a substantial increment in Measured and Indicated, and a minor increment in the total volume of the resource.

During the visits, all aspects that could materially impact the integrity of the drill holes and sampling databases (core logging, sampling, and database management) were reviewed with Penco Module´s staff. Also, Ausenco was able to interview staff to ascertain exploration procedures and protocols.

Ausenco toured the area and observed drill sites, collars and field status of the demarcations, and examined cores from a number of drill holes, finding that the logging information accurately reflects the actual core. The lithology and grade contacts checked by Ausenco matched the information reported in the core logs.

Ausenco reviewed the drill hole databases for the preparation of this technical report and Ausenco concluded that it is adequate to produce the block models, tonnage and grade evaluations to a satisfactory degree.

A complete review of the QA/QC was made without identifying any significant problems.

Finally, Ausenco believes that the aforementioned desktop and in-the-field reviews have the standard limitations of this type of work but indicate that the level of data verification conducted is adequate.

1.8 Metallurgical Testwork

The metallurgical tests developed by the University of Concepcion (Chile) and University of Toronto (Canada) together with the tests developed on a pilot scale in Chapi (Peru) provide enough information to propose a design.

Numerous tests have been developed in a period of 7 years that have allowed for the definition of a process and the parameters necessary the production of rare earth carbonates to be defined.

The main variables studied are the following:

- Definition of the Leaching Reagent and its optimal concentration
- Definition of Rare Earth and Impurity Precipitation Reagent
- Determination of leaching pH that optimizes extraction
- Determination of pH for the precipitation of impurities
- Determination of pH for precipitation of rare earths
- Determination of solid / liquid ratio in mineral leaching

- Effect of Agitation on rare earth extraction
- Kinetics of: Leaching, Impurity Precipitation, Rare Earth Precipitation
- Effect of temperature on leaching
- Configuration of the countercurrent extraction process and Number of stages
- Effect of particle size on leaching
- Sulfuric acid consumption
- Use of flocculant and its effect on leaching
- Study of the effect of seeds on crystal growth
- Evaluation of the use of NaOH as a precipitating reagent.

The main results with which the process design was carried out are:

- Leaching reagent to be used for the extraction process is ammonium sulfate
- Optimal concentration of ammonium sulfate is 0.15 M
- Optimum pH of extraction is 3.0 to 4.0
- Optimal ratio of solid / liquid extraction 1/3
- Extraction time greater than 7 minutes
- Use ammonium bicarbonate to precipitate impurities at a pH between 5.5 to 6.0
- Reaction time in impurity precipitation is 30 minutes
- Use ammonium bicarbonate to precipitate Rare Earth at a pH between 7.0 to 7.5
- Rare Earth Precipitation Time is 120 minutes
- It is possible to carry out a sequential extraction circuit because the concentration of REE in the solution increases as the circuit progresses, being able to be reused and not lose extraction capacity
- The results show that it is possible to recover Rare Earth through a clay washing process in the sequential extraction tests. In addition, the washing stage allows to eliminate the ammonium retained in the clays
- Drained washing solutions do not contain Rare Earth or ammonium ions, which demonstrates the high effectiveness of the washing process.

The net process recovery of rare earth elements determined in metallurgical testing is shown in Table 1-1 and the product quality in Table 1-2.

The recovery of the plant is based on the high efficiency in the rare earth precipitation reactions together with the efficiency of the technology, of the solid / liquid separation system, and washing allow to achieve a recovery of 98.1% and a product quality of 91.9% total rare earths.

Table 1-1: Leaching and Plant Recovery

Element	Leaching	Plant Recovery	Total Recovery
	%	%	%
Y	46.39	98.4	45.63
La	13.35	99.1	13.24
Ce	2.31	98.1	2.26
Pr	14.68	98.9	14.53
Nd	15.33	99.1	15.19
Sm	19.10	98.0	18.72
Eu	36.55	97.3	35.56
Gd	23.68	99.1	23.46
Tb	32.72	95.8	31.34
Dy	36.36	92.7	33.71
Ho	39.35	97.1	38.22
Er	40.35	96.5	38.94
Tm	38.49	95.1	36.59
Yb	36.28	94.4	34.24
Lu	37.91	90.5	34.29
REE Total	18.49	98.1	18.13

Table 1-2: Rare Earth Product Quality

Description – Dry Filtered Product	Unit	Value
Dry carbonate	t/a	1,275
REE Law	%	51.4
REE2 (CO_3) law	%	91.9
Eq REEO Law	%	91.9

Section 13 presents the details of the tests developed, the results and conclusions.

1.9 Mineral Resource Estimation

The modelling and estimation were conducted using Leapfrog 6.0, Sage2001 and Datamine Studio Softwares. The support for the Resources estimate is the data collected from the 2020 and 2021 drill and mapping programs.

381 sonic drill holes, comprising 10,493 m of drilling, and 5,009 samples, 185 of these are in the Victoria area, 87 in the Maite area, 38 in the Luna area and 71 in the Alexandra area.

The lithologies are garnet granitoid (GG), diorite (DRT), metapelite (MP) transformed in 4 layers of regolith (A to D). These lithologies and regolith layers were modeled and later combined according to the previously described geology, to get the UG model (geological units). Aclara and Ausenco agree to estimate only B1, B2 and C1 levels because they contain the mineralization. Levels A, C2 and D were excluded because they did not present grades of economic interest.

Using Pearson's correlation coefficient, 2 groups represent the total rare earth grades in direct relation with heavy and light rare earth elements (HREET, LREET). Europium was not correlated with any group and was analyzed separately.

Group 1: Heavy Rare Earth Elements (HREE)

- Dysprosium
- Terbium
- Lutetium
- Yttrium
- Gadolinium
- Erbium
- Holmium
- Ytterbium
- Thulium

Group 2: Light Rare Earth Elements (LREE)

- Neodymium
- Praseodymium
- Lanthanum
- Samarium
- Cerium

The length of 2 metres was applied to generate the composite intervals, respecting the contacts between the different Estimation Domains.

Contact plots for each domain to determine rare earth elements (REE) were prepared in order to estimate if the contact between the domains is soft or hard. Cumulative probability distribution by domain to define grade outliers, restriction was applied to high grade values, replacing by the outlier limit.

Down-the-hole and directional correlograms were constructed for HREET and LREET for all sectors to provide search distance and anisotropy direction to be used in the estimation. Blocks of 10 m x 10 m x 2 m, non-rotated, were considered.

The grades of the 15 total rare earth elements were estimated by domains using ordinary kriging (OK). The grade estimation was completed in three passes, using samples with at least three drill-hole in the first pass, with two in the second and at least one in the third pass.

The resource classification should integrate criteria addressing at least the following four parameters:

- Geological continuity of the mineralization (confidence in location, geometry and thickness between drill holes)
- Grade continuity
- Data quality and support (multiple points of support)
- Reasonable prospects for economic extraction

Measured: To date, the deposit does not have production data, so the short-range continuity has not been studied in detail. Thus, the level of confidence defined in this category of resources is suitable for generating volumes that are associated with quarterly or broader production plans, where the error of the fine produced should not exceed 15% in 90% of the cases.

For the materialization of the criteria adopted, the blocks estimated with at least three drill holes and the closest sample less than 40 m or, those blocks that were estimated with two drillings, but the nearest sample is at 24 m maximum.

Indicated: The level of confidence defined is suitable for volumes that are associated with one-year production plans, where the error of the fine produced, should be maintained and should not exceed 15% for 90% of the cases.

This category includes blocks estimated with at least three drill holes and the closest sample is less than 75 m or, those blocks that were estimated with less than three drill holes, but the closest sample is at a maximum of 40 m.

Inferred: Included in this category are all those estimated blocks that have not been classified as Measured or Indicated Resources.

For the Luna and Alexandra sectors, peripheral perimeters were generated with a 50-m distance from the edge of the last drilling run, in order to control that the classification of Measured or Indicated Resources is not affected by blocks that could potentially be considered extrapolated.

During the development of the resource estimation and mining studies, Aclara detected that its previous methodology to determine the Extraction Value had a bias of around 5% average downward, considering all the elements. Therefore, Aclara determined the correction factors for heavy rare earths, light rare earths and Europium. This correction was applied only to the extraction values within the estimation domains corresponding to GG lithology.

Reasonable prospects of eventual economic extraction were addressed by applying a resource pit shell defined using Whittle software and the parameters outlined from Table 1-3 through Table 1-6. Pit slope angles were derived from a study carried out by Lancuyén Ingeniería (2021) as shown in Table 1-7. The valuation of each block will be calculated using the Net Smelter Return methodology

Table 1-3: Metal Prices

Element	USD/kg
Dy_2O_3	566.37
Nd_2O_3	97.34
Tb_4O_7	1,415.92
Lu_2O_3	707.96
Y_2O_3	7.39
Er_2O_3	34.64
Gd_2O_3	37.16
Pr_6O_{11}	106.19
Ho_2O_3	111.50
Yb_2O_3	17.66
La_2O_3	2.86
Eu_2O_3	49.35
Sm_2O_3	2.45
Ce_2O_3	2.01
Tm_2O_3	0.00

Table 1-4: Conversion Factors

Element	Conversion Factor
Dy_2O_3	1.1477
Nd_2O_3	1.1664
Tb_4O_7	1.1761
Lu_2O_3	1.1371
Y_2O_3	1.2699
Er_2O_3	1.1435
Gd_2O_3	1.1526
Pr_6O_{11}	1.2081
Ho_2O_3	1.1455
Yb_2O_3	1.1386

Element	Conversion Factor
La_2O_3	1.1727
Eu_2O_3	1.1580
Sm_2O_3	1.1596
Ce_2O_3	1.1712
Tm_2O_3	1.1421

Table 1-5: Operating and financial parameters

Item	Unit	Value
Processing Cost	USD/t processed	7.13
G&A	USD/t processed	2.66
Discount	USD/kg Concentrate	7
Selling Cost	USD/kg Concentrate	0.032
Concentrate Purity	%	92.61%
Concentrate Moisture	%	<1%

Table 1-6: Mining Cost

Item	Unit	Alex.	Luna	Maite	V. Norte	V. Sur
Mining Cost	USD/t moved	2.14	1.96	2.25	2.00	1.86

Table 1-7: Overall Slope Angle

Parameter	Silty Clay	Maicillo
	Dry Talus	Dry Talus
Overall Slope	25°	30°

1.10 Mineral Resource Statement

Mineral Resource considers geology, mining, processing and economic constraints, and have been confined within appropriate LG pit shells, and therefore are classified in accordance with the 2014 CIM Definition Standards for Mineral Resources and Mineral Reserves. Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability.

The Penco Module mineral estimate was prepared by Luis Oviedo. Senior Geologist and Francisco Castillo, Ausenco Principal Resource Engineer. Mr. Luis Oviedo and Mr. Francisco Castillo are Qualified Persons for the estimate and are both

Registered Members of the Chilean Mining Commission. The effective date of the Mineral Resource estimate is August 19, 2021.

The Mineral Resources are not mineral reserves as they do not have demonstrated economic viability.

Mineral Resources are presented in Table 1-8 through Table 1-13 applying cut-off NSR of 9.79 USD/t

Table 1-8: Mineral Resource Statement

Category	Tonnage (t)	NSR (USD/t)	REYT (ppm)	TREO (ppm)	REO total content (t)	Recovery
Measured	15,357,416	28	2,080	2,467	37,887	18%
Indicated	5,323,628	25	1,945	2,309	12,292	17%
Measured + Indicated	20,681,044	27	2,045	2,426	50,178	18%
Inferred	2,083,200	24	1,936	2,299	4,788	16%

Table 1-9: Mineral Resource Statement by Sector

Sector	Category	Tonnage (t)	NSR (USD/t)	REYT (ppm)	TREO (ppm)	REO total content (t)	Recovery
Victoria Norte	Measured	5,210,244	29	2,394	2,837	14,782	18%
	Indicated	791,558	22	2,285	2,706	2,142	14%
	Inferred	177,568	20	2,368	2,803	498	13%
Sector	Category	Tonnage (t)	NSR (USD/t)	REYT (ppm)	TREO (ppm)	REO total content (t)	Recovery
Victoria Sur	Measured	1,496,982	24	1,639	1,943	2,909	19%
	Indicated	563,052	26	1,864	2,211	1,245	18%
	Inferred	369,265	23	2,021	2,397	885	15%
Sector	Category	Tonnage (t)	NSR (USD/t)	REYT (ppm)	TREO (ppm)	REO total content (t)	Recovery
Luna	Measured	1,104,992	30	1,353	1,617	1,787	26%
	Indicated	708,122	25	1,185	1,418	1,004	25%
	Inferred	311,517	26	1,105	1,321	411	31%
Sector	Category	Tonnage (t)	NSR (USD/t)	REYT (ppm)	TREO (ppm)	REO total content (t)	Recovery
Alexandra	Measured	2,160,105	26	2,082	2,473	5,341	15%
	Indicated	1,450,332	23	2,053	2,439	3,537	14%
	Inferred	749,167	23	2,038	2,420	1,813	14%
Sector	Category	Tonnage (t)	NSR (USD/t)	REYT (ppm)	TREO (ppm)	REO total content (t)	Recovery
Maite	Measured	5,385,093	28	2,046	2,427	13,067	18%
	Indicated	1,810,565	26	2,033	2,410	4,364	17%
	Inferred	475,684	26	2,094	2,482	1,181	17%

Table 1-10: Mineral Resource Statement by Rare Earth Elements

Category	Tonnage (t)	Y (ppm)	La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)	Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)
Measured	15,357,416	359	346	696	75	326	54	3	52	9	63	13	39	6	35	5
Indicated	5,323,628	349	316	640	73	300	50	3	50	9	61	13	38	5	34	5
Measured + Indicated	**20,681,044**	**356**	**338**	**682**	**74**	**319**	**53**	**3**	**52**	**9**	**62**	**13**	**39**	**6**	**35**	**5**
Inferred	2,083,200	352	313	631	74	297	50	3	50	9	61	13	38	6	35	5

Table 1-11: Mineral Resource Statement by Rare Earth Elements and Sectors

Sector	Category	Tonnage (t)	Y (ppm)	La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)	Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)
Victoria Norte	Measured	5,210,244	384	420	831	76	384	61	3	57	9	65	14	41	6	38	5
	Indicated	791,558	336	405	822	76	372	59	3	53	9	58	12	37	5	33	5
	Inferred	177,568	343	410	865	82	385	60	2	54	9	60	13	38	6	35	5
Sector	Category	Tonnage (t)	Y (ppm)	La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)	Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)
Victoria Sur	Measured	1,496,982	279	267	547	59	260	46	3	46	8	53	10	28	4	25	4
	Indicated	563,052	316	308	626	67	293	50	3	50	9	58	12	34	5	31	4
	Inferred	369,265	348	332	681	75	312	51	3	52	9	62	13	38	6	35	5
Sector	Category	Tonnage (t)	Y (ppm)	La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)	Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)
Luna	Measured	1,104,992	380	172	333	43	171	31	3	42	8	65	14	42	6	38	5
	Indicated	708,122	347	149	278	37	150	27	3	37	7	57	13	38	5	33	5
	Inferred	311,517	307	146	274	36	141	25	3	34	7	51	11	33	5	29	4
Sector	Category	Tonnage (t)	Y (ppm)	La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)	Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)
Alexandra	Measured	2,160,105	394	330	662	81	317	54	3	54	10	68	15	44	6	40	6
	Indicated	1,450,332	394	323	650	79	310	53	3	54	10	68	15	43	6	39	6
	Inferred	749,167	381	327	645	81	312	54	3	54	9	66	15	42	6	38	6
	Total	**4,359,603**	**392**	**327**	**655**	**81**	**313**	**54**	**3**	**54**	**10**	**68**	**15**	**43**	**6**	**39**	**6**
Sector	Category	Tonnage (t)	Y (ppm)	La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)	Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)
Maite	Measured	5,385,093	338	338	696	83	323	53	3	51	9	60	12	37	5	33	5
	Indicated	1,810,565	330	339	697	83	322	53	3	50	8	59	12	36	5	32	5
	Inferred	475,684	343	348	718	85	330	54	2	51	9	60	12	37	5	33	5

Table 1-12: Mineral Resource Statement grade of REO by elements

Category	Tonnage (t)	Grade (REO)	Y2O3	La2O3	Ce2O3	Pr6O11	Nd2O3	Sm2O3	Eu2O3	Gd2O3	Tb4O7	Dy2O3	Ho2O3	Er2O3	Tm2O3	Yb2O3	Lu2O3	REO total content (t)
		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
Measured	15,357,416	2,467	456	406	816	91	380	62	3	60	11	72	15	44	6	40	6	37,887
Indicated	5,323,628	2,309	443	371	749	88	350	58	3	57	10	70	15	43	6	39	6	12,292
Measured + Indicated	**20,681,044**	**2,426**	**452**	**397**	**798**	**90**	**372**	**61**	**3**	**59**	**10**	**71**	**15**	**44**	**6**	**40**	**6**	**50,178**
Inferred	2,083,200	2,299	447	367	740	89	346	58	3	57	10	70	15	44	6	40	6	4,788

Table 1-13: Mineral Resource Statement by REO elements and sector

Sector	Category	Tonnage (t)	Grade (REO)	Y2O3	La2O3	Ce2O3	Pr6O11	Nd2O3	Sm2O3	Eu2O3	Gd2O3	Tb4O7	Dy2O3	Ho2O3	Er2O3	Tm2O3	Yb2O3	Lu2O3	REO total content (t)
			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
Victoria Norte	Measured	5,210,244	2,837	487	493	973	91	448	71	3	66	11	74	16	47	7	43	6	14,782
	Indicated	791,558	2,706	427	475	963	91	434	69	3	62	10	67	14	42	6	38	5	2,142
	Measured + Indicated	6,001,802	2,820	479	491	971	91	446	71	3	65	11	73	16	47	7	43	6	16,924
	Inferred	177,568	2,803	436	481	1,014	99	449	70	3	62	10	69	15	43	6	40	6	498
Victoria Sur	Measured	1,496,982	1,943	354	313	641	72	303	54	3	53	9	61	12	32	5	28	4	2,909
	Indicated	563,052	2,211	401	361	733	82	342	58	3	57	10	66	13	39	6	35	5	1,245
	Measured + Indicated	2,060,034	2,016	367	326	666	74	313	55	3	54	10	62	12	34	5	30	4	4,154
	Inferred	369,265	2,397	442	389	798	90	364	60	3	60	11	71	15	43	6	39	6	885
Luna	Measured	1,104,992	1,617	482	202	390	51	200	35	3	48	10	75	16	48	7	43	6	1,787
	Indicated	708,122	1,418	440	175	325	45	175	31	3	43	9	65	15	43	6	38	5	1,004
		1,813,113	1,539	466	192	364	49	190	34	3	46	9	71	16	46	6	41	6	2,791

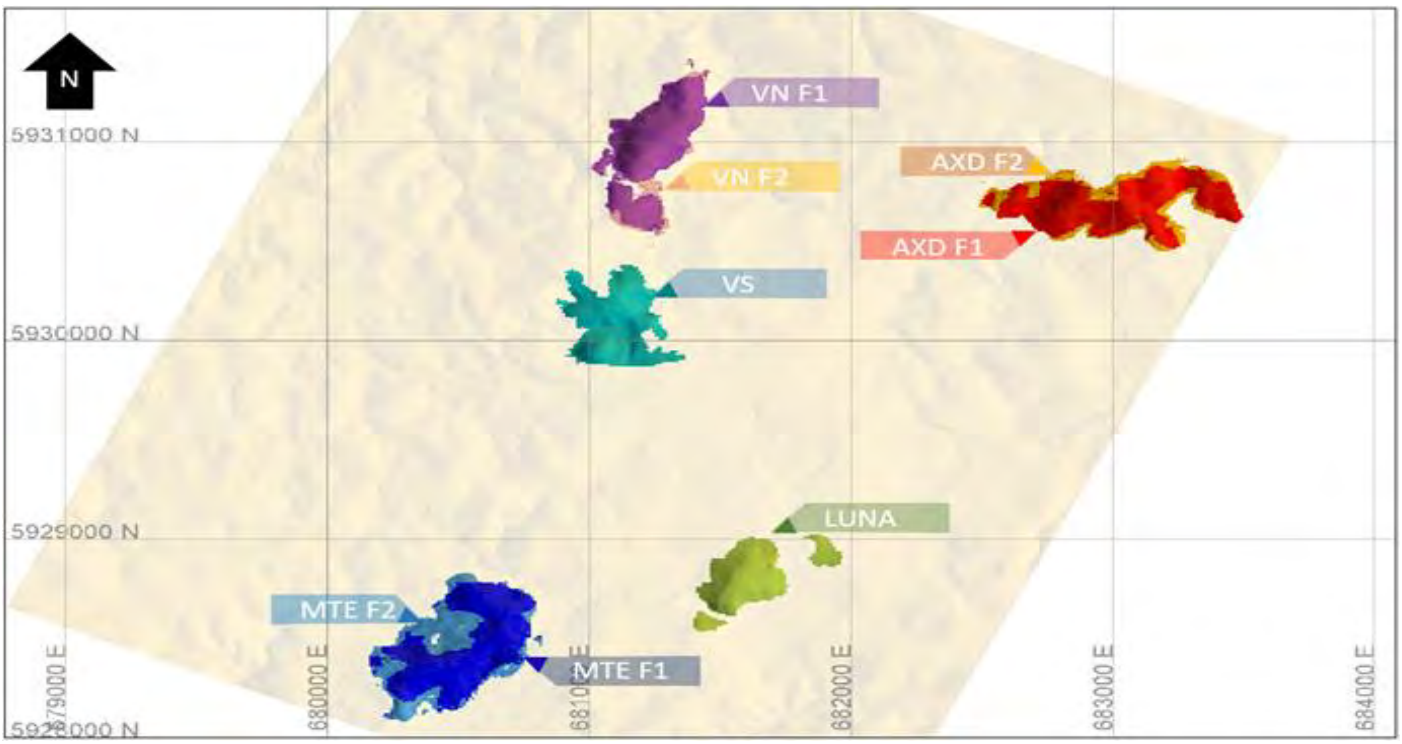
Sector	Category	Tonnage (t)	Grade (REO)	Y2O3	La2O3	Ce2O3	Pr6O11	Nd2O3	Sm2O3	Eu2O3	Gd2O3	Tb4O7	Dy2O3	Ho2O3	Er2O3	Tm2O3	Yb2O3	Lu2O3	REO total content (t)
			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
	Measured + Indicated																		
	Inferred	311,517	1,321	389	171	320	43	164	29	4	39	8	59	13	38	5	34	5	411
Alexandra	Measured	2,160,105	2,473	500	387	775	98	369	62	3	62	11	78	17	50	7	45	7	5,341
	Indicated	1,450,332	2,439	500	379	761	96	361	62	3	62	11	78	17	49	7	45	6	3,537
	Measured + Indicated	3,610,437	2,459	500	384	769	97	366	62	3	62	11	78	17	50	7	45	6	8,878
	Inferred	749,167	2,420	484	384	755	98	364	62	3	62	11	76	17	48	7	43	6	1,813
Maite	Measured	5,385,093	2,427	430	396	816	100	377	62	3	58	10	69	14	42	6	38	5	13,067
	Indicated	1,810,565	2,410	420	398	817	100	375	61	3	57	10	67	14	41	6	37	5	4,364
	Measured + Indicated	7,195,658	2,422	427	396	816	100	376	62	3	58	10	69	14	42	6	38	5	17,431
	Inferred	475,684	2,482	436	408	841	103	385	63	3	59	10	69	14	42	6	38	5	1,181

1.11 Mining Methods

As the aforementioned technical studies for the Preliminary Economic Assessment of the Project were developed, the following outcomes were obtained based on the available information:

- The final sequence obtained, following the plans indicated in the previous point, corresponds to Victoria Sur - Victoria Norte - Luna - Maite - Alexandra. (Figure 1-2)
- A sequential exploitation of the sectors is carried out. Once mining has been completed in one sector, then begins in another.
- Regarding the final pit shells selected by sector, Figure 1-2 shows a representation of the mining phases.

Figure 1-2: Mining Phases Location



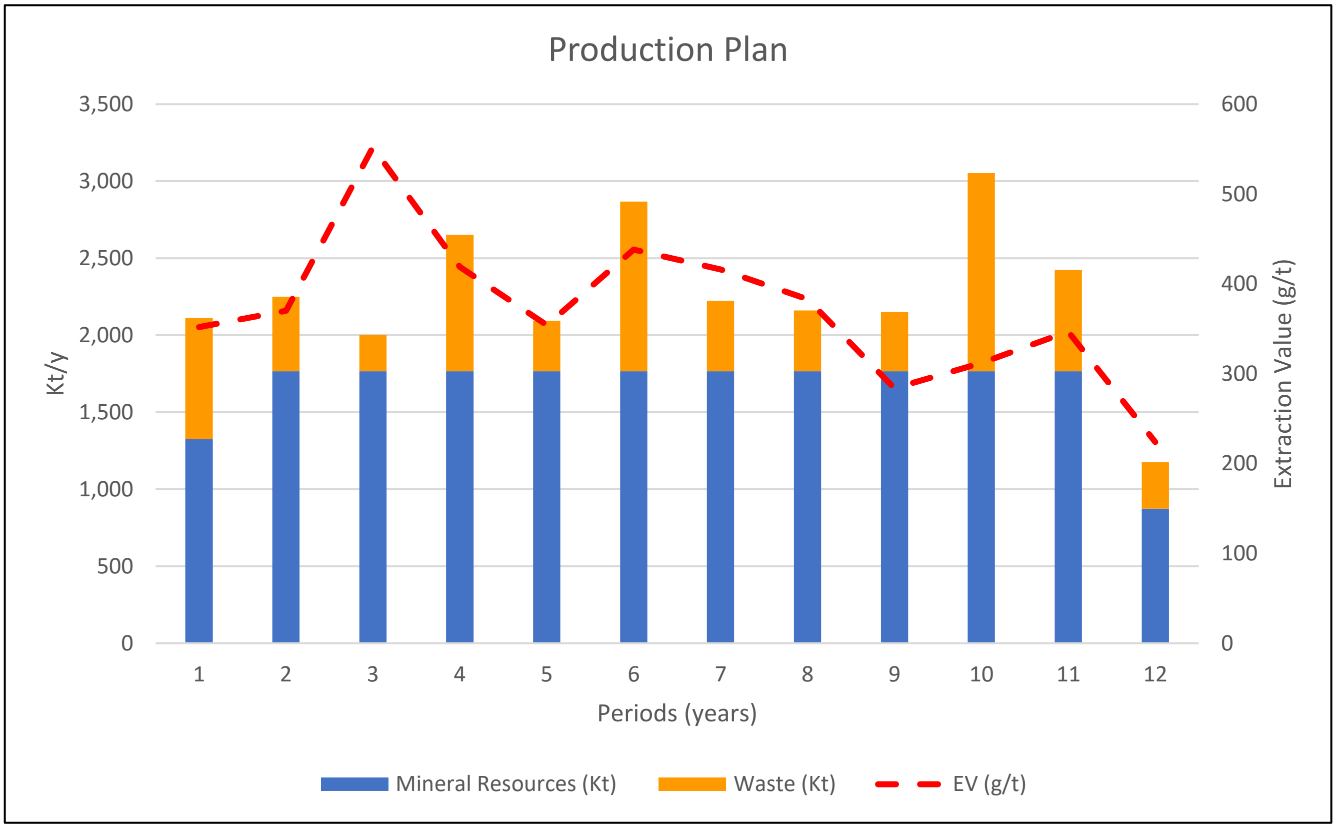
Note: prepared by Ausenco, 2021.

- Overall pit angles per rock type were used in the pit optimization analysis. No final pit and mining phase designs were generated during this stage of the Project.
- The mining Project consists of 5 pits: Victoria Norte, Victoria Sur, Alexandra, Maite, and Luna. In addition, there are Waste Disposal Facilities called Jupiter and Neptuno plus three temporary topsoil deposits or stockpiles.

- Three types of materials are obtained from mining the deposits: mineralized material, waste, and topsoil, which are destined for processing plants, disposal areas and temporary stockpiles respectively. Mineralized material will be sent to the processing plant, the waste and filtered tailings (mineralized material that have already been processed) will be sent to the Waste Disposal Facilities and the topsoil will be sent to temporary stockpiles.

- The production plan reflects a production rate of 1,765,680 t dry per annum of mineralized material, resulting in a Project life of 12 years considering a ramp-up (75% of the expected process plant feed) and final period of 6 month. (Figure 1-3).

Figure 1-3: Annual Production Plan



Note: prepared by Ausenco, 2021

- Together, the Jupiter and Neptuno deposits have a total capacity of approximately 21.2 million cubic meters, therefore, they have 12% of available volume.

- Regarding the temporary topsoil stockpiles, the three projected sectors together have a capacity of 1.5 million cubic meters, while the estimated volume of topsoil to be managed corresponds to approximately 900 cubic meters (without considering the volumes of topsoil for additional infrastructure) corresponding to the mined material from the pits, preparation of disposal zones, and the processing plant foundation area. This volume considers a 50-cm-thick layer and a 12% swelling factor.

1.12 Recovery Methods

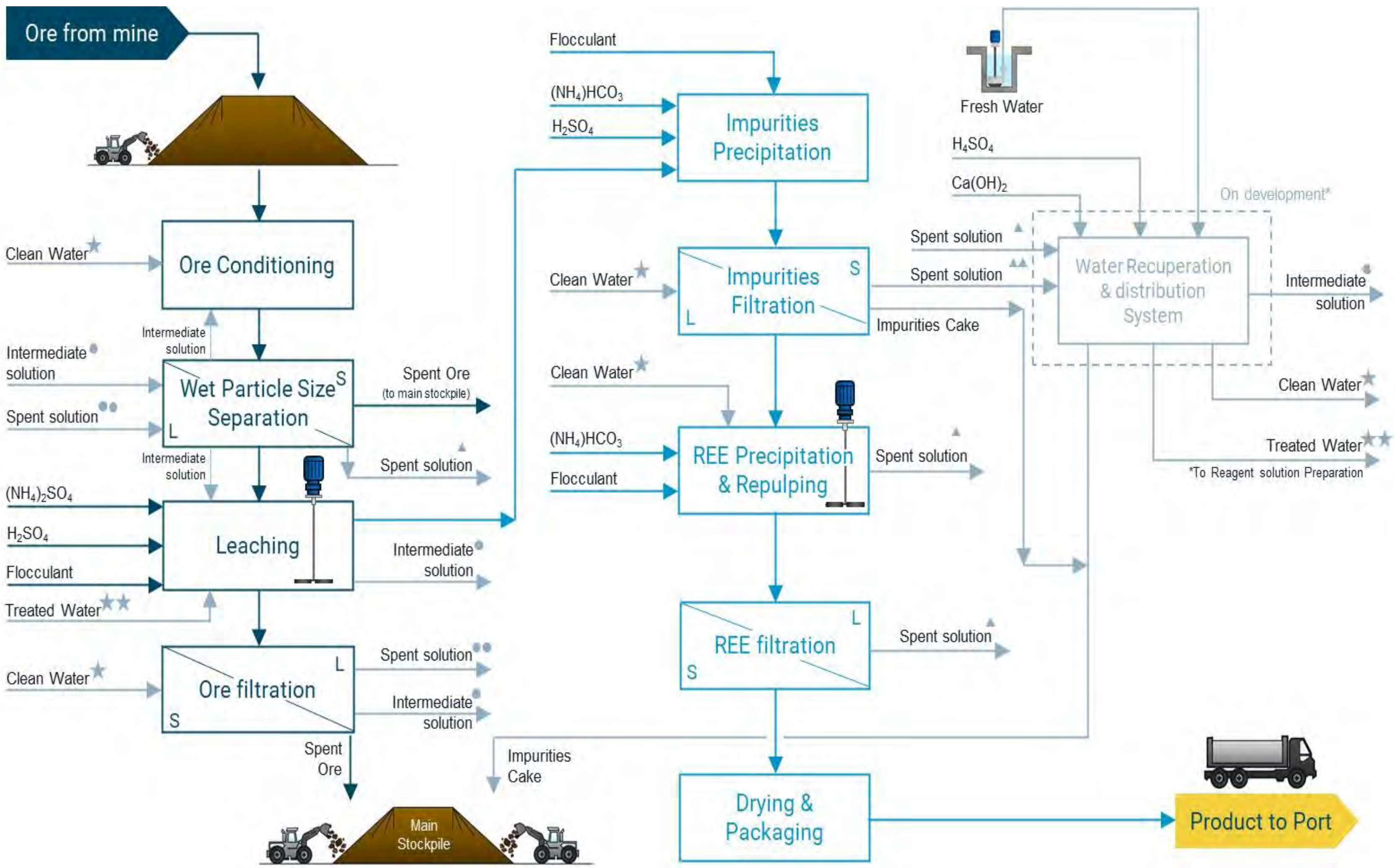
The facilities have been designed to treat 240 t / h of wet mineral and, through a leaching and precipitation process, obtain rare earth carbonate at a rate of 1,227 t/y.

The wet mineral from the mine remains in stockpile for 6 days with the purpose of squeezing the mineral from the excess water, then the mineral goes to a size selection process by means of a washing drum and a wet screen. The wet mineral continues the counter-current leaching process in thickeners using ammonium sulfate as a leaching reagent in an aqueous solution at a pH between 3.0 and 4.0. The pulp (spent ore + Liquid) is separated by means of a plate filter where the tailings are washed with water to reduce the contribution of stock solution in the impregnation of the mineral. These tailings go to a stacking sector and is then removed by trucks to its final disposal.

The solution rich in rare earths and pollutants generated in the extraction process is sent to the impurity precipitation stage, which is achieved by the Ammonium Bicarbonate reagent in aqueous solution at a pH between 5.0 and 5.5. Aluminum and iron precipitate are separated using a polishing filtering system and sent to the spent ore pile for final disposal. The liquid product rich in rare earths is sent to the carbonation sector which also uses Ammonium Bicarbonate in aqueous solution, but at a more basic pH between 7.0 to 7.5. The product, Rare Earth Carbonate, is separated with a polishing filtering system, where a part of the solution is recycled to the leaching process and the other weaker solution, product of the washings, is sent to the water recovery system, which is still under development. The wet product is discharged into a tank which contains abundant water in order to wash the product and then this pulp is discharged into a plate filter that again proceeds to wash the product. The liquid is sent to the same water recovery system and the product to the drying and packaging process.

A simplified diagram of the process is presented in Figure 1-4 and a detailed description of the process is presented in Section 17.

Figure 1-4: Process Flowsheet



Note: prepared by Ausenco, 2021

1.13 Project Infrastructure

Infrastructure to support the Penco Module will consist mainly of site civil work, site facilities/building, a water system, and site electrical.

Site civil work will include designs for the following infrastructure:

- Access and internal roads;
- Process facility platforms; and
- Disposal zones.

Site facilities will include both mine facilities and process facilities:

- The mine facilities will include the administration offices, canteen, mine workshop and change house. Explosives storage is not considered due to the operational definition of not considering drilling and blasting unit operations.
- The process facilities will include the process plant, administration offices, laboratory, warehouse, fuel storage, and miscellaneous facilities.
- Process facilities will be serviced with fresh water taken from the Penco Water Intake, fire water, compressed air, power and communication. In addition, a potable water tank that will be supplied by a tank truck will be considered in the Project.

1.13.1 Roads and Logistics

Access to the site from the Town of Penco is 5 km via Route 150 that connect with a 7 km paved road that leads to the site.

To access the different Project areas, about 10 km of existing roads will be used without modifications, 5 km of existing roads will be improved, and 15 km of new roads will be developed.

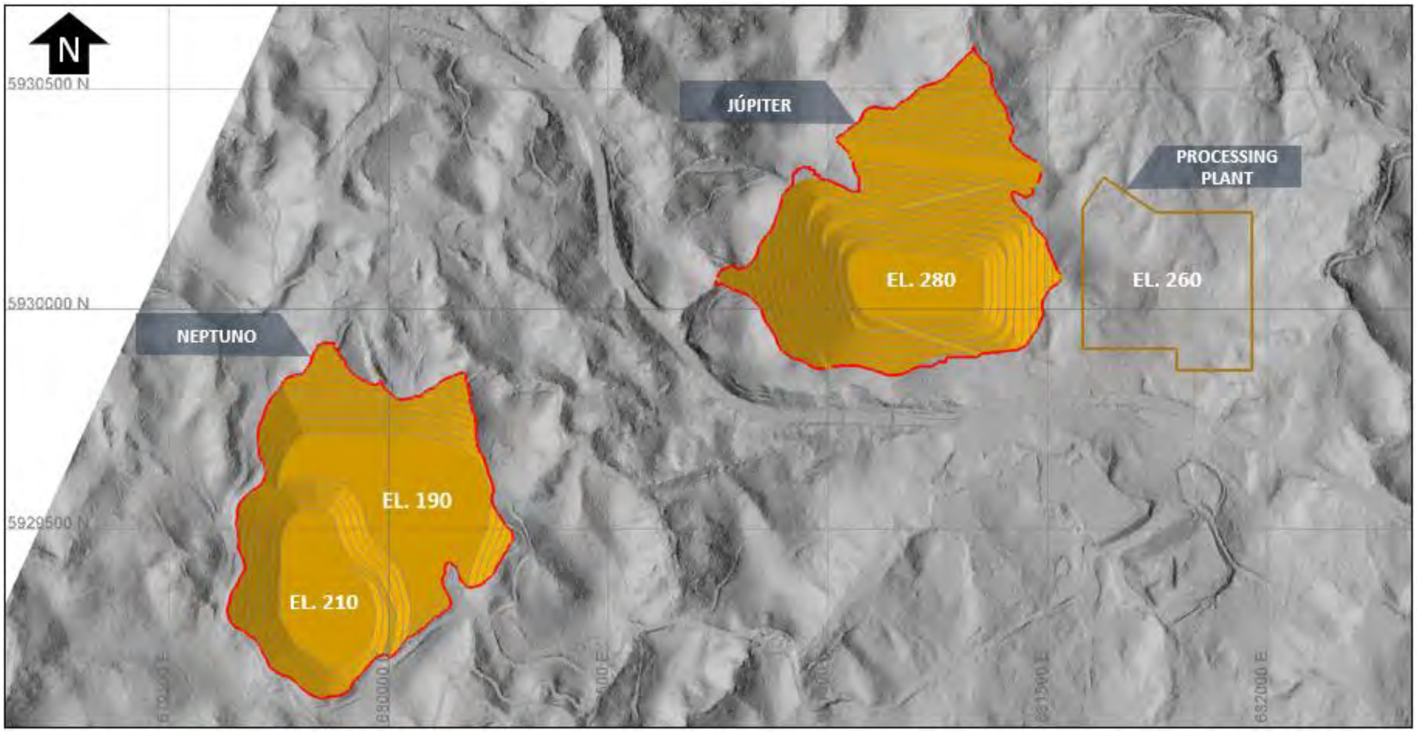
1.13.2 Waste Disposal Facilities (WDF)

The Project´s operation considers two WDFs; Jupiter, located near the process plant, and Neptuno, located 1 km southwest of Jupiter. The WDFs are designed to consist of co-placement of waste residual soil and filtered tailings from the process plant. It is important to notice that no comminution process is considered and that filtered tailings are obtained with pressure filters incorporated in the Process Plant to produce cake material that can be transported by trucks or conveyors.

No civil infrastructure-like buildings or roof structures are required, nor is a bottom geomembrane.

The location of the WDFs are shown in Figure 1-5.

Figure 1-5: **Waste Disposal Facilities Location**



Note: prepared by Ausenco, 2021.

The primary design objectives for the waste disposal facilities (WDF) are the secure confinement of waste residual soil and filtered tailings from the process plant and the protection of regional groundwater and surface water during mine operations and in the long term (post-closure).

WDFs were designed under geotechnical campaign outcomes, which provided information from laboratory programs defined to characterize both, founding geotechnical properties and waste materials. Preliminary Stability analyses were completed to assess the performance (i.e. factor of safety) of the WDF under static and pseudo static (seismic) loading conditions. The WDFs show a static factor of safety above 1.5 and a pseudo-static factor of safety above 1.1 that meet international standards.

1.13.3 Water Management

A projected water balance results in a consumption of 11.7 m^3/h of fresh water for the Process Plant. Considering other water consumptions related to services and road wetting, the estimated total consumption of fresh water is 35 m^3/h. The water supply consists of catchment and drive system from the Penco creek, where the water will be fed to the Processing Plant through a pipeline that will supply the required water for the Project. The catchment will be set by a water intake.

This process has the restriction of not generating liquid industrial waste, except for those contained in the impregnation of the solids discarded in mineral rubble or impurities. To achieve this condition, the design considers recovering the water from the weak solutions generated in the process (weak solutions from filtrations and repulping mainly) and treating them with reagents and technologies available in the industry in such a way that the recovered water returns to the process, significantly reducing the consumption of fresh water and the precipitate generated is deposited next to the rubble in its final disposal. This stage of water recovery is under development. Laboratory tests will soon begin to conform to the assumptions of the proposed design.

The overall water management concept for rainwater is to convey, evacuate and drain it in the extraction zones and in the WDF of the Project. Water management components in each area consist of evacuation channels, contour channels and discharge to ravines.

1.13.4 Built Infrastructure

The processing plant and associated infrastructure covers an area of 13.6 hectares, where there will be facilities and areas associated with ore processing, waste management and personnel services. The process plant area includes the following facilities:

Area 100 – Ore Stacking and Feeding. It will include a roofed shed without walls for a limited sector where ore blending will take place.

Area 200 – Mineral Leaching. It will have Thickeners (CCD), Plate Filters, Belt Filter, Belt Conveyor, Receptions Tank, Wet Screen, Dosage Pumps.

Area 300 - Impurities Precipitation. It will have Precipitation Reactors, Polishing Filter, Tanks, Dosage Pumps.

Area 400 – Precipitation and Drying of Carbonates. It will have Reactors Carbonation, Polishing Filters, Tanks Repulping, Plate Filter, Drying, and Packaging, Hopper, Belt Conveyor, Dosage Pump.

Area 500 – Water Recovery System. It will have Precipitation Reactors, Dosage Pumps, Nanofiltration, Reverse Osmosis and Ion Exchanges, Hopper.

Area 600 - Reagent Warehouse. There is a storage warehouse for chemical products for the various chemical products required in the process.

Area 700 - Administration, Offices and Laboratory. It is considered an administrative building, laboratory, dining hall, dressing rooms and control room.

Area 800 - Geological Core Sample Warehouse

Area 900 – Spend Ore Stacking

1.13.5 Accommodation

All employees will be housed offsite because of the location of the Project close to Penco and Concepcion districts. No accommodation camp is considered.

1.13.6 Power and Electrical

Average power demand will be 4.0 MW. For the process plant operation, the electrical power is considered to come from an existing line of 15 kV at 152 Route, located 300 m from the plant. For the operation of the water intake, a new line of 15 kV will tie-in to an existing line close to the water intake at 0-390 Route. To supply some critical process loads, a diesel generator of 1 MW, in low voltage (380 Volts) will be considered.

1.14 Environmental, Permitting and Social Considerations

The Project is located in Biobio Region, within the Penco and Concepcion districts, southeast of the city of Penco, covering an approximate intervention area of 240 ha for the entire Project. Being a mining project that considers exploitation, processing plants and waste and sterile disposal, the Project entered the Environmental Impact Assessment System (SEIA), as established in paragraph i) of Law 19.300 on General Environmental Bases modified by Law 20.417/2010, by means of an Environmental Impact Assessment (EIA).

1.14.1 Environmental Considerations

In accordance with the provisions of article 18 literal e) of D.S. N°40/12, Regulation for the Environmental Impact Assessment System (RSEIA), the Project's EIA presented several baseline studies for different environmental components such as: climate and meteorology, air quality, noise and vibrations, geology and geomorphology, hydrology, hydrogeology, water quality, soil science, flora and vegetation, terrestrial fauna, limnology, archaeology, landscape, human environment, protected areas, among others. From these studies, the EIA determined the existence of environmental impacts deemed as significant for soil, terrestrial fauna and flora and vegetation. These impacts will be addressed by the Project through mitigation, reparation and/or compensation measures, such as conservation plans and afforestation for native forest and protected species, relocation plans for low mobility fauna, the removal, storage and replacement of the topsoil cover during closure, among others. Monitoring measures are also in place to verify the correct application of these measures and compliance with the expected results.

In terms of wastes and emissions, these will be managed through mitigation measures (to minimize generation) and appropriate disposal by authorized contractors and offsite final disposal sites. Mining waste will be generated at the Extraction Zones (EZ) and by the Process Plant and will de disposed of at the Disposal Zones (DZ) Jupiter and Neptuno. In Addendum N°1 a complete characterization of the material was carried out, consisting of Total Rock, SPLP, mineralogy and pH analysis. Although specific values of Manganese (Mn), Ammonium (NH_4) and Sulfate (SO_4) slightly exceeded the maximum permissible concentrations in reference water standards (D.S N°90/2000 and NCh 1.333) it is highly unlikely that laboratory conditions (acid rainwater in agitation for 18 hours) will be replicated on the field. Additionally, water management measures and infrastructure, such as contour and discharge channels, will be put in place in order to minimize surface runoff entering the disposal zones and reduce infiltration, helped also by the level of compaction that the waste will have in the disposal areas. Considering these facts, the concentrations of any contaminants are expected to be much lower and under full compliance with relevant water reference standards. Contingency and emergency measures will also be in place in case any exceedances occur.

1.14.2 Closure and Reclamation Considerations

Regarding the Closure Plan, the EIA includes a preliminary version of the Mine Closure Plan (presented as PAS 137). Subsequently, once the Environmental License (RCA) has been obtained, a specific sectoral application must be presented to the National Geology and Mining Service (SERNAGEOMIN) to obtain the final Mine Closure Plan Permit. The technical requirements for this permit are to include all measures to provide physical and chemical stability of the Project area and a financial assessment of the costs of closing all mine facilities.

The main closure measures identified at this stage are the replacement of the previously removed topsoil layer on Disposal Zones and the subsequent revegetation with native species, that will allow for a much better recovery of the local ecosystems and possible alternative land use.

1.14.3 Permitting Considerations

The Project, submitted for Environmental Assessment in 2018, is moving forward with the development and presentation of Addendum N°2. This document corresponds to the responses to inquiries from relevant government services and raised by the community as a result of the Community Participation Processes.

As part of the review of the EIA, one environmental authority, the Environmental Assessment Service (SEA) has expressed concern about the possible effects of the Project over traditional activities in which two local indigenous communities participate and requested a complementary anthropological characterization of the area and communities to rule out an eventual Indigenous Consultation Process, which could extend the environmental licensing process, and to determine the appropriate mitigation and/or compensation measures, if applicable. On the other hand, the National Corporation for Indigenous Development (CONADI) has officially informed of their conformity with the information provided in the EIA and considers there will be no negative effects on these cultural practices. Following SEA's request, REE conducted the anthropological characterization, to be presented in Addendum N°2, and expects this will confirm CONADI's assessment on the nonexistence of significant impacts.

Although it is expected that after Addendum N°2 the environmental authority will proceed with considering the Project and issuing the corresponding Environmental License (RCA), it is possible that a new round of review will be opened, which would require a new Addendum to be presented (Addendum N°3). To minimize this possibility, Addendum N°2, which is to be submitted in November 2021, should be presented with the highest sufficiency of information possible, in order to obtain a vote for its approval by the Environmental Assessment Commission during Q1 2022.

In addition to the above, a strategic approach with the different government technical services that will review the Addendum and technically pronounce in favor or against the Project has been undertaken. It is recommended to maintain contact with the authorities in order to have a better understanding of their concerns about the Project and find the best way to resolve them.

1.14.4 Social Considerations

Finally, the Project has developed a Community Relationship Plan (CRP) since August 2020, which aims to communicate the most relevant milestones and aspects of the Project, as well as to guide the proper development of the community relationship with the main stakeholders and propose the actions to be carried out during the stages of evaluation, construction, operation, and closure. Currently, a strategy of relationship with stakeholders is carried out through "Participation Meetings" aimed at establishing a space for open, voluntary, official, and permanent dialogue between the Project and the stakeholders.

In addition, the matrix of stakeholders is updated monthly according to progress generated by meetings with new stakeholders who express interest in the development of the Project, as well as weekly meetings that are held with different local, regional, and national authorities in order to publicize and clarify concerns regarding the Project.

1.15 Capital Cost Estimates

Capital cost is defined as the capital expenditure required to engineer, design, procure, construct and commission the works required for the Project Scope within its defined battery limits. The capital includes Mine direct costs and Plant directs costs, inclusive of Project Indirect costs and contingency.

The estimate conforms to AACE Class 5 guidelines for a Concept Estimate with an expected accuracy range of -15% to -30% on the low side of the range and +20% to +50% on the high side of the range.

All costs are expressed in US dollars. The estimate base date is Q3 2021.

A summary of the total capital cost is shown in Table 1-8:

Table 1-14: Capital Cost Estimate Summary (USD)

Description	M USD
Initial Cost	$ 118.6
Sustaining Capital	$ 29.4
Total Initial + Sustaining Costs	$ 148.0

1.16 Operating Cost Estimates

The operating cost estimate is presented in Table 1-15 at a ±30% accuracy, using a base date of Q2, 2021, and considering an annual treatment of 1,766,016 dry tonnes of ore, with an average REE grade of 2,045 ppm and 18.49 % average recovery.

Table 1-15: Operating Cost Estimate Summary (USD)

Item	USD/y	USD/t
G&A	3,677,019	2.08
Labour	1,053,803	0.60
Mobile equipment	1,750,117	0.99
Other	873,100	0.49
Mine	7,110,798	4.03
Labour	919,282	0.52
Loading	724,331	0.41
Hauling	1,556,497	0.88
Ancillary	677,553	0.38
Contractor	3,233,135	1.83
Process	12,865,027	7.28
Labour	1,436,104	0.81
Power	2,997,300	1.70
Reagent and supplies	4,357,710	2.47
Spent ore transportation	1,437,063	0.81
Spare and maintenance	1,681,478	0.95
Laboratory and packing	955,372	0.54
TOTAL	23,652,844	13.39

One of the most important expenses is the consumption of reagents, which is detailed in Table 1-16:

Table 1-16: Reagents Cost Estimate Summary (USD)

Item	USD/y	USD/t
Fresh Water	51,386	0.029
Potable Water	4,380	0.002
R.O. Water	1,066,806	0.604
Sulphuric Acid	319,266	0.181
Flocculant	564,729	0.320
Ammonium Sulfate Solid	664,180	0.376
Ammonium Bicarbonate Solid	1,548,993	0.877
Calcium Hydroxide Solid	137,970	0.078
TOTAL	**4,357,710**	**2.468**

1.17 Market Studies and Contracts

CRU Consulting, an independent commodities research firm, has reviewed this Market Studies and Contracts chapter and the underlying data and models which derive the figures set out within it. It is the opinion of CRU Consulting that this report does reflect sound analysis, based on detailed and comprehensive data gathering, and the application of reasonable forecasting methods; and that this report can therefore be considered an independent market assessment for the purposes of the 43-101 exercise.

1.17.1 Market Overview

The rare earth element (REE) industry is a niche market that has been in a state of growth for many years, specifically over the last three (2019-2021). The main driver of this growth are the developing industries related to the green energy transition (electric vehicles (EV) and wind turbines), electronics, and other technological applications that require these metals to function.

From a global perspective, China has a dominant position in the REE industry. The country has managed to vertically integrate its REE production, providing a competitive advantage throughout the stages of the REE value chain. China's dominance in the REE market is driven by two fundamental reasons:

1) Benefit of its geography since geological conditions have provided the necessary environment to generate deposits with economic concentrations of REEs.

2) Specialized and skilled in the development of technologies at different points throughout the value chain, which have not been disclosed to the rest of the world.

As a result of China's REE dominance and REE's requirement in strategic applications, the United States and European Union have classified these minerals as 'critical'[1].

1.17.2 REE Demand

REE demand growth over the last 3 years has been primarily driven by permanent magnets used in applications such as EV and wind turbines. Permanent magnets, which are required for applications with a high level of performance, are most commonly composed of NdFeB (containing NdPr). Dy and Tb are added to the magnet's composition to increase its operating temperature from 60 °C up to a maximum of 200 °C (Pavel, C., Marmier, A., Tzimas, E., Schleicher, T., Schüler, D., Buchert, M. and Blagoeva, D., 2016). This characteristic inherent to Dy and Tb is a necessary feature for permanent magnets used in e-mobility, military applications, and electronics, where an operating temperature greater than 180 °C is required (Widmer, Martin, and Kimiabeigi, 2015). According to Adamas (2019), permanent magnets accounted for 35% of REE demand by volume and 91% by value in 2018 (Figure 19-5).

The main driver for the demand increase is the forecast exponential increase in EV2 demand from 2021-2030, as outlined by the International Energy Agency (IEA). According to IEA, EV demand is estimated to have a CAGR of 31% in the Sustainable Development Scenario SDS)[3] and a CAGR of 24% in Stated Policies Scenario (STEPS) from 2020 to 2030. According to Demeter EU project and University of Birmingham Magnet Materials Research Group, each new electric car is estimated to contain between 2 and 5 kg of Rare Earth magnets (Fears, 2020). The dysprosium loading in an NdFeB magnet for EVs can vary between 3.7% and 8.7%, and as a result the magnet increases its coercivity between 100 and 200°C. However, to avoid demagnetization along the life of the car, the NdFeB in the electric vehicle motor is kept in 7.5% (Pavel, et al., 2016).

Another driver of demand growth for NdFeB permanent magnets is from renewable energies, primarily off-shore wind turbines (Argus Media, 2020). According to the International Renewable Energy Agency (IRENA), the amount of GW generated by off-shore wind turbines will have a CAGR of 12% from 2020-2030 (IRENA, 2019). AMEC Environment & Infrastructure UK Limited (2014) outlines that offshore wind power (Geared wind turbine systems) had 186.6kg per MW of Nd content and 6.6 kg per MW of Dy content, with proportional Nd use to capacity increases assumed (AMEC Environment & Infrastructure UK Limited, 2014).

Other sources of demand for NdFeB permanent magnets include consumer electronics, industrial applications, air conditioners, and elevators.

1.17.3 EE Supply

In 2020, the world REO supply was estimated at 240,000 tonnes (USGS, 2021). In February 2021, China updated its H1 2021 production quota to 84,000 tonnes, which represented an increase of 27% (as compared to H1 2020), and a record level of production (Table 1-17). The global 2021 REE supply is estimated to be 263,000 tonnes, including the additional production expected to be supplied by China.

[1] The European Union has produced a critical assessment based on supply issues and economic importance for key materials, which is updated on a regular basis. The European Union identified Rare Earth elements as highly critical. Rare Earth elements are key to the manufacture of electronic goods, wind turbines, computer hard-drives, and electric and hybrid vehicles (which use a far greater quantity of rare earth magnets than traditional combustion engines). (Fears, 2020)

[2] Include Passenger Battery Electric Vehicles (BEV), Passenger Plug in Hybrid Electric Vehices (PHEV), and Commercial EV (Light, medium, and heavy duty vehices).

[3] *"The IEA's Sustainable Development Scenario (SDS) outlines a major transformation of the global energy system, showing how the world can change course to deliver on the three main energy-related SDGs simultaneously. To achieve the temperature goal, the Paris Agreement calls for emissions to peak as soon as possible and reduce rapidly thereafter, leading to a balance between anthropogenic emissions by sources and removals by sinks (i.e. net-zero emissions) in the second half of this century. These conditions are all met in the SDS."* (Source: International Energy Agency)

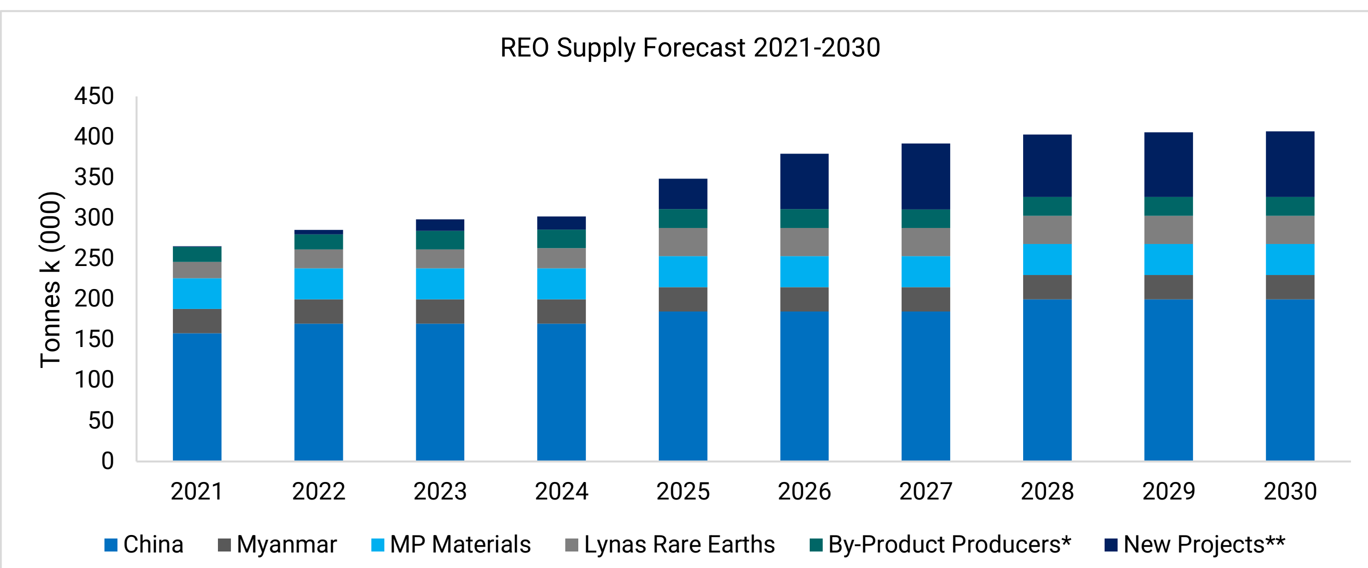
Table 1-17: 2020 REO Supply

USGS 2020 Supply	Unit	China	USA	Myanmar	Australia	By-product Supply	Total
Praseodymium	mt	7,287	1,634	1,183	1,034	1,060	12,197
Neodymium	mt	22,411	4,560	4,387	3,622	3,685	38,664
Terbium	mt	244	22	158	16	47	461
Dysprosium	mt	1,109	19	956	39	94	2,198
Other REE	mt	108,949	31,765	23,316	12,289	10,114	186,480
Total	**mt**	**140,000**	**38,000**	**30,000**	**17,000**	**15,000**	**240,000**

*By product producers: India (Tamil Nadu/Kerala), Russia (Lovozero), Brazil (Buona Norte), Vietnam (Dong Pao), Burundi (Rainbow Rare Earths), US (Energy Fuels), Australia (Iluka Resources), Madagascar (Rio Tinto), Thailand (unidentified).
Source: USGS. Basket distribution have been estimated using company public reports and research papers.

REO supply forecasts are derived using a number of underlying assumptions from third party data sources. Chinese production quotas have been projected with CAGR of 7% through the decade (2021-2030) up to 290,000 tonnes of REO, using 2021 REO supply as a basis. For Lynas, an increase in production has been assumed following the disclosure of its 2025 plan, which outlines a plan to reach 10,500 tonnes of NdPr production. For MP Materials, an increase in production has been assumed to 50,000 tonnes of REO by 2025 based on their disclosed future capacity. In the case of Myanmar, the production has been forecasted with CAGR of 6% through the decade. Finally, other by-product producers have been forecasted using their respective 2020 production estimates (Table 1-17). Additional supply has been estimated based on a group of new projects that are deemed to have a chance of entering into production. The detail of these projects has been taken from published technical reports and press releases. In addition, Figure 1-6 outlines the REO forecast from 2021-2030.

Figure 1-6: 2021-2030 REO Supply Forecast

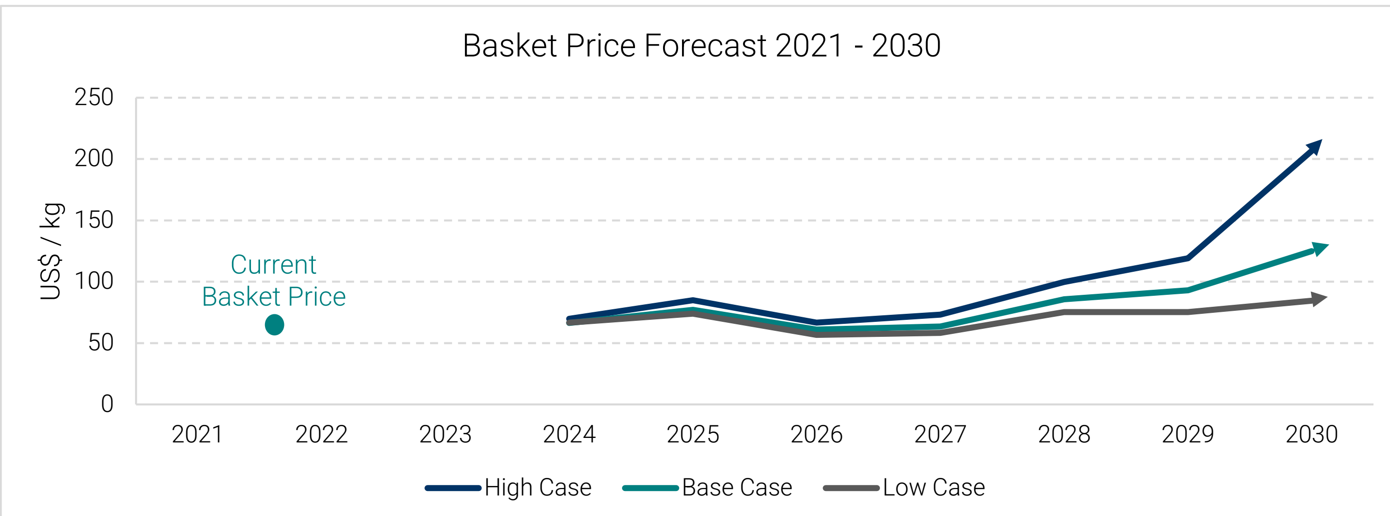


*By product producers: India (Tamil Nadu/Kerala), Russia (Lovozero), Brazil (Buona Norte), Vietnam (Dong Pao), Burundi (Rainbow Rare Earths), US (Energy Fuels), Australia (Iluka Resources), Madagascar (Rio Tinto), Thailand (unidentified).
** New Projects: Energy Fuels, Serra Verde, Biolantánidos, Vital Metals, Hasting Tech Metals, Arafura Resources, Peak Resources, Pensana, Northern Minerals, Australian Strategic Materials, Ionic Rare Earths
Source: Estimated using companies´ public reports and press releases.

1.17.4 REE Prices

Based on the three Dy price scenarios provided by CRU and the set of prices sourced by Argus Media, Figure 1-7 presents the forecast of Penco Basket Price throughout the decade. From 2030 prices have been considered flat.

Figure 1-7: Basket Price Forecast 2021-2030



Note: Basket price has been calculated using the distribution of each element as a percentage of the total rare earth element oxides multiplied by the price projection of each element.
Source: prepared by Argus Media (La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Ho, Er, Tm, Yb, Lu, Y) & by CRU (Dy).

1.17.5 Contracts

Biolantánidos has not yet entered into any commercial agreements for its REE product, including hedges or offtake agreements, as at the issuance of this report. The company has been in conversation with several OEM and forecasts a separation fee of $5/kg.

1.18 Economic Analysis

An engineering economic model was developed to estimate annual pre-tax and post-tax cash flows and sensitivities of the Project based on a 5% discount rate. It must be noted, however, that tax estimates involve many complex variables that can only be accurately calculated during operations and, as such, the after-tax results are only approximations. Sensitivity analysis was performed to assess impact of variations in rare earth oxides prices, head grades, operating costs and capital costs. The capital and operating cost estimates were developed specifically for this Project and are summarized in Section 21 of this Report (presented in Q3 2021 dollars). The economic analysis has been run with no inflation (constant dollar basis).

1.18.1 Financial Model Parameters

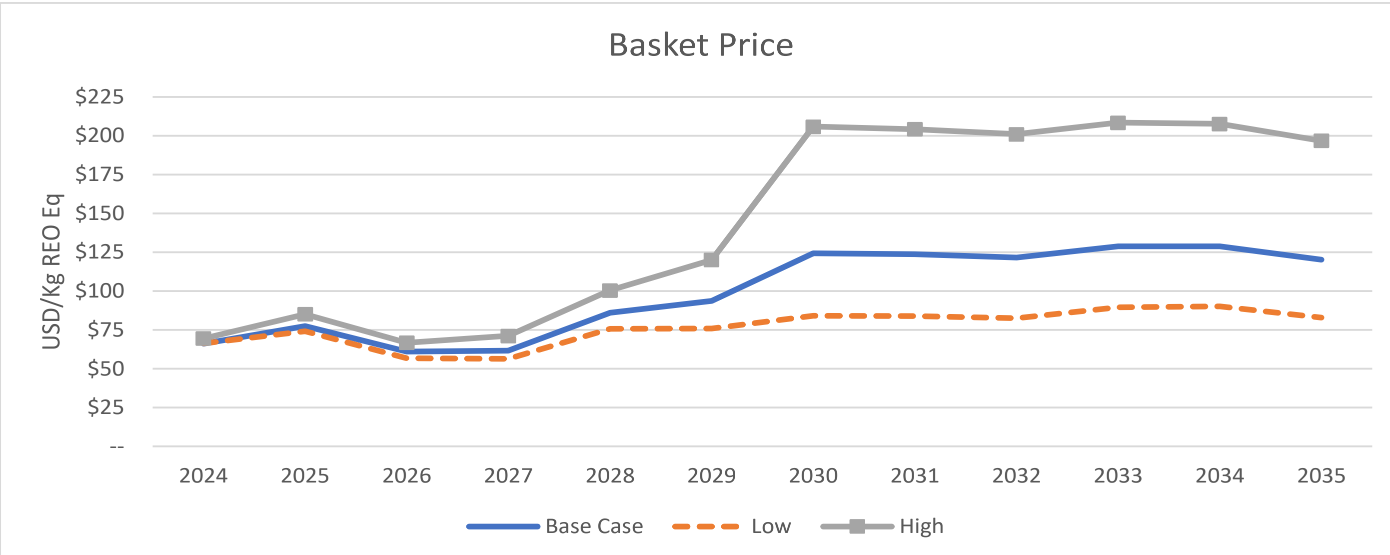
The economic analysis was performed using the following assumptions:

- Construction starts on January 1st, 2023.
- Ramp up production start-up in Q1 2024 and full process plant production will be achieved in Q4 2024.
- Mine life of 12 years.
- Cost estimates in constant Q3 2021 USD.
- No price inflation or escalation factors were taken into account.
- Results are based on 100% ownership.
- Capital costs funded with 100% equity (i.e., no financing costs assumed).
- All cash flows discounted to beginning of construction Jan 1, 2023.
- All rare earths products are assumed sold in the same year they are produced.
- Project revenue is derived from the sale of Rare Earth Concentrates.
- No binding contractual arrangements for treatment currently exist.
- Project Site purchase cost of USD 10 M that will be sold at the end of the LOM.
- Separation Fee of 5 USD/Kg REO as detailed in Section 19 of this Report.

1.18.2 Rare Earth Oxides Price Forecast

Base case for rare earth oxides prices were based on a study done by a third party consultant and detailed in Section 19 of this Report. The forecasts used are meant to reflect the rare earth oxides prices expectation over the life of the Project. Additionally, Low and High Price scenario forecasts have been defined. The basket price, based on REO Eq production is detailed in Figure 1-8.

Figure 1-8: Rare Earth Oxides Basket Price for the LOM

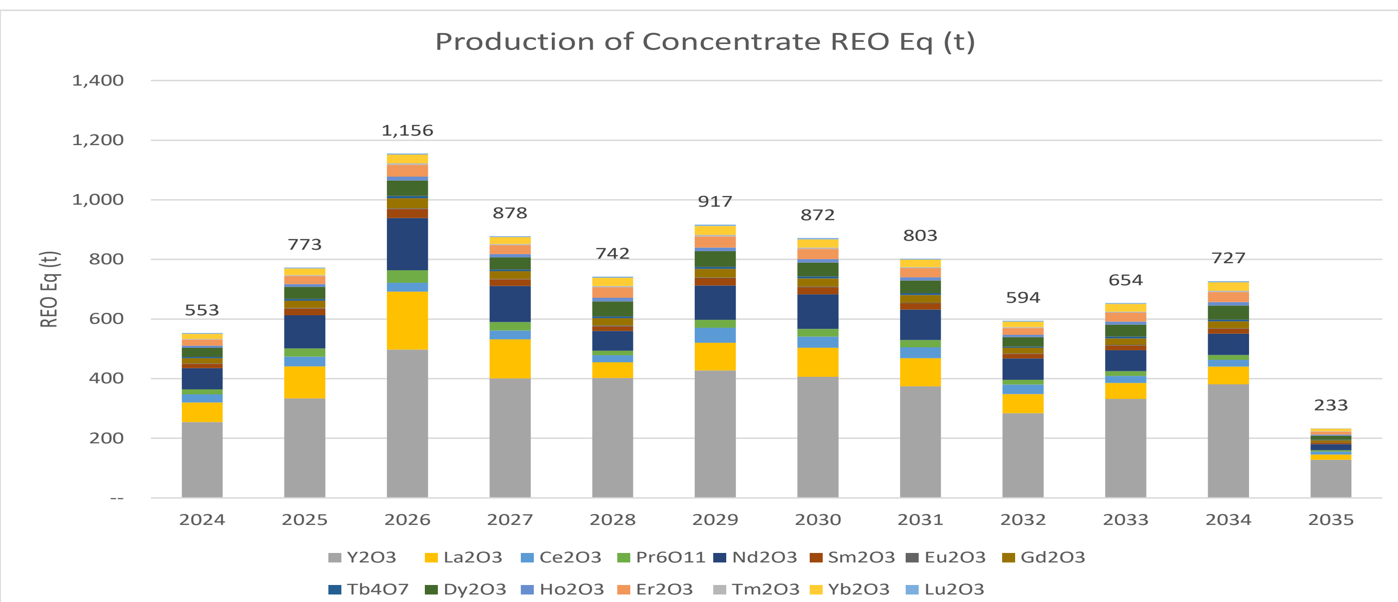


Note: Basket price has been calculated using the distribution of each element as a percentage of the total rare earth element oxides multiplied by the price projection of each element.
Source: prepared by Argus Media (La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Ho, Er, Tm, Yb, Lu, Y) & by CRU (Dy).

1.18.3 Concentrate Production

The Project is expected to produce a rare earths carbonate concentrate for which the REO content is shown in Figure 1-9 and Table 1-18. The concentrate produced will have a 92.6% REO content.

Figure 1-9: Production REO



Note: prepared by Ausenco, 2021

Table 1-18: Production REO

Year	% of Total REO	Total LOM	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Y2O3	47.4%	4,222	254	333	498	401	402	428	406	374	284	332	381	128
La2O3	11.6%	1,031	66	108	194	131	52	93	98	95	64	54	60	18
Ce2O3	4.0%	353	27	33	29	29	24	51	37	37	32	23	22	9
Pr6O11	2.9%	260	17	27	42	29	15	26	26	24	16	16	16	5
Nd2O3	12.5%	1,113	70	112	176	121	66	115	115	103	72	70	72	21
Sm2O3	2.6%	227	15	22	31	22	16	25	24	21	15	16	16	5
Eu2O3	0.2%	22	2	2	2	2	2	2	2	2	1	2	2	1
Gd2O3	3.1%	280	18	25	34	26	24	29	28	26	19	22	23	7
Tb4O7	0.7%	66	4	6	7	6	6	7	6	6	4	5	6	2
Dy2O3	5.5%	489	30	41	52	41	50	52	47	43	32	41	47	14
Ho2O3	1.3%	118	7	9	13	10	12	12	11	10	8	10	11	3
Er2O3	4.0%	352	20	27	39	31	35	37	34	31	23	30	34	10
Tm2O3	0.5%	47	3	4	5	4	5	5	5	4	3	4	5	1
Yb2O3	3.1%	279	17	22	29	22	27	30	28	24	18	26	28	8
Lu2O3	0.5%	40	2	3	4	3	4	4	4	4	3	4	4	1
TOTAL REO	100%	8,901	553	773	1,156	878	742	917	872	803	594	654	727	233

1.18.4 Economic Analysis Results

The economic analysis was performed assuming a 5% discount rate (see section 0). Cash flows have been discounted to the beginning of construction January 01, 2023 assuming that the Project execution decision will be made and major project financing would be carried out at this time.

For the Base Case Price Scenario, the pre-tax net present value discounted at 5% (NPV5%) is 228 MUSD, the internal rate of return IRR is 25.0%, and payback is 4.8 years. On an after-tax basis, the NPV5% is 178 MUSD, the IRR is 23.0%, and the payback period is 4.7 years. A summary of the Project economics is included in Table 1-19.

Table 1-19: Summary Results

Price Scenario	Base Case	Low Price	High Price
General	**LOM Total / Avg.**	**LOM Total / Avg.**	**LOM Total / Avg.**
Basket Price* (USD/Kg REO)	$96	$75	$138
Mine Life (years)	12	12	12
Total Waste Tonnes Mined (kt dry)	7,309	7,309	7,309
Total Process Plant Feed Tonnes (kt dry)	19,856	19,856	19,856
Strip Ratio	0.368	0.368	0.368

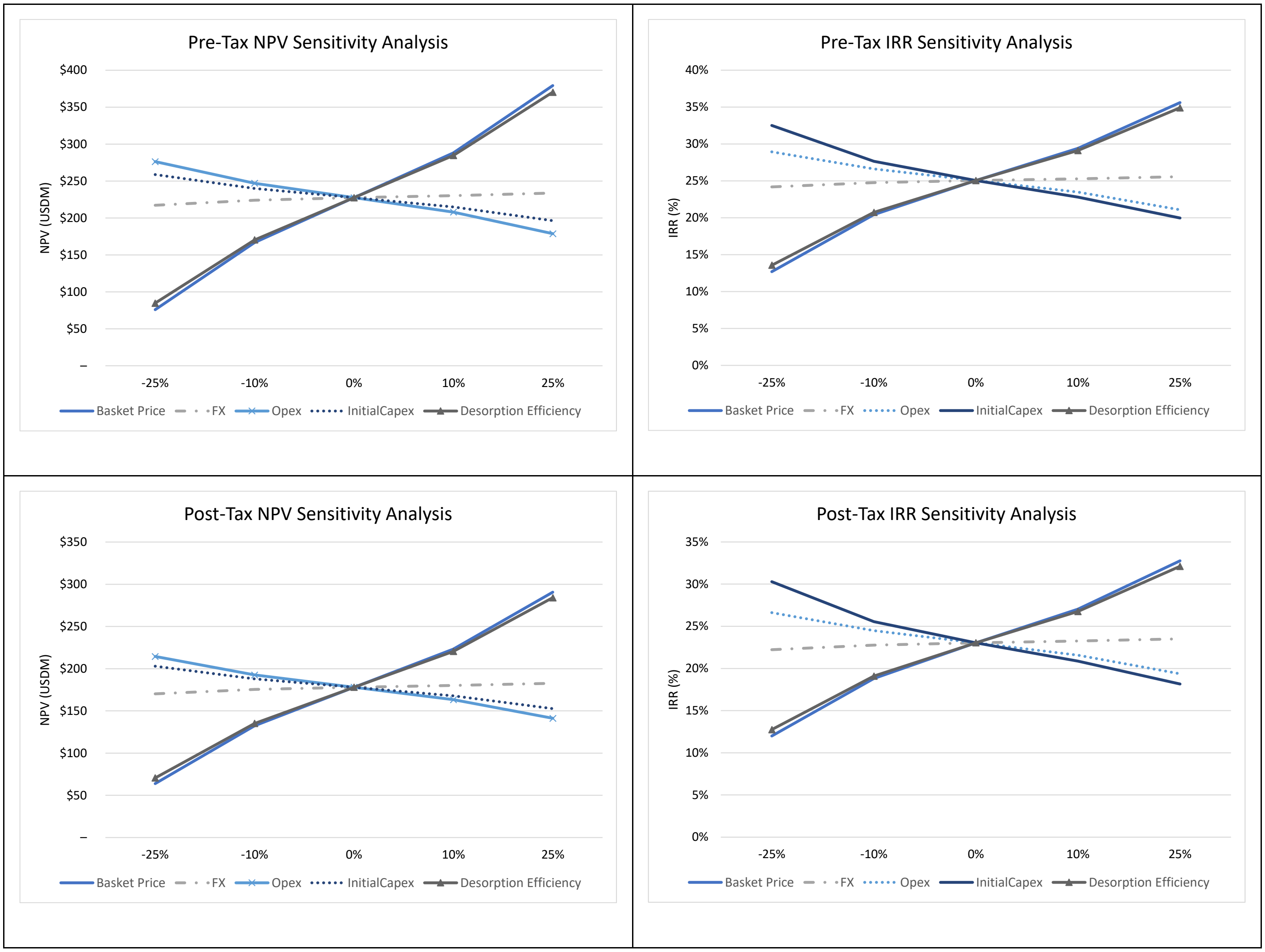
Price Scenario	Base Case	Low Price	High Price
Production	**LOM Total / Avg.**	**LOM Total / Avg.**	**LOM Total / Avg.**
Process Plant Head Grade Extraction Value REE (ppm)	378	378	378
Metallurgic Efficiency (%)	98%	98%	98%
Production REO (t)	8,901	8,901	8,901
Total Average Annual Production REO (t)	774	774	774
Operating Costs	**LOM Total / Avg.**	**LOM Total / Avg.**	**LOM Total / Avg.**
Mining Cost (USD/t Mined dry)	$3.11	$3.11	$3.11
Processing Cost (USD/t Processed dry)	$7.13	$7.13	$7.13
G&A Cost (USD/t Processed dry)	$2.20	$2.20	$2.20
Treatment & Transport Costs (USD/kg REO)	$5.03	$5.03	$5.03
Total Operating Costs** (USD/t Processed dry)	$13.59	$13.59	$13.59
Cash Costs*** (USD/kg REO)	$36	$36	$36
AISC**** (USD/kg REO)	$39	$39	$39
Capital Costs	**LOM Total / Avg.**	**LOM Total / Avg.**	**LOM Total / Avg.**
Initial Capital (USD M)	$119	$119	$119
Purchase Land Cost (USD M)	$10	$10	$10
Sustaining Capital (USD M)	$29	$29	$29
Closure Costs (USD M)	$18	$18	$18
Salvage Costs (USD M)	$15	$15	$15
Financials	**LOM Total / Avg.**	**LOM Total / Avg.**	**LOM Total / Avg.**
EBITDA LOM (USD M)	$539	$350	$906
Avg. EBITDA LOM (USD M)	$47	$30	$79
Pre-Tax NPV (5%) (USD M)	$228	$104	$467
Pre-Tax IRR (%)	25.0%	17.1%	34.9%
Pre-Tax Payback (years)	4.8	5.3	4.1
Post-Tax NPV (5%) (USD M)	$178	$87	$354
Post-Tax IRR (%)	23.0%	16.2%	31.9%
Post-Tax Payback (years)	4.7	5.3	4.0

Notes:
* Basket price has been calculated using the distribution of each element as a percentage of the total rare earth element oxides multiplied by the price projection of each element, which have been sourced by Argus Media (La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Ho, Er, Tm, Yb, Lu, Y) and CRU (Dy).
* *Operating Cost differs from what is presented in Section 21 of the Report due to Economic Analysis shows Operating Cost for the LOM Avg, but Section 21 presents cost for a single year for design purposes
***Cash costs consist of mining costs, processing costs, mine-level general & administrative expenses, treatment and transportation costs.
**** AISC includes cash costs plus sustaining capital, closure cost and salvage value.

1.18.5 Sensitivity Analysis

A sensitivity analysis was conducted on the base case pre-tax and after-tax NPV, IRR and Payback of the Project, using the following variables: rare earth oxides price, discount rate, desorption efficiency and initial capital costs, and operating costs. Analysis revealed, as show in Figure 1-10 that the Project is most sensitive to changes in Rare Earths oxides prices, extraction efficiency, initial capital cost then, to a lesser extent, to operating costs and exchange rates.

Figure 1-10: Sensitivity Analysis



1.19 Interpretation and Conclusions

1.19.1 Introduction

The QPs note the following interpretations and conclusions in their respective areas of expertise, based on the review of data available for this Report.

1.19.2 Mineral Tenure, Surface Rights, Water Rights, Royalties and Agreements

1.19.2.1 Mineral Tenure

The results of the PEA indicate that all the mineral tenure over the project are 100% owned by REE UNO SpA and have been granted or are in process of being granted by the respective court.

1.19.2.2 Surface Rights

REE UNO SpA owns most of the surface land where the project is located. REE UNO SpA owns 541 hectares of surface land. There is only one extraction area, called “Luna”, which land is not owned by REE. However, the surface land which covers “Luna” it’s ensured, because REE UNO SpA obtained the written permission from the owner of the surface land.

REE and the owner of the surface land where Luna is located, agreed to the terms, conditions and compensations for establishing an occupancy easement.

1.19.2.3 Water rights

The estimation of the PEA indicates that project needs 9.7 l/s of water to operate, and the water resource for the entire project development is ensured by a water use right owned by REE UNO SpA.

1.19.3 Geology and Mineralization

The geology of the area is relatively well-known, and the work exhibits detailed geology with proper administration of samples and analyses. The project and control of mineralization are well understood, and the anisotropies, used in orebody and UG models, are acceptable. Improvements to the work performed by Aclara are not necessary at this time.

1.19.4 Exploration, Drilling and Analytical Data Collection in Support of Mineral Resource

Considering the novelty of the Project, all exploration works including drilling, sampling, security, storage, analyses and overall data collection have been well developed and appropriately carried out. Despite some caveats present in extraction value samples — mostly related to the particularity of the methodology, the numerous elements involved or the nature of the reference material — the QA/QC is deemed sufficient and provides acceptable control of the sampling campaigns. Thus, Ausenco believes the database is appropriate for resource estimation.

The geological characteristics of the area show good possibilities of finding more prospects of this type. Geochemical maps show other anomalies to the northeast, and the geological environment to the north and south of the Project is very similar. Thus, exploration must prioritize looking for more GG following what has been learned in the past drill and geologic campaigns.

1.19.5 Mineral Resource Estimates

Ausenco considers that the database information, QA/QC and models, as far as the review could be carried out, are complete, ordered and can be used in a resource estimate, considering the observations made regarding the topography and the generation of the models.

The geology of the Project is well understood and with the contribution of the 2021 drilling campaign, the geology and grade for REYT can be better understood. The grades of economic interest are concentrated within the garnet granite and also the diorite presents some grades with economic interest.

The statistical analysis detected two groups of total rare earths, with strong correlations between their grades. Group 1 was defined by Dy, Tb, Lu, Y, Gd, Er, Ho, Yb, Tm, and Group 2 includes Nd, Pr, La, Sm and Ce. This information is relevant due to their strong correlation with the elements of their groups and can be validating elements, of the behaviors of the grades of the other elements.

It was detected that the grades are associated with the horizons by lithologies, highlighting that the horizons within the Garnet Granite lithology presenting the best grades, particularly Horizon B. Except the Luna sector where the best grades are the B2 and C1 horizons.

The resource estimate for the Penco Module is within the tolerances of acceptable bias for this type of study.

Mineral Resources consider geology, mining, processing and economic constraints, and have been confined within appropriate LG pit shells, and therefore are classified in accordance with the 2014 CIM Definition Standards for Mineral Resources and Mineral Reserves. An open pit extraction scenario is appropriate to the style of mineralization. Assumptions used in the LG shell are appropriate to the envisaged process route and mine plan. Mineral Resources are presented in Table 14-45 through Table 14-50.

The declaration of mineral resources measured and indicate for the Penco Module deposit is 20.68 million tons with an average grade of REYT 2,045 (ppm), with an NSR of 27 USD/t.

Victoria Norte is the sector with the best REYT grade with 2,379 (ppm) and an NSR of 28 USD/t.

1.19.6 Mine Plan

The conclusions of the different aspects and technical studies addressed by the mining discipline are shown below.

1.19.6.1 Geotechnical Considerations

In the case of silty clays, in dry conditions, the maximum interramp height achievable is 24 m (6 benches). By incorporating a 10 m catch bench, the height can be increased up to 32 m, i.e., a maximum configuration of 6 benches, a catch bench, and 2 additional benches. By including the effect of groundwater, conservatively, the design is restricted to a maximum height of 12 m; if a greater height is required, a catch bench should be included, and the maximum possible height should be evaluated.

In the case of maicillo slopes, in dry conditions, the maximum interramp height achievable is 60 m (15 benches). By incorporating a 10 m catch bench, it is possible to reach a maximum height of 76 m, i.e. a maximum configuration of 15 benches, a catch bench, and 4 additional benches. By including the effect of groundwater, conservatively, the design is also constrained to a maximum height of 32 m; if a greater height is required, a catch bench should be included, and the maximum possible height should be evaluated.

1.19.6.2 Mining Operations Considerations

The operating widths (25 m) included at the mining phases selection are those used by the industry in the movement of materials, considering the safety berms.

1.19.6.3 Mine Phases.

The identified interferences generated between the boundaries of final pits (5 sectors) and existing or projected facilities of the Project are the Itata route, the preservation forest and the property boundary.

1.19.6.4 Mine Extraction Sequence Definition

Since the Jupiter landfill considers an area of Victoria Sur, it was decided to mine the Victoria Sur sector first, thus speeding up the commissioning of the Jupiter disposal area.

The final sequence obtained, following the plans indicated in the previous point, corresponds to Victoria Sur - Victoria Norte - Luna - Maite - Alexandra.

1.19.6.5 Annual Production Plan

Mine production plan with 12 periods LOM is generated (considering pre-stripping), process plant feed of 12 periods with 10 in regime and decreasing extraction value vector.

Regarding the mined material, in period 10 there is an increase in the mining rate, due to the high waste / Mineral Resources ratio of the phases of the Alexandra sector, which is the only sector in operation in the indicated period.

1.19.6.6 Waste Disposal Facilities

Together, the Jupiter and Neptuno deposits have a total capacity of approximately 21.2 million cubic meters. At the end of Mine Life, the total occupied volume will be 18.7 million cubic meters.

Regarding the temporary topsoil stockpiles, the three projected sectors together have a capacity of 1.5 million cubic meters, while the estimated volume of topsoil to be managed corresponds to approximately 1.0 million cubic meters (without considering the volumes of topsoil for additional infrastructure) corresponding to the mined material from the pits, preparation of disposal zones, and the processing plant foundation area. This volume considers a 50-cm-thick layer and a 12% swelling factor.

The definition of the movement of Mineral Resources, waste and filtered tailings to the different destinations contained in the mine plan; the determination of their corresponding haulage distances (considering slope and horizontal routes), and the organizational chart necessary for a safe operation that achieves the objectives of the plan, will allow establishing a better understanding regarding the development of the mine's capital and operating cost estimation.

1.19.6.7 Waste Disposal Facilities Fill Sequence

According to the analysis made, it is not necessary to use Sector 3 of the topsoil stockpile for the process of depositing and subsequently returning the topsoil to its sector of origin.

Filling the Jupiter waste disposal facility is prioritized over depositing at Neptuno to reduce the transport distance.

Seventy-nine % of the projected available capacity of the Neptuno waste disposal facility and 100% of the Jupiter is used.

The permanent topsoil stockpile zone contains the material mined from the following zones: Process Plant, Jupiter and Neptuno.

As its name indicates, the temporary topsoil stockpile zone is used dynamically throughout the life of the project, receiving material from the deposits where mining begins and reclaiming it to return the topsoil to those where mining is exhausted.

To calculate volume of the process plant filtered tailings, a swelling factor of 12% and a moisture content of 20% were considered.

1.19.7 Metallurgical Testwork and Processing

The design of the process to produce rare earth concentrates is initially based on the results of laboratory tests developed at the University of Concepcion. These tests defined the parameters, and operating conditions with which a first process design is postulated, which is tested in a pilot plant and, the results of which allowed to verify the parameters, test the equipment technologies and verify the design. However, the results were not as expected, so Aclara decided to modify the process to reduce the losses of rare earths in all its unit operations. The tests continued at the University of Toronto where each chemical and thermodynamic variable, susceptible to being modified or optimized, was studied. The new modified process considers that the extraction of rare earths is in two-step; countercurrent using a solution of ammonium sulfate ($(NH_4)_2 SO_4$) as leaching agent, subsequently the enriched solution goes to a process of selective precipitation of pollutants using a solution of Ammonium bicarbonate (NH_4HCO_3) controlled by pH and then, this solution without contaminants, continues the process of precipitation of rare earth carbonates using again the ammonium bicarbonate solution (NH_4HCO_3) as precipitant, but in this case at a more basic pH . The product (rare earth carbonates) is dried and packed with the option to be calcinated, but this has not been studied in this report. This last design was corroborated with tests on a larger scale in Peru (Chapi) using various sectors of exploitation of the mine, the results of which are consistent with those obtained at the University of Toronto.

The results obtained in the different tests carried out define operating parameters for the process and also confirm the proposed new design: Leaching is carried out with ammonium sulfate in an equivalent concentration of 0.15 Molar mol/L at a pH between 3.0 and 4.0 and the required time to produce rare earth extraction is 7 minutes. The precipitation of impurities (aluminum, iron) is achieved with ammonium bicarbonate at a controlled pH between 5.5 and 6. 0 and a required time of 30 minutes. Rare earth carbonate precipitation is also carried out with ammonium bicarbonate, but at a higher pH between 7.0 and 7.5 and a reaction time of 120 minutes.

The proposed process design does not generate liquid industrial waste, as it considers recirculating all of the discarded liquids once they have been treated. The design considers a plant that treats this liquid waste and obtains water of sufficient quality that allows it to be reused again in the process. This recovered water will contain elements such as potassium, magnesium, sodium, and others in a maximum allowable concentration, in order to obtain lanthanide carbonates with the defined quality of 92% (dry basis). The mass balance generated for this evaluation did not include the impact of these ions (K, Na, Mg and others) which, according to the mass balance, would be part of the recirculation and leaching solution. Aclara asked the University of Toronto to carry out a preliminary exploration test of the extraction of rare earths, where these elements preliminarily identified are included in the mass balance (K, Na, Mg and others). The results indicate that there is an effect on extraction, being greater when these elements exist in the leaching solution. Therefore, there is a degree of uncertainty regarding the effective extraction that would occur when incorporating these elements in the recirculation solution, and it is unknown what would be the impact on the quality of the product.

1.19.8 Infrastructure

The infrastructure for this project consists of open pit mines or extraction zones, disposal zones and processing plant. Infrastructure to support the Penco Module will consist mainly of site civil work, site facilities/building, a water system, and site electrical.

1.19.9 Environmental, Permitting and Social Considerations

The Project, submitted for Environmental Assessment in 2018, is moving forward with the development and presentation of Addendum N°2. This document corresponds to the responses to inquiries from relevant government services and raised by the community as a result of the Community Participation Processes. Within this document, the most relevant issues are associated with flora and vegetation and the indigenous human environment.

Flora and vegetation are very sensitive due to the presence of Queule and Pitao, defined under Chilean law as natural monuments. In this regard, a specific study (known as Expert Report) has been presented where specific protection measures are committed to guarantee these and other protected species and forest formations are not affected, ensuring that the Project does not represent a threat to the continuity of the species at a local and national level, as established in Law 20.283, Recovery of Native Forest and Forest Development.

Regarding the indigenous human environment, the Project is not located on indigenous land nor indigenous development areas, but two indigenous organizations participate in traditional activities in the Project surroundings. As a result, one environmental authority (SEA) has expressed concern about the possible effects of the Project over these indigenous activities and is requiring more information to rule out an eventual Indigenous Consultation, as defined by article 6 of the International Labour Organization (ILO) Convention 169, which could impact the environmental licensing process timeframes.

Although it is expected that after Addendum N°2 the environmental authority will proceed with considering the project and issuing the corresponding Environmental License (RCA), it is possible that a new round of review will be opened, which would require a new Addendum to be presented (Addendum N°3). To minimize this possibility, Addendum N°2, which is to be submitted in November 2021, should be presented with the highest sufficiency of information possible, in order to obtain a vote for its approval by the Environmental Assessment Commission during Q1 2022.

In addition to the above, a strategic approach with the different government technical services that will review the Addendum and technically pronounce in favor or against the project has been undertaken, it is recommended to maintain this contact with the authorities in order to have a better understanding of their concerns about the Project and finding the best way to resolve them.

Regarding the communities, although there are positions against the project by community leaders and some non-governmental organizations, the territorial work started in August 2020 through periodic meetings with different stakeholders at the local level should be continued. As the pandemic has allowed fewer restrictions, face-to-face meetings and field visits have been held, which should intensify in the coming months.

1.19.10 Capital and Operating Costs

1.19.10.1 Capital Cost

Capital costs were estimated under a AACE Class 5 methodology for a Concept Estimate. The expected accuracy range of the estimate is -15% to -30% on the low side of the range and +20% to +50% on the high side of the range, based on the information available to produce a capital cost estimate and the maturity level of project definition. Direct costs were estimated based on a preliminary mechanical equipment list and the other commodities were estimated by factorization of mechanical equipment costs. Supply prices for mechanical equipment are based on referential quotes and database information. Indirect costs were estimated by each major account based on benchmark information. Contingency is based on the percentage expected for a Class 5 estimate.

A detailed project execution plan and an execution schedule were not available at this stage.

Among the main exclusions it is important to mention that escalation costs, land acquisition, project financing and interest charges, and closing costs are not included as part of the capital estimate. Impact on capital costs due to loss of productivity or work absenteeism caused by a sanitary emergency in a pandemic situation is not included.

The total Initial capital cost is $118.6 MUSD and the total Sustaining capital cost is $29.37 MUSD.

1.19.10.2 Operating Cost

The operating cost estimate is presented at a ±30% accuracy, using a base date of Q2, 2021, and considering an annual treatment of 1,766,016 dry tons of ore, with an average REE grade of 2,045 ppm and 18.49 % average recovery.

Operating costs are estimated at 23.65 MUSD/a, or 13.39 USD/t.

1.19.11 Economic Analysis

The economic analysis was performed assuming a 5% discount rate (see section 0.). Cash flows have been discounted to beginning of the construction January 01, 2023, assuming that the Project execution decision will be made and major project financing would be carried out at this time.

For the Base Case Price Scenario, the pre-tax net present value discounted at 5% ($NPV_{5\%}$) is 228 M USD, the internal rate of return IRR is 25.0%, and payback is 4.8 years. On an after-tax basis, the $NPV_{5\%}$ is 178 MUSD, the IRR is 23.0%, and the payback period is 4.7 years.

Analysis revealed that the Project is most sensitive to changes in Rare Earths oxides prices, extraction efficiency, initial capital cost, and to a lesser extent, operating cost and exchange rates.

1.20 Recommendations

1.20.1 Introduction

The economic analysis of this PEA study demonstrates, on a preliminary basis, that further development of the Penco Module Project through additional engineering and de-risking is warranted. Table 1-20 summarises the proposed budget to advance the project through the prefeasibility study (PFS) stage. The recommended work program is divided into two phases with a total cost of 6.1 M USD.

Table 1-20: Recommendations Cost

Recommendations	Cost (USD)
Phase 1	**1,489,600**
Drilling and Mineral Resource Estimations	489,600
Metallurgical Testwork	1,000,000
Phase 2	**4,605,000**
Metallurgical Testwork	3,000,000
Mining methods studies	140,000
Geotechnical Considerations (including drill and excavator)	460,000
Site Infrastructure studies	265,000
Process Plant Prefeasibility Study	740,000
Total	**6,094,600**

1.20.2 Phase 1

1.20.2.1 Drilling and Mineral Resource Estimations

- With respect to QA/QC, it is important to advance towards the certification of the reference materials used for desorption (prepared and assayed by AGS), as well as the use of certified blanks instead of quartz, and resuming the insertion of check samples for interlaboratory analysis.
- Conduct drilling in sectors categorized as inferred resources within areas with good grades.
- Increase the number of samples for density analysis.
- Penco Module plans to drill a further 60 drill holes (approximately 1,800 m). This program is estimated with all-in drilling costs of 272 USD/m, to be approximately 489,600 USD.

1.20.2.2 Metallurgical Testwork

As it is a novel process, it is necessary to simulate the proposed flowsheet on a laboratory scale for the next phase of engineering, to verify:

- Parameters defined in the process.
- Verify the chemical equilibrium of the different solutions generated in the process obtained in the mass balance.
- Verify the effect on the extraction of lanthanides due to the different elements present in the recirculation solution.
- Verify the solubilities of the polluting elements in the stage of precipitation of impurities and rare earth.

- Verify the solubilities of the Lanthanides in the impurity precipitation and carbonation stages.
- Verify the water recovery design
- Check product quality

The estimated cost to perform the testing and laboratory analysis activities is 1,000,000 USD.

1.20.3 Phase 2

1.20.3.1 Metallurgical Testwork

The following stage recommends pilot-scale tests in order to verify the obtaining of the product in commercial quality, process parameters, plant yield, reagent consumption, equipment efficiency, washing efficiency, materiality, waste management, among others. The estimated cost to carry out the pilot tests for a period of approximately 3 months is 3,000,000 USD.

1.20.3.2 Mining methods studies

- The recommendations associated with the mining methods studies have been estimated a cost of 140,000 USD.
- The following recommendations can be addressed from the study:

1.20.3.2.1 Pit Optimization

- The economic, financial and technical parameters that were considered in the pit limit analysis must be updated according to conclusions and recommendations of this study, and of recent market information to face the future engineering stage of the Project.

1.20.3.2.2 Mine Design

- Operational mine designs for the final pit and mining phases must be considered in the next stage of the study.

1.20.3.2.3 Mine Extraction Sequence Definition

- Based on the results obtained and on the restrictions mentioned in the section of Mining Extraction Sequence, it is recommended to analyze into the potential benefit of performing free mining sequence, coexistence in the exploitation of different mining sectors in order to maximize the asset value.

1.20.3.2.4 Annual Production Plan

- Study of the optimal process plant throughput in order to maximize the financial results of the Project.

1.20.3.2.5 Waste Disposal Facilities and Stockpile Fill Sequence

- Considering minimizing the hauling costs of the material moved, it is recommended to analyse other locations for the disposal of the waste, filtered tailings and topsoil stockpiles.

1.20.3.3 Geotechnical Considerations

- For design purposes, the use of the dry condition slope geometries presented in section 16.2 is recommended; however, in the event that groundwater is found in the slopes, the geometry proposed should be considered preliminarily, but the water levels and conditions observed on site should be verified, since the assumption indicated in this report may be too conservative.
- In the following stages of the study, the water tables considered should be verified to determine their potential impact on the designs and stability.
- The database and soil tests should be reviewed to define strength and deformation properties to supplement the stability analyses with displacement and deformation analyses.
- Conduct retrospective analyses of nearby civil works or mining sites with the same type of residual soils.
- In the following stages, the proposed designs for the pits defined in the mining zones must be analyzed, cross-checking these designs with the available geological models. This will allow us to better specify the results obtained in this technical note.
- The cost of geotechnical studies including geotechnical drills and excavator, in five extraction zones, two disposition zones and the processing plant area, is estimated at 460,000 USD.

1.20.3.4 Site Infrastructure

The following activities are recommended to be considered for the next stage of engineering:

- Geotechnical site investigations to characterize constructability of the material that will be used in waste disposal facilities. The estimated cost is 65,000 USD.
- Further development of the waste disposal facilities design incorporating the seismic hazard assessment recently carried out for the Project into the stability analysis. In addition, it is recommended to complete a runout analysis for an appropriate estimation of the impacted areas and losses qualification. The estimated cost is 100,000 USD.
- The access and mining roads, water intake and electrical supply should be further analysed, reviewed, and engineered. The estimated cost is 100,000 USD.
- To advance the energy supply agreement with the power distribution company in the Project zone to confirm the connection points and conditions of energy supply.

1.20.3.5 Process Plant Prefeasibility Study

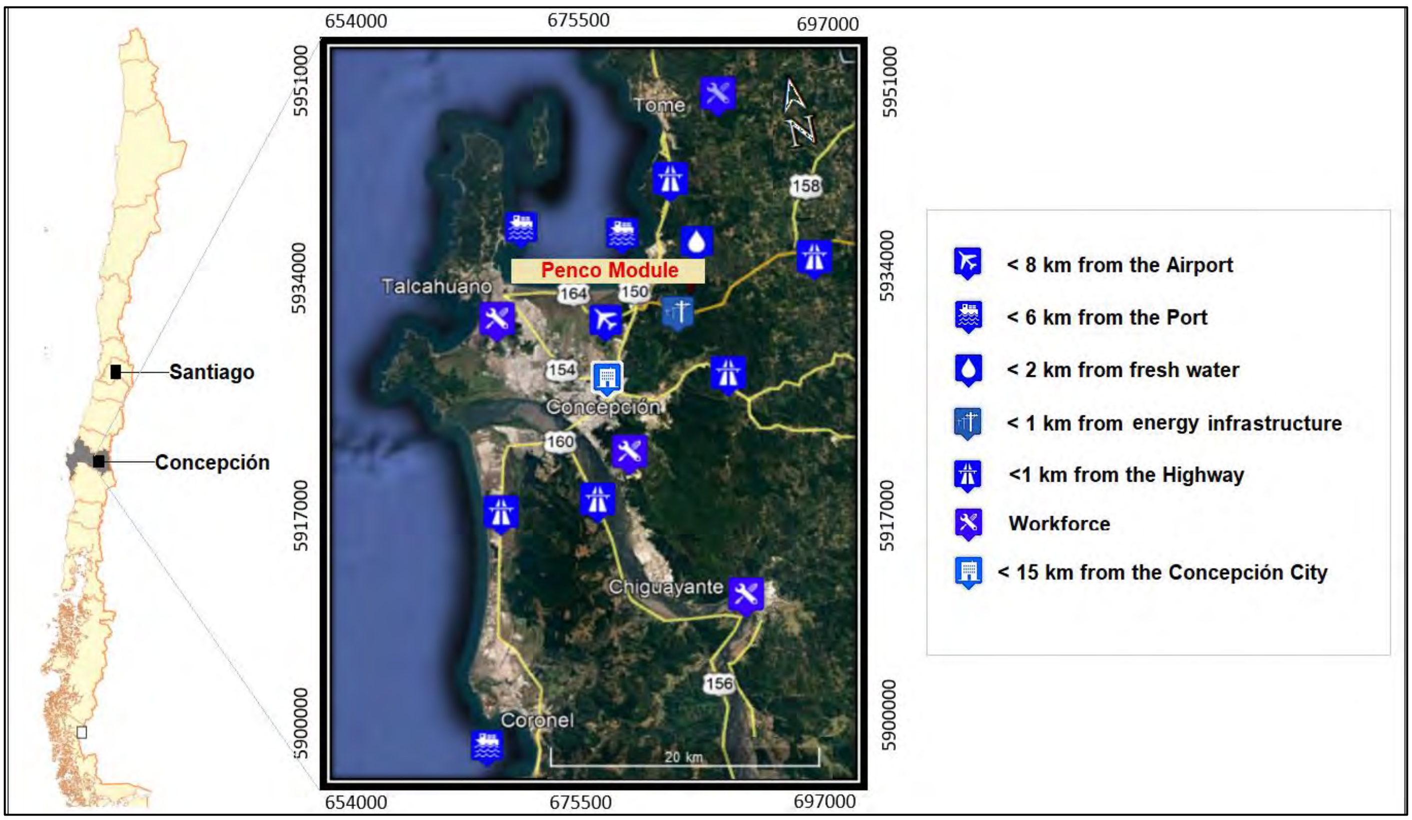
The estimated cost of the Pre-feasibility (PFS) study for the Process Plant is also included in the budget to get a complete estimation of the costs related to the PFS study completion. The estimated cost is 740,000 USD.

2 INTRODUCTION

2.1 Introduction

This report was prepared by Ausenco Chile, at the request of Aclara. This Technical Report presents the results of the Preliminary Economic Assessment (PEA) for a rare earth concentrate producing plant that is located between the districts of Penco and Concepcion, Biobio Region, Chile (see Figure 2-1).

Figure 2-1: Project Location



Note: prepared by Aclara, 2021.

2.2 Terms of Reference

The purpose of this report is to present the results of the PEA and to support Aclara's disclosure in connection with a potential going-public transaction in Canada.

All measure units used in this Report are metric unless otherwise noted Currency is expressed in United States dollars (USD). The Report uses English.

Mineral Resources and Mineral Reserves are estimated in accordance with using the 2019 edition of the Canadian Institute of Mining, Metallurgy and Exploration (CIM) Estimation of Mineral Resources & Mineral Reserves Best Practice Guidelines (2019 CIM Best Practice Guidelines) and are reported using the 2014 CIM Definition Standards for Mineral Resources and Mineral Reserves (2014 CIM Definition Standards).

Aclara has undertaken a wide range of mineral processing and metallurgical test work on samples from several Extraction Zone. The test work has been performed by the Concepcion University, University of Toronto and AGS-ALS Laboratory, in addition bench-scale testing performed in Peru and ANSTO Minerals in Australia.

2.3 Qualified Persons

This Report was prepared by the following Qualified Persons (QPs):

- Mr. Luis Oviedo, P.Geo, Senior Resource Consultant, Ausenco;
- Mr. Francisco Castillo, Senior Mining Engineer, Ausenco;
- Mr. Gavin Beer, P.Eng., Principal Metallurgist, Met-Chem;
- Mr. Scott Weston, P.Geo, Vice President, Business Development, Hemmera;
- Mr. Scott Elfen, P.E, Global Lead Geotechnical, Ausenco;
- Mr. Alejandro Solar, Senior Mining Engineer, Ausenco; and
- Mr. Manuel Hernandez, Civil Mining Engineer, CRU.

The Sections of this Report were prepared according to the Responsibility Matrix shown in Table 2-1.

Table 2-1: Responsibility for Each Section

Section	Description	Qualified Person	Company
1	Summary	All in part	All in part
2	Introduction	Francisco Castillo	Ausenco
3	Reliance on Other Experts	Francisco Castillo	Ausenco
4	Property Description and Location	Luis Oviedo	Ausenco
5	Accessibility, Climate, Local Resources, Infrastructure and Physiography	Luis Oviedo	Ausenco
6	History	Luis Oviedo	Ausenco
7	Geological Setting and Mineralization	Luis Oviedo 7.2.2 - Gavin Beer	Ausenco/ Met-Chem
8	Deposit Types	Luis Oviedo	Ausenco

Section	Description	Qualified Person	Company
9	Exploration	Luis Oviedo	Ausenco
10	Drilling	Luis Oviedo	Ausenco
11	Sample Preparation, Analyses and Security	Luis Oviedo	Ausenco
12	Data Verification	Luis Oviedo	Ausenco
13	Mineral Processing and Metallurgical Testing	Gavin Beer	Met-Chem
14	Mineral Resource Estimates	Francisco Castillo 14.1, 14.2, 14.4, 14.5, 14.12 and parts of 14.16,14.17,14.18 - Luis Oviedo	Ausenco
15	Mineral Reserve Estimates	N/A	N/A
16	Mining Methods	Francisco Castillo	Ausenco
17	Recovery Methods	Gavin Beer	Ausenco/ Met-Chem
18	Project Infrastructure	18.1, 18.2, 18.6, 18.7 and 18.8 -Francisco Castillo 18.3 - Scott Elfen 18.4 and 18.5 - Scott Weston	Ausenco/ Hemmera
19	Market Studies and Contracts	Manuel Hernandez	CRU
20	Environmental Studies, Permitting and Social or Community Impact	Scott Weston	Hemmera
21	Capital and Operating Costs	Gavin Beer 21.1.4, 21.1.8 and 21.2.3 - Alejandro Solar	Ausenco/ Met-Chem
22	Economic Analysis	Gavin Beer	Met-Chem
23	Adjacent Properties	N/A	N/A
24	Other Relevant Data and Information	N/A	N/A
25	Interpretation and Conclusions	All in part	All in part
26	Recommendations	All in part	All in part
27	References	All in part	All in part
28	Certificates	All in part	All in part

2.4 Site Visits and Scope of Personal Inspection

Mr. Luis Oviedo visited the site on two occasions, on 03 and 04 December 2020 and on 28 July 2021. On both visits he reviewed the database and it was in good overall condition except for minor observations in the Survey table, such as positive dips instead of negative, or some surveys without initial zero depth. To validate the transcription from certificates to database, Ausenco reviewed portions of the certificates, finding no errors. Furthermore, during the field visit, several relevant intervals selected from drill hole logs were checked against the corresponding cores, finding no inconsistencies.

Mr. Francisco Castillo visited the Penco Module site on 03 and 04 December 2020. He completed a personal inspection of the Penco Module, during which he visited the Victoria, Luna, Maite and Alexandra sectors. He also visited the future location of the processing plant and the Drill-hole storage area.

2.5 Effective Dates

The overall effective date of this Report is the effective date of the economic analysis which is 15 September 2021.

2.6 Information Sources and References

All references were listed in Section 27 of the present Report.

2.7 Unit and Name Abbreviations

Table 2-2: Unit Abbreviations

Abbreviation	Description
USD	United States dollar
CAD	Canadian dollar
CLP	Chilean peso
°C	degree Celsius
°F	degree Fahrenheit
%	percent
µ	micro
µm	micrometre
cm	centimetre
ft	feet
ft^2	square feet
g	gram
g/t	grams per tonne
ha	hectare
hr	hour

Abbreviation	Description
HP	horsepower
km	Kilometre (Canada) Kilometer (US)
koz	thousand ounces
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
kWh/t	Kilowatt per tonne
kN/m^3	kilonewton per cubic metre
MW	megawatt
kPa	kilopascal
kcmil	thousand circular mills
kN	kilonewton
masl	metres above sea level
mamsl	metres above mean sea level
L/s	litre per second
M	million
m	metre
m/a	metres per annum
m^2	square metre
m^3	cubic metre
mm	millimetres
m^3/hr	cubic meter per hour
mol/L	Moles per liter
t	metric tonne
st	short ton
Mt	million tonnes
Mt	mega tonne
ppb	parts per billion

Abbreviation	Description
ppm	parts per million
ton	short ton
t/hr	tonnes per hour
t/d	tonnes per day
t/a	tonnes per annum
w/w/ w/s	gravimetric moisture content (weight of water/weight of soil)
wt	weight

Table 2-3: Name Abbreviations

Abbreviation	Description
Aclara	Aclara Resources Inc.
Al	Aluminum
Ca	Calcium
CAGR	Compound Annual Growth Rate
CCD	Counter Current Decantation
CCLP	Close Continuous Leaching Process
Ce	Cerium
CEPC	Eastern Concepcion Plutonic Complex
DIA	Spanish acronym for Environmental Impact Declaration
DRT	Biotite-bearing diorite
Dy	Dysprosium
Dy Eq	Dysprosium Equivalent Grade
ED	Estimation Domain
EV	Extraction Value
EES	Environmental Evaluation Statement
EIA	Environmental Impact Assessment
Er	Erbyum
ESMC	Eastern Series Metamorphic Complex

Abbreviation	Description
F	Fault
Fe	Iron
Gd	Gadolinium
GG	Garnet-bearing granitoid
GPS	Global Positioning System
HREE	Heavy Rare Earth Elements
HM	Hochschild Mining
IOCG	Iron Oxide Copper Gold
Lancuyén	Lancuyén Ingeniería
LREE	Light Rare Earth Elements
Lu	Lutetium
MA	Minería Activa
MBL	Minera BioLantánidos
MP	Metapelites
Nb	Niobium
Nd	Neodymium
OB	Overburden
OK	Ordinary Kriging
PEA	Preliminary Economic Assessment
PGC	Penco Granitoid Complex
Pr	Praseodymium
QEMSCAN	Quantitative Evaluation of Materials by Scanning Electron Microscopy
QDP	Quartz-Diorite Pluton
QP	Qualified Person
REYT	Total Rare Earth Elements and Yttrium
REO	Rare Earth Oxides
RoW	Right of Way

Abbreviation	Description
RSEIA	Regulations for the System of Environmental Impact Assessment
Ta	Tantalum
Tb	Terbium
Th	Thorium
Ti	Titanium
UdeC	Spanish acronym for University of Concepcion
UG	Geological Units
UT	University of Toronto
Y	Yttrium

3 RELIANCE ON OTHER EXPERTS

3.1 Introduction

The QPs have relied upon the following other expert reports or statements, which provided information regarding mineral rights, surface rights, property agreements, environmental, permitting, social licence and taxation for sections of this Report.

3.2 Property Agreements, Mineral Tenure and Surface Rights

The QPs have not independently reviewed ownership of the Project area and any underlying property agreements, mineral tenure, surface rights, or royalties. The QPs have fully relied upon, and disclaim responsibility for, information derived from Aclara and legal experts retained on behalf of Aclara for this information through the following documents:

Daniela Rojas Escobar: Comments for QP Chapter 4: prepared for Aclara, August 27, 2021

This information is used in Section 4.11 of the Report. The information is also used in support of the sections 1, 14, 20 and 22 of the Report.

3.3 Environmental, Permitting, Closure, and Social and Community Impacts

The QPs have fully relied upon, and disclaim responsibility for, information supplied by Aclara for information related to environmental (including tailings and water management) permitting, permitting, closure planning and related cost estimation, and social and community impacts.

This information is used in Section 20 of the Report. The information is also used in support of the sections 1, 4, 14 and 22.

3.4 Taxation

The QPs have fully relied upon, and disclaim responsibility for, information supplied by experts retained by *Aclara* for information related to taxation as applied to the financial model as follows:

ATE Consultores Asociados,: Tax Modeling Review, Aclara Financial Model: prepared for Aclara, August 30, 2021

This information is used in Section 22, 1 and 25 of the Report. The Project has been evaluated on an after-tax basis to provide an approximate value of the potential economics. The calculations are based on the tax regime as of the date of the PEA and include estimates for Aclara expenditures, and related impacts to various tax pool balances, between the PEA and the assumed construction start date.

3.5 Markets

The QPs have not independently reviewed certain marketing or rare earth element pricing information. The QPs have fully relied upon, and disclaim responsibility for, information derived from Aclara and experts retained by Aclara for this information through the following document:

Adamas Intelligence, 2021. Rare Earth Magnet Outlook to 2030: prepared for Aclara, April 02,2021.

This information is used in Sections 14.17 and 16.4 of the Report to support mineral resources and mining methods.

Rare earth element price forecasting is a specialized business requiring knowledge of supply and demand, economic activity and other factors that are highly specialized and requires an extensive global database that is outside of the purview of a QP.

The QPs consider it reasonable to rely upon Adamas Intelligence as the company provides up-to-date, in-depth insight and analysis into all facets of the strategic metals and minerals industry, including production supply and costs as well as consumption demand, and price forecasts.

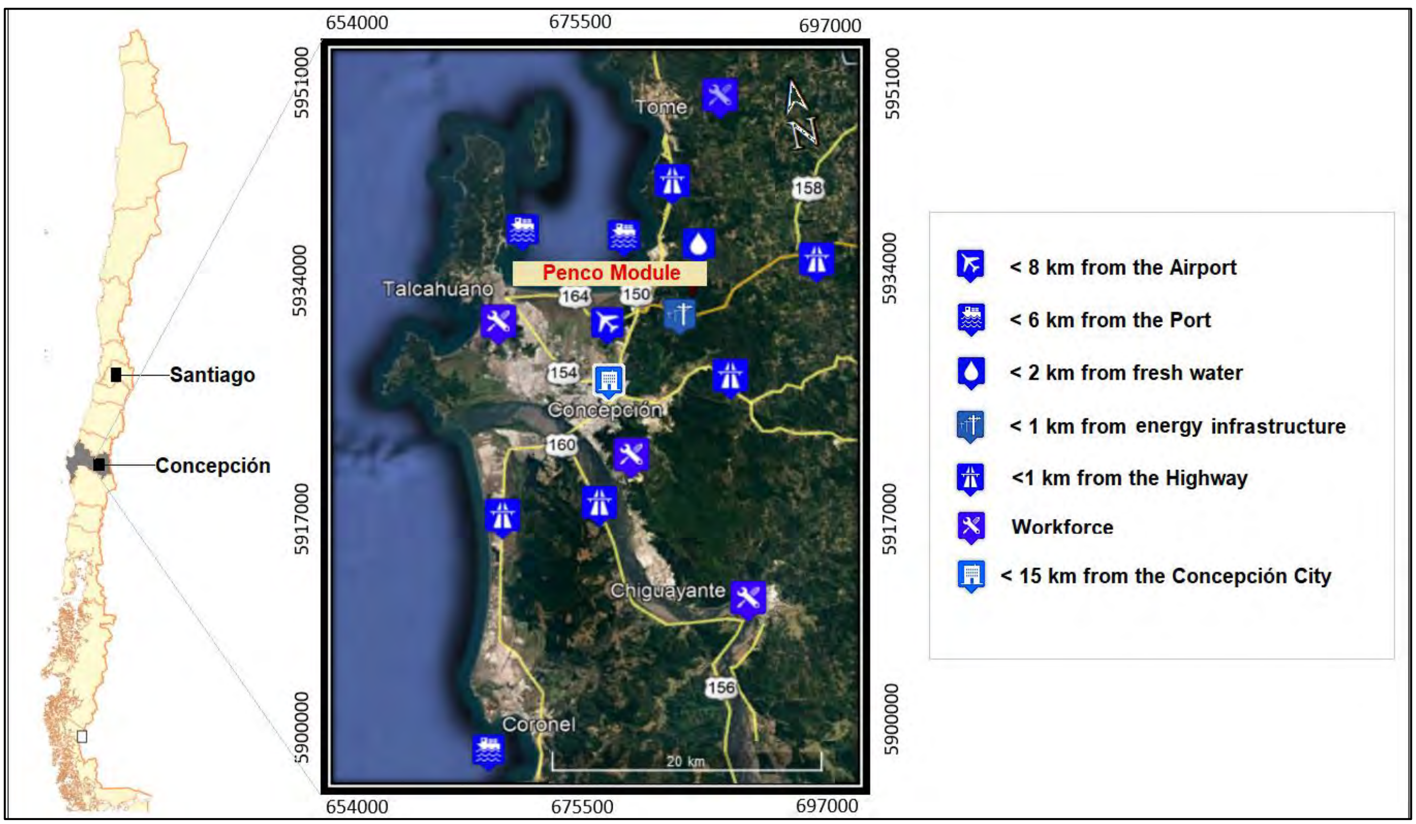
4 PROPERTY DESCRIPTION AND LOCATION

4.1 Introduction

The Penco Module is located in the boundaries of the Penco and Concepcion districts, in the Biobio Region of Chile, approximately 500 km south of Santiago, the country's capital. The assets of the Project are mostly located in the district of Penco (Figure 4-1). The central point of the Penco Project is North: 5,932,000, East: 683,400. These coordinates are in Datum Psad56 Huso 18.

The Penco Module covers a surface area of approximately 600 ha. However, the property directly involved has a surface area of approximately 250 ha.

Figure 4-1: Project Location



Note: prepared by Aclara, 2021.

4.2 Property and Title in Chile

Information in this subsection is based on data in the public domain and Chilean law.

4.2.1 Regulation

The mining industry is regulated by the following laws:

- Constitution of the Republic of Chile
- Constitutional Organic Law of Mining
- Code and Regulations governing Mining
- Code and Regulations governing Water Rights
- Laws and Regulations governing Environmental Protection as related to mining.

Chile's mining policy is based on legal provisions that were enacted as part of the 1980 constitution. These were established to stimulate the development of mining and to guarantee the property rights of both local and foreign investors. According to the law, the state owns all mineral resources, but exploration and exploitation of these resources by private parties is permitted through mining concessions, which are granted by the courts.

The concessions grant both rights and obligations, as defined by the Constitutional Organic Law on Mining Concessions (1982) and the Mining Code (1983). Many of the steps involved in the constitution of the mining concession are published weekly in Chile's official mining bulletin as are court processes due to conflicting claims.

4.2.2 Mineral Tenure

The concessions grant both rights and obligations as defined by a Constitutional Organic Law enacted in 1982. Concessions can be mortgaged or transferred, and the holder has full ownership rights and is entitled to obtain the rights of way for exploration (pedimentos) and exploitation (mensuras). In addition, the concession holder has the right to defend ownership of the concession against state and third parties. A concession is obtained by a claims filing and includes all minerals that may exist within its area.

Mining rights in Chile are acquired in the following stages:

4.2.2.1 Pedimento

A *pedimento* is an initial exploration claim whose position is well defined by Universal Transverse Mercator (UTM) coordinates which define north-south and east-west boundaries. The minimum size of a *pedimento* is 100 ha and the maximum is 5,000 ha with a maximum length-to-width ratio of 5:1.

The duration of validity is for a maximum period of two years; however, at the end of this period, and provided that no overlying claim has been staked, the claim may be reduced in size by at least 50% and renewed for an additional two years. If the annual claim taxes are not paid on a *pedimento*, the claim can be restored to good standing by paying double the annual claim tax the following year.

4.2.2.2 Manifestación

Before a pedimento expires, or at any stage during its two-year life, it may be converted to a manifestación or exploitation concession.

Within 220 days of filing a manifestación, the applicant must file a "Request for Survey" (Solicitud de Mensura) with the court of jurisdiction, including official publication to advise the surrounding claim holders, who may raise objections if they believe their pre-established rights are being encroached upon.

A manifestation may also be filed on any open ground without going through the pedimento filing process.

The owner is entitled to explore and to remove materials for study only (i.e. sale of the extracted material is forbidden). If an owner sells material from a manifestation or exploration concession, the concession will be terminated.

4.2.2.3 Mensura

Within nine months of the approval of the "Request for Survey" by the court, the claim must be surveyed by a government licensed surveyor. Surrounding claim owners may be present during the survey.

Once surveyed, presented to the court, and reviewed by the National Mining Service (Sernageomin), the application is adjudicated by the court as a permanent property right (a mensura), which is equivalent to a "patented claim" or exploitation right.

Exploitation concessions are valid indefinitely and are subject to the payment of annual fees. Once an exploitation concession has been granted, the owner can remove materials for sale.

There is a mining tax that provides protection of rights; it is calculated as a percentage of the Unidad Tributaria Mensual (UTM or monthly tax unit) and applies to each hectare of land included in the mining exploration and/or mining exploitation concessions. This tax is paid annually in a single payment before 31 March of each year.

For mining exploitation concessions, the tax rate is currently 10% of a UTM per hectare; for mining exploration concessions the tax rate is currently 2% of a UTM per hectare. The value of the UTM is adjusted monthly according to the consumer price index (IPC) in Chile.

4.2.2.4 Claim Processes

At each of the stages of the claim acquisition process, several steps are required (application, publication, inscription payments, notarization, tax payments, patent payment, lawyers' fees, publication of the extract, etc.) before the application is finally converted to a declaratory sentence by the court constituting the new mineral property. A full description of the process is documented in Chile's mining code.

Many of the steps involved in establishing the claim are published in Chile's official mining bulletin for the appropriate region (published weekly). At the *manifestación* and *mensura* stages, a process for resolution of conflicting claims is allowed.

Most companies in Chile retain a mining claim specialist to review the weekly mining bulletins and ensure that their land position is kept secure.

Legislation is being considered that seeks to further streamline the process for better management of natural resources. Under the new proposed law, mining and exploration companies will have to declare their reserves and resources and report drilling results. The legislation also aims to facilitate funds for mining projects across the country. In addition to the mining law, the Organic Constitutional Law on Mining Concessions (1982) and the Mining Code of 1983 are the two key mechanisms governing mining activities in Chile.

4.2.3 Surface Rights

Ownership rights to the subsoil are governed separately from surface ownership. Articles 120 to 125 of the Chilean Mining Code regulate mining easements. The Mining Code grants to the owner of any mining exploitation or exploration concessions full rights to use the surface land, provided that reasonable compensation is paid to the owner of the surface land.

4.2.4 Rights of Way

The Mining Code also grants the holder of the mining concession general rights to establish a right of way (RoW), subject to payment of reasonable compensation to the owner of the surface land. Rights of way are granted through a private agreement or legal decision which indemnifies the owner of the surface land. A RoW must be established for a particular purpose and will expire after cessation of activities for which the right of way was obtained. The owners of mining easements are also obliged to allow owners of other mining properties the benefit of the RoW, as long as this does not affect their own exploitation activities.

4.2.5 Water Rights

Water is considered part of the public domain and is considered to be independent of the land ownership. Individuals can obtain the rights to use public water in accordance with the Water Code. In accordance with the Code updated in 1981, water rights are expressed in litres per second (L/s) and usage rights are granted on the basis of total water reserves.

4.2.6 Environmental Regulations

Environmental impact assessments are required for projects such as dams, thermo- electric and hydroelectric plants, nuclear power plants, mining, oil and gas, roads and highways, ports, development of real estate in congested areas, water pipelines, manufacturing plants, forestry projects, sanitary projects, production, storage and recycling of toxic, and flammable and hazardous substances. Developments not covered by these categories must submit a sworn statement of environmental impact indicating that the Project or activity does not affect the environment and does not violate environmental laws. After the evaluation process, the Evaluation Commission of the respective region, or the executive director of the Environmental Evaluation Service (EES), as appropriate to a regional or interregional project, issues a resolution that qualifies the Project environmentally.

Decree No. 40/2012, 30 October 2012 Regulations for the System of Environmental Impact Assessment (Reglamento del Sistema de Evaluación de Impacto Ambiental, RSEIA) was approved and published in the Official Gazette on 12 August 2013. In general terms, the new regulation updates the assessment procedure in accordance with the legal and regulatory changes enacted in Chile from 2001 to date. It redefines the information that must be submitted when entering an Environmental Impact Assessment (EIA) or an Environmental Impact Declaration (DIA), seeking to give greater certainty to those regulated and to the citizens. The RSEIA seeks to make assessments early, to raise the standard of information and evaluation, and to reduce time to complete the process. The changes are consolidated in Law 19.300, especially with regard to public participation in EIAs. Indigenous consultation is included for projects entering the system, complying with ILO Agreement 169 in force in Chile since 2009.

4.2.7 Land Use

Chile's zoning and urban planning are governed by the General Law of Urban Planning and Construction (Ley General de Urbanismo y Construcción). This law contains several administrative provisions that are applicable to different geographical and hierarchical levels and sets specific standards for both urban and inter-urban areas.

In addition to complying with the Environmental Law (Ley Ambiental) and other legal environmental requirements, projects must also comply with urban legislation governing the different types of land use. Land use regulations are considered part of the Chilean environmental legal framework.

Land use regulatory requirements are diverse and operate at different levels, the main instruments are the inter-community regulatory plans (Planes Reguladores Intercomunales, PRI) and the community regulatory plans (Planes Reguladores Comunales, PRC). The PRIs regulate territories of more than one municipality, including urban and rural territory.

4.3 Project Ownership

REE Uno SpA (REE) is a capital company incorporated as a corporation by shares (sociedad por acciones) in accordance to the articles 424 to 446 of the Code of Commerce of the Republic of Chile.

REE Uno SpA is the unique holder and owner of the Penco Module, located in the borough of Penco, Region VIII of Biobio. This ownership covers the total material and immaterial assets included in the Penco Module , considering mining concessions, water rights, facilities, special agreements of land use, intellectual property, among others.

Currently, REE Uno SpA has a unique shareholder: Hochschild Mining Holding Limited (Hochschild Mining).Thus, Hochschild Mining is the sole and total controller of REE Uno SpA.

4.4 Mineral Tenure

REE UNO SpA owns 451,585 ha of mining rights, distributed between the Maule, Ñuble, Biobio and Araucania Regions. These rights are expressed in exploration and exploitation concessions. Table 4-1 and Table 4-2 show the number of exploration and exploitation concessions and their processing status.

Table 4-1: Mineral Tenure - Exploration Concessions

Exploration Concessions	Hectares	Concessions (N°)
Registered	97,000	343
In Process	346,800	1,211
Total	443,800	1,554

Table 4-2: Mineral Tenure – Exploitation Concessions

Exploitation Concessions	Hectares	Concessions (N°)
Registered	3,285	27
In Process	4,500	21
Total	7,785	48

The mining concessions related to Penco Module are summarized in Table 4-3 and Table 4-4, below.

Table 4-3: Exploitation Concessions

Exploitation Concessions	Hectares	Exploitation Concessions	Hectares
Catalina 1, 1 al 44	208	Bernardita 39, 1 al 8	38
Catalina 2, 1 al 17	84	Bernardita 42, 1 al 23	110
Catalina 6, 1 al 24	24	Bernardita 134, 1 al 30	30
Catalina 11, 1 al 70	70	Bernardita 58B 1 AL 30	300
Catalina 23, 1 al 40	200	Bernardita 59B 1 AL 30	300
Catalina 39, 1 al 6	30	Bernardita 60B 1 AL 30	300
Catalina 21, 1 al 40	200	Bernardita 10B 1 AL 20	200
Catalina 22, 1 al 40	200	Bernardita 57B 1 AL 10	100
Catalina 40, 1 al 6	30	Bernardita 19B 1 AL 10	100
Bernardita 3, 1 al 60	300	Bernardita 29B 1 AL 30	300
Bernardita 4, 1 al 32	156	Bernardita 34B 1 AL 10	100
Bernardita 5, 1 al 8	38	Bernardita 52B 1 AL 30	300
Bernardita 6A, 1 al 28	140	Bernardita 53B 1 AL 30	300
Bernardita 6B, 1 al 2	10	Bernardita 66B 1 AL 10	100
Bernardita 7, 1 al 42	210	Bernardita 67B 1 AL 30	300
Bernardita 8, 1 al 60	300	Bernardita 68B 1 AL 30	300
Bernardita 9, 1 al 32	160	Bernardita 69B 1 AL 30	300
Bernardita 10, 1 al 46	230	Bernardita 70B 1 AL 10	100
Bernardita 11, 1 al 28	140		
Bernardita 12, 1 al 10	50		

Exploitation Concessions	Hectares	Exploitation Concessions	Hectares
Bernardita 31, 1 al 5	23	Bernardita 8B 1 AL 30	300
Bernardita 32, 1 al 34	156	Bernardita 6B 1 AL 10	100
Bernardita 33, 1 al 32	160	Bernardita 7B 1 AL 10	100
Bernardita 34, 1 al 28	140	Bernardita 9B 1 AL 30	300
Bernardita 35, 1 al 12	48	Bernardita 18B 1 AL 10	100
Total: 7,785 ha			

Table 4-4: Exploration Concessions

Exploration concessions	Hectares	Exploration concessions	Hectares	Exploration concessions	Hectares	Exploration concessions	Hectares
Millaray 3B	300	Bernardita 33C	300	Bernardita 100C	300	Catalina A41	300
Millaray 7B	300	Bernardita 34C	300	Bernardita 101C	300	Catalina A42	300
Millaray 8B	300	Bernardita 52C	300	Bernardita 102C	300	Catalina A43	300
Millaray 9B	300	Bernardita 53C	300	Bernardita 103C	300	Catalina A44	300
Millaray 12B	300	Bernardita 54C	300	Bernardita107C	300	Catalina A45	300
Millaray 13B	300	Bernardita 55C	300	Bernardita 108C	300	Catalina A46	300
Millaray 15B	300	Bernardita 56C	300	Bernardita 117C	300	Catalina A47	300
Millaray 16B	300	Bernardita 57C	300	Bernardita 125C	300	Catalina A48	300
Catalina 3B	200	Bernardita 58C	300	Bernardita 126C	300	Catalina A49	300
Catalina 5B	100	Bernardita 59C	300	Bernardita 127C	300	Catalina A50	300
Catalina 6B	300	Bernardita 60C	300	Catalina A1	300	Catalina A51	300
Catalina 8B	200	Bernardita 66C	300	Catalina A2	300	Catalina A52	300
Catalina 9B	300	Bernardita 67C	300	Catalina A3	100	Catalina A53	300
Catalina 10B	300	Bernardita 68C	300	Catalina A4	300	Catalina A54	300
Catalina 19B	200	Bernardita 69C	300	Catalina A5	300	Catalina A55	300
Catalina 20B	300	Bernardita 70C	300	Catalina A6	300	Catalina A56	300
Catalina 22B	300	Bernardita 71C	300	Catalina A7	300	Catalina A57	300
Catalina 23B	300	Bernardita 72C	300	Catalina A8	300	Catalina A58	300
Catalina 24B	200	Bernardita 76C	300	Catalina A9	300	Catalina A59	300

Exploration concessions	Hectares	Exploration concessions	Hectares	Exploration concessions	Hectares	Exploration concessions	Hectares
Catalina 25B	300	Bernardita 77C	300	Catalina A10	300	Catalina A60	300
Catalina 26B	300	Bernardita 78C	300	Catalina A11	300	Catalina A61	300
Catalina 27B	300	Bernardita 79C	300	Catalina A12	300	Catalina A62	300
Catalina 28B	300	Bernardita 80C	300	Catalina A13	300	Catalina A63	300
Catalina 29B	300	Bernardita 81C	300	Catalina A14	300	Catalina A64	300
Catalina 30B	300	Bernardita 82C	300	Catalina A15	300	Catalina A65	300
Catalina 31B	300	Bernardita 83C	200	Catalina A16	300	Catalina A66	300
Catalina 33B	200	Bernardita 84C	200	Catalina A17	300	Catalina A67	300
Catalina 34B	300	Bernardita 85C	300	Catalina A18	300	Catalina A68	300
Catalina 37B	300	Bernardita 86C	300	Catalina A19	300	Catalina A69	300
Catalina 38B	300	Bernardita 87C	300	Catalina A20	300	Catalina A70	200
Catalina 39B	300	Bernardita 88C	300	Catalina A21	300	Catalina A71	300
Catalina 40B	300	Bernardita 89C	300	Catalina A22	300	Catalina A72	300
Catalina 41B	300	Bernardita 90C	300	Catalina A23	300	Catalina A73	300
Catalina 42B	300	Bernardita 91C	200	Catalina A24	300	Catalina A74	300
Catalina 43B	300	Bernardita 93C	300	Catalina A25	300	Catalina A75	300
Catalina 44B	200	Bernardita 94C	300	Catalina A26	300	Catalina A76	300
Catalina 45B	300	Bernardita 17B	300	Catalina A27	300	Catalina A77	300
Catalina 46B	300	Bernardita 14B	300	Catalina A28	300	Catalina A78	300
Catalina 49B	300	Bernardita 9B	300	Catalina A29	300	Catalina A79	300
Bernardita 1C	200	Bernardita 7B	300	Catalina A30	300	Catalina A80	300
Bernardita 2C	300	Bernardita 6B	300	Catalina A31	300	Catalina A81	300
Bernardita 5C	300	Bernardita 4B	300	Catalina A32	300	Catalina A82	300
Bernardita 8C	300	Bernardita 92B	200	Catalina A33	300	Catalina A83	300
Bernardita 10C	300	Bernardita 18B	300	Catalina A34	300	Catalina A84	300
Bernardita 15C	300	Bernardita 16B	300	Catalina A35	300	Catalina A85	300
Bernardita 19C	300	Bernardita 3B	300	Catalina A36	300	Catalina A86	300

Exploration concessions	Hectares	Exploration concessions	Hectares	Exploration concessions	Hectares	Exploration concessions	Hectares
Bernardita 20C	300	Bernardita 95C	300	Catalina A37	300		
Bernardita 28C	300	Bernardita 97C	100	Catalina A38	300		
Bernardita 29C	300	Bernardita 98C	200	Catalina A39	300		
Bernardita 32C	300	Bernardita 99C	300	Catalina A40	300		
Total: 56.900 ha							

The mining concessions related to the Penco Module in Penco are shown in Figure 4-2and Figure 4-3, below.

Figure 4-2: Exploration Concessions 1

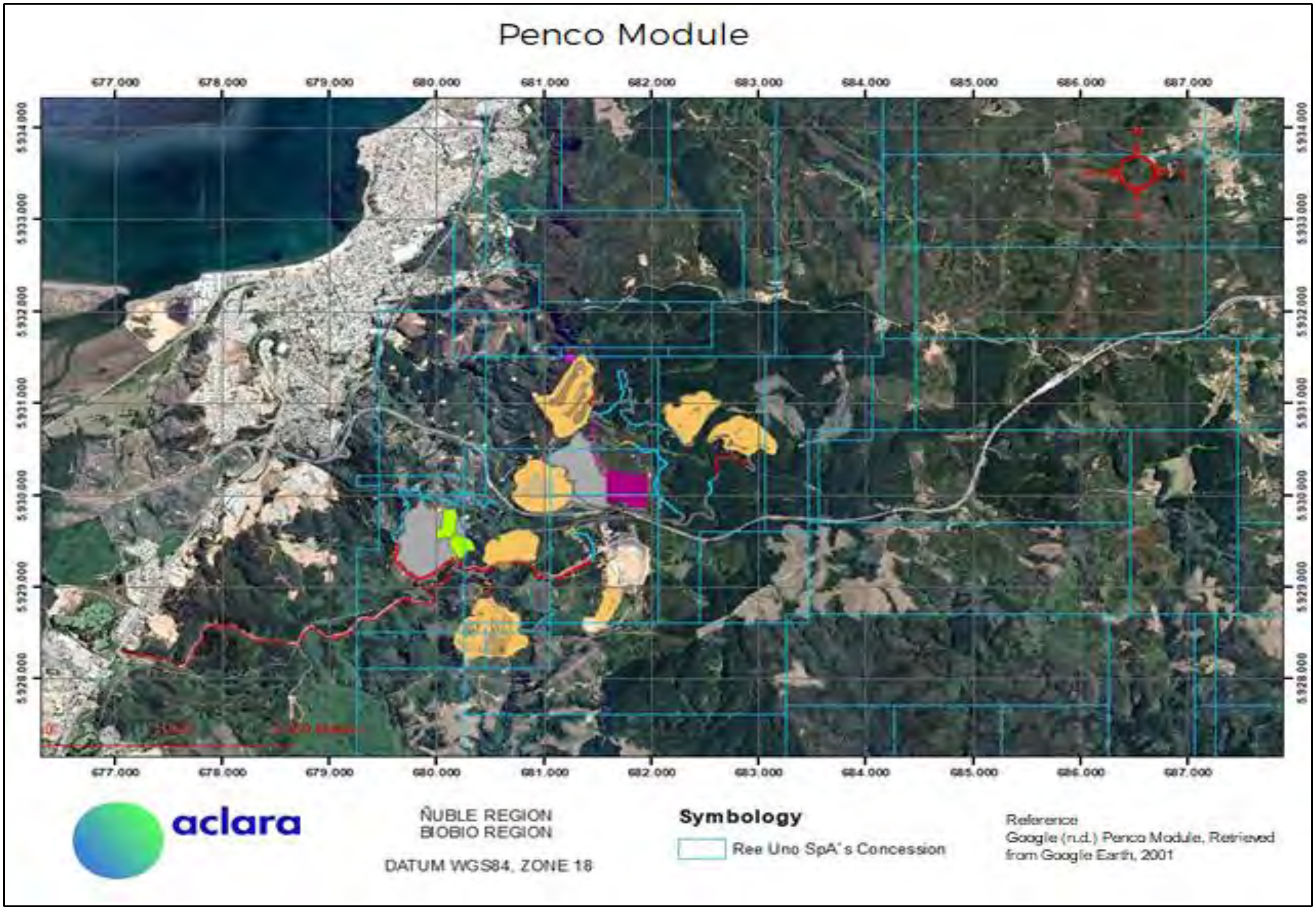


Figure 4-3: Exploration Concessions 2

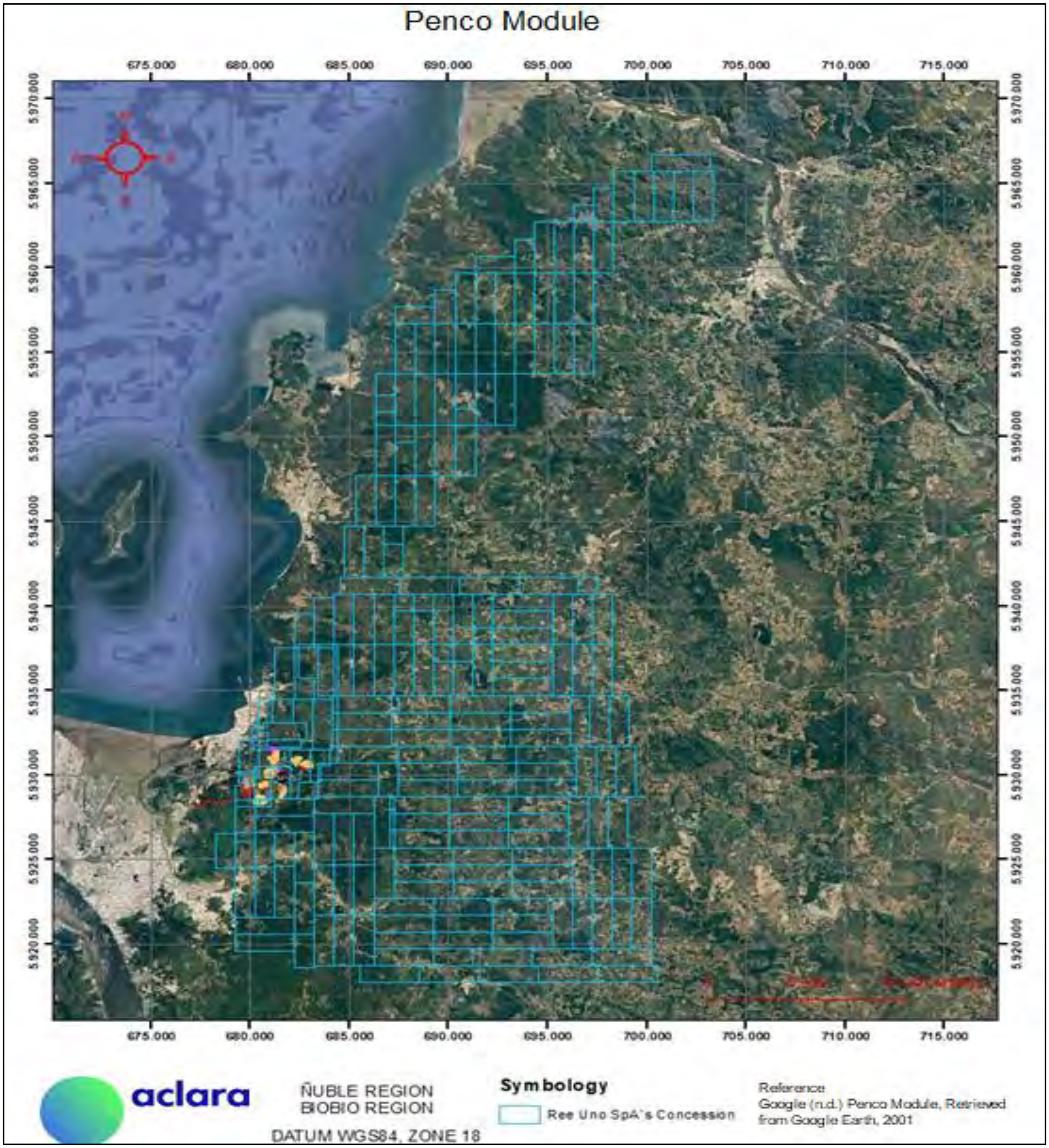
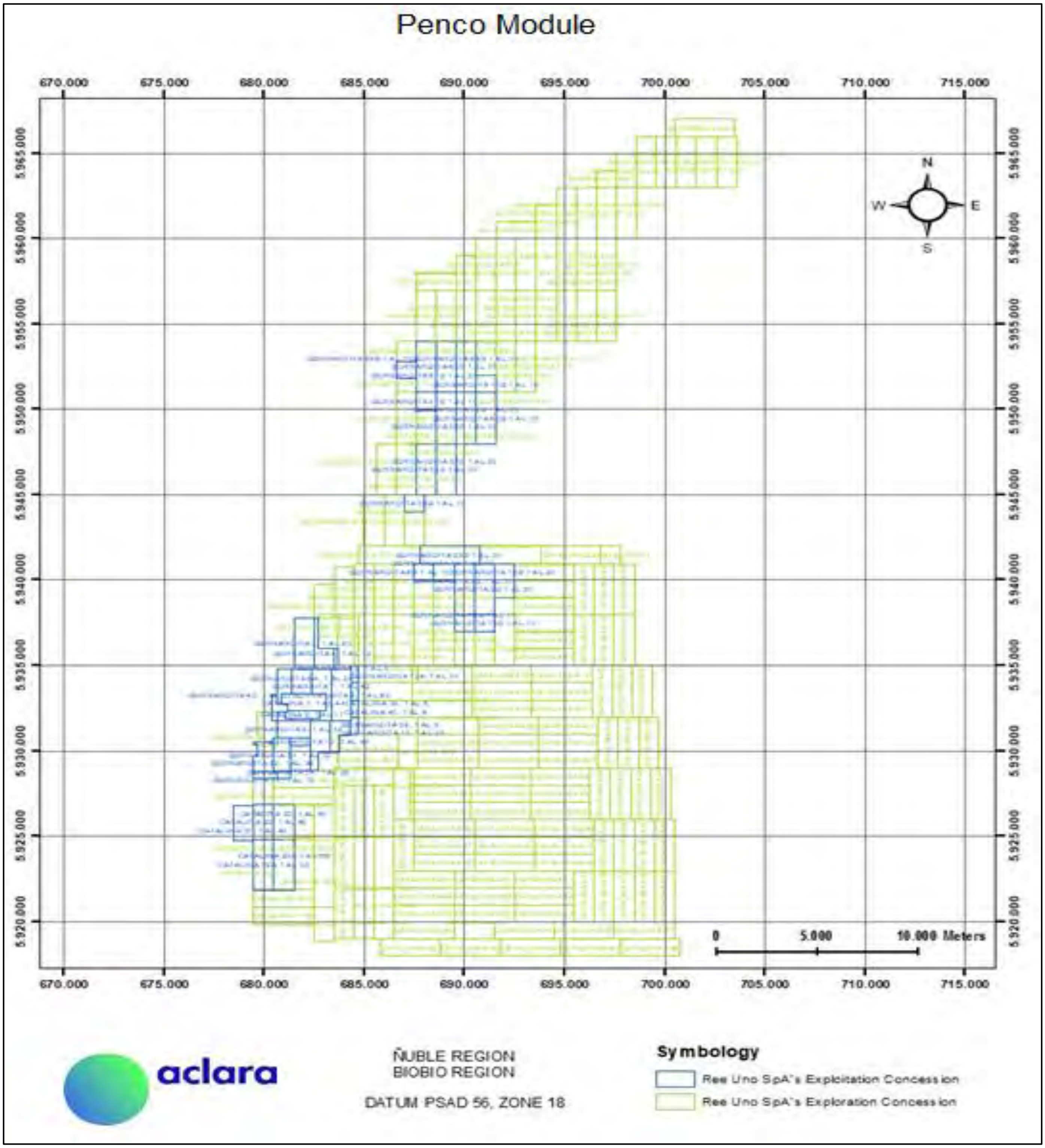


Figure 4-4: Exploration Concessions 2



A small part of the exploration/exploitation claims overlap with other mining claims. However, REE UNO SpA has the first and preferential right to own all these exploration/exploitation claims.

Figure 4-5 and Figure 4-6 show the overlaps.

Figure 4-5: Exploration/Exploitation Claims Overlap 1

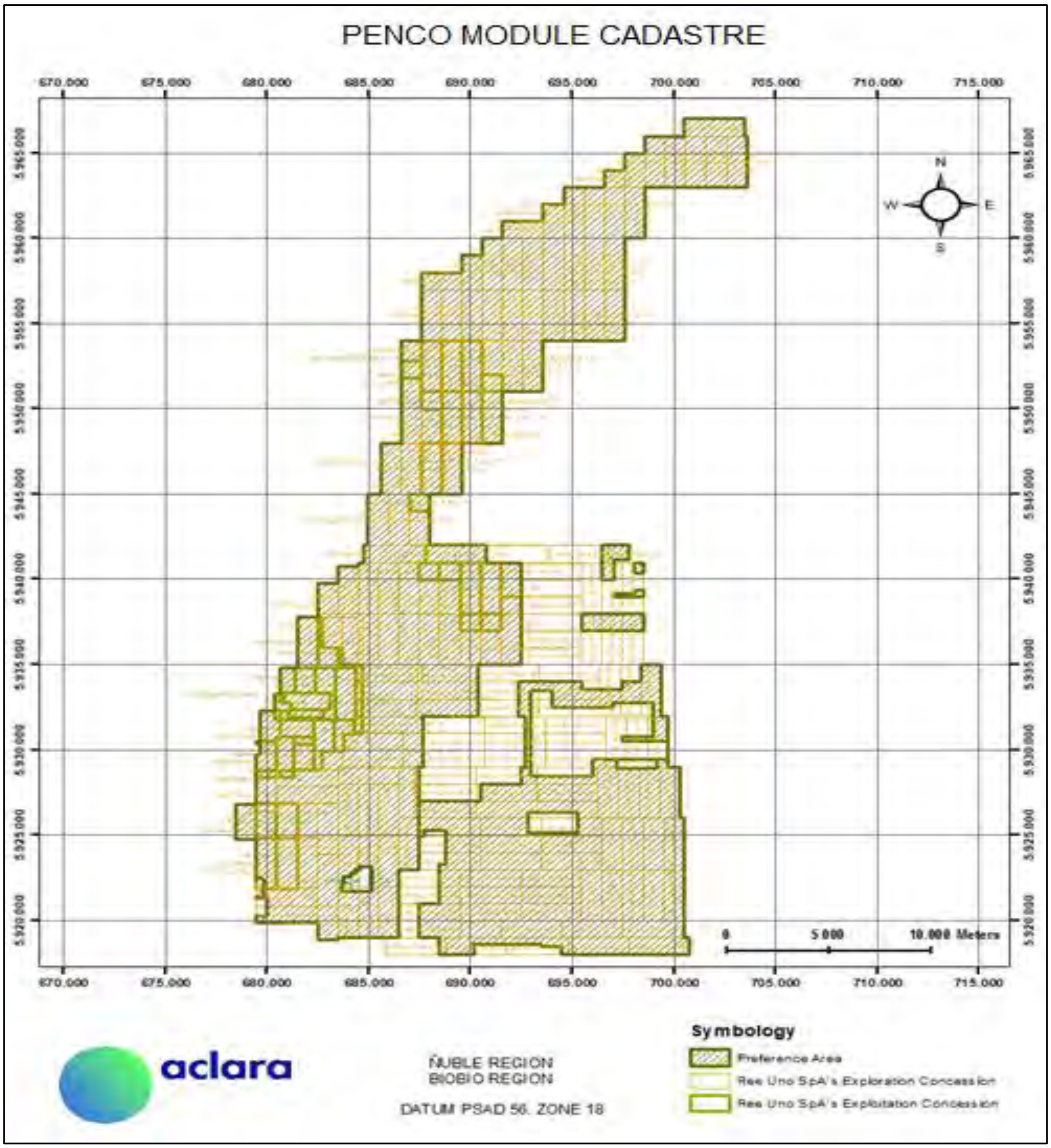
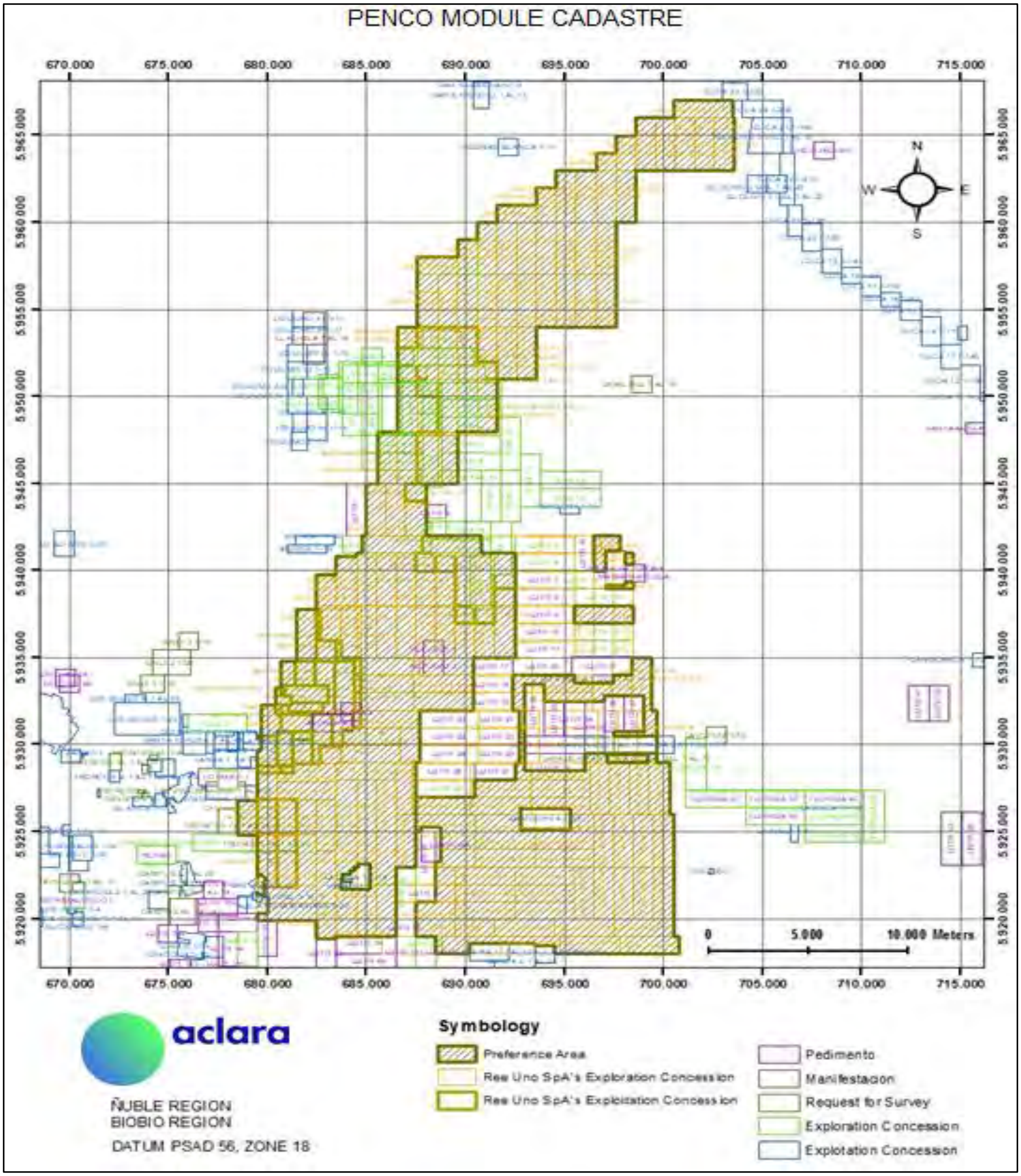


Figure 4-6: Exploration/Exploitation Claims Overlap 2



4.5 Surface Rights

REE UNO SpA owns the land and the surface rights where most of its mining concessions are located.

REE UNO SpA acquired the ownership of the surface land (which has an approximate area of 549.5 ha), pursuant to a real estate sale and purchase agreement executed between Forestal Arauco S.A. and REE UNO SpA, by means of a public deed dated November 23, 2020, Digest No. 22.519-2020, of the Notary's Office of Santiago of Mr. Iván Torrealba Acevedo.

Pursuant to real estate sale and purchase agreement mentioned before, REE UNO SpA acquired the ownership of 6 (six) land titles. All the land titles are registered in the Property Registry of the Penco and Concepcio

n Real Estate Registrar in 2021:

i. "Lote G, Bellavista" which has an approximate area of 131.40 hectares registered in the Property Registry of the Penco Real Estate Registrar of 2021, page 17, number 16.

ii. "Lote B, Coihueco" which has an approximate area of 291,76 hectares registered in the Property Registry of the Penco Real Estate Registrar of 2021, page 19, number 17.

iii. "Lote E, Retamo Uno" which has an approximate area of 5.93 hectares registered in the Property Registry of the Penco Real Estate Registrar of 2021, page 22, number 18.

iv. "Lote F, Retamo Uno" which has an approximate area of 5.12 hectares registered in the Property Registry of the Penco Real Estate Registrar of 2021, page 24, number 19.

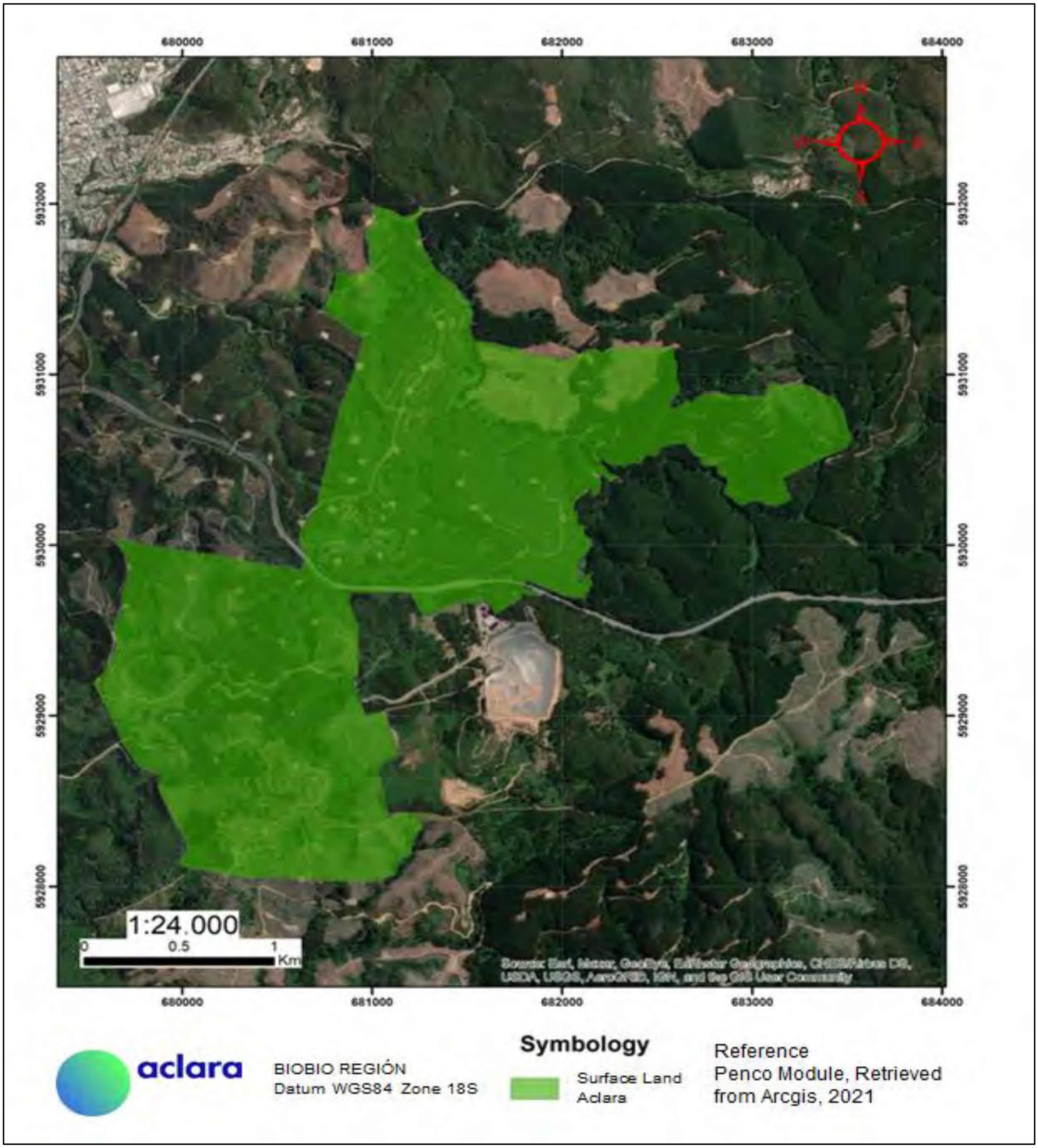
v. "Cortijo Dos" which as han approximate area of 91,0 hectares registered in the Property Registry of the Penco Real Estate Registrar of 2021, page 26, number 20.

vi. "Lote J, Retamo Dos" which has an approximate area of 15.40 hectares registered in the Property Registry of the Concepcion Real Estate Registrar of 2021, page 439, number 417.

All these land titles form the polygon indicated in Figure 4-7 below.

To secure the payment of the real estate sale and purchase agreement, REE UNO SpA constituted a mortgage in favor of Arauco on each one of the properties indicated in the previous paragraph. These mortgages are meant to be lifted on the date in which the purchase price is fully paid by REE UNO SpA, whose deadline is November 2026.

Figure 4-7: Polygon acquired from Forestal Arauco S.A.

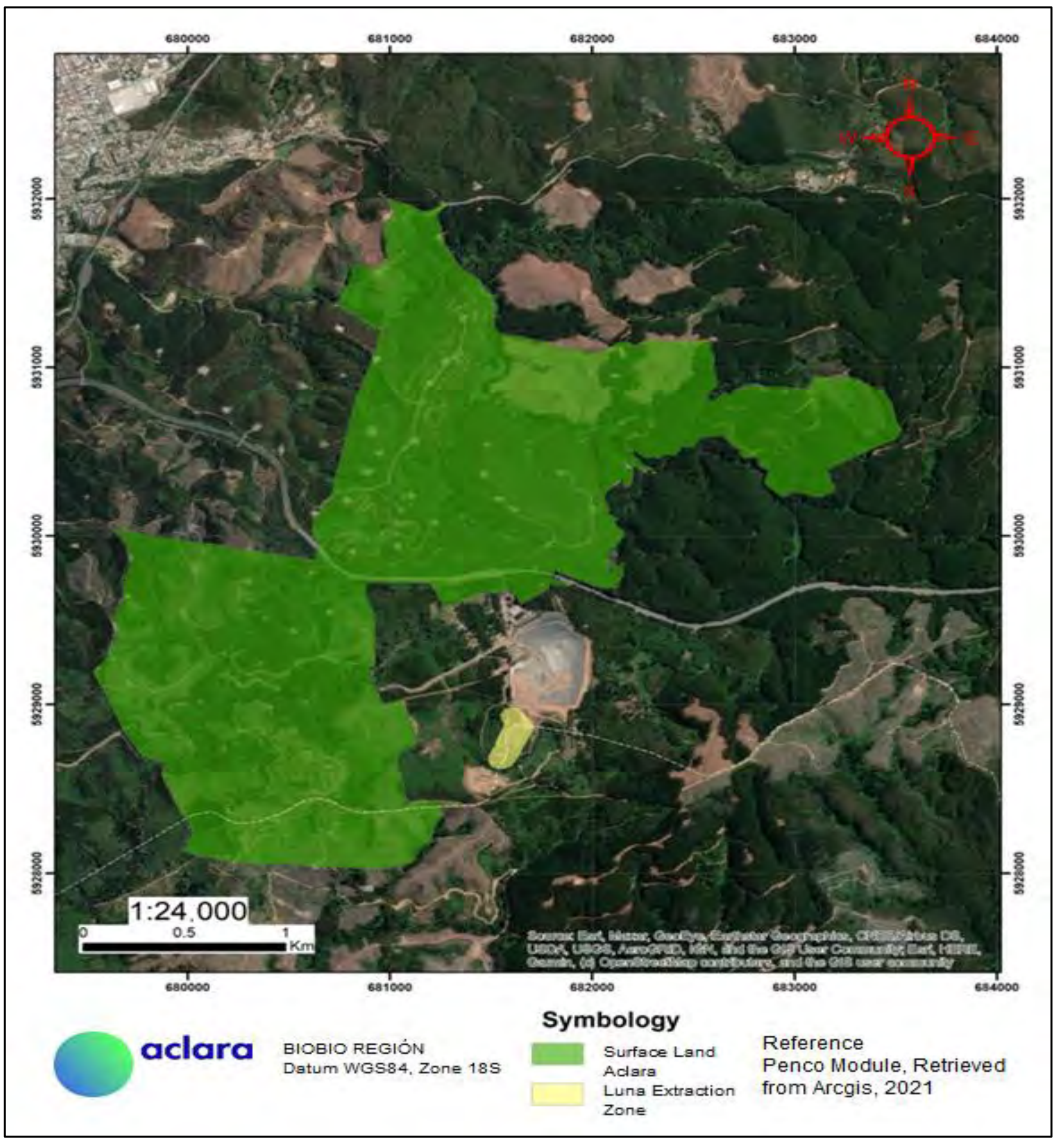


Additionally, there is the "Luna" extraction area of the Project, which is located in surface land that is owned by another company (Sociedad Inmobiliaria Hermanos Recart Ltda). The Luna extraction area is shown in Figure 4-8.

Nevertheless, this fact is not a limitation for REE UNO SpA to carry out exploration and exploitation activities in the area. This, since REE obtained the necessary authorization from the owners of the surface land in December of 2018, through the execution of a memorandum of understanding between REE UNO SpA and Sociedad Inmobiliaria Hermanos Recart Ltda.

According to the MOU, in April of 2021 the terms and the compensation of the mining land use easement were agreed. The most relevant terms are: 1) The land use easement covers and ensures all the hectares of the "Luna" extraction area; and 2) The land use easement is valid over all the lifetime of the Project. This mining easement is in the drafting process.

Figure 4-8: Location of the Luna Extraction Area (brown)



4.6 Water Rights

4.6.1 Water Use Rights

The Penco Module has two water rights to supply the commercial plant. The following rights are owned by REE UNO SpA:

- Right of consumptive use, on surface waters and streams of the Penco watershed, located in the district of Penco, Province of Concepcion, Biobío Region, according to the following exercise and distribution presented in Table 4-5:

Table 4-5: Right of Consumptive Use - Penco Watershed

Flow Rate	Unit	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Steady Continuous	l/s	24	20	22	33	49	49	49	49	49	49	49	35
Prospective Discontinuous	l/s	25	29	27	16	0	0	0	0	0	0	0	14

This right was granted by Resolution No. 208, dated 26 September 2016 of the General Directorate of Waters of the Biobío Region, reduced to a public deed in the Notary's Office of Concepcion of Esq. María Eugenia Rivera González dated 16 January 2017, Digest No. 51/2017 and registered in page 10 No. 7 of the Water Ownership Registry of the Real Estate Registrar of Penco for the year 2018.

The Project requires 9.7 l/s of water which will come from the Penco watershed. In this connection, the hydric resource for the entire project development is ensured by just this right of consumptive use.

- Right of consumptive use, on surface waters and streams of the Cabrito watershed, located in the district of Penco, Province of Concepcion, Biobio Region, according to the following exercise and distribution presented in Table 4-6:

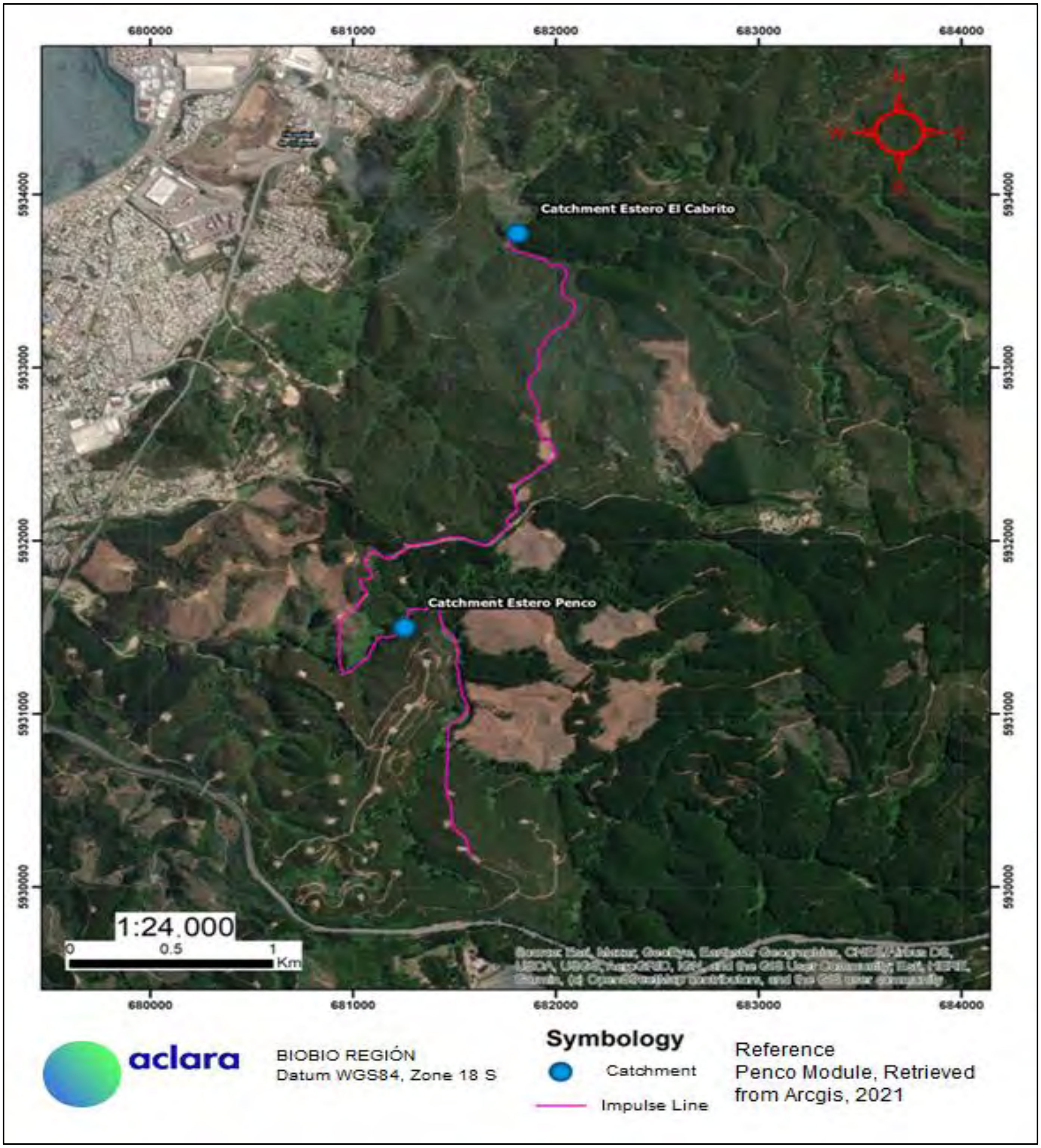
Table 4-6: Right of Consumptive Use - Cabrito Watershed

Flow Rate	Unit	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Steady Continuous	l/s	0	0	0	0	9	49	49	49	49	0	0	0
Prospective Discontinuous	l/s	0	0	0	0	40	0	0	0	0	49	49	40

This right was granted by Resolution No. 209 dated 26 September 2016 of the General Directorate of Waters of the Biobio Region, reduced to a public deed in the Notary's Office of Concepcion of Esq. María Eugenia Rivera González dated 16 January 2017, Digest No. 52/2017 and registered in page 7, No. 6 of the Water Ownership Registry of the Real Estate Registrar of Penco for 2018.

Figure 4-9 below shows more clearly the intake points from Penco and El Cabrito watersheds.

Figure 4-9: Intake Points



Additionally, REE owns two more water use rights near the Project; they are as follows:

- Right of **consumptive** use, on surface waters and streams of the Bellavista watershed, located in the district of Tomé, Province of Concepcion, Biobío Region, Table 4-7 shows the following exercise and distribution of flow rates.

Table 4-7: Right of Consumptive Use - Bellavista Watershed

Flow Rate	Unit	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Permanent discontinuous	l/s	0	0	0	0	9	49	49	49	49	49	0	0
Eventual discontinuous	l/s	49	49	49	49	40	0	0	0	0	0	49	49

This right was granted by Resolution No. 608 dated 10 December 2018 of the General Directorate of Waters of the Biobío Region, reduced to a public deed in the Notary's Office of Concepcion of Esq. Ramón García Carrasco dated 11 June 2019.

- Right of **consumptive** use, on surface waters and streams of the Popen watershed, located in the district of Florida, Province of Concepcion, Biobío Region, Table 4-8 shows the following exercise and distribution of flow rates.

Table 4-8: Right of Consumptive Use - Popen Watershed

Flow Rate	Unit	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Permanent discontinuous	l/s	0	0	0	49	49	49	49	49	49	49	49	0
Eventual discontinuous	l/s	49	49	49	0	0	0	0	0	0	0	0	49

This right was granted by Resolution No. 208, dated 9 November 2015 of the General Directorate of Waters of the Biobío Region, reduced to a public deed in the Notary's Office of Concepcion of Esq. Ramón García Carrasco dated 11 June 2019.

4.7 Permitting Considerations

Access to the Project is via Route 150 (this route is a public road) and then continues through a private road owned by Madi Ltda.

By means of a certificate of feasibility of use of the road granted at the Notary of Concepcion of Mrs. Zunilda Suazo Castillo on July 6, 2021, Madi Ltda. has authorized the Penco Module the use of the road located in their property.

4.8 Environmental Considerations

Refer to section 20 for details related to environmental considerations.

4.9 Social License Considerations

Refer to section 20 for details related to social license considerations.

4.10 Comments on Property Description and Location

In the opinion of the QP:

- Aclara Resources Inc. 100% of the mining project called "Penco Module". Aclara Resources Inc. is also the Project operator.
- Information from legal experts supports that the mining tenure held is valid and is sufficient to support the declaration of Mineral Resources and Mineral Reserves, as well as to support the development of the project.
- Aclara holds sufficient surface rights to allow construction and development of the planned mining-related infrastructure. Additional surface rights, needed for the develop of the Luna area, are currently in the process of occupation easement negotiation. Together, the current ownership of surface land and the occupation easement in negotiation, cover 100% of the area needed for construction of facilities and infrastructure, as well as the extraction area.
- Aclara holds water permits; these water rights guarantee the water requirement of the Project.
- The current permits have allowed the development of the Project activities. There are duly legalized authorizations regarding the use of private access roads to the Project. Environmental permits are currently in the evaluation process.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, AND PHYSIOGRAPHY

5.1 Accessibility

Access to the site from the town of Penco is 5 km via Route 150, which connects with a 7 km paved road that leads to the site as shown in Figure 5-1. Total travel time by road from Penco to site is approximately thirty minutes. Access is all year round.

Figure 5-1: Access to plant

Note: prepared by Aclara, 2021.

5.2 Climate

Local climate is temperate rainy warm with winter rains and high atmospheric humidity (Csbn's), which contemplate as basis the same characteristics related to temperature, precipitation, and thermic characteristics than Csb weather. However, this weather has rare fogs with high humidity in the air and lack of rain with a relative low temperature.

The reference elevation of land in which Process Plant will be located is, approximately, 250 meter above sea level.

The average temperature in the Project zone ranges from minimum values of 9° C to maximum values of 23.8 ° C in Summer, while in Winter the minimum averages 4.2 °C and maximum values of 11.6° C are reached.

The annual average relative humidity is 85%, with an average of 75% during summer and 95% during winter.

The mean annual total precipitation at site is 1,550 mm, with a monthly average rainfall of 35 mm and 150 mm during summer and winter respectively.

5.3 Local Resources and Infrastructure

The Penco Module is located in the border of the Penco and Concepcion districts. The population of Penco and Concepcion Districts are 47,367 and 223,574, respectively.

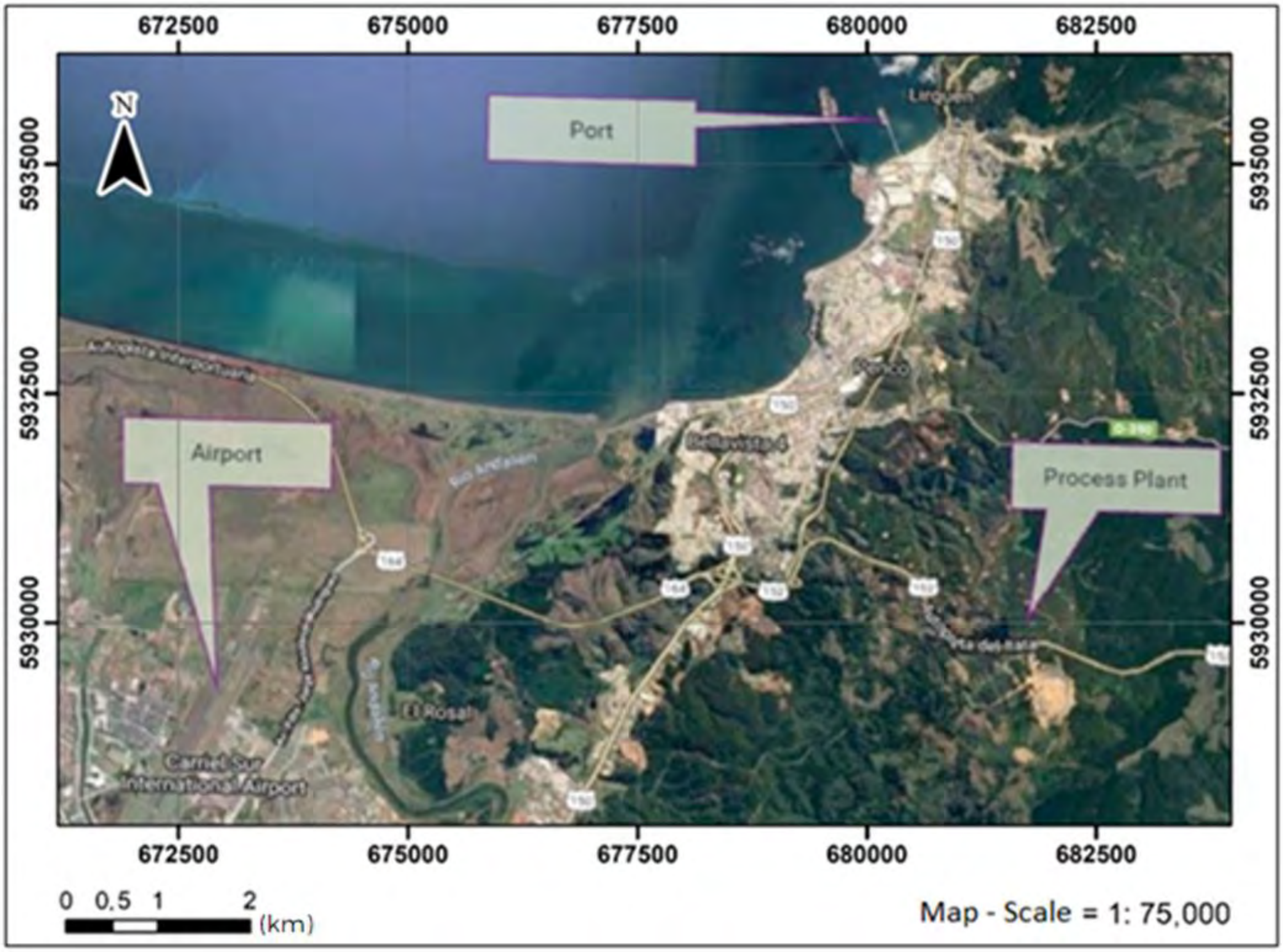
The Project contemplates the development of instances, in the districts of Penco and Concepcion, to promote the hiring of local labor according to the requirements of each stage of the Project; construction, operation and closure. Under the same concept, local supplier plans will be developed to promote the development of the districts and satisfy the requirements of the Project.

The province of Concepcion is considered a center for knowledge, culture, science and technology and for the development of research as a result of the knowledge developed by the great variety of professionals and specialists trained in the Universities of the province.

The region has extensive knowledge of the mining industry generated by the development of the coal industry and the steel industry. The region's economy is sustained by a strong export base from forestry activity, fishing and industrial activities, highlighting cellulose, fishmeal and steel.

The port, railways and service infrastructure (Figure 5-2) present in the districts of Concepcion and Penco elevate the BioBío region as a logistics platform for the country's exports and imports.

Figure 5-2: Port and Airport



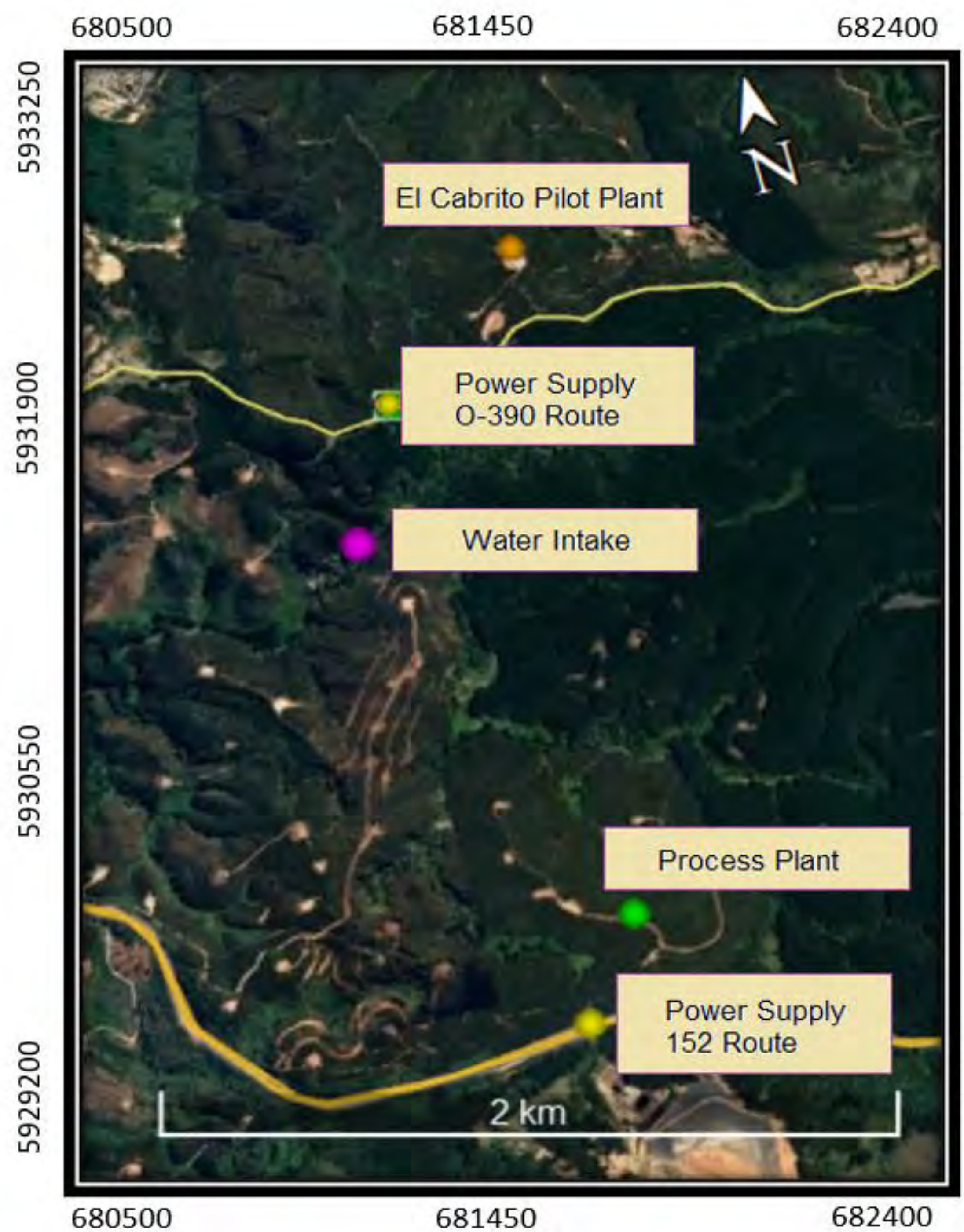
Note: prepared by Aclara, 2021.

The Ports of Lirquen and Talcahuano are located 8 km and 20 km from the Project site, respectively. The processing plant is located 12 km from the Carriel Sur International Airport located in the Talcahuano District as shown in Figure 5-2.

Concepcion is part of the great national railway logistics network for freight transport. The railway section that connects the cities of Penco and Concepcion is used only as a means of transport and supply to the ports of the BioBío Region.

The BioBío Region has the second largest installed power generating capacity and registers the highest consumption of primary energy in the country, making it the energy capital of Chile. The installed capacity in the region is 4,792 MW in 68 plants, of which 3,162 MW come from renewable energies. The processing plant is located less than 3 km from the Penco electrical station and less than 8 km from the Concepcion substation as shown in Figure 5-3.

Figure 5-3: Power And Water Supply



Note: prepared by Aclara, 2021.

The BioBío region has 21 water purification plants supplying more than 449,000 customers, through a permanently monitored underground network of pipes. A tank is considered in the project, which will be supplied by a tank truck. Potable water will be mainly used for human consumption and emergency eyewash showers.

The Project's fresh water will be supplied through a water intake in the Penco stream, which will allow the operation of the production plant.

5.4 Physiography

The Project is located in the Region of Biobio, in a general area located in the Costal Range, near the district´s of Penco and Concepcion. The Project area is between 180 and 400 meters of altitude, approximately.

Regarding geomorphology, the conditions present in the Region, according to the classification proposed by Börgel (Börgel, R., 1983) show a clear distribution within the type of formations that develop:

- Marine and / or fluviomarine plain.
- Coastal Range.
- Marginal granite basin.
- Plains of fluvial and / or alluvial sedimentation.
- Central fluvio-glacio-volcanic plain.
- Central plain with moraines and cones.
- Foothills- Andean mountain range with cryonic retention.
- Active volcanic mountain range.

Of the geomorphological formations indicated, the Project is located in the Costal Range formation. This physiographic unit is characterized by being a flattened relief, with some bodies with heights no higher than 780 meters.

From a hydrological point of view, the El Cabrito stream, the only channel with permanent flow, is located 1.5 km North of the Project. In the Central Zone of the Project there are streams that are part of the Penco stream drainage network, while in the South zone there are no bodies of water.

Based on the Bioclimatic and Vegetational Synopsis of Chile (Luebert & Pliscoff, 2017), the Project is located between two (2) plant formations, the sclerophyllous forest and the deciduous forest. However, an important part of the vegetation is fragmented and most of it has been replaced by Pinus radiata and Eucalyptus globulus plantations.

Iriarte (2008), established that the area where the Project will be located corresponds to the Valdivian forest, corresponding to an ecoregion of the south central zone of the country, between parallels 35 ° and 48 °, highlighting a large amount of native fauna. In addition to the above, Demangel (2017) identifies the Project area within the temperate forest biogeography. Despite what has been described above for this type of ecological or bioclimatic region, this area, and a large part of the Biobio region, has a large area of forest and agricultural plantations, the main ones being monoculture forest plantations, the cultivation of grass species forage crops and cereal cultivation, significantly reducing the possibility of finding a large part of the species of ecological interest.

The Project is not located in Protected Areas and Priority Sites for Conservation, so none of its activities, parts or works directly or indirectly affect this environmental component. The closest of these protected areas is the Nonguén National Reserve, at an approximate distance of 13 km to the South (S) of the Project's area of influence, while the Hualpén Peninsula Nature Sanctuary is located 20 km to the Southwest (SW) of the Project.

Additionally, the Project area does not coincide with any of the historical monuments and areas of historic conservation buildings.

5.5 Seismicity

According to the Chilean standard NCh2369, the Project is located in Seismic Zone 3, presenting maximum effective acceleration values of the soil of 0.4 g. It should be noted that the entire country's territory, with its three seismic zones, present a high seismic risk.

In 2021, Chilean company Gensis, Ingeniería Geotécnica Sísmica developed a study to evaluate seismic danger in the area where the Penco Module will be located, with the purpose of quantifying the seismic demand for different performance levels in the different areas of the Project. Recommendations will be included in future design phases.

6 HISTORY

6.1 Ownership History

From 2012 to 2018 Penco Module was majority-owned (94%) by a Chilean private fund FIP Lantánidos and controlled by a private equity firm named Minería Activa (MA). MA was created in 2008 to manage private equity investments in the mining industry, from exploration to production.

Hochschild Mining invested in the Project during 2018 and in early 2019 in exchange for a 6.2% equity stake with an option to increase ownership. At the end of 2019, Hochschild Mining took full ownership of the Penco Module deposit after acquiring the remaining 93.8% stake.

During the month of August, 2021, REE Uno SpA -the Chilean company holding 100% of the Project started to implement a change in the trading name of the Project, from BioLantánidos to Aclara. REE Uno SpA continues being the legal owner of all the Project's assets and rights and this is only a change in the commercial brand of the Project vis-a-vis its stakeholders, which has no legal impact in any of the Project's activities and pending processes. REE Uno SpA has started the registration of the relevant trademarks, logos and internet domain names to be associated with the use of the new commercial brand, both in Chile and Canada.

6.2 Exploration History

Minera BioLantánidos (MBL) began exploring Lanthanides in northern Chile, focusing on Iron Oxide Copper Gold (IOCG) ore deposits and Iron Apatite deposits. Nevertheless, the interest decreased after it was reflected that they are characterized by low-grade, low volumes and complex metallurgy. Considering the above, in 2012 MBL change the focus of the exploration program to an Ion Adsorption Clay model. This marks the beginning of the study and geological mapping of the Coastal Batholith, in the Region of Biobio, with the main focus in the migmatites of Santa Juana and the pegmatites of Florida, leading to the discovery of the peraluminous granite of Penco.

The High Rare Earth anomalies detected in Penco granites in 2014, were found in outcrops of slopes by new roads and studies involving radiometric flights, NanoTEM, Lidar topography, and surface sample ICP analysis. This sampling confirmed that the Garnet Granite is strongly correlated to the radiometric Th anomaly. At the same time, in early 2015, the first sample of REO Concentrate was obtained from this material using a pilot plant located in the sector of Cabrito in Penco.

In 2014, MBL acquired a sonic drill to drill the saprolite without water injection or additives. These activities were carried out in Penco and El Espino area located 13 km of Penco.

In September 2014, a second sonic machine was included. This program ended in June 2015, completing 4,888 m in 166 sonic drill-holes and 1,171 m in 11 diamond drill-holes. During this period, the source zones that were defined are now called Marisol, Alexandra, Victoria (Norte and Sur), Luna, and Maite. Phase III of drilling in Penco started in August 2015, completing 3,239 m with 125 sonic drill holes. The last phase started in 2017 and ended in 2018, 5,522 m were drilled in 176 sonic drill holes.

In 2020, MBL, planned a drill campaign to characterize the mineralogy, analyse the REE-total and REE exchangeable. This led to the establishment of a new geological domain and resource model estimation updated for Maite, Victoria (Norte and

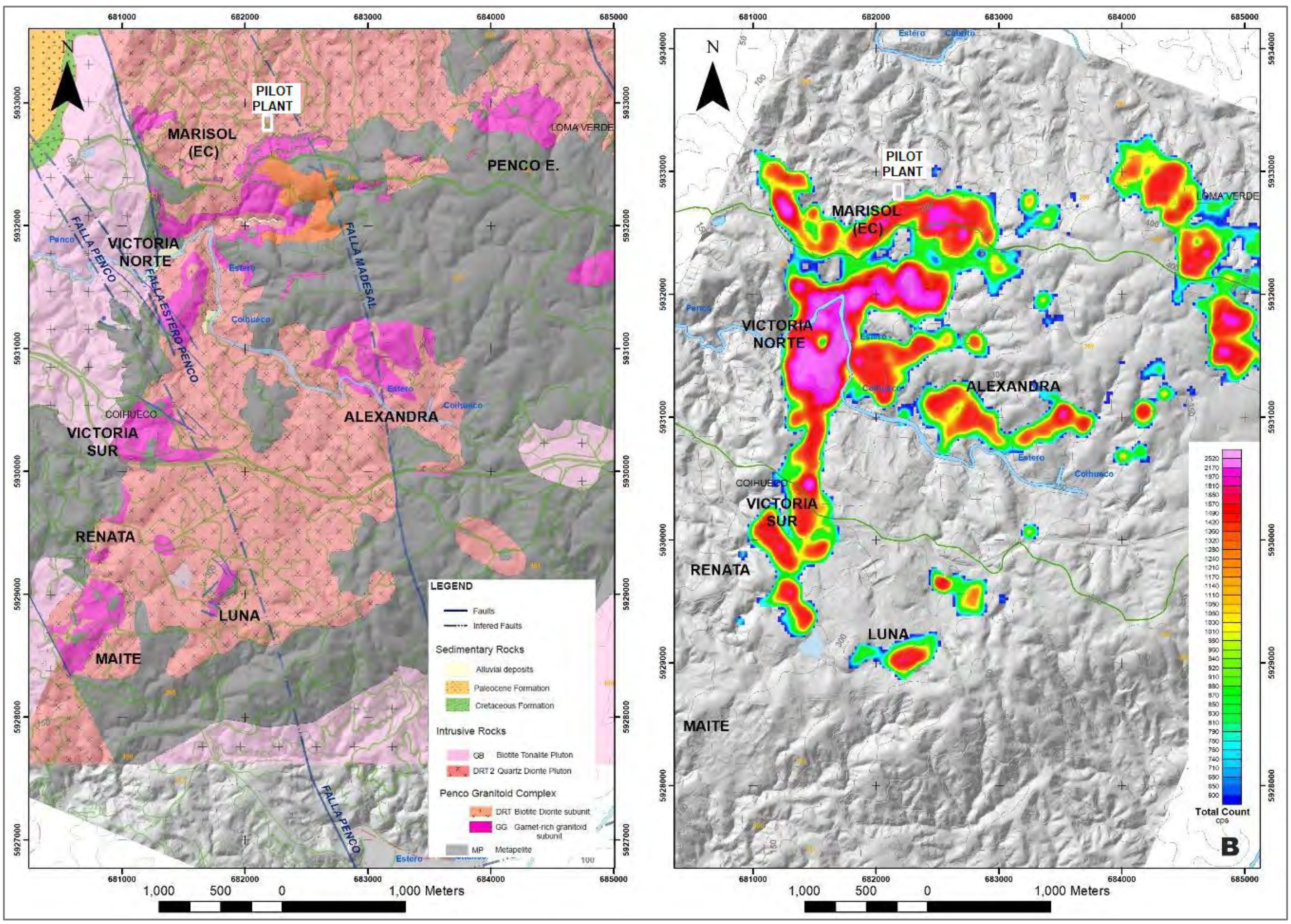
Sur), Luna y Alexandra ore bodies totalling 6,486 m in 220 sonic drill holes. From December 2020 to March 2021, a brownfield and infill campaign was performed for the Penco Project with a total of 6,418 m in 259 sonic drill holes. The objective was to extend the known mineralized ore bodies in Maite, Luna, Alexandra, Victoria Norte, and Victoria Sur totalling 6,700 samples.

7 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The Project covers an area of 6 km x 3 km, located in the Coastal Range in the Biobio Region in south-central Chile and it lies in a carboniferous granitoid batholith complex intruding the eastern metamorphic basement series. See Figure 7-1 for the location of these geological and geophysical anomalies.

Figure 7-1: District Geological and Geophysical Thorium Anomalies Maps



Note: prepared by Aclara, 2021.

These rocks were affected by humid temperate climatic conditions that lead to the development of an extensive and deeply weathered regolith (+/- 40 m). This regolith contains abundant clay minerals that were locally enriched with REE in the favorable horizons. Mineria Activa (MA) carried out a geochemical program in the zone that found significant yttrium (Y), cerium (Ce) and thorium (Th) anomalies (Figure 7-1).

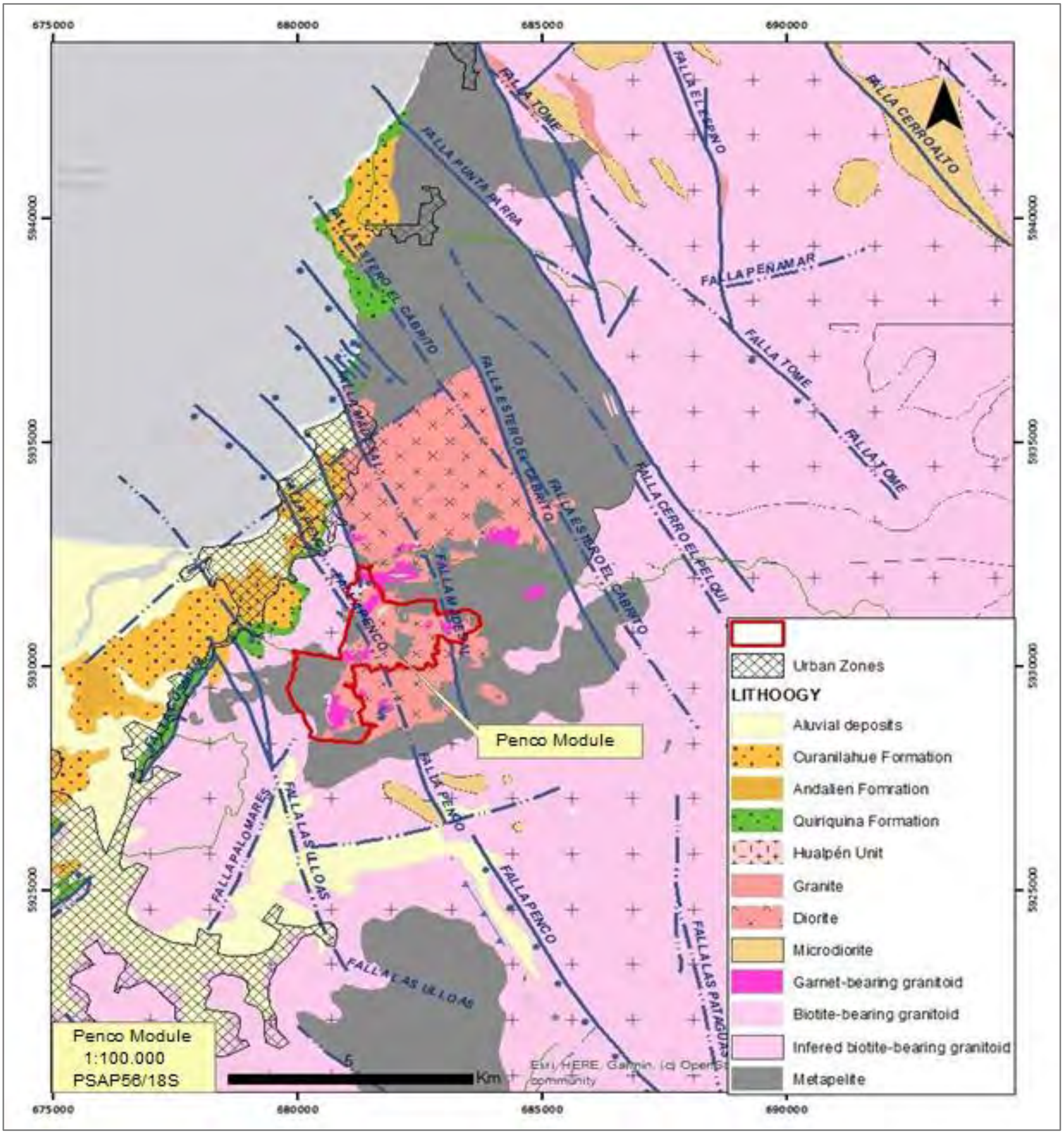
Locally, REE anomalies were detected through soil analysis, using a portable XRF in roadcut exposures. The most significant were found in the Penco sector. These findings were better defined by a radiometric flight, NanoTEM and LiDAR topography, confirming that GG is strongly correlated with the radiometric anomaly of Th.

7.2 Project Area Geology

7.2.1 Lithology

Four main rock complexes are recognized: Metapelites (Paleozoic basement), Eastern Concepcion Plutonic Complex (oldest intrusion, east of the Project), Penco Granitoid Complex (host of REE-rich ore bodies) and the Quartz-Diorite (youngest intrusion). Figure 7-2 presents the geology of the Project and the compositional variety of the igneous intrusions.

Figure 7-2: District Geological Map of the Penco Module Located Between the Western Series, the Metamorphic Complex (WMC) and Concepcion Eastern Concepcion Plutonic Complex (CEPC)



Note: prepared by Aclara, 2021.

7.2.1.1 Eastern Series Metamorphic Complex (ESMC)

According to its macroscopic aspect and the presence of weak foliation, the ESMC has been classified as a low-grade metamorphic metapelite of medium to fine grain size, brown to reddish-brown color, very competent, with abundant quartz and visible micas. Its high quartz content and silicification makes it resistant to weathering conditions, leaving it exposed at the southern and western zones of the district, prevailing in the higher parts of hills, usually as a roof pendant over the granitoids.

7.2.1.2 Eastern Concepcion Plutonic Complex (CEPC)

The CEPC is the oldest intrusive unit, characterized by biotite- and amphibole-bearing granitoid (GB) of I-type magmatism, with hornblende and high Ca-Na (plagioclase) concentrations (Deckart et al., 2014; Dold, 2015). The GB has a coarse to very coarse grain phaneritic texture with a whitish-gray color on the fresh surface, comprising quartz (35%), plagioclase (25-30%), biotite (15-18%), amphibole (5-10%) and occasional K-feldspar (<3%). In outcrops, the GB is yellowish-brown and rich in large quartz crystals (>5 mm) with a saprolitic matrix rich in clays and iron hydroxides, after feldspar, biotite and amphibole weathering. The CEPC is widely distributed as a NS-elongated belt in the eastern zone of the district. On its western margin, it has intruded the ESMC by fault contact (Creixell, 2001).

7.2.1.3 Penco Granitoid Complex (PGC)

After the CEPC intrusion, the PGC takes place through a biotite-bearing diorite (DRT) and garnet-bearing granitoid (GG). Radiometric dating of U-Pb in zircon yields an age of 318.9± 2.2 Ma for both subunits, which are distributed in the north and center zones of the district. The DRT locally contains low-grade REE-exchangeable mineralization and is the country rock of the garnet-rich GG. The DRT is characterized by medium to fine grain equigranular texture, with mainly plagioclase with subhedral biotite (15-20%), scarce interstitial quartz and rare interstitial amphibole. Its intrusion is followed by (or syngenetic to) the GG, likely generating regional metamorphism and/or partial melting of metasediments.

The GG consists of garnet- and biotite-bearing tonalites with coarse to medium-grained texture, comprising plagioclase (28-35%), quartz (15-25%), garnet (15-24%), and biotite (12-18%), with small quantities of amphibole (2%) and K- feldspar (1%). The almandine garnet is one of the latest formed minerals, characterized by euhedral crystals, commonly with ring-like inclusions of quartz, apatite, amphibole and ilmenite as well as accessory REE-rich minerals. Variable quantities of sericite, chlorite, and allanite-epidote are observed, and locally, calcite veins affect these rocks. Frequently, irregular and subangular centimetric- to metric-size diorite and metapelite xenoliths have been recognized in this subunit.

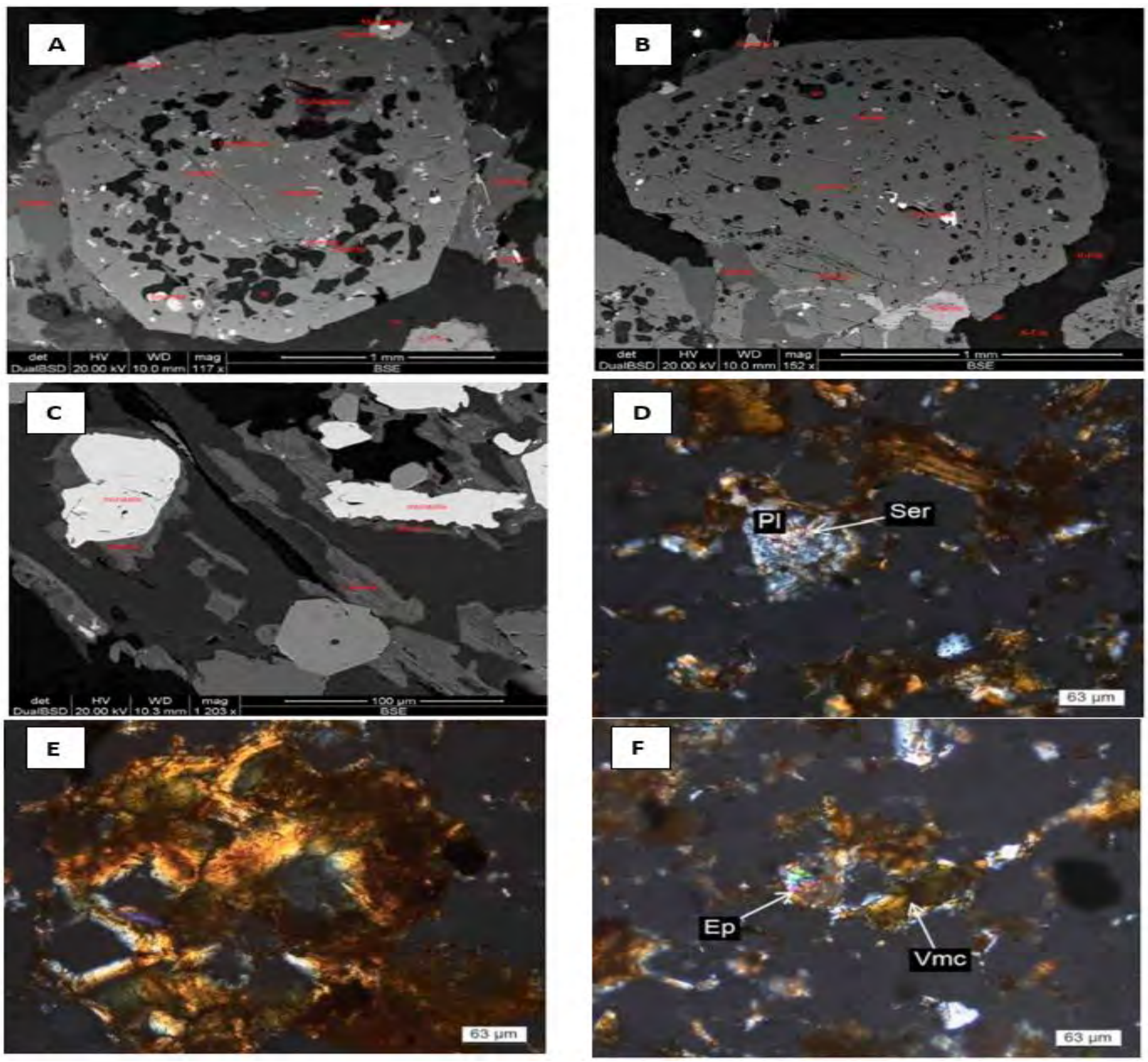
7.2.1.4 Quartz-Diorite Pluton (QDP)

The QDP is distributed in the northern part of the study area, on the roof of the GG, recognized as dikes in deep intercepts of the drill holes. These intrude the PGC and are barren of REE mineralization. Radiometric dating of U-Pb in zircon yields an age of 307.3±1.8 Ma for this unit, meaning that it is 10 Ma younger than the PGC. It is comprised of quartz-dioritic rocks with mostly medium-grained to porphyritic textures and primary minerals such as plagioclase, subhedral biotite, and scarce amphibole. Fine-grained anhedral biotite probably has a secondary origin. Anhedral quartz is commonly interstitial (>10%) with rare K-feldspar. Plagioclase is altered to sericite and locally to calcite, while mafic minerals are moderate to intensely altered to chlorite. Biotite alteration also affects mafic minerals. Accessory minerals are ilmenite, rutile, apatite, and zircon.

7.2.2 Mineralization

The regolith profile caused by the weathering of the different lithologies developed clay minerals with capacity for cation adsorption. Of these minerals, the garnet-bearing granitoid (GG) is the source of the REE mineralization and as such its regolith profile is the richest in exchangeable REE (Figure 7-3). Other lithologies such as the biotite-bearing diorite (DRT) and metapelites (MP) contain decreasing levels of exchangeable REE, based on proximity to the GG, due to secondary enrichment of REE-rich fluids sourced from the GG following lateral migration under specific geochemical conditions (pH, alteration). Thus, mineralization depends on GG weathering intensity and topography (flatter relief allows for thicker regolith profiles and preserves ore bodies).

Figure 7-3: Petrography and Mineralogy of the Parent Granite



Note: prepared by Aclara, 2021.

Note:
A) Garnet in GG with disseminated qz, hbl, mnz, ilm, zr inclusions;
B) Garnet in GG with disseminated qz, hbl, mnz, ilm, zr. At the garnet edges, precipitation of all and chl can be seen as a later "propylitic" phase;

C) Mnz replaced by all;
D) Moderately sericitized plg, crossed nicols, 200X (GG-A);
E) Vermiculite cluster, crossed nicols, 200X (GG-B1);
F) Ep patch next to ver, crossed nicols, 200X (GG-B2);
G) Tabular plg crystal with ill, ser and clay replacements, crossed nicols, 200X (GG-C1).

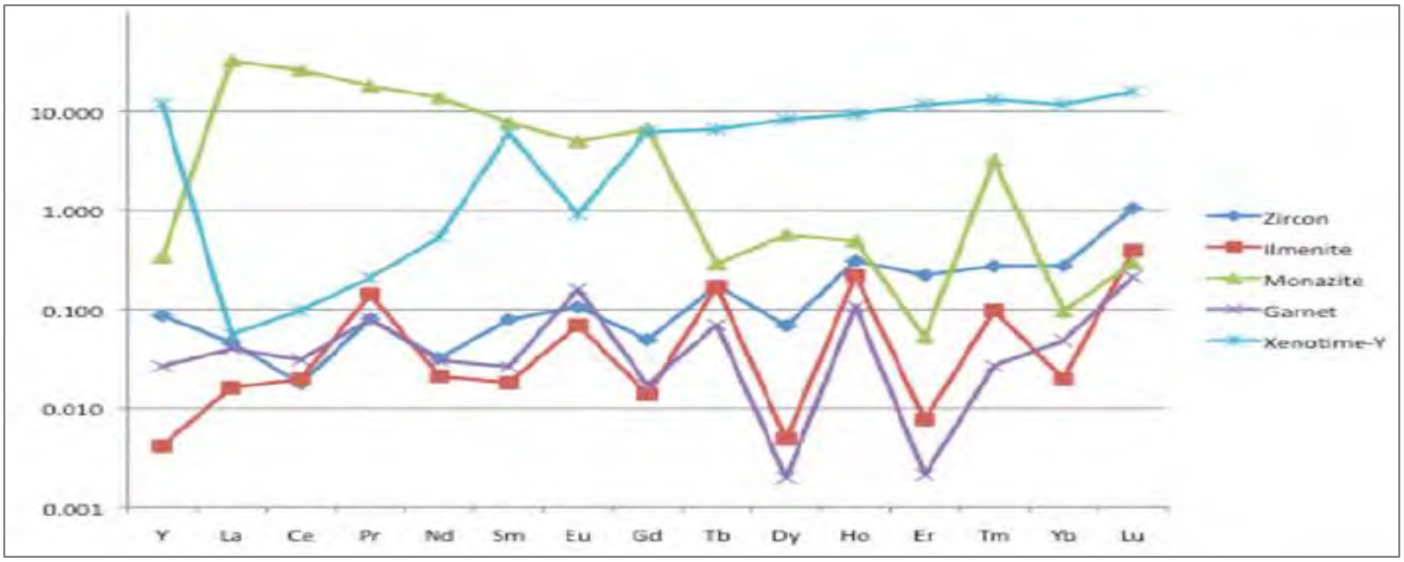
In the GG the source of LREE is mainly monazite and of HREE xenotime and zircon. Additionally, it has important contents of ilmenite and garnet (Table 7-1). A subsequent event of alteration via a solution rich in Ca, Al, and Fe result in a main alteration of monazite to allanite (Figure 7-3B). It was detected that the mineralogy that implies the source of the REE in the garnet granite, is mainly monazite with alteration to allanite and epidote of REE (Figure 7-3C). To better analyse its origin, the distribution (pattern) of REE in the different source minerals is presented and normalized to chondrite (Figure 7-4) according to Taylor and McClennan (1985).

Table 7-1: Mineral Geochemistry Data Integration from Microprobe with Mineralogical Quantification via QEMSCAN.

Mineral	n	%	%
Apatite (ap)	152	1.27	1.72
Titanite (tit)	69	0.42	0.00
Biotite (bt)	35	0.13	2.14
Hornblende (hbl)	22	0.20	0.00
Zircon (zr)	98	0.63	0.28
Ilmenite (ilmn)	48	0.16	0.43
Xenotime-Y (xen)	7	49.22	7.92
Monazite (mnz)	161	63.95	30.88
Allanite (all)	200	22.39	39.65
Chlorite (chl)	60	0.19	2.20
Garnet (grt)	33	0.23	14.76

Note:
The second column shows number of analyses by mineral (EMP). The third column shows total REE % for each mineral and calculated in combination with the quantification of minerals in the samples of the GG unit.

Figure 7-4: REE Composition of the Main Minerals Present in GG Normalized to Chondrite.

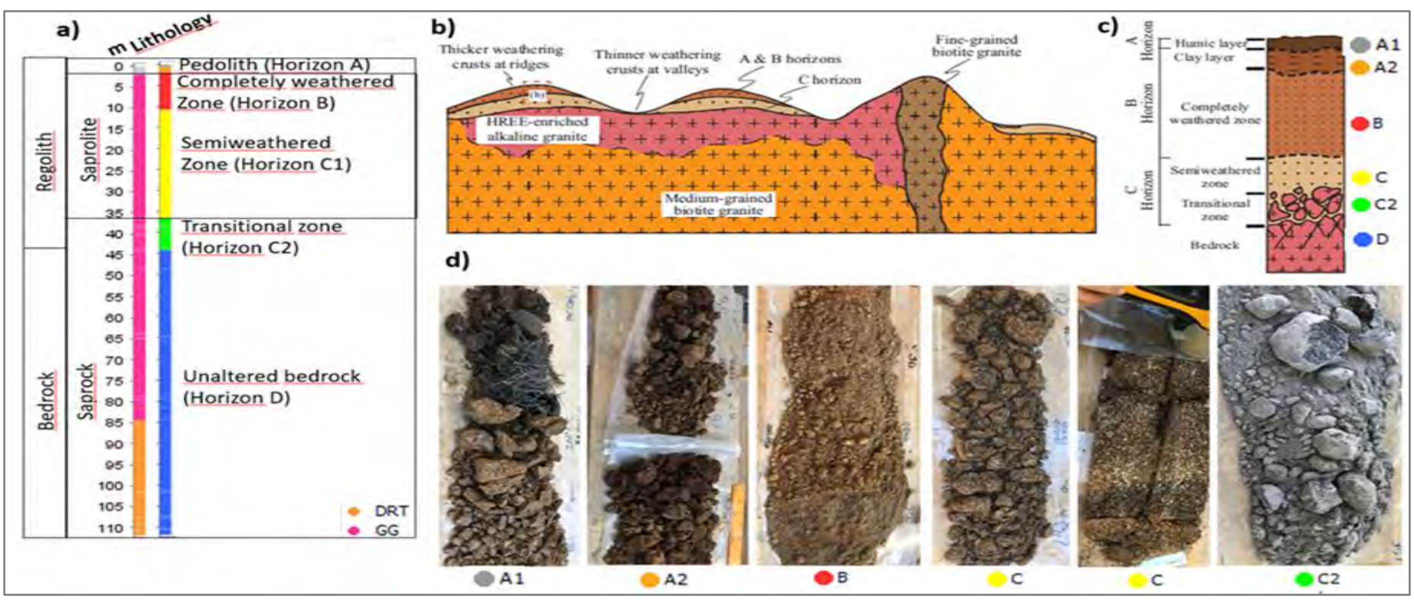


Note: prepared by Taylor and McCleannan, 1985.

7.2.3 Regolith and Soils Description

The Penco regolith profile is up to 35 m thick and comprises, from the bottom up (Figure 7-5): Unaltered bedrock (Horizon D), transitional zone (Horizon C2), semi-weathered zone (Horizon C1), completely weathered zone (Horizon B), pedolith and topsoil (Horizon A).

Figure 7-5: Regolith and Soils Description



Note: prepared by Aclara, 2021.

Note: a) The Penco regolith profile and their corresponding horizons D, C2, C1, B and A; b) and c) The weathering profile in Penco follows the findings of other IADs located in Southern China (Li et al., 2019); d) Illustrations from bore material recognized in the Penco Module and their corresponding regolith horizon.

The regolith profile is identified for every lithological unit such as the biotite-bearing diorite (DRT), metapelite (MP) and garnet-bearing granitoid (GG), the latter of which will be used ahead as the model. Apart from core logging, multidisciplinary techniques such as geochemistry (major elements and total REE), mineralogy, pH, and exchangeable REE with ammonium sulfate were used to define the geologic units as further described:

7.2.3.1 GG-D (unaltered bedrock)

Parental rock of altered garnet-bearing granitoid, under the regolith limit. In this horizon, it is possible to recover REE by cationic exchange by rock grinding. The total REE content is 2,509 ppm, pH range from 7 to 9, illite-dickite, vermiculite and kaolinite vary between 8-17%, 21-22%, and 2-40%, respectively.

7.2.3.2 GG-C2 (transitional zone)

Corresponds to the upper part of the bedrock from the saprolite/rock boundary up to 45 m depth, formed in the garnet-bearing granitoid. It has slight REE concentrations towards the interchangeable fraction. The presence of Ca-Mg decreases the cation exchange capacity of the lanthanides, and the increase of pH (> 6). The constant concentrations in this unit indicate that REE are enriched by weathering of the primary resource and not by leaching from the saprolite (Y, Dy-Tb < 10ppm). Clay minerals such as illite-dickite, vermiculite, and kaolinite vary between 4-14%, 10-30%, and 18-60%, respectively.

7.2.3.3 GG-C1 (semi-weathered zone)

It is located 15 to 5 m from the transitional horizon and corresponds to the lower part of the saprolite. Anomalous REE concentrations are associated with illite-dickite and vermiculite (minerals with cation exchange capacity) with decreasing values of 14-7% and 15-8%, respectively, whereas the kaolinite shows opposite values, from 52 to 78%. The total REE varies from 2,250 to 2,500 ppm and pH ranges from 7 to 5.5. Major elements exhibit negative excursions reaching values from 4.2-2.1% for hard-cations (the sum of Ca, Na, K, and Mg), 19-16.5% for semi-hard cations (including Fe and Mn), and 18-17% for immobile elements (including Al and Ti). It is most likely the product of the weathering of the primary resource, but without secondary enrichment from the top.

The regolith in this horizon is better preserved with dark brown color, texture observable to the naked eye and clusters of cohesive saprolite within the altered matrix. Garnet has better preservation than overlying horizons, both in size and percentage. Biotite is abundant and blackish to golden in color. Plagioclase is also abundant and moderately preserved, with an incipient kaolin alteration. Quartz is ~5 mm, abundant (5-30%) and subhedral. The matrix is underdeveloped, composed of Fe oxides and limonite from protolith alteration.

7.2.3.4 GG-B2 (completely weathered/enriched zone):

Corresponds to the medium part of the saprolite, it ranges from 4 to 30 m depth and contains most of the exploitable resource. This horizon has strong enrichment of total REE (3,500 ppm) and the exchangeable REE fraction (1,350 ppm), marked by high Y and Dy-Tb grades and mainly associated with kaolinite, which exhibits very positive values (70-80%), whereas illite-dickite show low values (5-3%), and vermiculite is nearly absent. The pH shows a negative excursion from 5.7-5.2, as well as 2.0-1.2% for hard-cations, 18.5-14% for semi-hard cations, and 17-15% for immobile elements.

The regolith in this horizon is less preserved than in the previous one (GG-C1), with a dark brown color and relatively well preserved texture, where the mineral arrangement can be observed. Garnet shows 4 mm sub-rounded and subhedral forms.

Plagioclase is better preserved (2-10%) exhibiting ~3 mm subhedral form and strong kaolin alteration, though preserving its shape. Biotite shows ~3 mm subhedral to euhedral form, golden colored, and sometimes chloritized. Biotite is disseminated across the horizon. Quartz is ~3 mm (5-25%) with subhedral to crystalline anhedral form. Opaque minerals associated with garnet are maintained and are represented by Fe oxides that leach from the horizon profile.

7.2.3.5 GG-B1 (completely weathered zone)

Corresponds to the upper part of the saprolite, the first 4-10 m. Total and exchangeable REE contents decrease compared to the previous zone (GG-B2) due to the higher recovery of hard-cations (4%) and immobile elements (20%), as well as the increase of pH (> 5.7). Clay minerals such as illite-dickite and vermiculite show positive values, whereas kaolinite decreases.

The regolith in this horizon is completely altered, the primary texture is wholly obliterated exhibiting a dark brown color. Garnet abundance decreases compared to the underlying horizon (2-15%), showing a sub-rounded anhedral form. Plagioclase is ~2 mm (2-5%) with subhedral form and highly altered to kaolin. Biotite is ~2 mm (2-8%) with subhedral to euhedral form, golden colored, sometimes chloritized, and disseminated across the horizon. Quartz is 3 mm (5-20%) with subhedral to crystalline anhedral form. There is an increase in vein content of various sizes (~1-10 mm), with an opaque mineral/garnet association. Kaolin veinlets are distributed chaotically.

7.2.3.6 GG-A (top of regolith)

Corresponds to the pedolith, which includes the ferruginous and topsoil zones. It is characterized by a completely obliterated texture with brown to red coloring. In the first few centimeters from the top, it is possible to find an area of blackish organic matter with plant remains of leaves and/or roots. The primary relict mineralogy is garnet (2-10%) with ~ 3 mm, anhedral sub-rounded form, moderately to strongly altered. Under pressure garnet is broken giving a reddish coloration on the fresh face. Biotite is <1 mm (2-5%) with subhedral form, and some chloritization. Quartz is well preserved (2-15%) exhibiting 3 mm subhedral to anhedral crystalline form. Kaolin is disseminated (2-8%) as supergene mineralogy due to plagioclase replacement. Opaque minerals are especially associated with garnet (2-5%) with a blackish color. Iron oxides are represented by the limonite group (5-25%).

7.2.4 Alteration

As previously mentioned, the protolith is affected by a propylitic hydrothermal process characterized by chlorite, sericite, epidote-allanite and local biotite. The closest process related to a classical mineralization-related alteration could be said to correspond to the leaching of the primary REE minerals, subsequently deposited in the favorable clay layers of the regolith.

In this type of regolith deposit, typical hydrothermal alterations do not seem to be useful for the definition of mineralization units as they do not seem to control the occurrence.

7.2.5 Structure

There are some important NNE faults that seem to be related to deep gullies, interrupting the continuity of the REE mineralized horizons, not precisely for their tectonic effect but because they facilitate erosion of the regolith. Thus, their importance in controlling the geometry of the deposits and their effect in the mineralization distribution is not clear so far.

7.3 Deposit Geology

7.3.1 Victoria

This deposit previously corresponded to 2 sectors named Victoria Norte and Victoria Sur that were unified into a single orebody named Victoria. It is the most important deposit in the Project.

Victoria Norte is mainly dominated by the garnet-bearing granitoid (GG) that extends to Victoria Sur (Figure 7-6). The GG is 1,800 m long and 350 m wide, limited by a belt of metapelites (MP) to the west and a basement of biotite-bearing diorite (DRT) to the east, acting as the GG country rock. The saprolite ranges from 39 to 14 m in thickness, better developed in Victoria Norte than Victoria Sur. The GG was the main target of the drillings campaign because its saprolite hosts most of the exchangeable REE mineralization. Thus, the geological units used for the metallurgical tests were the GG-B1, GG-B2 and GG-C1. Other lithologies such as DRT and MP were mineralized in their B regolith profile (DRT-B1 and MP-B1) due to REE-rich fluid migration following certain chemical conditions (pH, alteration, clay adsorption).

The main clay mineral recognized in Victoria Norte and Sur is kaolinite as indicated by DRX characterization. For instance, in Victoria Norte, kaolinite increases abruptly from an average of 37.8% in the C1 horizon to 52.1% in the lower B2 horizon and 57% in the upper B1 horizon. On the other hand, in Victoria Sur, kaolinite increases gradually from an average of 43.56% in the C1 horizon to 47.9% in the lower B2 horizon and 60.63% in the upper B1 horizon, ending abruptly in the top A horizon with 71.22%. Halloysite and montmorillonite were recognized only by Terraspec Halo, and are present in the majority of horizons in Victoria Norte, but relatively scarce in Victoria Sur. In addition to the clay minerals mentioned above, illite and smectite are present only sporadically.

Averaged results of the bulk geochemistry analyses are reported in Table 7-2, and the entire dataset is available in the assay table of the Project. The parent granite (GG) is low in alkalis and highly peraluminous. P and Ca concentrations are high. REE concentrations are relatively high, particularly those of HREE. The (La/Yb)/N ratio ranges from 14.22 to 12.50. Samples from different soil horizons show large variations in their elemental compositions. Samples of the A, upper B1 and lower B2 horizons have the highest chemical indices of alteration, followed by samples of the C1 and D horizons respectively.

Aclara studied the concentrations of a variety of major and trace elements as a function of the CIA to understand their behavior during weathering. The contents of Al_2O_3, Fe_2O_3 (total iron), and TiO_2 increase gradually with increasing CIA from the bedrock to the A horizon. These changes are consistent with the immobility of these elements, and their apparent increase in concentration is due to the overall loss of mass during progressive weathering. In contrast, concentrations of CaO and Na_2O drop sharply from the bedrock to the soil in the lower D horizon as a result of the strong leaching of these elements by the weathering solution. The decrease in K2O concentration is more gradual, i.e., from 1.31 in the bedrock to 0.65 wt % on average in the A horizon (Table 7-2). This likely reflects the fixation of K_2O by clay minerals like illite. The concentration of SiO_2 gradually decreases from the bedrock to the upper horizon B1 with an average of 57.15 to 55.29 wt % and then decreases sharply to an average of 51.60 wt % in the A horizon (Table 7-2). The gradual decrease is probably due to a significant mass loss in this horizon and the relative immobility of SiO_2 during weathering, whereas the sharp decrease in the A horizon probably reflects dilution due to the addition of organic matter. The concentration of P2O5 increases slightly from the bedrock to the B1 horizon (0.49 wt % avg) and then decreases sharply to an average of 0.32 wt % in the A horizon (Table 7-2).

Bedrock REE concentrations increase progressively from the D horizon (1,727 ppm avg) to a maximum in the C1 (2,217 ppm avg) and lower B2 horizons (2,442 ppm avg), and then decrease in the upper B1 (2,123 ppm avg) and A horizons (1,231 ppm avg) (Table 7-2). The first part of the trend matches the increase in the CIA, but is reversed above the lower B2 horizon, suggesting a sharp change in REE mobility above and below this horizon. The (La/Yb)N ratio decreases from a value of 11.17 on average in the parent granite, which is highly enriched in LREE, to 9.3 in the C1 horizon and 8.17 in the lower B2 horizon. Samples from the upper B1 horizon and A horizon have average (La/Yb)N ratios of 9.89 and 10.73, respectively.

Thus, the enrichment in REE of the C1 and lower B2 horizons correspond to enrichment in HREE relative to the parent granite and drop to values close to that of the parent granite in the upper B1 horizon and REE-poor A horizon. High field strength elements such as Th, Nb, Ta, and Ti behave conservatively during weathering, increasing progressively from the granite to the B horizon. Besides Th decreasing abruptly in the A horizon, their concentrations increase due to the overall mass loss from the leaching of other elements.

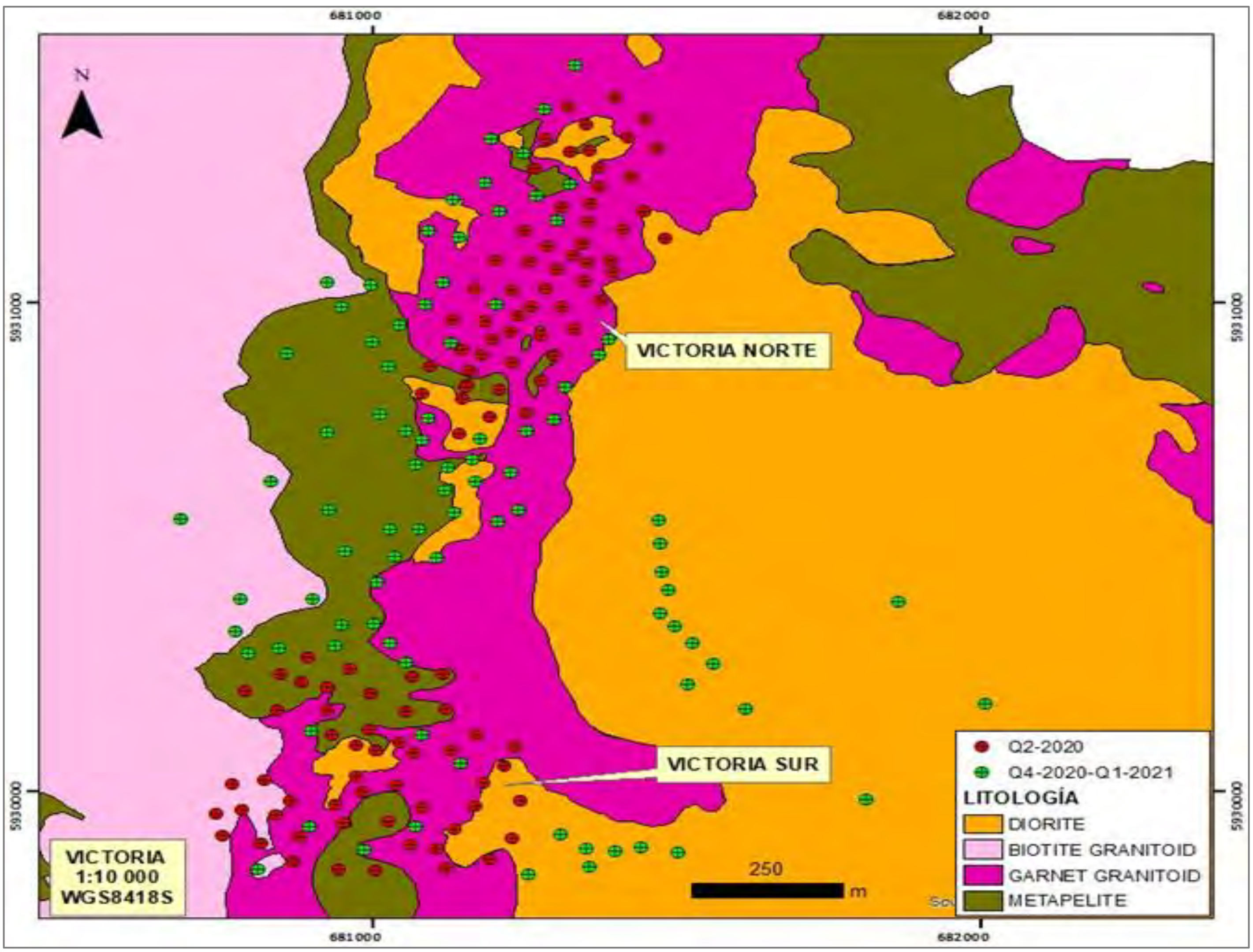
Table 7-2: Average Density, pH, and Bulk Major and Trace Element Compositions of the Regolith and Fresh-Rock Samples from the Victoria Penco Deposit

Horizon	VIC GG-A	VIC GG-B1	VIC GG-B2	VIC GG-C1	VIC GG-D
Density (g/cm^3)	1.4	1.7	1.71		
pH	5.84	5.48	5.37	6.07	7.87
Major element compositions in wt%					
SiO_2	51.60	55.29	56.85	56.06	57.15
Al_2O_3	19.03	16.30	15.57	15.40	16.26
Fe_2O_3	13.80	15.38	15.13	15.63	13.60
CaO	0.20	0.24	0.28	1.17	2.14
MgO	0.47	0.61	0.74	1.09	1.48
Na_2O_3	0.11	0.08	0.12	0.46	1.08
K_2O	0.65	0.79	0.88	0.94	1.31
Cr_2O_3	0.01	0.01	0.01	0.01	0.01
TiO_2	1.41	1.01	0.92	0.96	0.94
MnO	0.17	0.25	0.27	0.28	0.22
P_2O_5	0.32	0.49	0.48	0.47	0.39
SrO	0.01	0.01	0.01	0.01	0.02
BaO	0.02	0.02	0.03	0.03	0.03
LOI	12.11	9.41	8.70	7.35	5.20
Total	99.92	99.88	99.97	99.83	99.82
CIA	95.66	94.15	93.13	88.20	82.56

Horizon	VIC GG-A	VIC GG-B1	VIC GG-B2	VIC GG-C1	VIC GG-D
Trace element compositions in ppm					
Ba	214.24	209.88	254.89	271.64	310.31
Cr	62.05	49.36	46.92	53.52	61.88
Cs	5.37	4.87	5.11	4.38	5.33
Ga	26.07	23.31	22.42	21.92	23.60
Hf	19.16	24.00	23.70	25.18	21.52
Nb	18.57	18.02	17.77	18.29	17.39
Rb	44.28	49.68	56.71	52.86	70.99
Sn	2.62	2.33	2.28	2.22	2.38
Sr	36.78	27.35	27.01	85.79	148.86
Ta	1.08	1.05	1.02	1.05	1.03
Th	88.04	138.25	141.65	137.25	111.00
U	2.52	2.30	2.27	2.19	2.24
V	150.54	81.83	65.93	73.12	89.31
W	2.46	2.55	2.88	3.82	4.94
Y	130.50	271.40	427.07	338.02	246.12
Zr	774.13	968.73	949.82	1010.69	860.94
La	209.93	377.62	410.52	379.19	299.72
Ce	505.14	779.89	809.63	783.32	621.50
Pr	52.09	91.97	98.53	91.96	72.96
Nd	199.25	351.89	380.00	353.43	279.37
Sm	32.91	55.69	61.64	56.95	44.46
Eu	1.84	2.42	2.78	2.39	2.16
Gd	27.68	48.56	60.06	52.58	41.66
Tb	4.31	7.83	10.19	8.80	6.76
Dy	27.70	52.42	70.78	59.78	44.89
Ho	5.40	10.78	14.97	12.29	9.22
Er	15.43	32.09	44.15	35.79	26.88

Horizon	VIC GG-A	VIC GG-B1	VIC GG-B2	VIC GG-C1	VIC GG-D
Tm	2.26	4.74	6.26	5.15	3.85
Yb	14.76	31.23	39.47	32.83	23.97
Lu	2.11	4.54	5.77	4.74	3.40
REE	1231	2123	2442	2217	1727
LREE	999	1657	1760	1665	1318
HREE	232	466	681	552	409

Figure 7-6: Geology of Victoria Norte and Victoria Sur characterized by a principal GG hosting REE exchangeable in its regolith part and the collars of the drilling campaigns.



Note: prepared by Aclara, 2021.

7.3.2 Maite and Luna

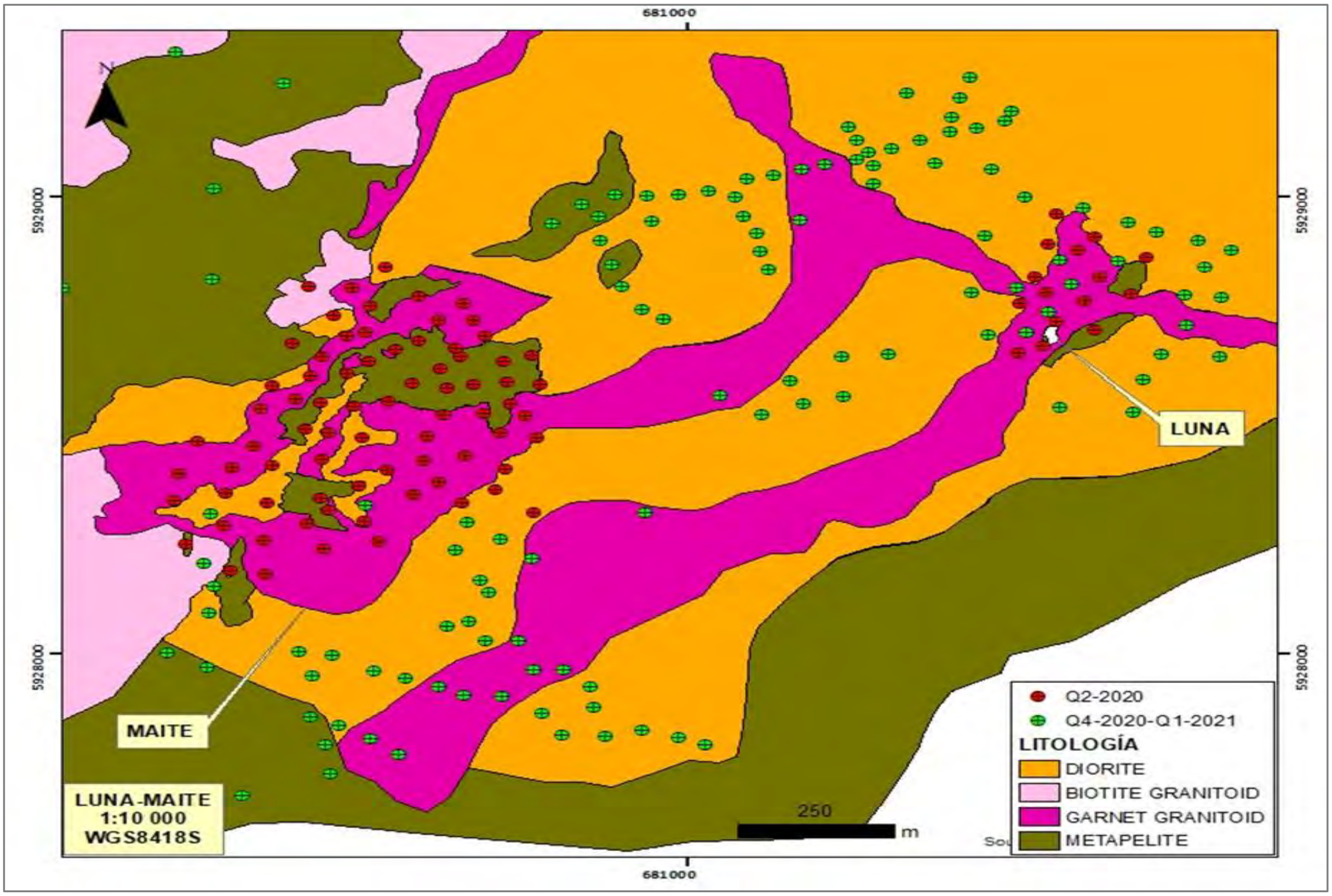
Maite is characterized by an 800 m long and 350 m wide GG, presenting MP xenoliths, and hosted by the DRT (Figure 7-7). As expected, the saprolite from the GG is the most important from an economic point of view and therefore was drilled in very high detail. It ranges from 45 to 20 m in thickness, comprising the GG-B1, GG-B2, and GG-C1 units. Other relevant units are the DRT-B1 and MP-B1. All lithologies and horizons cited above were used for the metallurgical test due to their significant exchangeable REE contents.

The units recognized in Maite extend towards Luna, characterized by a 300 m long and 125 m wide GG surrounded by DRT. The saprolite ranges from 38 to 26m in thickness, again comprising the GG-B1, GG-B2, and GG-C1 units, with GG-B2 and GG-C1 as the most economically important. Other units such as the DRT-B2, DRT-C1, MP-B2, and MP-C1 were also mineralized due to REE-rich fluid migration coming from the GG. All these units were also tested for metallurgy due to their significant exchangeable REE contents.

The main clay mineral in Maite is kaolinite as recognized by DRX characterization, increasing abruptly from an average of 28% in the C1 horizon to 50% in the lower B2 horizon and then decreasing in the upper B1 horizon to 46.2%. Smectite also gradually increases from an average value of 0.06% in the C1 horizon to 0.1% in the lower B2 horizon, though it was not detected in the upper B1 horizon. Some local clays were detected using the Terraspec halo such as halloysite, montmorillonite, and others.

In Luna, as in Maite, the predominant clay mineral is kaolinite, increasing gradually from an average of 41.85% in the C1 horizon to 47.52% in the lower B1 horizon and then decreasing in the upper B1 horizon to 44.51%. The percentage of kaolinite is more developed in the C1 horizon in Luna than in Maite, indicating deeper chemical alteration. Halloysite and montmorillonite were identified locally with the Terraspec Halo.

Figure 7-7: Geology of Maite and Luna characterized by a principal GG hosting REE exchangeable in its regolith part and surrounded by diorite. The collars of the drilling campaigns are also shown.



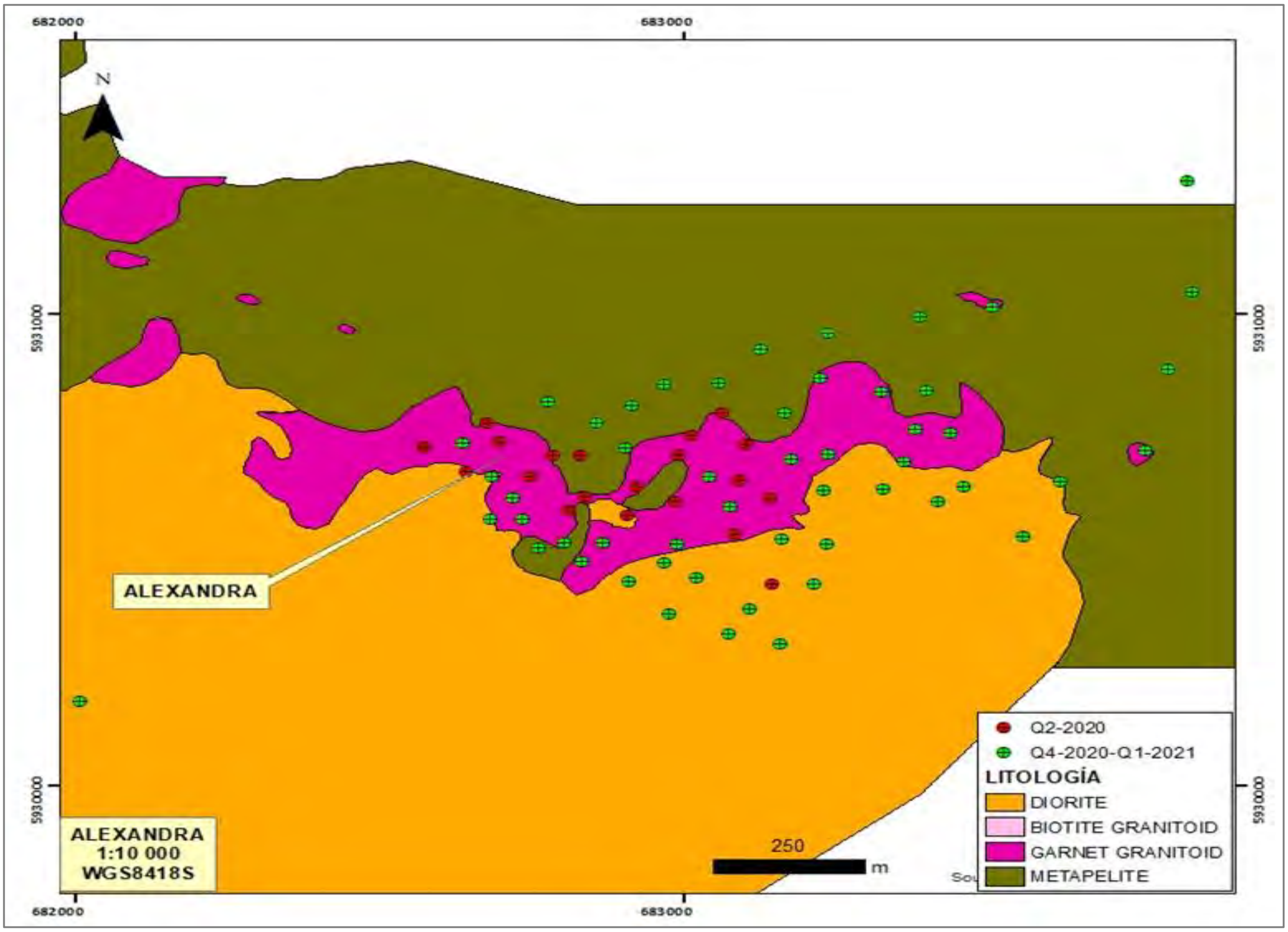
Note: prepared by Aclara, 2021.

7.3.3 Alexandra

Alexandra is characterized by a 1,000 m long and 300 m wide GG, and a saprolite ranging from 40 to 20m in thickness. The GG is limited to the north by a belt of MP and DRT in the south (Figure 7-8). Through the drilling campaigns, geological units such as GG-B1, GG-B2, GG-C1, DRT-B1, and MP-B1 were identified, which were also analyzed for metallurgical tests due to their significant exchangeable REE contents.

The predominant clay mineral is kaolinite, increasing abruptly from an average of 13.81% in the C1 horizon to 49.13% in the lower B2 horizon, 53.78% in the upper B1 horizon, and then decreasing gradually in the top A horizon to 53.09%. Kaolinite is more developed in the upper horizons indicating more chemical alteration upwards.

Figure 7-8: Geology of Alexandra Characterized by a GG that is Mineralized by REE Exchangeable in its regolith



Note: prepared by Aclara, 2021.

7.4 Prospects and Exploration Targets

Juan Pablo Navarro, Aclara's chief geologist, assured that there are a couple of exploration targets and prospecting ideas in development, though did not provide any further information as it is not strategically appropriate. At the moment there is no program or budget assigned by Aclara for brownfield exploration.

7.5 Comments

The geological characteristics of the area show good possibilities of finding more prospects of this type. Geochemical maps show other anomalies to the NE and the geological environment to the north and south of the Project is very similar. Thus, exploration must prioritize looking for more GG occurrences in this belt. It is highly recommended that Aclara develops a program and budget for this task.

8 DEPOSIT TYPES

The Penco Module deposits have been defined as "regolith-hosted REE deposits" or "ion-adsorption deposits" (IAD). These are traditionally formed by tropical or subtropical weathering and decomposition of intrusive rocks with a primary enrichment in either mid/heavy REEs (peralkaline igneous rocks) or light REEs (peraluminous igneous rocks or carbonatites), where REEs are readily liberated by ionic solutions and are hence ion exchangeable (Wang et al., 2015; Dostal, 2017; Borst et al., 2020). Exchangeable REEs are associated with kaolinite and halloysite, the dominant clay minerals in IADs due to their role in adsorbing and fractionating REEs (Wu et al., 1990; Bau, 1991; Jeong, 2000; Bao and Zhao 2008; Williams-Jones et al., 2012; Sanematsu and Watanabe, 2016; Li et al., 2019; Yang, 2019; Borst et al., 2020 and references within).

The regolith profiles in the Project (Figure 7-5) were developed through subtropical weathering of a peraluminous garnet-bearing granitoid, hence richer in LREEs. The regolith ranges between 25 to 48 m in thickness and is more developed in the garnet-rich granitoid than the other granitoids. The primary REE source is hosted in monazite-allanite and lesser xenotime, garnet and ilmenite. A secondary paragenesis formed by a late propylitic hydrothermal alteration (chlorite, sericite, epidote-allanite, locally biotite) replaced monazite with allanite and torite, and was relevant for the subsequent REE fractioning (Dold, 2015).

The exchangeable REE fraction in the Penco Module orebodies was obtained after the destruction of allanite, xenotime, and garnet (not refractory minerals) by weathering. The exchangeable REE is inferred to be weakly adsorbed onto clay minerals, dominantly by kaolinite and less by illite and/or smectite. This primary adsorption is observed by the positive correlation between kaolinite abundance and REE recovery. Further confirming this observation, clay mineralogy from DRX characterization indicates kaolinite as the dominant clay mineral (after halloysite).

IADs are the major source of HREEs (Gd-Lu, and Y) in the world (Chi and Tian, 2008; Bao and Zhao, 2008; Sanematsu and Watanabe, 2016). The majority of economically exploited IADs occur in southern China, hosted in the weathering profiles of granitic rocks (Borst et al., 2020), with the largest deposits in Jiangxi and Guangdong provinces, known since 1969, accounting for roughly 80% of global HREEs. Despite being low grade (0.05–0.2 wt% total RE2O3, including Y2O3; Li et al., 2017; Bao and Zhao, 2008; Borst et al., 2020), REEs from these deposits are easily leached by electrolyte salt solutions, such as sodium or ammonium base solutions without mineral processing (Wu et al. 1990; Chi and Tian 2008) and generate less radioactivity than conventional hard-rock carbonatites and alkaline igneous REE deposits (Sanematsu and Watanabe; 2016).

9 EXPLORATION

MA began exploring lanthanides under the concept of IADs in 2012. This marked the beginning of the study and geological mapping of the Coastal Batholith of south-central Chile in the Penco District, Biobio Region. HREE anomalies were detected analyzing soil geochemistry with Y, Ce, and Th readings using a portable XRF in roadcut exposures. These findings were subsequently tested by radiometric flight and NanoTEM, confirming a strong correlation between the garnet-bearing granitoid (GG) and a radiometric Th anomaly.

In 2014, a drilling program was carried out, including 4,888 m in 166 sonic drill holes and 1,171 m in 11 diamond drill holes. During this period IADs were defined, hosted by the GG, in places called Marisol, Alexandra, Victoria Norte, Victoria Sur, Luna, and Maite. Additional campaigns were carried out to define the orebodies' extension, completing 3,239 m in 125 sonic drill holes during 2015 and 5,522 m in 176 sonic drill holes during 2017-2018.

In 2020-2021, Penco Module planned a drilling exploration campaign to characterize the mineralogy, analyze the total and exchangeable REE content and establish a new geological domain along with a resource estimation of the Maite, Victoria (Norte and Sur), Luna and Alexandra orebodies, totaling 12,909.1 m in 479 sonic drill holes. The exploration work of the Penco Module to support resource modeling and estimation comprises:

- Surface geological map (1:1,000 scale), longitudinal and transverse geological sections were prepared for Maite, Luna, Victoria and Alexandra.
- Geological logging for 479 sonic drill holes. Several lithological and structural units including fault (F), overburden (OB), metapelite (MP), biotite-bearing diorite (DRT), garnet-bearing granitoid (GG), and biotite- and amphibole-bearing granitoid (GB).
- Regolith horizons (A-C) following the schematic weathering profile for the Zudong deposit as proposed by Li et al. (2019).
- Sampling intervals were defined according to lithologies and regolith horizons. Additionally, XRF geochemistry served as complement to this criterion. Sample intervals are 2 m in length and range from 1 to 2 m. Rock fragments were not sampled.
- Total REE, major and trace elements were analyzed under alkali fusion together with inductively coupled plasma mass spectroscopy (ICP-MS) as a measurement technique (assay results were carefully assessed with the help of a thorough QAQC procedure).
- Exchangeable REE determinations by simple leaching electrolyte salt solutions, such as ammonium sulfate ($(NH_4)SO_4$), followed by ICP-MS reading as an estimative method.
- Regolith characterization and (semi) quantification of clays using DRX and a handheld TerraSpec Halo mineral identifier.

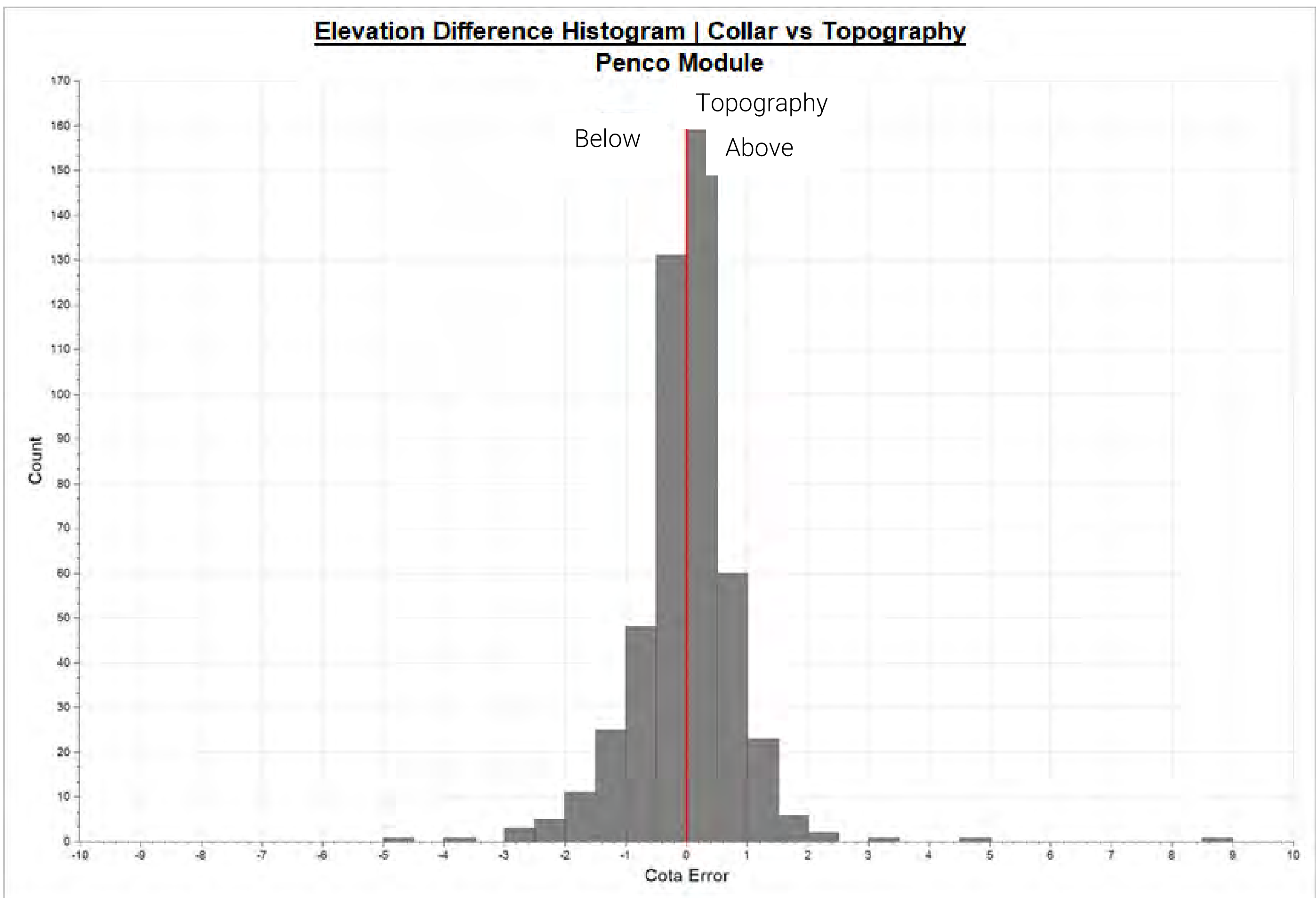
Based on this database, geological domains for the four orebodies were determined.

10 DRILLING

10.1 Drills and Topography

The topography file "CARTOGRAFIA_PENCO_UTM18_WGS84_3D_V2.dwg" contains main contour lines every 5 m and secondary contours every 1 m, which were obtained and certified in 2013, using LiDAR photogrammetry. This was used as the basis for the topographic update carried out during the 2021 campaign by the Georeference company. The level of coincidence of these corrected topographies was compared with the drill collars of the 2020-2021 campaigns (Figure 10-1) whose coordinates were obtained using geodetic GPS, with their corresponding validation certificates. The red line indicates elevation 0 (topographic level), on the left the collars under the topography and vice versa.

Figure 10-1: Collars Elevation Difference Histogram vs Topography.



Note: prepared by Ausenco 2021

Of the 479 drill holes, 463 of them (97%) are within a maximum acceptable range of up to 2 m (above or below the topography); 12 of them (2%) are slightly more deviated, with distances between 2 and 4 m exclusively below the topography; while 4 collars are at a distance greater than 4 m from the topography. Mr. Oviedo considers that at least the latter deserve immediate correction, and in the second instance the 12 that are more than 2 m away, in order to avoid gaps between the estimation wireframes, whose reference is the topography corresponding to each sector, and the composites, which are 2 m long and whose reference is the height of the necklace.

The solution proposed by Penco Module to overcome these gaps is to use the topography as a reference elevation, ignoring the original dimensions of the collars, but it must be said that this does not solve the problem. The next stage is expected to have new measurements or at least studies that justify the diversion of said collars.

10.2 Drilling

In 2014, a drilling program was carried out, including 4,888 m in 166 sonic drill holes and 1,171 m in 11 diamond drill holes. Located in Alexandra, Victoria, Luna, and Maite. Additional campaigns were carried out completing 3,239 m in 125 sonic drill holes during 2015 and 5,522 m in 176 sonic drill holes during 2017-2018.

In 2020-2021, Penco Module executed a drilling campaign to characterize and establish geological domains along with a resource estimation of the Maite, Victoria, Luna and Alexandra orebodies, totalling 12,909.1 m in 479 sonic drill holes.

The Sonic drilling uses a hydraulic actuator device that generates vibrations at an extremely high frequency (approximately 150 Hz), hence the name "sonic." These waves reduce the friction in the drilling bit, producing liquefaction and inertia that prevent clay from sticking to the bit and thus reducing the load. This combination of effects directly improves drilling speed, making sonic drilling faster than traditional methods. Rotary sonic drilling has a series of advantages, such as:

- It allows drilling without using fluids, is small in size, versatile and agile for exploring wooded areas.
- Vibration waves allows drilling up to 3 times faster than conventional technologies.
- Sonic drilling generally achieves good sample recovery, usually over 90%

In this method is necessary to completely remove the drilling column until reaching the drilling barrel, where the sample is retained, in order to retrieve it. Then, with the help of sonic vibration plus pneumatic pressure, the sample is expelled from the interior of the drilling barrel and deposited inside a polyethylene sleeve previously installed on the outside of the barrel. Occasionally, when the sample is too adhered to the barrel, it is necessary to inject pressurized water to expel it from the barrel. In the Project's Phase I, a drilling diameter of 4 ½" inches were used, which generated between 15 and 20 kg of samples per 2-meter interval. See Table 10-1.

Table 10-1: Summarizes the Drilling Program Attributes.

Sector	Drills	Meters	Samples
Victoria	198	5,145.40	2,693
Maite	122	3,415.40	1,715
Luna	88	2,433.50	1,284
Alexandra	71	1,914.80	1,008
Total	479	12,909.10	6,700

The Sonic drilling campaigns, in order to construct a database to support resource modelling and estimation, is based on an aqua regia (nitric acid and hydrochloric acid) digestion or lithium metaborate fusion and ICP-MS reading of rare earth and other major elements of interest.

All drills were vertical and the diameter of the resulting cores is 3.25 inches (8.25 cm). Cores were recovered from the sonic drill in 1-2 m intervals and encased in plastic bags. Sample lengths was 2 m. except for situations where limits between geological horizons or structures are encountered taking a 1 m. sample. The drills where be about 30 - 40 m in depth (ranging between 10 and 50 m).

The cores were logged, photographed and mapped.

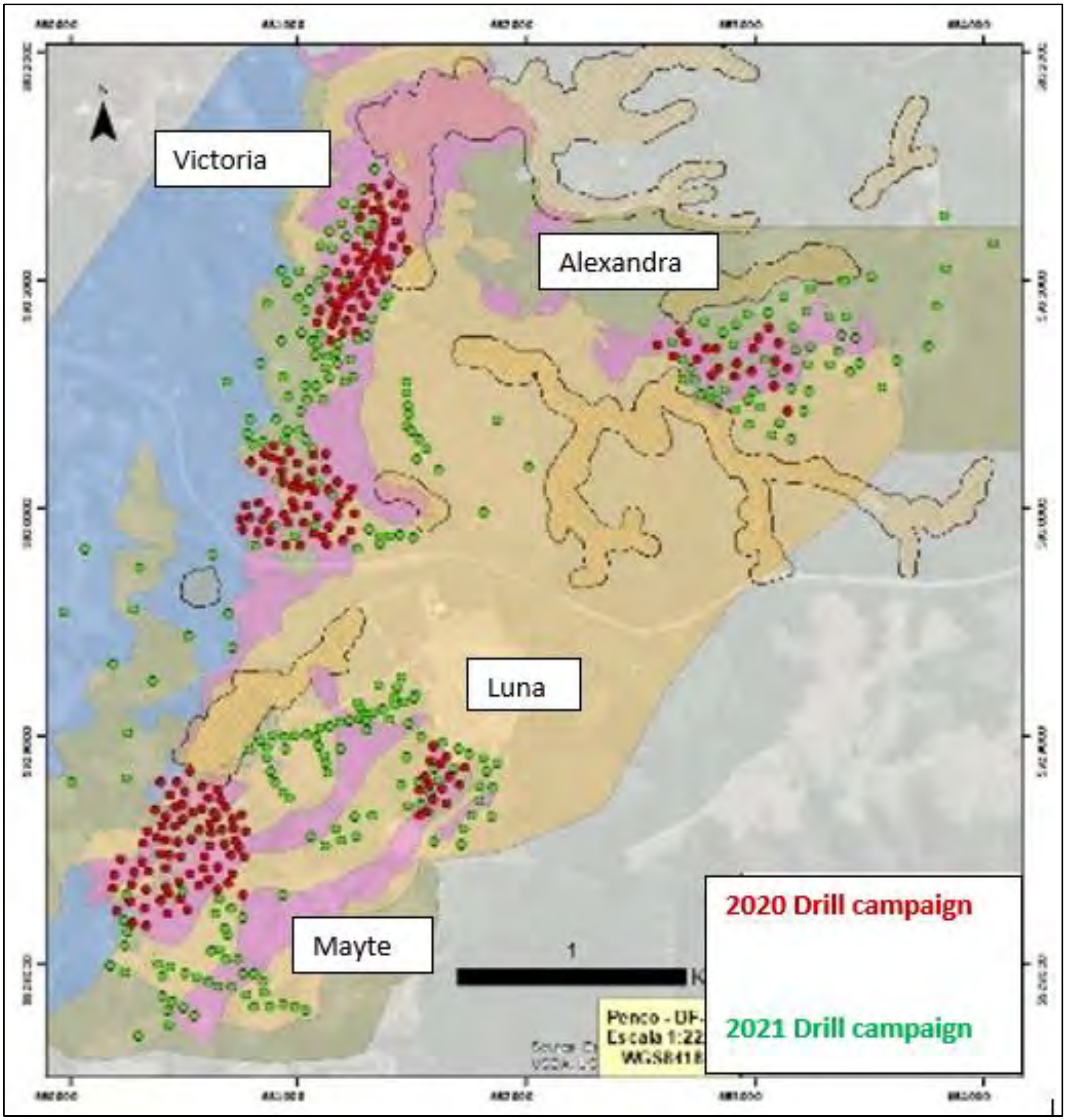
The cores were split lengthwise manually using a steel “guillotine”.

These considerations, in addition to calculation of the minimum sample mass required to adequately produce samples that represent the core’s original granulometric distribution were taken into account during the design of the sampling and preparation protocol and QA/QC structure, which are reviewed in the following sections.

In general, the drills are in good condition, except for minor observations in the Survey table, such as positive dips instead of negative or some surveys without initial zero depth. To validate the correct transcription of grades from the certificates to the database, portions of the certificates were reviewed; no errors were found. Likewise, during the field visit, the logs were partially inspected, verifying that they are representative of what was observed in the cores of each of the sectors.

Additionally, the protocols for handling, logging, sampling and QA/QC of the sonic drilling samples have a sufficient level of detail, concluding that the processes are appropriate. Regarding the handling of the data obtained during the aforementioned processes, the manual of use of the software for the administration of the DB and the QA/QC (GEMM) has a good level of detail, concluding that it allows a safe and secure handling of data. Penco Module drill hole locations are presented in Figure 10-2.

Figure 10-2: Drill Hole Locations in the Different Ore Bodies.



Note: prepared by Ausenco,2021

11 SAMPLE PREPARATION, ANALYSES, AND SECURITY

11.1 Sampling and Preparation

The sampling and preparation for sonic cores split at 1-m (25%) and 2- m (75%) intervals; also, the preparation of the sample, which is the same in both methods, is as follows:

Core splitting:

- Cores were received from the drill rig and checked.
- The plastic casings were carefully cut open lengthwise.
- The cores were photographed and mapped.
- Sampling intervals of approximately 2 m were defined, separated and labelled.
- The 1 m core was split lengthwise using a steel guillotine to produce two ½ cores.
- The ½ cores were carefully separated, taking care to move all the fragments (including the fine particles at the bottom) to their corresponding side.
- One of the ½ cores was split lengthwise again to form two ¼ cores.

Any solid rock cores (about 5 cm in length or more) were split lengthwise using a diamond saw or a hydraulic press. Half and quarter pieces of these rock fragments, along with the corresponding finer fragments that were produced during splitting were placed back in their corresponding sides of the ½ or ¼ cores.

Normal samples for acid digestion/fusion and ICP-MS:

- For normal samples, one of the ¼ cores is transferred to a plastic bag, clearly labelled, sealed and sent for preparation.
- The remaining ¼ and ½ core are carefully joined and resealed in the same plastic casing that the sample came in from the drill rig.
- The sample was dried at 40˚C for 3 to 4 days (as necessary) in an electric oven with forced ventilation.
- The sample was then crushed to reach 95% under #10 Ty (1.7 mm) in a secondary jaw crusher.
- A rotary divider was used to obtain 1 kg of the crushed material. This division must take at least 3 minutes to perform.
- The 1 kg sample was pulverized using a single puck to reach 90% under #200.

- Three envelopes (marked A, B and C) were filled with 20 g each by taking multiple (at least 10) increments taken directly from the pulverized bowl using a spatula once the puck had been removed.
- The remaining pulverized material (940 g) was stored in a sealed and clearly marked plastic bag and returned to Penco Module.

Normal samples for desorption and ICP-MS:

- Once the normal samples (A, B and C) had been prepared, the reject (about 870 g) from the rotary divider (step 5 in the process for normal samples for acid digestion/fusion and ICP-MS) were crushed to 100% under #10 Ty.
- A rotary splitter is used to obtain two (2) samples of 60 to 75 g of each crushed material. This division takes at least 3 minutes to perform. The samples were placed in envelopes marked D1 and D2 (D is used to denote samples processed by desorption). The analyst will then weigh exactly 50 g for the desorption process.
- The rejects (approximately 750 g) were stored in a labelled and sealed plastic bag.

Duplicate samples for acid digestion/fusion and ICP-MS:

- When a sample interval was flagged to produce duplicates, the procedure for core splitting was unaltered up to step 8. One of the ¼ cores was then transferred to a plastic bag, clearly labelled, sealed and sent for preparation. This was the original sample. The second ¼ core was transferred to a second plastic bag, clearly labelled, sealed and sent for preparation. This will be the field duplicate.
- The sample was dried at 40˚C for 3 to 4 days (as necessary) in an electric oven with forced ventilation.
- The sample was then crushed to reach 95% under #10 Ty (1.7 mm) in a Boyd or similar secondary jaw crusher.
- A rotary divider was used to split the crushed material into two equal portions of approximately 0.80 kg each.
- The first 0.80 kg portion was pulverized in an LM-2, Boyd or similar pulveriser that uses a single puck to reach 90% under #200.
- One envelope (labelled E) was filled with 20 g by taking multiple (at least 10) increments taken directly from the pulveriser bowl using a spatula once the puck has been removed. The remaining pulverized material (780 g) was stored in a sealed and clearly marked plastic bag and returned to Penco Module.
- The second 0.80 kg portion was pulverized in an LM-2, Boyd or similar pulveriser that uses a single puck to reach 90% under #200.
- One envelope (labelled F) was filled with 20 g by taking multiple (at least 10) increments taken directly from the pulveriser bowl using a spatula once the puck has been removed. The remaining pulverized material (780 g) was stored in a sealed and clearly marked plastic bag and returned to Penco Module.

Duplicate samples for desorption and ICP-MS:

- Once the duplicates (E and F) are prepared, the reject (about 270 g) from the rotary divider (step 4 in the process for duplicate samples for acid digestion/fusion and ICP-MS) must be crushed to 100% under #10 Ty.

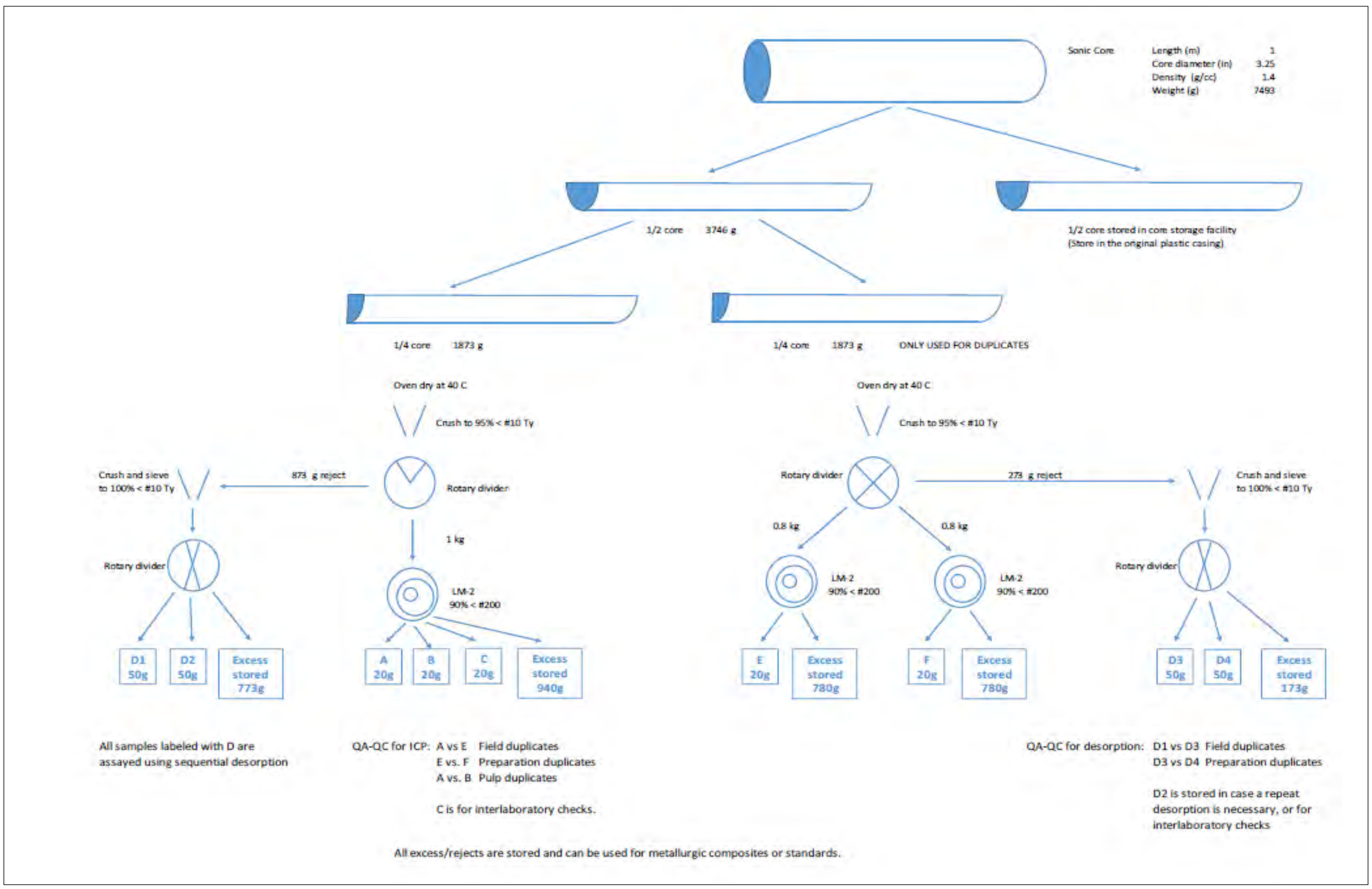
- A rotary divider was used to obtain two (2) samples of 60 to 75 g of each crushed material. This division must take at least 3 minutes to perform. The samples were placed in envelopes marked D3 and D4 (D is used to denote samples processed by desorption). The analyst then weighs exactly 50 g for the desorption process.
- The reject (approximately 120 g) was stored in a labelled and sealed plastic bag.

Reject crushed material

- All reject of crushed material from a sample must be stored in a sealed and labelled plastic bag and returned to Penco Module.
- All excessive and rejected materials (at #10 or #200) were used to create composites for metallurgical tests or as material for certified standards.

The preparation of the sample, which is the same for both methods, is shown in Figure 11-1.

Figure 11-1: Sample Preparation Protocol for 2 m Intervals.



Note: prepared by GIS Analytics, 2020

Mr. Luis Oviedo, visited the operation and observed the drilling in operation, visited the drill and sample storage, the sample preparation yard, observed the handling of the samples. After careful observation, Mr. Oviedo determined that the operation is well done and it meets industry standards.

11.2 Quality Assurance / Quality Control

Aclara designed thorough quality assurance and control processes for both total REE and Y (REY) analyses, carried out by ALS laboratory in Lima, Peru, and extraction value REY analyses, carried out by AGS laboratory in Coquimbo, Chile. Mr. Oviedo reviewed the four QA/QC reports prepared by Aclara — one for each sample type, total and extraction value. and one for each campaign, 2020 and 2021 — as well as their working protocols, developed with technical advice from consultant Armando Simón (PhD with over 40 years of experience in QA/QC techniques). In addition, an independent review of the database and the corresponding certificates was conducted reaching similar conclusions. The observations and recommendations are detailed further ahead. A Summary of QA/QC programs is presented in Table 11-1.

Table 11-1: Summary of QA/QC Programs

Zone	Primary Lab Batches	External Lab Batches	Total REY Samples	Total REY Controls	Coverage
Victoria	65	3	2,679	565	21.1%
Maite	40		1,715	363	21.2%
Luna	31		1,281	252	19.7%
Alexandra	23		1,008	195	19.3%
Total	159	3	6,683	1,375	20.6%
Zone	**Primary Lab Batches**	**External Lab Batches**	**Total REY Samples**	**Total REY Controls**	**Coverage**
Victoria	65	None	2,679	419	15.6%
Maite	40		1,715	281	16.4%
Luna	31		1,281	204	15.9%
Alexandra	23		1,008	153	15.2%
Total	159	-	6,683	1,057	15.8%

Note: total samples (6,683) do not match Table 10-1 (6,700) as 3 samples from hole SDLUN21005 were not assayed and 14 samples from hole SDVIS21015 did not have results in time for resource estimation.

Mr. Oviedo considers that there is a good amount of controls inserted for Total REY (20.6%, Table 11-1) and a somewhat lower but acceptable amount for extraction value REY (15.8%, Table 11-1), due to the impossibility of using fine blanks and lack of check or interlaboratory samples. These percentages are distributed similarly among control samples, equating to around 2% for each sample type.

Given that REE and Y comprise 15 elements, which would require an unreasonable effort to control for, Aclara decided to focus only on the four most economically relevant elements: Dysprosium (Dy), neodymium (Nd), praseodymium (Pr) and terbium (Tb). Mr. Oviedo supports this decision, though recommends controlling other minerals of moderate economic relevance such as lutetium (Lu), gadolinium (Gd) and yttrium (Y).

It is important to mention that solutions from the desorption process are only partially controlled, through duplicates taken by AGS. The use of standard solutions was evaluated by Aclara, but ultimately ruled out as they would increase the workload.

11.2.1 Duplicates:

Aclara inserted 3 duplicate types for quality control of total and extraction value REY: Twin (field duplicate), crushing (coarse duplicate) and pulverized (pulp duplicate) samples. To evaluate duplicate precision, Aclara uses the relative differences method, which identifies (for 90% of the population) the percentage of samples showing relative errors (RE) within established limits for each duplicate type (Table 11-2 and Table 11-3), and the hyperbolic method, which determines the percentage of failures (Table 11-4) with respect to a hyperbolic curve constructed from parameters such as RE and the practical limit of detection (PDL), which is empirically determined.

Table 11-2: Validation Chart for the Relative Error Method by Analysis Type, Element, Duplicate Type and Campaign. Total REY

Total REY	ACCEPTABLE RE% (2020)			ACCEPTABLE RE% (2021)		
	Twin Sample	Coarse Duplicate	Pulp Duplicate	Twin Sample	Coarse Duplicate	Pulp Duplicate
Dy	100%	100%	96%	98%	100%	92%
Nd	100%	98%	93%	100%	100%	90%
Pr	100%	98%	93%	100%	100%	90%
Tb	100%	100%	96%	100%	100%	97%

Table 11-3: Validation Chart for the Relative Error Method by Analysis Type, Element, Duplicate Type and Campaign. Extraction Value REY

Desorb. REY	ACCEPTABLE RE% (2020)			ACCEPTABLE RE% (2021)		
	Twin Sample	Coarse Duplicate	Pulp Duplicate	Twin Sample	Coarse Duplicate	Pulp Duplicate
Dy	98%	95%	80%	98%	98%	93%
Nd	98%	97%	77%	98%	98%	95%
Pr	96%	94%	71%	98%	98%	98%
Tb	94%	92%	72%	100%	100%	93%

The relative differences method shows a very good total REY sample percentage (i.e. within the acceptable limits) for the 3 duplicates types and both campaigns. The same is observed for extraction value REY in the 2021 campaign and most of the 2020 campaign, though the latter's pulp duplicates are below acceptable, especially in the earlier campaign samples, which is partly attributed to low grade bias but could have other causes that are reportedly being monitored.

Table 11-4: Validation Chart for the Hyperbolic Method by Analysis Type, Element, Duplicate Type and Campaign.

Total REY (2020)	Element	Samples	Failed Pairs	Failed Pair %	Total REY (2021)	Element	Samples	Failed Pairs	Failed Pair %
Twin Samples	Dy	104	0	0.0%	Twin Samples	Dy	60	1	1.7%
	Nd	104	0	0.0%		Nd	60	0	0.0%
	Pr	104	0	0.0%		Pr	60	0	0.0%
	Tb	104	0	0.0%		Tb	60	0	0.0%
Coarse Duplicates	Dy	105	0	0.0%	Coarse Duplicates	Dy	57	0	0.0%
	Nd	105	2	1.9%		Nd	57	0	0.0%
	Pr	105	2	1.9%		Pr	57	0	0.0%
	Tb	105	0	0.0%		Tb	57	0	0.0%
Pulp Duplicates	Dy	105	4	3.8%	Pulp Duplicates	Dy	59	5	8.5%
	Nd	105	7	6.7%		Nd	59	6	10.2%
	Pr	105	7	6.7%		Pr	59	5	8.5%
	Tb	105	4	3.8%		Tb	59	2	3.4%
Extraction Value REY (2020)	Element	Samples	Failed Pairs	Failed Pair %	Extraction Value REY (2021)	Element	Samples	Failed Pairs	Failed Pair %
Twin Samples	Dy	101	1	1.0%	Twin Samples	Dy	60	0	0.0%
	Nd	101	2	2.0%		Nd	60	0	0.0%
	Pr	101	0	0.0%		Pr	60	0	0.0%
	Tb	101	4	4.0%		Tb	60	0	0.0%
Coarse Duplicates	Dy	98	5	5.1%	Coarse Duplicates	Dy	57	0	0.0%
	Nd	98	2	2.0%		Nd	57	0	0.0%
	Pr	98	2	2.0%		Pr	57	0	0.0%
	Tb	98	4	4.1%		Tb	57	0	0.0%
Pulp Duplicates	Dy	104	12	11.5%	Pulp Duplicates	Dy	59	0	0.0%
	Nd	104	10	9.6%		Nd	59	0	0.0%
	Pr	104	7	6.7%		Pr	59	0	0.0%
	Tb	104	8	7.7%		Tb	59	0	0.0%

The hyperbolic method shows acceptable total REY failure percentages for the 3 duplicates types and both campaigns, with only one case above the threshold (Nd) in the 2021 campaign pulp duplicates, which does not warrant further review. For extraction value REY, in the 2020 campaign pulp duplicates failure percentages tend to be higher with one case near the threshold (Nd) and another above it (Dy). Again, the majority of failures happen early in the campaign, agreeing with the finding of the relative differences method. Conversely, the 2021 campaign shows no failures in any duplicate type, which is very rare and attributable to an overly flexible LPD determination.

Evaluation methods used by Aclara are deemed appropriate by Ausenco, and have also been correctly applied, as similar results were achieved in an independent review, which leads to the conclusion that duplicates are acceptable. Regarding the anomalous extraction value REY validation percentages observed in the 2020 campaign pulp duplicates, further investigation of the causes and sample reanalysis are recommended, if necessary. In addition, the LPD determination should lean towards the conservative, to avoid omitting potential questionable duplicates. Finally, recommendations include delineating reanalysis protocols, as with standards and blanks, for those duplicates that fail in multiple elements, especially if it is not attributable to low grades.

11.2.2 Standards

Aclara inserted 3 in-house standards for quality control of total REY: STD1 (low), STD2 (medium) and STD3 (high), prepared by GISAnalytics and certified by GeoAssay. Ausenco has reviewed the preparation and certification protocols for these standards and finds that they meet industry standards. For extraction value REY, Aclara inserted 5 in-house reference materials: MR1 and MR2 (medium-high); MR3 and MR4 (medium) and MR5 (medium-low), prepared and tested by AGS, but not certified due to the particularities of the extraction methodology, meaning these are not actual standards. In order to mitigate this shortcoming to some extent, Aclara sent a few samples to the University of Toronto (UT) —where the same methodology was applied, with the exception of the final ICP test— for an alternative grade assessment: Three samples for MR1, which compared acceptably with AGS, except for Nd; ten samples for MR2, with somewhat lower grades for UT though still within reasonable, except again for Nd; and five samples for MR3, MR4 and MR5 respectively, all of which compared mostly well with AGS, with only slightly lower grades for Pr.

According to Aclara, the source of most discrepancies between UT and AGS, specially in the case of MR2, is likely the use of ICP-EOS in the former and ICP-MS in the latter, though in the case of Nd for MR1 and MR2 it's probably something else, as will be discussed further in this section. Mr. Oviedo reviewed the preparation and analysis protocols for these reference materials and finds that, despite their low reliability due to lack of certification, the existence of an alternative grade assessment with mostly acceptable results makes them good enough to provide a referential bias percentage in most cases.

To evaluate standard accuracy, Aclara calculates the bias (which should not exceed 5%), by comparing the mean of the analyzed standards against their best value (certified standard mean). In addition, Aclara marks as failures any standards that exceed ± 3DE (standard deviation) from the mean of the analyzed standards when there are more than 100 samples, and from the best value otherwise. Once identified, all samples within the influence of a failed standard are reanalyzed and depending on whether the result is similar or differs in coherence with the standard, the original or reanalysis is chosen, respectively. Aclara does not perform precision analyses from these standards, which should be possible at least in the case of certified total REY standards.

Table 11-5: Failure and Bias Percentages for Total REY by Standard Type, Element and Campaign.

STD Type (2020)	Element	Best Value (Total REY)	Mean Value (Total REY)	Samples	Failures	Failures %	Bias %
STD1	Dy	31.81	32.26	118	0	0.0%	1.4%
	Nd	177.65	181.27	118	1	0.8%	2.0%
	Pr	45.8	46.31	118	0	0.0%	1.1%

STD Type (2020)	Element	Best Value (Total REY)	Mean Value (Total REY)	Samples	Failures	Failures %	Bias %
	Tb	4.65	4.75	118	0	0.0%	2.2%
STD2	Dy	62.2	62.88	117	0	0.0%	1.1%
	Tb	9.45	9.57	117	0	0.0%	1.3%
	Nd	380.55	390.41	117	1	0.9%	2.6%
	Pr	98.6	100.13	117	1	0.9%	1.5%
STD3	Dy	96.48	97.37	46	0	0.0%	0.9%
	Tb	12.91	13.16	46	0	0.0%	2.0%
	Nd	495.22	509.52	46	0	0.0%	2.9%
	Pr	129.01	131.11	46	0	0.0%	1.6%
STD Type (2021)	Element	Best Value (Total REY)	Mean Value (Total REY)	Samples	Failures	Failures %	Bias %
STD1	Dy	31.81	32.29	52	0	0.0%	1.5%
	Nd	177.65	177.67	52	0	0.0%	0.0%
	Pr	45.8	46.3	52	1	1.9%	1.1%
	Tb	4.65	4.74	52	1	1.9%	1.9%
STD2	Dy	62.2	62.89	72	1	1.4%	1.1%
	Nd	380.55	386.56	72	1	1.4%	1.6%
	Pr	98.6	100.59	72	0	0.0%	2.0%
	Tb	9.45	9.71	72	0	0.0%	2.8%
STD3	Dy	96.48	96.52	27	0	0.0%	0.0%
	Nd	495.22	508.07	27	0	0.0%	2.6%
	Pr	129.01	133.22	27	0	0.0%	3.3%
	Tb	12.91	13.27	27	0	0.0%	2.8%

Total REY samples (Table 11-5) show acceptable bias and few to no failures for the 3 standard types and both campaigns. extraction value REY samples (Table 11-6) show generally acceptable bias, with the exception of Nd in MR2 (-6.4% in 2020 and -7.0% in 2021), for which a significant difference had already been detected with respect to the reference laboratory. Further inspection seems to point to a problem with the initially analyzed material and not with the samples sent during the campaigns. It should also be noted that MR4 shows downward biases very close to the threshold, and in the case of Nd exceeding it, though still within the acceptable. In terms of failures, few to none are generally observed in the 3 types of standard and in both campaigns, with MR2 showing the most failures per element, though being the most inserted standard (270) it is an acceptable result.

Table 11-6: Failure and Bias Percentages for Extraction Value REY by Standard Type, Element and Campaign.

STD Type (2020)	Element	Best Value (EV. REY)	Mean Value (EV. REY)	Samples	Failures	Failures %	Bias %
MR1	Dy	55.03	54.55	24	0	0.0%	-0.9%
	Nd	81.388	81.38	24	0	0.0%	0.0%
	Pr	17.401	17.69	24	0	0.0%	1.7%
	Tb	6.249	6.29	24	2	8.3%	0.7%
MR2	Dy	24.691	25.2	241	7	2.9%	2.1%
	Nd	83.716	78.33	241	6	2.5%	-6.4%
	Pr	18.043	17.85	241	4	1.7%	-1.1%
	Tb	3.541	3.58	241	7	2.9%	1.0%
STD Type (2021)	Element	Best Value (EV. REY)	Mean Value (EV. REY)	Samples	Failures	Failures %	Bias %
MR2	Dy	24.691	24.55	29	0	0.0%	-0.6%
	Nd	83.716	77.89	29	0	0.0%	-7.0%
	Pr	18.043	17.86	29	0	0.0%	-1.0%
	Tb	3.541	3.56	29	0	0.0%	0.5%
MR3	Dy	10.06	9.9	67	0	0.0%	-1.6%
	Nd	37.17	36.91	67	0	0.0%	-0.7%
	Pr	8.58	8.42	67	0	0.0%	-1.9%
	Tb	1.43	1.4	67	0	0.0%	-2.1%
MR4	Dy	7.92	7.55	41	1	2.4%	-4.6%
	Nd	30.59	28.92	41	1	2.4%	-5.5%
	Pr	7.09	6.79	41	1	2.4%	-4.3%
	Tb	1.08	1.03	41	1	2.4%	-4.2%
MR5	Dy	27.5	26.81	16	0	0.0%	-2.5%
	Nd	65.61	64.05	16	0	0.0%	-2.4%
	Pr	15.73	15.33	16	0	0.0%	-2.5%
	Tb	3.44	3.33	16	0	0.0%	-3.0%

Ausenco considers that evaluation and mitigation methods used by Aclara are generally appropriate and have been correctly applied, having also reached similar results in an independent review, which leads to the conclusion that the standards, despite some caveats explained by the particularity of the desorption methodology, are acceptable. Mr. Oviedo recommends preparing a new medium-high standard to replace MR1 and MR2 and making an effort to involve a third reference laboratory for the desorption process, so that the validation of in-house standards can approach a traditional round-robin.

11.2.3 Check Samples (Interlaboratory):

As a complement to the 2020 campaign QA/QC program, Aclara sent 134 duplicates (along with 5 standards and 2 blanks) to the ALS laboratory, Loughrea headquarters (Ireland), for total REY analysis. These were compared against the original samples from the main ALS laboratory, Lima headquarters (Peru). No check samples were sent for the 2021 campaign and, according to Aclara, it was not possible to use this control type for extraction value REY analysis, due to the particularities of the desorption methodology.

To evaluate check sample accuracy, Aclara performs a linear regression to obtain the correlation coefficient R2, and also calculates the bias (which should not exceed 5%) by comparing the mean of the samples from both laboratories, before and after removing outliers (see Table 11-7).

Table 11-7: Correlation Coefficient and Bias for Total REY Check Samples, Before and After Removing Outliers.

	Element	R2	Pairs	m	m Error	b	b Error	Bias %
RMA All Samples	Dy	0.93	134	0.97	0.02	-1.29	1.77	2.9%
	Nd	0.84	134	0.98	0.03	-8.18	10.61	2.3%
	Pr	0.86	134	0.95	0.03	-0.63	2.55	5.5%
	Tb	0.92	134	0.98	0.02	-0.39	0.23	1.8%
RMA No Outliers	Dy	0.99	131	0.95	0.01	1.33	0.72	4.9%
	Nd	0.98	131	0.98	0.01	-1.26	3.66	1.7%
	Pr	0.98	131	0.95	0.01	1.31	0.98	5.4%
	Tb	0.98	131	0.96	0.01	-0.01	0.1	4.1%

Check samples show acceptable correlation coefficients even with the presence of 3 outliers, which improve considerably when they are removed. Likewise, acceptable bias are observed, though somewhat above the threshold in Pr,and approaching it in Tb and Dy after outlier removal.

Evaluation methods used by Aclara are generally appropriate and have been correctly applied, having also reached similar results in an independent review, which leads to the conclusion that the check samples are acceptable. This type of control for total REY is considered of vital importance and, once again, the effort to involve another reference laboratory for check sample control of the desorption process is highly recommended.

11.2.4 Blanks

Aclara inserted 2 blank types for quality control of total REY: Coarse and fine blanks. For extraction value REY, Aclara inserted only coarse blanks, as fine blanks are sifted through a smaller mesh size than necessary for the desorption process. In both cases, the coarse blank material is quartz, purchased from Dimaquin. The fine blank material is also quartz, initially purchased from Target Rocks Peru and later changed, due to its high levels of rare earths, to quartz from Dimaquin.

The quartz used as blank, in both cases, contains REE traces at levels exceeding the detection limit (DL), meaning that inserted samples are not working as proper blanks. Therefore, to evaluate potential contamination, Aclara marks as failures any blanks that exceed 5DL (coarse blanks) and 3DL (fine blanks) from a "baseline" mean calculated using a set of 9 and 20 reference samples for coarse and fine blanks, respectively. Once identified, all samples within the influence of a failed blank are re-analyzed and depending on whether the result is similar or differs in coherence with the blank, the original or reanalysis is chosen, respectively.

Total REY samples show few failures for coarse blanks (<5%) in both campaigns, likewise few failures for fine blanks were observed for Dy and Tb, as well as slightly more than normal (7%) for Nd and Pr in both campaigns, though with no evidence of systematic error. Extraction value REY samples show few failures for coarse blanks in both campaigns, except in the case of Dy in 2020 (6%), though with no evidence of systematic error. After an independent review, Mr. Oviedo considers that these positive results may have been more optimistic than expected due to omissions in Aclara's evaluation methods for each blank type, as will be explained below.

In coarse blanks within the batch of 9 samples used to calculate baseline mean grades (Table 11-8), one of them corresponds to a very high value outlier, which skews the mean considerably to almost twice the sample mean without it. Had this outlier been removed, a greater number of missed blanks would have been observed, though with no evidence of contamination.

Table 11-8: Sample Batch for Thick Blank Baseline Analysis

Element	Dy	Nd	Pr	Tb
Method	ME-MS81	ME-MS82	ME-MS83	ME-MS84
Units	ppm	ppm	ppm	ppm
Detection Limit	0.05	0.1	0.02	0.01
100951	0.05	0.2	0.06	0.01
100952	0.19	0.7	0.19	0.02
100953	0.06	0.2	0.05	0.02
100954	0.17	0.8	0.16	0.04
100955	0.19	0.8	0.18	0.05
100956	0.06	0.2	0.05	0.02
100957	0.67	5.8	1.43	0.12
100958	0.11	0.3	0.06	0.02
100959	0.05	0.2	0.06	0.01
MEAN	0.17	1.02	0.25	0.04
MAX	0.67	5.8	1.43	0.12
MIN	0.05	0.2	0.05	0.01
STD DEV	0.18	1.71	0.42	0.03

In fine blanks, after changing the material supplier, the total REY content of the inserted blanks, has a lower mean graded. However, these new samples were evaluated by Aclara against the considerably higher baseline mean of the previous material, making it impossible to identify failures properly, though it cannot be said that this is evidence of contamination.

Mr. Oviedo believes that the use of quartz as blanks, while not ideal, can be accepted, but recommends the purchase of certified blanks. Regarding evaluation methods used by Aclara, Mr. Oviedo considers that they were inappropriate and not entirely well applied, despite having good failure mitigation protocols. This leads to the conclusion that blanks can be considered acceptable assuming a moderate risk due to a number of issues, though non-present evidence of contamination. Mr. Oviedo recommends ceasing the use of a “baseline” mean calculated from a batch of samples as a reference to establish the reanalysis threshold and replace it with the mean of all the blanks analyzed. In addition, fine blanks populations (TRP vs Dimaquin) should be separated and evaluated with respect to their own means.

12 DATA VERIFICATION

12.1 Verifications by Penco Module

The exploration and production work completed by Penco Module is conducted using documented procedures and involved verification and validation of exploration and production data, prior to consideration for geological modelling and Mineral Resource estimation. During drilling, experienced geologists implemented industry standard measures designed to ensure the consistency and reliability of the exploration data.

Quality control failures are investigated and appropriate actions are taken when necessary, including requesting re-assaying of certain batches of samples.

12.2 Verifications by Ausenco

In accordance with National Instrument 43-101, Mr. Luis Oviedo, under the supervision of Ausenco, visited the Aclara properties on two occasions. These visits were accompanied by J.P. Navarro, Chief geologist of Aclara. The first visit included Francisco Castillo P. Eng., both are considered qualified persons according to National Instrument 43- . The second site visit was on July 18, 2021, to verify the work produced by the new drill program. The big change was the quality of the resource because of the densification of the drilling with a substantial increment in Measured and Indicated resources and a minor increment in the total volume of the resource.

During the visits, all aspects that could materially impact the integrity of the drill holes and sampling databases (core logging, sampling, and database management) were reviewed with Aclara staff. Also, Luis and Francisco were able to interview staff to ascertain exploration procedures and protocols.

Mr. Oviedo and Mr. Castillo toured the Aclara area and observed drill sites, collars and the field status of the demarcations, and examined core from a number of drill holes, finding that the logging information accurately reflects actual core. The lithology and grade contacts checked, match the information reported in the core logs.

Mr. Oviedo and Mr. Castillo, on behalf of Ausenco, reviewed the drill hole databases for the preparation of this technical report and concluded that it is adequate to produce the block models, tonnage and grade evaluations to a satisfactory degree.

Mr. Oviedo and Mr. Castillo also completed statistical comparisons of the block models' global grade against the informing drilling data and visually compared on plans and sections the block models against the informing samples to confirm that the estimations are generally an adequate representation of the distribution of the REY mineralization.

Mr. Oviedo and Mr. Castillo believe that the review made both in the field and in cabinet has standard limitations for this type of work but indicated that the level of checks done are correct.

Finally, no verification samples were taken during Mr. Oviedo's two visits to the Project as the complete process of production of the samples and the database were reviewed in detail. Additionally, Mr. Oviedo reviewed and verified the logging description and storage of boreholes with the geologists and project technicians on site. The number of samples to make a valid verification must be a geostatistically-accepted quantity, which involves a high number of samples. Also, the process of analysis and handling of these samples is complex and unusual, and there is, at least in Chile, no third-party laboratory other than the one used by Aclara to perform these analyses. Finally, the QA/QC of the samples was reviewed in detail and the results were satisfactory. All of this indicates that verification samples were not necessary.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Introduction

Aclara initiated preliminary studies to design a metallurgical process for the recovery of rare earth elements (REEs) from ionic clays by extractive desorption and selective precipitation.

In brief, the proposed process is considering REE extraction using a two-step counter-current leaching process with ammonium sulfate solution ($(NH_4)_2SO_4$) as the lixiviant and a pH between 3 and 4. There are two main potential mechanisms for the adsorption of REEs onto ionic clay minerals:

- Ion-exchange mechanism, which is considered the main chemical mechanism present in the Penco Module process. The REE3+ ions are adsorbed on binding sites with permanent negative charges on the clay surface. These binding sites are produced by imbalanced charges due to substitutions of aluminum Al3+ and silicon Si4+ ions in the crystal structure of the aluminosilicates ($Al_2Si_2O_5(OH)_4$)like Caolinites, Halloysites and other similar minerals. In this case, the chemical equilibria are dependent on the ion concentration and the particle size.

- Surface-complexation adsorption mechanism, in which the RE3+ ions complex with the clay surface via a hydrolysis reaction with amphoteric hydroxyl groups ([ionic clay]–OH) at the edges of clay particles. So, the acid environment generates the hydronium ion forming which liberates the REE ion into the solution, so this mechanism is pH-dependent.

After leaching, a selective precipitation process that involves an ammonium bicarbonate solution (NH_4HCO_3) is used to remove impurities such as Al and Fe. This process will operate as a closed loop to be environmentally friendly, reduce water and reagent consumption, and to avoid the production of environmentally damaging waste. Following the extraction steps, the clay solids will be washed to recover any remaining ammonium sulfate, and to allow them to return to its original state so that it can be backfilled in the mine to allow revegetation.

The product is a dry REE carbonate mixed with an expected purity around 92%, with Al, Ca and Mg as the main impurity.

Metallurgical testwork has been conducted by several laboratories on various stages of the Project to provide the necessary design criteria for this study. The initial bench-scale testwork was conducted by the Universidad de Concepcion (UdeC) in 2016-2017, the Toronto University and AGS-ALS Laboratory in 2020, and a bench-scale testing program was completed at the end of 2020 (November) in Peru. Also, the Project has been working closely with different well-known vendors for equipment selection, sizing and plant design.

A summary of the experimental procedure and the main test results are presented below; there are at least seven years of research behind the summarized data. It is important to note that during 2019 Hochschild Mining Plc bought the Project, which implies that several modifications were done to the process and more entities were involved on the metallurgical testwork. Table 13-1 provides a summary of Section 13.

Table 13-1: Summary of Section 13 Content

Item	Stage	Item	Test	Date
13.2	Historical Metallurgical Testwork Programs	13.2.1	Universidad de Concepcion	2014 - 2018
		13.2.2	Pilot Test	2018
13.3	Most Recent Metallurgical Testwork Programs	13.3.1	University of Toronto	2019 - still running
		13.3.2	Benchscale Test "Chapi"	2020
		13.3.3	Ansto Radioactivity Test	2020 - 2021
		13.3.4	Vendor Test	ongoing
13.4	Recovery Modelling	13.4.1	Drill hole Samples	2020 - 2021
		13.4.2	Experimental Procedure Baseline Method for leachable REE	2019 - still running

13.2 Historical Metallurgical Testwork Programs

13.2.1 Testwork Universidad de Concepcion

Between September 2014 and April 2015, the Universidad de Concepcion (UdeC) was in charge of developing preliminary tests to develop a process for rare earths extraction (Gutierrez L, 2015). The conclusions are summarized in the following points:

- Using ammonium sulfate, the results of the basic desorption parameters were:
  - concentration of ammonium sulfate between 0.1 mol/L and 0.2 mol/L, solid/liquid (S/L) ratio 1:3 and desorption time greater than 7 minutes.
- The use of flocculants in the S/L separation stage is fundamental after the extraction process.
- Washing the clay after the extraction process showed good results to recover REE retained in the moisture of the cake.
- The recirculation of the REE's weak solution is considered a viable option.

This report was based on the development of a prognostic test that aims to measure the quantity of rare earth elements in a simplified manner. This prognostic test was based on the measurement of turbidity of the suspension when REE oxalates are precipitated.

In 2016, studies continued to define parameters and optimize the extraction process of rare earths. Table 13-2 shows the reports submitted by the UdeC corresponding to the tests carried out in 2016.

Table 13-2: UdeC Reports for Penco Module

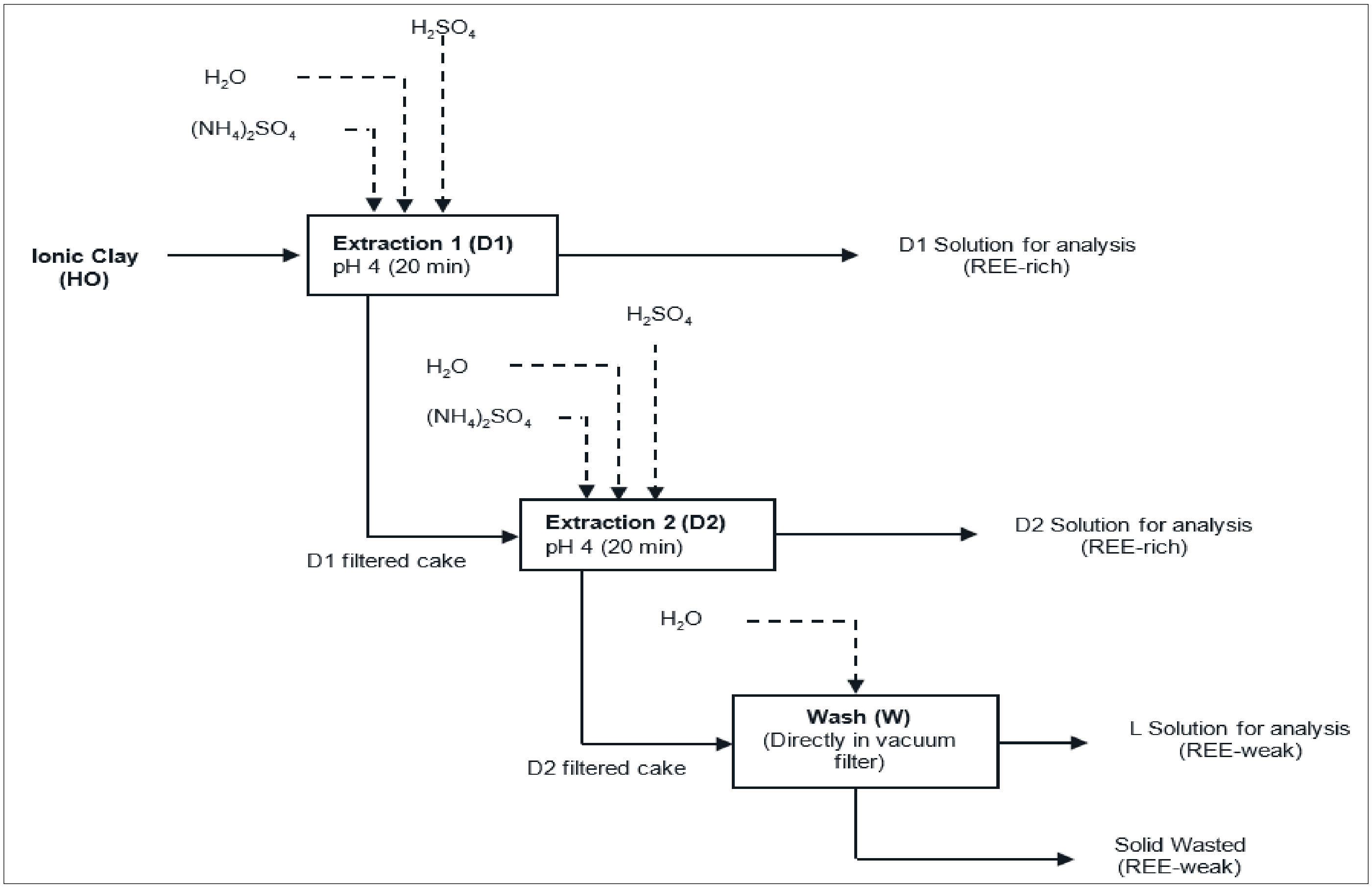
Test Year	Report Year	Laboratory	Report Name
2016	2017	UdeC	Research studies of rare earth extraction from ionic clays Part I
2016	2017	UdeC	Research studies of rare earth extraction from ionic clays Part II
2016	2017	UdeC	Research studies of rare earth extraction from ionic clays Part III
2016	2017	UdeC	Research studies of rare earth extraction from ionic clays Part IV

The reports issued by the UdeC describe the investigation and optimization of different variables that are fundamental for carrying out a rare earth extraction process. These variables were:

- type of leaching reagent;
- leaching reagent concentration;
- pH leaching;
- solid / liquid ratio;
- leaching kinetics;
- secondary mineral precipitation;
- leaching circuits;
- temperature;
- washing steps;

Aclara and the Universidad de Concepcion defined a procedure for the extraction of rare earths Figure 13-1shows a diagram of the extraction process.

Figure 13-1: Schematic Diagram of Extraction Process



Note: prepared by UdeC, 2017

In general terms, the procedure consists of leaching the mineral in a stirred reactor for twenty minutes with an aqueous solution of ammonium sulfate, a S/L ratio of 1:3 and a pH controlled by sulfuric acid addition. This leaching is carried out in two stages: as shown in Figure 13-1, the solid phase (filtered wet cake) from the first stage feeds into the second stage and is leached again under the same conditions, that is, in the same S/L ratio, leaching time, ammonium sulfate concentration and equal pH. The last stage of the extraction procedure consists of using water to wash the filtered cake from the second leaching stage.

Finally, solutions D1, D2 and L are sent to chemical analysis which determines the quantity of rare earth extracted in the leaching process as well as the quantities of pollutants by using ICP OS/MS depending of level of concentration.

13.2.1.1 Analytic Method to Determine REE

The analytic method used to measure REE quantities is described in detail in a document issued by Aclara called "Sequential Desorption Procedure for laboratory with Ammonium Sulfate," (BioLantánidos , 2020).

During these experimental campaigns, the REE total analyses were not considered, and the research was based on the leached REE from the ore. That is why, in this chapter there recovery is not traditional.

Table 13-3 shows the parameters that were studied in each report issued and the analysis methodology used. Two analysis methodologies were used, which are: REO titration method and ICP-MS analysis. Note that the REO titration method is an estimative method to obtain the equivalent REO concentration of a liquid sample.

Table 13-3: Parameters and Analysis Methodology Reports UdeC

Report	Study parameter	Methodology	Clay
Part I	Concentration ammonium sulfate, pH of extraction, Solid / Liquid ratio, kinetic of extraction, precipitation of secondary minerals, temperature, washing, sequential extraction circuit, particle size evaluation with extraction.	REO Titration	A, B and C
Part II	Leaching reagent type, Leaching reagent concentration, pH of extraction, Solid / Liquid ratio, kinetic of extraction	REO Titration	D, E and F
Part III	Secondary minerals precipitation	ICP-MS Analysis	D, E and F
Part IV	Sequential extraction circuit	ICP-MS Analysis	D, E and F

In the UdeC reports, 6 types of clays were used, called Clay A, B, C, D, E and F. These samples were taken from the same slope between 3 and 5 m deep in a sector called Cerro Penco Norte (CPN), which is 750 m approximately north of the clay known as the Pit Test (Victoria Norte), crossing the valley of the Penco estuary. Figure 13-3 shows the area where the clay was obtained (CPN) and the distance from the Pit Test.

Figure 13-2: Clay Location A, B, C, D, E and F

Source: NCL, 2019

A geo-metallurgical unit (GMU) was assigned to each studied clay. There are three different zones which are:

- GMU1: Leached zone
- GMU2: Enriched zone
- GMU3: Weathered protolith zone

13.2.1.2 Conclusions

The main conclusions that can be obtained from the studies carried out by the Universidad de Concepcion are:

- Leaching reagent to be used for the extraction process is ammonium sulfate.
- Optimal concentration of ammonium sulfate is 0.15 mol/L.
- Optimum pH for extraction is 4.0.
- Optimal ratio of S/L extraction 1:3.
- Extraction time greater than 7 minutes.

- Use ammonium bicarbonate as a precipitating agent of secondary minerals at a pH close to 4.5.
- Use ammonium bicarbonate as precipitator of REE carbonates at pH 7.0.
- It is possible to carry out a sequential extraction circuit because the concentration of REE in the solution increases as the circuit progresses, being able to be reused and not lose extraction capacity.
- The results show that it is possible to recover REE through a clay washing process in the sequential extraction tests. In addition, the washing stage allows to eliminate the ammonium retained in the clays, reaching concentrations close to zero with 6 stages of washing.
- Drained washing solutions do not contain REE or ammonium ions, which demonstrates the high effectiveness of the washing process.
- Biodegradable agents were studied, but the results were not as expected. Although these agents should not be discarded and should continue to be studied using other agents and higher concentrations.

These results are very important to be applied as improvements in the land extraction process and thus demonstrate that they are applicable to a pilot scale process. In addition, these trials involved clays belonging to the GMU1 and GMU2 of Cerro Penco Norte (CPN), where this area is very similar to the Test Pit clay (Victoria Norte).

There is no information on recovery during this period of time because the procedure titration or ICP were applied over the liquid samples therefore, there are no Total REE analyses. That is why, on the described experiment, there was not a relationship between the clay fed and the spent clay or the product obtained.

13.2.2 Pilot Plant

With the development done by Universidad de Concepcion, in 2017, the Penco Module Project erected a pilot-scale operation (throughput = 1 t/h), that resumed the operation of the El Cabrito Pilot Plant, which includes improvements to the Close Continuous Leaching Process (CCLP), in which the sequential extraction stage is located. The operation of the Pilot Plant allowed to validate a series of unit operations and equipment, to subsequently scale the designs to commercial level production plants and perform operation tests to achieve the final REE oxide product, until this moment the target was getting REE oxides.

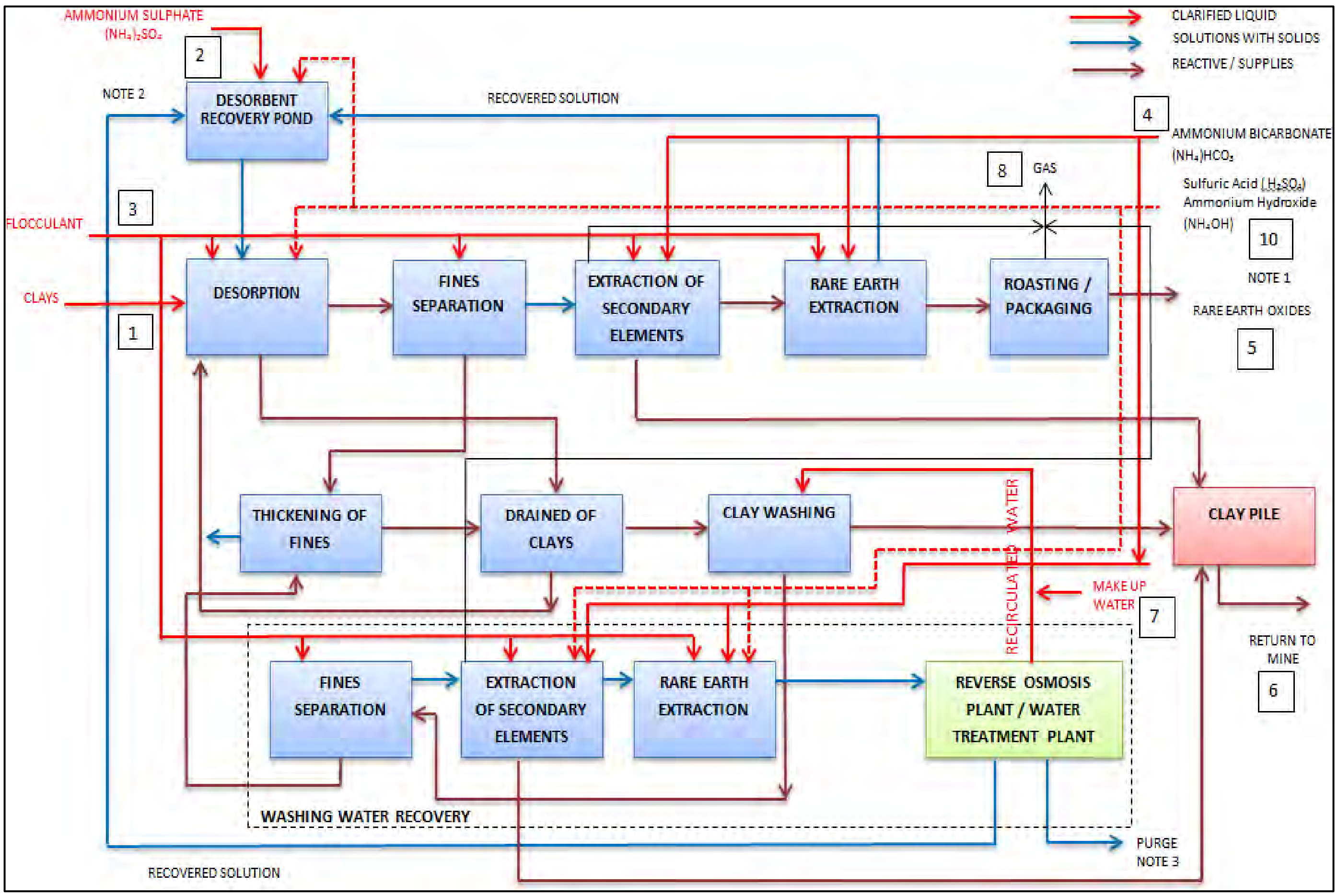
The general process of the REE extraction Pilot Plant can be divided into 5 stages:

- Mixing and extraction: Process in which the ionic clay is contacted with the extractant solution in order to extract the elements of interest contained in the ionic clays.
- Precipitation of Secondary Minerals: Stage where it proceeds to precipitate non-valuable elements present in the solution, with the aim of increasing the grade of the final concentrate.
- REE Carbonate Precipitation: Stage of precipitation of elements of interest as a solid species, that is, REE carbonates.
- Calcination: Stage corresponding to the calcination, where a high temperature chemical reaction occurs from REE carbonates to REE oxides.

- Treatment of washing water clays: Process where the washing water from the clays already processed is treated for the recovery of chemical agents and valuable elements.

Figure 13-3shows the general block diagram of the Pilot Plant operation using the CCLP extraction method.

Figure 13-3: Pilot Plant Process Block Diagram



Note: prepared by NCL, 2019

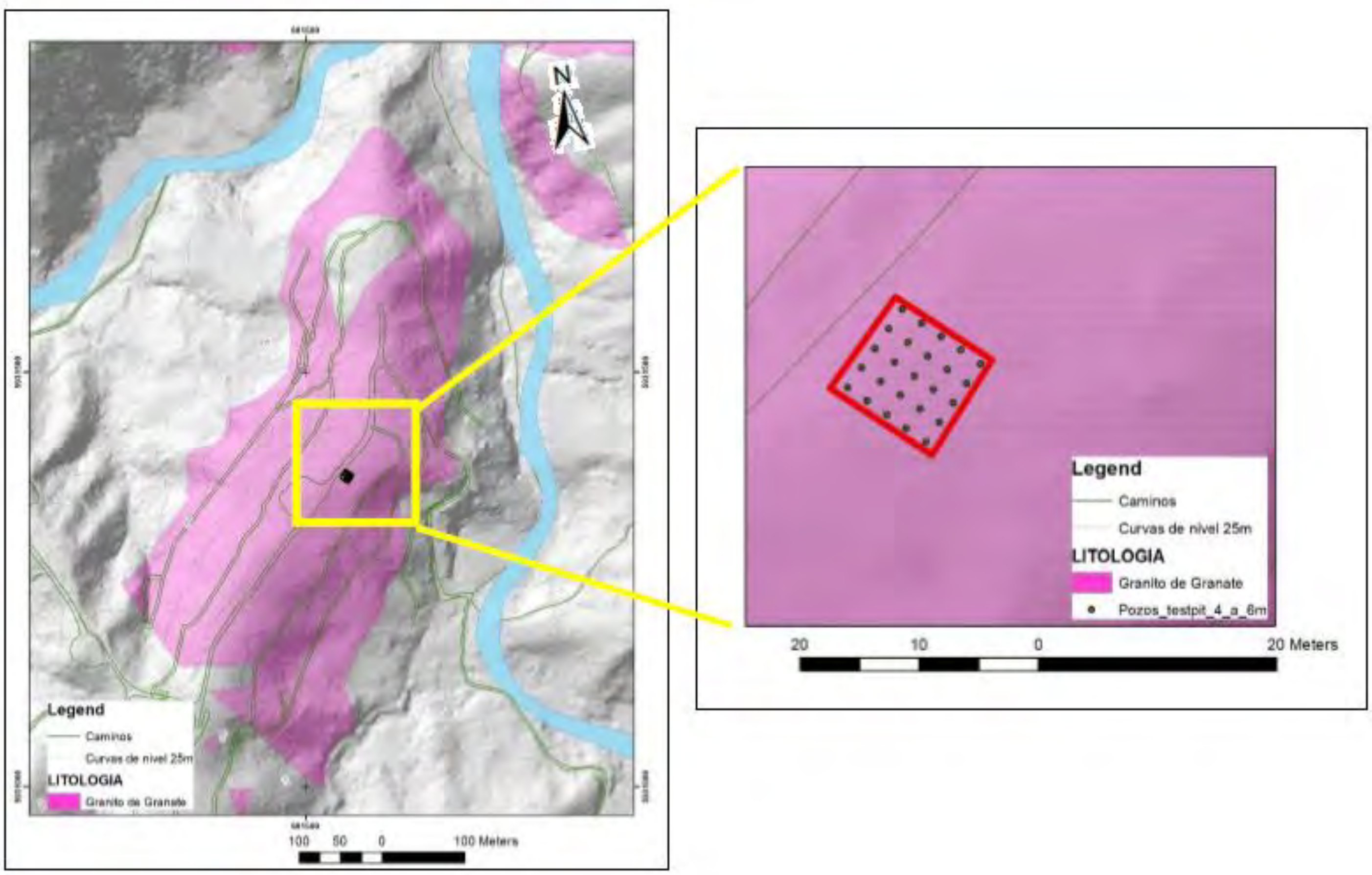
13.2.2.1 Sampling

For the selection of a suitable zone for the extraction of ionic clay, two choice criteria were considered:

- Easy access for extraction of clay
- High soluble REE grades, based on the previous test.

A sector located in Victoria Norte was chosen, since it has an easy access with a lateral road, in addition to a flat area that allows the safe development of clay extraction; this clay was called "TEST PIT". Figure 13-4 shows the extraction zone demarcated for the Test Pit. In this area, 25 drill holes were made at a depth between 4 and 6 m.

Figure 13-4: Test Pit Location



Note: prepared by NCL, 2019

13.2.2.2 Test Execution

A procedure for manual sampling was designed to perform sampling of ionic clay used to feed the sequential extraction process. A screw feeder was installed to resolve the issues that arose due to the sticky nature of the ore during the pilot operation.

In order to have the best representation of the material entering the extraction process, the following sampling process was carried out:

- It was performed in a day shift and a night shift of 12 hours each, covering from 08:00 hrs to 20:00 hrs (day shift) and from 20:00 hrs to 08:00 hrs (night shift). One sample per hour during the shift. 12 samples per shift.

- The 12 liquid samples were sent per shift to the UdeC to make a composite per shift and perform its subsequent process of sequential extraction. The composites are sent to ICP-MS analysis to SGS Chile.

To get a mass balance between the leachable REE provided by lab and the final product obtained at the plant, samples of the rare earth carbonate were taken and composited during the test operation, which is detailed below:

- A representative sample of 500 g of wet rare earth carbonate (RECO3) is taken and enters the drying stage in the conventional electric oven (HEC) at a temperature of 250 °C for 4 hours.
- Once the drying process is finished, the dry amount of RECO3 is weighed. The dry carbonate is then placed on a clean plastic sheet to roll and divide the sample into quarters.
- The cake material is then available with approximately 2 to 3 cm of thickness.
- Subsequently, a process of taking individual portions is carried out until a dry sample of 30 g of RECO3 is generated, it is stored in a sealed bag and sent to SGS Canada, Rare Earth Salts and Actlabs Canada for analysis.
- From this same cake, portions are taken to generate 100 g of dry carbonate, then this enters the industrial electric furnace (HEI) for calcination at 900 °C for 14 hours, to obtain Rare Earth Oxide (REO).
- The REO is then laid out on a clean plastic to be rolled and cut into quarters. A cake is finally formed portions are collected until generating a mass of 30 g of REO. It is stored in a sealed bag and sent for analysis. In addition, another sample of 30 g of REO is kept as a control. The average REO content in the product was around 71.3%, the main impurity was Aluminium (Av = 21.8%).

13.2.2.3 Results

The TP's global operation started on May 31, 2018 and ended on June 27, 2018. This operation can be divided in two stages:

- May 31- 2018 to June 29 -2018: Continuous Plant Operation
- July 01-2018 to July 17-2018: Operation Plant Heap Leaching (HL)

Taking into account the parameters described above, it is possible to quantify the amount of leachable clays that enter the sequential extraction process by means of ICP-MS analysis (sampling-ion clay), and a quantification of the final product is performed with ICP-MS analysis (REE sampling carbonate); therefore, a metallurgical plant recovery can be calculated. Table 13-4 summarizes the results.

Table 13-4: Pilot Plant Yield

Element	Yield (%)
Y	56.3
La	54.7
Ce	38.9
Pr	48.9

Element	Yield (%)
Nd	54.9
Sm	50.8
Eu	35.1
Gd	48.4
Tb	38.6
Dy	51.7
Ho	43.7
Er	51.1
Tm	33.1
Yb	49.2
Lu	29.6

According to the results, the process considered was not efficient enough because those results present several REE losses and a new test plan was defined and executed. The main conclusion was that the Project must modify the recovery method and S/L separation to increase the Plant Yield.

For this baseline methodology, it is important to remember that this procedure involved only analysis in the liquid phase, and until this stage, the total content of Total REE were not used.

13.2.2.4 SGS Verification

Between June 6, 2018 and June 9, 2018, SGS Minerals Lakefield visited the El Cabrito Pilot Plant with the objective of validating the rare earth extraction process (CCLP). During the visit several samples were taken at different points of the plant, then the performance of the Pilot Plant was validated and evaluated using the CCLP extraction method. The main conclusions and recommendations by SGS Minerals Lakefield were:

- The Pilot Plant is operable and it is possible to extract a concentrate of rare earths.
- SGS recommends carrying out S/L separation tests to determine the required sedimentation areas. Use different types of clays to measure the effect of mineral variability.
- The average extraction efficiency was 75% with respect to the total leachable amount. For example, for Pr and Nd achieved extraction efficiencies of 79% and 78% respectively.
- The extraction of scandium, thorium and uranium was negligible, and the concentrations of these elements in solution were generally below the limit of detection.
- SGS recommends putting a third stage of extraction to recover the missing fraction that has been extracted (leachable).

- The losses of REE in the precipitation of secondary minerals were negligible (0.12%), but SGS reports that the operational conditions when the samples were taken were not optimal.
- The greater the elimination efficiencies, the greater the REE losses will be due to the low removal of aluminum (Al).
- The REE carbonate precipitation efficiencies averaged around 95%, while the co-precipitation of Al and Mn was 99% and 5% respectively, while other elements such as Si and Mg were negligible.
- Significant losses of REE are estimated due to the fact that the REE carbonate does not reach precipitation in the settler and is not captured in the filter, the losses are estimated close to 22%. This can be improved by the addition of flocculant and coagulant or the installation of filters for finer particles.
- The high content of Al in the final concentrate can be attributed to the lack of control of pH in the stage of precipitation of secondary minerals. It is important that Aclara operate the pilot circuits with a rapid analytical response to be able to operate each circuit under the design conditions and, therefore, avoid the production of rare earth precipitates out of specification.
- Results and Conclusions
- The main conclusions that can be obtained from the Pilot Plant are:
- The process of extraction of rare earths, "Close Continuous Leaching Process (CCLP)" is a viable and valid method that can be developed at an industrial scale, but certain improvements in the process must be included.
- It is known that the achievable recovery of REE is in order for 80%. However, due to the difficulties presented during the operation of the pilot plant, which consisted of:
    - Soluble REE losses associated with unwashed clarifier underflow.
    - Losses of fines during the separation process.
    - Soluble losses associated with unwashed impurity removal solids.
    - Rare earth precipitate ends not captured in settler / thickener or cartridge filter.
    - Only an effective soluble REE plant recovery of 53% was achieved.
- The main factors that affected a low recovery of REE were improving extraction efficiency, losses in rare earths in the fines, lack of control of pH in secondary mineral precipitation, loss of REE carbonates in the sedimentation stage.
- The results of the circuit for obtaining rare earth carbonates for the different geo-metallurgical units showed different results of recoveries. This indicates that each GMU present in each extraction zone behaves differently and must be studied individually and thus, find an optimal and specific procedure to maximize resources from a metallurgical point of view.

- Based on these results, the Penco Module decided to modify the process to reduce REE losses in all its unit operations.

13.3 Most Recent Metallurgical Testwork Programs

13.3.1 Testwork University of Toronto

When Hochschild Mining Plc purchased the Project, the University of Toronto (UT) was commissioned to develop and optimize the process for the recovery of rare earth elements (REEs) from ionic clays by leaching and selective precipitation. The recovery process was developed in 2019 and is still running. The proposed process considers that REE extraction is achieved using a two-step counter-current extraction process with ammonium sulfate ($(NH_4)_2SO_4$) as the lixiviant and a selective precipitation process, using ammonium bicarbonate (NH_4HCO_3) as the precipitant. The clay solids wasted will be washed to recover any remaining ammonium sulfate.

Every chemical and thermodynamics variable, able to be modified, was studied in the following tests, which are described in detail in a document issued by University of Toronto titled, (Toronto University, 2021).

A summary of the most important tests is provided in Table 13-5, Table 13-6 and Table 13-7.

Table 13-5: Rare Earth Leaching Tests

Test Year	Report Year	Laboratory	Test Type
2019	2020	UT	Determine optimum extraction temperature
2019	2020	UT	Determine optimum S/L ratio
2019	2020	UT	Determine the chemical composition of different clays
2019	2020	UT	Baseline extraction tests
2019	2020	UT	Validate the use of the counter-current extraction process configuration
2019	2020	UT	Validate the use of the two-step extraction procedure
2019	2020	UT	Determine the effect of particle size on REE distribution within the clay
2019	2020	UT	Ammonium mass balance for the extraction process
2019	2020	UT	Determine sulfuric acid consumption for extraction
2019	2020	UT	Determine optimum ammonium sulfate concentration
2019	2020	UT	Evaluate the effect of flocculant presence on the extraction step
2019	2020	UT	Determine the effect of pH (1–3) on extraction of REEs, Th, U, and impurities
2019	2020	UT	Determine the effect of the extraction pH (1–3) on the precipitation processes

2019	2020	UT	Characterization and extraction of two sets of pilot plant clay samples (10 in total)
2019	2020	UT	Determine the effect of seeding

Table 13-6: Secondary Mineral Precipitation (Impurities)

Test Year	Report Year	Laboratory	Test Type
2019	2020	UT	Determine impurity precipitation kinetics
2019	2020	UT	Determine the effect of ammonium hydroxide as the precipitant
2019	2020	UT	Determine the effect of pH on impurity and REE precipitation
2019	2020	UT	Determine optimum ammonium bicarbonate dosages
2019	2020	UT	Determine impurity precipitation kinetics

Table 13-7: Rare Earth Precipitation

Test Year	Report Year	Laboratory	Test Type
2019	2020	UT	Determine REE precipitation kinetics

13.3.1.1 Baseline Leaching Condition

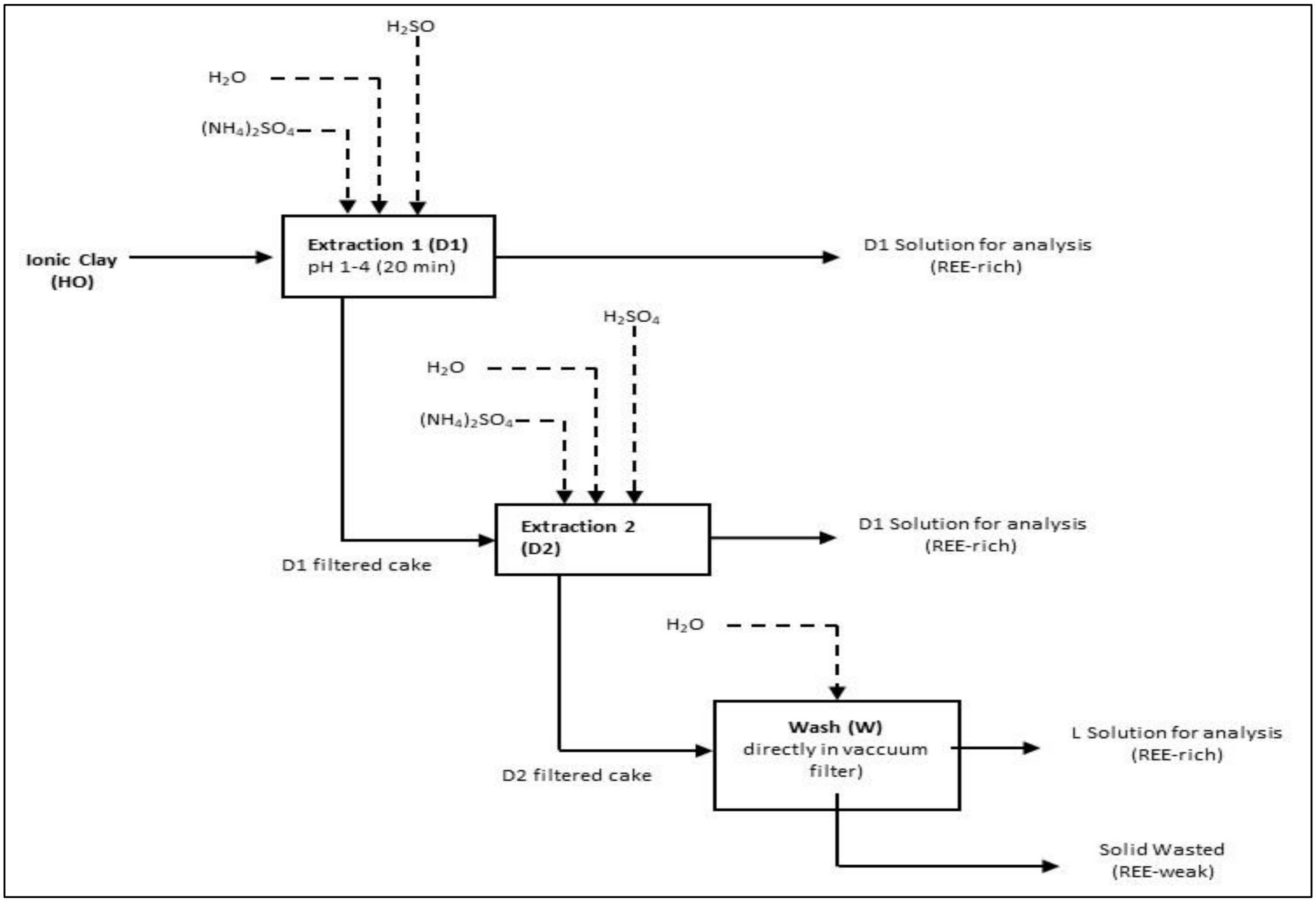
As previously mentioned, the Project was purchased by Hochschild Mining in 2019, which implies that several new tests and entities involved. During the most recent campaign the effort has been on recovery estimation, and this section includes a chemical analysis Total for rare earths and leachable rare earths that takes into consideration the previous parameters determined by the UdeC. See Table 13-8.

Table 13-8: Baseline Leaching Condition for Determination of Leachable REE

Description	Unit	Baseline Method
Liquid/solid ratio		
Internal	-	3/1
External	-	6/1
Leaching Solution		
Ammonium sulfate	gpl	20
TDS	%	1
Operation		
Scheme		Parallel
Agitation		stocking
Residence time	min	20
pH		4

The Figure 13-5 shows the basic rare earth extraction method used for the tests performed by University of Toronto (UT). A first extraction stage (D1), then a second extraction stage (D2) and finally a washing stage (W) were considered.

Figure 13-5: D1 + D2 + W Process Flowchart



Note: prepared by Aclara, 2020.

13.3.1.2 Sample Characterization

The chemical composition of the initial clay sample is shown in Table 13-9.

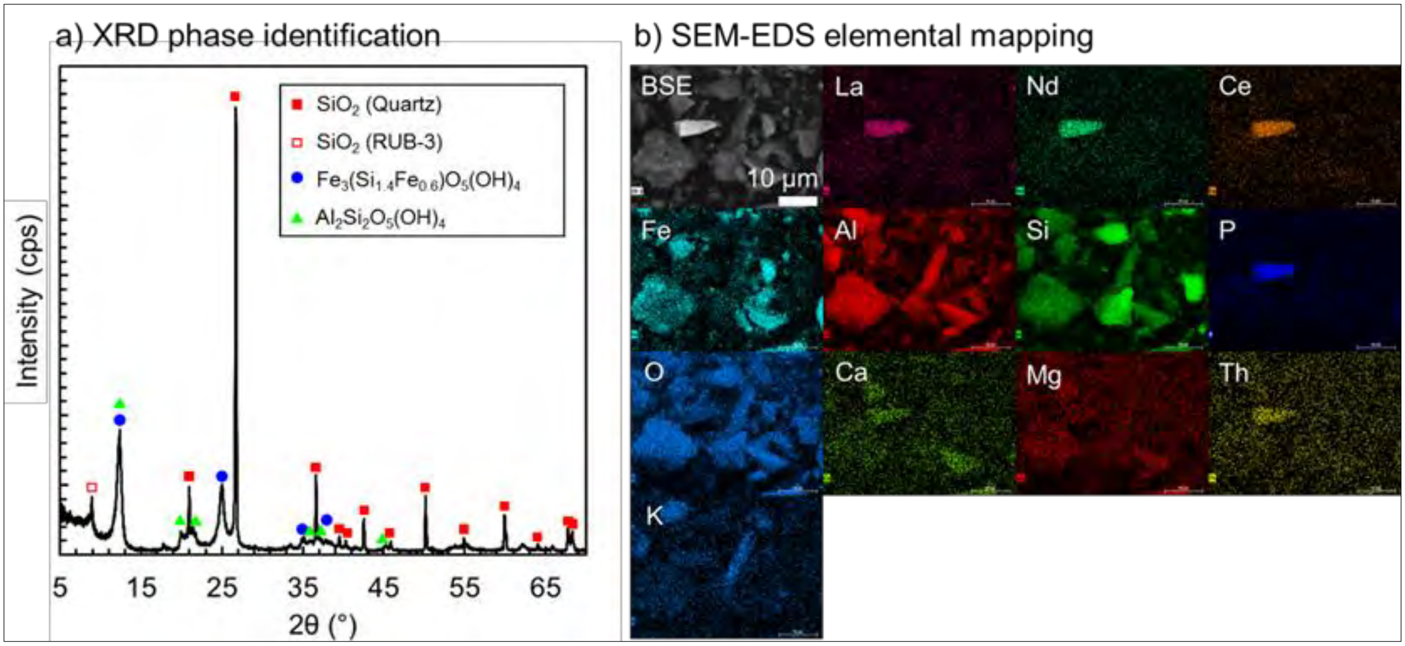
The compositions were determined by ICP-MS (REEs, U, Th) or ICP-OES (bulk metals) after MW-AR (5 replicates).

Table 13-9: Sample Characterization

Repeat digestions (n = 5)					
Element	Average mg/kg	Std. Dev. mg/kg	Element	Average wt%	Std. Dev. wt%
Sc	49.3	2.1	Fe	14.68	0.23
Y	772.3	47.0	Al	8.01	0.15
La	573.0	36.9	Mg	0.37	0.01
Ce	1080.8	34.5	Mn	0.36	0.01
Pr	129.1	5.2	Ca	0.05	0.01
Nd	528.4	16.9	Zn	0.00	0.00
Sm	82.8	3.0	K	0.39	0.04
Eu	2.4	0.0	Na	0.00	0.03
Gd	85.9	1.8			
Tb	16.5	0.7			
Dy	122.1	2.9			
Ho	30.3	1.1			
Er	85.1	1.7			
Tm	13.6	0.6			
Yb	86.6	3.8			
Lu	13.4	0.6			
U	1.5	0.1			
Th	186.1	7.9			
REE TOT	3672	125			
Radioactivity (Bq/kg)	792	34			

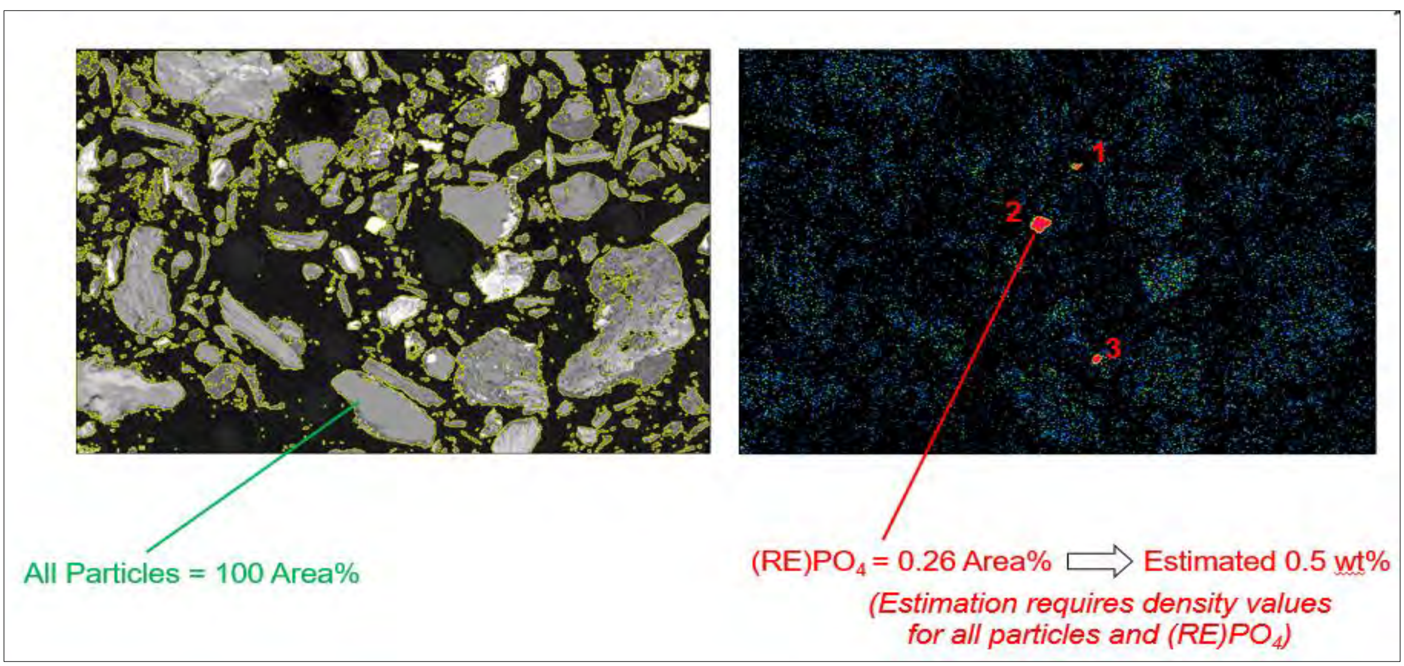
Several samples have been characterized by XRD and SEM-EDS to determine the mineral composition, the main compound found related to the ion exchange mechanism were halloysite ($Al_2Si_2O_5(OH)_4$), cronstedtite ($Fe_3(Si_{1.4}Fe_{0.6})O_5(OH)_4$), and quartz ($SiO_2$) – these minerals contains leachable REEs. The SEM-EDS analysis allows detection of small amounts of monazite ((Ce, La, Nd, Th)PO_4, (Figure 13-7 and Figure 13-7) within the clay. Monazite behaves as a refractory material up to Penco Module process, proposed for this Project.

Figure 13-6: Mineralogical and Morphological Characterization of the Starting Ionic Clay. a) XRD phase identification of the ionic clay. b) SEM-EDS elemental mapping of ionic clay



Note: prepared by Aclara, 2021

Figure 13-7: Presence of Monazite in Ore

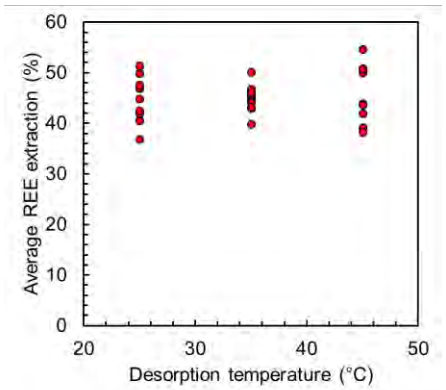


Note: prepared by Aclara, 2021

13.3.1.3 Extraction Temperature

The leaching temperature does not have a significant effect on the extraction of any of the leachable REEs within the range of 25–45°C (see Figure 13-8). It was shown that on average, the trials at low temperature and high temperatures were equivalent. In addition, that extraction between 0–5 °C also does not affect REE extraction. Since temperature does not have a significant effect and conducting trials without temperature control is logistically easier than employing temperature control, operation was set at room temperature for all the tests.

Figure 13-8: Average REE Extraction as a Function of Temperature

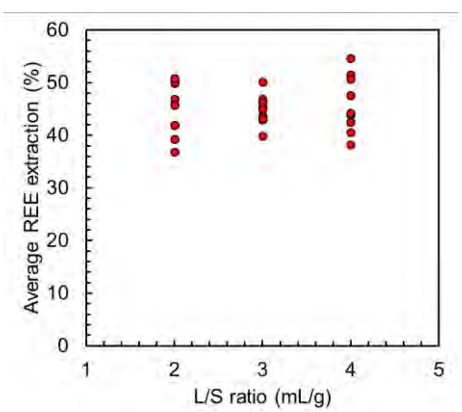


Note: prepared by UT, 2021

13.3.1.4 Extraction Solid/Liquid Ratio

An extraction optimization test was performed in which it was determined that the L/S ratio has no significant effect on the extraction of REEs within the range of 2:1 to 4:1 (see Figure 13-9). On average, the trials at low and high L/S were equivalent. Although the L/S ratio did not have a significant impact on extraction, it was set at the intermediate value of 3:1 to avoid mechanical issues that would arise at larger scales if a lower L/S ratio was used.

Figure 13-9: Average REE Extraction as a Function of L/S

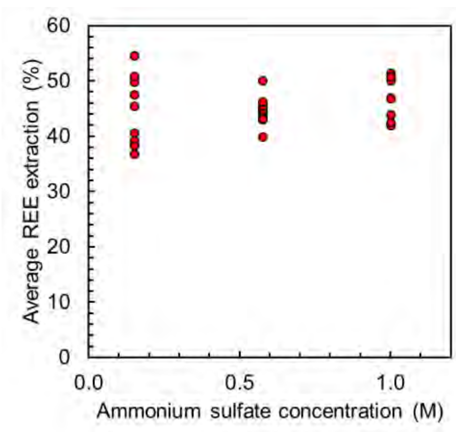


Note: prepared by UT, 2021

13.3.1.5 Ammonium sulfate concentration

The UdeC defined an optimal ammonium sulfate concentration in their previous works, which the UT optimized in 2020 through extraction optimization tests. The ammonium sulfate concentration was found to have no significant effect on the extraction of REEs within the range between 0.15–1.0 mol/L. On average, the trials at 0.15 mol/L and 1.0 mol/L were equivalent (see Figure 13-10). A slight improvement in extraction was observed at higher ammonium sulfate concentrations specifically when the highest tested pH (pH 4) was used. Given the near-negligible effect of ammonium sulfate concentration, and the importance of removing the ammonium sulfate from the clay after extraction, this concentration was set at the lower bound (0.15 mol/L) for the trials.

Figure 13-10: Average REE Extraction as Function Ammonium Sulfate Concentration



Note: prepared by UT, 2021

Also, the effect of using lower concentrations like 0.15 mol/L, was investigated. The results of this test indicate that lower concentrations of ammonium sulfate (above 0.1 mol/L, preferably between 0.125 and 0.15 mol/L) can also result in acceptable REE extraction levels. Since the ammonium sulfate concentration in the process is set at 0.15 mol/L, and ammonium is recovered in the closed-loop process, it is unlikely that the concentration would fall below 0.1 mol/L. It is recommended that the ammonium sulfate concentration be kept between 0.125 and 0.15 mol/L to achieve desirable REE extraction levels.

13.3.1.6 Extraction pH

In the previous work done by the UdeC, an extraction pH of 4.0 was defined. In addition, an Aclara study (Biolantánidos, 2019) showed decreasing pH results in higher extraction of uranium and thorium.

Given that extraction of these elements was consistently observed to be low at a pH of 3.0 (for all tested samples), and the co-extraction (and potential concentration) of radioactive Th and U was undesired, the pH was set at 3.0 as a lower pH to operate the leaching stage.

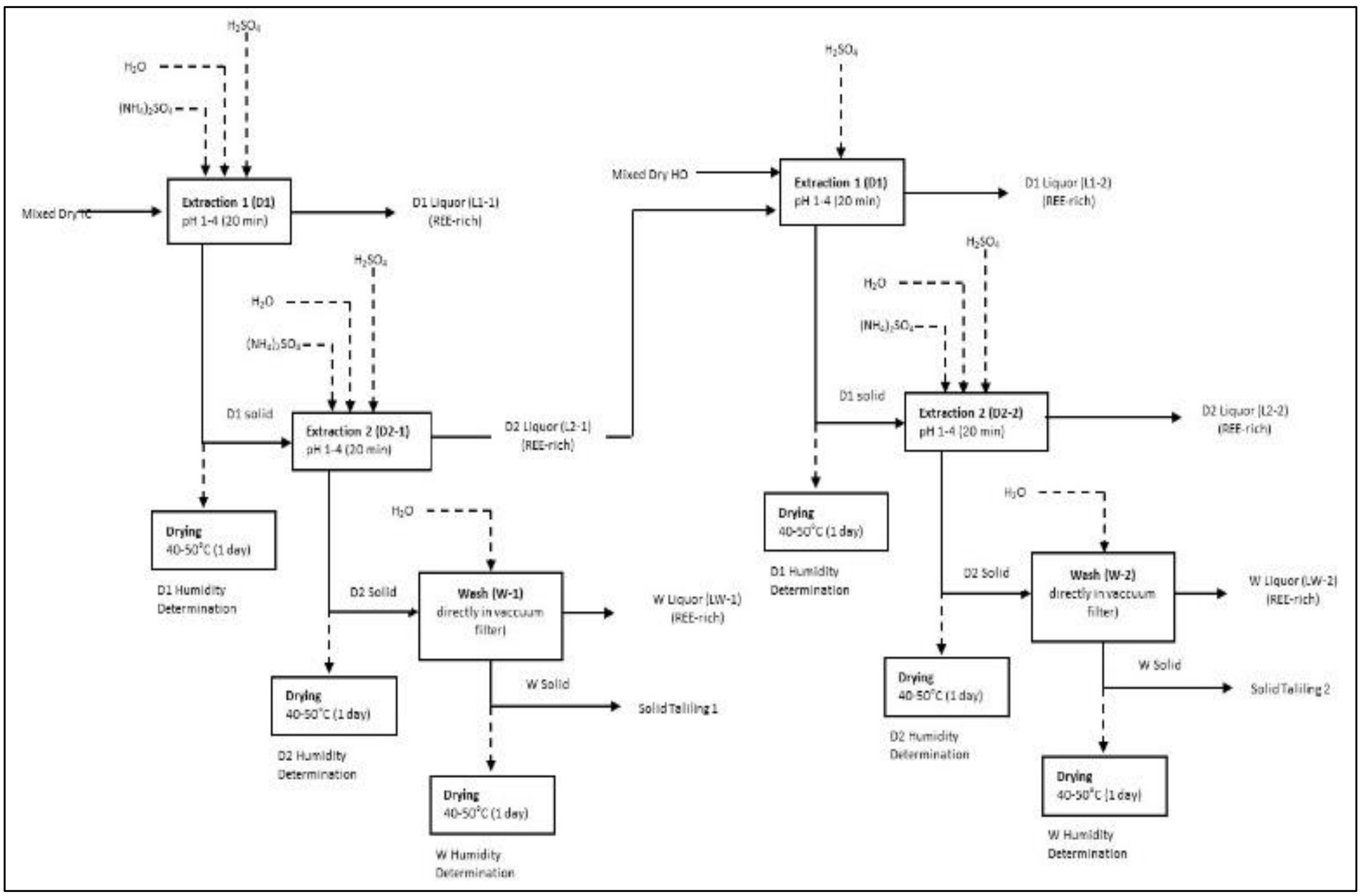
The results showed that reduction of pH has a positive effect on the desorption of REEs, but the effect plateaus at around a pH 2.0.

Some trials in this report were conducted even with pH 1.0 to determine the effect of extremely low pH. But it is important to highlight that the current process will operate in a pH range between 3 – 4. Avoiding all potential radioactive elements, this was largely studied with Ansto (See Section 13.3.3 for further information).

13.3.1.7 Effect of The Use of Counter-Current Extraction Process Configuration

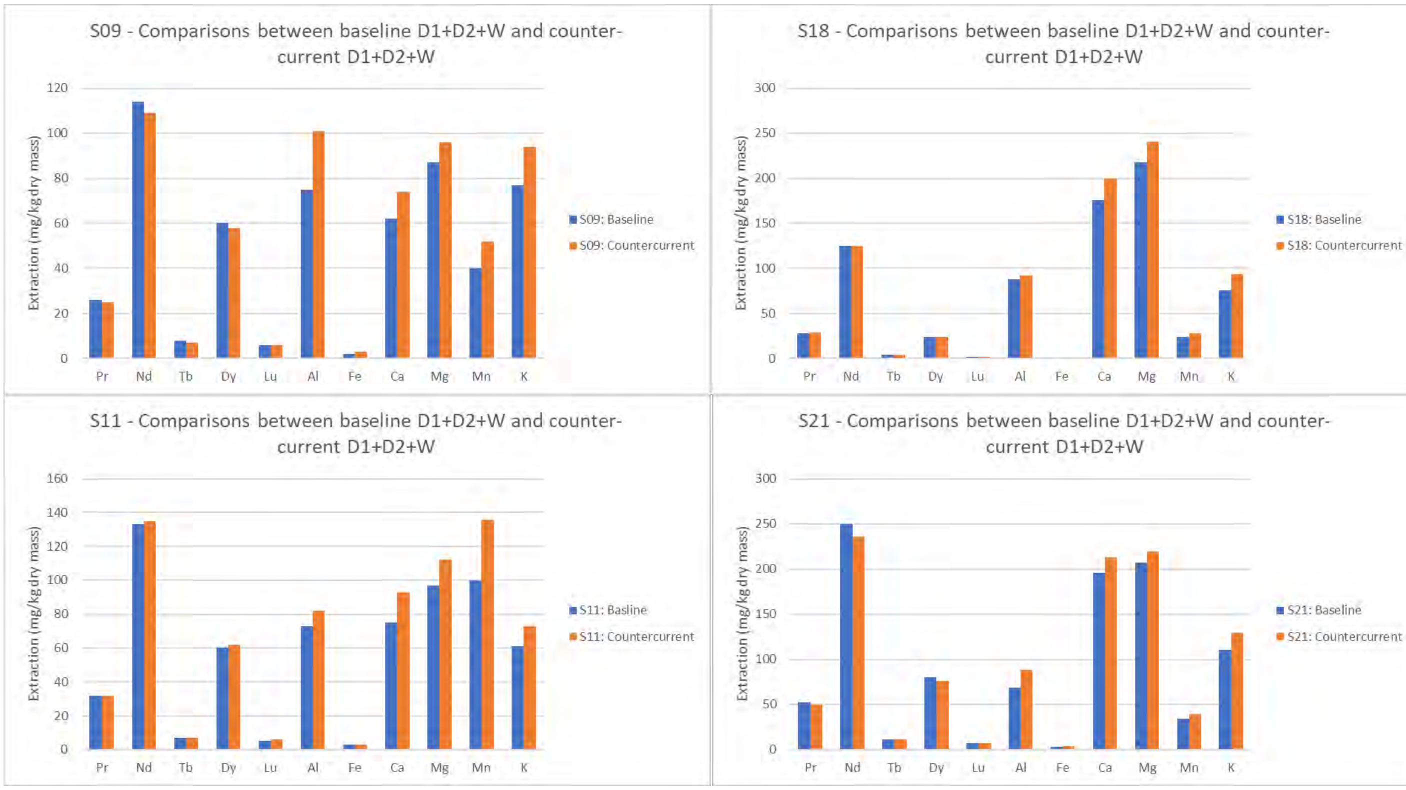
The desorption process in the plant will be operated in the countercurrent mode, with the L2 liquor from the D2 desorption step being used as the lixiviant in the D1 step. By using this countercurrent scheme, the consumption of $(NH_4)_2SO_4$ and water during desorption can be essentially reduced by half, since they are only added in D2 instead of D1 and D2. To assess the viability of this approach and to determine its effect on the desorption efficiency, countercurrent desorption trials were conducted in which the L2 liquor from a standard desorption trial was used for the desorption of fresh clay, without the addition of extra water or $(NH_4)_2SO_4$. Figure 13-11 shows the schematic flow diagram of this process. Figure 13-12 shows a comparison between the baseline and countercurrent configuration.

Figure 13-11: D2 → D1 Counter-Current Process Flowchart



Note: prepared by UT, 2021

Figure 13-12: Comparisons Between Baseline and Counter-Current Configuration

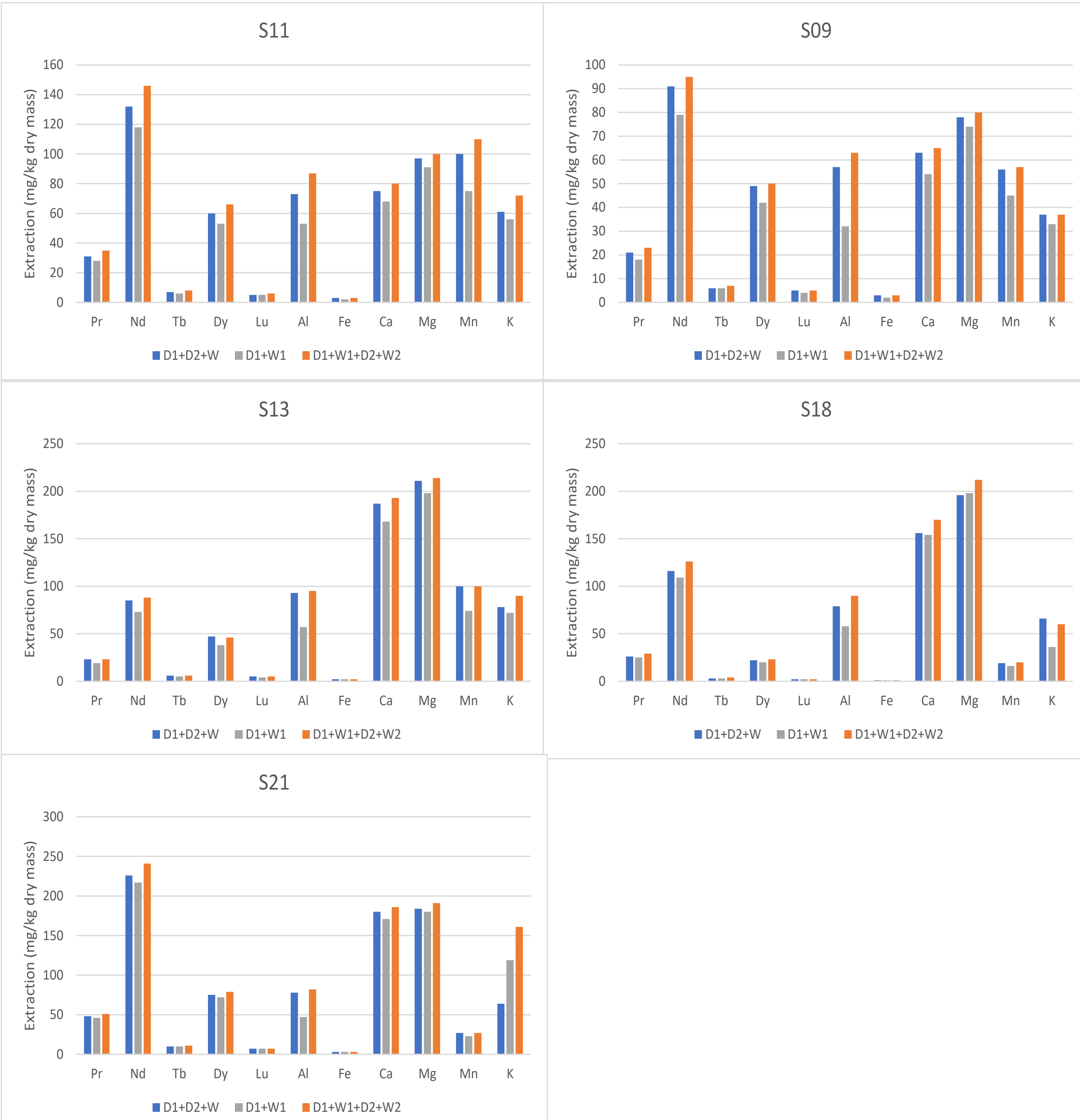


Note: prepared by UT, 2021

13.3.1.8 Importance of the D2 Extraction Step

A modified extraction procedure (D1 + W1 + D2 + W2) was tested, using an additional intermediate washing step (W1) after the first extraction step (D1), and it was compared to the normal procedure (D1 + D2 + W). The addition of step W1 allows evaluating the importance of step D2, because if D2 only has a washing function, step W1 would have the same degree of reaction as step D2 in the normal scheme, and step D2 would have a reduced extraction in the modified scheme. Conversely, if additional physical/chemical extraction occurs during D2, step W1 would have a considerably lower extraction than the standard D2, and D2 would continue to have a measurable extraction in the new scheme. Figure 13-3 shows the results.

Figure 13-13: Comparison for REEs between D1+D2+W, D1+W1, and D1+W1+D2+W2 process configurations for S11, S09, S13, S18, and S21 (correspond to various samples used)



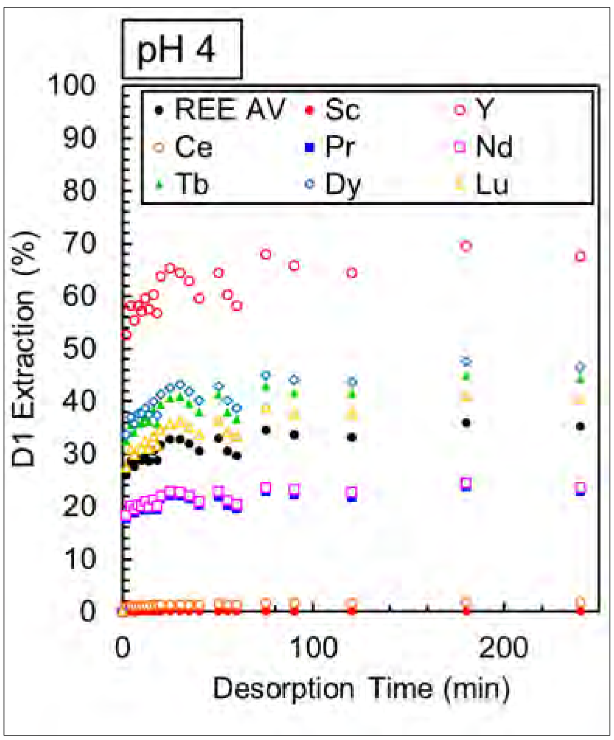
Note: prepared by UT, 2021

The results of these trials show that the addition of the D2 extraction step is beneficial for extraction, as it contributes to leaching beyond a simple washing effect. These tests also demonstrate that the addition of an intermediate washing step between steps D1 and D2 can offer a slight extraction advantage for REEs; however, this step also results in increased extraction of impurity elements. It may not be beneficial to add this extra washing step considering the advantages versus disadvantages of increased processing costs and increased impurity extraction.

13.3.1.9 D1 Desorption Kinetics

The objective of this test was to determine the optimal leaching duration, to enable equipment sizing. These trials show the time required to fully extract all the leachable REEs and will determine if a time-delayed hydrolysis or equivalent loss in extraction efficiency occurs. The results are shown in Figure 13-14.

Figure 13-14: Kinect Curve – REE Totals



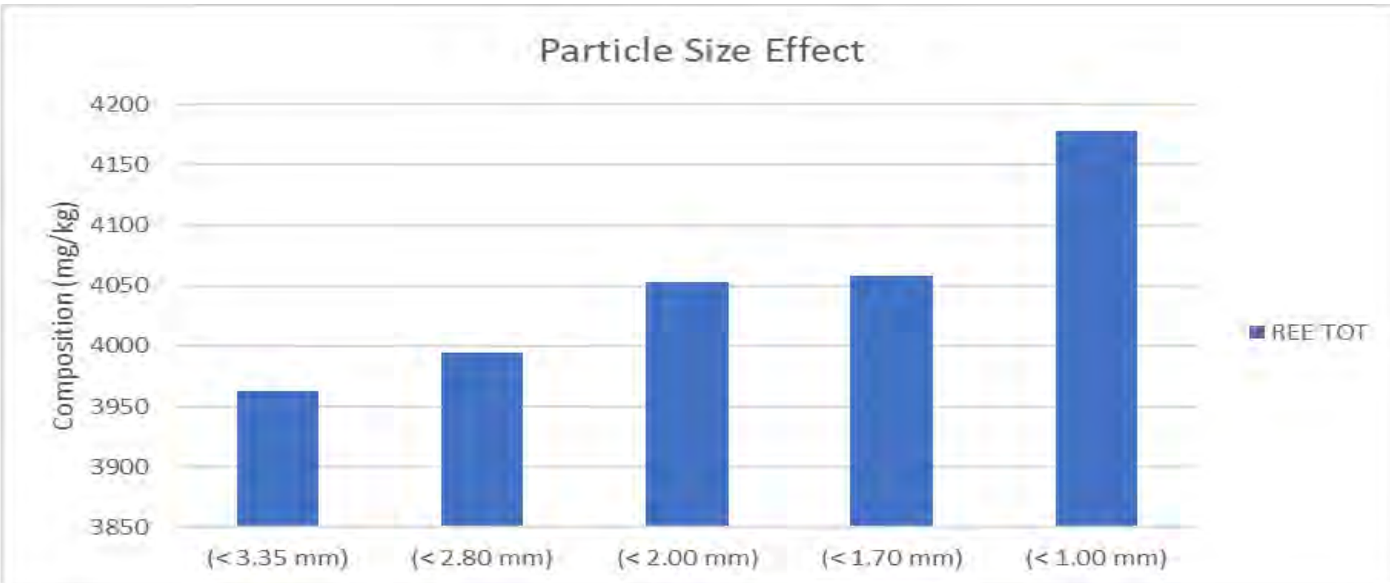
Note: prepared by UT, 2021

The extraction kinetics were rapid, with the majority of the REE extraction occurring within the first two minutes after $(NH_4)_2SO_4$ addition, and by 20 minutes, an extraction plateau had been reached. However, the maximum extraction is obtained with large residence time.

13.3.1.10 Particle Size Effect on REE Distribution Within the Clay

The sieve analysis indicates that REE concentration increases slightly (by 5–8%) with decreasing the particle size (see Figure 13-15).

Figure 13-15: Particle Size Effect on REE Distribution



Note: prepared by UT, 2021

On the other hand, the tests show that the REE content of the fine particles was higher than that of the coarse particles, which increase the leaching, since finer particles will have a higher available surface area per unit mass.

Aclara performed a cost analysis to determine if the large particle sizes could be discarded without a negative effect on the economics of the process. One note indicates that particle size classification in wet screening has costs associated and that it is not advisable to remove mineral on the 1 mm mesh or other that may affect the recovery (study in developed).

13.3.1.11 Optimization of the washing step and ammonium mass balance in the extraction process

The results of these tests led to the following conclusions:

- Increasing the wash water ratio results in increased ammonium removal, but this value starts reaching a plateau after 1.5 mL/g. Increasing this ratio from 1.5 to 2.2 mL/g results in ~10% extra removal. Considering the increased operating costs associated with additional water, 1.5 mL/g seems to be an acceptable number. If further removal is desired, this ratio can be increased.

- Based on ammonium mass balance, the calculated and measured ammonium concentrations for D1 solid are close to each other. For D2 solid, the measured value is slightly lower than the calculated one; similarly, for W solid the measured value is lower than the calculated one. This suggests that clay can adsorb ammonium ion, for example at the sites of extracted REEs or impurities. This means it is unlikely that the W solid creates environmentally damaging ammonium-rich runoff. This behavior needs to be validated at the plant scale.

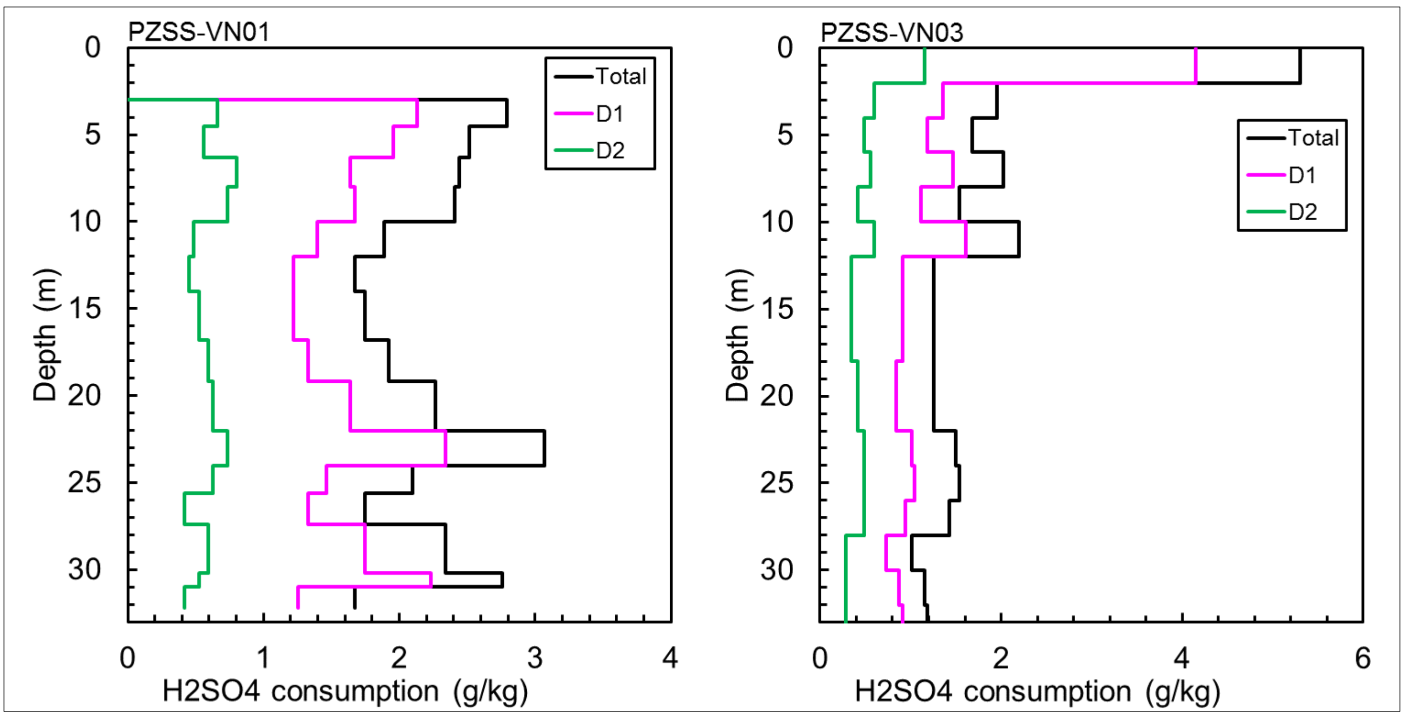
- Based on sulfur (sulfate) mass balance, the measured sulfate is slightly larger than the calculated value. This can suggest that there are sulfur containing species in the clay that are extracted in the presence of acid in D1 and D2 and they are carried in the processing circuit, and they will go out of the process with the W solid. This behavior also needs to be validated at the pilot plant scale.

13.3.1.12 Sulfuric acid consumption for clay extraction as a function of depth

The objective of this test was to determine if the sulfuric acid consumption in the extraction process changes by the depth at which the clay sample was extracted. To address this objective, the sulfuric acid consumption for the extraction of the 32-sample trials was measured.

The result indicates that the acid consumption in the extraction process is highly variable across different clay samples from different depths (see Figure 13-16). Therefore, active pH control should be employed to control the pH during operation rather than using a fixed acid dosage to achieve consistent results.

Figure 13-16: Acid Consumption (gH2SO4/kg ore) During D1 and D2 to Maintain the Desorption pH at 4.0



Note: prepared by UT, 2021

13.3.1.13 Effect of Flocculant Addition on Extraction

The recorded concentrations (mg/L) are given in Table 13-10 for each trial. The D1 extractions and concentrations for test PRE1, which was desorbed under equivalent conditions, without the addition of flocculant are also shown for comparison. Overall, comparing the results for different flocculant addition points, the extractions and concentrations do not appear to be influenced by the flocculant addition, or on its addition order (before or after the desorption step). The settling time is quicker when the flocculant was added immediately before filtration as well as expected.

Table 13-10: Solution Concentrations (mg/L) for Desorption Trials with Flocculant Added. The Results for Trials A, B, and C (as listed above) are Shown, Alongside Trial PRE1 for Comparison

Trial	Solution concentration (mg/L)										
	Pr	Nd	Tb	Dy	Lu	Al	Fe	Ca	Mg	Mn	K
A: D1 + D2 + W (flocculant after desorption)											
D1	7	29	2	13	1	18	1	25	27	31	16
D2	2	6	0	3	0	13	0	5	4	10	3
W	0	1	0	0	0	1	0	0	0	1	0
B: D1 (flocculant before desorption)											
D1	7	29	2	13	1	18	1	20	25	28	15
C: D1 + W1 + D2 + W (flocculant after desorption)											
D1	7	28	2	12	1	16	1	23	25	30	15
W1	1	2	0	1	0	1	0	2	2	3	1
D2	1	4	0	2	0	11	0	3	2	6	1
W2	0	0	0	0	0	1	0	0	0	1	0
PRE1: D1 (no flocculant for comparison)											
D1	7	31	2	14	1	16	1	26	25	26	15

From these tests it could be concluded that the addition of flocculant does not have a negative impact on extraction, and that extraction is not affected by the order of flocculant addition. Qualitative observations suggest that flocculant is more effective in accelerating settling time when added immediately prior to filtration; however, this can be explored in more detail during the vendor and pilot tests.

13.3.1.14 Effect of pH on Extraction of REEs, Th, U, and Impurities

The objective of this test is to study the effect of pH on the REE, U and Th extraction in the pH range of 1–3. Nine samples from 20 kg pilot batch were selected and leaching at pH 1.0, 2.0, and 3.0. The precipitation of impurities and REEs plus Th and U for three samples extracted at pH 1.0, 2.0, and 3.0 is also studied to determine if the extraction pH has an effect on the pH at which impurities and REEs precipitate.

The results of this experiment show that decreasing pH has a diminishing positive effect on the extraction of REEs. Reduction of pH has positive effect on the extraction of REEs but the effect plateaus at around pH 2.0.

The operational range for the current operating conditions will be pH 3.0 –pH 4.0. For security aspect the plant will be designed not able to decrease the pH below that condition. The difference between pH 4.0 and pH 2.0 is 100 times approximately, so the pumps will not have that range.

13.3.1.15 Effect of Extraction pH on the Impurity and REE Precipitation pH

The objective of this test is to obtain detailed precipitation curves of pilot plant samples produced using D1 leachate extracted at pH 3.0, 2.0, and 1.0. This allows precise determination of the pH at which each of the studied element precipitate when ammonium bicarbonate is used as the precipitating agent.

- Impurity Removal pH

In test for leaching at pH 4.0, it was observed that at pH=6.0, 94% of Al precipitates with small loss of REEs (1–4%). Decreasing the pH to 5.73 can reduce REE precipitation to almost zero, but Al precipitation also drops to 86%. Increasing pH to above 6.0 (e.g., 6.27) is detrimental to REEs and it should be avoided.

The test, for pH 3.0, it is observed that at pH=6.06, 95% of Al precipitates with minimal loss of REEs (except for Lu=8%), but 100% precipitation of Th.

The test, for pH 2.0, it is observed that at a pH of 5.58, 98% of Al precipitates but some loss of REEs is observed. Decreasing pH to 5.15 results in 81% precipitation of Al, and minimum loss of REEs. In both cases, 100% of Th precipitates.

The test, for pH 1.0, it is observed that at pH=5.23, 92% of Al precipitates with minimal loss of REEs. Th precipitation is 100%.

Based on the results of this test, for extraction at pH 1.0 and 2.0, it is recommended that impurity removal be performed in a pH range of 5.2–5.5 to avoid loss of REEs. In the cases of extraction at pH 3.0 and 4.0, it is recommended that the impurity removal be performed at pH=6.0 to avoid loss of REEs while maximizing impurity removal.

- REE Precipitation pH

  At pH 4.0 leaching, complete REE (except Lu: 91%) precipitation occurred at pH=6.7. At a pH 3.0 leaching, complete REE (except Lu: 92%) precipitation occurred at pH=7.08. At pH 2.0 leaching, complete REE (except Lu: 93%) precipitation occurred at pH=6.78. At pH 1.0 leaching, near complete REE precipitation occurred at pH=6.69.

- REE Precipitation pH Conclusion

  Based on these results, it is recommended that the step is carried out in a pH range of 7.0–7.50. The pH=7.5 guarantees that the entire REE content (except for Lu=95%) would precipitate.

13.3.1.16 Research on effect of Agitation

To reduce the Project CAPEX and OPEX, the possibility of using a Counter Current Decantation (CCD) circuit to replace the agitated extraction stages was investigated. Using thickener tanks would reduce agitator power consumption and facilitate the solid–liquid separation stage. This investigation was focused on determining whether agitation is required to achieve efficient REE extraction.

In previous trials, agitation was maintained such that the particles were fully and uniformly suspended within the solution. In theory, since the reaction is limited to the particle surface, the agitation rate should not affect extraction; however, since solution pH is critical to the extraction efficiency, sufficient agitation may be required to maintain pH control. In a thickener the residence time is higher than the 20 minutes' reactor.

This experiment compared the extraction efficiency of different agitation rates and residence times by conducting the D1 extraction in two stages, an agitated stage (of variable rate and time) with pH control at pH 3.0, and a residence stage (of variable time) with no agitation or pH control.

The result of this test indicates that agitation has a slight positive effect on the extraction. It is difficult to mimic the conditions of a thickener in the lab. Considering that the difference between extraction efficiencies at different agitation rates is not significant, it can be concluded that thickener is a suitable equipment for the extraction process considering the level of saving in the CAPEX and OPEX. The residence time could increase the recovery over the agitation effect.

13.3.1.17 Impurity Precipitation Kinetics

The kinetics of impurity precipitation was measured to determine the best residence time to help with equipment sizing. These trials show the time required to precipitate impurities with minimum REE co-precipitation.

As shown in Figure 13-17, for both clays (S11 and S9), precipitation of Al was rapid, reached 93% after 10 min, 94% after 15 min, and 95% after 30 min. The remaining Al precipitates during the REE carbonate precipitation at higher pH values. Looking at REEs percent precipitation, it can be observed that 30 minutes results in less (by 1-2%) loss compared to 20 min. Based on the results of this test, it is recommended to run the precipitation of impurities at pH=6.0 in a timeframe of 20–30 min, with 30 minutes being slightly better by ~1%.

Other impurity elements such as Ca, Mg, Mn, and K did not precipitate in the impurity precipitation step and demonstrated a small amount of precipitation in the REE carbonate precipitation step. In terms of Fe, some precipitations between 8 and 19% were observed, but that could be due to the very low concentration of Fe which introduces some measurement errors. In terms of Mg, Mn, and Ca, precipitation was low between 0 and 3% (0% being at 20 and 30 min). For K, the percent precipitation was also low, between 0 and 6% (being at 3% at 20 and 30 min).

Looking at REEs behavior during the impurity precipitation, the loss was between 0 and 5% (except for Lu that was between 0 and 13% which could be because of its very low concentration). Comparing the % precipitation between 20 and 30 min, except for Pr and Tb in clay S9, other elements had equal or 1% less precipitation at 30 min. Based on these results, it is recommended to carry out the impurity precipitation process at pH=6.0 in a timeframe of 20–30 min, with 30 min being slightly better by ~1%.

Figure 13-17: % Precipitation of Impurities and REEs as a Function of Time in the Impurity Precipitation Kinetic Trials at pH=6.0.

Note: prepared by UT, 2021

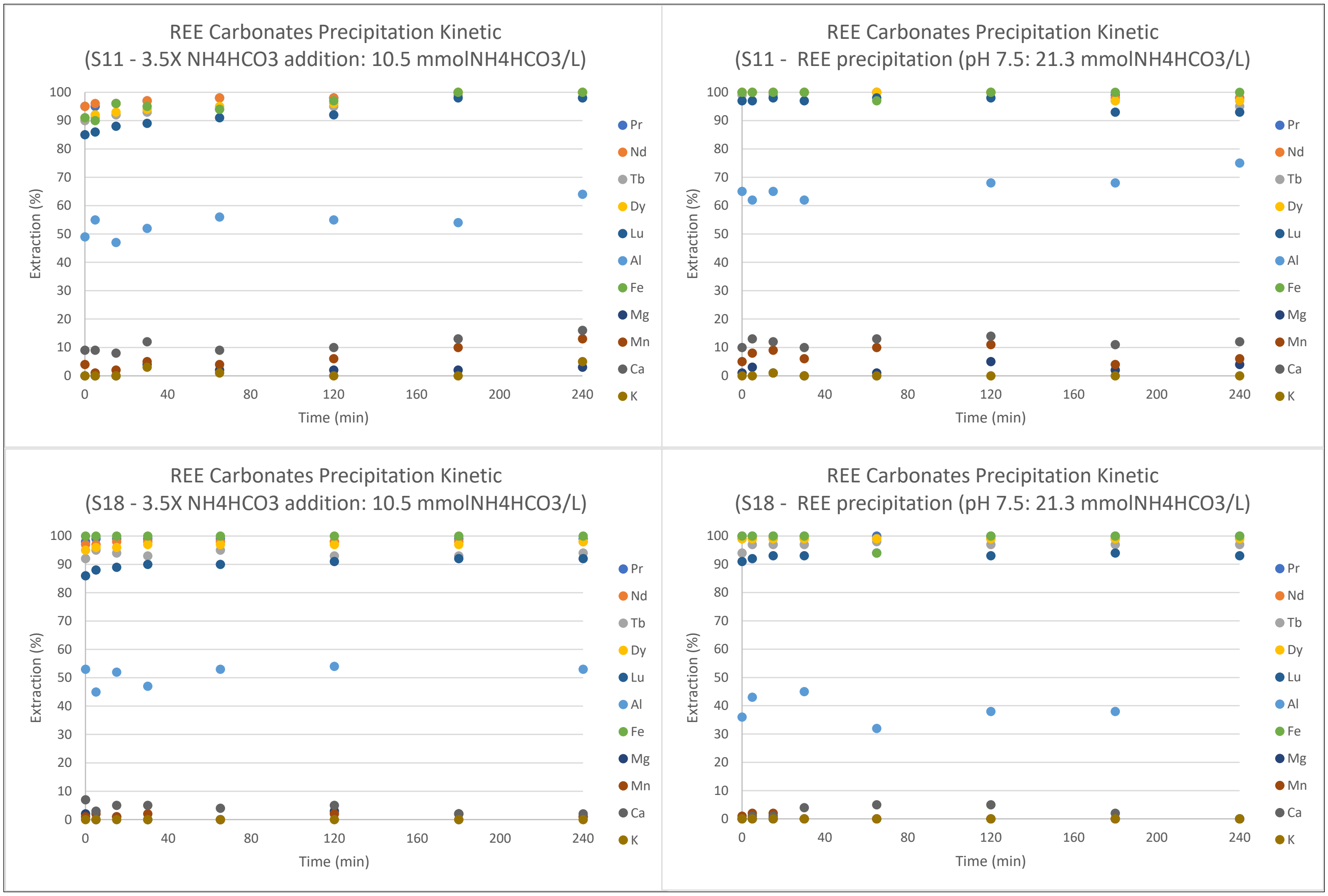
13.3.1.18 The REE carbonate precipitation kinetics

The kinetics of REE carbonate precipitation is measured to determine the optimal REE precipitation duration to enable equipment sizing. These trials show the time required to fully precipitate REE carbonates, producing readily filterable REE carbonate crystals with minimal impurities.

The results show that at both pH levels (natural pH and pH 7.5), nearly 100% of the REEs precipitate; however, operating at controlled pH of 7.5 resulted in faster precipitation, with the precipitation appearing to be complete immediately after required ammonium bicarbonate was added. The kinetics of precipitation appeared to mostly depend on the solution pH. The pH control is the key determining factor for the REE carbonate precipitation kinetics, i.e., if a higher pH, such as pH=7.5 is employed, precipitation step occurs fast.

Figure 13-18 show % precipitation of impurities and REEs as a function of time in the REE carbonate precipitation kinetic trials. The REE precipitation trials were carried out at two different NH_4HCO_3 dosage levels: an approximate "3.5 × molar ratio of the expected REE content", and a higher dosage enabling the precipitation to be conducted at pH ~ 7.5.

Figure 13-18: Carbonate Precipitation Kinetics



Note: prepared by UT, 2021

The goal of this test was to determine the residence time for the REE carbonate precipitation step. The results suggest that pH control is a critical factor for REE precipitation.

- Nearly 100% precipitation of REEs can be achieved immediately if the precipitation step is operated at pH 7.5.
- In the lab scale testing, less than 10 minutes were enough to achieve 100% REE precipitation at pH=7.5, while lower pH values required more residence time and resulted in slightly less than 100% precipitation efficiency.

13.3.1.19 Use of ammonium hydroxide for impurity precipitation

This test is focused on determining the effect of the precipitant type on the impurities and REE precipitation processes. In previous trials, ammonium bicarbonate was used as the precipitant. Impurities (mainly Al) precipitate as hydroxides and REEs as carbonates. In this test, ammonium hydroxide (NH_4OH) was used as the precipitant to determine its effect on impurity and REE precipitation.

The percent precipitations for S11 and S18 clays using NH_4OH and NH_4HCO_3 are reported in Table 13-11.

The following observations are made:

1) In terms of sample type, S11 and S18 show comparable results when NH_4HCO_3 was used as the precipitant. The S18 had slightly higher precipitation by 1–2% except for Lu which is higher by about 10%. However, Lu concentration is low and there could be measurement errors, even with few ppm differences, it can lead to a large difference.

2) In terms of precipitant type, for S11, NH_4OH resulted in slightly higher precipitation of REEs. A similar trend was observed with S18. It is recommended that NH_4HCO_3 is used to reduce the possibility of REE hydroxide precipitation.

Table 13-11 shows initial leachate concentration and percent precipitation of each element in the impurity precipitation kinetic trials using NH_4OH. Precipitation was carried out for 25 minutes. The 30 minutes precipitation values for sample S11 from test PRE-1 are also shown for comparison.

Table 13-11: Use Ammonium Hydroxide for Impurity Precipitation

	Pr	Nd	Tb	Dy	Lu	Al	Fe	Mg	Mn	Ca	K
S11-NH_4OH (first trial, June 26, 2020)											
D1 Leachate concentration (mg/L)	7.5	31.3	1.9	14.1	1.3	13.5	0.5	25.4	26.1	25.8	14.3
Initial % precipitation	0	0	0	0	0	0	0	0	0	0	0
25 min % precipitation	1	1	4	5	12	93	NA	0	1	0	0
S11-NH_4OH (second trial, July 3, 2020)											
D1 Leachate concentration (mg/L)	8.0	34.8	2.1	15.4	1.4	16.6	0.6	27.6	30.6	21.3	17.4
Initial % precipitation	0	0	0	0	0	0	0	0	0	0	0
20 min % precipitation	1	3	7	7	13	96	22	0	1	1	0
S11-NH_4HCO_3 (first trial, results from trial PRE-1)											
D1 Leachate concentration (mg/L)	7.5	31.3	1.9	14.1	1.3	13.5	0.5	25.4	26.1	25.8	14.3
Initial % precipitation	0	0	0	0	0	0	0	0	0	0	0
30 min % precipitation	2	2	3	5	13	95	14*	0	1	0	3
S11-NH_4HCO_3 (second trial, July 3, 2020)											
D1 Leachate concentration (mg/L)	8.0	33.4	2.1	14.9	1.4	16.3	0.5	26.2	29.7	21.4	18.3
Initial % precipitation	0	0	0	0	0	0	0	0	0	0	0
20 min % precipitation	0	0	3	3	11	95	13	0	0	0	4
S18-NH_4HCO_3 (control, second trial, July 3, 2020)											
D1 Leachate concentration (mg/L)	10.5	47.4	1.5	9.6	0.8	17.9	0.3	79.6	6.0	57.9	14.3
Initial % precipitation	0	0	0	0	0	0	0	0	0	0	0
20 min % precipitation	4	3	3	3	20	96	17	0	0	2	9
S18-NH_4OH (trial July 3, 2020)											
D1 Leachate concentration (mg/L)	10.4	46.0	1.5	9.4	0.8	18.0	0.3	78.4	6.0	57.1	13.3
Initial % precipitation	0	0	0	0	0	0	0	0	0	0	0
20 min % precipitation	1	0	4	10	17	96	NA	0	0	0	0

The results of this test confirm the following:

- Between ammonium bicarbonate and ammonium hydroxide, ammonium bicarbonate is a better precipitant that results in less REE loss during impurity precipitation.

- Ammonium bicarbonate is more environmentally friendly, less toxic, and less expensive that ammonium hydroxide.
- The storage of ammonium bicarbonate (that is in solid form) is significantly easier than that of ammonium hydroxide which exists in the solution form and requires storage tanks.
- Furthermore, during the experiments, it was more difficult to control the pH when ammonium hydroxide was used. Ammonium hydroxide can also lead to the formation of rare earth hydroxides that have low solubility and precipitate easily.
- Ammonium hydroxide can be used if there is a problem with the supply of ammonium bicarbonate at some point.

13.3.1.20 The REE and impurity precipitation curves as a function of pH

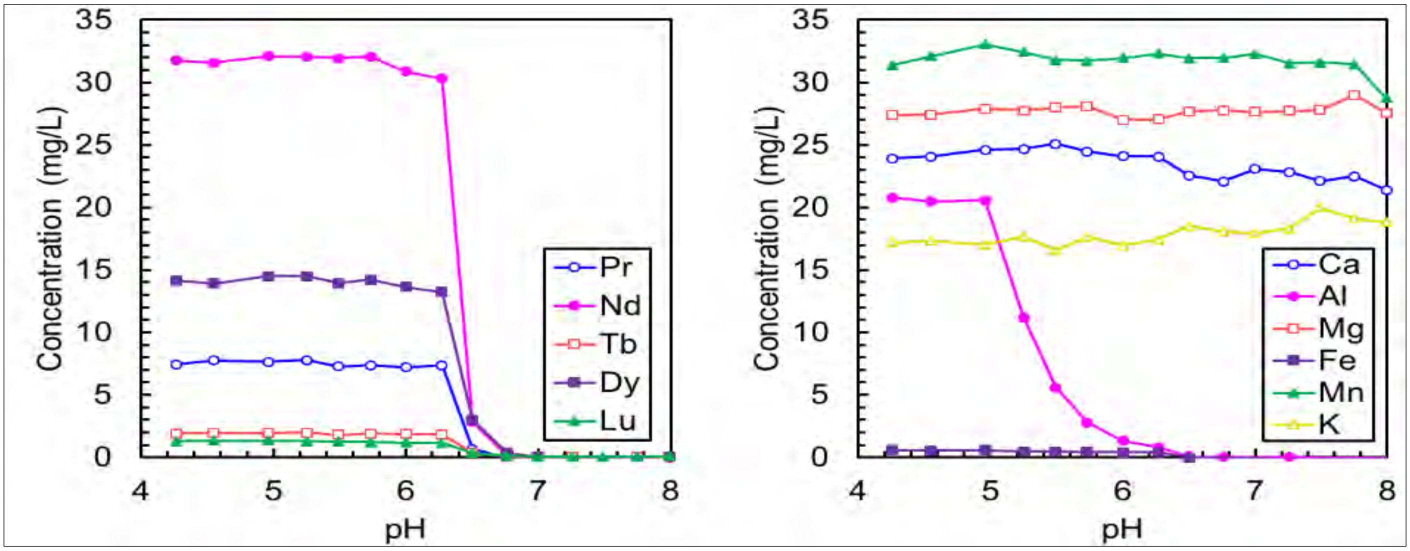
The objective of this test is to obtain detailed precipitation curves of pilot plant samples produced using D1 leachate desorbed at pH 3.0, 2.0, and 1.0. This allows precise determination of the pH at which each of the studied species precipitate when ammonium bicarbonate is used as the precipitating agent.

The pH of the S11 leachate was gradually increased from 4.26 to 7.99 in 0.25 intervals by controlled addition of NH_4HCO_3 solution. The solution concentrations were analyzed for each sample to determine the pH at which each element precipitates. At pH=5.73, the % precipitation of REEs is zero except for Lu (5%) which is due to very low concentration of this element in the leachate. At this pH, Al precipitation is at 86%. When pH is increased to 6.0, 94% Al precipitation is observed, with a slight increase in the precipitation of REEs (1-4%) (and 9% Lu). Increasing pH above 6 results in higher REE precipitation, and above 6.5, there is a great loss of REEs.

For the REE precipitation step, almost all REEs precipitate completely at pH=7.0. To ensure that complete REE precipitation is achieved in the plant, it is recommended that pH is kept at 7.25–7.50 range. Complete precipitation of Lu was not observed even at pH=8.0.

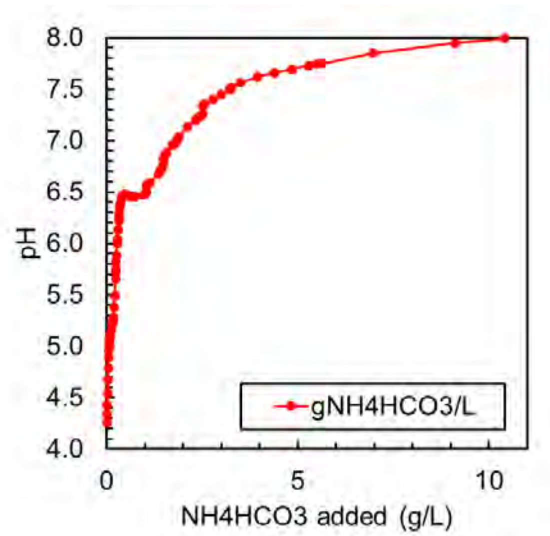
Figure 13-19 show percent precipitation of REEs and impurities from S11 ionic clay. The pH of the D1 leachate solution was increased by controlled addition of 1.3 mol/L NH_4HCO_3 solution (see Figure 13-20). The pH was sampled at regular intervals, and the concentrations were measured by ICP-OES.

Figure 13-19: Concentration pH curves for REE and Impurities



Note: prepared by Uof T, 2021

Figure 13-20: pH Increase Associated with the Addition of NH_4HCO_3 Solution



Note: prepared by UT, 2021

13.3.1.20.1 Impurity Removal pH

At pH=6.0, 94% of Al precipitates with small loss of REEs (1–4%). Decreasing the pH to 5.73 can reduce REE precipitation to almost zero, but Al precipitation also drops to 86%. Increasing pH to above 6.0 (e.g., 6.27) is detrimental to REEs and it should be avoided. It is therefore recommended that the impurity removal step is carried out at pH=6.0 and increasing above this value must be avoided.

13.3.1.20.2 REE Precipitation pH

It is recommended that this step is carried out in a pH range of 7.25–7.50. The pH=7.5 guarantees that the entire REE content (except for Lu=95%) would precipitate.

13.3.1.21 Optimum ammonium bicarbonate dosage

During the impurity precipitation process, ammonium bicarbonate dosage was selected based on the expected molar concentrations of the extraction solutions. Since pH needs to be maintained at the target levels to achieve acceptable impurity and REE separation, sulfuric acid and ammonium hydroxide were used to maintain the target pH. The objective of this test is to determine the effect of ammonium bicarbonate dosage on product yield and purity, as well as sulfuric acid and ammonium hydroxide consumption.

During the impurity precipitation process, ammonium bicarbonate dosage was selected based on the expected molar concentrations of the extraction solutions. Since pH needs to be maintained at the target levels to achieve acceptable impurity and REE separation, sulfuric acid and ammonium hydroxide were used to maintain the target pH. The objective of this test is to determine the effect of ammonium bicarbonate dosage on product yield and purity, as well as sulfuric acid and ammonium hydroxide consumption.

The precipitation yields for each trial are presented in Table 13-12. The results suggest that the NH_4HCO_3 dosage does not have a significant effect on the impurity precipitation process. The key determining factor for the precipitation step is the pH control.

All trials were conducted at pH 6.0 for 20 minutes. The dosages correspond to the dosage of 100 g/L NH_4HCO_3 solution added to induce precipitation. The pH was maintained at 6.0 by additions of 2.9 mol/L NH4OH and 0.36 mol/L H2SO4 solutions, as noted.

Table 13-12: **Optimum Ammonium Bicarbonate Dosage**

Time	pH	H_2SO_4 added (mL/L)	NH_4OH added (mL/L)		Pr	Nd	Tb	Dy	Lu	Al	Fe	Mg	Mn	Ca	K
A. 0.96 mLNH_4HCO_3/L leachate															
Initial concentration	4.15			mg/l	8	34	2	15	1	20	1	27	31	23	17
20 min	6	0.20	1.02	% precipitation	2	2	6	3	13	92	28	0	2	2	1
B. 1.34 mLNH_4HCO_3/L leachate															
Initial concentration	4.15			mg/l	8	34	2	15	1	20	1	27	30	22	16
20 min	6	0.10	0.82	% precipitation	1	2	5	4	11	94	15	0	0	2	0
C. 1.73 mLNH_4HCO_3/L leachate															
Initial concentration	4.15			mg/l	8	34	2	16	1	20	1	27	30	22	16
20 min	6	0.00	0.61	% precipitation	1	1	2	4	11	94	18	0	0	0	0
D. 1.92 mLNH_4HCO_3/L leachate															
Initial concentration	4.14			mg/l	8	34	2	16	1	20	1	27	31	22	17
20 min	6	0.00	0.51	% precipitation	3	3	3	5	13	94	18	1	0	0	1
E. 2.11 mLNH_4HCO_3/L leachate															
Initial concentration	4.14			mg/l	8	34	2	16	1	20	1	27	30	22	17
20 min	6	0.00	0.41	% precipitation	2	1	1	5	11	94	24	0	0	0	0
F. 2.50 mLNH_4HCO_3/L leachate															
Initial concentration	4.15			mg/l	8	35	2	16	1	20	1	28	30	22	17
20 min	6	0.21	0.21	% precipitation	3	3	3	6	13	94	-	2	0	0	0
G. 2.88 mLNH_4HCO_3/L leachate															
Initial concentration	4.15			mg/l	8	36	2	16	1	21	1	28	31	23	17
20 min	6	0.52	0.21	% precipitation	3	3	5	8	17	94	28	2	0	1	0

These tests show that if pH is controlled at 6.0, the actual ammonium bicarbonate dosage utilized does not affect the precipitation of impurities or REEs during the impurity precipitation step of the process.

a) These tests indicate that to achieve the optimum results, only NH_4HCO_3 should be used to bring pH to 6.0 at which impurity precipitation takes place. As long as the pH stays at 6.0, the dosage of NH_4HCO_3 does not have a significant effect. There is no need to use NH_4OH to keep pH at 6.0.

b) Anything above -30% excess results in 94% Al precipitation and REE precipitations are less than 5%.

c) These tests indicate that one efficient approach is to use only NH_4HCO_3 to bring pH to 6.0 and give enough time to impurities to precipitate.

d) Another approach could be to add the stoichiometric amount of NH_4HCO_3 or 10% extra and adjust pH by adding NH4OH. This will allow acceptable separation of impurities and REEs.

e) One of these approaches can be selected based on the reagent costs and the convenience of the process at the plant scale.

13.3.1.22 Effect of seeding on REE precipitation kinetics

One potential technique for improving the kinetics of REE carbonate precipitation and the size of the product crystals is seeding the precipitating solution with pre-formed carbonate crystals. In this trial, the precipitation over time and the particle size of the product crystals are measured for different seeding ratios.

In all cases, the REE precipitation was extremely rapid. With no seeding, more than 99% of all REEs (except Lu 95.8%) precipitated within 30 minutes. Adding seed decreased this time to 5 minutes. However, the percent precipitations were all high in all cases; thus, it may not be required to seed this process and add complexity and cost to the process.

One interesting observation was that in all cases, the solution pH increased slowly over time, stabilizing at pH 7.4-7.6; however, high % precipitations were achieved right away.

The REEs were not affected evenly by the seeding. The light/medium REEs (Pr, Nd, Tb) saw essentially 100% precipitation immediately in all cases, with seeding having no appreciable effect. In contrast, the heavy REEs (Y, Dy, Lu) experienced a small to moderate increase in precipitation over time (~95 → 99% for Dy, ~90 → 98% for Lu, and ~82 → 96% for Y). For these REEs, the seeding had a small positive effect on decreasing the time at which the precipitation plateau was achieved, but it did not affect the final precipitation amount.

These results suggest that by employing seeding, the required residence time for complete REE can be slightly decreased. In practice, the seeding could be achieved by conducting precipitation in a hold-up tank in which REE-carbonate crystals are suspended, and directly injecting the pH 5.8 REE liquor and NH_4HCO_3 solutions into the tank – in this configuration, the crystals already present in the tank could seed the further precipitation, without the need to employ recirculating pumps – since the positive effect of seeding is quite minor. This is just a suggestion and design engineers can decide on the configuration that best suits the process requirements.

These seeding tests show that employing seeding can have a small impact on reducing the time required to achieve full precipitation for some REEs (Y, Dy, Lu), while it has no impact on other REEs (Pr, Nd, Tb), which precipitated immediately in all cases. Considering the small effect and large operating costs, it may not be required to employ seeding in this process.

13.3.1.23 Direct impurity precipitation in the D1 tank before filtration

To address the possibility of reducing the process complexity by reducing the required number of filtration steps, the possibility of carrying out the impurity precipitation step directly within the D1 slurry, prior to filtration, was tested.

As shown in the table, the REE concentrations decreased by approximately half when the pH was raised in the presence of D1 clay.

Table 13-13 concentrations of REEs in the D1 slurry (20 kg pilot plant clay) at the desorption pH (4) and the impurity precipitation pH (5.8).

Table 13-13: Direct Impurity Precipitation in the D1 Tank before Filtration

Item	Pr	Nd	Tb	Dy	Lu	Th	U
pH 4.00 Concentration (mg/L)	4	22	2	15	2	0.001	0.001
pH 5.83 Concentration (mg/L)	2	11	1	7	1	0.000	0.000
% Loss	50	51	54	55	65	100	90

Direct precipitation of impurities in the desorption tank by increasing pH will result in REE loss. Because at increased pH, REEs will re-adsorb to the surface of the clay and the extraction reaction is reversed. Thus, this process is not a viable choice and impurity separation must be performed in a separate tank after the clay is filtered.

13.3.1.24 Validation of predicted plant performance

The overall mass balance was not considering a total rare earths analysis, and either it was not performed mass balance using a software like Metsim or Syscad, as the Project currently uses. This implies that the process was not properly estimated due was not considered in the ion exchange mechanism the effect of ions other than rare earths that are product of close loop circuit. In the ion-exchange mechanism, where the REE3+ ions adsorbed on binding sites with permanent negative charges on the clay surface. These binding sites are produced by charge imbalances due to isomorphous substitutions of aluminum Al3+ and silicon Si4+ sites in the crystal structure of the clay aluminosilicates ($Al_2Si_2O_5(OH)_4$). The chemical equilibria are mainly dependent on ion concentration. So, when we increase the concentration of monovalent or divalent salts (ammonium [NH4+], sodium [Na+], potassium [K+], Magnesium [Mg+2]), all those ions are leached from the clay in parallel with REE extraction. The atomic radio and the ionic strength are different this would benefit the leaching for free because these elements are leached from the clays like impurities.

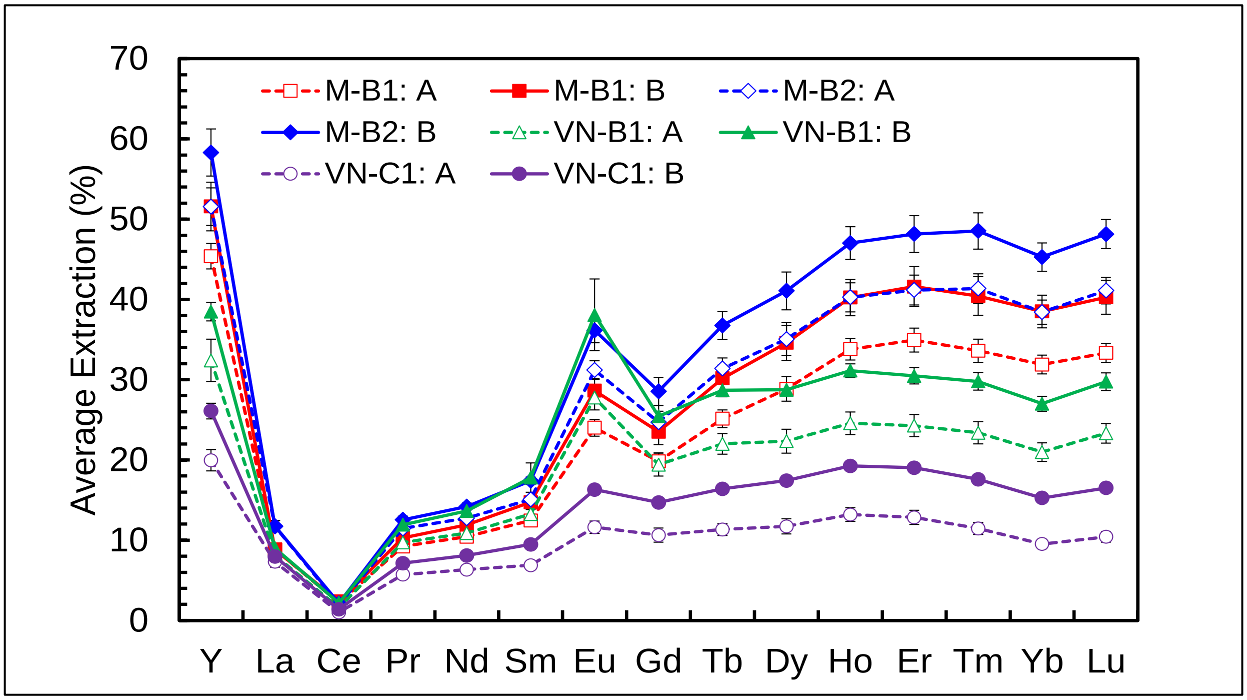
Given the above hypothesis, a few tests were performed to determine the difference presented by the baseline desorption method to the predicted process conditions of the plant. The main differences within the process currently under development and the previous readings are presented in the Table 13-14.

Table 13-14: Process Parameters

Description	Unit	Baseline method (Condition A)	Current Process (Condition B)	Comments
Liquid/solid ratio				
Internal	-	3/1	3/1	
External	-	6/1	2,7/1	
Leaching Solution				
Ammonium sulfate	gpl	20	20	
Sodium sulfate	gpl	0	20	
Potassium sulfate	gpl	0	3	
Magnesium sulfate	gpl	0	1	
Operation				
Scheme		Parallel	Parallel	
Agitation		High	Low	Leaching occurs in CCD circuit
Residence time	min	20	120	approx. thickening diameter
pH		4	3	

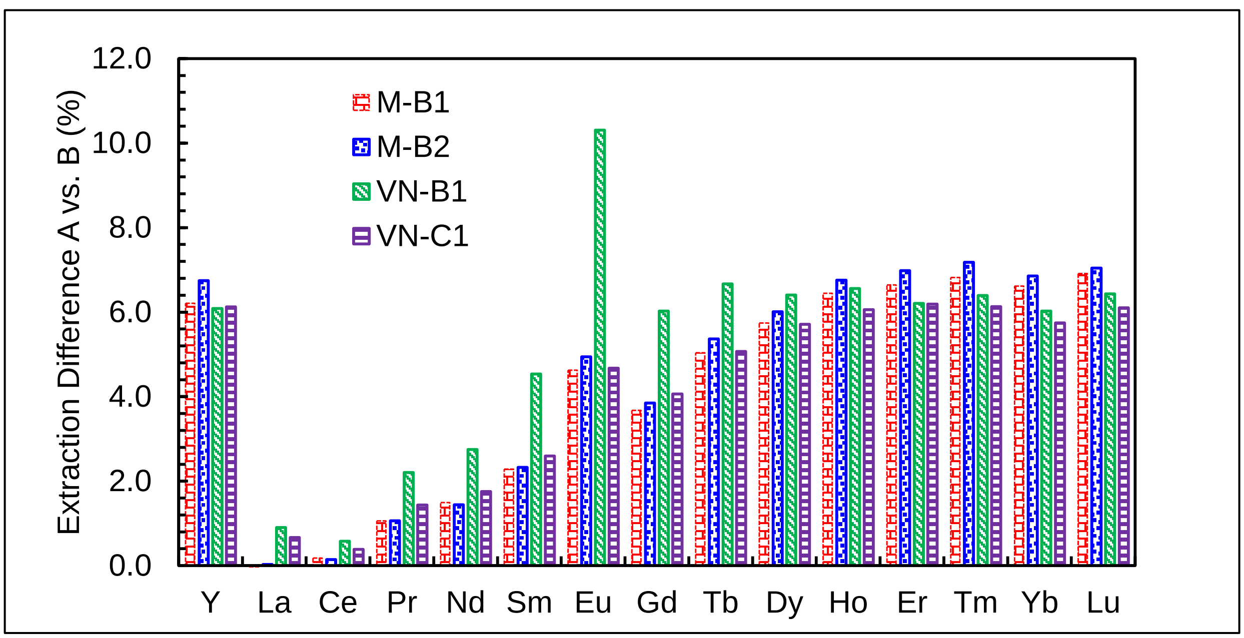
The average results are also shown graphically in Figure 13-21, and the differences between condition A and condition B are shown in Figure 13-22. In all cases, condition B results outperformed condition A results, considerably, likely due to the lower desorption pH (B: 3.0, A: 4.0). The presence of Na_2SO4, K_2SO_4, and $MgSO_4$ in condition B appear to have a positive impact on the process, as was previously predicted.

Figure 13-21: Average D1 % extractions at condition A and condition B



Note: prepared by UT, 2021

Figure 13-22: Differences in D1 % extractions for each of the GMUs between condition A and condition B



Note: prepared by UT, 2021

It is important to note that the University of Toronto continues to carry out tests at the submission of this report with the purpose of attaching background information that supports the design.

13.3.2 Test Bench Scale "Chapi"

13.3.2.1 Introduction

From October 2020 to December 2020 batch pilot tests were conducted in Lima, Peru. The companies responsible for the tests are Dewatering Solutions and the Chapi Metallurgical Laboratory (test performer) and the SGS Peru Laboratory (chemical analysis).

For the development of the pilot tests, 19 representative samples of the 5 Project zones were chosen and selected from only the geology, therefore, the samples were called as the "19 UG's" (UG is the Spanish acronym for Geological Unit). Some of these samples fueled tests conducted at the University of Toronto.

Extraction Zone: Alexandra, Victoria Norte, Victoria Sur, Maite y Luna,

Nomenclatures by Extraction Zone:

Alexandra

UG_GG_C1 = Geological Unit Garnet Granite Horizon C1 (Alexandra GG_C1)

UG_GG_B1 = Geological Unit Garnet Granite Horizon B1 (Alexandra GG_B1)

UG_DRT-B1-B2 = Diorite Geological Unit of Horizon B1-B2 (Alexandra DRT_B1_B2)

UG_GG_B2 = Horizonte B2 Garnet Granite Geological Unit (Alexandra GG_B2)

Victoria Norte

UG_GG_B1 = Geological Unit Garnet Granite Horizon B1 (Victoria Norte B1)

UG_GG_B2 = Geological Unit Garnet Granite Horizon B2 (Victoria Norte B2)

UG_GG_C1 = Geological Unit Garnet Granite Horizon C1 (Victoria Norte C1)

Victoria Sur

UG_GG_C1 = Horizon C1 Garnet Granite Geological Unit (Victoria Sur GG_C1)

UG_MP_B1_B2 = Horizonte Metapelite Geological Unit B1_B2 (Victoria Sur MP_B1_B2)

UG_DRT_B1 Horizonte B1 Diorite Geological Unit (Victoria Sur DRT_B1)

UG_GG_B1_B2 = Horizon Garnet Granite Geological Unit B1_B2 (Victoria Sur GG_B1_B2)

Maite

UG_GG_B1 = Geological Unit Garnet Granite Horizon B1 (Maite B1)

UG_GG_B2 = Geological Unit Garnet Granite Horizon B2 (Maite B2)

UG_GG_C = Geological Unit Garnet Granite Horizon C (Maite C)

Luna

UG_GG_C1 = Geological Unit Garnet Granite Horizon C1 (Luna C1)

UG_GG_B1 = Geological Unit Garnet Granite Horizon B1 (Luna B1)

UG_MP-B1-C1 = Metapelite Geological Unit of Horizon B1C1 (Luna MP B1C1)

UG_DRT-B1-C1 = Diorite Geological Unit of Horizon B1C1 (Luna DRT B1C1)

UG_DRTG-B1-C1 = Geological Unit Diorite / Horizon Garnet B1C1 (Luna DRTG B1C1)

13.3.2.2 Homogenization

The wet samples from the different extraction areas are received in a pilot plant and are placed in a mechanical preparation area to proceed with the homogenization and quartering of each one of them.

The quartering of all the samples was completed and 20 kg (wet weight) bags were generated, sealed and stored in the laboratory ready for processing.

During the manipulation of the sample, the presence of coarse particles in a range of 3/4 "and 1/2" could be observed, these particles cannot enter the extraction reactors and are therefore removed from the homogenization process.

Figure 13-23 shows the details of the mechanical preparation for obtaining representative samples of 20 kg.

Figure 13-23: Mechanical Preparation 19 UG's

Note: prepared by Aclara, 2020

13.3.2.3 Physical Characterization

The samples after the mechanical preparation were performed a physical characterization, where it was measured: humidity, specific gravity and granulometry.

Consider that the results shown are the average of data per extraction zone.

13.3.2.4 Determination of Granulometry and Density

A representative sample of 500 grams is taken from each of the UG samples and the de-agglomerating is carried out on the 400M fine mesh, and the retained fraction was dried, weighed and sieved on a series of TYLER series sieves, with which the granulometry of the samples is determined.

Density is determined using a pycnometer.

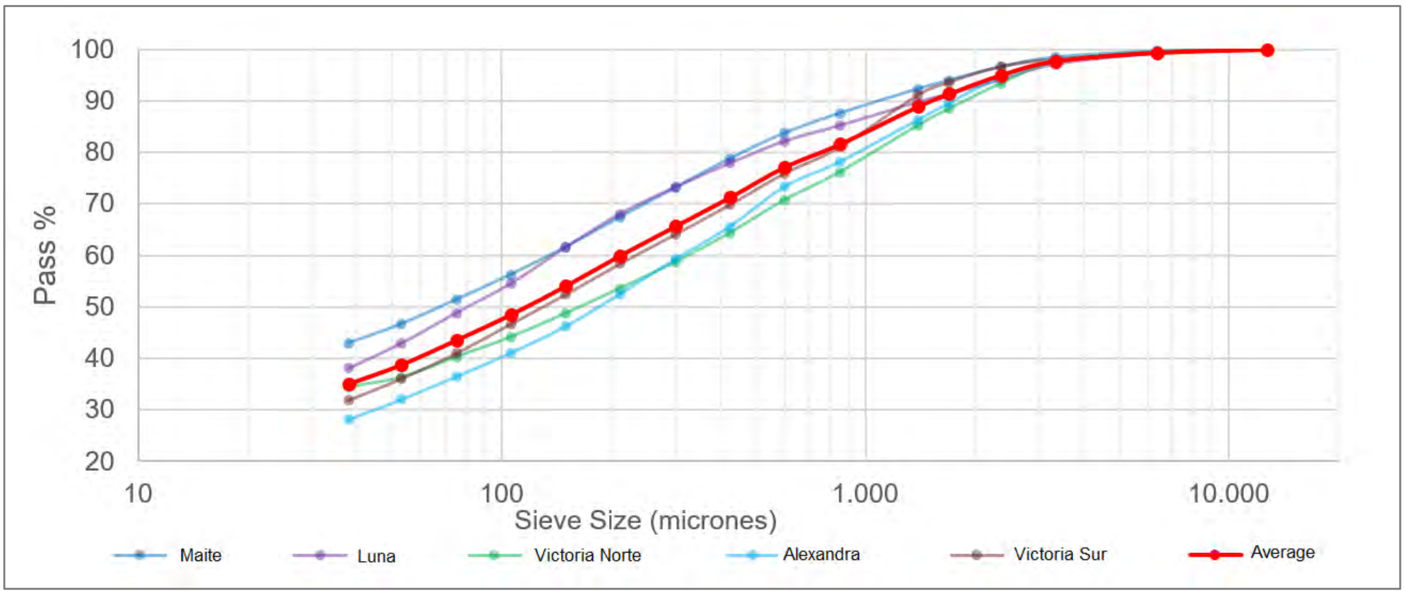
In Table 13-15 average humidity and average specific gravity per extraction area are displayed

Table 13-15: Humidity and Specific Gravity by Extraction Area

Zone	Moisture (%) *	Density
Maite	12.8%	2.70
Luna	9.8%	2.74
Victoria Norte	7.1%	2.66
Victoria Sur	13.4%	2.71
Alexandra	12.7%	2.74

Figure 13-24 shows the results of the average granulometric analyses by extraction area.

Figure 13-24: Average Granulometry by Extraction Zone



Note: prepared by Aclara, 2020

13.3.2.5 Main Equipment Used for Pilot Testing

Equipment used were: Automatic ore feeder, recirculation pump, desorption reactor, reactor to precipitate secondary minerals and reactor to precipitate carbonates. Figure 13-25 shows each piece of equipment used.

Figure 13-25: Reaction Tanks

Note: prepared by BioLantánidos, 2020

13.3.2.6 Description of Stages and Parameters for Piloting

Table 13-16 shows a summary of the parameters used in each unit stage that make up the batch pilot test.

Table 13-16: Parameters of Extraction Pilot Test

Stage	Parameters	Unit	Range
Leaching Step D1	Wet Mineral Mass	kg	19 - 20
	Sample Moisture	%	15 - 17
	Dry mineral Mass	kg	17 - 19
	Amount of water required for ammonium sulfate solution	L	46 - 58
	Ammonium sulfate consumption	kg	0.9 - 1.1
	pH	-	4.0 - 3.0 - 2.0
	Reaction time	minutes	20
	Flocculant concentration	g/L	0.5
	Flocculant volume	L	2 - 3
Leaching Step D2	Ore moisture	%	30
	Dry mineral Mass	kg	17 - 19
	Amount of water required for ammonium sulfate solution	L	43 - 48
	Ammonium sulfate required	kg	0.9 - 1.1
	pH	-	4.0 - 3.0 - 2.0
	Residence Time	minutes	20
	Flocculant Concentration	g/L	0,5
	Flocculant Volume	L	2 - 3
Washing	Washing Ratio	m^3/kg (dry mineral)	0.9
	Washing Water	L	15 - 17
Impurities precipitation	Solution Volume	L	46 - 49
	Ammonium bicarbonate concentration	g/L	50
	Volume Ammonium Bicarbonate	L	0.5 – 0.7
	pH	-	5.2 - 5.8
	Reaction time	minutes	20
Carbonate precipitation	Solution Volume	L	43 - 48
	Ammonium bicarbonate concentration	g/L	50
	Volume Ammonium Bicarbonate	L	0.2 - 1.2
	pH	-	7.0 - 7.5
	Reaction time	minutes	180
Drying/Calcination	Drying Temperature	°C	200 - 250
	Drying Time	minutes	120
	Calcination Temperature	° C	900 - 950
	Calcination Time	minutes	240

13.3.2.7 Results

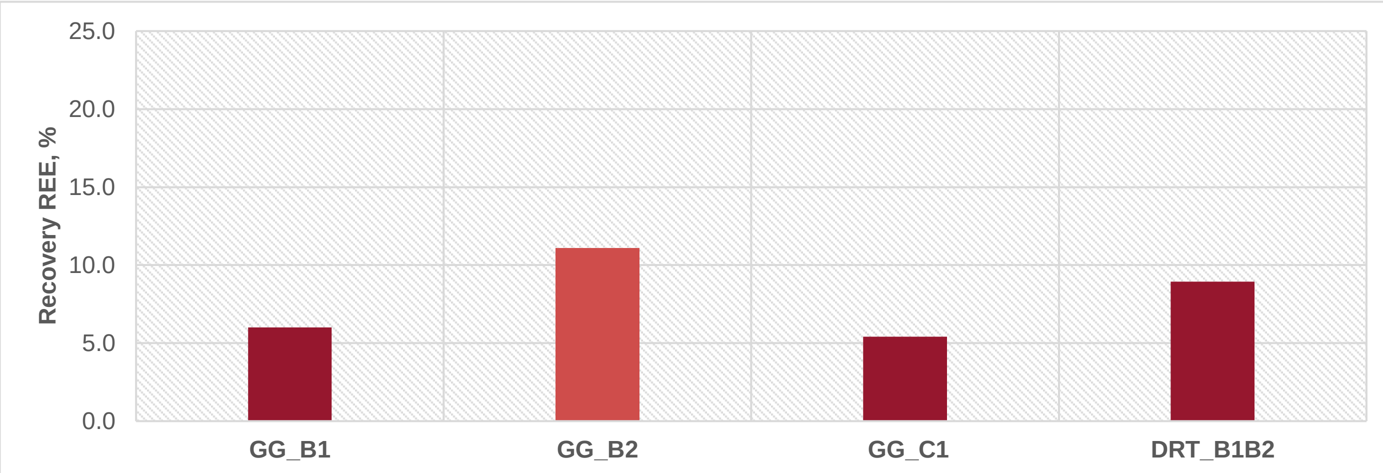
Table 13-17 shows the summary of the results obtained for the Alexandra extraction zone.

Table 13-17: Result Summary (Alexandra)

Description	Sample	Alexandra			
		GG-C1	GG-B1	DRT-B1-B2	GG-B2
p80	µm	1,182	1,176	471	1,116
Rate Filtration	$kg/m^2/h$	225-340			
Moisture	%	30			
Grade	ppm	4,510	3,249	2,155	4,394
Extraction	%	5	4	5	7
Grade of oxide	%	92.8	93.5	92.9	93.6
Consumption H_2SO_4 D1	kg/t dry	0.94	0.94	0.54	0.75
Consumption H_2SO_4 D2	kg/t dry	0.74	0.7	0.64	0.75
Consumption Ammonium bicarbonate impurities	kg/t dry	1.73	1.71	1.8	1.71
Consumption Ammonium bicarbonate $REECO_3$	kg/t dry	2.01	1.37	1.2	2.02
pH Extraction (D1-D2)		4	4	4	4
pH of impurities		5.4 – 5.8	5.4 – 5.8	5.4 – 5.8	5.4 – 5.8
Impurities	kg dry/t dry	0.005	0.053	0.0975	0.195
pH of Carbonation		7.29 – 7.49	7.33 – 7.43	7.39 – 7.50	7.32 – 7.44
impurities – Moisture	%	78.9	69.9	79.9	70.1
Clay washed – Moisture	%	29.41	29.13	31.76	31.41
Density	g/cc	2.75	2.75	2.72	2.73
Flocculant	g/t	80			
Leaching Time	min	20			
Weight Loss on Calcination 950 ° C	%	89	91	93	86

Figure 13-26shows the average recovery for each UG corresponding to the Alexandra Extraction Zone.

Figure 13-26: Recovery by UG for Alexandra Extraction Zone



Note: prepared by Aclara, 2021

Table 13-18 shows the summary of the results obtained for the Victoria Norte extraction zone.

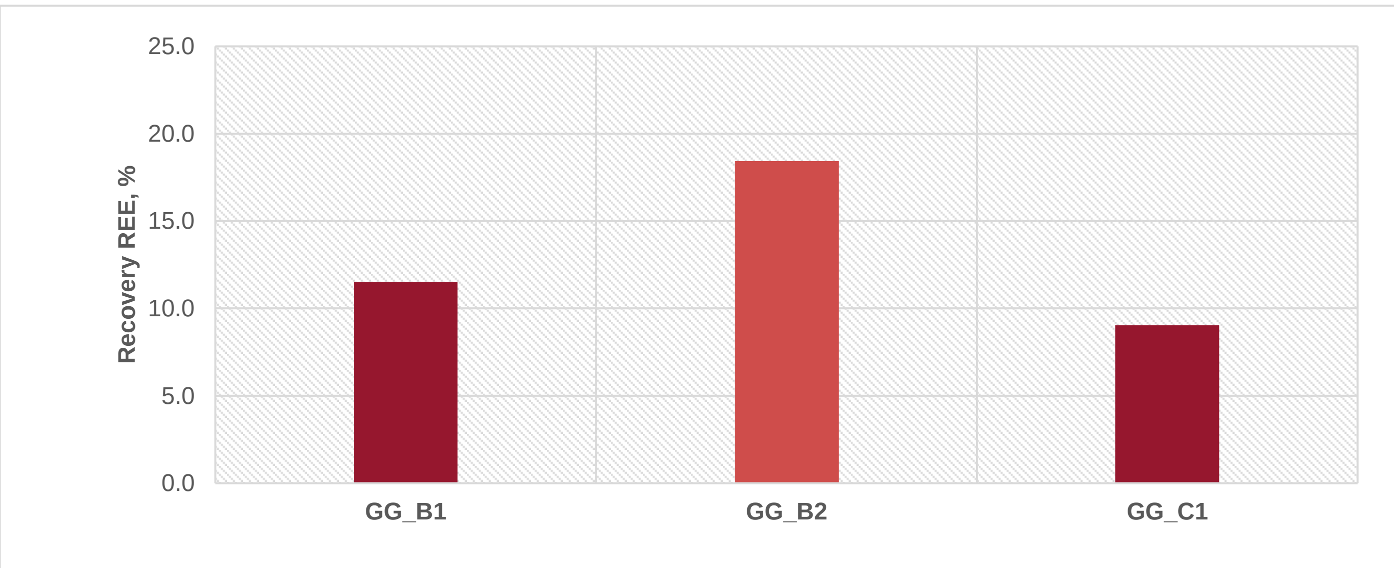
Table 13-18: Result Summary (Victoria Norte)

Description	Sample	Victoria Norte		
		GG-B1	GG-B2	GG-C1
p80	µm	1,123	1,258	850
Rate Filtration	kg/m²/h	300 – 400		
Moisture	%	30 – 32		
Grade	ppm	2,404	3,132	2,323
Extraction	%	9	16	8
Grade of oxide	%	94.9	94.3	92.7
Consumption H_2SO_4 D1	kg/t dry	1.08	1.24	1.22
Consumption H_2SO_4 D2	kg/t dry	0.84	0.75	0.87
Consumption Ammonium bicarbonate impurities	kg/t dry	1.64	1.62	1.68
Consumption Ammonium bicarbonate REECO3	kg/t dry	1.91	3.23	1.68
pH Extraction (D1-D2)		4	4	4
pH of impurities		5.6 – 5.8	5.6 – 5.8	5.4 – 5.8
Impurities	kg dry/t dry	0.1	0.115	0.112
pH of Carbonation		7.18 – 7.44	7.49 – 7.52	7.34 – 7.43
impurities – Moisture	%	83.2	85.3	84.8

Description	Sample	Victoria Norte		
		GG-B1	GG-B2	GG-C1
Clay washed – Moisture	%	30	28.8	27
Density	g/cc	2.63	2.55	2.79
Flocculant	g/t	80		
Leaching Time	min	20		
Weight Loss on Calcination 950 ° C	%	88	87	90

Figure 13-27 shows the average recovery for each UG corresponding to the Victoria Note Extraction Zone.

Figure 13-27: Recovery by UG for Victoria Note Extraction Zone



Note: prepared by Aclara, 2021

Table 13-19 shows the summary of the results obtained for the Victoria Sur extraction zone.

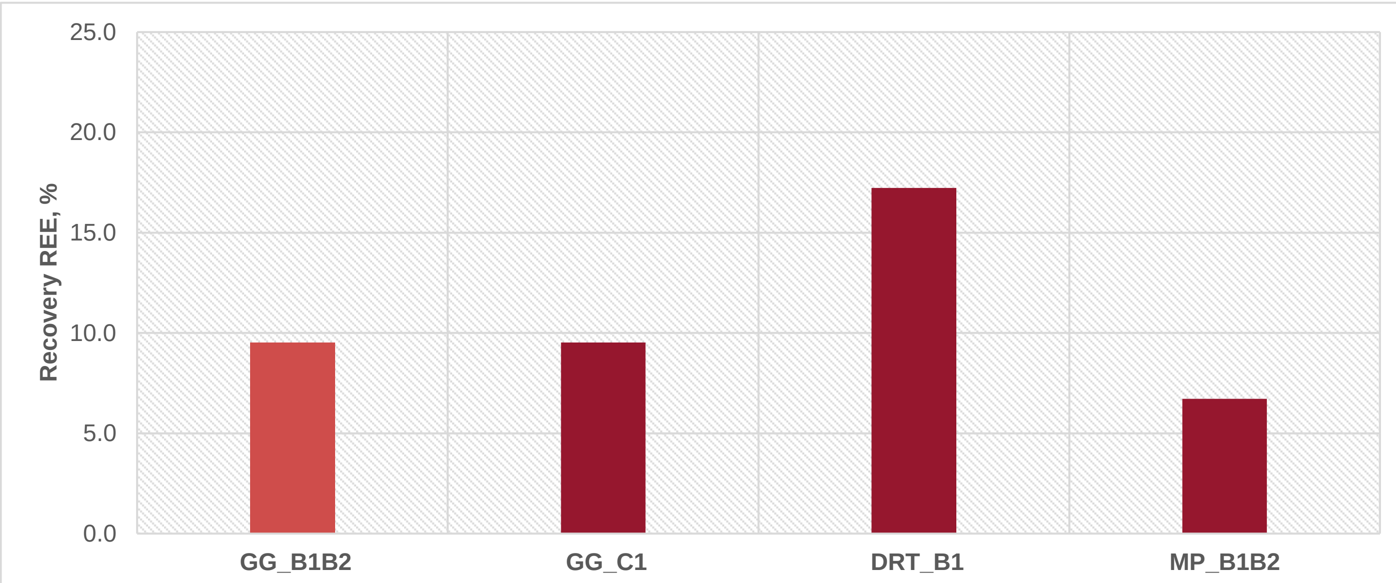
Table 13-19: Result Summary (Victoria Sur)

Description	Sample	Victoria Sur			
		GG-C1	MP-B1-B2	DRT-B1	GG-B1-B2
p80	µm	1,072	375	968	486
Rate Filtration	kg/m²/h	300 - 450			
Moisture	%	30			
Grade	ppm	2,968	1,758	1,603	3,593

Description	Sample	Victoria Sur			
		GG-C1	MP-B1-B2	DRT-B1	GG-B1-B2
Extraction	%	7	5	13	6
Grade of oxide	%	93.3	93.6	92.1	93.5
Consumption H_2SO_4 D1	kg/t dry	0.71	0.86	0.39	0.67
Consumption H_2SO_4 D2	kg/t dry	0.72	0.76	0.67	0.80
Consumption Ammonium bicarbonate impurities	kg/t dry	1.71	1.71	1.81	1.76
Consumption Ammonium bicarbonate $REECO_3$	kg/t dry	1.45	1.00	0.63	1.14
pH Extraction (D1-D2)		4	4	4	
pH of impurities		5.4 – 5.8	5.4 – 5.8	5.4 – 5.8	5.4 – 5.8
Impurities	kg dry/t dry	0.1883	0.036	0.4316	0.1183
pH of Carbonation		7.25 – 7.44	7.34 – 7.50	7.32 – 7.45	7.28 – 7.45
impurities – Moisture	%	66.8	65.6	71.23	72.1
Clay washed - Moisture	%	30.84	28.26	30.28	30.54
Density	g/cc	2.72	2.71	2.71	2.7
Flocculant	g/t	80			
Leaching Time	min	20			
Weight Loss on Calcination 950 ° C	%	87	93	91	88

Figure 13-28 shows the average recovery for each UG corresponding to the Victoria Sur Extraction Zone

Figure 13-28: Recovery by UG for Victoria Sur Extraction Zone



Note: prepared by Aclara, 2021

Table 13-20 shows the summary of the results obtained for the Maite extraction zone.

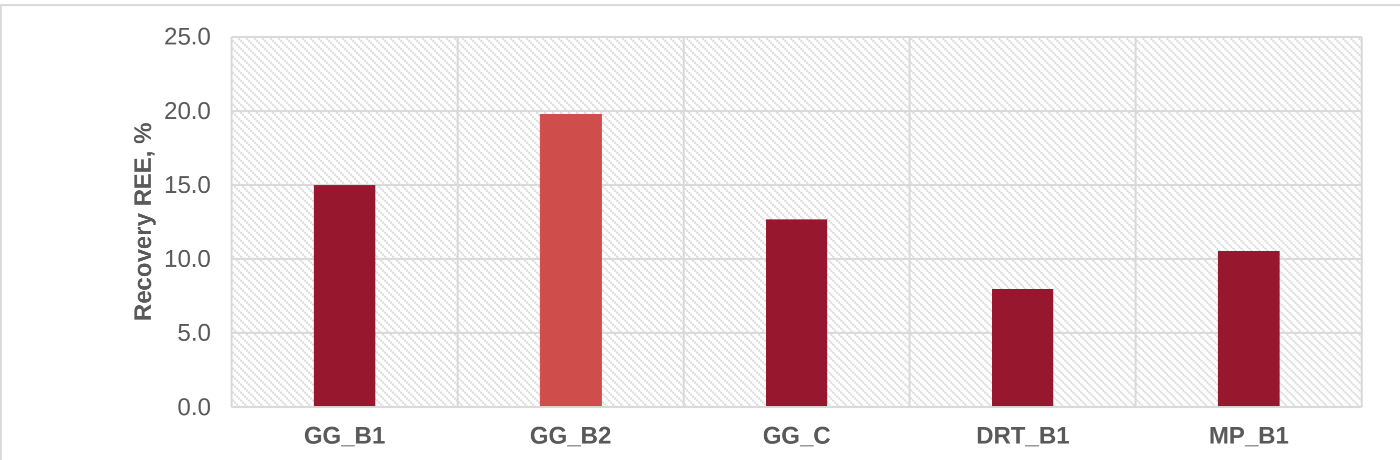
Table 13-20: Result Summary (Maite)

Description	Sample	Maite		
		Maite B1	Maite B2	Maite C
p80	µm	595	743	685
Rate Filtration	$kg/m^2/h$	500 - 600		
Moisture	%	27-32		
Grade	Ppm	2,274	2,848	2,617
Extraction	%	11.8	15.4	10.6
Grade of oxide	%	93.7	93.2	93.4
Consumption H_2SO_4 D1	kg/t dry	0.89	0.76	0.86
Consumption H_2SO_4 D2	kg/t dry	0.75	0.71	0.74
Consumption Ammonium bicarbonate impurities	kg/t dry	1.48	1.51	1.42
Consumption Ammonium bicarbonate $REECO_3$	kg/t dry	2.08	3.63	1.99
pH Extraction (D1-D2)		4	4	4
pH of impurities		5.4 – 5.6	5.4 – 5.6	5.6 – 5.8
Impurities	kg dry/t dry	0.33	0.15	0.03
pH of Carbonation		7.53 – 7.57	7.48 – 7.58	7.26 – 7.39
impurities – Moisture	%	86.5	88.9	90.6
Clay washed - Moisture	%	28.2 - 30.4	29.4 – 30.9	27.7 – 31.6
Density	g/cc	2.74	2.74	2.75

Description	Sample	Maite		
		Maite B1	Maite B2	Maite C
Flocculant	g/t	40		
Leaching Time	Min	20		
Weight Loss on Calcination 950 ° C	%	87	93	91

Figure 13-29 shows the average recovery for each UG corresponding to the Maite Extraction Zone.

Figure 13-29: Recovery by UG for Maite Extraction Zone



Source: Aclara, 2020

Table 13-21 shows the summary of the results obtained for the Luna extraction zone.

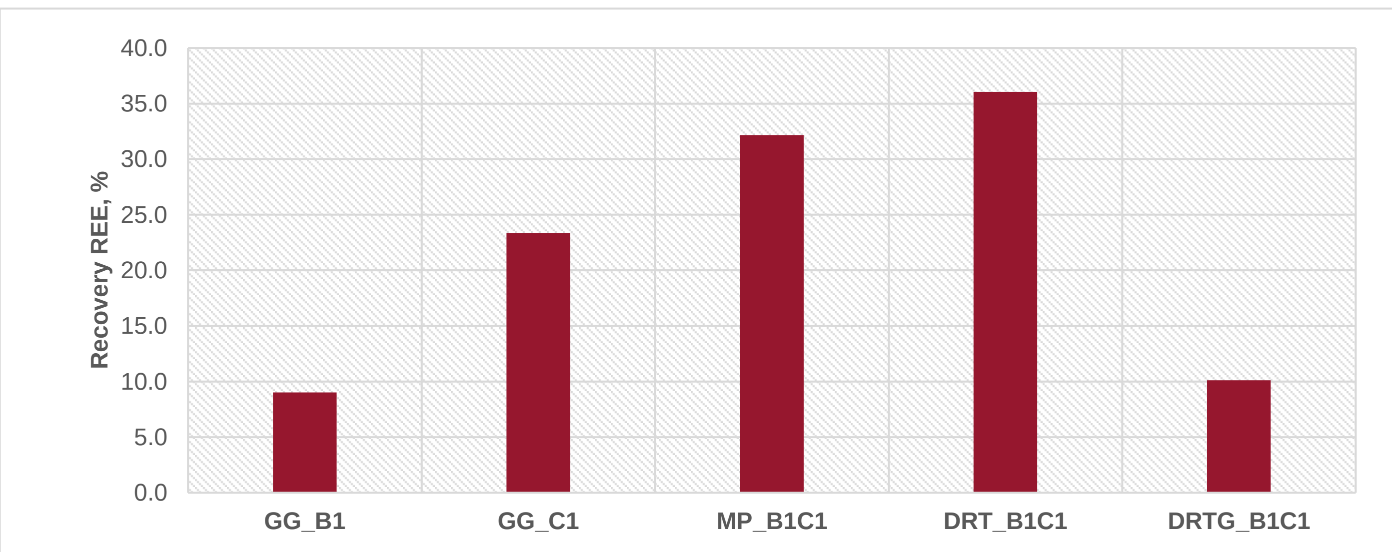
Table 13-21: Result Summary (Luna)

Description	Sample	Luna				
		Luna C1	Luna B1	MP-B1C1	DRT B1C1	DRTG B1C1
p80	µm	822	881	518	192	492
Rate Filtration	kg/m²/h	400 – 500				
Moisture	%	32-35				
Grade	Ppm	2,266	2,295	1,438	1,173	1,047
Extraction	%	18	7	28	26	10
Grade of oxide	%	93.8	92.8	94.5	94	92.0
Consumption H_2SO_4 D1	kg/t dry	1.14	1.75	0.90	0.61	0.56
Consumption H_2SO_4 D2	kg/t dry	0.88	1.06	0.69	0.73	0.67
Consumption Ammonium bicarbonate impurities	kg/t dry	1.72	1.66	1.78	1.73	1.75

Description	Sample	Luna				
		Luna C1	Luna B1	MP-B1C1	DRT B1C1	DRTG B1C1
Consumption Ammonium bicarbonate $REECO_3$	kg/t dry	1.95	1.8	2.08	2.02	2.05
pH Extraction (D1-D2)		4.0	4.0	4.0	4.0	4.0
pH of impurities		5.4 – 5.8	5.4 – 5.8	5.4 – 5.8	5.4 – 5.8	5.4 – 5.8
Impurities	kg dry/t dry	0.224	0.042	0.144	0.456	0.606
pH of Carbonation		7.32 – 7.41	7.42 – 7.52	7.34 – 7.46	7.36 – 7.50	7.31 – 7.49
impurities - Moisture	%	85.4	78.8	82.2	79.85	84.3
Clay washed - Moisture	%	31.9	31.0	27.96	36.77	34.16
density	g/cc	2.72	2.88	2.72	2.68	2.70
Flocculant	g/t	80				
Leaching Time	Min	20				
Weight Loss on Calcination 950 ° C	%	84	90	88	89	90

Figure 13-30 shows the average recovery for each UG corresponding to the Luna Extraction Zone.

Figure 13-30: Recovery by UG for Luna Extraction Zone



Note: prepared by Aclara, 2020

13.3.2.8 Other Tests

10 samples were chosen for pilot tests at pH 3.0 for the leaching stage. Conducting these tests had as the main objective to check if there had been an increase in the recovery of REE at a more acidic leaching pH. Table 13-22 lists the samples selected for testing.

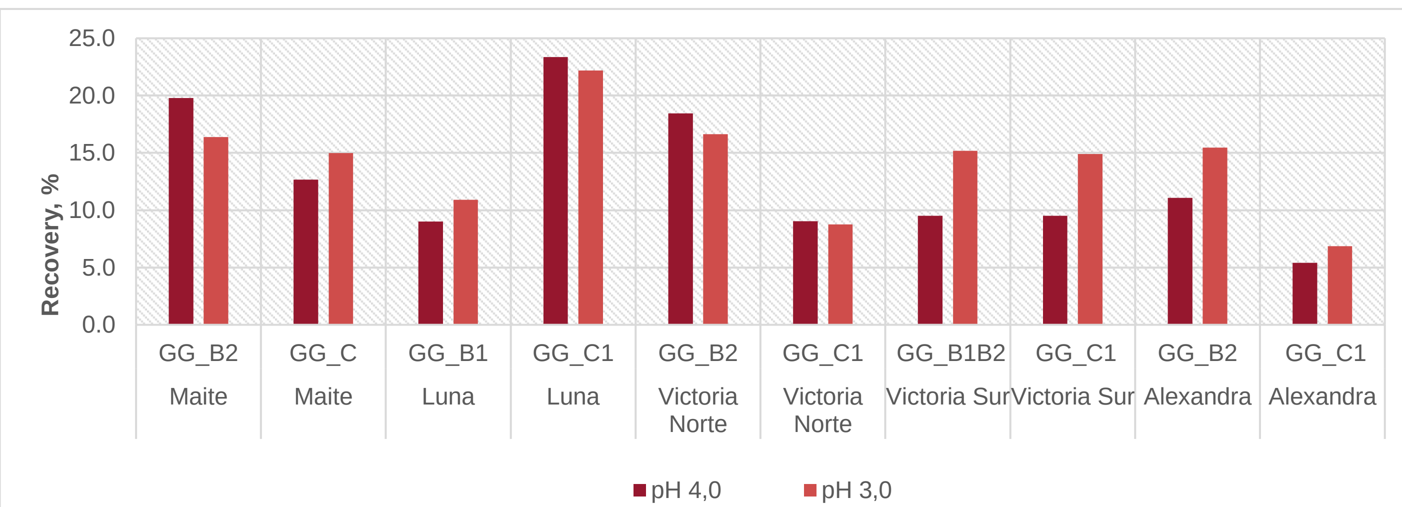
Table 13-22: Samples Selected for Piloting at pH 3.0 and 2.0 Leaching

Zone	Nomenclature
Maite	Maite GG_B2
	Maite GG_C
Luna	Luna GG_B1
	Luna GG_C1
Victoria Norte	Victoria Norte GG_B2
	Victoria Norte GG_C1
Victoria Sur	Victoria Sur GG_B1B2
	Victoria Sur GG_C1
Alexandra	Alexandra GG_B2
	Alexandra GG_C1

It is important to note that the only relevant parameter that is changed is the leaching pH, all other parameters remain unchanged.

Figure 13-31 shows a comparison between recoveries obtained at pH 3.0 and pH 4.0 at the leaching stage.

Figure 13-31: Comparison for 10 UG at pH 4.0 and 3.0 in the Leaching Stage



Note: prepared by Aclara, 2021

13.3.2.9 Conclusions

- The recoveries obtained in the laboratory are replicated with those obtained at the pilot level.

- Preliminary laboratory tests allowed to define the operating parameters of the pilot tests, which required minimum adjustments.

- The most important control variable during extraction, secondary mineral precipitation and carbonate precipitation is the pH. This variable must be carefully monitored and controlled.

- In the secondary mineral precipitation, it is fundamental to control the pH and have a good filter to avoid contaminating the purified rare earth solution and consequently contaminating the final product. It was determined that pH 5.4 to 5.8 is adequate for secondary mineral precipitation.

- It was also determined that an adequate dosage of ammonium bicarbonate related to the ratio by weight with the amount of REO must be maintained, and that the reaction pH must be maintained between 7.0 and 7.5.

- The extraction depends on the Zone and is very variable (5% to 28%)

- The purity reached in the oxides was between 70% and 91%

- It is very important to analyze and understand the effect of recirculating liquor in the extraction process.

- The granulometric analyses indicate a P_{80} varies and depends on the area and the geological unit. A minimum P80 of 192 µm is determined for Luna DRT B1C1, and the maximum P80 of 1,258 µm is determined for Victoria Norte zone GGB2.

- The filtering capacity depends on the extraction area and varies between 225 - 600 kg / m2 / h and with average humidity from ranges from 25% to 35%. The filter definition must be revised by vendor as pilot testing continues with the appropriate filter.

- The total rare earth grade depends on the extraction zone. In Alexandra, the average total rare earth is 3,077 ppm while Luna is only 1,834 ppm. On the other hand, the extraction is higher in Luna (22% on average) and lower in Alexandra (8% on average).

- It is recommended to continue optimizing the Impurity Precipitation stage, since this stage is essential to obtain a product that is within the required specification. The main improvements should focus on the precipitation stage itself and on the subsequent solid / liquid separation stage and avoid carry-over of impurities towards the final concentrate.

- When comparing the recoveries between pH 4.0 and 3.0, it is observed that for some samples there is a greater recovery when working at a more acidic leaching pH, while in other samples a decrease in recovery is seen, which is related to the extraction mechanisms.

- The pH is a relevant parameter that will be further studied in conjunction with the recirculation of solutions and complemented with DRX analysis for the clay-centered head samples.

13.3.3 Ansto Radioactivity Test

During the end of 2020 and the first semester of 2021, Aclara carried out radioactivity measurements on REE Mixed Carbonates produced by preliminary batch pilot testing. The REE Mixed Carbonates were produced by Aclara from Desorption 1 liquors only from the Chapi tests, and the concentrations of radionuclides in the carbonates were determined by ANSTO (one of Australia's largest public research organizations and is widely recognized as an international player in the field of nuclear science and technology).

Initial results indicate that the REE Mixed Carbonates produced at the plant´s expected pH processing conditions (1) are classified as "Exempt," according to the International Atomic Agency, for Transport per SSR-6 (2), and for Bulk Handling per GSR Part 3 (3). The main results are shown in Table 13-23.

1) Carbonates are produced at a pH of 3.0. Other process conditions are in the process of optimization. Future testing may be required.

2) International Atomic Energy Agency, 2018. Regulations for the Safe Transport of Radioactive Material. IAEA Safety Standards Series, ISSN 1020-525X; no. SSR-6 (Rev. 1). Referred to as SSR-6. The SSR-6 takes precedence over all other IAEA documents in relation to transportation of radioactive material.

3) International Atomic Energy Agency, 2014. Radiation Protection and Safety of Radiation Sources: International Basic Safety Standard GSR Part 3. Referred to as GSR-3.

Table 13-23: Summary of Radioactivity Test Results

											Transport - SSR-6				Handling - GSR-3
		Activity Concentration (Bq/g)[a]									Activity Concentration (Bq/g)[b]			Classification	Classification[d] (Dry and Wet)
Sample Description		U-238	Ra-226	Pb-210	Ac-227	Th-232	Ra-228	Th-228	K-40	Sm-147	Dry	Wet[c]	Limit	(Dry and Wet)	Bulk Quantities[e]
Maite	GG B2	< 0.12	< 0.014	0.064	0.12	< 0.04	0.21	0.014	< 0.13	1.4	2.0	1.0	15	Exempt	Exempt
	GG C	< 0.12	< 0.012	< 0.063	0.15	< 0.04	0.14	0.026	< 0.092	1.5	2.1	1.1	12	Exempt	Exempt
	DRT	0.18	0.028	0.28	0.12	0.09	0.18	0.11	< 0.12	1.5	2.9	1.5	19	Exempt	Exempt
Victoria Norte	GG B2	0.14	< 0.011	0.36	0.10	< 0.04	0.26	0.036	< 0.11	1.7	2.9	1.5	23	Exempt	Exempt
	GG C1	< 0.12	< 0.011	< 0.097	0.15	< 0.04	0.25	0.038	< 0.12	1.6	2.3	1.2	13	Exempt	Exempt
	MP	0.26	< 0.043	0.78	0.39	0.07	< 0.079	0.11	< 0.30	1.8	4.5	2.2	10	Exempt	Exempt
Victoria Sur	GG B1B2	< 0.12	< 0.011	0.24	0.13	< 0.04	0.18	0.031	< 0.12	1.5	2.3	1.2	15	Exempt	Exempt
	GG C1	< 0.12	< 0.012	0.20	0.11	< 0.04	0.22	0.037	< 0.13	1.6	2.4	1.2	18	Exempt	Exempt
	DRT	< 0.12	< 0.009	0.10	0.087	< 0.04	0.13	0.023	< 0.077	1.7	2.2	1.1	20	Exempt	Exempt
	MP	0.25	< 0.017	0.69	0.33	< 0.04	0.11	0.036	< 0.12	1.8	4.1	2.1	11	Exempt	Exempt
Luna	GG B1	< 0.12	< 0.010	0.11	0.13	< 0.04	0.16	0.019	< 0.10	1.5	2.2	1.1	14	Exempt	Exempt
	UG GG C1	< 0.12	0.008	< 0.062	0.033	< 0.04	0.066	0.007	< 0.044	0.89	1.1	0.5	24	Exempt	Exempt
	DRT	< 0.12	< 0.017	0.12	< 0.031	< 0.04	< 0.034	0.034	< 0.13	1.7	1.9	0.9	86	Exempt	Exempt
	MP	0.17	0.045	0.26	0.16	< 0.04	0.14	0.025	< 0.13	0.94	2.2	1.1	12	Exempt	Exempt
Alexandra	GG B2	< 0.12	< 0.013	0.17	0.048	< 0.04	0.11	0.021	< 0.10	1.3	1.8	0.9	26	Exempt	Exempt
	GG C1	< 0.12	< 0.013	< 0.13	0.057	< 0.04	0.09	0.036	< 0.17	0.91	1.2	0.6	17	Exempt	Exempt
	DRT	< 0.12	< 0.010	0.10	< 0.020	< 0.04	0.10	0.028	0.12	1.0	1.3	0.7	90	Exempt	Exempt
	MP	0.17	< 0.051	< 0.23	< 0.084	0.17	< 0.11	0.19	< 0.50	1.1	1.8	0.9	51	Exempt	Exempt

13.3.3.1 Conclusions and Recommendations

The main findings of the work program are as follows and refer to REE carbonate products at the time of sample production:

- The REE carbonate products contained mixtures of naturally occurring radionuclides that were not in secular equilibrium, which is not unexpected for a product from a chemical process.
- For the REE carbonate products in this work program, the calculated activity concentrations for transport did not exceed the respective calculated activity concentration limit for transport for any dry or wet (50%) RE carbonate product. Therefore, the dry and wet REE carbonate products are not subject to the Regulations for transport.
- Bulk quantities of dry and wet (50%) REE carbonate product would be exempt from the requirements of the GSR-3 for handling and processing, since the dry and wet materials would contain less than 1 Bq/g of all radionuclides from the uranium or thorium decay chains and less than 10 Bq/g for K-40.
- For both transport and handling, the concentrations of radionuclides in the REE carbonate products could increase considerably before products were subject to regulations.
- Regarding handling and processing, international classification for bulk quantities of material depends on the concentrations of contained radionuclides, which will depend on the moisture content. Dilution due to moisture content is permissible by the international regulations if the moisture content in the solid is due to natural water retention in the undried filter cake.

13.3.4 Vendor Test

Aclara is developing a series of tests together with vendors in order to select equipment and technology early. The companies involved in these studies are: Andritz, Sepro, Metso-Outotec, Takraf-Delkor, Eral, Diemme, Kamengo.

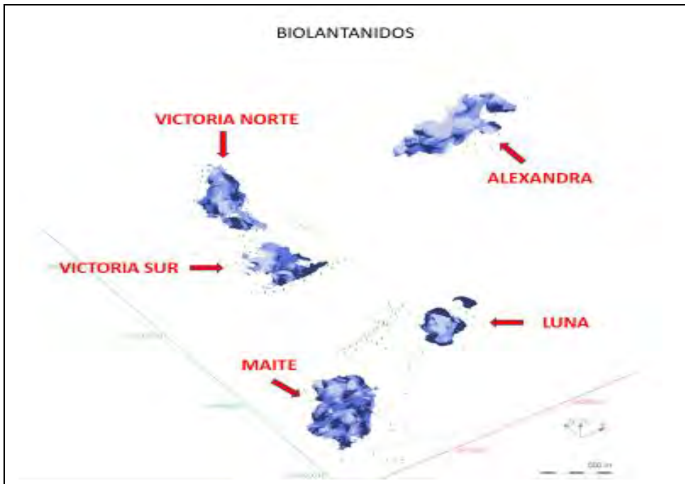
13.4 Recovery Modelling

13.4.1 Drill Hole Samples

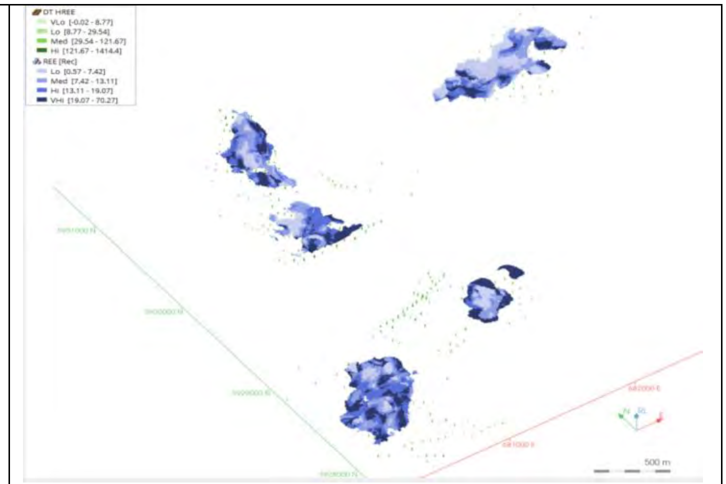
The Lithology (GG, DRT and MP) and the regolith limits (A to D) models were generated according to the previously described geology and mining chapter. These were later combined to obtain the UG (geological units) model.

The same drill holes' samples were tested with the leachable test for supporting the recovery estimate. This data was collected between 2020 and 2021 as is described in geology and mining sections. In this period of time the same number of samples was analyzed by total REE and leachable REE . That is why the recovery based on that way to work is 100% representative of the deposit. Figure 13-32 and Figure 13-33 show how the recovery has been presented as a mining model.

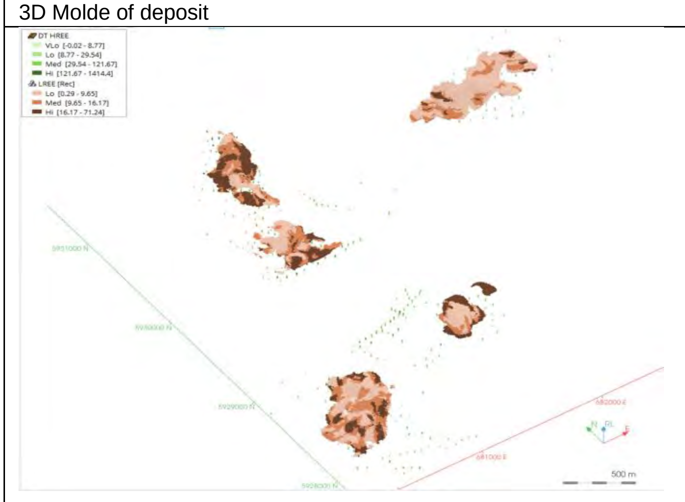
Figure 13-32: Cancha Software Simulation[4]



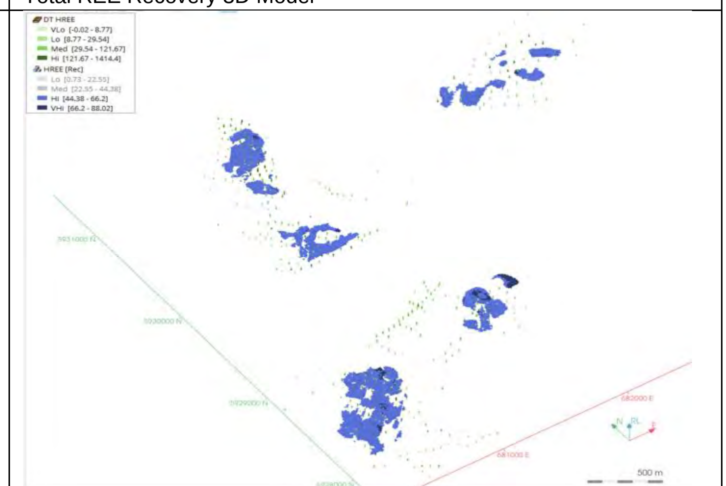
3D Molde of deposit



Total REE Recovery 3D Model



Light REE Recovery 3D Model

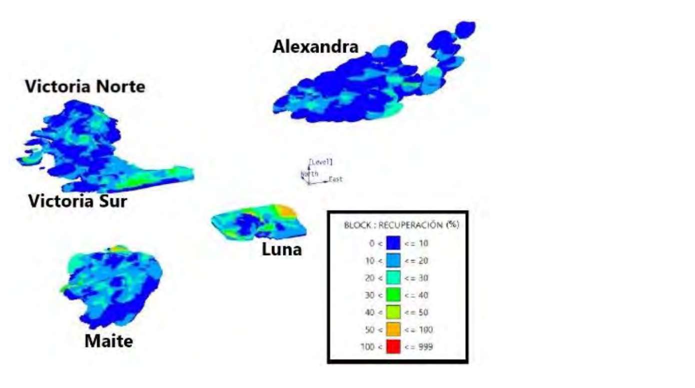


Heavy REE Recovery 3D Model

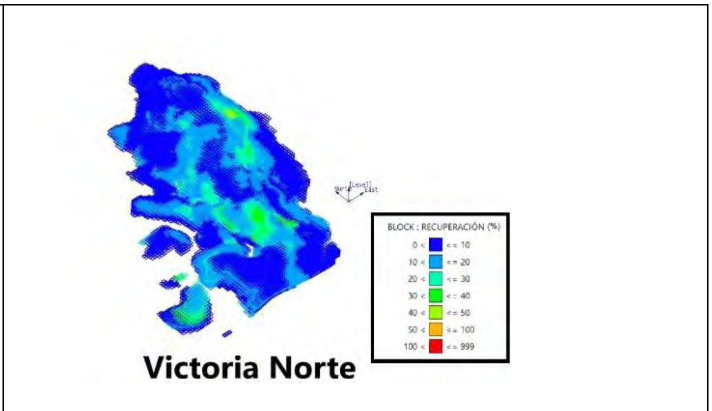
Note: prepared by Aclara, 2021

[4] Cancha is the only integrated solution for geometallurgical sample selection, result interpretation, prediction modelling and reporting

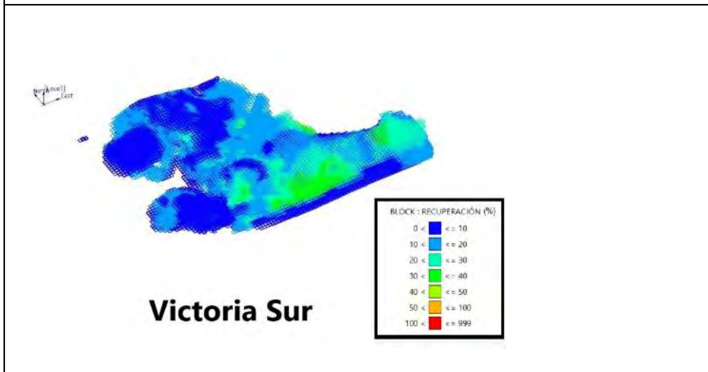
Figure 13-33: Maptek Vulcan Software Simulation



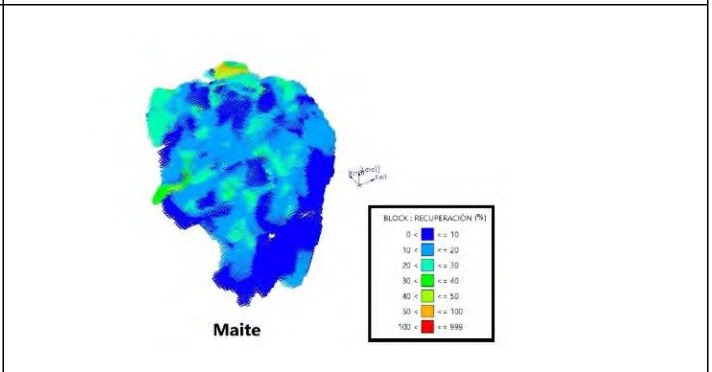
Total REE Recovery 3D Model



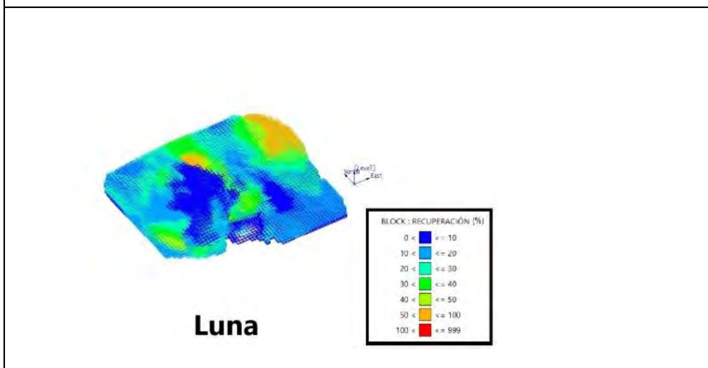
Total REE Recovery 3D Model Victoria Norte



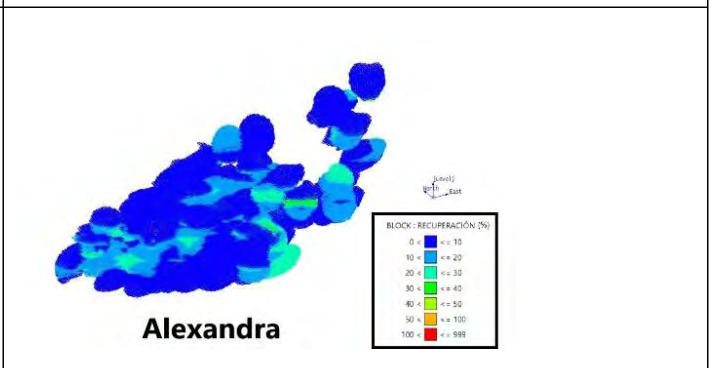
Total REE Recovery 3D Model Victoria Sur



Total REE Recovery 3D Model Maite



Total REE Recovery 3D Model Victoria Luna



Total REE Recovery 3D Model Alexandra

Note: prepared by Aclara, 2021

In the next chapters the calculation is explained in detail, with this approach the Project is pretty confident about the recovery representability.

13.4.2 Experimental Procedure Baseline Method for leachable REE

The methodology developed by Aclara for the quantification of rare earths present in mineral samples (ionic clays), was worked using the concept called "baseline". Its significance is attributed to the amount of rare earths that can be extracted from a solid phase sample to a liquid phase under a series of previously defined metallurgical parameters. The relevant parameters are reagent, reagent concentration, pH, reaction time.

13.4.2.1 Procedure

The leaching procedure reflex the same conditions explained on the Table 13-24 Baseline Leaching condition for determination of leachable REE. This "baseline" methodology is divided into 3 stages: Leaching 1 (Lx1), Leaching 2 (Lx2) and Washing (W). Each of these stages are contributors to total leached rare earths (REYD), i.e. REYD = D1 + D2 + L.

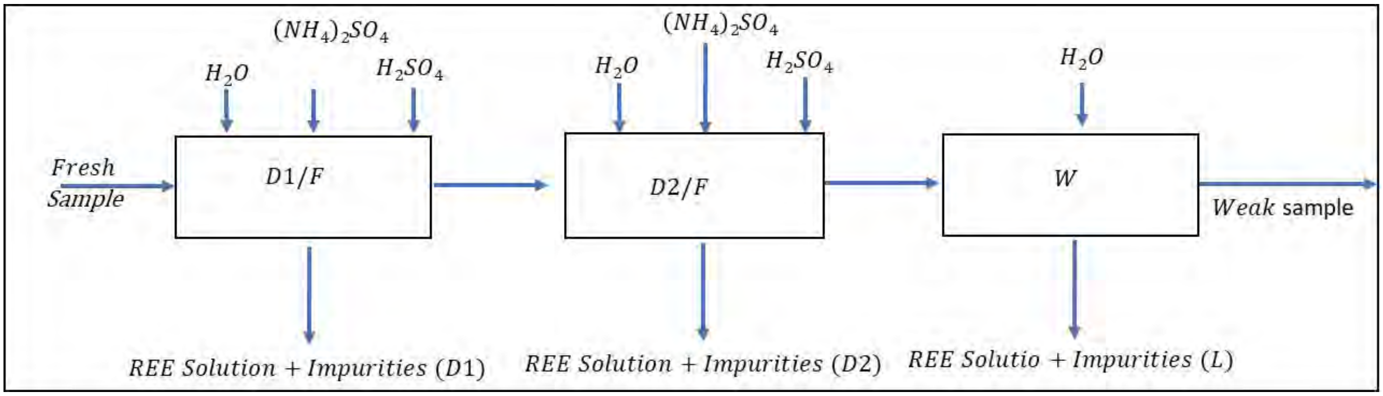
Table 13-24 shows the metallurgical parameters used in the quantification of rare earths under the "baseline" methodology.

Table 13-24: Metallurgical Parameters Baseline Method

Parameters	Data
Lx1 – Lx2	
Reagent	Ammonium sulfate
Ammonium sulfate concentration	0,15 M
pH	4
Reaction Time	20 min
% solids	25%
Temperature	Environment
Washing (W)	
Washing Water	200 ml

Figure 13-34 shows the diagram of each of the stages that make up the "baseline" methodology.

Figure 13-34: Sequential Leaching Process Scheme



Note: prepared by Aclara, 2020

The unit of measurement used is ppm, i.e. rare earths in the liquid phase (mg) / dry ore mass (kg).

$$ppm=\frac{mg\ element\ of\ interest\ (Dy, Tb, Y, Na, Fe, etc)}{kg\ ore\ dry}$$

In order to express the elements of interest in ppm (mg/kg dry ore) it is possible to consider the measurement of different data, which are:

- Analysis of liquids using ICP-MS (REE) + ICP-OES (Impurities) for D1, D2 and L.
- Measurement of recovered volume in D1, D2 and W.
- Measurement of humidity and mass for the process stage.

The following calculation methodology was used to calculate rare earths in ppm:

$$D1\ (ppm)=\frac{Reading\ ICP\_MS_{Lx1}\ (\frac{mg}{L})*Volume\ Recovered\ _{Lx1}(L)}{Dry\ mass\ Ore\ _{Lx1}(kg)}$$

$$D2\ (ppm)=\frac{Reading\ ICP_{MS_{Lx2}}\ (\frac{mg}{L})*Volume\ Recovered\ _{Lx2}(L)}{Dry\ mass\ Ore\ _{Lx2}(kg)}$$

$$L\ (ppm)=\frac{Reading\ ICP\_MS_{W}\ (\frac{mg}{L})*Volume\ Recovered\ _{W}(L)}{Dry\ mass\ Ore\ _{W}(kg)}$$

$$REYD\ (ppm)=D1+D2+L$$

The "baseline" methodology was executed by "Activation Geological Services (AGS)" Laboratory, based on the procedure delivered by Aclara (BioLantánidos, 2020).

Finally, rare earth recoveries (REE) can be calculated as the solid samples are subjected to total earth readings (REYT), developed by the ALS laboratory.

$$Recovery\ REE\ (\%) = \frac{REYD\ (ppm)}{REYT\ (ppm)} * 100$$

13.4.2.2 Extraction summary by zone and Horizon (Domains)

The extraction is determined based on the samples generated in the bores carried out in the different extraction areas of the deposit.

The extraction procedure used by AGS and ALS laboratories to determine the grade and extraction corresponds to that described in section 13.4.2.

The 6,683-extraction data obtained from the bores are used to generate a three-dimensional block model of the deposit, where each block contains the grade and value of extraction at different depths and area. The following tables show these extractions by UG or ore strips in order to spatially visualize the value of the extractions for the different lanthanide elements at different depths.

13.4.2.3 Extraction by Zone and UGs

Table 13-25 shows the average extraction per element for the different UGs of Maite extraction zone.

Table 13-25: Maite Extraction

UG	Average Extraction (%)															
	Light Rare Earth					Heavy Rare Earth									Eu	Tota
	Nd	Pr	La	Sm	Ce	Dy	Tb	Lu	Y	Gd	Er	Ho	Yb	Tm		REE
DRT-A	11.7	10.6	9.5	13.9	3.7	17.9	17.1	17.6	23.1	13.8	19.7	18.8	17.9	17.6	21.6	10.6
DRT-B1	12.1	10.6	8.8	16.0	4.6	23.1	21.5	24.7	28.7	17.3	25.7	24.6	24.4	24.8	25.0	13.4
DRT-B2	12.6	11.0	8.9	16.6	3.7	25.0	23.7	26.1	32.5	18.4	27.7	26.8	25.2	26.2	27.7	13.9
DRT-C1	7.4	6.4	5.9	9.5	3.3	13.4	12.8	13.0	18.7	10.4	14.8	14.4	12.8	13.6	15.1	8.1
DRT-D	3.6	3.3	3.6	4.0	2.2	5.8	5.3	5.6	8.5	4.5	6.3	5.4	5.2	5.5	5.0	3.9
GG-A	8.0	7.6	6.5	9.7	2.5	15.3	13.8	15.2	19.5	10.5	16.6	16.1	15.1	16.0	19.5	8.0
GG-B1	13.0	11.5	9.3	16.6	3.2	27.3	24.9	29.4	34.3	18.6	30.6	29.7	28.7	30.1	31.6	14.0
GG-B2	17.5	15.0	13.8	22.2	3.3	42.4	37.6	45.8	54.0	26.8	48.2	46.2	44.7	46.9	38.0	21.0
GG-C1	5.7	4.8	5.0	7.5	1.5	15.5	13.8	17.4	22.1	10.2	18.4	17.6	16.5	17.8	14.5	7.5

UG	Average Extraction (%)															
	Light Rare Earth					Heavy Rare Earth									Eu	Tota REE
	Nd	Pr	La	Sm	Ce	Dy	Tb	Lu	Y	Gd	Er	Ho	Yb	Tm		
GG-D	3.4	3.0	3.4	3.9	1.3	7.6	6.7	8.5	12.3	5.2	9.7	8.8	8.6	9.1	7.6	4.3
MP-A	7.9	7.7	8.0	8.3	3.3	9.2	8.9	9.3	14.3	8.1	10.5	10.0	9.3	10.0	14.0	6.9
MP-B1	21.5	17.7	15.0	25.3	5.7	29.1	29.4	28.7	34.5	24.7	32.8	30.0	26.0	29.7	35.9	19.8
MP-B2	25.3	23.1	19.7	30.6	6.7	35.8	34.6	33.6	38.1	29.5	36.6	36.3	33.6	36.4	44.3	23.0
MP-C1	10.8	9.4	7.6	13.7	5.0	19.8	19.1	16.5	23.9	15.6	19.6	19.7	17.3	18.1	27.0	11.1
MP-D	6.4	5.5	5.5	7.2	3.1	7.7	7.4	6.1	12.2	7.7	7.5	8.1	6.0	6.6	7.8	6.4

Table 13-26 shows the average extraction per element for the different UGs of Luna extraction zone.

Table 13-26: Luna Zone Extraction

UG	Average Extraction (%)															
	Light Rare Earth					Heavy Rare Earth									Eu	Total REE
	Nd	Pr	La	Sm	Ce	Dy	Tb	Lu	Y	Gd	Er	Ho	Yb	Tm		
DRT-A	12.3	11.8	12.0	13.6	5.6	18.6	17.7	17.6	23.6	14.2	19.8	20.0	17.9	19.0	24.3	11.8
DRT-B1	26.2	24.6	21.7	31.3	9.9	38.2	36.9	36.2	42.1	30.5	39.4	39.2	36.6	38.1	48.6	23.7
DRT-B2	18.8	17.2	14.8	24.5	6.8	33.1	31.5	31.4	37.3	25.1	34.5	34.4	32.0	33.4	39.1	19.9
DRT-C1	7.8	6.8	5.8	10.2	3.2	15.7	14.5	14.7	19.2	11.6	16.7	16.6	15.0	16.1	19.2	8.3
DRT-D	5.2	4.5	3.8	6.8	2.7	10.3	9.6	9.8	13.0	7.8	11.0	10.9	9.9	10.7	12.5	5.7
GG-A	8.3	7.4	7.1	9.4	3.0	15.0	14.5	14.3	18.2	12.9	15.8	15.2	14.1	15.2	18.3	8.0
GG-B1	10.1	8.8	6.7	12.8	2.6	16.8	15.9	16.3	18.9	12.5	17.5	17.3	16.2	16.8	25.9	9.0
GG-B2	16.6	14.5	12.0	21.6	3.4	31.3	29.7	30.8	36.1	22.8	33.2	32.5	30.5	31.9	34.8	19.3
GG-C1	9.5	8.0	6.4	13.1	2.5	23.4	21.2	22.7	29.9	16.4	25.8	24.9	22.5	24.3	23.2	13.5
GG-D	3.0	2.3	1.6	4.8	0.7	7.2	7.2	6.6	8.1	5.6	7.4	7.3	6.3	6.8	17.0	3.7
MP-A	4.7	4.5	5.8	5.2	2.9	6.7	6.2	6.4	8.3	5.3	6.9	6.7	6.4	6.6	8.5	4.9
MP-B1	11.6	10.9	9.6	12.5	3.2	14.8	13.7	14.0	15.3	11.2	14.9	14.9	14.1	15.0	19.3	9.6
MP-B2	24.2	22.4	21.8	29.3	3.3	48.0	44.3	46.7	47.3	30.9	46.7	47.5	46.9	50.2	38.9	32.9

UG	Average Extraction (%)															
	Light Rare Earth					Heavy Rare Earth									Eu	Total REE
	Nd	Pr	La	Sm	Ce	Dy	Tb	Lu	Y	Gd	Er	Ho	Yb	Tm		
MP-C1	11.8	10.6	9.8	14.5	3.9	19.3	18.7	16.6	19.5	14.7	18.0	18.8	16.9	17.5	27.3	13.8
MP-D	5.9	4.4	3.3	7.8	1.9	10.4	10.1	8.5	10.8	8.6	9.3	10.6	9.0	9.2	18.5	5.4

Table 13-27 shows the average extraction per element for the different UGs of Alexandra extraction zone.

Table 13-27: Alexandra Zone Extraction

UG	Average Extraction (%)															
	Light Rare Earth					Heavy Rare Earth									Eu	Total REE
	Nd	Pr	La	Sm	Ce	Dy	Tb	Lu	Y	Gd	Er	Ho	Yb	Tm		
DRT-A	3.9	3.2	2.6	5.4	1.4	10.8	9.5	10.7	15.2	7.1	12.3	12.2	11.2	11.6	11.3	4.6
DRT-B1	7.8	6.3	4.5	11.1	2.0	19.7	17.0	22.1	25.0	12.9	23.4	22.0	22.6	22.6	19.7	8.5
DRT-B2	9.0	6.5	3.7	15.7	1.8	34.1	29.8	37.1	41.2	22.0	38.6	36.7	37.1	37.4	25.4	16.3
DRT-C1	3.5	2.5	1.7	5.5	1.0	11.6	9.9	12.7	16.4	7.9	14.1	13.3	12.9	14.2	11.0	4.9
DRT-D	2.1	1.6	1.1	3.2	0.9	6.6	5.5	6.9	9.8	4.5	8.4	7.7	7.9	8.6	7.8	2.9
GG-A	3.7	3.5	3.2	4.6	0.8	9.4	8.0	8.8	12.0	5.6	9.8	9.5	9.0	10.0	14.5	4.1
GG-B1	8.1	7.2	6.4	10.5	1.4	21.3	18.6	22.0	24.1	13.1	22.9	21.9	21.9	22.1	25.9	10.1
GG-B2	11.2	9.9	9.1	15.0	1.7	34.1	30.1	36.0	40.2	20.4	37.5	36.3	35.5	36.0	36.0	15.8
GG-C1	4.6	4.0	3.8	6.6	1.1	17.5	15.2	18.9	22.9	10.2	19.8	19.3	18.5	18.7	17.8	8.1
GG-D	2.7	2.3	2.3	3.8	0.7	9.9	8.6	9.4	13.4	5.8	10.8	10.5	9.5	9.8	10.7	4.5
MP-A	3.2	3.0	3.2	3.5	1.1	4.1	3.9	4.0	5.6	3.4	4.4	4.3	3.9	4.0	6.9	2.8
MP-B1	10.8	9.8	8.1	12.1	3.1	14.6	13.8	13.6	16.7	11.4	15.2	15.0	14.2	14.4	19.9	9.4
MP-B2	10.5	9.2	7.6	11.9	2.6	13.0	12.8	12.2	13.6	10.7	12.8	12.9	12.6	12.4	19.1	8.6
MP-C1	11.9	10.2	7.9	13.9	3.1	15.9	15.5	14.1	16.5	13.1	15.6	15.7	14.3	14.5	20.5	9.8
MP-D	5.3	3.9	2.2	7.2	1.0	10.8	10.5	10.8	11.8	8.8	11.7	11.9	11.5	11.1	15.5	5.6

Table 13-28 shows the average extraction per element for the different UGs of "Victoria Norte" extraction zone.

Table 13-28: Victoria Norte Zone Extraction

UG	Average Extraction (%)														
	Light Rare Earth					Heavy Rare Earth								Eu	Total REE
	Nd	Pr	La	Sm	Ce	Dy	Tb	Lu	Y	Gd	Er	Ho	Yb	Tm		
DRT-A	5.6	5.2	5.6	6.4	1.6	10.2	9.1	9.0	14.7	6.6	11.5	11.0	9.6	10.3	10.7	5.5
DRT-B1	15.0	13.0	10.2	18.8	3.9	27.2	25.0	27.2	32.3	19.6	29.6	28.6	27.9	28.8	31.7	13.9
DRT-B2	11.9	10.4	8.8	15.7	4.0	24.0	22.5	23.1	29.5	17.1	25.8	25.3	23.3	24.7	26.8	12.3
DRT-C1	5.8	4.9	4.7	7.3	2.2	11.4	10.7	10.9	15.4	8.3	12.4	12.2	11.1	11.7	13.6	6.0
DRT-D	2.8	2.3	2.2	3.5	1.1	5.8	5.4	4.9	8.6	4.4	6.1	6.2	5.1	5.4	7.9	3.1
GG-A	6.9	6.9	7.5	7.0	1.1	9.3	9.0	8.1	14.3	7.0	10.1	10.1	8.3	9.2	12.8	5.6
GG-B1	14.7	13.4	13.6	16.3	1.4	23.6	22.0	23.7	29.9	17.4	25.8	25.5	22.7	24.8	27.2	12.4
GG-B2	15.9	14.0	15.9	18.3	1.8	31.7	29.3	31.6	41.8	22.0	35.1	34.7	30.3	33.5	30.7	17.6
GG-C1	8.5	7.5	9.0	9.8	1.8	15.7	14.7	15.2	22.9	11.9	17.6	17.3	14.3	16.2	15.7	9.0
GG-D	4.1	3.6	4.4	4.4	1.2	5.2	5.0	5.2	7.9	4.8	5.5	5.7	4.7	5.1	5.4	3.8
MP-A	8.8	8.5	8.6	9.3	2.2	11.4	10.6	10.9	14.6	8.6	11.9	11.8	10.8	11.4	15.0	7.2
MP-B1	16.7	15.7	13.4	18.1	4.1	21.7	20.9	19.8	25.7	16.7	22.0	22.2	20.2	21.1	27.0	14.2
MP-B2	19.3	17.3	14.1	23.0	4.8	28.7	27.8	26.0	33.6	22.2	29.1	29.3	26.7	28.2	35.3	18.3
MP-C1	5.7	4.8	3.9	7.5	2.2	11.7	11.1	10.1	15.0	8.5	12.0	12.1	10.3	11.1	17.6	5.9
MP-D	2.3	1.8	1.2	3.3	0.9	5.9	5.9	4.8	7.7	4.3	5.9	6.0	4.9	5.2	12.4	2.7

Table 13-29 shows the average extraction per element for the different UGs of “Victoria Sur” extraction zone.

Table 13-29: Victoria Sur Zone Extraction

UG	Average Extraction (%)														
	Light Rare Earth					Heavy Rare Earth								Eu	Total REE
	Nd	Pr	La	Sm	Ce	Dy	Tb	Lu	Y	Gd	Er	Ho	Yb	Tm		
DRT-A	7.9	7.4	8.1	9.2	2.4	15.0	13.3	12.5	21.9	11.7	15.5	15.5	13.1	13.9	17.1	7.7
DRT-B1	18.1	15.6	12.4	23.4	5.9	34.6	32.2	35.7	42.7	26.1	37.8	37.2	36.0	37.1	32.4	19.4
DRT-B2	11.7	10.0	8.4	16.1	3.9	24.8	22.9	24.5	30.9	18.4	26.8	26.4	25.0	26.1	23.8	13.6
DRT-C1	4.5	3.9	3.6	6.2	1.8	10.9	9.6	11.9	15.3	7.7	12.8	12.2	11.7	12.4	11.3	5.5
DRT-D	2.5	2.2	2.6	2.8	0.9	5.8	4.9	6.5	9.3	3.9	7.1	6.6	6.8	6.8	5.0	3.0
GG-A	5.5	5.5	5.9	5.8	0.9	8.2	7.4	7.8	10.9	5.9	9.0	9.0	7.7	8.2	13.4	4.3
GG-B1	12.7	11.8	11.6	15.0	1.8	25.5	23.2	26.7	35.5	17.0	27.8	27.6	25.3	26.7	30.4	13.4
GG-B2	12.3	11.0	10.0	15.5	2.5	31.1	27.7	34.4	41.7	19.4	35.0	34.1	33.7	34.0	34.3	15.8
GG-C1	9.3	8.5	8.3	11.6	2.4	21.1	19.2	22.5	28.5	14.0	23.3	23.4	21.9	22.5	22.2	11.4
GG-D	9.6	8.9	8.9	12.1	1.6	21.7	19.8	20.1	25.8	14.4	22.2	23.2	19.8	21.0	18.6	11.4
MP-A	5.4	5.2	4.8	5.7	2.0	6.3	6.0	6.2	8.4	5.5	7.0	6.8	6.0	6.4	9.3	4.4
MP-B1	14.2	12.8	10.4	15.3	4.0	13.6	13.8	12.6	16.7	12.7	13.7	13.6	12.8	12.8	21.3	10.6
MP-B2	17.6	15.7	12.8	20.3	4.3	23.0	22.6	20.3	30.1	19.6	22.8	23.2	20.9	21.5	29.1	16.7
MP-C1	9.1	7.7	5.8	11.5	3.2	17.1	15.8	15.7	26.2	13.4	18.0	17.6	16.0	16.6	21.1	10.8

Aclara carried out a review of the extraction calculations using the mass balance method and found that the impregnation volumes of the filter cakes, whose humidity is between 20% and 30%, were not considered in the equation calculation, which means that there is a bias in the extraction calculation.

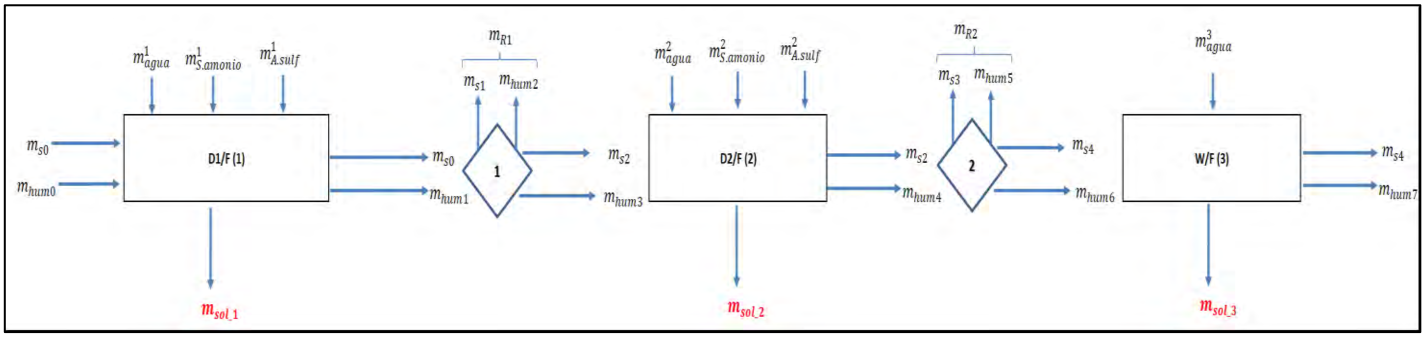
Aclara performs a recalculation of the extractions using the mass balance methodology which is described in Table 13-30, Table 13-31,and Table 13-32

13.4.2.4 Mass Balance Method

The mass balance methodology is based on considering that the input mass is equal to the output mass, therefore, it takes into consideration much of the data measured in the "baseline" methodology and other data are calculated from these measurements.

Figure 13-35 shows the diagram with the in and out points to consider in the mass balance.

Figure 13-35: Sequential Leaching Process Scheme Using Mass Balance



Source: Aclara, 2021

Table 13-30: Extraction Calculation Stage D1

Nomenclature	Extraction calculation 1 / Filtering (D1/F)	Status
m^1_{agua}	Mass of water added in D1	Measured Value
m_{s0}	Mass of dry mineral entering the process	Measured Value
m_{hum0}	Mineral water mass	Measured Value
$m^1_{s.amonio}$	Mass of ammonium sulphate added in D1	Measured Value
$m^1_{A.sulf}$	Mass of Sulfuric Acid added in D1	Measured Value
m_{sol_1}	Mass of solution recovered in D1	Calculated Value
m_{hum1}	Impregnation mass in D1	Measured Value
m_{R1}	Wet mass sample for humidity measurement D1	Measured Value
m_{s1}	Dry mass sample for humidity measurement D1	Measured Value
m_{hum2}	Impregnation mass in humidity measurement D1	Measured Value

Table 13-31: Extraction Calculation Stage D2

Nomenclature	Extraction calculation 2 / Filtering (D2/F)	Status
m^2_{agua}	Mass of water added in D2	Measured Value
m_{s2}	Mass of dry mineral entering the process	Calculated Value
m_{hum3}	Impregnation mass from mineral stage D1	Measured Value
$m^2_{s.amonio}$	Mass of ammonium sulfate added in D2	Measured Value
$m^2_{A.sulf}$	Mass of Sulfuric Acid added in D2	Measured Value
m_{sol_2}	Mass of solution recovered in D2	Calculated Value
m_{hum4}	Impregnation mass in D2	Measured Value
m_{R2}	Wet mass sample for humidity measurement D2	Measured Value
m_{s3}	Dry mass sample for humidity measurement D2	Calculated Value
m_{hum5}	Impregnation mass in humidity measurement D2	Measured Value

Table 13-32: Extraction Calculation Stage W

Nomenclature	Washing calculation / Filtering (W/F)	Status
m^3_{agua}	Mass of water added in W	Measured Value
m_{s4}	Mass of dry mineral entering the process	Calculated Value
m_{hum6}	Impregnation mass from mineral stage D2	Measured Value
m_{sol_3}	Mass of solution recovered in W	Calculated Value
m_{hum7}	Impregnation mass in W	Measured Value

Boundary conditions:

- The balance considers the impregnation of the mineral in each of the stages.
- The balance considers the mass removed for moisture measurement in the intermediate stages.
- It recalculates based on measured data the recovered mass of solution that is the basis for estimating the mass of elements that were extracted in the leaching process.

In addition, it is important to highlight that the mass balance methodology considers a series of assumptions which are:

- It is assumed that there is no loss of mass.
- It is assumed that the humidity measured in D1, D2 and W is correct.
- Filtering and impregnation solutions are assumed to have a density of 1.0 g/ml.

13.4.2.5 Corrected Extraction Results

Table 13-33 shows the average extraction per element for the different UGs of Maite extraction zone (corrected).

Table 13-33: Maite Zone Extraction

UG	Average Extraction (%)															
	Light Rare Earth					Heavy Rare Earth									Eu	Total REE
	Nd	Pr	La	Sm	Ce	Dy	Tb	Lu	Y	Gd	Er	Ho	Yb	Tm		
DRT-A	12.9	11.8	10.6	15.4	4.1	19.9	19.1	19.6	25.7	15.3	21.9	20.9	19.9	19.7	23.9	11.8
DRT-B1	13.4	11.7	9.7	17.7	5.1	25.4	23.6	27.1	31.5	19.0	28.2	27.0	26.8	27.2	27.4	14.7
DRT-B2	13.8	12.2	9.8	18.3	4.1	27.4	26.1	28.7	35.9	20.3	30.4	29.5	27.7	28.8	30.4	15.3
DRT-C1	8.1	7.0	6.5	10.3	3.6	14.6	13.9	14.1	20.4	11.3	16.0	15.6	13.9	14.7	16.3	8.8
DRT-D	3.9	3.5	3.9	4.3	2.3	6.2	5.7	6.0	9.1	4.8	6.7	5.8	5.6	5.8	5.4	4.2
GG-A	8.9	8.5	7.3	10.8	2.8	17.1	15.5	16.9	21.8	11.7	18.6	18.0	16.9	17.9	21.8	8.9
GG-B1	14.1	12.5	10.1	18.0	3.5	29.7	27.1	32.1	37.5	20.3	33.4	32.4	31.3	32.9	34.4	15.2
GG-B2	18.7	16.1	14.7	23.8	3.5	45.5	40.3	49.1	57.9	28.7	51.6	49.5	47.9	50.2	40.8	22.5
GG-C1	6.1	5.2	5.3	8.0	1.6	16.7	14.8	18.7	23.8	11.0	19.8	18.9	17.8	19.2	15.5	8.1

UG	Average Extraction (%)															
	Light Rare Earth					Heavy Rare Earth									Eu	Total REE
	Nd	Pr	La	Sm	Ce	Dy	Tb	Lu	Y	Gd	Er	Ho	Yb	Tm		
GG-D	3.6	3.2	3.7	4.2	1.4	8.2	7.2	9.1	13.2	5.6	10.4	9.5	9.3	9.8	8.1	4.7
MP-A	8.6	8.4	8.7	9.1	3.6	10.1	9.8	10.2	15.7	8.8	11.6	11.0	10.3	11.0	15.2	7.5
MP-B1	22.9	18.9	16.1	26.9	6.1	30.8	31.1	30.4	36.6	26.2	34.7	31.8	27.6	31.4	38.2	21.0
MP-B2	27.5	25.0	21.4	33.2	7.2	39.0	37.6	36.5	41.4	32.1	39.9	39.5	36.6	39.7	48.0	25.1
MP-C1	11.5	10.0	8.1	14.7	5.3	21.2	20.4	17.7	25.6	16.7	21.0	21.0	18.5	19.4	28.9	11.9
MP-D	6.8	5.8	5.8	7.6	3.2	8.2	7.9	6.4	12.9	8.1	8.0	8.6	6.4	7.0	8.2	6.7

Table 13-34 shows the average extraction per element for the different UGs of Luna extraction zone (corrected).

Table 13-34: Luna Zone Extraction

UG	Average Extraction (%)															
	Light Rare Earth					Heavy Rare Earth									Eu	Total REE
	Nd	Pr	La	Sm	Ce	Dy	Tb	Lu	Y	Gd	Er	Ho	Yb	Tm		
DRT-A	13.7	13.2	13.4	15.1	6.3	20.8	19.8	19.6	26.4	15.9	22.1	22.3	19.9	21.2	27.0	13.1
DRT-B1	29.2	27.4	24.2	34.9	11.1	42.4	41.0	40.3	46.8	33.9	43.7	43.5	40.6	42.3	54.0	26.4
DRT-B2	20.7	19.0	16.3	26.9	7.5	36.3	34.6	34.5	41.0	27.5	37.9	37.7	35.1	36.6	42.9	21.9
DRT-C1	8.5	7.4	6.4	11.2	3.5	17.2	15.9	16.1	21.0	12.7	18.3	18.2	16.4	17.6	21.0	9.0
DRT-D	5.6	4.9	4.1	7.4	2.9	11.3	10.4	10.7	14.2	8.5	12.0	11.9	10.8	11.7	13.6	6.2
GG-A	9.0	8.2	7.8	10.3	3.3	16.2	15.6	15.4	19.9	13.9	17.1	17.2	15.2	16.5	19.8	9.1
GG-B1	11.0	9.7	7.4	14.0	2.8	18.4	17.3	17.8	20.7	13.6	19.2	18.9	17.7	18.4	28.2	9.9
GG-B2	17.8	15.6	12.9	23.1	3.7	33.6	31.8	33.0	38.7	24.4	35.6	34.8	32.7	34.1	37.4	20.7
GG-C1	10.2	8.6	6.9	14.0	2.7	25.1	22.7	24.4	32.1	17.6	27.7	26.7	24.1	26.1	24.9	14.5
GG-D	3.2	2.5	1.8	5.2	0.8	7.8	7.9	7.2	8.8	6.0	8.0	7.9	6.9	7.3	18.5	4.0
MP-A	5.0	4.8	6.2	5.5	3.0	7.1	6.6	6.8	8.9	5.7	7.3	7.1	6.8	7.0	9.1	5.2
MP-B1	12.5	11.7	10.3	13.4	3.4	15.9	14.7	15.0	16.4	12.0	15.9	16.0	15.1	16.0	20.8	10.3
MP-B2	26.0	24.0	23.4	31.4	3.5	51.5	47.5	50.1	50.7	33.2	50.1	51.0	50.4	53.8	41.8	35.4
MP-C1	12.5	11.2	10.3	15.3	4.1	20.2	19.5	17.4	20.4	15.5	18.8	19.6	17.7	18.3	28.6	14.4
MP-D	6.2	4.7	3.5	8.3	2.0	11.1	10.8	9.1	11.4	9.1	9.9	11.2	9.5	9.7	19.5	5.7

Table 13-35 shows the average extraction per element for the different UGs of Alexandra extraction zone (corrected).

Table 13-35: Alexandra Zone Extraction

UG	Average Extraction (%)															
	Light Rare Earth					Heavy Rare Earth									Eu	Total REE
	Nd	Pr	La	Sm	Ce	Dy	Tb	Lu	Y	Gd	Er	Ho	Yb	Tm		
DRT-A	4.2	3.5	2.8	5.9	1.5	11.7	10.3	11.7	16.5	7.7	13.4	13.2	12.2	12.7	12.2	5.0
DRT-B1	8.5	6.9	4.9	12.1	2.2	21.5	18.4	24.0	27.2	14.1	25.4	23.9	24.6	24.5	21.4	9.3
DRT-B2	9.9	7.1	4.1	17.2	2.0	37.2	32.5	40.3	44.9	24.1	41.9	40.0	40.3	40.6	27.8	17.8
DRT-C1	3.8	2.7	1.8	6.0	1.1	12.5	10.7	13.7	17.8	8.6	15.2	14.4	13.9	15.2	11.9	5.3
DRT-D	2.2	1.6	1.2	3.3	1.0	7.0	5.8	7.2	10.3	4.7	8.8	8.1	8.3	9.0	8.2	3.0
GG-A	4.0	3.8	3.5	4.9	0.9	10.1	8.6	9.5	12.9	6.1	10.6	10.3	9.7	10.8	15.6	4.5
GG-B1	8.6	7.6	6.8	11.1	1.4	22.7	19.8	23.4	25.6	13.9	24.3	23.3	23.3	23.5	27.5	10.7
GG-B2	11.9	10.6	9.7	16.0	1.8	36.1	31.9	38.1	42.6	21.6	39.7	38.4	37.7	38.2	38.2	16.8
GG-C1	4.9	4.2	4.0	7.0	1.2	18.6	16.1	20.1	24.4	10.8	21.0	20.5	19.6	19.9	19.0	8.6
GG-D	2.9	2.5	2.4	4.0	0.8	10.5	9.1	9.9	14.2	6.2	11.4	11.1	10.0	10.4	11.3	4.8
MP-A	3.5	3.3	3.4	3.7	1.2	4.4	4.2	4.3	6.0	3.7	4.7	4.6	4.2	4.3	7.5	3.0
MP-B1	11.5	10.5	8.7	13.0	3.4	15.6	14.7	14.5	17.8	12.2	16.2	16.0	15.1	15.3	21.2	10.1
MP-B2	11.1	9.8	8.0	12.6	2.8	13.8	13.6	13.0	14.4	11.3	13.6	13.7	13.4	13.2	20.2	9.1
MP-C1	12.7	10.8	8.4	14.7	3.3	16.8	16.5	14.9	17.6	13.9	16.6	16.6	15.2	15.3	21.8	10.4
MP-D	5.6	4.1	2.3	7.6	1.1	11.3	11.0	11.3	12.3	9.2	12.2	12.4	12.0	11.6	16.2	5.8

Table 13-36 shows the average extraction per element for the different UGs of Victoria Norte extraction zone (corrected).

Table 13-36: Victoria Norte Zone Extraction

UG	Average Extraction (%)														
	Light Rare Earth					Heavy Rare Earth								Eu	Total REE
	Nd	Pr	La	Sm	Ce	Dy	Tb	Lu	Y	Gd	Er	Ho	Yb	Tm		
DRT-A	6.2	5.7	6.2	7.0	1.7	11.1	9.9	9.8	16.2	7.2	12.6	12.0	10.5	11.2	11.7	6.0
DRT-B1	16.4	14.3	11.1	20.6	4.3	29.8	27.3	29.7	35.3	21.4	32.4	31.2	30.4	31.4	34.6	15.2
DRT-B2	12.9	11.3	9.5	17.1	4.3	26.0	24.4	25.1	32.0	18.5	28.0	27.5	25.2	26.8	29.1	13.3
DRT-C1	6.2	5.2	5.0	7.8	2.4	12.2	11.4	11.7	16.5	8.9	13.3	13.1	11.9	12.6	14.5	6.5
DRT-D	3.0	2.4	2.4	3.7	1.2	6.1	5.8	5.2	9.1	4.7	6.5	6.6	5.4	5.7	8.4	3.3
GG-A	7.5	7.5	8.3	7.7	1.2	10.2	9.9	8.9	15.8	7.7	11.1	11.1	9.1	10.1	14.0	6.1
GG-B1	15.7	14.2	14.5	17.4	1.5	25.1	23.5	25.2	31.8	18.5	27.4	27.1	24.1	26.3	28.9	13.2
GG-B2	16.8	14.8	16.8	19.3	1.9	33.6	31.0	33.5	44.2	23.3	37.2	36.7	32.1	35.4	32.5	18.6
GG-C1	9.0	7.9	9.5	10.3	1.9	16.6	15.5	16.1	24.1	12.5	18.5	18.2	15.1	17.0	16.5	9.5
GG-D	4.4	3.8	4.7	4.7	1.3	5.5	5.3	5.6	8.4	5.1	5.9	6.0	5.0	5.5	5.7	4.1
MP-A	9.5	9.1	9.3	10.0	2.4	12.3	11.5	11.8	15.8	9.3	12.8	12.7	11.7	12.3	16.2	7.7
MP-B1	17.9	16.8	14.4	19.4	4.4	23.4	22.5	21.3	27.7	17.9	23.8	23.9	21.8	22.7	28.9	15.2
MP-B2	20.5	18.3	15.0	24.4	5.1	30.4	29.5	27.6	35.6	23.6	30.9	31.1	28.4	30.0	37.5	19.4
MP-C1	6.0	5.2	4.2	8.0	2.3	12.4	11.8	10.7	15.9	9.0	12.7	12.8	11.0	11.7	18.6	6.3
MP-D	2.4	1.9	1.3	3.5	1.0	6.2	6.2	5.1	8.1	4.5	6.3	6.4	5.1	5.5	13.1	2.9

Table 13-37 shows the average extraction per element for the different UGs of Victoria Sur extraction zone (corrected)

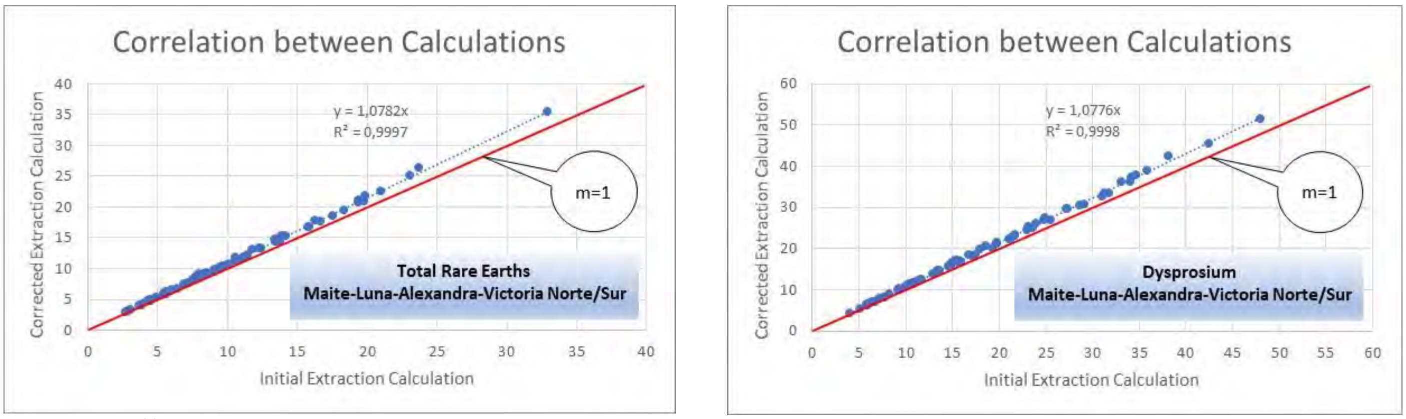
Table 13-37: Victoria Sur Zone Extraction

UG	Average Extraction (%)														
	Light Rare Earth					Heavy Rare Earth								Eu	Total REE
	Nd	Pr	La	Sm	Ce	Dy	Tb	Lu	Y	Gd	Er	Ho	Yb	Tm		
DRT-A	8.7	8.1	8.9	10.0	2.6	16.5	14.6	13.7	24.0	12.8	17.1	17.0	14.4	15.3	18.7	8.5
DRT-B1	19.7	17.1	13.6	25.5	6.4	37.8	35.1	38.9	46.5	28.4	41.2	40.5	39.3	40.5	35.3	21.1
DRT-B2	12.7	10.8	9.1	17.4	4.3	26.9	24.8	26.5	33.4	19.9	29.0	28.6	27.1	28.2	25.9	14.7
DRT-C1	4.9	4.2	3.8	6.7	1.9	11.7	10.3	12.7	16.4	8.3	13.7	13.0	12.6	13.3	12.1	5.9
DRT-D	2.7	2.4	2.8	3.1	1.0	6.3	5.3	7.1	10.1	4.2	7.7	7.2	7.4	7.3	5.5	3.3
GG-A	6.1	6.1	6.6	6.4	0.9	9.0	8.2	8.6	12.1	6.5	9.9	9.9	8.4	9.0	14.8	4.8
GG-B1	13.5	12.6	12.3	15.9	1.9	27.0	24.7	28.3	37.8	18.0	29.5	29.3	26.9	28.4	32.3	14.3
GG-B2	13.0	11.6	10.6	16.3	2.6	32.7	29.1	36.1	43.9	20.4	36.9	35.9	35.4	35.8	36.1	16.7
GG-C1	9.9	9.0	8.8	12.3	2.5	22.3	20.4	23.9	30.2	14.8	24.7	24.9	23.2	23.9	23.6	12.1
GG-D	10.2	9.5	9.4	12.9	1.7	23.1	21.0	21.3	27.4	15.2	23.6	24.7	21.1	22.3	19.8	12.1
MP-A	5.8	5.6	5.2	6.2	2.2	6.9	6.6	6.8	9.2	6.0	7.6	7.5	6.6	7.0	10.2	4.8
MP-B1	15.1	13.7	11.1	16.3	4.3	14.5	14.7	13.4	17.8	13.5	14.5	14.5	13.6	13.6	22.6	11.2
MP-B2	18.7	16.7	13.6	21.6	4.6	24.4	24.0	21.5	31.9	20.8	24.1	24.6	22.2	22.8	30.9	17.7
MP-C1	9.7	8.2	6.2	12.3	3.4	18.2	16.8	16.6	27.8	14.3	19.1	18.7	16.9	17.6	22.5	11.4

When comparing the initial and corrected extraction data, it is found that there is a correlation between the two of them.

Figure 13-36 shows the equations that relate to the initial extraction and the corrected extraction, where in both cases the correlation factor is greater than R^2= 0.999.

Figure 13-36: Initial Extractions vs Corrected Extraction for Total Rare Earths and Dysprosium



Note: prepared by Ausenco, 2021

The background is clear and indicates that initial and correct extractions can be predicted from a factor.

Aclara proceeded to search for these factors for the different rare earth elements, in order to use them in updating the mining study and obtaining a new mining plan.

13.4.2.6 Criteria for Evaluating Correlation Factors for Extractions

- Regression analysis: Linear regression analysis by ordinary least squares was performed. The intersection was defined equal to "0" (n = 0), that is, centered data. Initially, an analysis was made with all the extraction data initially calculated and corrected.
- Eliminated samples: To simplify the analysis, it was defined to work only with the units that provide the greatest value, which correspond to Garnet Granite.
- Domains analyzed: In order to verify whether the relationship between the extraction calculations for the different elements was maintained, an additional regression analysis was carried out:

1) All data were analyzed ("GG-B-C" that is, horizons B and C of the Granite Garnet lithology).
2) They were separated by horizon ("GG-B" and "GG-C").
3) Subsequently, each horizon was analyzed in each of the extraction zones (Alexandra (Ax), Luna (Lu), Maite (Ma), Victoria Norte and Sur (Vi) ("Ax-GG-B", "Ax- GG-C "," Lu-GG-B "," Lu-GG-C "," Ma-GG-B "," Ma-GG-C "," Vi-GG-B "," Vi-GG- C ").

4) Finally, in each of the previous subsets, the different quartiles (q) of dysprosium grade were analyzed (For example, "GG-B-q1", "GG-B-q2", "GG-B-q3 "," GG-B-q4 "," GG-C-q1 "," GG-C-q2 "," GG-C-q3 "," GG-C-q4 "," Ax-GG-B-q1 "," Ax-GG-b-q2 "," Ax-GG-B-q3 "," Ax-GG-B-q4 "," Ax-GG-C-q1 "," Ax-GG-C-q2 "," Ax-GG-C-q3 "," Ax-GG-C-q4 ", and successively for the other zones" Lu "," ma "and" vi ").

The summary of the evaluation is shown in Table 13-38 and Figure 13-37, from which it can be deduced that:

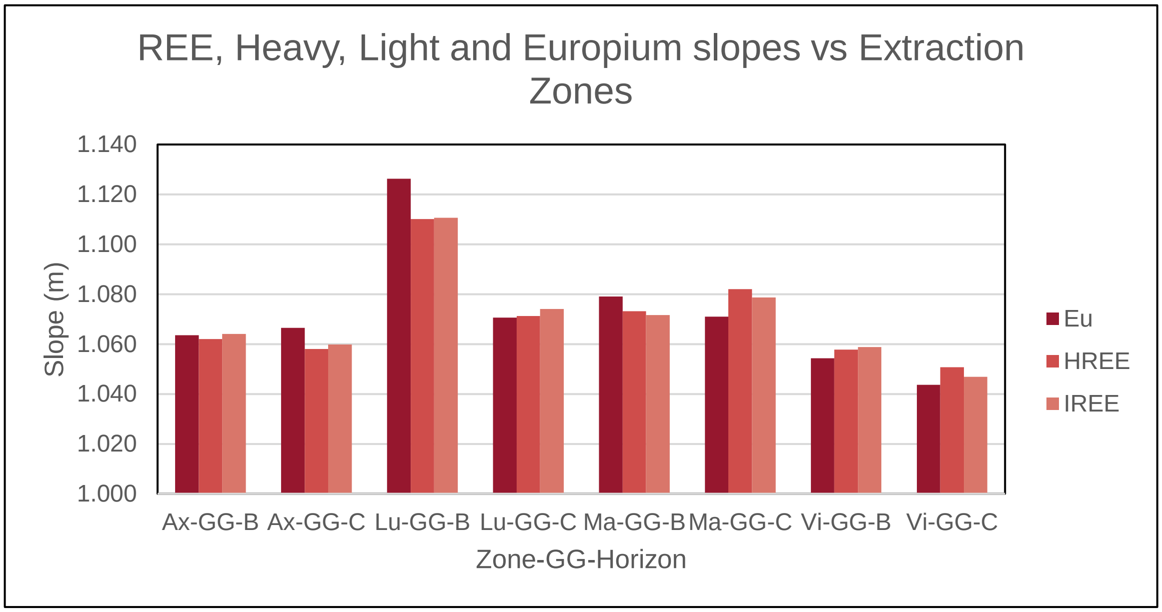
- The different extraction zones show a similar slope (m), standing out Luna followed by Maite. This would be explained by the fine granulometry of these minerals, which retain greater moisture, which also produces a greater contribution of solution to the corrected extraction calculation. The opposite occurs in Victoria where the granulometry would be coarser. See Figure 13-37.
- Except for Luna, the slope is not observed to show a trend related to the grade. See sheet "results-quartiles".
- The percentage differences between each quartile of a domain and the respective complete domain (q1, q2, q3 and q4) were calculated, obtaining that for HREE and LREE the greatest difference was 2.3%, being the averages close to zero. See Table 13-38.
- Based on the analysis of correlations between the REE elements carried out for the estimation of Project resources, together with what was observed in the results of this analysis, the relevance of working with only 3 factors was confirmed: one for HREE (rare earths heavy), another for LREE (light rare earths) and a third for Eu (Europium) (without correlation with other elements).
- This information is used for the mining study.

Table 13-38: Slope (m) Summary

Domain	linear regression slope (Y = mX)		Percentage Difference	
	Heavy REE slope	Light REE slope	Heavy REE %	Light REE %
Ax-GG-B	1,062	1,064	0	0
Ax-GG-B-q1	1,064	1,055	0.23	-0.85
Ax-GG-B-q2	1,057	1,064	-0.48	0.02
Ax-GG-B-q3	1,062	1,069	0.04	0.43
Ax-GG-B-q4	1,062	1,062	0.01	-0.14
Ax-GG-C	1,058	1,060	0	0
Ax-GG-C-q1	1,034	1,052	-2.27	-0.74
Ax-GG-C-q2	1,064	1,057	0.54	-0.29
Ax-GG-C-q3	1,056	1,052	-0.23	-0.71
Ax-GG-C-q4	1,058	1,067	-0.02	0.66
Lu-GG-B	1,110	1,111	0	0
Lu-GG-B-q1	1,085	1,099	-2.24	-1.00
Lu-GG-B-q2	1,093	1,109	-1.57	-0.14

Domain	linear regression slope (Y = mX)		Percentage Difference	
	Heavy REE slope	Light REE slope	Heavy REE %	Light REE %
Lu-GG-B-q3	1,119	1,115	0.84	0.37
Lu-GG-C	1,071	1,074	0	0
Lu-GG-C-q1	1,060	1,089	-1.07	1.43
Lu-GG-C-q2	1,071	1,077	0.00	0.32
Lu-GG-C-q3	1,074	1,084	0.30	0.95
Lu-GG-C-q4	1,071	1,069	-0.05	-0.51
Ma-GG-B	1,073	1,072	0	0
Ma-GG-B-q1	1,080	1,084	0.62	1.19
Ma-GG-B-q2	1,073	1,086	-0.04	1.31
Ma-GG-B-q3	1,079	1,075	0.52	0.28
Ma-GG-B-q4	1,072	1,071	-0.09	-0.08
Ma-GG-C	1,082	1,079	0	0
Ma-GG-C-q1	1,080	1,074	-0.18	-0.42
Ma-GG-C-q2	1,072	1,061	-0.91	-1.69
Ma-GG-C-q3	1,092	1,077	0.93	-0.12
Ma-GG-C-q4	1,077	1,087	-0.47	0.80
Vi-GG-B	1,058	1,059	0	0
Vi-GG-B-q1	1,057	1,063	-0.10	0.42
Vi-GG-B-q2	1,050	1,056	-0.78	-0.24
Vi-GG-B-q3	1,053	1,055	-0.45	-0.40
Vi-GG-B-q4	1,058	1,060	0.07	0.09
Vi-GG-C	1,051	1,047	0	0
Vi-GG-C-q1	1,042	1,037	-0.85	-0.95
Vi-GG-C-q2	1,047	1,046	-0.31	-0.13
Vi-GG-C-q3	1,045	1,039	-0.53	-0.79
Vi-GG-C-q4	1,056	1,058	0.51	1.08

Figure 13-37: Slopes of Linear Equation vs Extraction Zones



Note: prepared by Ausenco, 2021

Table 13-39: Nomenclature

Nomenclature	Description
GG	Garnet Granite
B	Mineralized Horizon "B"
C	Mineralized Horizon "C"
Ax	Alexandra Extraction Zone
Lu	Luna Extraction Zone
Ma	Maite Extraction Zone
Vi	Victoria Extraction Zone (north and south)
Q	Quintile

14 MINERAL RESOURCE ESTIMATES

14.1 Introduction

The Aclara Mineral Resource model was generated by Luis Oviedo and Ausenco and the Dysprosium (Dy), Neodymium (Nd), Terbium (Tb), Lutetium (Lu), Yttrium (Y), Gadolinium (Gd), Praseodymium (Pr), Erbyum (Er), Holmium (Ho), Ytterbium (Yb), Lanthanum (La), Europium (Eu), Samarium (Sm), Cerium (Ce) and Thulium (Tm) grades were estimated within the defined estimation units.The effective date of the Mineral Resource estimate is August 19, 2021.

The modelling and estimation were conducted using commercially available Leapfrog Geo 6.0 and Datamine Studio Softwares.

The Mineral Resources herein are not Mineral Reserves as they do not have demonstrated economic viability.

14.2 Geological Modeling

The Lithology (GG, DRT and MP) and the regolith limit (A to D) models were generated according to the previously described geology. These were later combined to obtain the UG (Geological Units) model. Prior to this, regolith characterization was refined using multidisciplinary techniques such as geochemistry (major elements, total and exchangeable REE) and mineralogy.

The models were initially generated by Aclara's chief geologist, Juan Pablo Navarro, and later delivered to the Ausenco modeling team for eventual corrections and generation of the final Estimation Domain (ED) model, in combination with the resources.

14.3 Database Supporting Mineral Resource Estimate

The support for the Mineral Resources estimate is the data collected from the 2020 and 2021 drill programs, totaling: 381 Sonic Drill holes, comprising 10,493 m of drilling, and 5,009 samples 185 are in the Victoria area, 87 were drilled in the Maite area, 38 are in the Luna area and 71 drill holes in the Alexandra area.

Table 14-1 shows a summary of drilling for the Penco Module.

Table 14-1: Summary of Drilling Performed by Area

Area	N° Drill Holes	Drilled Meters (m)	N° Samples
Victoria	185	4,818.2	2,335
Maite	87	2,660.0	1,282
Luna	38	1,100.6	497
Alexandra	71	1,914.8	895
TOTAL	381	10,493.6	5,009

14.4 Sample Coding

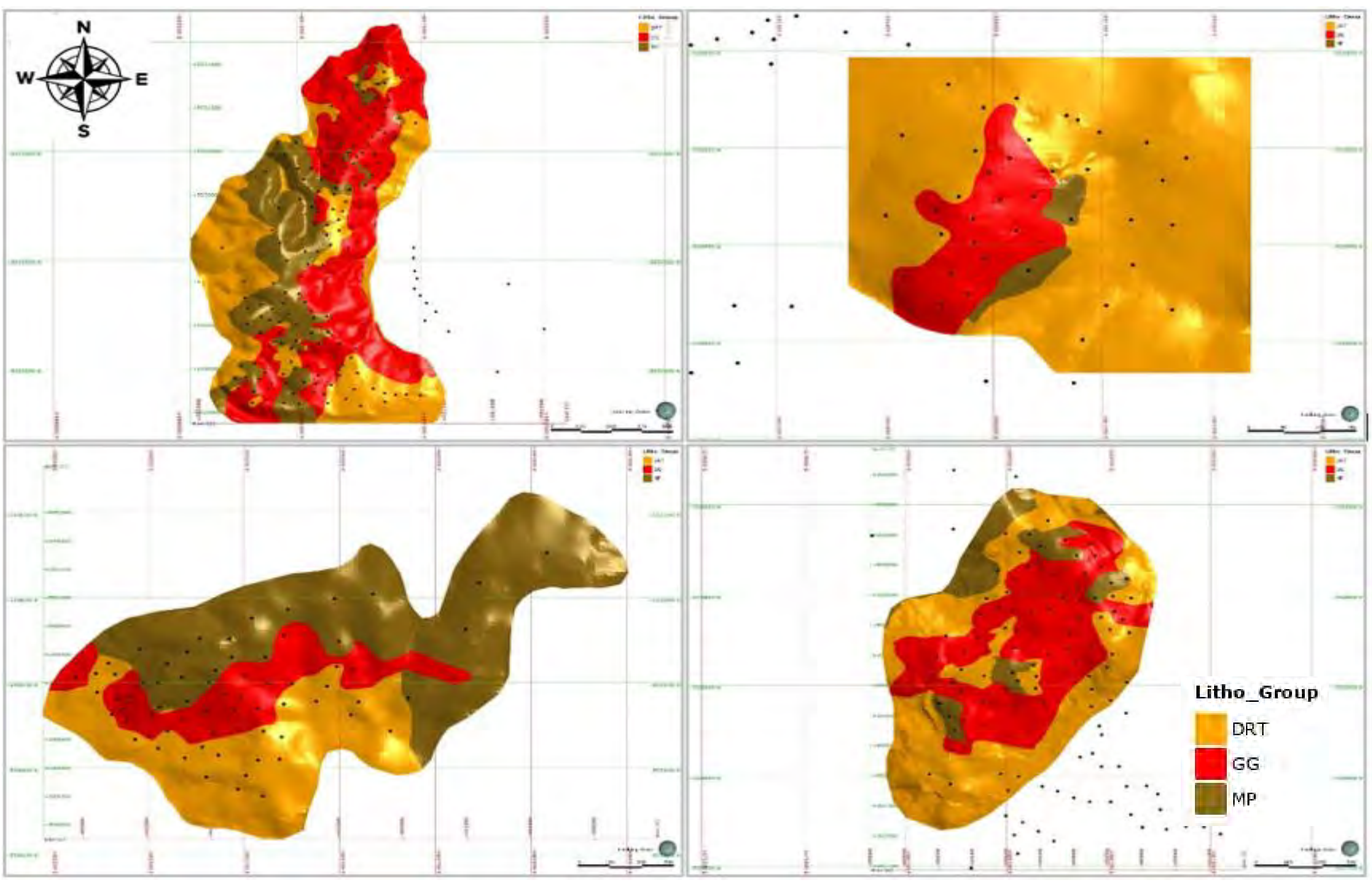
Samples from the database were coded based on the solids lithology and regolith codes, based on the solid that contained the centroid sample. See Figure 14-1

In order to validate the three-dimensional lithologic model, Ausenco back-tagged drill holes with the lithology and regolith solids and compared the total length of each domain from the original logs to the total length obtained from the interpreted model. Results are summarized in Table 14-2. Ausenco believes the differences are acceptable for this level of study.

Table 14-2: Percentage of comparison of the lithological model with the registered lithology

	GG	DRT	MP
Victoria	94%	87%	94%
Luna	90%	91%	98%
Alexandra	90%	85%	80%
Maite	87%	86%	85%

Figure 14-1: Plan view of the lithological models and drillings for Victoria, Luna, Alexandra and Maite (from left to right and from top to bottom).



Note: prepared by Ausenco 2021

14.5 Definition of Estimation Domain

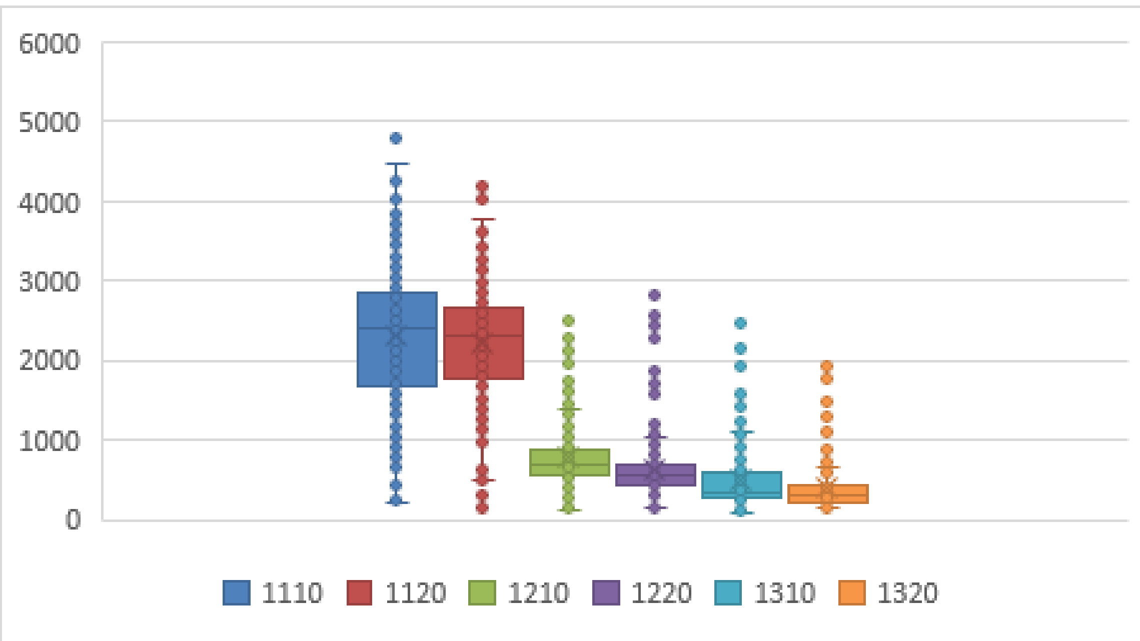
During the review and discussion stage with the Aclara technical team about the regolith levels to be used in the estimation, it was agreed that the levels to be estimated would be B1, B2 and C1 because they are the levels that contain the mineralization. Levels A, C2 and D were excluded from the estimate because they did not present a grade of economic interest.

A study of the total rare earth grades and extraction value was carried out within each horizon, with the objective of grouping ED that present similar grade.

Figure 14-2, Figure 14-3 and Figure 14-4 show the REYT, Total Heavy Rare Element (HREET) and Total Light Rare Elements (LREET) values for Victoria. A segmentation of estimation domain 1110 and 1210 is observed with respect to the other ED; this is why it was decided that statistics would be performed separately. In the case of the ED 1210 and 1310, they will be grouped into a single unit called 1210 & 1310, in the same way of the ED 1220 and 1320 were grouped as 1220&1320. This analysis was carried out for the Luna, Maite and Alexandra sectors. Table 14-3 shows the grouped codes.

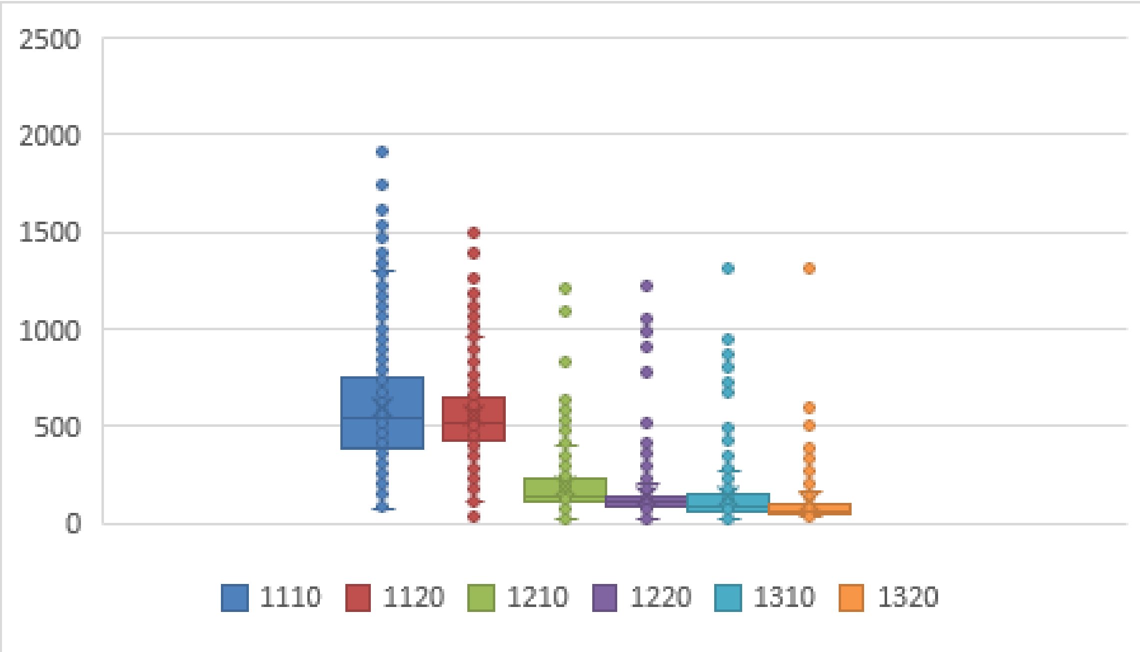
Figure 14-5 through Figure 14-8 show vertical sections for Victoria, Luna, Alexandra and Maite.

Figure 14-2: Box plot for REYT assays, ED Victoria



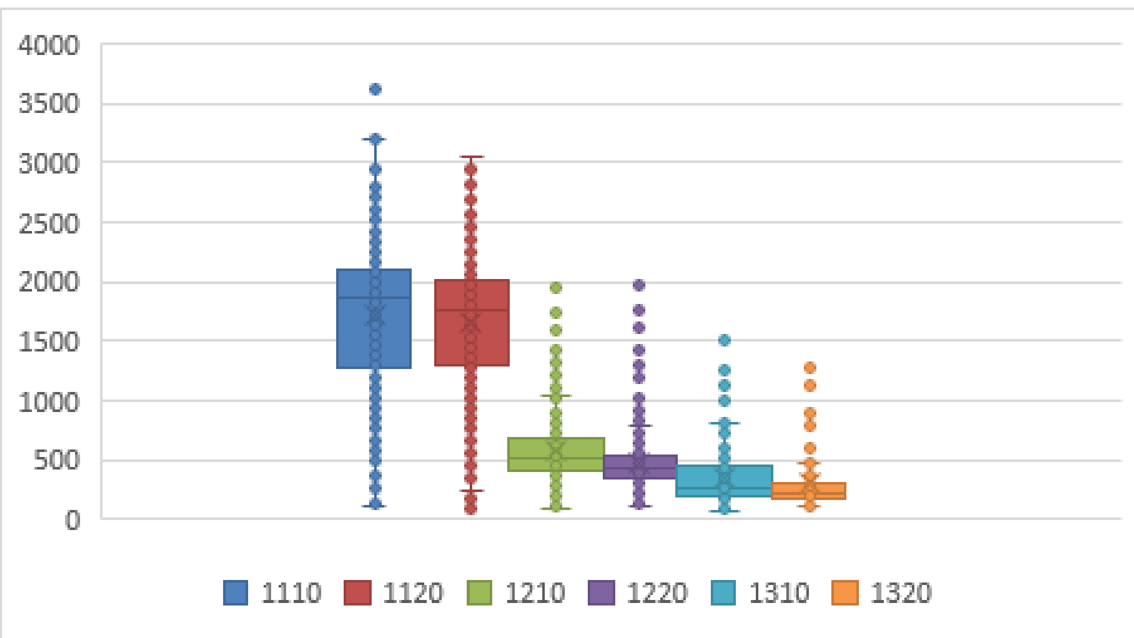
Note: prepared by Ausenco, 2021

Figure 14-3: Box plot for Heavy HREYT assays, ED Victoria



Note: prepared by Ausenco, 2021

Figure 14-4: Box plot for Light Rare Earth REYT assays, ED Victoria

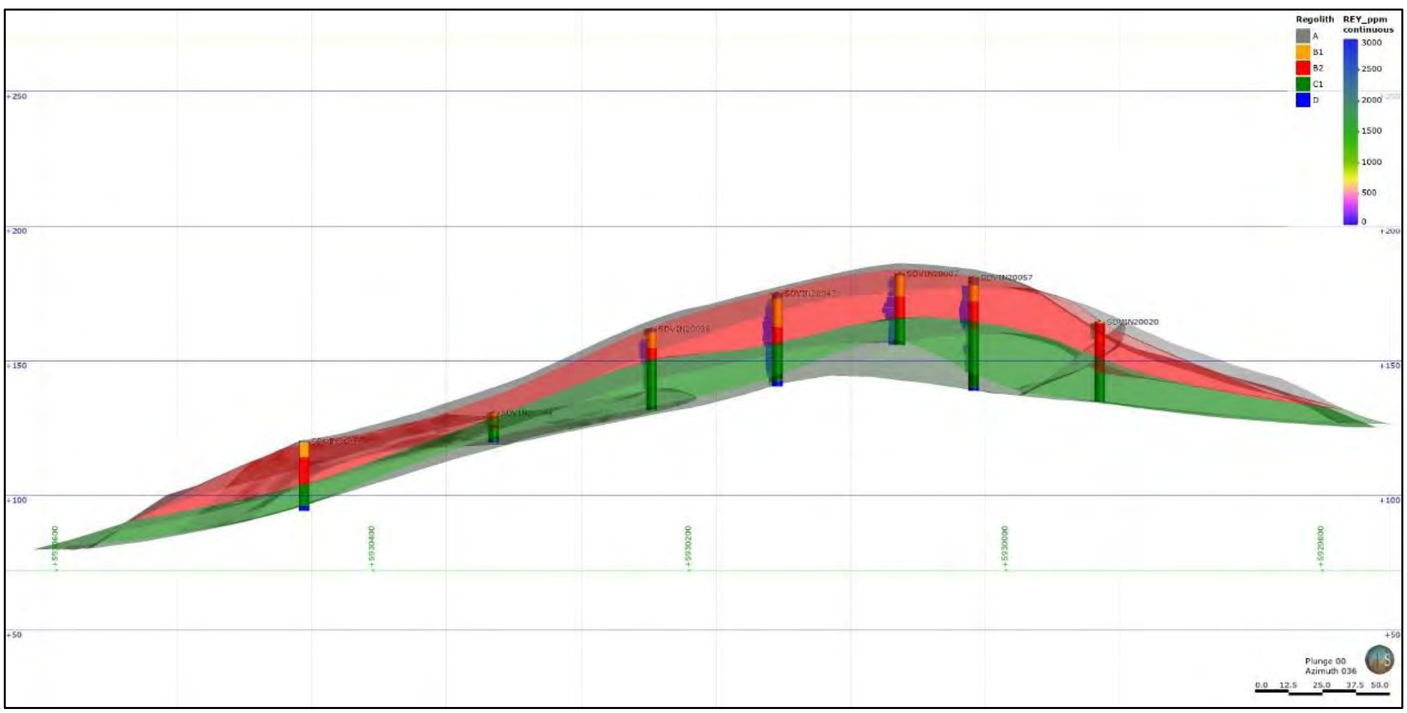


Note: prepared by Ausenco, 2021

Table 14-3: **Definition of Estimation Unit**

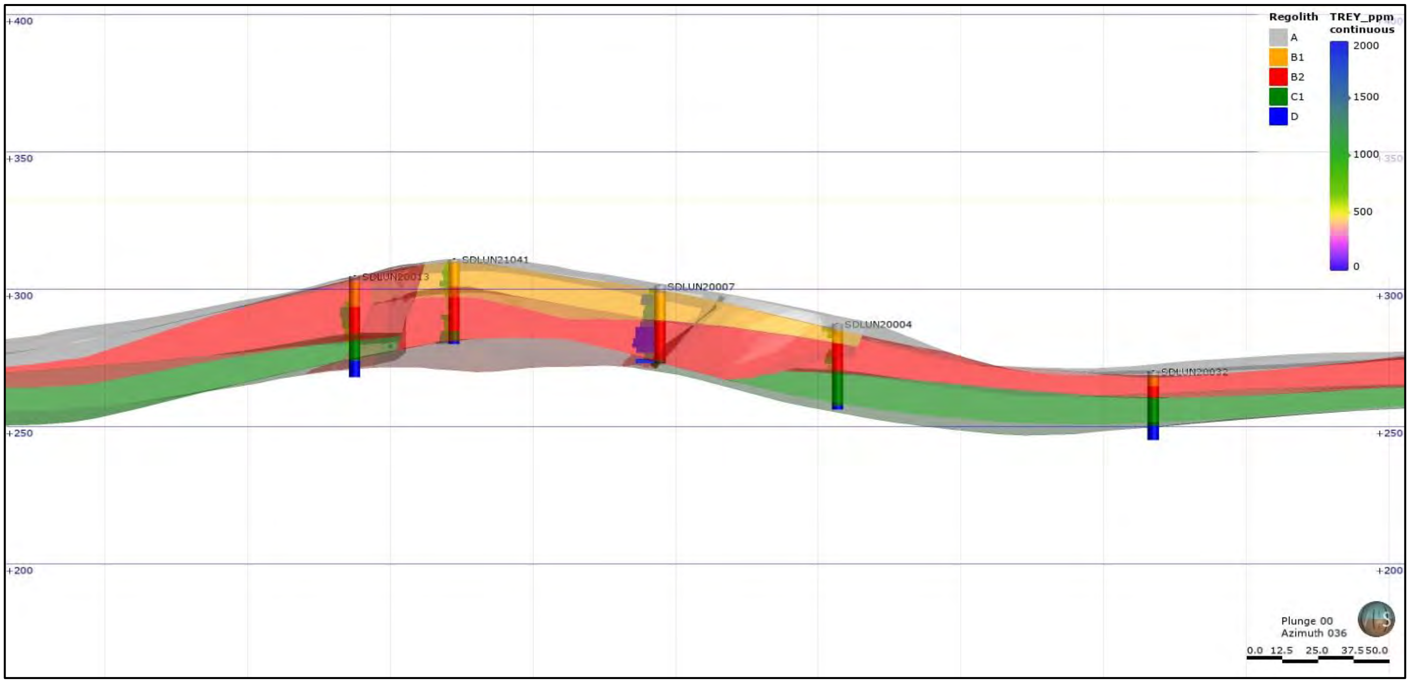
ED	Description
1110	Garnet Granitoid | ED B1-B2, Victoria
1120	Garnet Granitoid | ED C1, Victoria
1210,1310	Diorite-Metapelite | ED B1-B2, Victoria
1220,1320	Diorite-Metapelite | ED C1, Victoria
2110	Garnet Granitoid | ED B1, Luna
2120	Garnet Granitoid | ED B2-C1, Luna
2210,2310	Diorite-Metapelite | ED B1-B2, Luna
2220,2320	Diorite-Metapelite | ED C1, Luna
3110	Garnet Granitoid | ED B1-B2, Alexandra
3120	Garnet Granitoid | ED C1, Alexandra
3210,3310	Diorite-Metapelite | ED B1-B2, Alexandra
3220,3320	Diorite-Metapelite | ED C1, Alexandra
4110	Garnet Granitoid | ED B1-B2, Maite
4120	Garnet Granitoid | ED C1, Maite
4210,4310	Diorite-Metapelite | ED B1-B2, Maite
4220,4320	Diorite-Metapelite | ED C1, Maite

Figure 14-5: **Vertical section NNW Victoria, ED and drillings with Regolith intercepts and REYT grade**



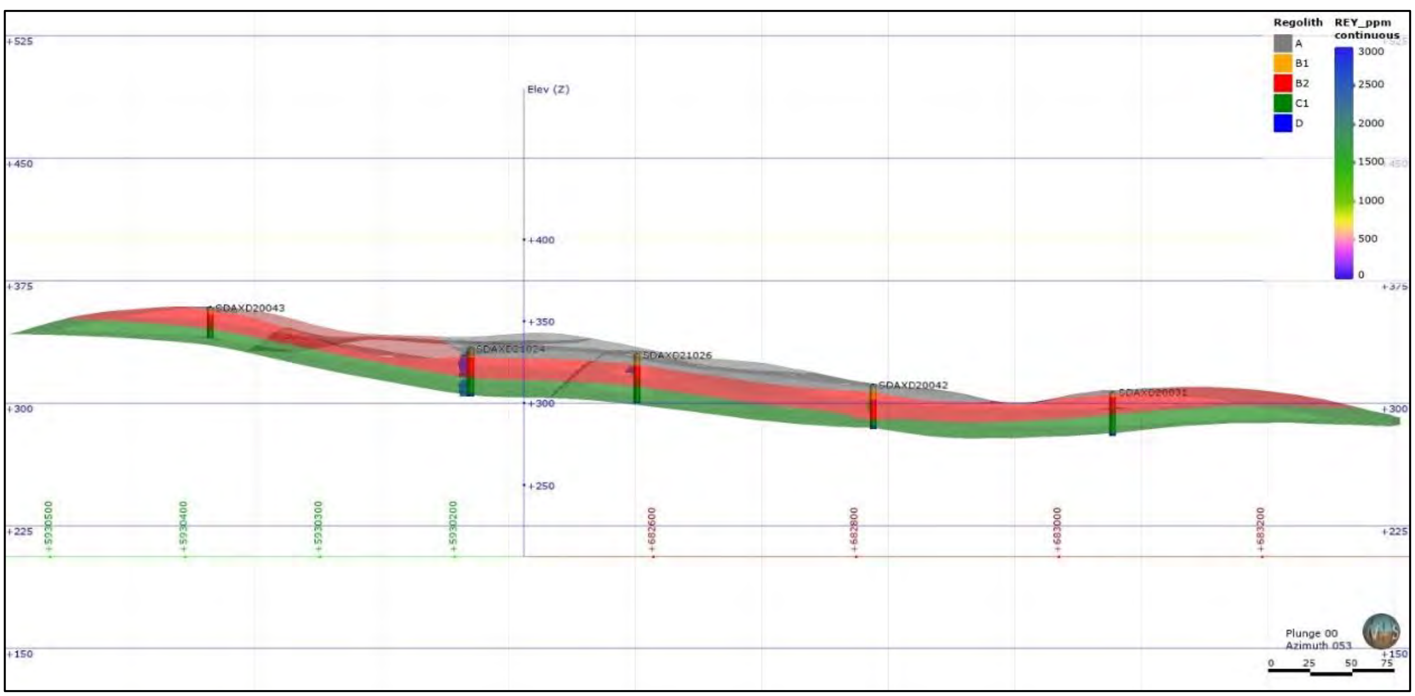
Note: prepared by Ausenco, 2021.

Figure 14-6: Vertical section NNW Luna, ED and drillings with Regolith intercepts and REYT grade



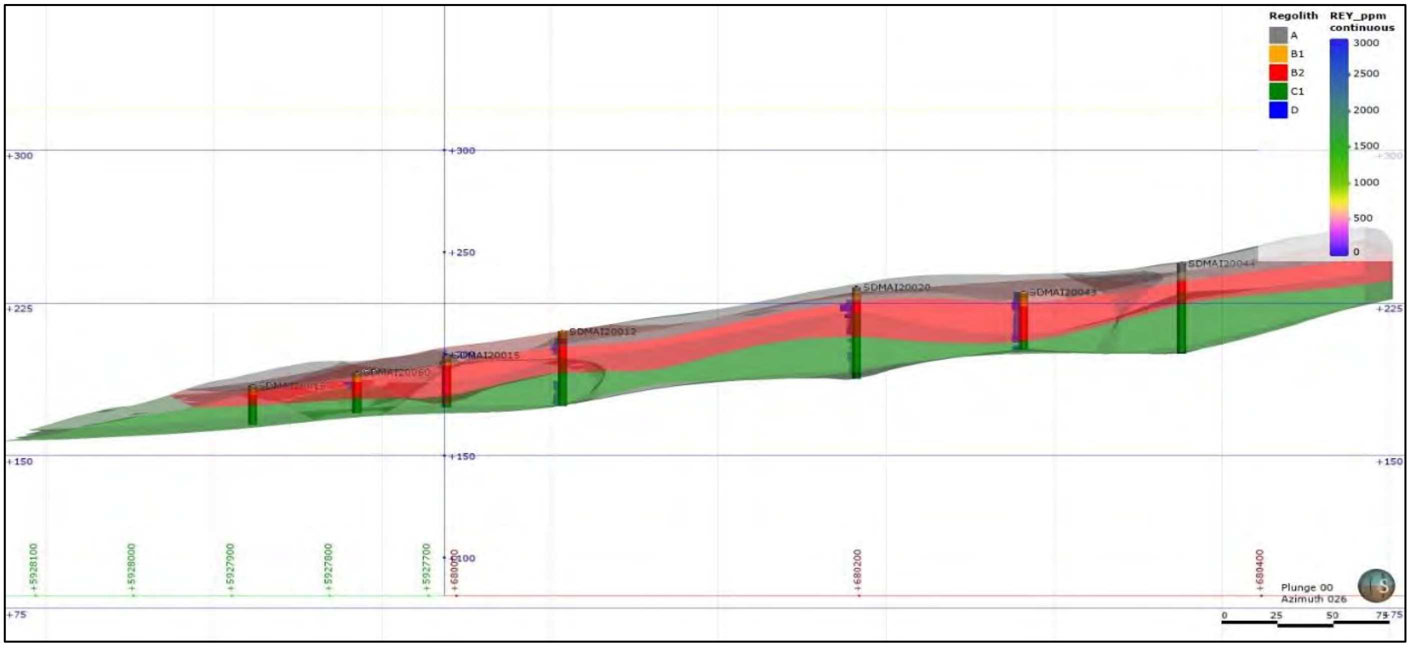
Note: prepared by Ausenco 2021

Figure 14-7: Vertical section NNW Alexandra, ED and drillings with Regolith intercepts and REYT grade



Note: prepared by Ausenco 2021

Figure 14-8: Vertical section NNW Maite, ED and drillings with Regolith intercepts and REYT grade



Note: prepared by Ausenco 2021

14.6 Exploratory Data Analysis

A summary of sample statistics was prepared for REYT by ED for the Victoria, Luna, Alexandra and Maite sectors. Ausenco observed that the Garnet Granitoid has the highest REYT mean of all sectors, and the ED has a lower coefficient of variation (CV) with homogenous distributions.

Box plots were constructed for REYT assays displaying different distributions between the units. The Garnet Granitoid unit is favourably mineralized, with the higher mean in REYT.

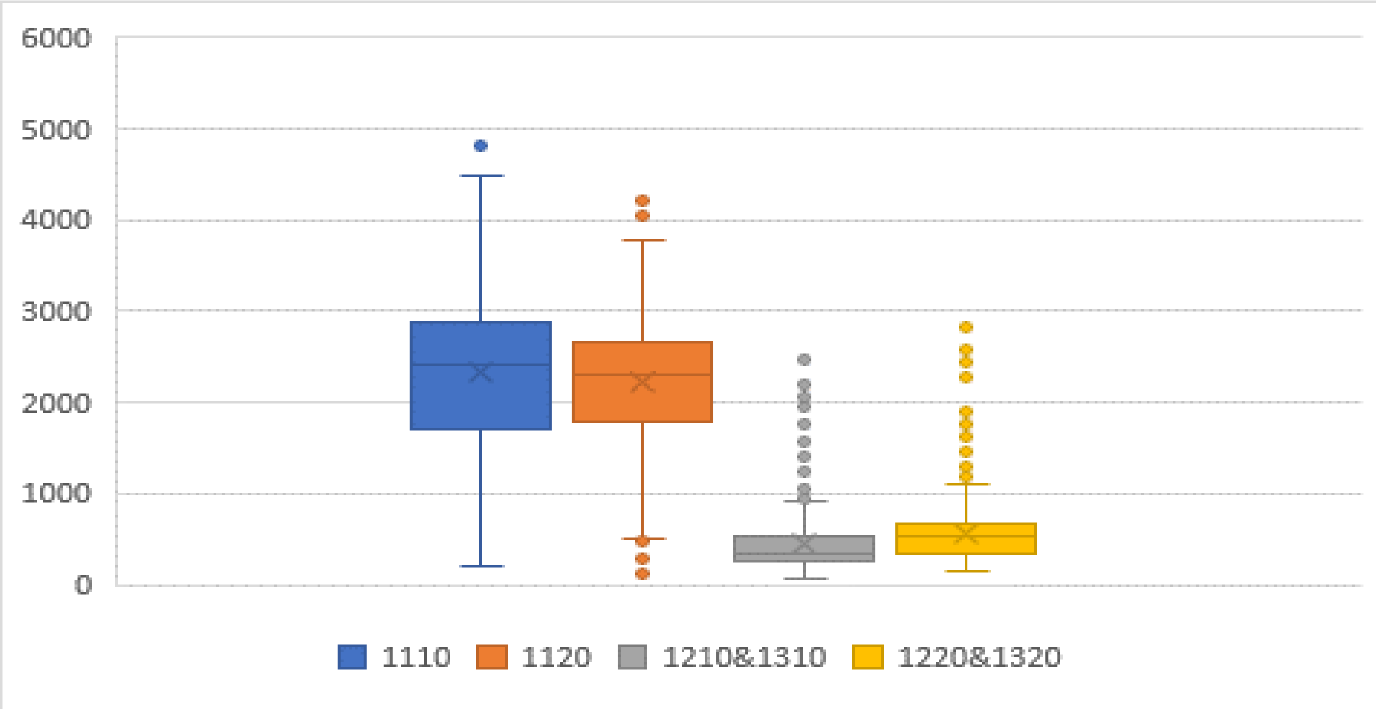
Ausenco also calculated cumulative-frequency distributions and histograms for the 15 rare earth elements including yttrium in the ED.

14.6.1 Victoria Assay

A total of 2,335 data have been used to obtain statistical descriptors. The area has been divided into 4 sectors according to its ED, which corresponds to 1110, 1120, 1210 & 1310 and 1220 & 1320.

Figure 14-9 and Table 14-4 show the REYT associated with the 4 previously defined ED. The highest average of REYT corresponds to the horizon 1110 with a value of 2,361 ppm and 1120 with 2,228 ppm, which are within the Garnet Granitoid. The ED located within the diorite and metapelite lithologies have a lower REYT grade.

Figure 14-9: Box plot REYT (ppm) Victoria



Note: prepared by Ausenco, 2021

Table 14-4: Sample Statistics for REYT by ED, Victoria

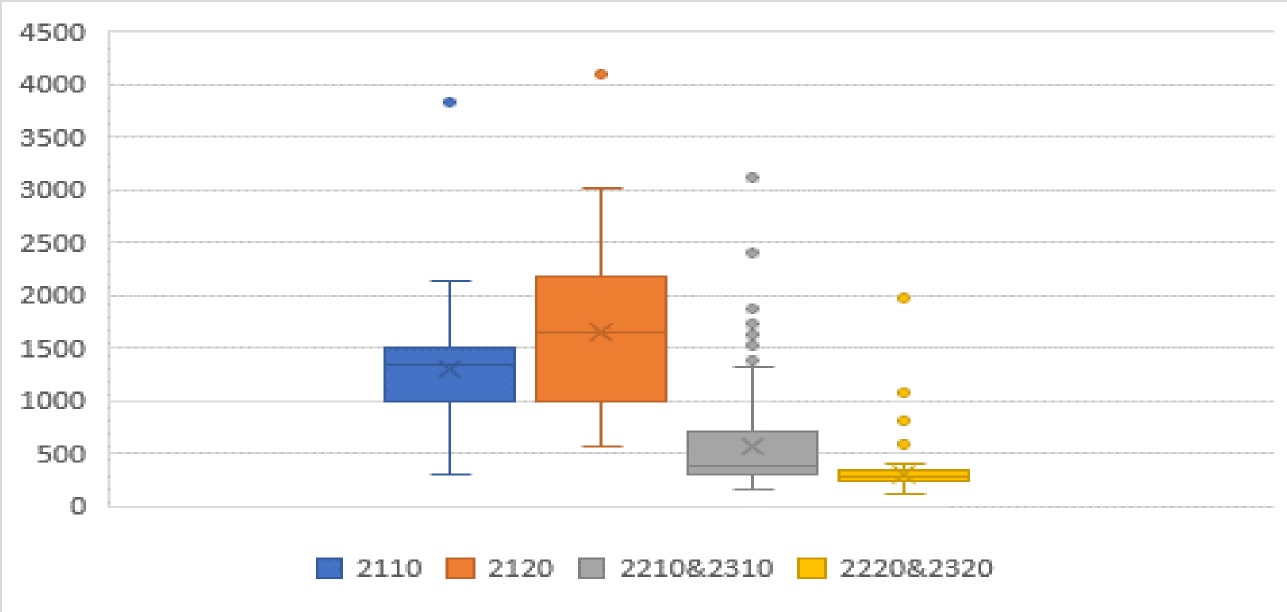
ED	N° Samples	REYT	
		Mean (ppm)	CV
1110	742	2.361	0.34
1120	412	2,228.0	0.30
1210&1310	669	623.1	0.63
1220&1320	512	568.2	0.64
Total	**2,335**	**694.7**	**1.48**

14.6.2 Luna Assay

A total of 497 data have been used to obtain statistical descriptors, the sector has been divided into 4 according to its ED, which correspond to 2110, 2120, 2210 & 2310 and 2220 & 2320.

The highest average of REYT corresponds to the horizon 2120 with a value of 2,161 ppm and followed by horizon 2110. Figure 14-10 and Table 14-5 show a statistical summary.

Figure 14-10: Box plot REYT (ppm) Luna



Note: prepared by Ausenco, 2021

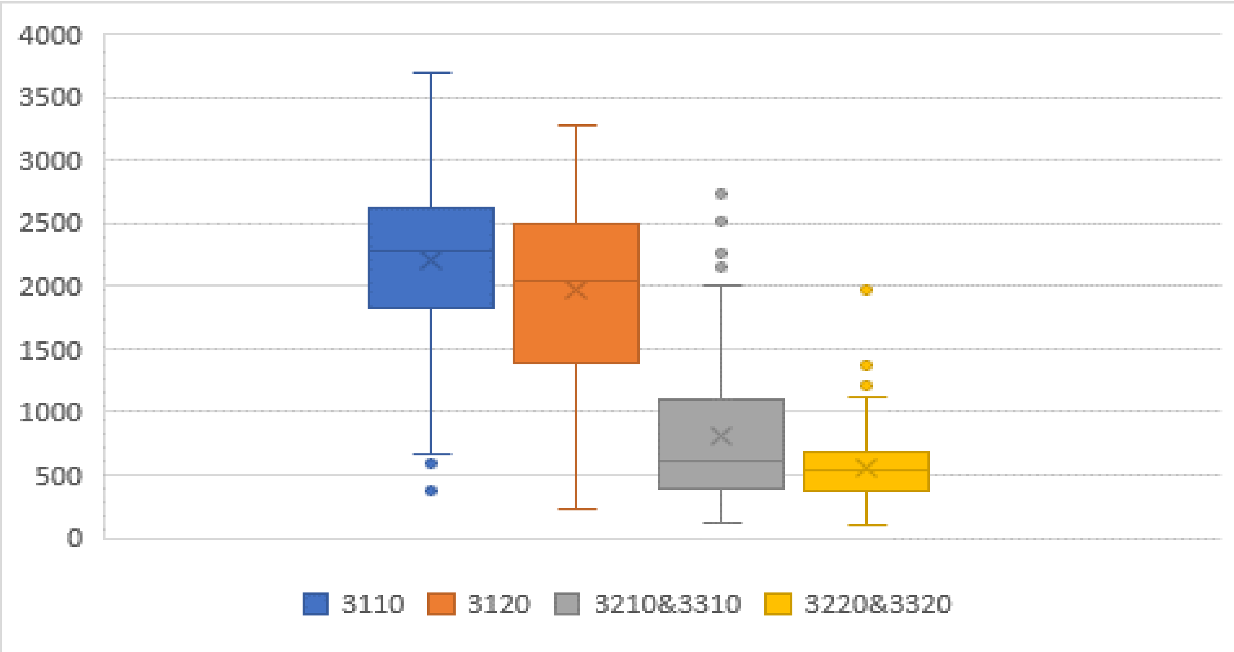
Table 14-5: Sample Statistics for REYT by ED, Luna

ED	N° Samples	REYT	
		Mean (ppm)	CV
2110	68	1,295	0.38
2120	105	2,161	0.43
2210&2310	204	376	0.76
2220&2320	120	294	0.66
Total	497	829.9	0.85

14.6.3 Alexandra Assay

Alexandra's sector incorporates a total 895 samples for statistical analysis. Figure 14-11 and Table 14-6 show that the highest REYT grades are in the ED 3110 and 3120 with grades of 2,227 (ppm) and 2,002 (ppm) respectively. The garnet granite hosts the best grades. Diorite and metapelite has low REYT grades. It is observed that the grades are homogeneous in all the ED analyzed.

Figure 14-11: Box plot REYT (ppm) Alexandra



Note: prepared by Ausenco, 2021

Table 14-6: Sample Statistics for REYT by ED, Alexandra

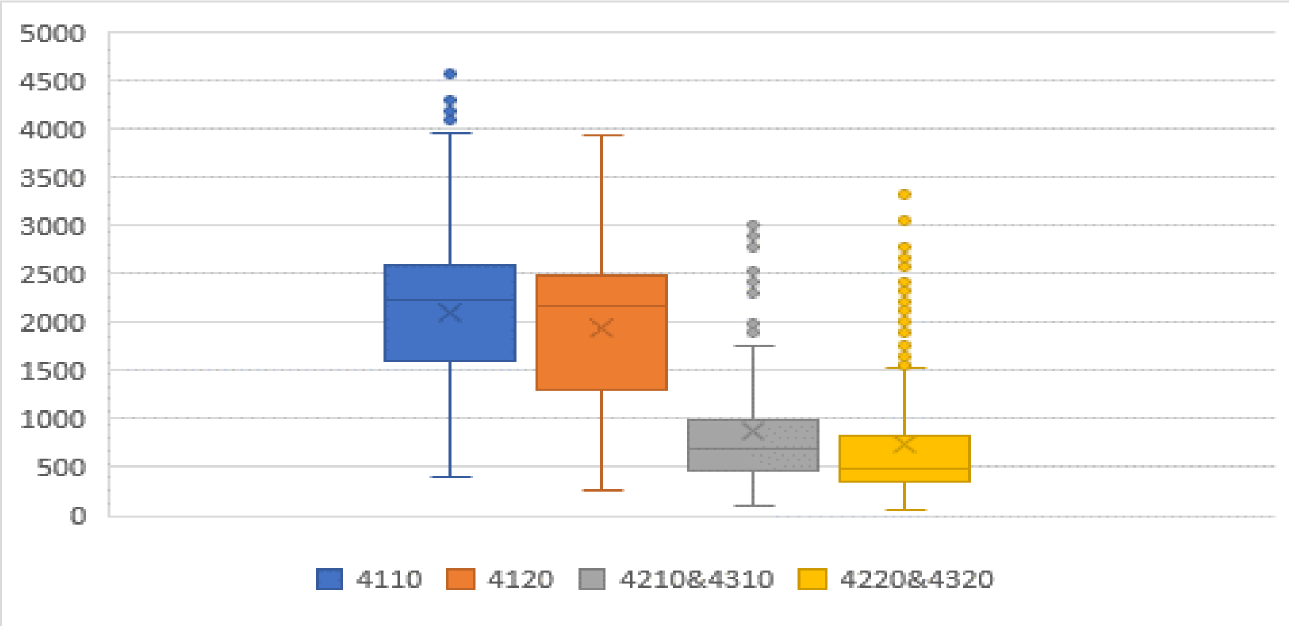
ED	N° Samples	REYT	
		Mean (ppm)	CV
3110	233	2,227	0.28
3120	115	2,002	0.34
3210&3310	271	810	0.65
3220&3320	276	552	0.44
Total	895	1,257.6	0.70

14.6.4 Maite Assay

A total of 1.282 data have been used to obtain statistical descriptors, the sector has been divided into 4 according to its ED, which correspond to 4110, 4120, 4210&4310 y 4220&4320.

Figure 14-12shows the REYT associated to the ED defined. The highest average of REYT corresponds to the horizon 4110 with a value of 2,128 ppm, while que the horizon 4120 has an average 1,933 ppm. The last two correspond to an estimation domain 4210 & 4310 with an average REYT of 889 ppm, finally the horizon 4220 & 4320 has the lowest average REYT (See Table 14-7).

Figure 14-12: Box plot REYT (ppm) Maite



Note: prepared by Ausenco, 2021

Table 14-7: Sample Statistics for REYT by ED, Maite

ED	N° Samples	REYT	
		Mean (ppm)	CV
4110	523	2.128	0,35
4120	241	1,933	0.43
4210&4310	223	889	0.98
4220&4320	295	729	0.88
Total	1,282	1,556.5	0.61

14.7 Correlation Analysis

Using Pearson's correlation coefficient, 2 groups represent the behavior of the total rare earth grades, which are in direct relation to heavy and light rare earth elements. The element Europium was not correlated with any group; or this reason, it was analyzed separately.

The groups formed correspond to the following:

- Group 1: Heavy Rare Earth Elements (HREE)
    - Dysprosium

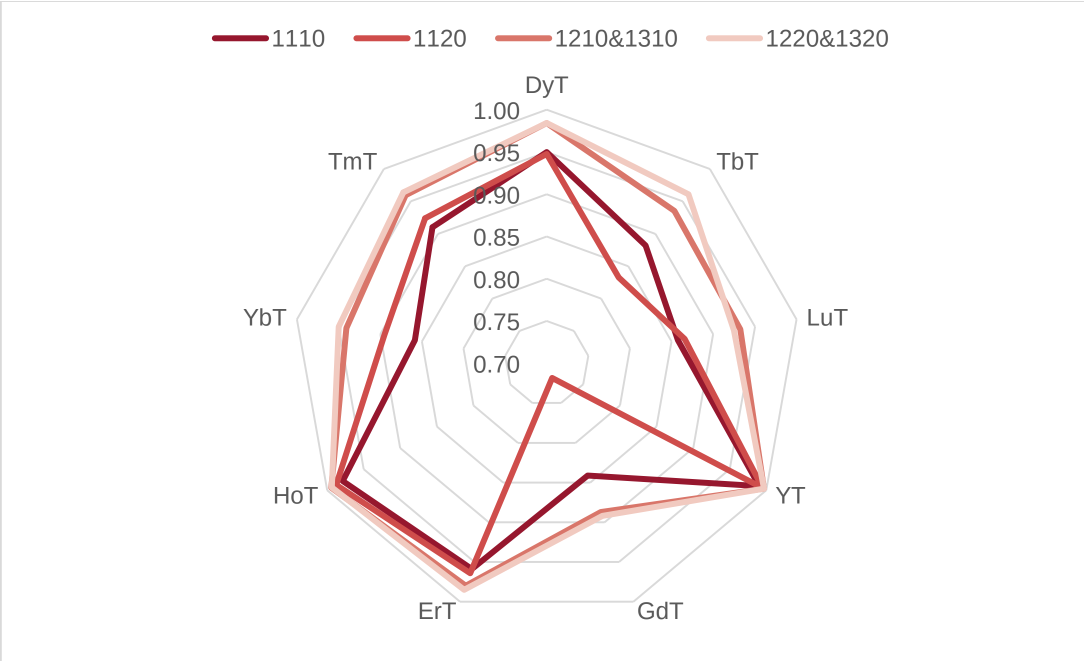
- Terbium
- Lutetium
- Yttrium
- Gadolinium
- Erbium
- Holmium
- Ytterbium
- Thulium

- Group 2: Light Rare Earth Elements (LREE)
  - Neodymium
  - Praseodymium
  - Lanthanum
  - Samarium
  - Cerium

Once the correlation coefficients were obtained, the determination coefficient was calculated to quantify the relationship of the elements of interest for each group. Figure 14-13 through Figure 14-20 show the determination coefficient for the Victoria, Luna, Alexandra and Maite sectors around 0.7, which is considered acceptable to be part of the groups.

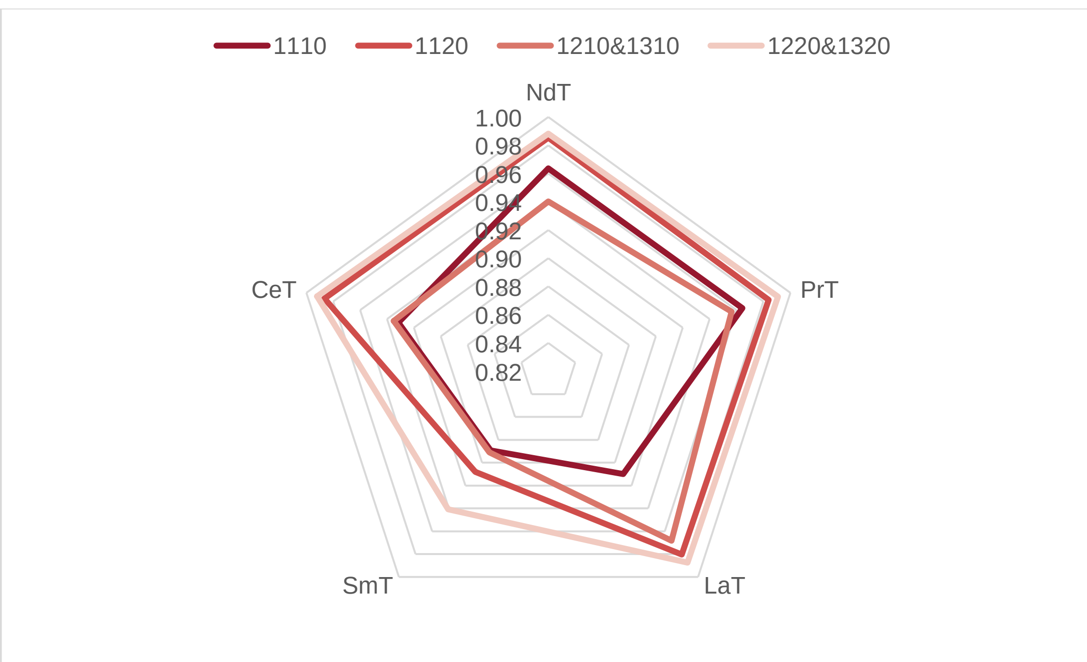
The following graphs show a comparison between the elements studied with the sum of their respective group using the coefficient of determination, by the HREE or LREE groups as appropriate. Values close to 1 allow statistically indicating that the group has a better correlation.

Figure 14-13: Coefficient of Determination HREET, Victoria



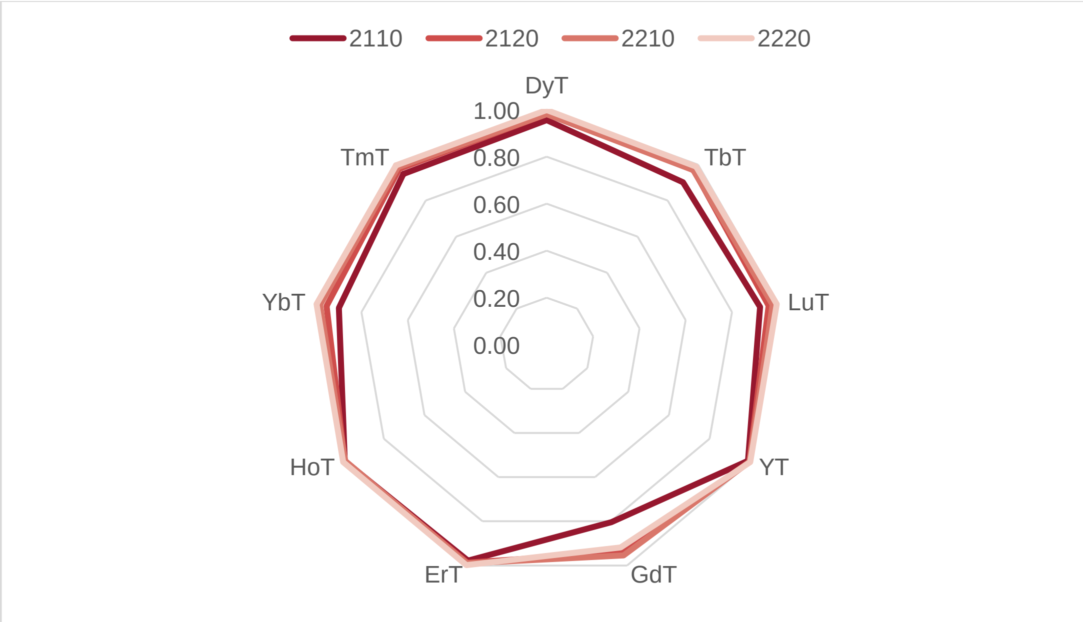
Note: prepared by Ausenco, 2021

Figure 14-14: Coefficient of Determination LREET, Victoria



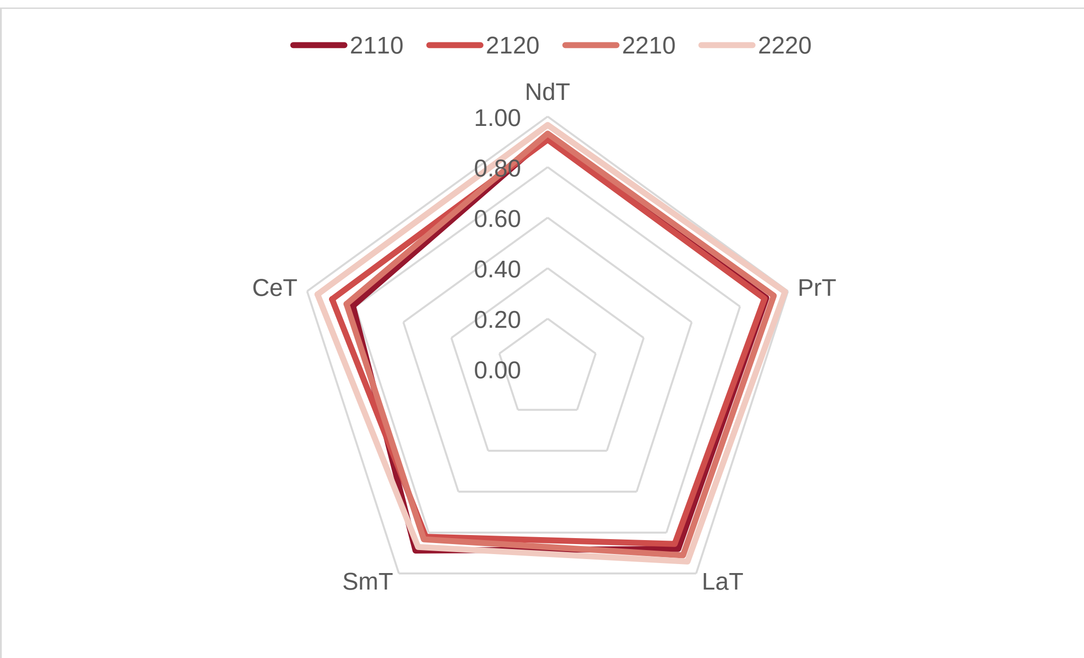
Note: prepared by Ausenco, 2021

Figure 14-15: Coefficient of Determination HREET, Luna



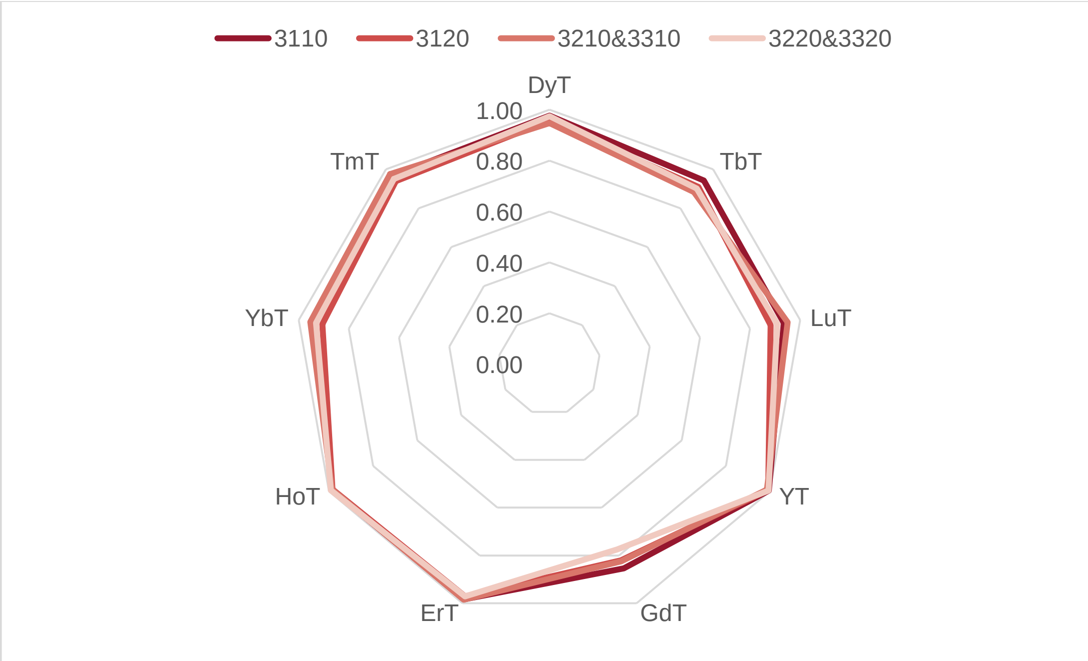
Note: prepared by Ausenco, 2021

Figure 14-16: Coefficient of Determination LREET, Luna



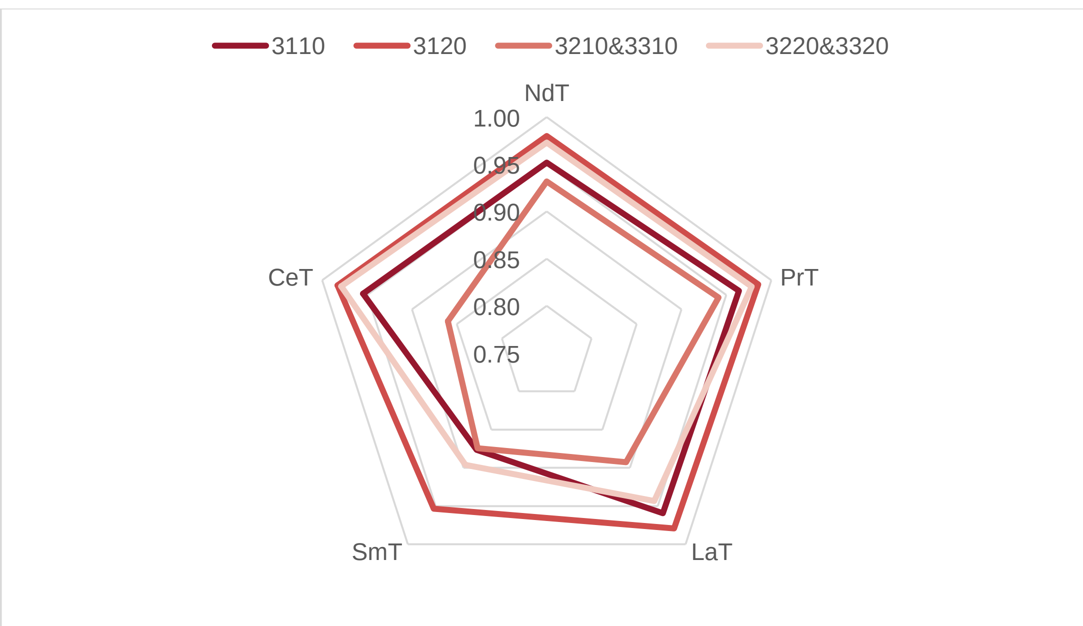
Note: prepared by Ausenco, 2021

Figure 14-17: Coefficient of Determination HREET, Alexandra



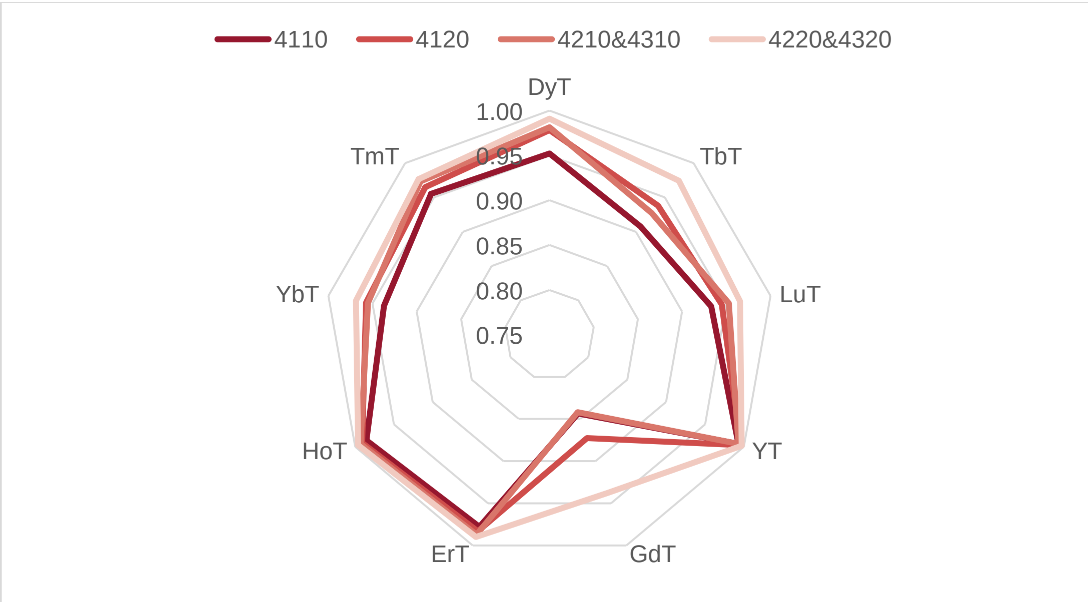
Note: prepared by Ausenco, 2021

Figure 14-18: Coefficient of Determination LREET, Alexandra



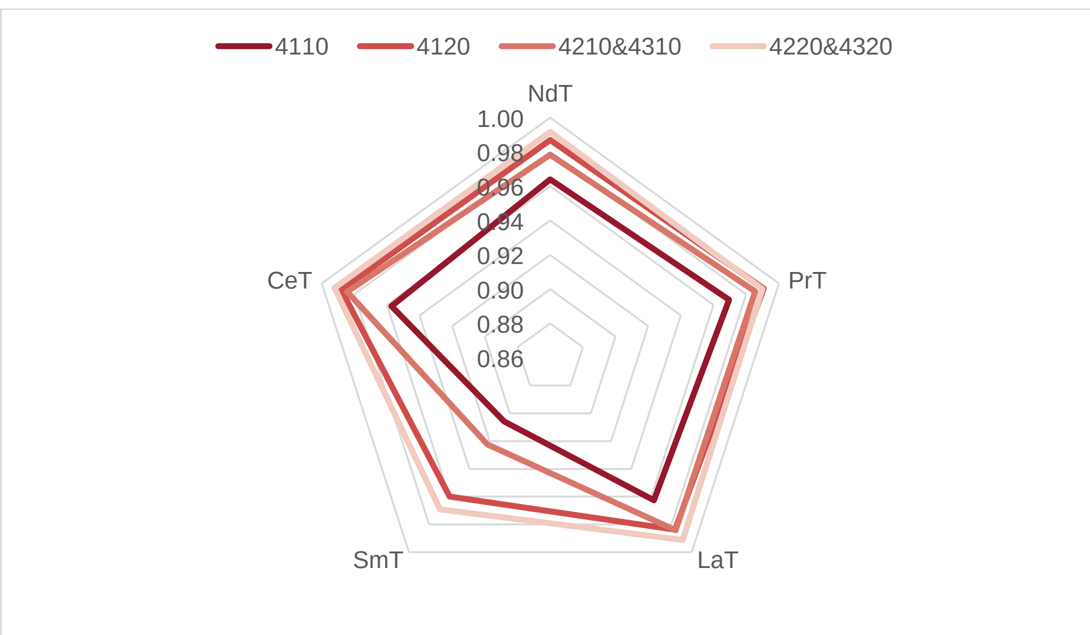
Note: prepared by Ausenco, 2021

Figure 14-19: Coefficient of Determination HREET, Maite



Note: prepared by Ausenco, 2021

Figure 14-20: Coefficient of Determination LREET, Maite



Note: prepared by Ausenco, 2021

14.8 Composites

The nominal sample length for assays was 2 m, corresponding to 64.18% of total samples; 35.82% of the samples are less than 2 m long. For this reason, the length of 2 meters was applied to generate the composite intervals, respecting the contacts between the different ED. However, due to statistical weight effects, samples with length less than 1 m are not considered and that are equal to 1.02% of the length of the original samples.

Composite summary statistics were prepared for total rare earths by ED. The statistics are summarized in Table 14-8 through Table 14-11. To develop the statistical analysis, only were used encoded samples contained by ED.

Table 14-8: Composite Statistics for REYT by ED, Victoria

ED	N° Samples	REYT	
		Mean (ppm)	CV
1110	661	2,363	0.33
1120	373	1,256	0.51
1210&1310	577	549	0.70
1220&1320	459	397	0.92
Total	**2,070**	**1,464.6**	**0.71**

Table 14-9: Composite Statistics for REYT by ED, Luna

ED	N° Samples	REYT	
		Mean (ppm)	CV
2110	63	1,290	0.40
2120	92	1,676	0.43
2210&2310	176	553	0.77
2220&2320	112	301	0.68
Total	**443**	**831.2**	**0.85**

Table 14-10: Composite Statistics for REYT by ED, Alexandra

ED	N° Samples	REYT	
		Mean (ppm)	CV
3110	215	2.226	0.26
3120	106	2.002	0.32
3210&3310	238	817	0.64
3220&3320	260	553	0.43
Total	**819**	**1,328.7**	**0.64**

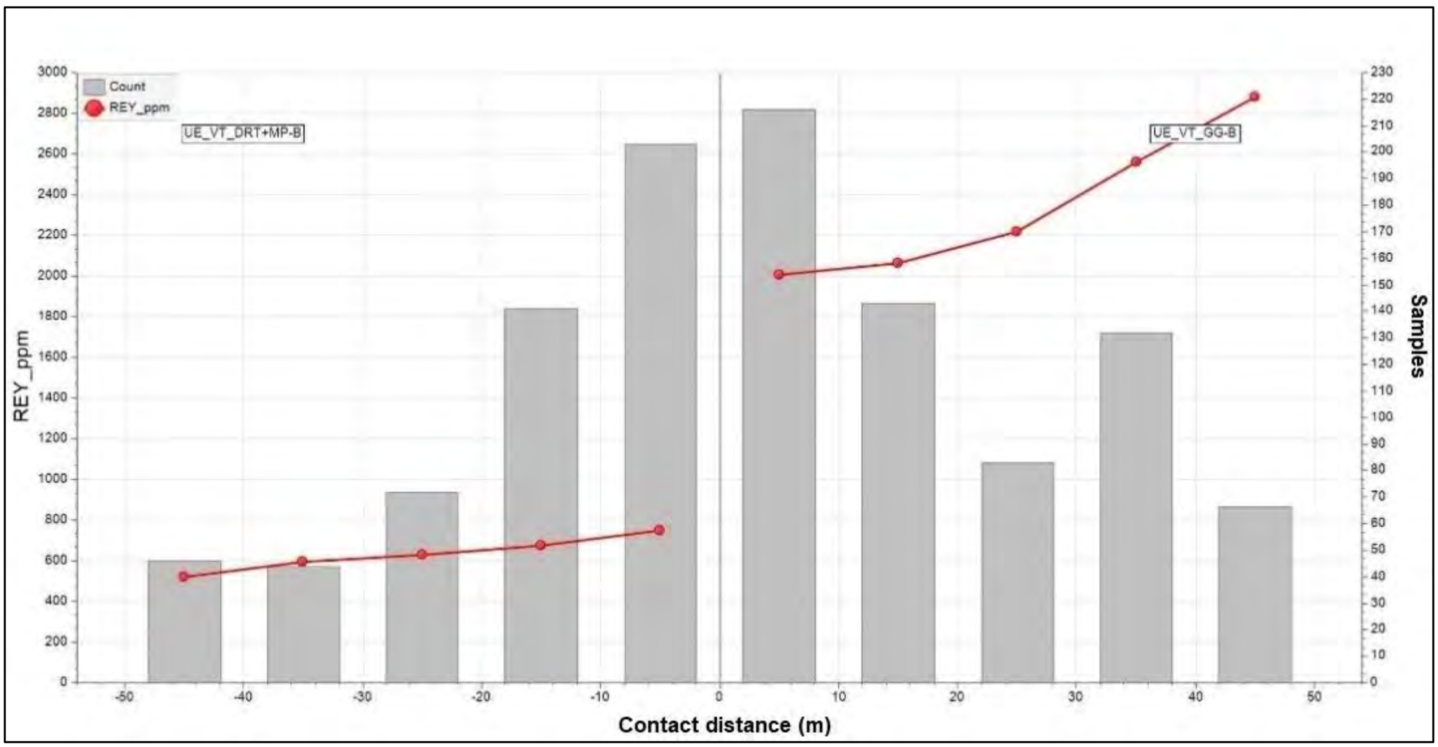
Table 14-11: Composite Statistics for REYT by ED, Maite

ED	N° Samples	REYT	
		Mean (ppm)	CV
4110	482	2,127	0.34
4120	224	1,934	0.43
4210&4310	201	892	0.69
4220&4320	276	730	0.86
Total	**1,183**	**1,556.8**	**0.61**

14.9 Contact Analyses

Contact plots were conducted between each domain to determine whether rare earth elements (REE) estimation should use soft or hard contacts. The graphs indicated that all contacts were hard, for that the domains were independently estimated. Figure 14-21 Shows Contact plot for REYT between ED 1110 and 1210&1310 at Victoria sector.

Figure 14-21: Contact plot for REYT, 1110 -1210&1310, Victoria



Note: prepared by Ausenco, 2021

14.10 Capping/Outlier Restriction

Cumulative probability distribution by estimation domain to define grade outliers. Outlier values can impact the grade estimation through the smearing of anomalous high grades, and subsequently cause grade overestimation. Restriction was applied to high grade values, replaced by the value of the defined outlier limit.

Table 14-12: Outlier Restriction REET, Victoria

Composite Victoria			1110	1120	1210& 1310	1220& 1320
1	Dysprosium	Dy	127	110	70.5	45
2	Neodymium	Nd	520	560	340	340
3	Terbium	Tb	19	13	13	7.5
4	Lutetium	Lu	11	11.5	5.5	3.5
5	Yttrium	Y	1,000	660	450	250
6	Gadolinium	Gd	110	82	55	50
7	Praseodymium	Pr	75	150	90	90
8	Erbium	Er	105	97	45	25
9	Holmium	Ho	32	25	15	9
10	Ytterbium	Yb	95	75	46	25
11	Lanthanum	La	720	650	340	390
12	Europium	Eu	5	3.9	5.5	3.9
13	Samarium	Sm	110	82	56	55
14	Cerium	Ce	1,200	1,160	610	800
15	Thulium	Tm	17	11	6.5	3.8

Table 14-13: Outlier Restriction REET, Luna

Composite Luna			2110	2120	2210& 2310	2220& 2320
1	Dysprosium	Dy	84	170	110	30
2	Neodymium	Nd	410	300	200	105
3	Terbium	Tb	14	19	15	5
4	Lutetium	Lu	7	11	8	3
5	Yttrium	Y	480	1050	800	200
6	Gadolinium	Gd	71	90	60	30
7	Praseodymium	Pr	110	90	43	20
8	Erbium	Er	58	110	80	20
9	Holmium	Ho	24	39	25	7
10	Ytterbium	Yb	50	90	60	15
11	Lanthanum	La	510	340	180	98
12	Europium	Eu	4.9	4	9	3
13	Samarium	Sm	65	55	35	20

14	Cerium	Ce	790	650	310	140
15	Thulium	Tm	8	16	10	3

Table 14-14: Outlier Restriction REET, Alexandra

Composite Alexandra			3110	3120	3210& 3310	3220& 3320
1	Dysprosium	Dy	140	115	85	35
2	Neodymium	Nd	540	425	390	180
3	Terbium	Tb	18	14.5	14	5
4	Lutetium	Lu	12	9.5	8	3
5	Yttrium	Y	900	650	550	250
6	Gadolinium	Gd	90	75	70	30
7	Praseodymium	Pr	140	120	100	48
8	Erbium	Er	90	75	60	24
9	Holmium	Ho	35	25	20	8.5
10	Ytterbium	Yb	80	70	50	20
11	Lanthanum	La	550	475	450	200
12	Europium	Eu	4.9	4	6	3.3
13	Samarium	Sm	82	70	70	28
14	Cerium	Ce	1,050	950	750	400
15	Thulium	Tm	14	12	8	3

Table 14-15: Outlier Restriction REET, Maite

Composite Maite			4110	4120	4210& 4310	4220&4 320
1	Dysprosium	Dy	140	90	75	70
2	Neodymium	Nd	590	500	400	430
3	Terbium	Tb	16	14	11	11
4	Lutetium	Lu	12	11	6.2	5.5
5	Yttrium	Y	800	640	450	400
6	Gadolinium	Gd	90	80	60	60
7	Praseodymium	Pr	150	140	100	105
8	Erbium	Er	90	70	48	42
9	Holmium	Ho	28	20	16	15
10	Ytterbium	Yb	85	75	45	35
11	Lanthanum	La	600	600	450	450
12	Europium	Eu	5	3.2	5	3.5
13	Samarium	Sm	85	80	68	65
14	Cerium	Ce	1,190	1,150	900	950
15	Thulium	Tm	12	11	6.8	5.8

Table 14-16 shows the reduction of the average grade as result of capping for the REYT by estimation domain and sectors.

Table 14-16: Effect of caping on REYT grade

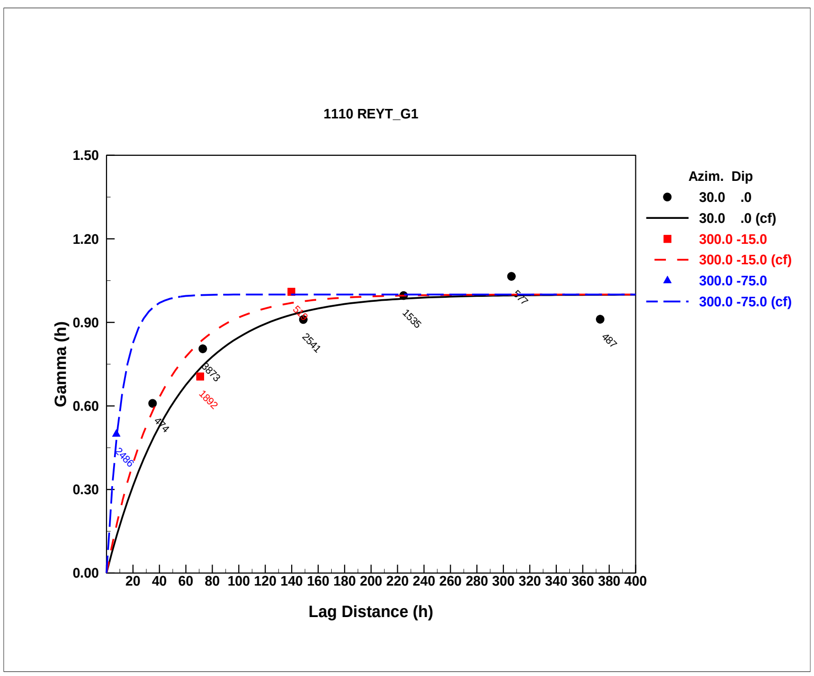
Victoria			
1110	1120	1210&1310	1220&1320
1.59%	0.43%	0.95%	1.24%
Luna			
2110	2120	2210&2310	1220&1320
1.25%	0.51%	1.54%	5.39%
Alexandra			
3110	3120	3210&3310	3220&3320
0.22%	0.44%	1.63%	1.14%
Maite			
4110	4120	4210&4310	4220&4320
0.58%	0.60%	0.98%	0.78%

14.11 Variography

Ausenco used the Sage2001 software to construct down-the-hole and directional correlograms for HREET and LREET in all sectors. The correlograms show good continuity in the orientation of the mineralized body (Garnet Granitoid), striking approximately between 0° to 30°azimuth, and dipping between 0°to 15°.Figure 14-22, Figure 14-23 and Figure 14-24 shows correlograms of HREET, HREET and Europium respectively in the Victoria sector.

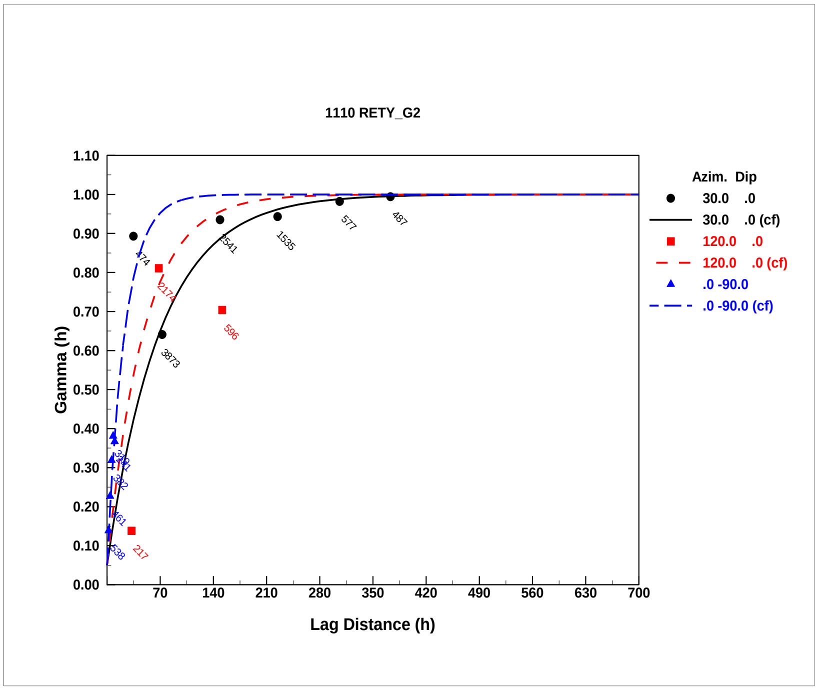
Due to the low density of samples, the Diorite and Metapelite lithologies by horizons were combined for the variographic study. For the variographic study for the Luna sector, estimation units 2110 and 2120 were combined due to the low density of samples within these units and Metapelite was combined with Diorite.

Figure 14-22: Correlogram HREET 1110



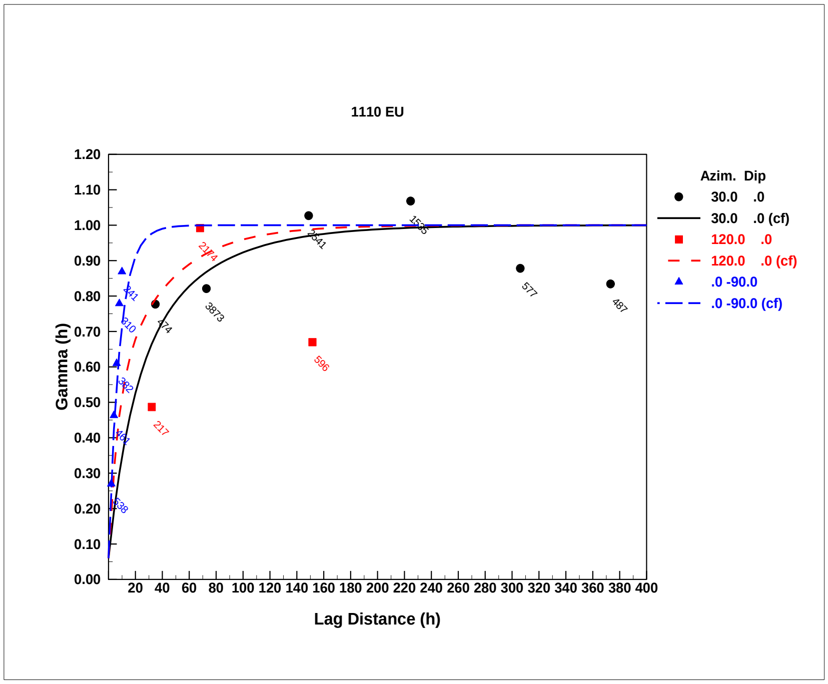
Note: prepared by Ausenco 2021

Figure 14-23: Correlogram LREET 1110



Note: prepared by Ausenco 2021

Figure 14-24: Correlogram Europium 1110



Note: prepared by Ausenco 2021

Table 14-17: Correlograms by Estimation Domain, Victoria

ED			1ª Structure				2ª Structure			
	Axes	Co	C1	Az	Dip	Range	C2	Az	Dip	Range
1110 HREYT	X	0.0	0.0	120	15	80	0.999	121	15	120
	Y			30	0	80		30	0	180
	Z			300	75	10		300	75	30
1110 LREYT	X	0.05	0.95	120	0	145				
	Y			30	0	210				
	Z			90	90	70				
1110 EU	X	0.06	0.446	120	0	20	0.494	120	0	120
	Y			30	0	50		30	0	160
	Z			90	90	20		90	90	30
1120 HREYT	X	0.0	1	120	0	32				
	Y			30	0	125				
	Z			90	90	20				
1120 LREYT	X	0.0	1	120	0	110				
	Y			30	0	160				
	Z			90	90	20				
1120 EU	X	0.1	0.9	120	0	80				
	Y			30	0	160				
	Z			90	90	20				
1210-1310 HREYT	X	0.0	1	120	0	90				
	Y			30	0	160				
	Z			90	90	20				
1210-1310 LREYT	X	0.0	1	99	-4	145				
	Y			9	-8	340				
	Z			34	81	40				
1210-1310 EU	X	0.1	0.9	120	0	130				
	Y			30	0	160				
	Z			90	90	20				

ED			1ª Structure				2ª Structure			
	Axes	Co	C1	Az	Dip	Range	C2	Az	Dip	Range
1220-1320 HREYT	X	0.0	1	90	0	180				
	Y			360	0	210				
	Z			90	90	30				
1220-1320 LREYT	X	0.05	0.95	90	0	110				
	Y			360	0	250				
	Z			90	90	30				
1220-1320 EU	X	0.05	0.95	90	0	80				
	Y			360	0	180				
	Z			90	90	30				

Table 14-18: Correlograms by Estimation Domain. Luna

ED			1ª Structure				2ª Structure			
	Axes	Co	C1	Az	Dip	Range	C2	Az	Dip	Range
2110-2120 HREYT	X	0.05	0.95	30	15	210				
	Y			300	0	56				
	Z			210	75	20				
2110-2120 LREYT	X	0.05	0.95	120	0	32				
	Y			30	0	210				
	Z			90	90	36				
2110-2120 Eu	X	0	1	90	0	40				
	Y			360	0	180				
	Z			90	90	15				
2210-2220 HREYT	X	0	1	120	0	90				
	Y			30	0	210				
	Z			90	90	40				
2210-2220 LREYT	X	0.05	.95	90	0	220				
	Y			360	0	350				
	Z			90	90	30				

ED			1ª Structure				2ª Structure			
	Axes	Co	C1	Az	Dip	Range	C2	Az	Dip	Range
2210-2220 EU	X	0	1	90	0	85				
	Y			360	0	140				
	Z			90	90	25				

Table 14-19: Correlograms by Estimation domain. Alexandra

ED			1ª Structure				2ª Structure			
	Axes	Co	C1	Az	Dip	Range	C2	Az	Dip	Range
3110-3120 HREYT	X	0	1	150	0	60				
	Y			60	0	140				
	Z			90	90	30				
3110-3120 LREYT	X	0	1	120	0	60				
	Y			30	0	120				
	Z			90	90	30				
3110-3120 Eu	X	0	1	150	0	60				
	Y			60	0	140				
	Z			90	90	20				
3210-3310 HREYT	X	0	1	210	0	60				
	Y			120	0	150				
	Z			90	90	20				
3210-3310 LREYT	X	0	1	210	0	60				
	Y			120	0	150				
	Z			90	90	20				
3210-3310 EU	X	0	1	210	0	60				
	Y			120	0	200				
	Z			90	90	20				
3220-3320 HREYT	X	0.16	0.84	150	0	60				
	Y			60	0	150				
	Z			90	90	20				

ED			1ª Structure				2ª Structure			
	Axes	Co	C1	Az	Dip	Range	C2	Az	Dip	Range
3220-3320 LREYT	X	0.1	0.9	150	0	60				
	Y			60	0	200				
	Z			90	90	20				
3220-3320 EU	X	0	1	180	0	60				
	Y			90	0	150				
	Z			90	90	20				

Table 14-20: Correlograms by Estimation domain. Maite

ED			1ª Structure				2ª Structure			
	Axes	Co	C1	Az	Dip	Range	C2	Az	Dip	Range
4110 HREYT	X	0.1	0.9	60	9	250				
	Y			330	0	90				
	Z			240	81	30				
4110 LREYT	X	0.1	0.9	60	15	250				
	Y			330	0	85				
	Z			240	75	30				
4110 EU	X	0	1	360	15	80				
	Y			270	0	20				
	Z			180	75	10				
4120 HREYT	X	0.0	1	30	0	250				
	Y			300	0	100				
	Z			90	90	30				
4120 LREYT	X	0.05	0.95	30	0	300				
	Y			300	0	80				
	Z			90	90	30				
4120 EU	X	0.4	0.6	30	0	170				
	Y			300	0	45				
	Z			90	90	15				
4210-4310	X	0.1	0.9	30	0	215				

ED	Axes	Co	C1	1ª Structure Az	Dip	Range	2ª Structure C2	Az	Dip	Range
HREYT	Y			300	0	80				
	Z			90	90	30				
4210-4310 LREYT	X	0.0	1	30	0	215				
	Y			300	0	80				
	Z			90	90	30				
4210-4310 EU	X	0.1	0.9	150	-15	55				
	Y			60	0	130				
	Z			150	75	15				
4220-4320 HREYT	X	0.1	0.9	60	15	240				
	Y			330	0	75				
	Z			240	75	30				
4220-4320 LREYT	X	0.05	0.95	60	15	190				
	Y			330	0	75				
	Z			240	75	30				
4220-4320 EU	X	0.1	0.9	60	0	190				
	Y			330	0	40				
	Z			90	90	20				

14.12 Density

The density was determined by Aclara using the information collected for the different sectors of the deposit. Sonic drilling with Shelby tube and taking samples in trenches were used for sampling. Ausenco considers that the number of samples that support the calculation of density is very low and more samples will be needed to refine the density model. The Densities are summarized in Table 14-21 through Table 14-25.

Table 14-21: Density by horizons B and C. Victoria

Sonic drilling with Shelby tube	
Horizons B and C	**Density (t/m³)**
Metapelite	1.66
Garnet Granitoid	1.71
Diorite	1.61

Table 14-22: Density by Horizon A. Victoria

Trenches Sample	
Horizon A	Density (t/m³)
Metapelite	1.34
Garnet Granitoid	1.29
Diorite	1.37

Table 14-23: Density by Horizon Luna

Horizon	Density (t/m³)
Garnet Granitoid -B1	1.6
Garnet Granitoid -B2	1.66
Garnet Granitoid -C1	1.63
Diorite-B1	1.46
Diorite-B2	1.58
Diorite-C1	1.49
Metapelite-B1	1.7
Garnet Granitoid-A	1.39
Diorite-A	1.27
Metapelite -A	1.5

Table 14-24: Density by Horizon Alexandra

Horizon	Density (t/m³)
Garnet Granitoid-A	1.52
Garnet Granitoid-B1	1.63
Garnet Granitoid-B2	1.63
Garnet Granitoid-C1	1.65
Garnet Granitoid-D	2.7
Diorite-A	1.44
Diorite-B1-B2	1.58
Diorite-C1	1.62
Metapelite-A	1.54

Metapelite-B1-B2	1.46
Metapelite-C1	1.62

Table 14-25: Density by Horizon Maite

Horizon	Density (t/m3)
Garnet Granitoid-A	1.45
Garnet Granitoid-B1	1.56
Garnet Granitoid-B2	1.49
Garnet Granitoid-C1	1.62
Diorite-A	1.39
Diorite-B1	1.48
Diorite-B2	1.41
Diorite-C1	1.58
Metapelite-A	1.41
Metapelite-B1	1.50
Metapelite-B2	1.52
Metapelite-C1	1.58

14.13 Block Model

For the estimation of the REET grades. blocks with regular support of 10 m x 10 m x 2 m. not rotated. was considered. The parameters of the block model are presented in Table 14-26. This block size was chosen because it better represents the geology of the bodies and the continuity of the grade.

Table 14-26: Block model Origin

Coordinates	Minimum (m)	Maximum (m)	Block Size (m)	N° Block
Easting	679,500	684,350	10	485
Northing	5,927,500	5,932,000	10	450
Elevation	-30	400	2	215

14.14 Estimation Plan

The grades of the 15 total rare earth elements were estimated by ED using ordinary kriging (OK). The grade estimation was completed in three passes; these are summarized in Table 14-27 through Table 14-39.

The estimation includes three passes that increase the search area, using different number of samples with at least 3 drill-hole in the first pass, with two in the second and at least 1 in the third pass.

The estimation of a block used a minimum of 6 and a maximum of 12 samples in the first pass. In the case of the second pass, a minimum of 4 and a maximum of 12 samples were considered and the last pass considered a minimum of 2 and a maximum of 12 samples. In order to use the largest number of grade samples, the search was not restricted by octants and only a maximum of 2 samples per drill hole was applied. Hard contacts were assumed, so that samples were not shared across boundaries.

Within this estimation plan. the extraction values were estimated. which were determined by the AGS laboratory and were included in the database. To estimate the extraction values in the block model. The same estimation plan was used as for REYT.

During the development of the resource estimation and mining studies, Aclara detected that its previous methodology to determine the Extraction Value had a bias of around 5% average downward, considering all the elements. Therefore, Aclara determined the correction factors for heavy rare earths, light rare earths and Europium. This correction was applied only to the extraction values within the estimation domains corresponding to GG lithology. (Section 13.4.2.5)

Table 14-27: Estimation Parameters for HREE, LREE and Europium, estimation domain 1110

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
1	X	120	15	30	6	12	2
	Y	30	0	40			
	Z	300	75	7.5			
2	X	120	15	60	4	12	2
	Y	30	0	80			
	Z	300	75	15			
3	X	120	15	120	2	12	2
	Y	30	0	160			
	Z	300	75	30			

Table 14-28: Estimation Parameters for HREE, LREE and Europium, estimation domain 1120

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
1	X	120	0	8	6	12	2
	Y	30	0	41.25			
	Z	0	90	5			
2	X	120	0	16	4	12	2
	Y	30	0	82.5			
	Z	0	90	10			
3	X	120	0	32	2	12	2
	Y	30	0	160			
	Z	0	90	20			

Table 14-29: Estimation Parameters for HREE, LREE and Europium, estimation domain 1210&1310

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
1	X	120	0	22.5	6	12	2
	Y	30	0	40			
	Z	0	90	5			
2	X	120	0	45	4	12	2
	Y	30	0	80			
	Z	0	90	10			
3	X	120	0	90	2	12	2
	Y	30	0	160			
	Z	0	90	20			

Table 14-30: Estimation Parameters for HREE, LREE and Europium, estimation domain 1220&1320

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
1	X	90	0	20	6	12	2
	Y	360	0	45			
	Z	0	90	7.5			
2	X	90	0	40	4	12	2
	Y	360	0	90			
	Z	0	90	15			
3	X	90	0	80	2	12	2
	Y	360	0	180			
	Z	0	90	30			

Table 14-31: Estimation Parameters for HREE, LREE and Europium, estimation domain 2110 and 2120

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
1	X	120	0	35	6	12	2
	Y	30	0	15			
	Z	0	90	5			
2	X	120	0	70	4	12	2
	Y	30	0	30			
	Z	0	90	10			
3	X	120	0	140	2	12	2
	Y	30	0	60			
	Z	0	90	20			

Table 14-32: Estimation Parameters for HREE, LREE and Europium, estimation domain 2210 and 2220

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
1	X	120	0	21.25	6	12	2
	Y	30	0	35			

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
	Z	0	90	6.25			
2	X	120	0	42.5	4	12	2
	Y	30	0	70			
	Z	0	90	12.5			
3	X	120	0	85	2	12	2
	Y	30	0	140			
	Z	0	90	25			

Table 14-33: Estimation Parameters for HREE, LREE and Europium, estimation domain 3110 and 3120

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
1	X	150	0	15	6	12	2
	Y	60	0	35			
	Z	0	90	7.5			
2	X	150	0	30	4	12	2
	Y	60	0	70			
	Z	0	90	15			
3	X	150	0	60	2	12	2
	Y	60	0	140			
	Z	0	90	30			

Table 14-34: Estimation Parameters for HREE, LREE and Europium, estimation domain 3210 and 3310

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
1	X	210	0	15	6	12	2
	Y	120	0	37.5			

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
	Z	0	90	5			
2	X	210	0	30	4	12	2
	Y	120	0	75			
	Z	0	90	10			
3	X	210	0	60	2	12	2
	Y	120	0	150			
	Z	0	90	20			

Table 14-35: Estimation Parameters for HREE, LREE and Europium, estimation domain 3220 and 3320

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
1	X	150	0	15	6	12	2
	Y	60	0	37.5			
	Z	0	90	5			
2	X	150	0	30	4	12	2
	Y	60	0	75			
	Z	0	90	10			
3	X	150	0	60	2	12	2
	Y	60	0	150			
	Z	0	90	20			

Table 14-36: Estimation Parameters for HREE LREE and Europium, estimation domain 4110

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
1	X	60	9	62	6	12	2
	Y	330	0	21			

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
	Z	240	81	7.5			
2	X	60	9	124	4	12	2
	Y	330	0	42			
	Z	240	81	15			
3	X	60	9	248	2	12	2
	Y	330	0	84			
	Z	240	81	30			

Table 14-37: Estimation Parameters for HREE, LREE and Europium, estimation domain 4120

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
1	X	30	0	62	6	12	2
	Y	300	0	20			
	Z	0	90	7.5			
2	X	30	0	124	4	12	2
	Y	300	0	40			
	Z	0	90	15			
3	X	30	0	248	2	12	2
	Y	300	0	80			
	Z	0	90	30			

Table 14-38: Estimation Parameters for HREE, LREE and Europium, estimation domain 4210 and 4310

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
1	X	30	0	54	6	12	2
	Y	300	0	20			

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
	Z	0	90	7.5			
2	X	30	0	108	4	12	2
	Y	300	0	40			
	Z	0	90	15			
3	X	30	0	216	2	12	2
	Y	300	0	80			
	Z	0	90	30			

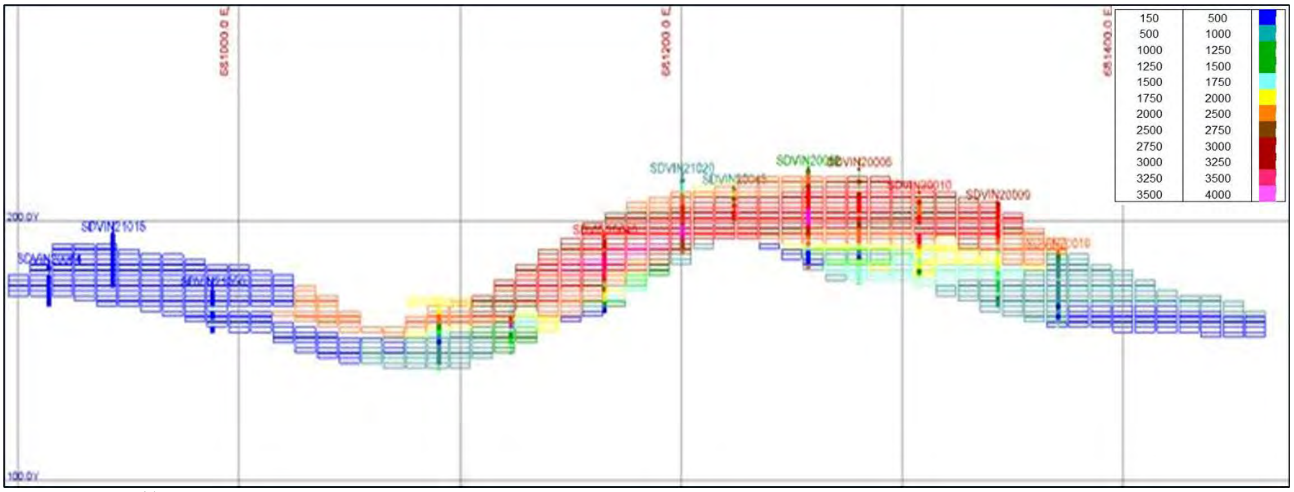
Table 14-39: Estimation Parameters for HREE, LREE and Europium, estimation domain 4220 and 4320

Pass	Ellipsoid				Min N°	Max N°	N° Samples per
	Axes	Az	Dip	Range	Samples	Samples	Drillhole
1	X	60	15	48	6	12	2
	Y	330	0	19			
	Z	240	75	7.5			
2	X	60	15	96	4	12	2
	Y	330	0	38			
	Z	240	75	15			
3	X	60	15	192	2	12	2
	Y	330	0	76			
	Z	240	75	30			

14.15 Block Model Validation

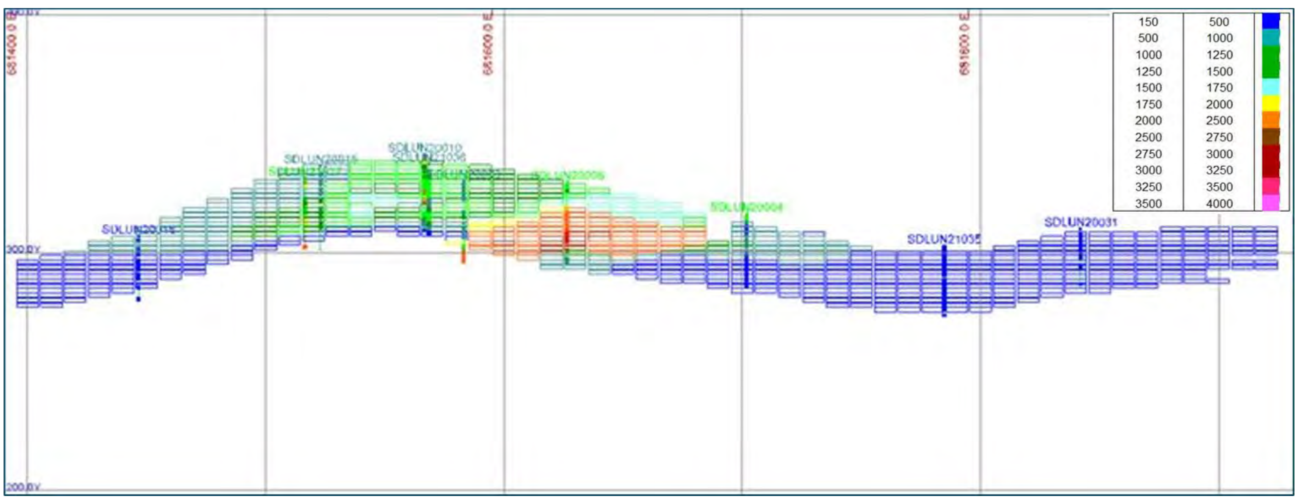
A visual inspection of the plan views and vertical sections of the block model was performed to compare the model grades with the drillhole grades. The inspection did not indicate problems. Figure 14-25 and Figure 14-26 shows the section view for Victoria Norte and Luna.

Figure 14-25: Section View Victoria Norte 5931015 N, REYT Grade



Note: prepared by Ausenco 2021

Figure 14-26: Section View Luna 5928765 N, REYT Grade



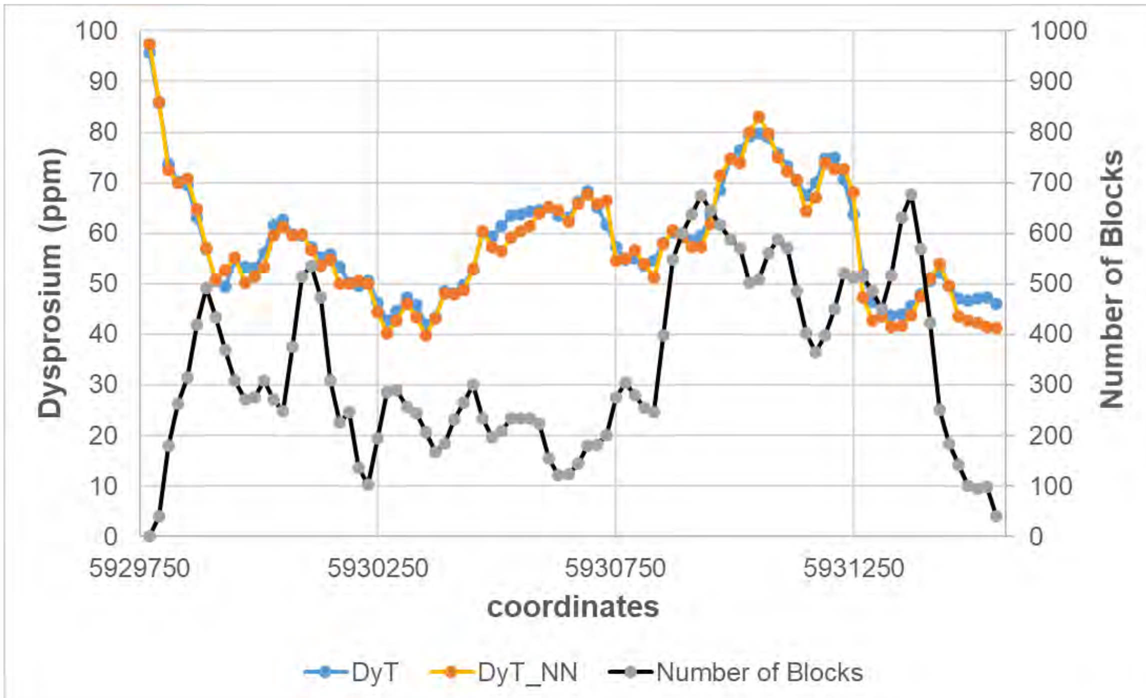
Note: prepared by Ausenco 2021

Block grades are validated against the raw data from the drillhole used in the estimation and with the ungrouped grades from a Nearest Neighbor (NN) analysis. No overall biases were observed.

The drift analysis of Dy. Nd. Tb and Lu grade models in the Victoria, Luna, Alexandra and Maite sectors show a good match between the estimated grades and NN. Figure 14-27, Figure 14-28, Figure 14-29 and Figure 14-30 show the drift analysis for the element dysprosium within the ED in the Victoria sector.

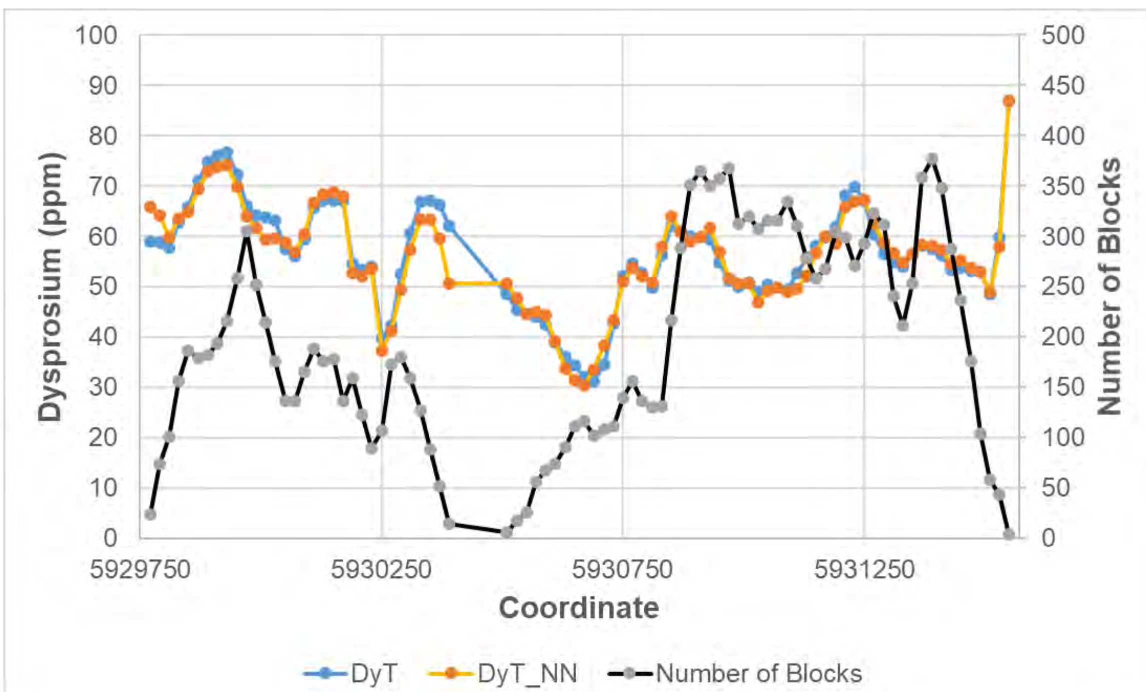
The results of the almost 400 drift analyses divided into the four estimated sectors, show adjusted results between Ordinary Kriging and NN, with good correlation in the estimation of the deposit grades.

Figure 14-27: Drift Analysis Dysprosium. north-south direction Victoria. 1110.



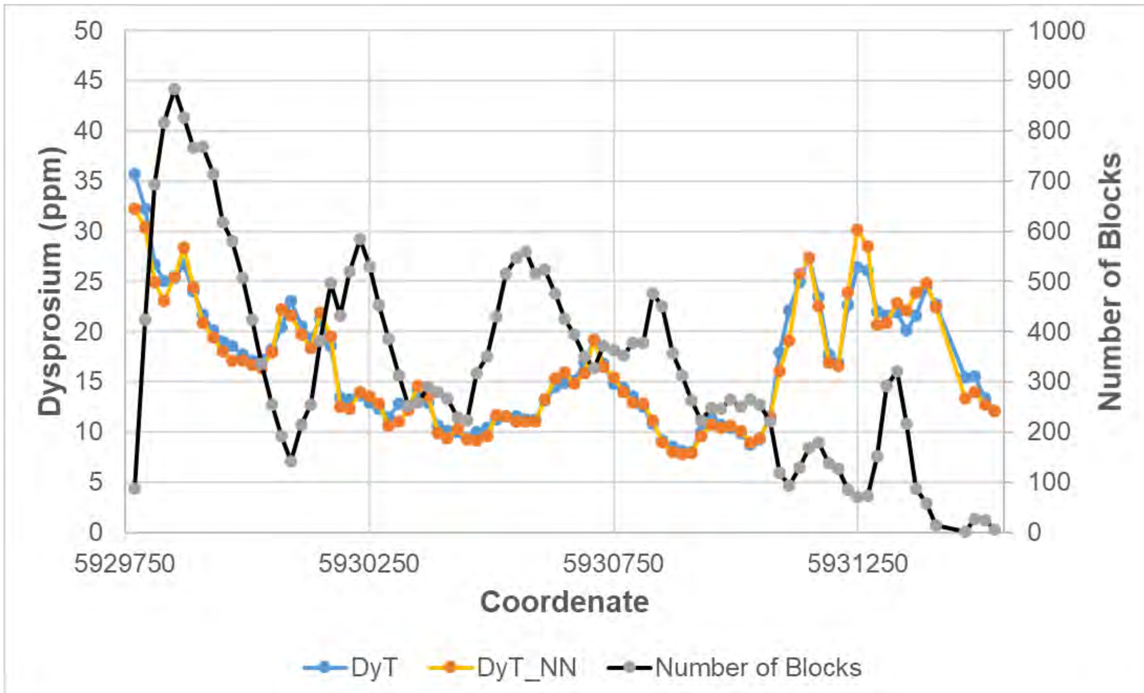
Note: prepared by Ausenco 2021

Figure 14-28: Drift Analysis Dysprosium. north-south direction Victoria. 1120



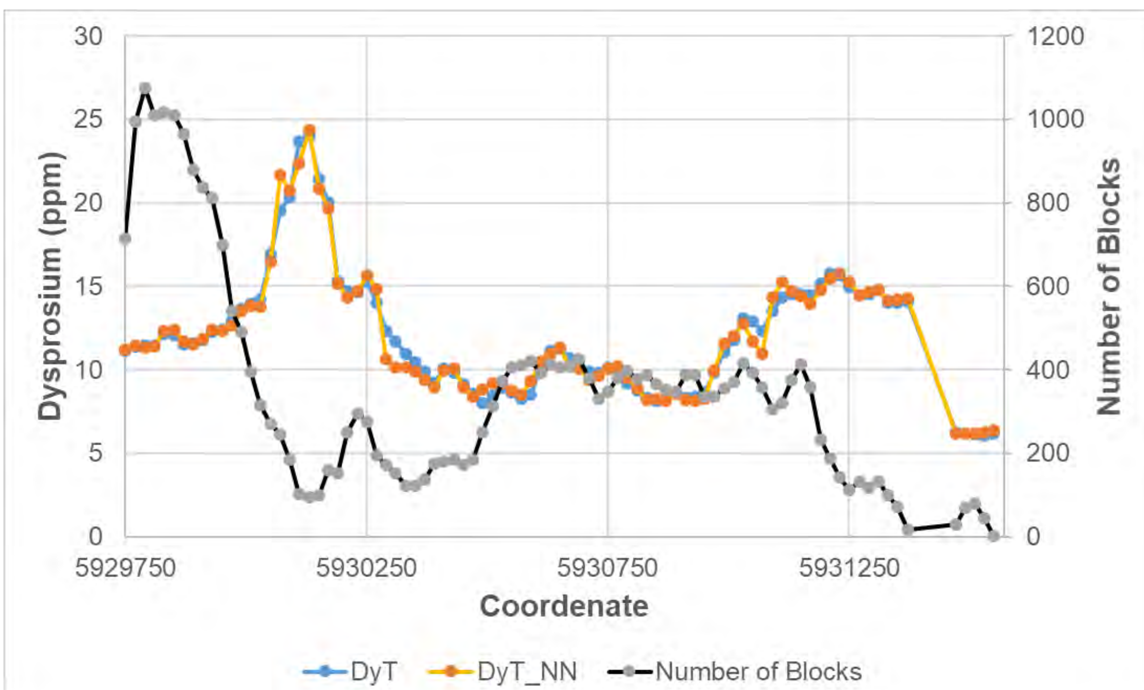
Note: prepared by Ausenco 2021

Figure 14-29: Drift Analysis Dysprosium. north-south direction Victoria. 1210/1310



Note: prepared by Ausenco 20 21

Figure 14-30: Drift Analysis Dysprosium. north-south direction Victoria. 1220/1320



Note: prepared by Ausenco 2021

14.16 Classification of Mineral Resources

The resource classification should integrate criteria addressing at least the following four parameters:

- Geological continuity of the mineralization (confidence in location, geometry and thickness between drill holes)
- Grade continuity
- Data quality and support (multiple points of support)
- Reasonable prospects for economic extraction.

A single classification criterion was used for the categorization of the resource models, which was designed according to the following considerations for each category of Mineral Resources.

Measured: To date, the deposit does not have production data, so the short-range continuity has not been studied in detail, Thus, the level of confidence defined in this category of resources is suitable for generating volumes that are associated with quarterly or broader production plans, where the error of the fine produced should not exceed 15% in 90% of the cases.

For the materialization of the criterion adopted, the blocks estimated with at least three drill holes and the closest sample less than 40 m, or those blocks that were estimated with two drillings, but the nearest sample is at 24 m maximum, Blocks that have been estimated with 1 drill hole are not allowed in this category.

Indicated: The level of confidence defined in the Indicated Mineral Resources is suitable for volumes that are associated with one-year production plans; where the error of the fine produced should be maintained and should not exceed 15% for 90% of the cases.

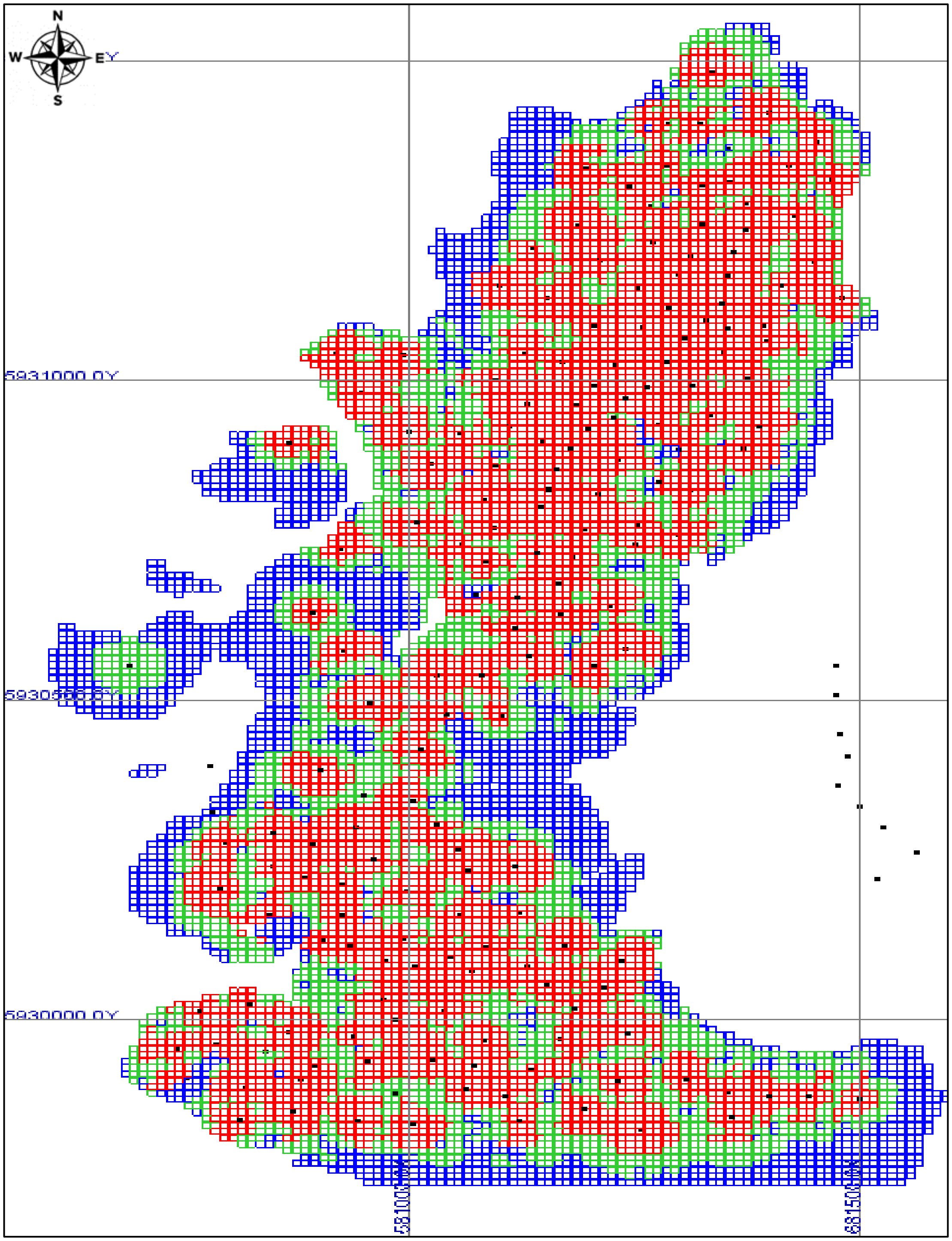
This category includes blocks estimated with at least three drill holes and that the closest sample is less than 75 m, or those blocks that were estimated with less than three drill holes, but the closest sample is at a maximum distance of 40 m.

Inferred: Included in this category are all those estimated blocks that have not been classified as Measured or Indicated Resources.

Except for the Luna and Alexandra sectors, peripheral perimeters were generated from a 50-m distance from the edge of the last drilling run, in order to control that the classification of Measured or Indicated Resources is not associated with blocks that could potentially be considered extrapolated.

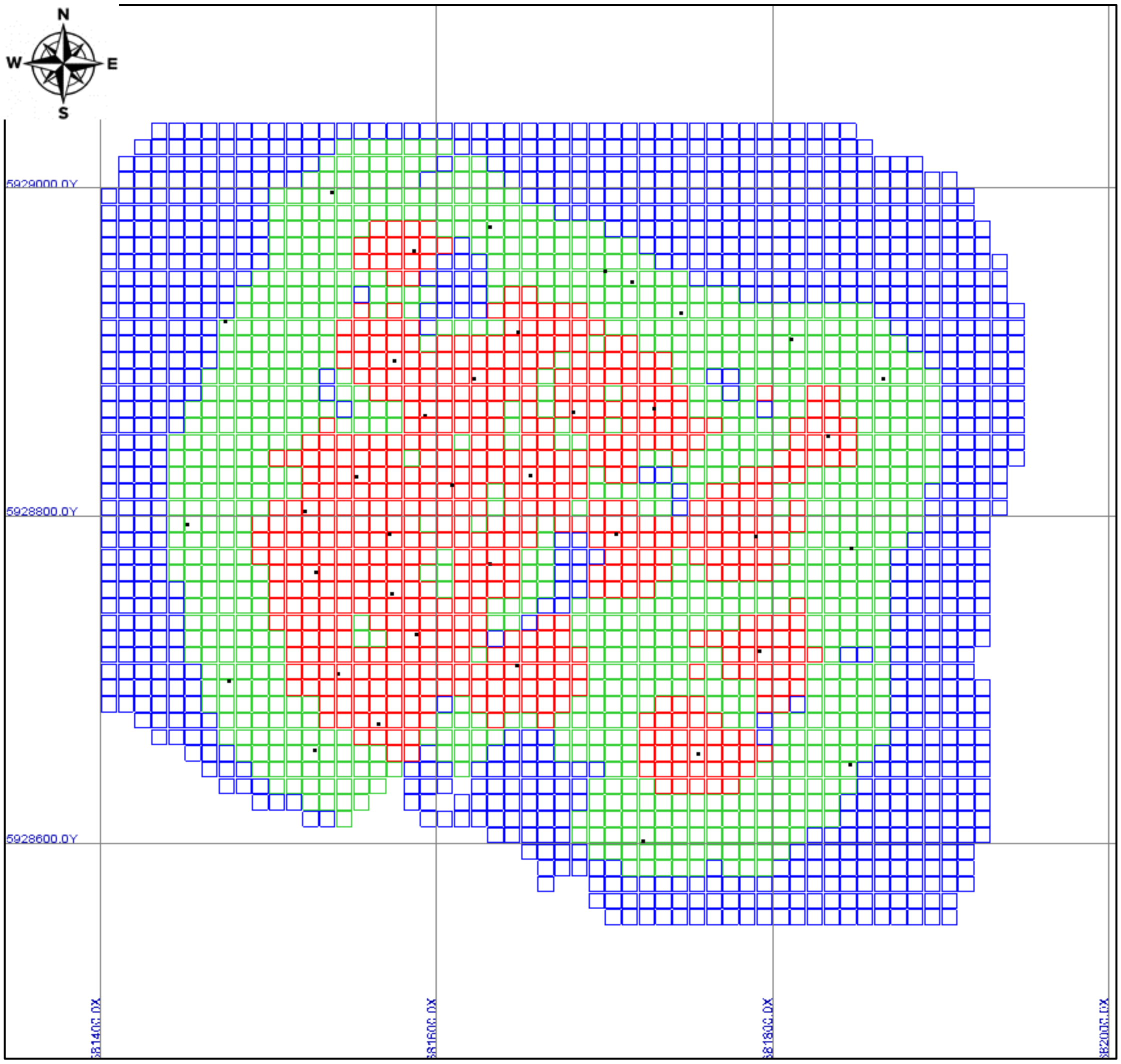
Figure 14-31 to Figure 14-34 shows the plant view of the categories by Victoria, Luna, Alexandra, and Maite sectors.

Figure 14-31: Plant view shows Victoria's resource classification.



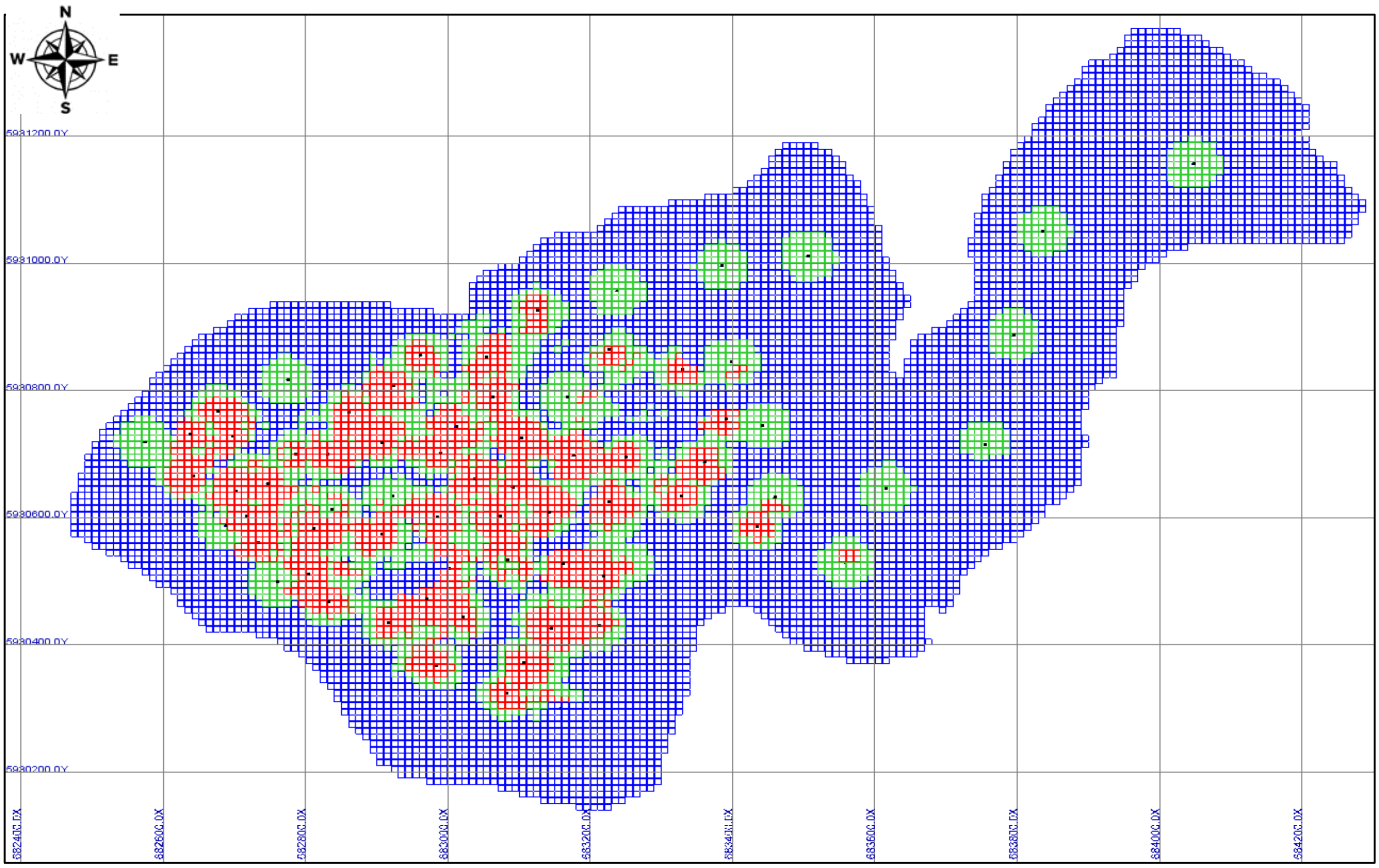
Note: prepared by Ausenco 2021, in red the measured resources, in green the indicated resources and in blue the inferred resources. The black points show the spatial distribution of the data

Figure 14-32: Plant view shows Luna's resource classification.



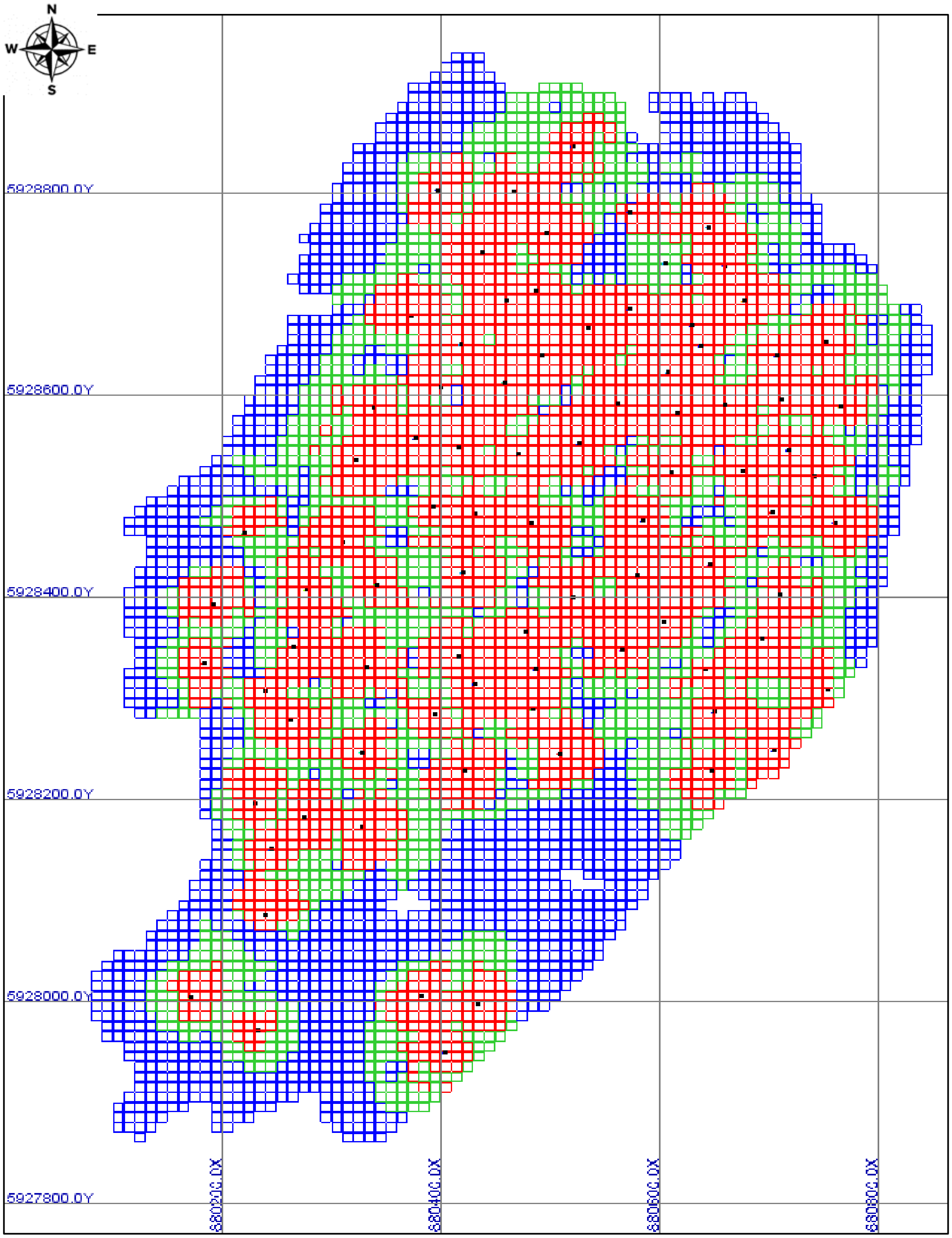
Note: prepared by Ausenco 2021, in red the measured resources, in green the indicated resources and in blue the inferred resources. The black points show the spatial distribution of the data

Figure 14-33: Plant view shows Alexandra's resource classification.



Note: prepared by Ausenco 2021, in red the measured resources, in green the indicated resources and in blue the inferred resources. The black points show the spatial distribution of the data

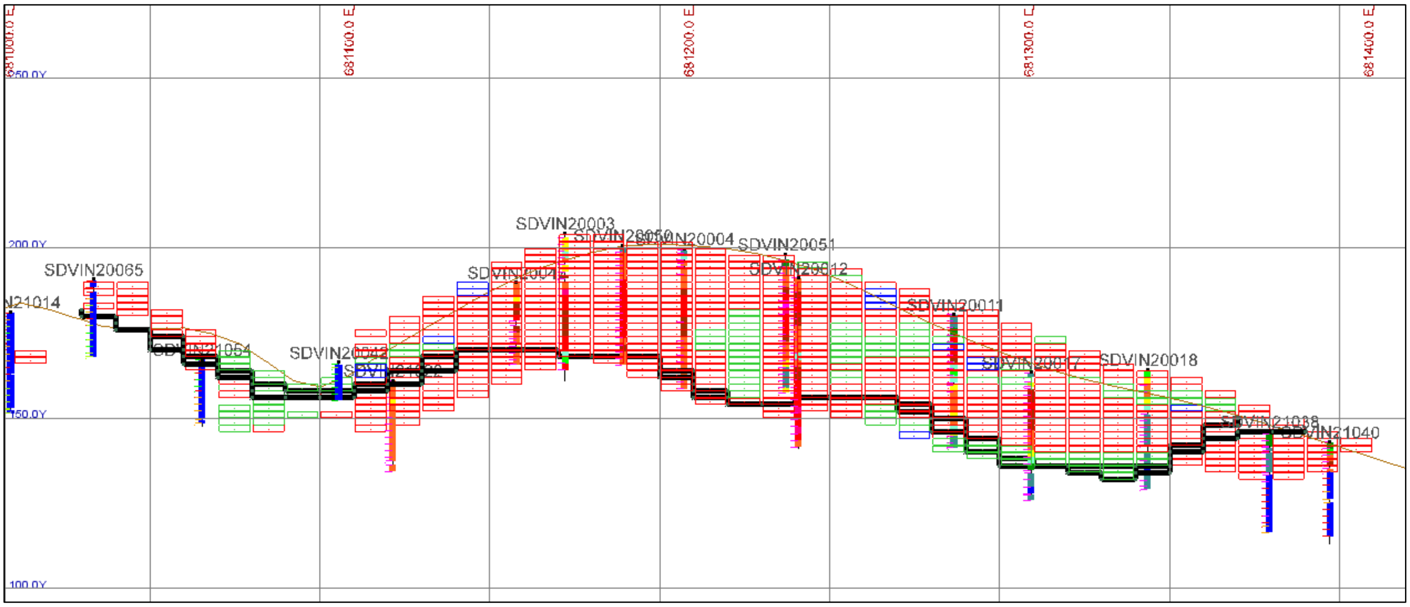
Figure 14-34: Plant view shows Maite's resource classification.



Note: prepared by Ausenco 2021, in red the measured resources, in green the indicated resources and in blue the inferred resources. The black points show the spatial distribution of the data.

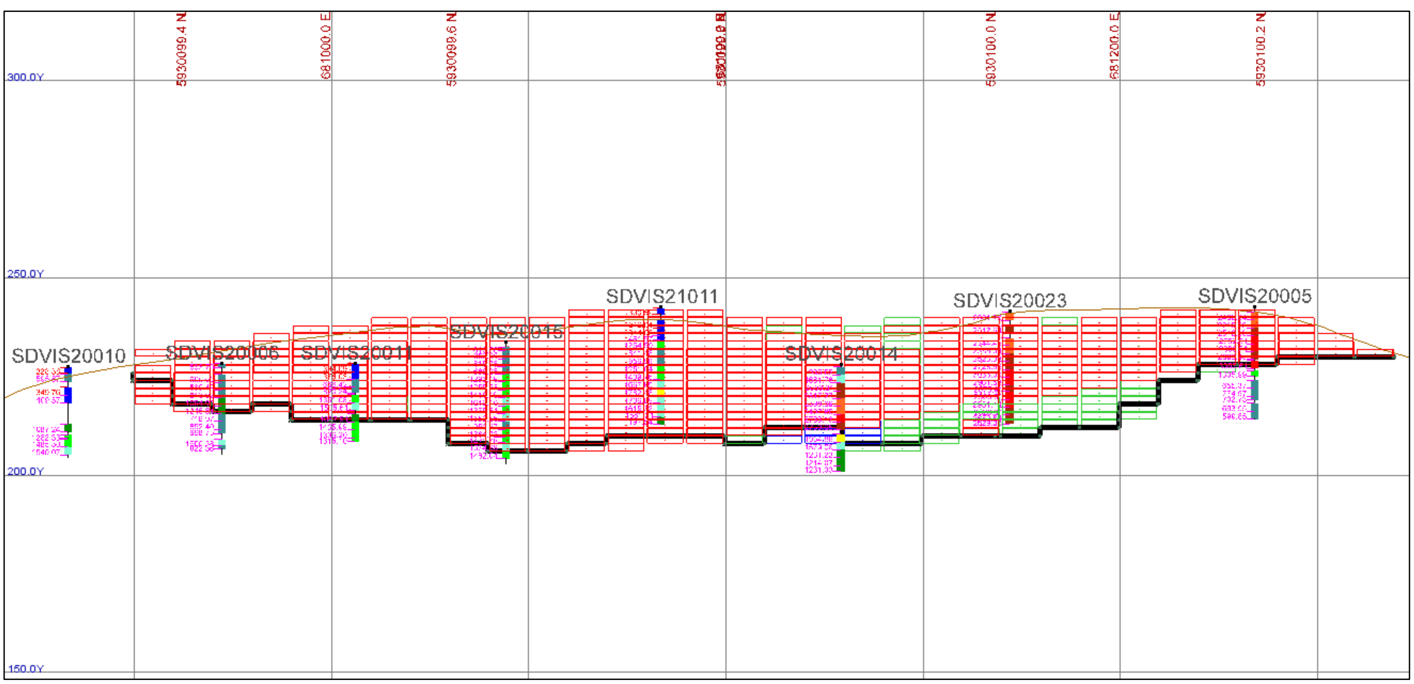
Figure 14-35 through Figure 14-39 are cross-sections through the block model showing the classified blocks in relation to the supporting drill holes and the Resource Pit Shell.

Figure 14-35: Block model cross section shows Victoria Norte's resource classification



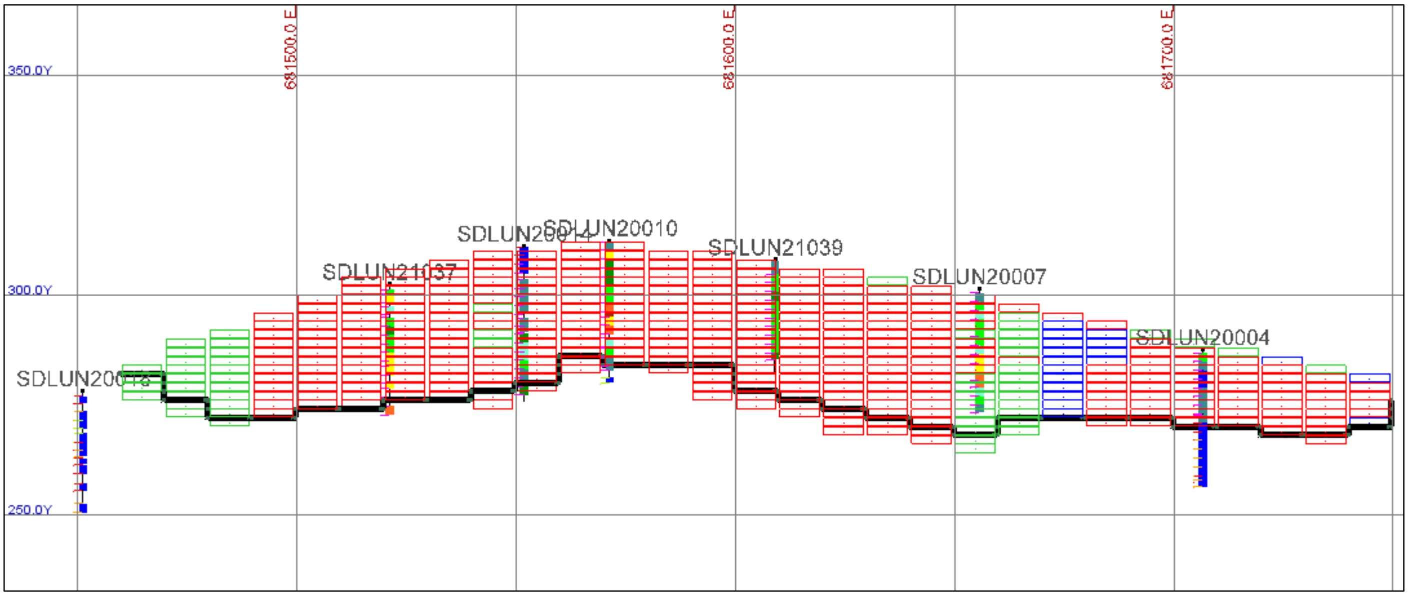
Note: prepared by Ausenco 2021, in red the measured resources, in green the indicated resources and in blue the inferred resources.

Figure 14-36: Block model cross section shows Victoria Sur's resource classification.



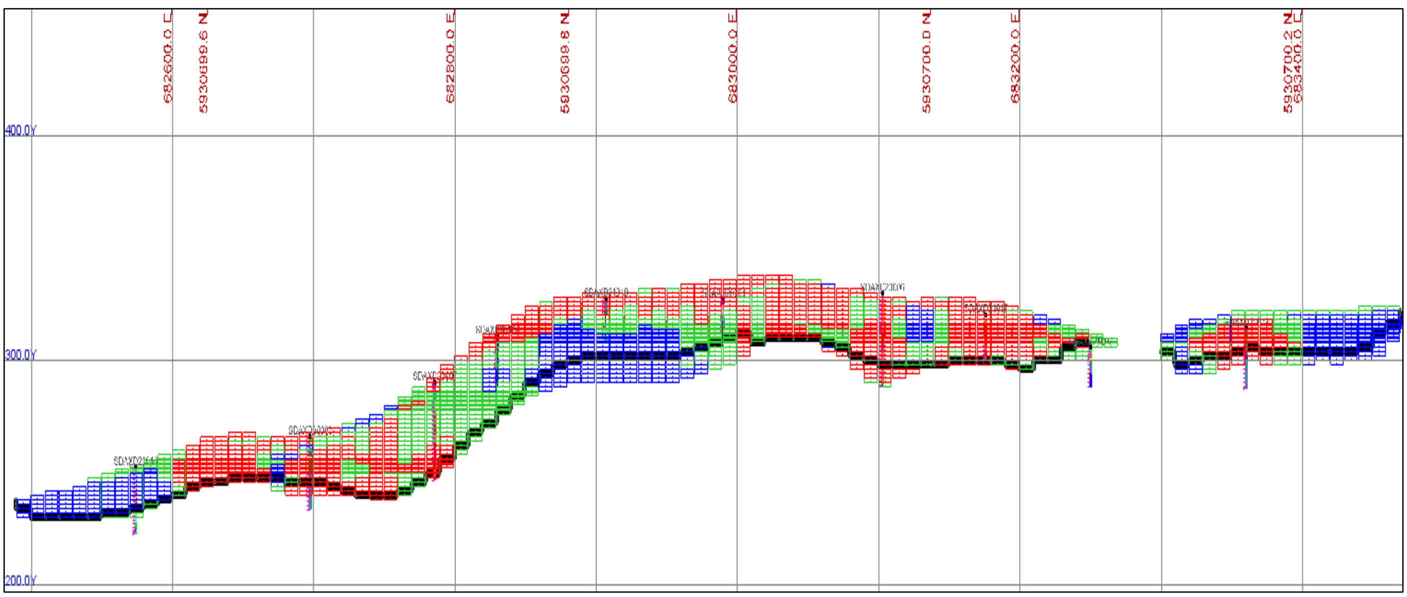
Note: prepared by Ausenco 2021, in red the measured resources, in green the indicated resources and in blue the inferred resources

Figure 14-37: Block model cross section shows Lunas's resource classification.



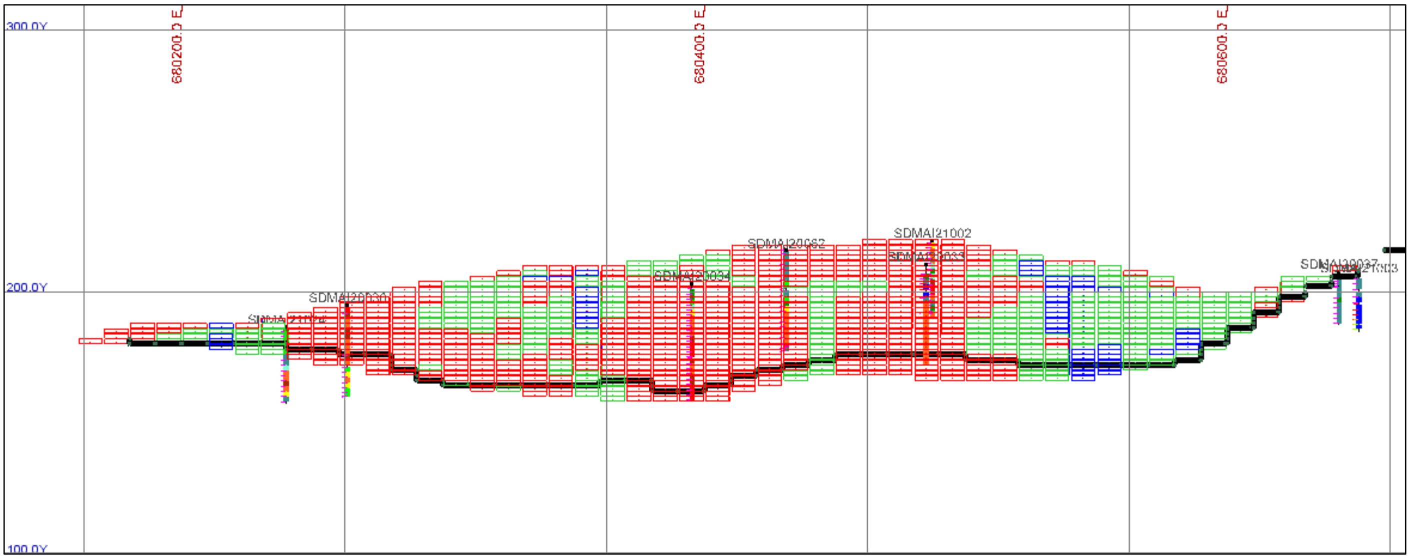
Note: prepared by Ausenco 2021, in red the measured resources, in green the indicated resources and in blue the inferred resources

Figure 14-38: Block model cross section shows Alexandra's resource classification.



Note: prepared by Ausenco 2021, in red the measured resources, in green the indicated resources and in blue the inferred resources

Figure 14-39: Block model cross section shows Maite's resource classification.



Note: prepared by Ausenco 2021, in red the measured resources, in green the indicated resources and in blue the inferred resources

14.17 Reasonable Prospects of Eventual Economic Extraction

Reasonable prospects of eventual economic extraction were addressed by applying a resource pit shell defined using Whittle software and the parameters outlined from Table 14-40 through Table 14-43. Pit slope angles were derived from a study carried out by Lancuyén Ingeniería (2021). See Table 14-44.

The valuation of each block will be calculated using the Net Smelter Return methodology. The calculation is carried out according to the following methodology:

1. $$NSR = Revenue - Discount$$

Revenue:

2. $$Revenue\left[\frac{US\$}{t}\right] = MetallurgicgradeREO\left[\frac{g}{t}\right] * Price\left[\frac{US\$}{kg}\right] * \left[\frac{kg}{10^3 g}\right]$$

3. $$MetallurgicgradeREO\left[\frac{g}{t}\right] = REYTGrade\left[\frac{g}{t}\right] * Ef.Desorption[\%] * Ef.Metallurgic * ConversionFactor$$

Discount:

4. $$ConcentrateREO\left[\frac{kg}{t}\right] = \frac{MetallurgicgradeREO\left[\frac{g}{t}\right]}{ConcentratePurity[\%]} * \left[\frac{kg}{10^3 g}\right]$$

5. $$Discount\left[\frac{US\$}{t}\right] = ConcentrateREO\left[\frac{kg}{t}\right] * (SellingCost + DiscountCommercial)\left[\frac{US\$}{kg}\right]$$

Equivalent Grade

Factoring Metallurgic grade REO

$$NSR = MetallurgicgradeREO\left[\frac{g}{t}\right] * (\,Price\left[\frac{US\$}{kg}\right] * \left[\frac{kg}{10^3 g}\right] - \frac{SellingCost+DiscountCommercia}{10^3 * ConcentratePurity\,[\%]}\left[\frac{US\$}{g}\right])$$

6.

7. $$MetallurgicgradeREO\left[\frac{g}{t}\right] = \frac{NSR\left[\frac{US\$}{t}\right]}{Price\left[\frac{US\$}{kg}\right]*\left[\frac{kg}{10^3 g}\right]-\frac{SellingCost+DiscountCommercial}{10^3 * ConcentratePurity[\%]}\left[\frac{US\$}{g}\right]}$$

Replacing Metallurgic grade REO by REYT Equivalent grade * DE * ME * CF

8. $$REYTEquivalentGrade\left[\frac{g}{t}\right] = \frac{NSR\left[\frac{US\$}{t}\right]}{\left(Price\left[\frac{US\$}{kg}\right]*\left[\frac{kg}{10^3 g}\right]-\frac{SellingCost+DiscountCommercial}{10^3 * ConcentratePurity[\%]}\left[\frac{US\$}{g}\right]\right)*(ED*EM*FC)}$$

*Note: DE: Desorption Efficiency. DM: Metallurgic Efficiency. CF: Conversion Factor.

Metal Prices

For the resource optimization. the metal prices are shown in Table 14-40.

Table 14-40: Metal Prices

Element	USD/kg
Dy_2O_3	566.37
Nd_2O_3	97.34
Tb_4O_7	1,415.92
Lu_2O_3	707.96
Y_2O_3	7.39
Er_2O_3	34.64
Gd_2O_3	37.16
Pr_6O_{11}	106.19
Ho_2O_3	111.50
Yb_2O_3	17.66
La_2O_3	2.86
Eu_2O_3	49.35
Sm_2O_3	2.45
Ce_2O_3	2.01

Tm_2O_3	0.00

Conversion Factors

Conversion factors were used to convert REE elements into REO. The conversion factors for each element are shown in Table 14-41.

Table 14-41: Conversion Factors

Element	Conversion Factor
Dy_2O_3	1.1477
Nd_2O_3	1.1664
Tb_4O_7	1.1761
Lu_2O_3	1.1371
Y_2O_3	1.2699
Er_2O_3	1.1435
Gd_2O_3	1.1526
Pr_6O_{11}	1.2081
Ho_2O_3	1.1455
Yb_2O_3	1.1386
La_2O_3	1.1727
Eu_2O_3	1.1580
Sm_2O_3	1.1596
Ce_2O_3	1.1712
Tm_2O_3	1.1421

Metallurgical and extraction efficiency

A general metallurgical efficiency of 98.01% is considered according to the Ausenco report (PEA-Criterio de Diseño Parámetros Optimización de Rajo. 7-9-2021). The optimization of resources will assume this value for the different extraction zones.

Regarding the extraction value per element, it is obtained directly from the estimation of the block model, which considers information from the laboratory analyzed from the samples of the drillholes. The recovery is implicitly included in the value of the extraction of Rare Earths.

Operating and Financial parameters

Other parameters used in resource optimization are summarized in Table 14-42, Table 14-43 shows mining cost by sector.

Table 14-42: Operating and Financial Parameters

Item	Unit	Value
Processing Cost	USD/t min	7.13
G&A	USD/t min	2.66
Discount	USD/kg	7
Selling Cost	USD/kg	0.032
Concentrate Purity	%	92.61%
Concentrate Moisture	%	<1%

Table 14-43: Mining Cost

Item	Unidad	Alex.	Luna	Maite	V.Norte	V.Sur
Mining Cost	USD/t mat	2.14	1.96	2.25	2.00	1.86

Table 14-44: Inter Ramp and Overall Slope Angles

Parameter	Silty Clay	Maicillo
	Dry Talus	Dry Talus
Overall Slope. α_G	25°	30°

14.18 Mineral Resources Statement

Mineral Resources consider geology, mining, processing and economic constraints, and have been confined within appropriate LG pit shells and, therefore, are classified in accordance with the 2014 CIM Definition Standards for Mineral Resources and Mineral Reserves.

The Mineral Resources herein are not Mineral Reserves as they do not have demonstrated economic viability.

The Aclara Mineral estimate was prepared by Luis Oviedo, Senior Geologist and Francisco Castillo, Ausenco Principal Resource Engineer. Mr Luis Oviedo and Mr Francisco Castillo are Qualified Persons for the estimate, and Registered Members of the Chilean Mining Commission.

Mineral Resources are presented in Table 14-45 through Table 14-50 applying cut-off NSR of 9.79 USD/t.

Table 14-45: Mineral Resource Statement

Category	Tonnage (t)	NSR (USD/t)	REYT (ppm)	TREO (ppm)	REO total content (t)	Recovery
Measured	15,357,416	28	2,080	2,467	37,887	18%
Indicated	5,323,628	25	1,945	2,309	12,292	17%
Measured + Indicated	20,681,044	27	2,045	2,426	50,178	18%
Inferred	2,083,200	24	1,936	2,299	4,788	16%

Table 14-46: Mineral Resource Statement by Sector

Sector	Category	Tonnage (t)	NSR (USD/t)	REYT (ppm)	TREO (ppm)	REO total content (t)	Recovery
Victoria Norte	Measured	5,210,244	29	2,394	2,837	14,782	18%
	Indicated	791,558	22	2,285	2,706	2,142	14%
	Inferred	177,568	20	2,368	2,803	498	13%
Sector	Category	Tonnage (t)	NSR (USD/t)	REYT (ppm)	TREO (ppm)	REO total content (t)	Recovery
Victoria Sur	Measured	1,496,982	24	1,639	1,943	2,909	19%
	Indicated	563,052	26	1,864	2,211	1,245	18%
	Inferred	369,265	23	2,021	2,397	885	15%
Sector	Category	Tonnage (t)	NSR (USD/t)	REYT (ppm)	TREO (ppm)	REO total content (t)	Recovery
Luna	Measured	1,104,992	30	1,353	1,617	1,787	26%
	Indicated	708,122	25	1,185	1,418	1,004	25%
	Inferred	311,517	26	1,105	1,321	411	31%
Sector	Category	Tonnage (t)	NSR (USD/t)	REYT (ppm)	TREO (ppm)	REO total content (t)	Recovery
Alexandra	Measured	2,160,105	26	2,082	2,473	5,341	15%
	Indicated	1,450,332	23	2,053	2,439	3,537	14%
	Inferred	749,167	23	2,038	2,420	1,813	14%
Sector	Category	Tonnage (t)	NSR (USD/t)	REYT (ppm)	TREO (ppm)	REO total content (t)	Recovery
Maite	Measured	5,385,093	28	2,046	2,427	13,067	18%
	Indicated	1,810,565	26	2,033	2,410	4,364	17%
	Inferred	475,684	26	2,094	2,482	1,181	17%

Table 14-47: Mineral Resource Statement by Rare Earth Elements

Category	Tonnage (t)	Y (ppm)	La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)	Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)
Measured	15,357,416	359	346	696	75	326	54	3	52	9	63	13	39	6	35	5
Indicated	5,323,628	349	316	640	73	300	50	3	50	9	61	13	38	5	34	5
Measured + Indicated	**20,681,044**	**356**	**338**	**682**	**74**	**319**	**53**	**3**	**52**	**9**	**62**	**13**	**39**	**6**	**35**	**5**
Inferred	2,083,200	352	313	631	74	297	50	3	50	9	61	13	38	6	35	5

Table 14-48: Mineral Resource Statement Grade of REO by Elements

Category	Tonnage (t)	Grade (REO)	Y2O3	La2O3	Ce2O3	Pr6O11	Nd2O3	Sm2O3	Eu2O3	Gd2O3	Tb4O7	Dy2O3	Ho2O3	Er2O3	Tm2O3	Yb2O3	Lu2O3	REO total content (t)
		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
Measured	15,357,416	2,467	456	406	816	91	380	62	3	60	11	72	15	44	6	40	6	37,887
Indicated	5,323,628	2,309	443	371	749	88	350	58	3	57	10	70	15	43	6	39	6	12,292
Measured + Indicated	**20,681,044**	**2,426**	**452**	**397**	**798**	**90**	**372**	**61**	**3**	**59**	**10**	**71**	**15**	**44**	**6**	**40**	**6**	**50,178**
Inferred	2,083,200	2,299	447	367	740	89	346	58	3	57	10	70	15	44	6	40	6	4,788

Table 14-49: Mineral Resource Statement by rare earth elements and sector

Sector	Category	Tonnage (t)	Y (ppm)	La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)	Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)
Victoria Norte	Measured	5,210,244	384	420	831	76	384	61	3	57	9	65	14	41	6	38	5
	Indicated	791,558	336	405	822	76	372	59	3	53	9	58	12	37	5	33	5
	Inferred	177,568	343	410	865	82	385	60	2	54	9	60	13	38	6	35	5
Sector	Category	Tonnage (t)	Y (ppm)	La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)	Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)
Victoria Sur	Measured	1,496,982	279	267	547	59	260	46	3	46	8	53	10	28	4	25	4
	Indicated	563,052	316	308	626	67	293	50	3	50	9	58	12	34	5	31	4
	Inferred	369,265	348	332	681	75	312	51	3	52	9	62	13	38	6	35	5
Sector	Category	Tonnage (t)	Y (ppm)	La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)	Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)
Luna	Measured	1,104,992	380	172	333	43	171	31	3	42	8	65	14	42	6	38	5
	Indicated	708,122	347	149	278	37	150	27	3	37	7	57	13	38	5	33	5
	Inferred	311,517	307	146	274	36	141	25	3	34	7	51	11	33	5	29	4
Sector	**Category**	**Tonnage (t)**	**Y (ppm)**	**La (ppm)**	**Ce (ppm)**	**Pr (ppm)**	**Nd (ppm)**	**Sm (ppm)**	**Eu (ppm)**	**Gd (ppm)**	**Tb (ppm)**	**Dy (ppm)**	**Ho (ppm)**	**Er (ppm)**	**Tm (ppm)**	**Yb (ppm)**	**Lu (ppm)**
Alexandra	Measured	2,160,105	394	330	662	81	317	54	3	54	10	68	15	44	6	40	6
	Indicated	1,450,332	394	323	650	79	310	53	3	54	10	68	15	43	6	39	6
	Inferred	749,167	381	327	645	81	312	54	3	54	9	66	15	42	6	38	6
Sector	**Category**	**Tonnage (t)**	**Y (ppm)**	**La (ppm)**	**Ce (ppm)**	**Pr (ppm)**	**Nd (ppm)**	**Sm (ppm)**	**Eu (ppm)**	**Gd (ppm)**	**Tb (ppm)**	**Dy (ppm)**	**Ho (ppm)**	**Er (ppm)**	**Tm (ppm)**	**Yb (ppm)**	**Lu (ppm)**
Maite	Measured	5,385,093	338	338	696	83	323	53	3	51	9	60	12	37	5	33	5
	Indicated	1,810,565	330	339	697	83	322	53	3	50	8	59	12	36	5	32	5
	Inferred	475,684	343	348	718	85	330	54	2	51	9	60	12	37	5	33	5

Table 14-50: Mineral Resource Statement by REO elements and sector

Sector	Category	Tonnage (t)	Grade (REO)	Y2O3	La2O3	Ce2O3	Pr6O11	Nd2O3	Sm2O3	Eu2O3	Gd2O3	Tb4O7	Dy2O3	Ho2O3	Er2O3	Tm2O3	Yb2O3	Lu2O3	REO total content (t)
			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
Victoria Norte	Measured	5,210,244	2,837	487	493	973	91	448	71	3	66	11	74	16	47	7	43	6	14,782
	Indicated	791,558	2,706	427	475	963	91	434	69	3	62	10	67	14	42	6	38	5	2,142
	Measured + Indicated	**6,001,802**	**2,820**	**479**	**491**	**971**	**91**	**446**	**71**	**3**	**65**	**11**	**73**	**16**	**47**	**7**	**43**	**6**	**16,924**
	Inferred	177,568	2,803	436	481	1,014	99	449	70	3	62	10	69	15	43	6	40	6	498
Victoria Sur	Measured	1,496,982	1,943	354	313	641	72	303	54	3	53	9	61	12	32	5	28	4	2,909
	Indicated	563,052	2,211	401	361	733	82	342	58	3	57	10	66	13	39	6	35	5	1,245
	Measured + Indicated	**2,060,034**	**2,016**	**367**	**326**	**666**	**74**	**313**	**55**	**3**	**54**	**10**	**62**	**12**	**34**	**5**	**30**	**4**	**4,154**
	Inferred	369,265	2,397	442	389	798	90	364	60	3	60	11	71	15	43	6	39	6	885
Luna	Measured	1,104,992	1,617	482	202	390	51	200	35	3	48	10	75	16	48	7	43	6	1,787
	Indicated	708,122	1,418	440	175	325	45	175	31	3	43	9	65	15	43	6	38	5	1,004
	Measured + Indicated	**1,813,113**	**1,539**	**466**	**192**	**364**	**49**	**190**	**34**	**3**	**46**	**9**	**71**	**16**	**46**	**6**	**41**	**6**	**2,791**
	Inferred	311,517	1,321	389	171	320	43	164	29	4	39	8	59	13	38	5	34	5	411
Alexandra	Measured	2,160,105	2,473	500	387	775	98	369	62	3	62	11	78	17	50	7	45	7	5,341
	Indicated	1,450,332	2,439	500	379	761	96	361	62	3	62	11	78	17	49	7	45	6	3,537
	Measured + Indicated	**3,610,437**	**2,459**	**500**	**384**	**769**	**97**	**366**	**62**	**3**	**62**	**11**	**78**	**17**	**50**	**7**	**45**	**6**	**8,878**
	Inferred	749,167	2,420	484	384	755	98	364	62	3	62	11	76	17	48	7	43	6	1,813
Maite	Measured	5,385,093	2,427	430	396	816	100	377	62	3	58	10	69	14	42	6	38	5	13,067

Sector	Category	Tonnage (t)	Grade (REO)	Y2O3	La2O3	Ce2O3	Pr6O11	Nd2O3	Sm2O3	Eu2O3	Gd2O3	Tb4O7	Dy2O3	Ho2O3	Er2O3	Tm2O3	Yb2O3	Lu2O3	REO total content (t)
			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
	Indicated	1,810,565	2,410	420	398	817	100	375	61	3	57	10	67	14	41	6	37	5	4,364
	Measured + Indicated	7,195,658	2,422	427	396	816	100	376	62	3	58	10	69	14	42	6	38	5	17,431
	Inferred	475,684	2,482	436	408	841	103	385	63	3	59	10	69	14	42	6	38	5	1,181

15 MINERAL RESERVE ESTIMATES

This section is not relevant to this Report.

16 MINING METHODS

16.1 Overview Process Design

The mining method used in each of the mining areas is open pit, the location of the mineralization and low overburden make this option feasible. The exploitation of the deposits (Victoria Norte, Victoria Sur, Luna, Alexandra and Maite) is planned sequentially mainly due to predefined environmental compromises. The mining operation is defined with contractors after a trade-off analysis previously carried out.

16.2 Geotechnical Considerations

In general, the residual soil where the Mining Zones will be located is composed of rock and soil units (see Figure 16-1). Geometallurgical units with the following geological characteristics have been defined in this regolith:

UG_GG - D (undisturbed bedrock): granitoid parent rock with altered garnet, below the regolith boundary. At this horizon level, it is possible to recover REE with cation exchange by crushing the rock.

UG_GG - C2 (transition zone): corresponds to the upper part of the bedrock of the saprolite / saprock boundary up to a depth of 45 m, formed in the granitoid with garnet. The constant concentrations in this unit indicate that the REE are enriched by weathering of the primary resource and not by leaching of the saprolite. Clay minerals such as illite-di, vermiculite and kaolinite range from 4-14%, 10-30% and 18-60%, respectively.

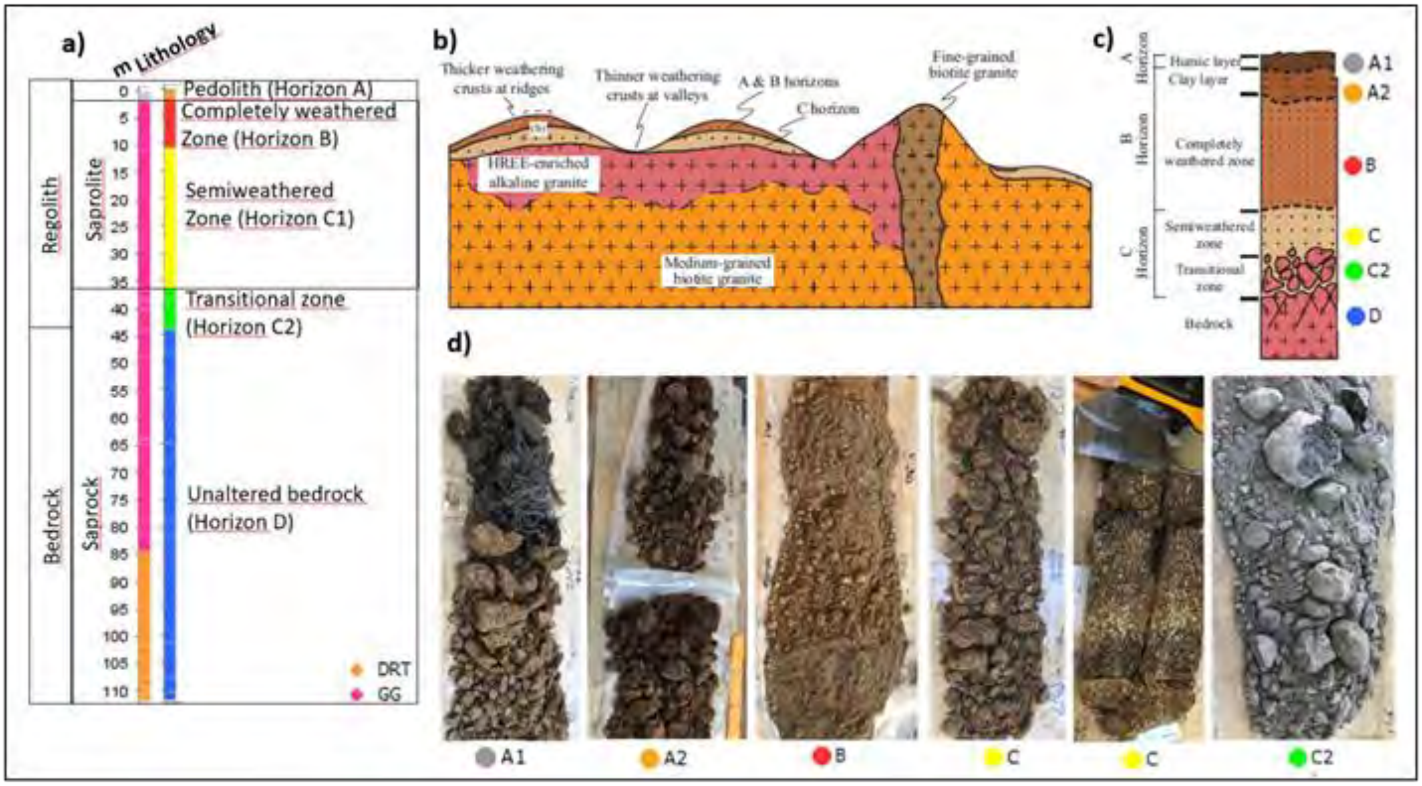
UG_GG - C1 (semi-weathered zone): located between 10 and 35 m from the transition horizon, it corresponds to the bottom part of the saprolite. Anomalous REE concentrations are associated with illite-di and vermiculite with decreasing values (14-7% and 15-8%, respectively), while kaolinite shows opposite values (from 52 to 78%). It is very likely that these concentrations are the product of weathering of the primary resource, but without secondary enrichment.

UG_GG - B2 (fully degraded / enriched zone): corresponds to the middle part of the garnet, granitoid - saprolite zone, varies from 4 to 30 m in depth and represents most of the resources. This horizon has a strong REE enrichment.

UG_GG - B1 (fully weathered zone): It corresponds to the first 4-10 m of the upper part of the granitoid / saprolite zone with fully eroded garnet. Clayey minerals such as illite-di and vermiculite also show positive values, while kaolinite decreases.

UG_GG - A: Corresponds to the pedolith, which includes the iron-rich zone and topsoil.

Figure 16-1: Profile of the Penco Regolith and its Corresponding Horizons and Others



Note: prepared by b y c: Li, Y. H. M., Zhao, W. W. and Zhou, M.-F, 2017. Nature of parent rocks, mineralization styles and ore genesis of regolith-hosted REE deposits in South China: an integrated genetic model. J. Asian Earth Sci. 148, 65–95, a and d Aclara (2020). Geology, Mineralization, and Alteration of The Weathred Crust Elution-Deposited Rare Earth Ore In Penco Report

Lancuyén Ingeniería (2021) has identified the main characteristics of the existing soil types from the geotechnical characterization campaigns carried out in the mining areas and has managed to define two main groups corresponding to Heavily Weathered Granite/Maicillo (SM) and Silty Clay (ML), whose physical properties (unit weight) and resistance (friction angle and cohesion) were estimated. Resistance parameters based on humidity are not available. Average values are presented in Table 16-1.

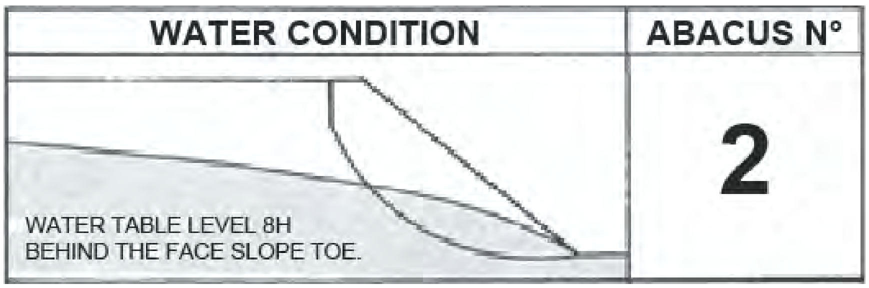
Table 16-1: Geotechnical Units and Residual Soil Properties (Lancuyén, 2021)

Geotechnical Unit	Unit Weight (KN/m^3)	Cohesion (KPa)	Angle of Friction (°)	Undrained Strength (KPa)
Maicillo	19	11	39	270
Silty Clay	16	11	30	200

Thus, for stability analysis purposes, two geotechnical residual soil materials, which will form the slopes, will be considered for this engineering stage.

Two groundwater conditions were considered, based on field studies and observations. In one scenario, the slope is considered dry or with a water table below the slope foot (not affecting stability) and in the other, a water table is present (conservative condition), assuming a Type 2 condition according to the Hoek & Bray (1982) circular failure abacuses. See Figure 16-2.

Figure 16-2: Water Condition Considered (taken from Hoek & Brown 1981)



Note: prepared by Ausenco, 2021.

From these results, the following can be stated:

Silty Clay Slopes

- A configuration of 10 benches can be achieved in dry conditions in the static scenario, with a maximum height of 40 m, satisfying the acceptability criteria. In the seismic scenario, the maximum possible height is 24 m in a configuration of 6 benches, satisfying the acceptability criteria.
- With a water table, in the static scenario, the maximum height of the slopes would be 12 m, i.e., 4 benches. In the seismic scenario, the same maximum height of 12 m is obtained.
- When considering undrained strength in the seismic scenario, although higher safety factor values are observed than in the case with a water table, the maximum height limits would remain at 24 m.
- Based on these results, the maximum height of a bench package in silty clay would be 24 m (6 benches with a height of 4 m)—assuming the dry slope condition to be the predominant one in the Project satisfying the static and seismic acceptability criteria. This maximum slope height would correspond to an interramp slope, since if a greater height is required, a catch bench must be included. Evaluating an increase in height, with a 10 m catch bench (after reaching 24 m), it is possible to reach a height of 32 m, since in this case the safety factor in seismic conditions would be at the limit of the admissible.
- Silty clay presents some design limitations in the presence of groundwater, which highlights the importance of a proper hydrogeological characterization, the use of geotechnical instrumentation, and drainage works, which will help to ensure slope stability.

Maicillo Slopes

- A configuration of 15 benches can be achieved in dry conditions in both the static and the seismic scenarios, with a maximum height of 60 m, satisfying the acceptability criteria.

- In the presence of a water table, the maximum height of the slopes in the static scenario is 52 m (13 benches), while in the seismic scenario this is reduced 32 m (8 benches).
- When considering undrained strength in the seismic scenario, safety factor values are observed to be higher than in the case with water table, allowing a maximum height of 56 m, i.e., 14 benches.
- Based on these results, the maximum height of a bench package in heavily weathered granite would be 60 m (15 benches with a height of 4 m)—assuming the dry slope condition to be the predominant one in the Project satisfying the static and seismic acceptability criteria. This maximum slope height would correspond to an interramp slope, and if a greater height is required, a catch berm must be included. Evaluating an increase in height, with a 10 m catch berm (after reaching 60 m), a height of 76 m can be achieved because, in this case, the safety factor in seismic conditions would be at the limit of what is admissible.
- Heavily weathered granite also presents some design limitations in the presence of groundwater, which once again highlights the importance of a proper hydrogeological characterization, the use of geotechnical instrumentation, and drainage works, which will help to ensure slope stability.

Finally, the proposed design parameters for the main geotechnical units of the Project are presented in Table 16-2.

Table 16-2: Proposed Design Parameters

Parameter	Silty Clay (ML)		Maicillo (SM)	
	Dry slope	Slope with water	Dry slope	Slope with water
Bench Height	4 m	4 m	4 m	4 m
Batter Angle	45°	45°	55°	55°
Minimum Berm Width	4.2 m	4.2 m	4.0 m	4.0 m
Interramp Angle	26°	26°	30.5°	30.5°
Interramp Height	24 m	12 m	60 m	32 m
Decoupling Berm	10 m	10 m	10 m	10 m
Global Height	32 m	---	76 m	---
Global Angle	25°	26°	30°	30.5°

16.3 Hydrogeological Considerations

There is no indication of underground watercourses at the basin level in the area that the Project will be developed as only 5% of drill holes were detected with water from a total of 270 drillings up to 70 meters depth.

With the presence of surface water, silty clay presents some limitations in the design, which highlights the importance of an adequate hydrogeological characterization, the use of instrumentation geotechnical and drainage work, which will help the stability of the slopes for the open pits.

The presence of water in Maicillos, at the saturation level of these, usually occurs when there are hanging or subsurface layers, which generally have a local domain and therefore can be drained in limited times, however, although their presence is not expected in the form In general, the intersection of any of them cannot be disregarded.

16.4 Open Pit

16.4.1 Pit Optimization

This section aims to determine a final pit outline that best meets all the technical-economic requirements involved in the study and that is sustainable over time.

There are limitations to consider in optimizing Project Mineral Resources. These correspond to areas that cannot be affected by mining and become restricted areas for mining operations that must be respected during mining.

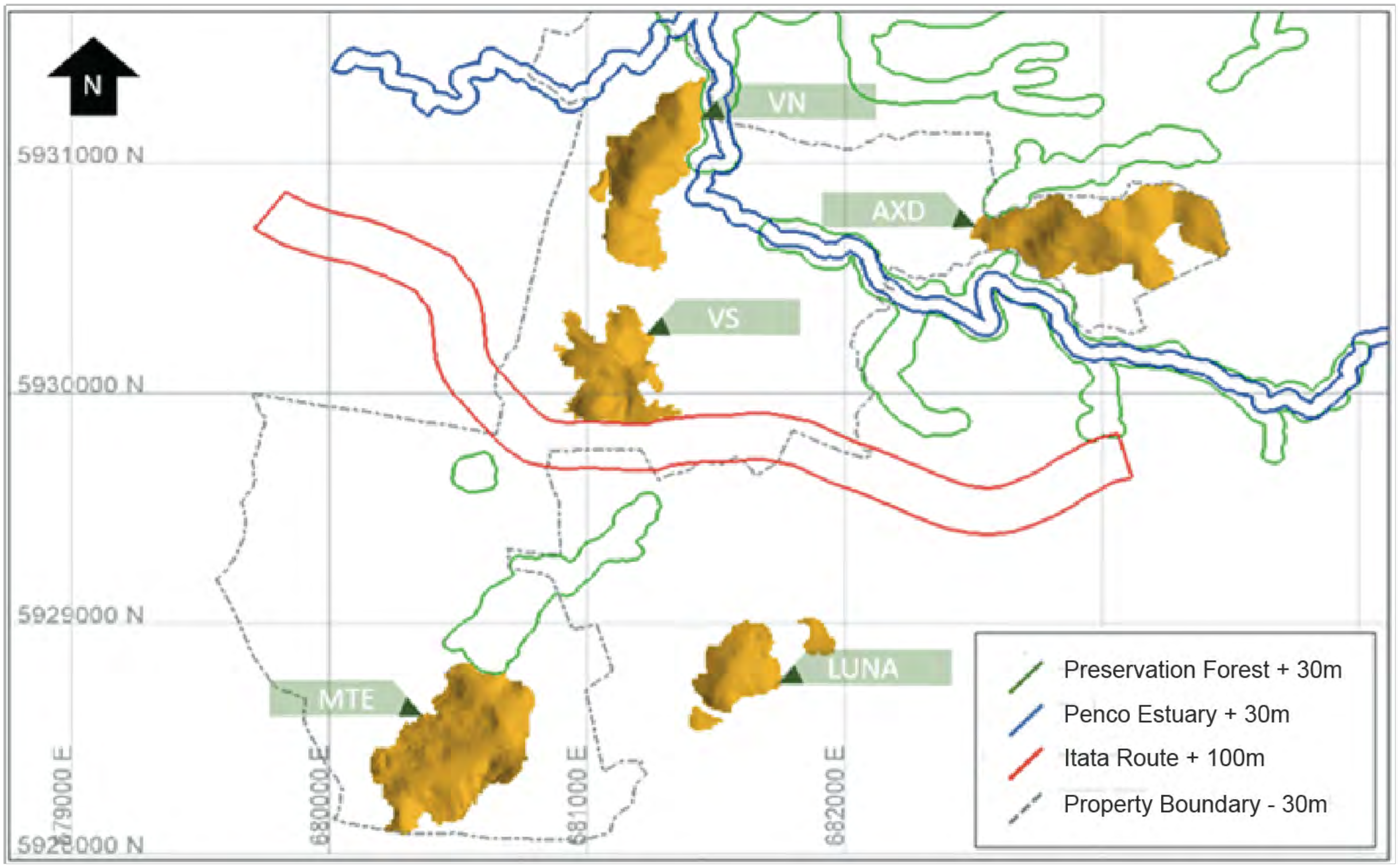
The areas that cannot be affected correspond to the Penco Estuary and the Preservation Forest, areas for which a safety distance of 30 meters has been defined to limit mining in the sectors close to the aforementioned areas. Also, for La Ruta Itata it was considered a safety distance of 100 m.

As regards the surface area to be considered for mining and the infrastructure to be considered in the implementation of the project, this corresponds to the boundary of the Project's surface property; a margin of 30 meters has been defined with respect to the polygon that encloses the Project's boundary.

It should be noted that the Luna sector does not belong to the polygon that delimits the acceptance area, however, it is incorporated in the Project optimization.

The spatial distribution of the Victoria Norte, Victoria Sur, Luna, Alexandra and Maite sectors and the areas that limit the Project Mineral Resources optimization are in Figure 16-3.

Figure 16-3: Project Area



Note: prepared by Ausenco, 2021.

The determination of the final pit and the mining sequence was based on the Lerchs & Grossman algorithm incorporated in the pit optimization module of the Whittle Software. This software performs an economic evaluation of the blocks based on the Mineral Resources contained in each one of them, considering the costs downstream of the mine. Subsequently, an optimization is carried out to analyze the economic contribution of extracting a mineralized block paying for the waste material located on it. This analysis is performed in all directions, based on a previously indicated slope angle and a series of factors that are applied to the NSR of each block and that end up simulating a series of prices.

The analysis of a trade-off study based on preliminary mine plans and economic evaluations, conclude the final pit shells selected from the Whittle nested pits for each sector are presented in Table 16-3.

Table 16-3: Final Pit Shells Selected by Sector

Sector	Revenue Factor 1 Nested Pit (N°)	Final Pit Shell Selected (N°)
Victoria Sur	36	36
Victoria Norte	36	22
Maite	36	30
Luna	36	36
Alexandra	36	36

For this purpose, the Mineral Resources are classified, according to their level of reliability, in Measured, Indicated, and Inferred resources contained in the Mineral Resources model. From Table 16-4 to Table 16-5 are a summarized the pit limit optimization and then the ore broken down by category by sector.

Table 16-4: Pit Limit Optimization Summary by Sector

Sector	Total Mineral Resources (>=9.79 NSR)					Waste	Total
	Tonnage (t)	REYT (g/t)	EV (g/t)	NSR (USD/t)	Dy Eq (g/t)	Tonnage (t)	Tonnage (t)
Victoria Sur	2,320,263	1,765	327	24	108	847,502	3,167,765
Victoria Norte	4,154,669	2,496	489	32	151	815,612	4,970,281
Maite	7,151,261	2,069	380	27	119	2,412,772	9,564,033
Luna	2,019,514	1,289	342	27	110	985,425	3,004,939
Alexandra	4,202,998	2,074	312	24	124	2,254,610	6,457,609
Total	19,848,706	2,045	378	27	125	7,315,921	27,164,627

Table 16-5: Summary of Mineral Resources with Measured Category

Sector	Measured Mineral Resources				
	Tonnage (t)	REYT (g/t)	EV (g/t)	NSR (USD/t)	Dy Eq (g/t)
Victoria Sur	1,442,809	1,657	321	23	103
Victoria Norte	3,700,171	2,510	500	32	152
Maite	5,071,643	2,069	384	27	119
Luna	1,075,868	1,360	356	29	116
Alexandra	2,098,065	2,086	325	25	124
Total	13,388,556	2,092	398	28	127

Table 16-6: Summary of Mineral Resources with Indicated Category

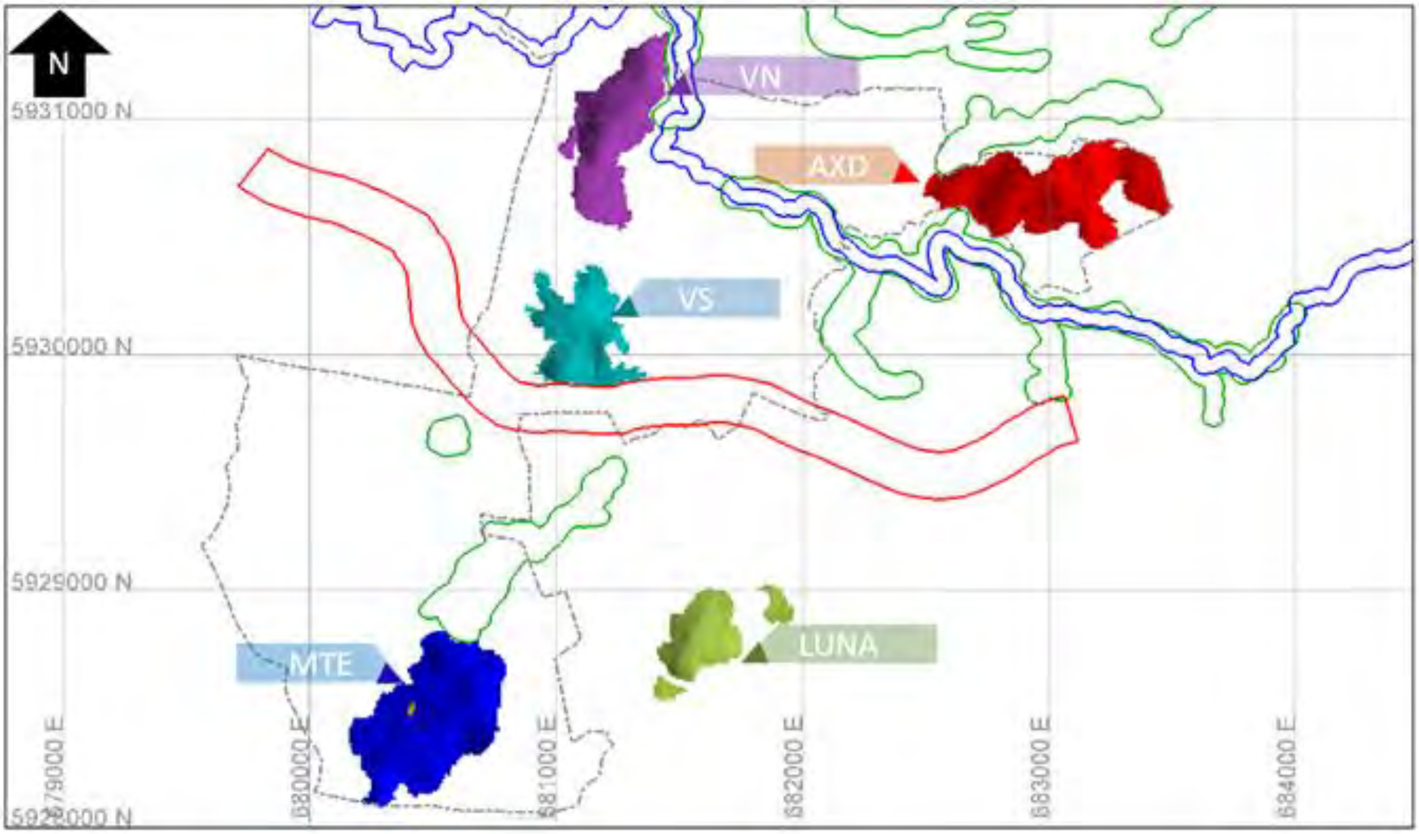
Sector	Indicated Mineral Resources			
	Tonnage (t)	REYT (g/t)	EV (g/t)	NSR (USD/t)
Victoria Sur	540,915	1,890	349	25
Victoria Norte	397,265	2,374	405	26
Maite	1,653,412	2,062	368	26
Luna	673,493	1,210	309	24
Alexandra	1,393,448	2,065	298	22
Total	4,658,533	1,946	339	24

Table 16-7: Summary of Mineral Resources with Inferred Category

Sector	Inferred Mineral Resources			
	Tonnage (t)	REYT (g/t)	EV (g/t)	NSR (USD/t)
Victoria Sur	336,539	2,029	321	23
Victoria Norte	57,233	2,445	384	24
Maite	426,206	2,098	376	26
Luna	270,154	1,204	366	27
Alexandra	711,485	2,056	296	22
Total	1,801,617	1,945	333	24

The Figure 16-4 is an overview of the final pit limit optimization of each sector.

Figure 16-4: Final Pit Limit Optimization of Each Sector



Note: prepared by Ausenco, 2021.

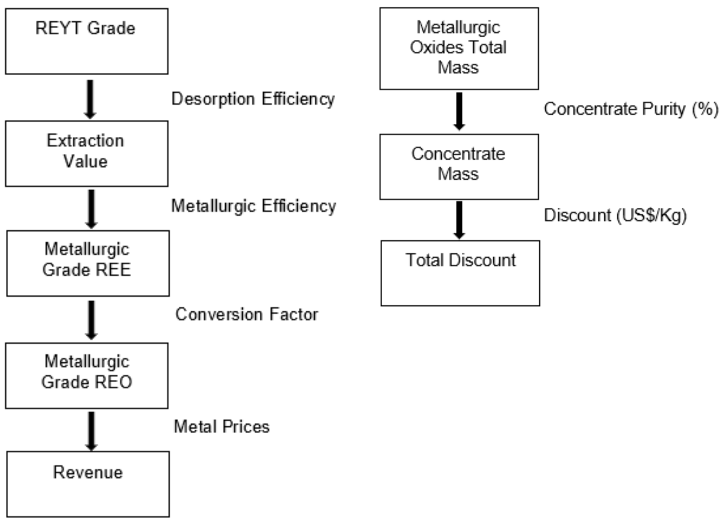
16.4.1.1 Key Assumptions/Basis of Estimate

The valorization of each block of the Mineral Resources model was calculated through the Net Smelter Return methodology. The calculation is made according to the following formula:

$$NSR = Revenue - Discount$$

The Revenue and discount will be estimated as shown in Figure 16-5.

Figure 16-5: Expected Revenue and Discount

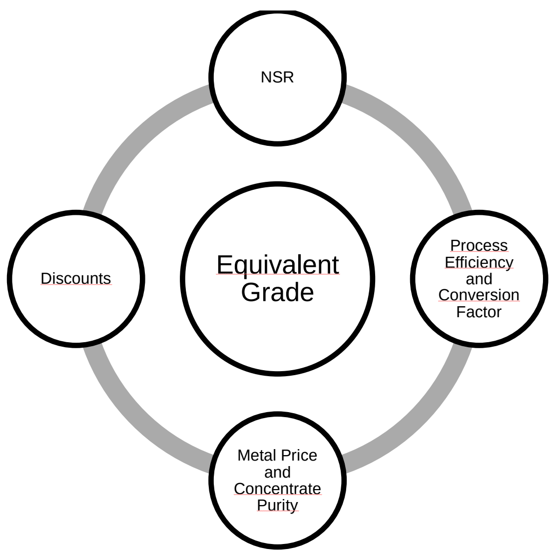


Source: Ausenco, 2021

The equivalent grade methodology was also used to calculate the Net Smelter Return (NSR), since this alternative allows the sensitivity analysis of modifying factors that influence the determination of the final pit envelope of the Project to be performed with greater agility.

The parameters that influence the determination of the equivalent grade are shows in Figure 16-6.

Figure 16-6: Equivalent Grade Parameters



It is worth noting that the NSR methodology generates the same value if it is calculated using the equivalent grade or the grades of the 15 elements.

The following parameters were used in the pit limit optimization analysis:

16.4.1.1.1 REE Prices

For the Mineral Resources optimization, the element prices used are presented in the Table 16-8.

Table 16-8: REE Prices

REE Oxide	USD/kg
Dy_2O_3	537.93
Nd_2O_3	96.34
Tb_4O_7	1,344.82
Lu_2O_3	707.97
Y_2O_3	6.78
Er_2O_3	31.76
Gd_2O_3	35.55
Pr_6O_{11}	92.93
Ho_2O_3	106.65
Yb_2O_3	16.20
La_2O_3	2.62
Eu_2O_3	41.40
Sm_2O_3	2.16
Ce_2O_3	1.88
Tm_2O_3	0

16.4.1.1.2 Conversion Factors

Conversions factors were used to convert RRE elements into REO. The conversion factors for each element are shown in the Table 16-9.

Table 16-9: Conversion Factors

REE	Conversion Factor
Dy_2O_3	1.148
Nd_2O_3	1.167
Tb_4O_7	1.177
Lu_2O_3	1.138
Y_2O_3	1.270
Er_2O_3	1.144
Gd_2O_3	1.153
Pr_6O_{11}	1.209
Ho_2O_3	1.146
Yb_2O_3	1.139
La_2O_3	1.173
Eu_2O_3	1.158
Sm_2O_3	1.160

Ce_2O_3	1.172
Tm_2O_3	1.143

16.4.1.1.3 Metallurgic and desorption efficiencies

Metallurgic and desorption efficiencies have been defined as 98.01% for all deposits and zones within the deposits.

16.4.1.1.4 Operating and financial parameters

The operating costs and other parameters used in the pit limit optimization analysis are summarized from Table 16-10 and Table 16-11.

Table 16-10: Operating Costs

Operating Cost	Unit	Alexandra	Luna	Maite	Vic. North	Vic. South	Source
Mining	USD/t mined	2.14	1.96	2.25	2.00	1.86	Ing. PFS Ausenco 2021
Process	USD/t processed	7.13					Ing. PFS Ausenco 2021
G&A	USD/t processed	2.66					Ing. PFS Ausenco 2021

Table 16-11: Other Parameters

Item	Unit	Value	Source
Discount	USD/kg Concentrate	7	Aclara
Selling Cost	USD/kg Concentrate	0.032	Aclara
Concentrate Purity	%	92.61%	Aclara
Concentrate Moisture	%	<1%	Aclara

16.4.1.2 Ore Loss and Dilution

This aspect was considered as a factor in the operational methodology and mine planning, in the sense that as part of the operational definition of not considering drilling and blasting unit operations, dilution is controlled to a great extent, added to the use of small mining equipment with respect to the reality of traditional mining operations, which allows high selectivity. Furthermore, the existence of a bedrock identified as D horizon with high rock density, appears as a natural limit for mining exploitation.

16.4.1.3 Pit Slopes

See Section 16.2 for details.

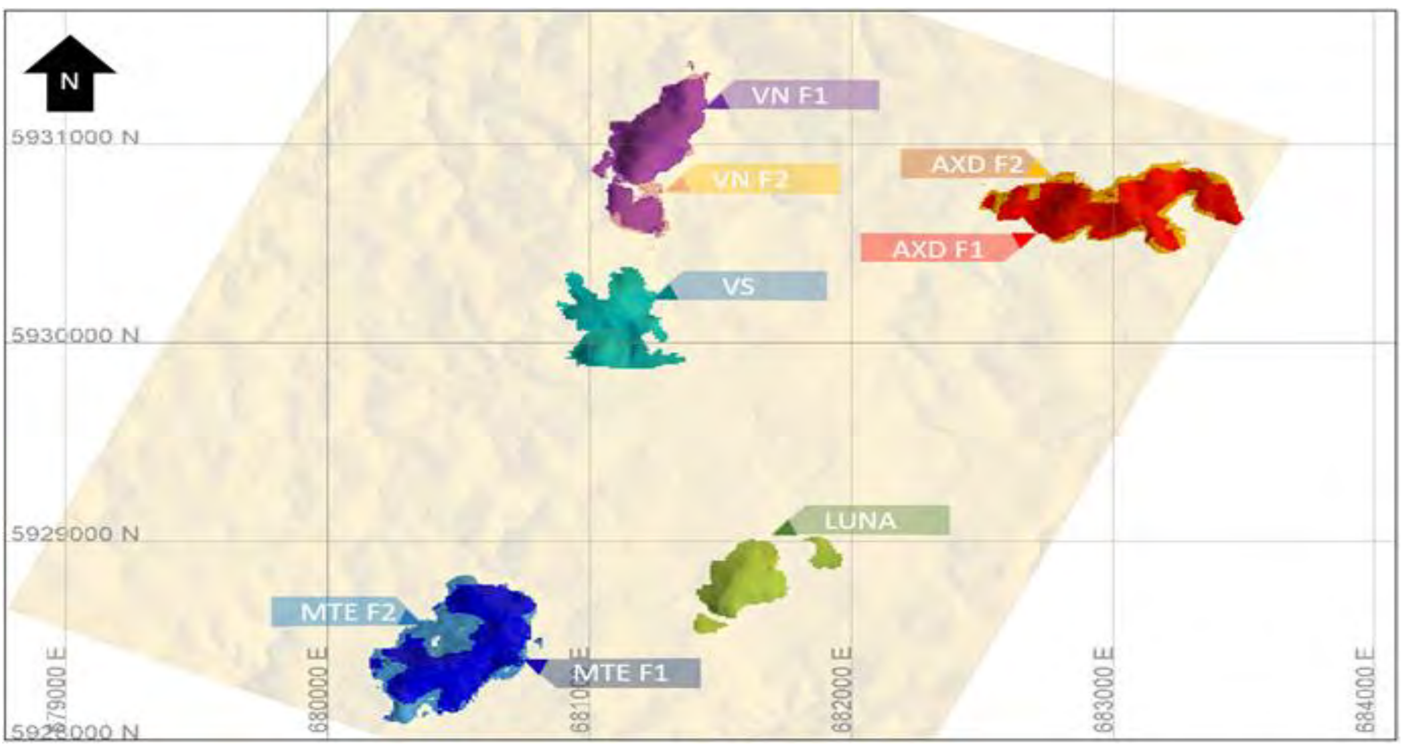
16.4.2 Pit and Phase Selection

As it was explained in section 16.4 regarding the final pit shells selected by sector, the Table 16-12 and Figure 16-7 show an estimation and a representation of the mining phases.

Table 16-12: Mining Phases Statistics

Phase	Mineral Resources				Waste	Total Mined
	Tonnage (kt)	REYT (g/t)	EV (g/t)	NSR (USD/t)	Tonnage (kt)	Tonnage (kt)
Alexandra Phase 1	2,829,339	2,128	358	28	1,605,522	4,434,861
Alexandra Phase 2	1,373,659	1,963	215	15	649,088	2,022,747
Luna	2,019,514	1,289	342	27	985,425	3,004,939
Maite Phase 1	4,553,412	2,120	437	31	1,640,747	6,194,159
Maite Phase 2	2,597,849	1,980	280	19	772,025	3,369,874
Victoria Norte Phase 1	3,709,642	2,538	516	33	677,944	4,387,586
Victoria Norte Phase 2	445,027	2,148	267	18	137,669	582,696
Victoria Sur	2,320,263	1,765	327	24	847,502	3,167,765
Total General	19,848,706	2,045	378	27	7,315,921	27,164,627

Figure 16-7: Mining Phases Location



Note: prepared by Ausenco, 2021.

16.4.3 Pit Design

No final pit and mining phase designs were determined during this stage of the Project. The use of overall pit angles per rock type in the pit limit optimization analysis, represents an appropriate approach for the level of accuracy of this study.

16.4.4 Consideration of Marginal Cut-off Grades

As indicated in section 16.4.1.1, the optimization of resources and subsequent production plan were carried out based on the NSR variable to differentiate between waste and Mineral Resources.

From a cut-off grade perspective , given that each block of the Mineral Resources model within the optimized pit shell has a calculated NSR and that block will be extracted (with a different destination, depending on the respective NSR value), it will be considered as a marginal cut-off grade (USD/t) to the sum of the costs incurred in the processing of the Mineral Resources, so a specific block will only be sent to the process plant if its NSR is greater than or equal to those costs.

For this stage of the study, the costs associated with the processing of the Mineral Resources are the process plant cost (7.13 USD/t) and the general and administrative cost (2.66 USD/t), obtaining a marginal cut-off grade (NSR cut-off) of 9.79 USD/t.

16.4.5 Operational Cut-off Grades

Since the operational and environmental restrictions defined at this stage of the study, no stockpiling strategy has been applied to the mine production schedule, so the material feed to the process plant is based on the marginal cut-off grade from the mine.

16.4.6 Grade Control and Production Monitoring

The mining approach proposed for the Project will require the ability to accurately predict the contact between different types of materials (mineralized material and waste). The ore control team will be responsible for:

- construction of test pits;
- merging the sampling data with the coordinates of the test pits;
- generating short-term planning block models;
- making contact between mineralized material and waste; and
- mine - process plant reconciliation and quality control.

The ore control team will be under the direction of the geology department. Ore control personnel will include in the field a geologist and assistant to assist mine operations with mineralized material / waste decision making.

The proposed ore control methodology for the Project is described below.

16.4.6.1 Drillhole Sampling

The location of the test pits will be indicated by the geology team. Once the rock is exposed, they will seek to determine the continuity of mineralization and the qualities of the elements present. With the sampling, a short-term block model should be generated that allows, based on this new information, to take the best of the destination of the materials extracted from the deposits.

16.4.6.2 Mineral Resources and Waste Polygon Setup

Once the mineralization has been constructed and adjusted for the extraction of the materials and the grade interpolation has been completed, the Mineral Resources and waste polygons will be created. In general, the Mineral Resources polygons for a typical 4 m bench will consist of two polygons that represent the height of the blocks that the model has (2 m) and will have minimum dimensions equal to the SMU (Selective Mining Unit). These polygons will be shown with their Mineral Resources or waste properties on the mine production drawings and could be loaded into the GPS systems on the loading and hauling equipment. The use of the GPS system would reduce the operator's dependence on traditional survey stake control but will not eliminate this need for greater control.

16.5 Production Schedule

The goal is to develop a mining plan with a constant mine movement over time that allows the generation of a homogeneous loading and haulage fleet that represents the best economic result for the Project.

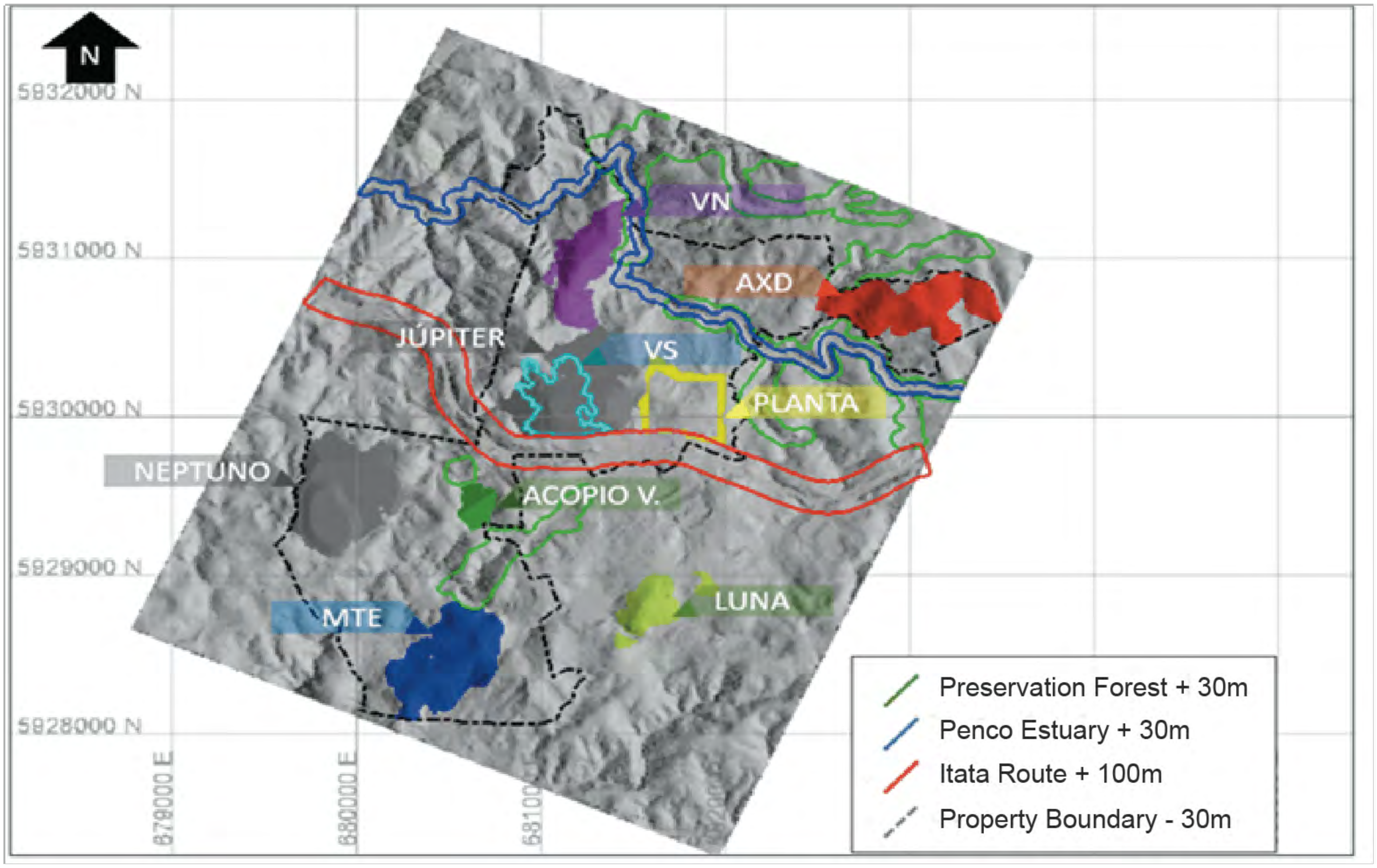
The general criteria used in the development of the mine plan include:

- Whittle nested pits are used as mining phases
- Aim to fill the process plant's maximum capacity in order to maximize the use of assets
- Mining begins with Victoria Sur since the Jupiter waste disposal facility is generated in that sector
- For the first pit, it has been defined that the result of the Project's initial pre-stripping will generate a certain amount of mineralized material equivalent to the capacity of the operational stock available in the plant sector (7 days of autonomy)
- The objective is to maintain a constant mine capacity from the second year. This is because the first year of production with a full plant allows the generation of income that offsets the capital expenditure required to get the Project up and running.
- A sequential exploitation of the sectors will be carried out. Once mining has been completed in one sector, it then begins in another.
- It has been determined that the greatest interaction occurs when one sector comes into production as another is being depleted.

16.5.1 Production Schedule

The Project consists of 5 pits: Victoria Norte, Victoria Sur Alexandra, Maite, and Luna. In addition, it has two Waste Disposal Facilities called Jupiter and Neptuno plus three temporary topsoil deposits or stockpiles. (Figure 16-8).

Figure 16-8: Project Overview



Note: prepared by Ausenco, 2021.

Three types of materials are obtained from mining the deposits: mineralized material, waste, and topsoil, which are destined for processing plants, disposal areas and temporary stockpiles, respectively. The mineralized material will be sent to the processing plant, the waste and filtered tailings (mineralized material that have already been processed) will be sent to the Waste Disposal Facilities and the topsoil will be sent to temporary stockpiles.

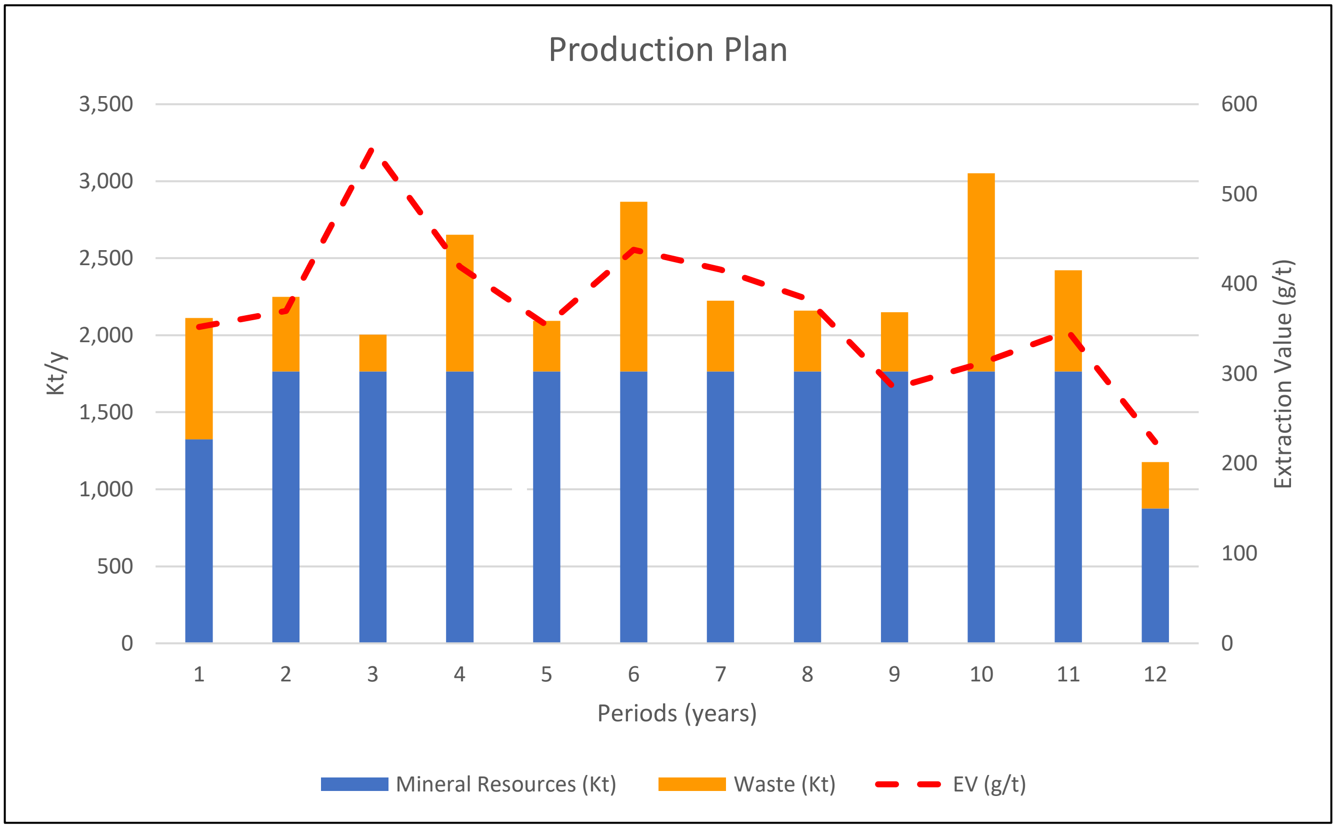
There are 4 discharge points: the Jupiter and Neptuno disposal zones, the processing plant, and the temporary topsoil stockpiles.

The production plan (Table 16-13 and Figure 16-9) reflect a production rate of 1,765,680 t dry per annum of mineralized material, resulting in a Project life of 12 years considering a ramp-up (75% of the expected process plant feed) and ramp-down period.

Table 16-13: Annual Production Plan

Period	Mineral Resources				Waste	Total Rock
	Tonnage (t) (dry)	REYT (g/t)	EV (g/t)	NSR (USD/t)	Tonnage (t)	Tonnage (t)
1	1,324,260	1,764	352	23	787,345	2,111,605
2	1,765,680	2,047	370	24	484,653	2,250,333
3	1,765,680	2,642	552	34	238,093	2,003,773
4	1,765,680	2,259	419	27	886,509	2,652,189
5	1,765,680	1,312	354	28	328,632	2,094,312
6	1,765,680	2,049	438	33	1,101,044	2,866,723
7	1,765,680	2,049	416	31	457,964	2,223,644
8	1,765,680	2,130	383	28	395,334	2,161,014
9	1,765,680	1,982	284	21	384,901	2,150,581
10	1,765,680	2,062	312	25	1,286,077	3,051,757
11	1,765,680	2,174	347	28	657,287	2,422,967
12	874,737	1,945	224	17	300,991	1,175,729
Total	**19,855,797**	**2,045**	**378**	**27**	**7,308,829**	**27,164,626**

Figure 16-9: Annual Production Plan



Note: prepared by Ausenco, 2021

Table 16-14: Mining Rates Per Sector

Sector	1	2	3	4	5	6	7	8	9	10	11	12	Total
Alexandra										2,858,913	2,422,967	1,175,729	6,457,609
Luna				879,853	2,094,312	30,774							3,004,939
Maite						2,835,950	2,223,644	2,161,014	2,150,581	192,844			9,564,033
Victoria Norte		1,194,172	2,003,773	1,772,336									4,970,281
Victoria Sur	2,111,605	1,056,160											3,167,765
Total	2,111,605	2,250,333	2,003,773	2,652,189	2,094,312	2,866,723	2,223,644	2,161,014	2,150,581	3,051,757	2,422,967	1,175,729	27,164,626

16.5.2 Mining Sequence

The methodology used to define the mining sequence that optimizes the present value of the Project was:

- Free Mine Run (no restriction on total movement) with plant feed target not indicating which sectors to mine from.
- Since the Jupiter landfill considers an area of Victoria Sur, it was decided to mine the Victoria Sur sector first, thus speeding up the commissioning of the Jupiter disposal area.
- A new Free Mine run with a plant feed target is carried out, defining VS as the first sector to be mined and the other sectors as free, obtaining a new mining sequence: Victoria Sur – Victoria Norte - Maite - Luna – Alexandra.
- To determine the final mining sequence of the Project, plans considering both mining sequences are prepared. In addition, it is defined that, once mining has started in one sector, that sector must be completed before mining another sector. The latter limitation was not defined in the first two plans.
- The final sequence obtained, following the plans indicated in the previous point, corresponds to Victoria Sur - Victoria Norte - Luna - Maite - Alexandra.

16.6 Blasting and Explosives

Based on background information reviewed and provided by Aclara, the Project will not be developed with drilling and blasting operations.

16.7 Grade Control

See Section 16.4.6 for details.

16.8 Mining Equipment

16.8.1 Drilling and Blasting

Based on the background information that was reviewed and provided by the client, it was determined that the Project will not be developed with drilling and blasting operations.

16.8.2 Loading

The material from the pits will be loaded using hydraulic excavators. According to the background information reviewed, the hydraulic excavator capacity is 2.4 m^3 (Table 16-15). This definition was part of the trade-offs that have been made during this engineering stage.

Table 16-15: Mining Rates Per Sector

Excavator	Un.	Ore	Waste	Topsoil	Plant Waste
Bucket Capacity	m^3	2.5	2.5	2.5	2.5
Excavator Fill Factor	%	95%	95%	95%	95%
Wet Sponge Density	t/m^3	1.69	1.52	1.03	1.79
Wet Load	t	4.01	3.62	2.45	4.26
Bucket Cycle	min	0.65	0.65	0.65	0.65
Maximum Truck Capacity	m^3	20	20	20	20
Maximum Truck Capacity	t	30.0	30.0	20.6	30.0
Truck Fill Factor	%	96%	96%	96%	96%
Expected Truck Capacity	t	28.8	28.8	19.8	28.8
Passes	un	7.2	8.0	8.1	6.8
Estimated Passes	un	8.0	8.0	9.0	7.0
Loading Time per Truck	min	5.2	5.2	5.85	4.55
Tightening per Truck	min	0.5	0.5	0.5	0.5
Maneuvers	min	0.6	0.6	0.6	0.6
Wet Tons per Hour	tph ef	274	274	171	306
Operational Efficiency	%	83.3%	83.3%	83.3%	83.3%
Productive Hours	tph op	228	228	142	255
Availability	%	77.7%	77.7%	77.7%	77.7%
Utilization	%	87.5%	87.5%	87.5%	87.5%
Hourly Production	tph	155	155	97	173
Hours per Shift	h	12	12	12	12
Shifts per Day	un	2	2	2	2
Days per Year	d	330	330	330	330
Annual Production	ktpa	1230	1230	767	1372
Daily Production	ktpd	3.7	3.7	2.3	4.2

16.8.3 Haulage

In order to minimize the CAPEX and considering the topography of the sector where the mining operation will be located, it has been determined that material from the pits will be transported using a fleet of trucks with a capacity of 20 m^3 or more.

The characteristics of the transportation equipment to be used in the Project are shown below (Table 16-16).

Table 16-16: Mining Rates Per Sector

Trucks	Unit	Ore	Waste	Topsoil	Plant Waste
Capacity	m3	20	20	20	0
Wet Sponge Density	t/m3	1.69	1.52	1.03	1.79
Capacity	t	30.0	30.0	20.6	30.0
Filling Factor	%	96%	96%	96%	96%
Actual Capacity	t	28.8	28.8	19.8	28.8
Travel Time	min	14.47	16.51	14.5	12.81
Loading Time	min	7.85	7.85	7.85	7.85
Unloading Time	min	1.10	1.10	1.10	1.10
Cycle Time	min	23.42	25.46	24.79	21.76
Wet Tons per Hour	tph ef	77	71	50	83
Operational Efficiency	%	89%	89%	92%	89%
Productive Hours	tph op	69	63	46	74
Availability	%	83%	83%	83%	83%
Utilization	%	83%	83%	83%	83%
Hourly Production	tph	47	44	32	51
Hours per Shift	h	12	12	12	12
Shifts per Day	un	2	2	2	2
Days per Year	d	330	330	330	330
Annual Production	ktpa	374,942	344,896	251,774	403,514
Daily Production	tpd	1,136	1,045	763	1,223

16.8.4 Support and Auxiliary Equipment

16.8.4.1 Compactor Roller

The equipment will be used in site preparation works for the mining and disposal zones (for the disposal zone wall and filling of the disposal zone).

The following are the characteristics of the equipment to be used in the Project (Table 16-17).

Table 16-17: Compactor Roller Operating Parameters

Item	Value	Unit
Brand	Volvo	-
Model	SD1000D V	-
Power	125	HP
Weight	10.034	t
Width	2.134	m

16.8.4.2 Bulldozer

It is required for deposits with H/V= 4/1 or flatter slopes, which may be shaped by a bulldozer moving along the slope and be compacted by a bulldozer-drawn vibrating roller. This will prevent loose erosion-prone materials from being left on the surface, which will subsequently be protected with creeping vegetation or by consolidation with erosion-stable binding substances.

The following are the characteristics of the equipment to be used in the Project (Table 16-18).

Table 16-18: Bulldozer Operating Parameters

Item	Value	Unit
Brand	CAT	-
Model	D9T	-
Power	325	kW
Blade Width	4.0	m
Equipment Width	3.3	m
Length	8.2	m

16.8.4.3 Water Truck

Industrial water and drinking water will be supplied during the first months of the construction phase using water trucks, until the reservoirs in the El Cabrito and Penco estuaries are built.

The following are the characteristics of the equipment to be used in the Project (Table 16-19).

Table 16-19: Water Truck Operating Parameters

Item	Value	Unit
Brand	Mercedes Benz	-
Capacity	20,000	L

16.8.4.4 Motor Grader

Auxiliary equipment used in the installation and commissioning of the sites, excavation of mining and disposal zones, construction of the processing plant, and the commissioning of internal roads (**Table 16-20**).

Table 16-20: Motor Grader Operating Parameters

Item	Value	Unit
Brand	CAT	-
Model	120	-
Power	93	kW
Blade Width	3.7	m
Equipment Width	2.6	m
Length	9.8	m

16.9 Comments on Mining Methods

During the development of the PEA stage, different trade-off studies and analyses were developed, of which the following can be highlighted:

- Sensitivity analysis of the pit limit analysis modifying factors.
- Mining sequence analysis.
- Final pit limits and mining phases were determined from the optimization nested pits.
- Operational cut-off grade strategy.
- Mine planning analysis considering the variation of the prices of the rare earth elements trough time.
- Financial analysis to guide strategic mine planning decisions.
- Haulage profiles, Waste Disposal Facility and topsoil stockpile fill sequence analysis to optimized hauling costs.

17 RECOVERY METHODS

17.1 Overview

The rare earth carbonate production process was designed based on the results obtained in the tests developed by the Universities of Concepcion and Toronto, in addition to the Chapi batch tests.

The Project considers an average production of 1,275 t/a (dry basis) of carbonate of earth rare, where the raw material is an ionic clay mineral containing various lanthanides whose feed to the process is at a rate of 240 wet t per hour.

The mineral in a first stage is selected wet to a defined granulometry <1mm. This mineral under 1 mm is leached with an acidic ammonium sulfate solution (pH =3.0 – 4.0) through a countercurrent process. The leaching solution is not selective, in addition to extracting rare earths, it leaches a series of polluting elements.

This solution enriched with rare earths and pollutants is subsequently treated to precipitate, by chemical reaction, the pollutants, mainly aluminum and iron, by means of an acidic solution of ammonium bicarbonate at a controlled pH between 5.5 and 6.0. The pollutant precipitate is discarded, and the solution continues to the carbonation process where, at a controlled pH between 7.0 and 7.5, the insoluble rare earth carbonates are precipitated by chemical reaction with an ammonium bicarbonate solution.

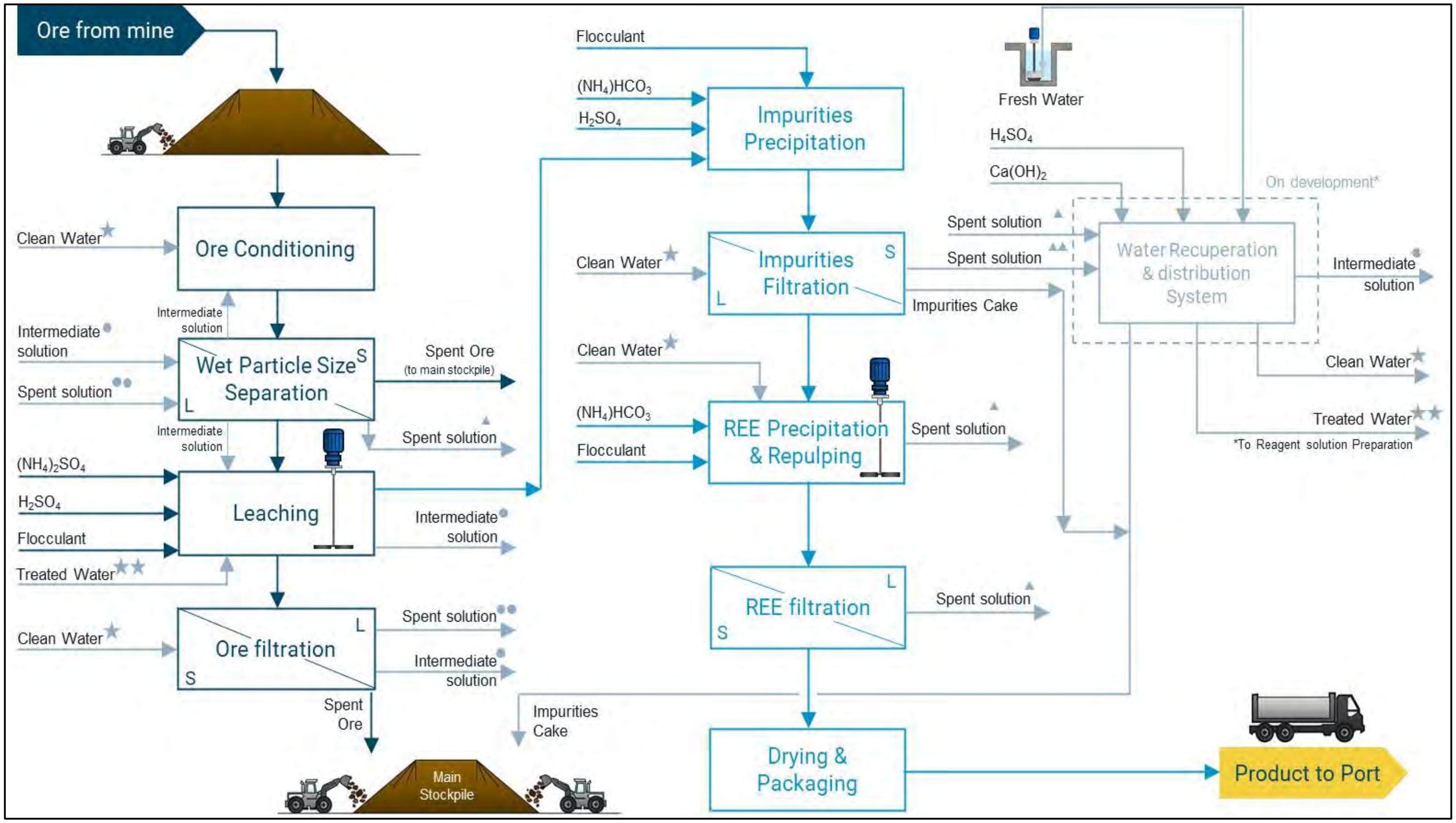
This product is repulped with water to eliminate the impregnation solution and obtain a product of the required quality. Finally, the filtered cake (product) is subjected to the drying and packaging process.

This process has the restriction of not generating liquid riles, except for those contained in the impregnation of the solids discarded in mineral rubble or impurities. To achieve this condition, the design considers recovering the water from the weak solutions generated in the process (weak solutions from filtrations and repulping mainly) and treating them with reagents and technologies available in the industry in such a way that the recovered water returns to the process, significantly reducing the consumption of fresh water and the precipitate generated is deposited next to the rubble in its final disposal. This stage of water recovery is under development. Laboratory tests will soon begin to conform to the assumptions of the proposed design.

17.2 Process Flowsheet

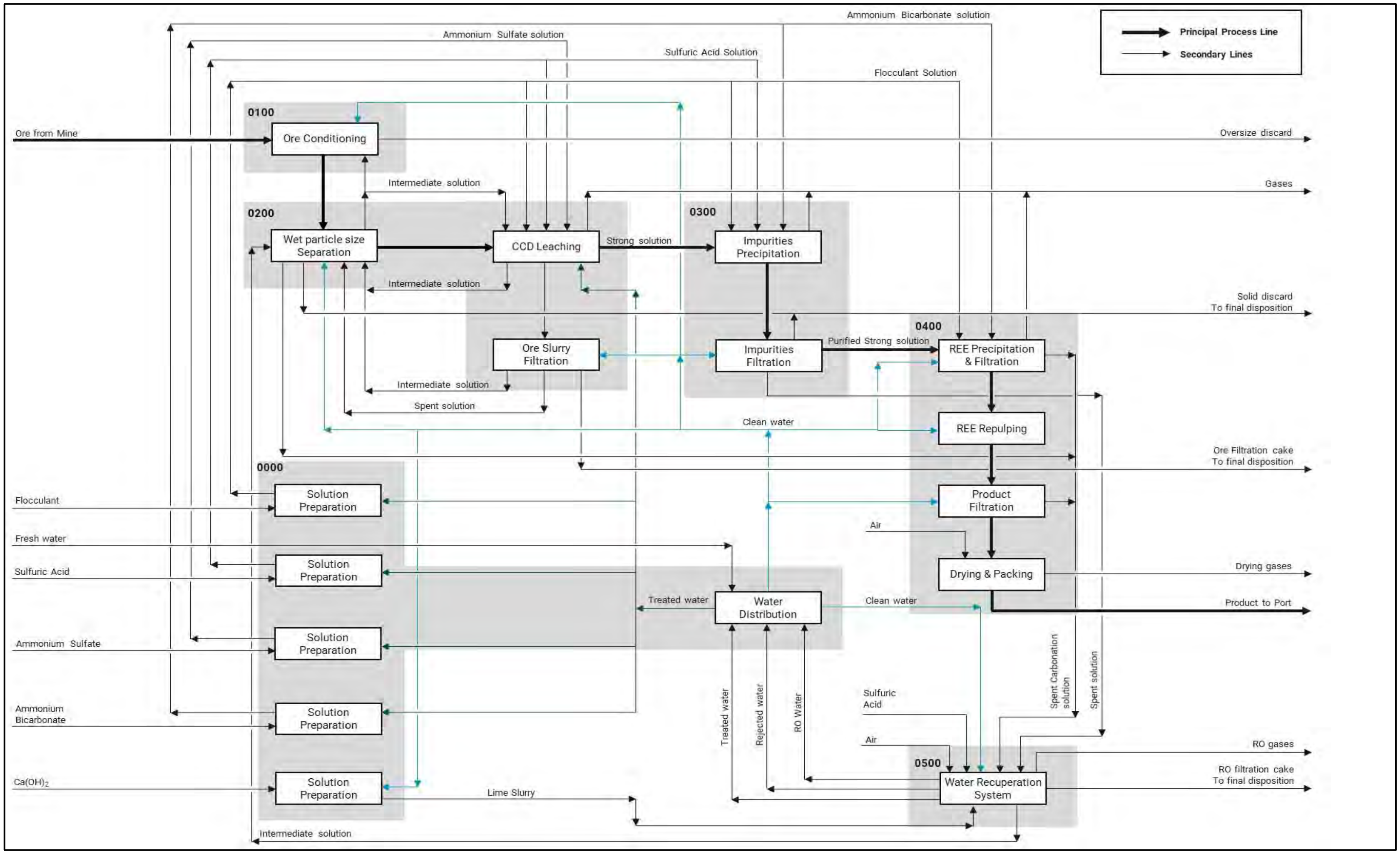
Figure 17-1 below shows a general diagram while Figure 17-2 shows a detailed diagram of the process that will be described in the following points.

Figure 17-1: Process Flowsheet



Note: prepared by Ausenco, 2021.

Figure 17-2: Detailed Process Flowsheet



Note: prepared by Ausenco, 2021.

17.3 Plant Design

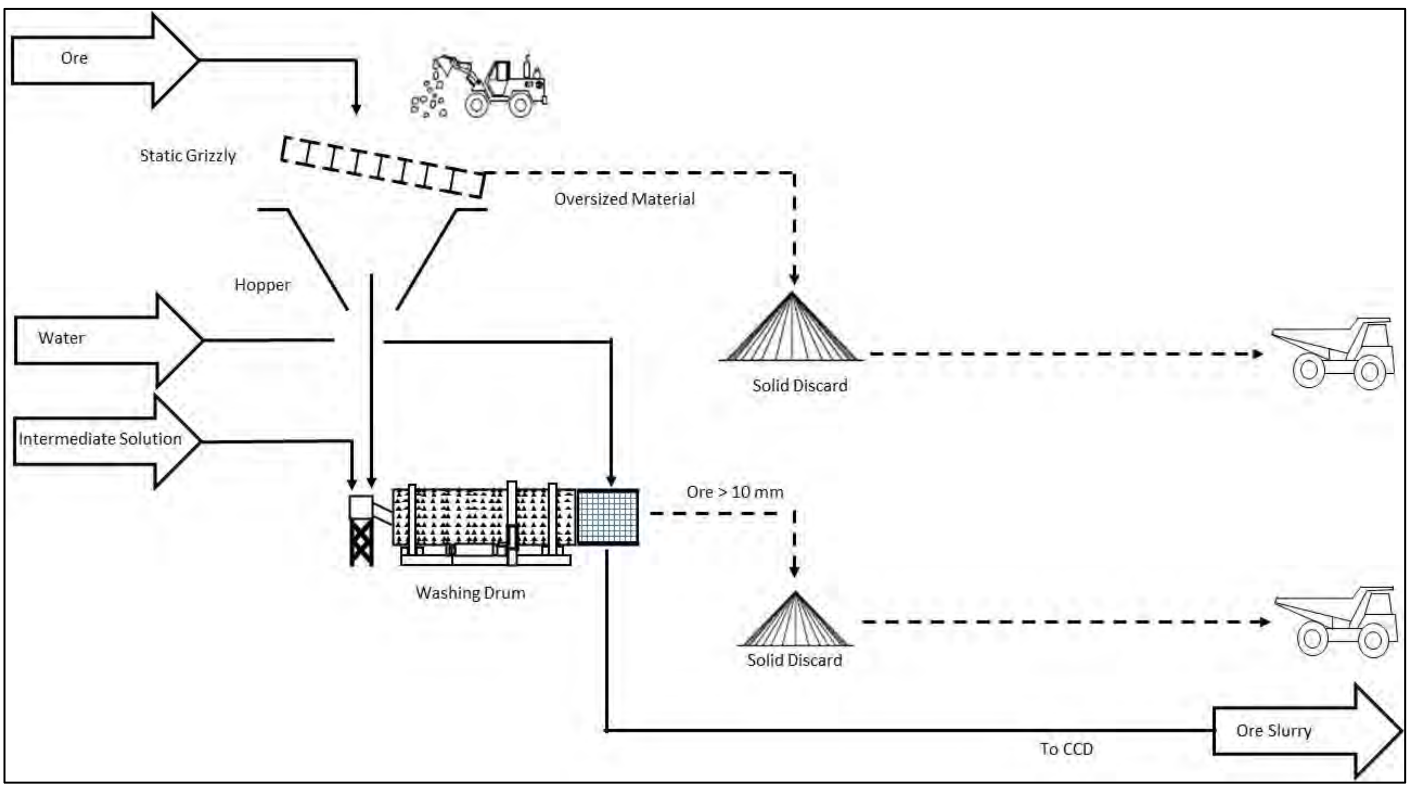
17.3.1 Wet Clay Stacking and Feeding (Area 0100)

The stacking area (Figure 17-3)will consist of two sectors, an ore stacking sector coming from the mine and a second daily stacking.

The ore from the second stack is removed to a hopper which has a static grizzly in its top part to eliminate any oversized elements (vegetables, rocks, others). These discarded elements are temporarily stacked and removed and sent to the final disposal sector.

The ore coming from the hopper discharges and feeds a washing drum where the ore is washed with clean water and the particles over 10 mm are separated. The rest of ore particles goes to a feed box where also intermediate solution is fed (from leaching step), then the obtained ore slurry is pumped to the Leaching circuit area.

Figure 17-3: Scheme of area 0100



Note: prepared by Ausenco, 2021.

17.3.2 Mineral Leaching (Area 0200)

The mineral pulp from the washing drum is fed to the countercurrent circuit using two settlers (CCD) where the extraction occurs through the ion exchange mechanism between the ammonium (liquid phase) and the lanthanide (solid phase) present in the mineral. The leaching reagent corresponds to 0.15 Molar ammonium sulfate, this process occurs in an acidic condition, pH is between 3 and 4.

$$[IC^{3-}] \cdot [RE^{3+}]_{(s)} + 3[NH_4^+]_{(aq)} \rightleftharpoons [IC^{3-}] \cdot 3[NH_4^+]_{(s)} + [RE^{3+}]_{(aq)}$$

Product of the CCD circuit, two streams are produced, one corresponds to a mineral sterile pulp that feeds a humid screen which separates the fraction greater than 1mm by overflow which feeds a band filter, where it is washed with clear water producing three streams: A weak wash solution that is sent to the water recovery system and an intermediate solution that returns to the leaching process. The other stream is the filtered tailings which are stocked and later transferred to its final disposal.

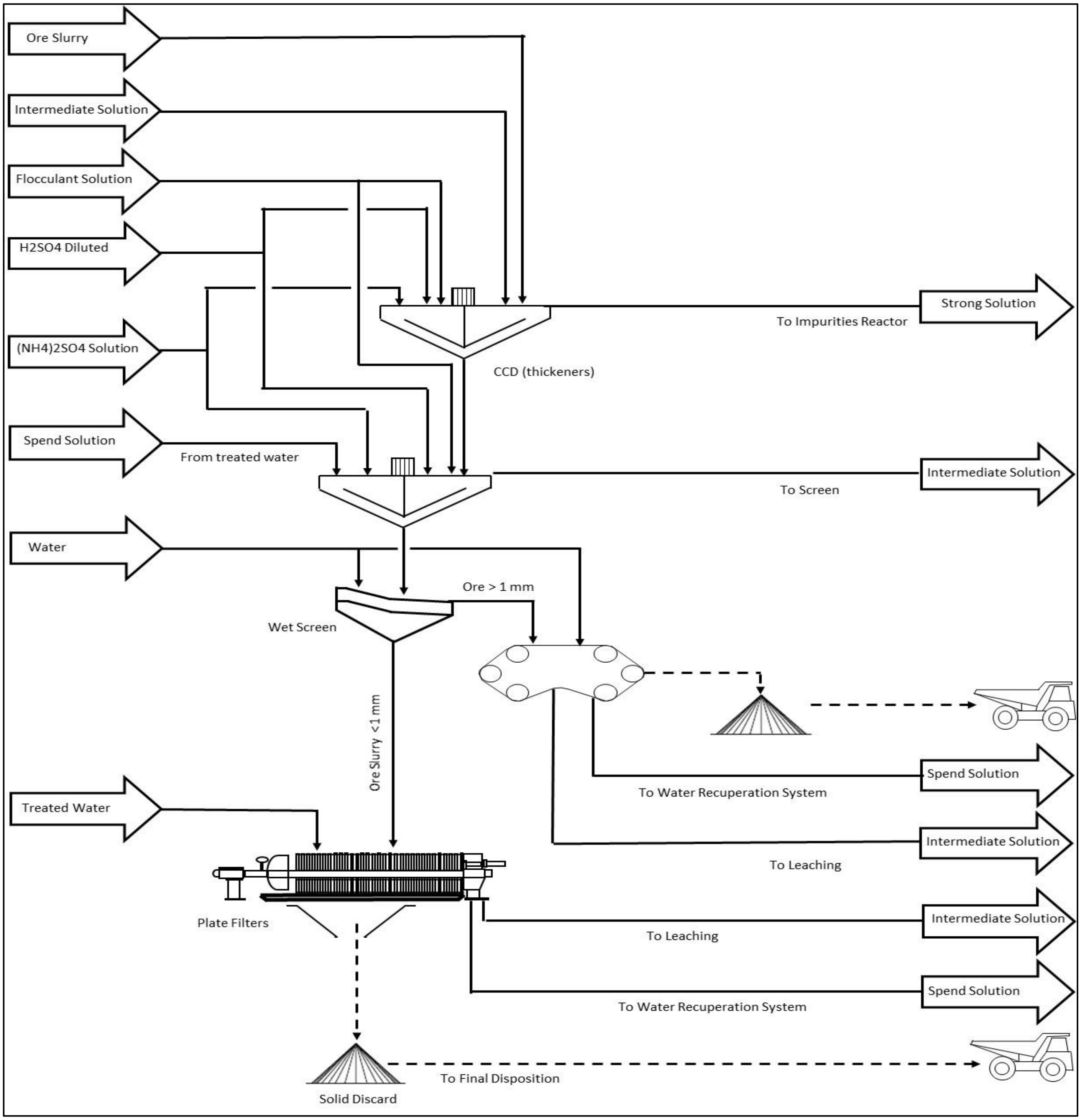
The countercurrent leaching circuit receives a contribution of solution from the carbonation process that corresponds to part of the solution that has already precipitated the lanthanides that enter the second settler.

The strong solution generated in the leaching corresponds to the overflow of the first thickener which contains the leached lanthanides together with the contaminants, mainly aluminum and iron, manganese. This solution is sent to the impurity precipitation processes

On the other hand, the mineral pulp under 1 mm that corresponds to the underflow of the wet screen, feeds the plate filtration system, where the solid is washed with treated water. This process also generates three streams: A weak solution that is sent to the water recovery system and an intermediate solution that returns to the leaching process. The filtered tailings is stacked and later transferred to its final disposal.

The parameters with which the design is carried out correspond to those determined in the different tests, which are shown in Figure 17-4.

Figure 17-4: Scheme of Area 0200.



Note: prepared by Ausenco, 2021.

17.3.3 Impurities Precipitation (Area 0300)

The strong solution obtained from the leaching process and received in the tank that feeds the impurity elimination system, where enough ammonium bicarbonate is added for the precipitation of impurities, maintaining a controlled pH between 5.5 to 6.0 adding sulfuric acid of be necessary. Then, the generated pulp is sent to polishing filters to separate the solid phase composed of impurities from the lanthanide-rich liquid phase. The strong and clean solution continues to the next stage of carbonation of rare earths and the pulp product of the polishing filters discharged into a stirred pond and pumped to its final disposal. (see Figure 17-5)

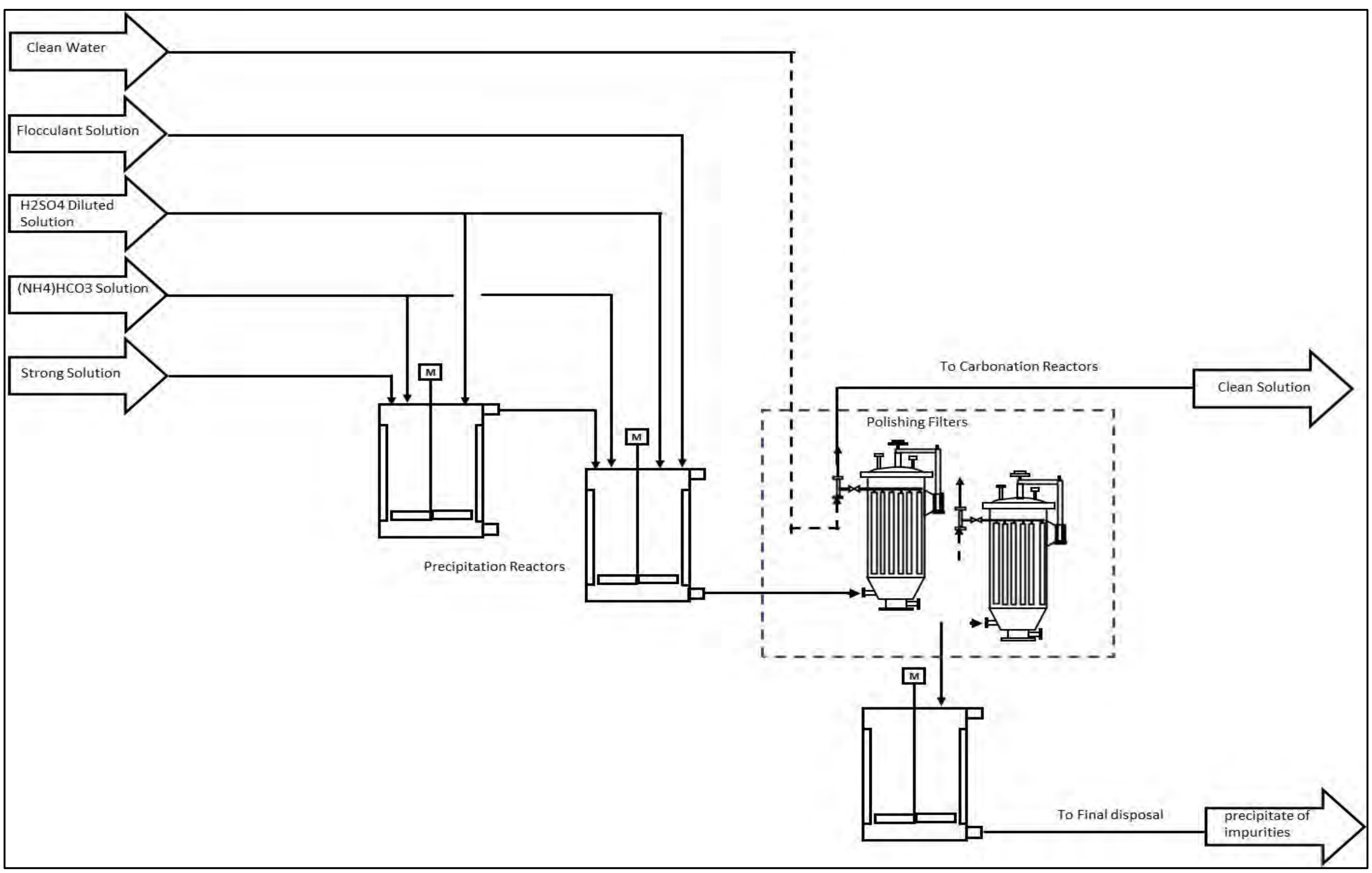
The equations that explain the precipitation process are as follows:

$$Al^{3+} + 3\ NH_4HCO_3 \rightleftharpoons Al\ (OH)_3 + 3CO_2 + 3NH_4^+$$

$$Fe^{3+} + 3\ NH_4HCO_3 \rightleftharpoons Fe\ (OH)_3 + 3CO_2 + 3NH_4^+$$

$$Th^{4+} + 4\ NH_4HCO_3 \rightleftharpoons Th\ (OH)_4 + 4CO_2 + 4NH_4^+$$

Figure 17-5: Scheme of Area 0300.



Note: prepared by Ausenco, 2021.

17.3.4 Carbonation and Drying (Area 0400)

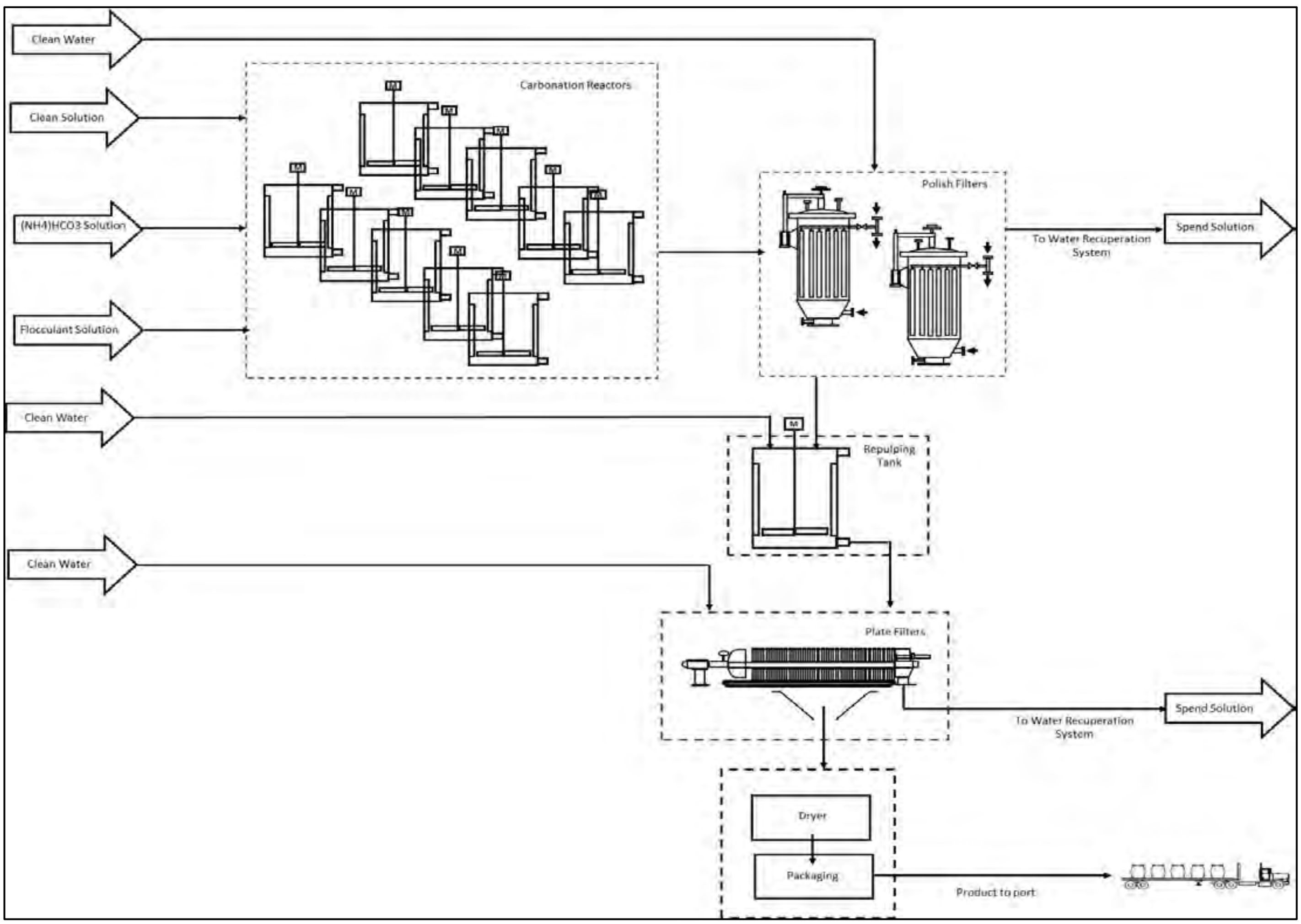
The clean solution of the polishing filters, from the purification, is fed to the rare earth carbonation system (reactors) where enough ammonium bicarbonate is added to precipitate the lanthanides as carbonates. The process must keep the pH controlled in the range of 7.0 to 7.5. The pulp generated is sent to polishing filters, where the solid (rare earth carbonates) is discharged into an agitated pond for washing with water to remove the impregnation solution. The pulp obtained in this process is fed to a plate filter where the solid continues to the drying process and subsequent packaging.

The solutions generated in this carbonation process are sent to the water recovery system from where part of these solutions return to the leaching process. See Figure 17-6

The precipitation equation of rare earth carbonates:

$$2REE^{3+} + 6HCO_3 \rightleftharpoons Re_2(CO_3)_3 + 3CO_2 + 3H_2O$$

Figure 17-6: Scheme of Area 0400.



Note: prepared by Ausenco, 2021.

17.3.5 Water Treatment System (Area 0500)

The treatment system of discarded solutions has the purpose of recovering water and removing impurities that affect the quality of the product.

The design will feature chemical precipitation by adding reagents along with other technologies in studies such as Nanofiltration, Reverse Osmosis and Ion Exchanges.

17.3.6 Parameters and Result of Mass Balance

The extraction data generated from the 6,683 drill holes, are used to obtain a mining plan. This mining plan produces an annual flow of ore that feeds the plant along with the grade per element and extraction throughout the useful life of the Project. From these data, an average mineral feed flow is obtained accompanied by the grade for elements and extraction, which are used to perform the mass balance.

Table 17-1 shows the average data of the extraction generated from the mining plan together with the results of the recovery of the plant.

Table 17-1: Recovered Mineral

Element	Leaching	Plant Recovery	Total Recovery
	%	%	%
Y	46.39	98.4	45.63
La	13.35	99.1	13.24
Ce	2.31	98.1	2.26
Pr	14.68	98.9	14.53
Nd	15.33	99.1	15.19
Sm	19.10	98.0	18.72
Eu	36.55	97.3	35.56
Gd	23.68	99.1	23.46
Tb	32.72	95.8	31.34
Dy	36.36	92.7	33.71
Ho	39.35	97.1	38.22
Er	40.35	96.5	38.94
Tm	38.49	95.1	36.59
Yb	36.28	94.4	34.24
Lu	37.91	90.5	34.29
REE Total	18.49	98.1	18.13

The recovery of the plant is based on the high efficiency in the rare earth precipitation reactions, data obtained in the laboratory tests and described in Section 13 that together with the efficiency of the technology, of the solid / liquid separation system, and washing allow to achieve a recovery of 98,1%.

The latest efficiency data in the separation of solid liquid and washing, vendor information, is being verified through tests with specialized companies in the market.

Regarding the parameters used in mass balance, these were obtained in the various laboratory tests and subsequently checked in Test Bench scale "Chapi" which are shown in Section 13 of this Report.

Table 17-2 shows the list the parameters used.

Table 17-2: Information and Evaluation Conditions

Description	Unit	Value
Feeding		
Processed Wet Mineral	t/h	240
Dry Mineral	t/h	202
Fresh Mineral Moisture	%	16
REE Grade	ppm	2,047
Leaching		
pH		3-4
$(NH_4)_2SO_4$ Concentration	Molar	0.15
Impurities Precipitation		
pH		5.5-6.0
Carbonate Precipitation		7.0-7.5
Dry Filtered Product		
Dry carbonate	t/a	1,275
REE grade	%	51.4
REE2 (CO_3) grade	%	91.9
Eq REEO grade	%	91.9
Metallurgical performance		
Leaching	%	18.49
Plant yield	%	98.1
Overall performance	%	18.13
Fresh Water Consumption	m^3/h	11.7

17.4 Reagents

The reagents that are needed on the REE carbonates production process are indicated on Table 17-3.

Table 17-3: Reagents Used in the Process.

Reagent Consumption	Unit	Value
Sulfuric Acid (98%)	kg/t dry	1.063
Ammonium sulphate	kg/t dry	1.140
Ammonium bicarbonate	kg/t dry	1.949
Lime	kg/t dry	0.434
Flocculant	kg/t dry	0.121

The detailed procedures of how these reagents are going to be used are listed below.

17.4.1 Sulfuric Acid Diluted Solution Preparation

Sulfuric acid is one of the most used reagents on the Lanthanide Production Plant. The 98% Sulfuric acid is brought in a cistern truck and is fed to a H_2SO_4 receiver tank, then it's pumped through a solution mixer where it is mixed with treated water from the water recuperation system. The mix is fed to a H_2SO_4 solution tank and is dissolved with acid scrubber solutions coming from the Drying and RO Plant area Scrubber systems, obtaining a 10% H_2SO_4 solution already diluted for being pumped and used on the Process Plant required areas previously mentioned.

17.4.2 Ammonium Sulphate Solution Preparation

Maxi bags of 750 kg solid $(NH_4)_2SO_4$ are distributed with a Jib crane in a way that the solid may be fed to two $(NH_4)_2SO_4$ solution agitated tanks which are also fed with treated water from the water recuperation system. Then, the obtained $(NH_4)_2SO_4$ solution is pumped to be used in the Process Plant leaching circuit.

17.4.3 Ammonium Bicarbonate Solution Preparation

Ammonium Bicarbonate is the most used reagent on the Lanthanide Production Plant. Maxi bags of 750 kg solid $(NH_4)HCO_3$ are distributed with a Jib crane in a way that the solid may be fed to two $(NH_4)HCO_3$ solution agitated tanks which are also are fed with treated water from the water recuperation system. Then, the obtained $(NH_4)HCO_3$ solution is pumped to be used in the Process Plant required areas previously mentioned.

17.4.4 Lime Slurry Preparation

Maxi bags of 750 kg solid $Ca(OH)_2$ are distributed with a Jib crane in a way that the solid may be fed to two Lime slurry preparation agitated tanks which are also are fed with clean water from the water recuperation system. Then, the obtained lime slurry is pumped to be used in the RO Plant area impurities precipitation stage.

17.4.5 Flocculant Solution Preparation

Bags of 50 kg flocculant are used to feed a flocculant solution agitated tank through a flocculant dispenser. The tank is also fed with both treated and clean water from the water recuperation system, then the solution is pumped to be used in the Process Plant required areas that were previously mentioned.

17.5 Supplies

17.5.1 Air

Air is needed on the process plant mainly for two purposes. One is for supply air lines on all the plant areas and instruments and the second is particularly for compression on Plates Filters that are used on Leaching, carbonation, and RO Plant areas.

The atmospheric air is passed by air compressors, air driers, air filters and then Process air receivers, which distributes air to instruments, plant hose station and the process plant Plates filters.

17.5.2 Water Distribution

17.5.2.1 Clean Water

All the fresh water needed for the Process plant requirements is taken from the Penco Water intake, which mainly feed a Clean water tank that also receives RO Water from the two RO Plants considered on the Water treatment system. This clean water is pumped to all Process plant required areas that were previously mentioned.

17.5.2.2 Treated Water

The rejected water from RO Plant 2, and the treated water from the water recuperation system feeds a Treated water tank, which through pumping, distributes treated water to all Process plant areas which do not need high purity water and is mainly used for reagent solutions preparation. Destination areas are previously mentioned in detail.

17.5.2.3 Potable Water

A potable water cistern truck fed the Potable water tank, from where potable water is pumped to the safety showers placed on the process plant, and also to areas where it is necessary for people to use and consume.

17.5.2.4 Fire System Water

Part of the fresh water taken from the Penco Water intake is fed to a Fire System Tank, from where it is pumped to a tap for fire emergencies on the plant.

18 PROJECT INFRASTRUCTURE

18.1 Introduction

The overall site plan (see Figure 18-1) shows the major Project facilities, including the open pit mines or extraction zones, disposal zones and processing plant. Infrastructure to support the Penco Project will consist mainly of site civil work, site facilities/building, a water supply system, and site electrical.

Site civil work will include designs for the following infrastructure:

- Access and internal roads;
- Process facility platforms;
- Disposal zones

Site facilities will include both mine facilities and process facilities:

- The mine facilities will include the administration offices, canteen, mine workshop and change house. Explosives storage is not considered due to the operational definition of not considering drilling and blasting unit operations.
- The process facilities will include the process plant, administration offices, laboratory, warehouse, fuel storage, and miscellaneous facilities.
- Process facilities will be serviced with fresh water taken from the Penco Water Intake, fire water, compressed air, power and communication. In addition, a potable water tank that will be supplied by a tank truck will be considered in the project.

Accessibility, local resources and offsite infrastructure is described in Section 5.

18.2 Roads and Logistics

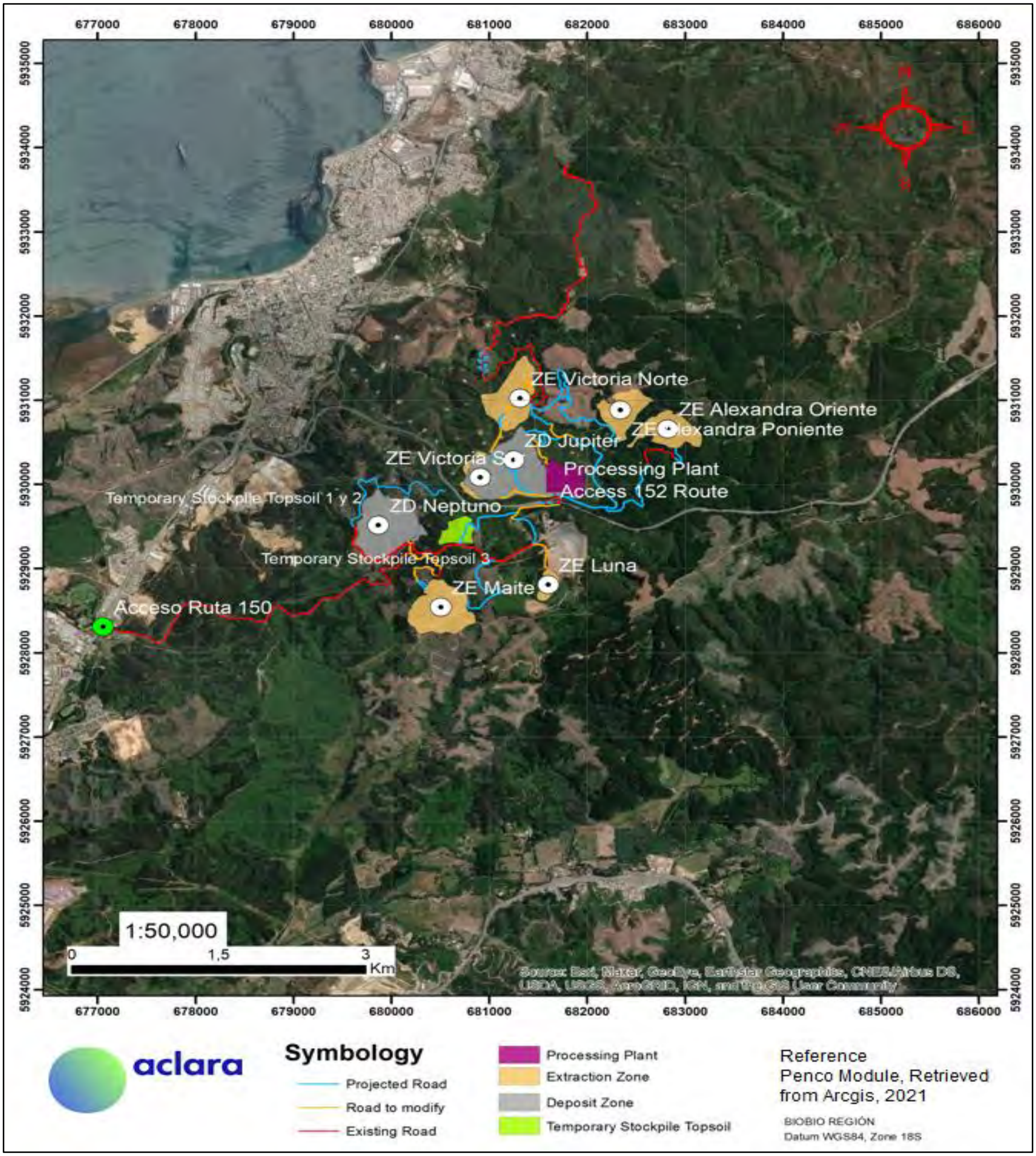
Access to the site from the Town of Penco is 5 km via Route 150 that connect with a 7 km paved road that leads to the site.

The General Directorate of Concessions is studying to enable different accesses on the 152 Route. Aclara is coordinating with this Chilean road authority, the incorporation of an access to the Project in km 71, as depicted in Figure 18-1.

To access the other areas of the Project, existing roads will be used, considering the forestry activity present in the area, which will be improved if they are required for the Project operation, in addition to enabling new roads.

The Penco Module internal roads will form a network of approximately 30 km, as depicted in Figure 18-1.

Figure 18-1: Infrastructure Layout Plan



The use of these roads is required mainly for the transportation of materials from the Extraction Zones to the Process Plant and/or Waste Disposal Facilities, according to the corresponding cycle.

The road network is formed by:

- Existing roads: roads that currently exist in the Project areas with an approximate length of 10 km. In general, no modifications will be required to these roads, except in specific areas that require local repair, which will be evaluated in future stages.
- Roads to be modified: roads that currently exist in the Project areas and that will have to be modified for the traffic of mining equipment. The approximate length is estimated in 5 km.
- Projected roads: roads that will have to be built in the Project areas for the traffic of mining equipment, considering approximately 15 km.

18.3 Waste Disposal Facilities (WDF)

18.3.1 Introduction

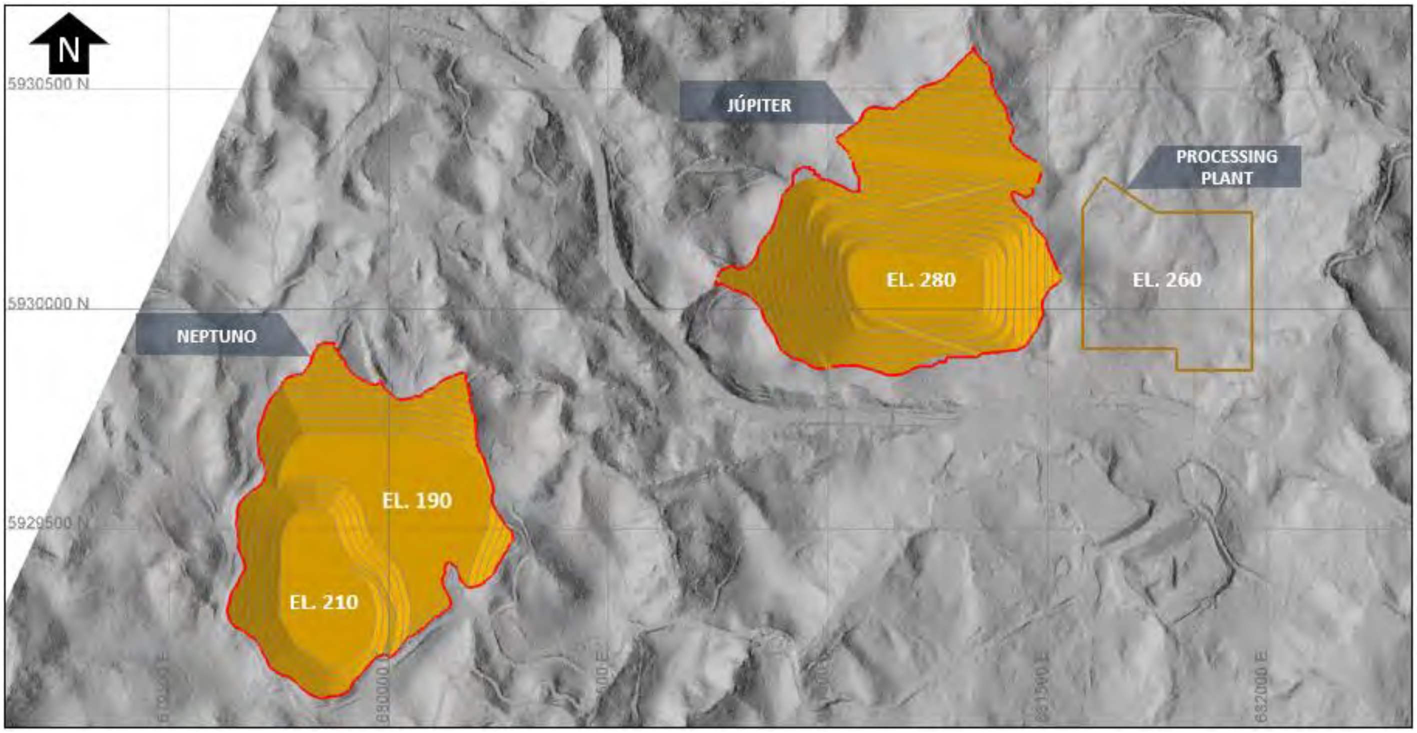
A preliminary siting and waste material deposition trade-off study was carried out to evaluate potential sites and disposal methods for tailings and waste residual soil. For tailings, Ausenco looked at both wet and filtered tailings deposition and identified several potential storage sites. However, based on the site's proximity to local communities and potential environmental impacts, it was decided to move forward with a filtered tailings storage option. It was also decided to progress with co-placement of filtered tailings and waste residual soil to minimize environmental impacts and improve the short- and long-term physical stability of the two waste streams. It is important to notice that no comminution process is considered and a filtration process with pressure filters is considered to produce cake material that can be transported by trucks or conveyors.

The waste disposal facility (WDF) is divided into two sections: the waste residual soil facility (WRSF) at the southern end and the dry stack tailings facility (DSTF) at the northern end. There are two WDF; Jupiter located near the process plant and Neptuno located 1 km southwest of Jupiter. The WDFs are designed to consist of co-placement of waste residual soil and filtered tailings. No civil infrastructure-like buildings or roof structures are required, nor is a bottom geomembrane.

Regarding the water management, the Project considers hydraulic infrastructure to prevent runoff from entering disposal areas, and to collect and dispose off runoff that eventually generate within these areas. Main infrastructure considers evacuation channels and contour channels. Evacuation channels are designed to collect water that enters disposal zones and contour channels are considered to prevent surface runoff from entering the Disposal Zones, these channels will be located upstream and bordering these areas, to receive runoff from surrounding hills and nearby streams, but also from the evacuation channels. These channels will restore rainfall water into the natural water courses and minimize the water entering the Disposal Zones. Restitution works (corrugated steel gutters) will be in place for the discharge into nearby ravines. Additional information on the water management is provided in Section 18.5.

The locations of the Waste disposal facilities are shown in Figure 18-2.

Figure 18-2: **Waste Storage Facilities Location**



Note: prepared by Ausenco 2021

The primary design objectives for the WRSFs and DSTFs are the secure confinement of waste residual soil and filtered tailings and the protection of regional groundwater and surface water during mine operations and in the long term (post-closure). The design of the WDF and water management facilities has taken into account the following:

- Staged development of the facility over the life of the Project.
- Flexibility to accommodate operational variability in the waste residual soil and filtered tailings (filter plant shutdowns along with placement during variable climate conditions).
- Control, collection, and removal of contact water from the facility during operations for reuse as process water to the maximum practical extent.

Approximately 5.6 Mm^3 of mine residual soil will be stored within the WDFs along with 13.8 Mm^3 of filtered tailings. The placement of materials will be trucked from the open pit and plant and spread and compacted with a dozer and compactor. The overall exterior slope will be 3.5:1 (H:V). The deposition method provides a number of benefits, as follows:

- Filtered tailings that do not meet moisture content or density targets can be placed in the interior to not have an impact on overall stability of the facility.
- The primary requirement for the filtered tailings will be the ability to transport the material to the facility and trafficability for subsequent placement utilizing coarser filtered tailings to provide a trafficable surface.

Surface water management for the WDF consists of a series of collection channels and contour channels to convey contact surface water from the WDF to the appropriate receiving environment. As described in section 18.5, for the contour channel dimensions, maximum precipitations in 24 hours with return periods up to 100 years will be considered.

18.3.2 Production Schedule and material properties

Mine residual soil and filtered tailings production schedule and key properties are shown in Table 18-1, Table 18-2 and Table 18-3:

Table 18-1: Mine residual soil production schedule

Period	Process Plant Feed Dry t/y	Waste mine Dry t/y	Moisture Waste Mine range
1	1,324,260	787,345	15% - 20%
2	1,765,680	484,653	15% - 20%
3	1,765,680	238,093	15% - 20%
4	1,765,680	886,509	15% - 20%
5	1,765,680	328,632	15% - 20%
6	1,765,680	1,101,044	15% - 20%
7	1,765,680	457,964	15% - 20%
8	1,765,680	395,334	15% - 20%
9	1,765,680	384,901	15% - 20%
10	1,765,680	1,286,077	15% - 20%
11	1,765,680	657,287	15% - 20%
12	874,737	300,991	15% - 20%
Total	19,855,797	7,308,829	15% - 20%

Table 18-2: Particle Size distribution curve of mine residual soil

Sieve	Diameter (µm)	Partial Retained (%)	Percent finer (%)
3/4"	19,050	0.00	100
1/2"	12,700	0.00	100
3/8"	9,525	0.04	100
1/4"	6,350	0.23	100
4	4,750	0.36	99
6	3,350	1.35	98
8	2,360	2.60	95
10	1,700	3.65	92
12	1,400	2.85	89
20	850	6.61	82
28	600	4.51	78
35	425	6.02	72
48	300	5.79	66

Sieve	Diameter (µm)	Partial Retained (%)	Percent finer (%)
65	212	5.58	60
100	150	5.69	55
150	106	5.29	49
200	75	4.73	45
270	53	4.63	40
400	38	3.57	37
- 400	0	36.5	0

Table 18-3: Filtered Tailings Production Schedule

Year	Oversize Static Grizzly Dry t/y	Trommel Oversize (>10mm) Dry t/y	Coarse spent Ore Filtration Cake (1mm < GR < 10mm) Dry t/y	Fine Spent Ore filtration Cake (< 1 mm) Dry t/y	RO Plant Filtration Cake Dry t/y	Total Filtered tailing Dry t/y	Moisture Filtered Tailings (3)	Total Filtered Tailings t/y	Range % < 1 mm	Range % > 1 mm
1	Eventual Flow (Considered 0 in mass balance)	665	158,779	1,166,139	5,646	1,331,230	20%	1,664,038	80%-90%	10%-20%
2		887	211,706	1,554,852	7,528	1,774,974	20%	2,218,717	80%-90%	10%-20%
3		887	211,706	1,554,853	7,528	1,774,974	20%	2,218,718	80%-90%	10%-20%
4		887	211,706	1,554,853	7,528	1,774,974	20%	2,218,718	80%-90%	10%-20%
5		887	211,706	1,554,853	7,528	1,774,974	20%	2,218,718	80%-90%	10%-20%
6		887	211,706	1,554,852	7,528	1,774,974	20%	2,218,718	80%-90%	10%-20%
7		887	211,706	1,554,852	7,528	1,774,974	20%	2,218,718	80%-90%	10%-20%
8		887	211,706	1,554,852	7,528	1,774,974	20%	2,218,718	80%-90%	10%-20%
9		887	211,706	1,554,853	7,528	1,774,974	20%	2,218,718	80%-90%	10%-20%
10		887	211,706	1,554,853	7,528	1,774,974	20%	2,218,718	80%-90%	10%-20%
11		887	211,706	1,554,853	7,528	1,774,974	20%	2,218,718	80%-90%	10%-20%
12		440	104,881	770,291	3,730	879.342	20%	1,099,177	80%-90%	10%-20%
Total	0	9,977	2,380,720	17,484,955	84,659	19,950,389	20%	24,950389	80%-90%	10%-20%

Source: Aclara, 2021.
Note 1: The Design is developed to accomplish chilean normative regarding to hazardous component. Chemically stable and not leachable with rain water.
Note 2: The design doesn't generate liquid waste, excepting the impregnant solution (H2O).
Note 3: Moisture Filtered Tailings range is between 17% and 20% according to Andritz Pilot Test.

18.3.3 Design Criteria

Table18-5 shows the design criteria defined for this study, considering information provided by the client, and the recommendations from Ausenco from similar projects and standard practice.

The codes presented in Table 18-4 are used to reference the origin of items of information and data that appear in the design criteria:

Table 18-4: Source of information and data

Code	Source of Information data
1	Data or criteria provided by Client
2	Consultants reports or data
3	Standard Industry / operating practice / benchmarking
4	Ausenco recommendation, standard procedures, or in-house data

Table18-5: Design Criteria

Design Criteria -Infrastructure	Unit	Criteria	Source
Tailings Storage Facility			
Type of tailings	Filtered/Slurry/Paste	Filtered	1
Face lining required	Yes / No	No	3
Foundation lining required	Yes / No	No	3
Commodity	Type	Rare earths	1
Years of LOM (Life-of-mine)	Years	12	1
Filtered Tailings			
Tailings Production	t/y	See Table 181	1
Total Tailings production	t	24,950,389	1
Final Dry Tailings (in place) density	t/m^3	1.76	2
Final humid Tailings (in place) density	t/m^3	2.12	2
Mine residual soil			
Tailings Production	t/y	See Table 181	1
Total Tailings production	t	7,308,829	1
Final Dry Tailings (in place) density	t/m^3	1.76	2
Final humid Tailings (in place) density	t/m^3	2.12	2
Jupiter WDF			
Global Slope Angle	°	16	4
Maximum Height	M	84	4
Elevation	masl	280	4
Capacity	m^3	9,903,682	4

Neptuno WDF			
Global Slope Angle	°	17	4
Maximum Height	m	83	4
Elevation	masl	210	4
Capacity	m^3	11,333,301	4

18.3.4 Geotechnical Parameters

Disposal waste facilities were designed under geotechnical campaigns outcomes, which provided information from laboratory programs defined to characterize both, founding geotechnical properties and waste materials. Estimated parameters are shown in Table 18-6 and Table 18-7, below, which were defined in previous analyses by Lancuyen (2020)

Table 18-6: Neptune Geotechnical Parameters

Material	Unit Weight (kN/m^3)	Cohesion (kPa)	Friction Angle (°)	Undrained Resistance $\delta/\sigma v$
Mine Residual Soil	20.77	3	30	-
Filtered Tailings	20.77	-	-	0.429
Layer 2 (SM)	16.66	19.5	32	-
Layer 3 (Rock Foundation)	26.50	0	38	-

Table 18-7: Jupiter Geotechnical Parameters

Material	Unit Weight (kN/m^3)	Cohesion (kPa)	Friction Angle (°)	Undrained Resistance $\delta/\sigma v$
Mine Residual Soil	20.77	3	30	-
Filtered Tailings	20.77	-	-	0.424
Layer 2 (SM)	16.66	19.5	32	-
Layer 3 (Rock Foundation)	26.50	0	38	-

Drained behaviour of mine residual soil must be guarantied by compaction process during construction. On the other hand, undrained properties were considered for filtered tailings as a conservative criteria based on the difficulty to reach the design moisture with filtered process and the raining weather conditions on the site.

18.3.5 Failure Consequences Classification

Despite not being a tailings dam, for classification purpose, the Dam Safety Guidelines (CDA, 2013) is used. This guide provides a method to classify dams based on the consequences of failure. Table 18-8 presents a classification scheme that can be used for this purpose.

Table 18-8: Dam Classification – CDA 2013

Dam class	Population at risk	Incremental losses		
		Lost of life	Environmental and cultural values	Infrastructure and economics
Low	None	0	Minimal short-term loss No long-term loss	Low economic losses; area contains limited infrastructure or services
Significant	Temporary only	Unspecified	No significant loss or deterioration of fish or wildlife habitat Loss of marginal habitat only Restoration or compensation in kind highly possible	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes
High	Permanent	10 or fewer	Significant loss or deterioration of important fish or wildlife habitat Restoration or compensation in kind highly possible	High economic losses affecting infrastructure, public transportation, and commercial facilities
Very high	Permanent	100 or fewer	Significant loss or deterioration of critical fish or wildlife habitat Restoration or compensate in kind possible but impractical	Very high economic losses affecting important infrastructure or services (e.g., highway, industrial facility, storage facilities for dangerous substances)
Extreme	Permanent	More than 100	Major loss of critical fish or wildlife habitat Restoration or compensation in kind impossible	Extreme losses affecting critical infrastructure or services (e.g., hospital, major industrial complex, major storage facilities for dangerous substances)

In this project is expected a classification "low" or "significant" for both WDFs, considering the following:

- Non-existent population around both WDFs.
- Staff are also not expected to work permanently in the vicinity of the WDFs.
- Because it is filtered tailings, high solid contents are expected and low possibility to flow, then, in an eventual failure, the released material is expected to slide a very short distance. This would mean a low environmental impact on the affected areas.
- No major infrastructure or facility have been identified near the WDFs. Figure 8-2 shows a road, some access for internal use of mine, and the process plant which elevation is the same of the highest elevation of WDF Jupiter.

However, for next engineering phases is recommended to complete a Runout analysis for an appropriate estimation of impacted areas and losses quantification. This will determine a classification based on a better approximation of failure consequences.

18.3.6 Design Earthquake

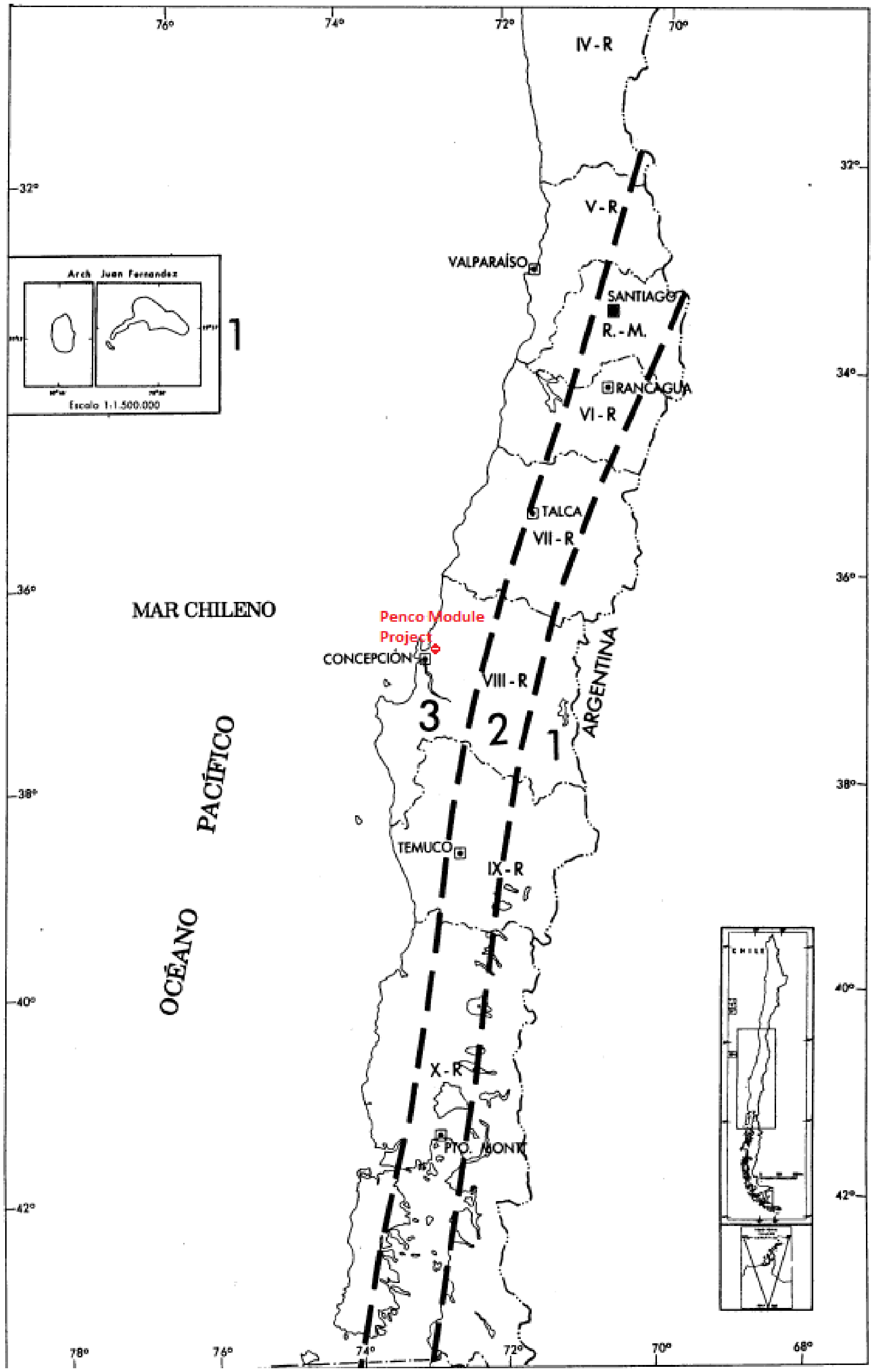
At the time the slope stability analysis was complete, a site seismic hazard assessment was not available. Due this, a local standard (Norma Chilena Oficial – NCh2369.of 2003) was used to select the ground peak acceleration. This standard divides the Chilean territory in three zones affected by different ground acceleration levels. Table 18-9presents the peak ground acceleration for each zone, and Figure 18-3 shows the location of the project into the Zone 3. Then, ground peak acceleration recommended for this location is 0.4 g.

Table 18-9: Ground Peak Accelerations for seismic zone

Seismic Zone	a_{max}
1	0.20 g
2	0.30 g
3	0.40 g

Note: prepared by *Norma Chilena Oficial* – NCh2369.of 2003
Note: Accelerations based on 10% of exceedance probability and 50 years of exposure (Section C.4.2 – NCh2369.Of2003).

Figure 18-3: Seismic Zones in Chilean Territory



Note: prepared by Norma Chilena Oficial – NCh2369.Of2003

Subsequently, the client provided a seismic hazard study developed by Gensis (2021). Table 18-10shows ground accelerations presented in that report:

Table 18-10: Ground Acceleration for Retorn Period – Gensis (2021)

Zone	Pseudo Acceleration for Retorn Period (g)[1]		
	T = 73 years	T = 475 years	T = 2475 years
WDF Jupiter	0.1567	0.3352	0.6129
WDF Neptuno	0.1734	0.3752	0.7187

Note 1: Values with Sa = 0.01 s and 50% percentile.

In the same way, CDA provides values for annual exceedance probability of design earthquakes (see Table 18-11). In this case, for a "Significant" classification, as discussed on previous section, the return period recommended would be between 1/100 and 1/1,000. This corresponds quite well to the value of peak ground acceleration selected for the current analysis (0.4g).

Table 18-11: Target Levels for Earthquakes Hazards – CDA (2013)

Dam Classification	Annual Exceedance Probability – Earthquakes
Low	1/100 AEP[1]
Significant	Between 1/100 and 1/1,000
High	1/2,745
Very High	½ Between 1/2,475 and 1/10,000 or MCE[2]
Extreme	1/10,000 or MCE

Note 1: AEP, Annual exceedance probability.
Note 2: MCE, maximum Credible Earthquake.

Based on this, a horizontal earthquake coefficient of 0.20 was selected, estimated as 0.5 a_{max}.

For a better estimation of a specific value of earthquake coefficients, in next engineering studies is recommended to use the project specific seismic hazard assessment recently provided by the client (Gensis, 2021), in addition to an appropriate classification based on failure consequences.

18.3.7 Stability Analysis

Stability analyses were completed to assess the performance (i.e., safety factor) of Waste Disposal Facility under, static and pseudo static (seismic) loading conditions. Safety factor is defined as the ratio of forces tending to resist failure over forces tending to cause failure. Based on Canadian Dam Association – CDA (2019)[5] minimum factors defined to evaluate acceptable performance are presented in Table 18-12.

[5] Application of Dam Safety Guidelines to Mining Dams (2019).

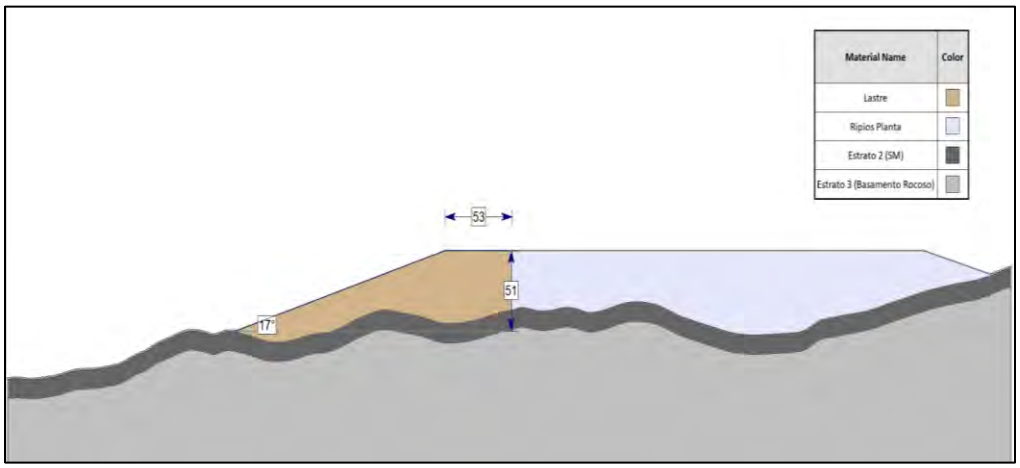
Table 18-12: Required Minimum Factor of Safety

Stability Assessment	Target Factor of Safety
Long term – Static Assessment	≥ 1.50
Pseudo Static Seismic Assessment	≥ 1.00

Slope stability analyses were performed using SLIDE 5.0 of Rocscience Inc. Canada. The Spencer (1967) method was used to analyze the stability of the WDF slopes, which is based on limit equilibrium where solution satisfied both force, and moment equilibrium.

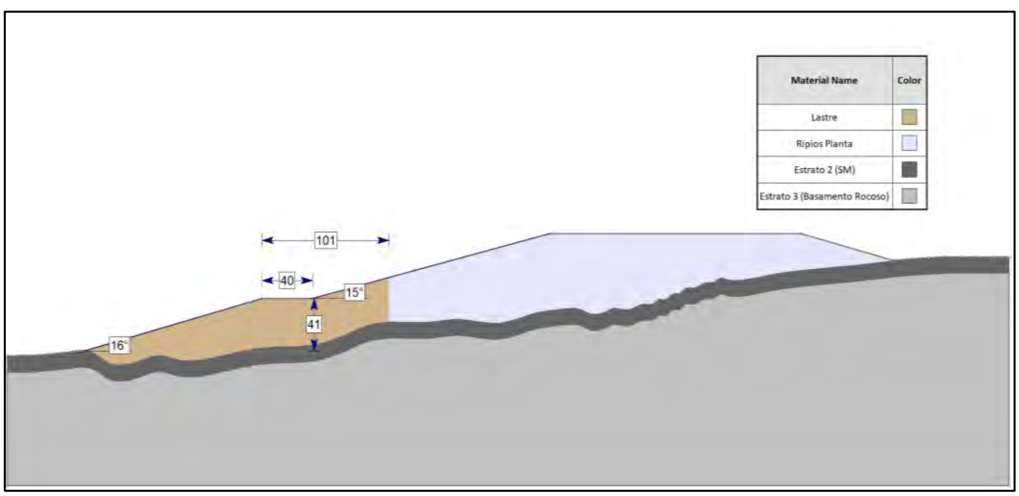
Typical cross-sections are shown in Figure 18-4 and Figure 18-5.

Figure 18-4: Neptuno Cross Sections Analysis



Note: prepared by Ausenco, 2021.

Figure 18-5: Jupiter Cross Sections Analysis



Note: prepared by Ausenco, 2021.

Static and pseudo-static stability assessments are summarized in Table 18-13 and Table 18-14.

Table 18-13: Neptuno Stability Assessment

Stability Assessment	Method	Calculated Minimum Factor of Safety	Required Minimum Factor of Safety
Static	Spencer	2.016	1.5
Pseudo Static MCE (Kh=0.20)	Spencer	1.151	1.0

Table 18-14: Jupiter Stability Assessment

Stability Assessment	Method	Calculated Minimum Factor of Safety	Required Minimum Factor of Safety
Static	Spencer	1.932	1.5
Pseudo Static MCE (Kh =0.20)	Spencer	1.102	1.0

Under initial configuration, for the pseudo-static condition, both Waste Disposal Facilities show safety factors above 1.0, considered stable according to the magnitude of the applied earthquake and study level.

18.4 Water Supply

A projected water balance results in a consumption of 11.7 m^3/h of fresh water for the Process Plant. Considering other water consumptions related to services and road wetting, the estimated total consumption of fresh water is 35 m^3/h. The water supply consists of catchment and drive system from the Penco creek, where the water will be driven to the Processing Plant through a pipeline, aiming to supply the required water for the Project. The catchment will be set by a water intake. This considers a fixed barrier within the channel, which diverts the water flow to a loading chamber, where a bilge pump is located. A side spillway is included for the restitution of water that is not picked up by the system, towards its natural course.

The construction within the water course will be built with reinforced concrete, while the floodgates of the inlet of the flow and its drainage will be iron made, free to operate them manually. An electric transmission line with wooden poles will be enabled for electricity supply to the catchments, which will be located parallel to the existing roads through which the catchments are accessed. The specific location coordinates of catchment are listed in the Table 18-15.

Table 18-15: Location of Fresh Water Catchment

Type	Name	Coordinates UTM (WGS84 – huso 18)	
		E (m)	N (m)
Catchment	Penco	681256	5931502

The water driving system from the Penco creek towards the Processing Plant will be through HDPE pipelines induced by a pump. The impulsion system for PEA purposes has been initially dimensioned for a maximum 35 m^3/h flowrate. The pipe and pump parameters are listed in Table 18-16.

Table 18-16: Fresh Water Drive Pipe Features

Design Parameters	Value
Flowrate (m^3/h)	35
Height difference (m)	151
Length (m)	2000
Pipe diameter (mm)	140
Pipe type	PN-25

The water drive will count with two pumps in the catchment point, in a 1+1 configuration, which means, one operating while the other is on standby. The drive itself will have suction cups in its layout, mainly at the highest points, to release the air from the pipe and / or avoid possible overpressures. It should be noted that the Project already has water rights on the location where the catchment is going to be set, in the Penco creek.

Potable water for human consumption, bathrooms and safety showers will be supplied from water cistern trucks.

18.5 Water Management

Annual precipitations in the Project area range between 800 mm/year and 1650 mm/year, which is why rainwater management systems have been designed to prevent runoff from entering areas such as pits or coming into contact with Waste Disposal Facilities.

In each extraction zone, hydraulic works corresponding to evacuation channels will be enabled, according to the contributing surfaces of each bank, and contour channels whose size depend on the flow that is required to evacuate, in addition to works of restitution of rainwater to the natural channels. The rainwater that falls on the surface and slope of each Extraction Zone bank (terrace) will be evacuated through evacuation channels, which are placed on each slope foot, towards the contour channels, by which water is diverted to the appropriate receiving environment.

Several sizes of evacuation channels will be designed within each Extraction Zone. This design will depend on the contributing surfaces of each bank. Rectangular sections will be used to facilitate construction (backhoe) and will consider a return period of 10 years and 0.2% slopes to avoid erosion.

Given that slopes are mainly determined by topography, in some contour channels the velocity is expected to be greater than 0.5 m/s. To avoid the erosion of the channels, they will be constructed as trapezoidal at the base with variable height and slopes in a 1:1 ratio (45%), lined with concrete (or technically similar solution) and irregularly shaped stones of sufficient size, to reduce the flow energy.

In other areas with speeds greater than 1 m/s, to prevent erosion the following criteria will be included:

- A concrete cover with irregularly arranged stones and stable construction system (with wire mesh or technically similar solution. The coating could also be changed by technically similar characteristics, as defined in later phases of detail engineering).
- In high slope sections there will be bleachers implemented, also made of concrete with wire mesh and stones arranged irregularly (or technically similar solution).
- Curves of the channels will be smoothed taking as a parameter that the minimum radius of the curvature for a channel carrying 0.5 m^3/s will be 5 m. and for a channel carrying 1 m^3/s it will be 10 m.

- To minimize the water flow rate through the channels, the contour channels will evacuate water as soon as the topography makes it possible. This is made to avoid high flowrates being carried. To lower the impact, the natural shape of the draining net is considered.

The energy will be dissipated by bleachers and falls, which will slow the flow, reducing its energy and velocity.

The contour channels will receive runoff from surrounding hills and nearby streams, as well as from the evacuation channels. The discharge of an evacuation channel into a contour channel will be set based on a sill plate and concrete walls with wire mesh and irregularly arranged stones.

For the discharge towards nearby ravines, the implementation of restitution works is considered, which are intended to direct and restore rainfall coming from the contour channels into natural water courses. Contour channels will discharge water towards the appropriate receiving environment through corrugated galvanized steel gutters.

For the contour channel dimensions, maximum precipitations in 24 hours with return periods up to 100 years will be considered.

Process water management is described in Section 17.

18.6 Built Infrastructure

The processing plant covers an area of 13.6 hectares, where there are several facilities and areas associated with ore processing, waste management and personnel services.

The process plant area will include the facilities described below:

18.6.1 Industrial Buildings

The buildings of the plant area will be designed according to the weather conditions of the site and requirements of the process.

The Project areas are classified as follows:

- Area 100 – Ore Stacking and Feeding:
  - Stacking Sector of temporary ore, Static Grizzly with Hopper and Washing Drum. It will include a roofed shed without walls for a limited sector where ore blend will be made.
- Area 200 – Mineral Leaching:
  - Thickeners (CCD), Plate Filters, Belt Filter, Belt Conveyor, Receptions Tank, Wet Screen, Dosage Pumps
- Area 300 - Impurities Precipitation:
  - Precipitation Reactors, Polishing Filter, Tanks, Dosage Pumps
- Area 400 –Precipitation and Drying of Carbonates

  - Reactors Carbonation, Polishing Filters, Tanks Repulping, Plate Filter, Drying, and Packaging, Hopper, Belt Conveyor, Dosage Pump.

- Area 500 – Water Recuperation System:
  - Precipitation Reactors, Dosage Pumps, Nanofiltration, Reverse Osmosis and Ion Exchanges, Hopper.
- Area 600 - Reagent Warehouse:
  - There is a storage warehouse for chemical products for the various chemical products required in the process, ammonium Sulfate, flocculant, Sulfuric Acid, Ammonium Bicarbonate, Lime.
- Area 700 - Administration, Offices and Laboratory:
  - It is considered an administrative building, laboratory, dining hall, dressing rooms and control room.
- Area 800 - Geological Core Sample Warehouse:
  - It is considered buildings for core sample storage.
- Area 900 – Spend Ore Stacking: In progress.
- Area 0000 – General Area:
  - Reagent preparation building (ammonium Sulfate solution, flocculant solution, Sulfuric Acid diluted, Ammonium Bicarbonate solution, Lime Slurry), Compressors room, Water conditioning plant.

18.7 Accommodations

All employees will be housed offsite because of the location of the Project close to Penco and Concepcion districts. No accommodation camp is considered.

18.8 Power and Electrical

For the process plant operation, the electrical power is considered to come from an existing line of 15 kV at 152 Route, located 300 m from the plant. For the operation of the water intake, a new line of 15 kV will be considered that will be connected to an existing line close to the water intake at 0-390 Route.

For both cases, Aclara is holding conversations with the "*Compañía General de Electricidad" (CGE SA*), the company that is responsible for distributing power in the zone to agree a contract for the power supply.

Energy prices were considered according with the energy cost estimation report made by "*Match Energía*" in 2020.

The average demand is calculated in 4.0 MW. Total loads have been estimated using the Project's process plant mechanical equipment list and other building power requirements. To supply some critical process loads, a diesel generator of 1 MW, in low voltage 380 Volts is considered.

The electrical system considerers: Substations of medium/low Voltage, 5 MVA, 15/0.38 kV, Electrical rooms with motor control center, frequency drives, electrical panels, auxiliary services, overhead power lines to distribute inside the plant, emergency generator, some electrical duct bank, electrical equipment's for control and protections the electrical system of plant.

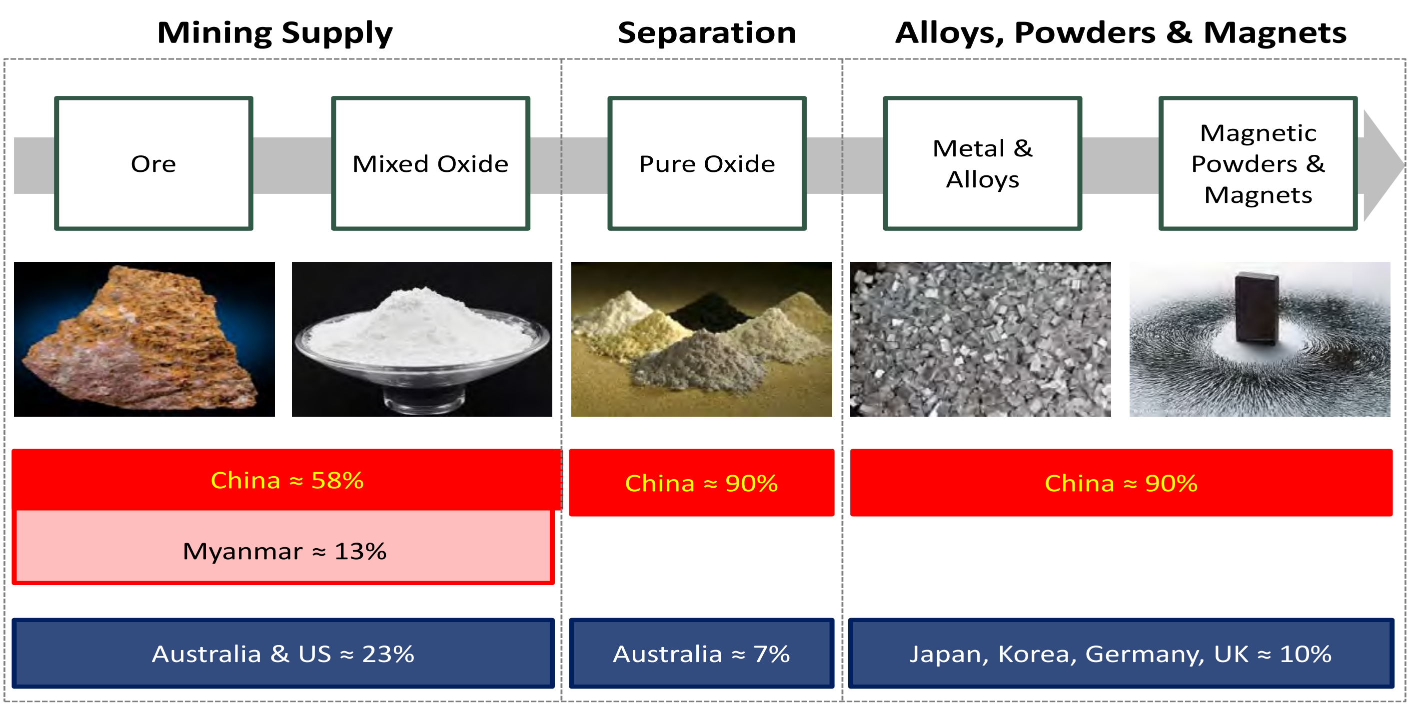
19 MARKET STUDIES AND CONTRACTS

CRU Consulting, an independent commodities research firm, has reviewed this Market Studies and Contracts chapter and the underlying data and models which derive the figures set out within it. It is the opinion of CRU Consulting that this report does reflect sound analysis, based on detailed and comprehensive data gathering, and the application of reasonable forecasting methods; and that this report can therefore be considered an independent market assessment for the purposes of the 43-101 exercise.

19.1 Market Overview

The REE industry is a niche market that has been in a state of growth for many years, specifically over the last three (2019-2021). The main driver of this growth are the developing industries related to the green energy transition (electric vehicles (EV) and wind turbines), electronics, and other technological applications that require these metals to function. From a global perspective, China has a dominant position in the REE industry. The country has managed to vertically integrate its REE production, providing a competitive advantage throughout the stages of the REE value chain (Figure 19-1).

Figure 19-1: Value Chain and China's Monopoly



Source of share by stage: USGS 2021 / Argus 2020

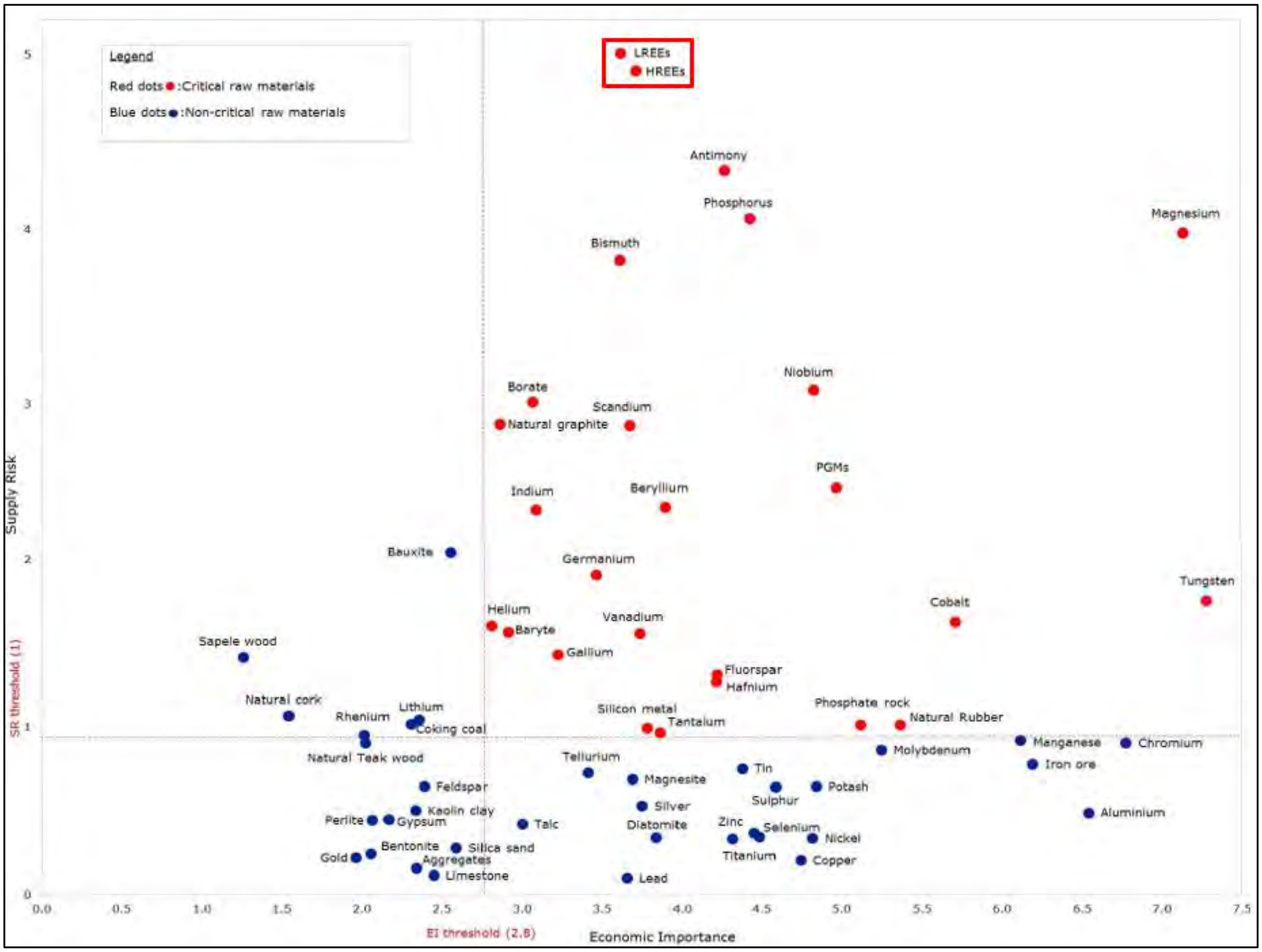
China's dominance in the REE market is driven by two fundamental reasons:

1) Benefit of its geography since geological conditions have provided the necessary environment to generate deposits with economic concentrations of REEs.

2) Specialized and skilled in the development of technologies at different points throughout the value chain, which have not been disclosed to the rest of the world.

As a result of China's REE dominance and REE's requirement in strategic applications, the United States and European Union have classified these minerals as 'critical'[6]. In addition to REEs, a number of base metals and industrial minerals have been given the 'critical' designation, as seen in the figure below (Figure 19-2).

Figure 19-2: Economic Importance and Supply Risk Results of 2017 Criticality Assessment.



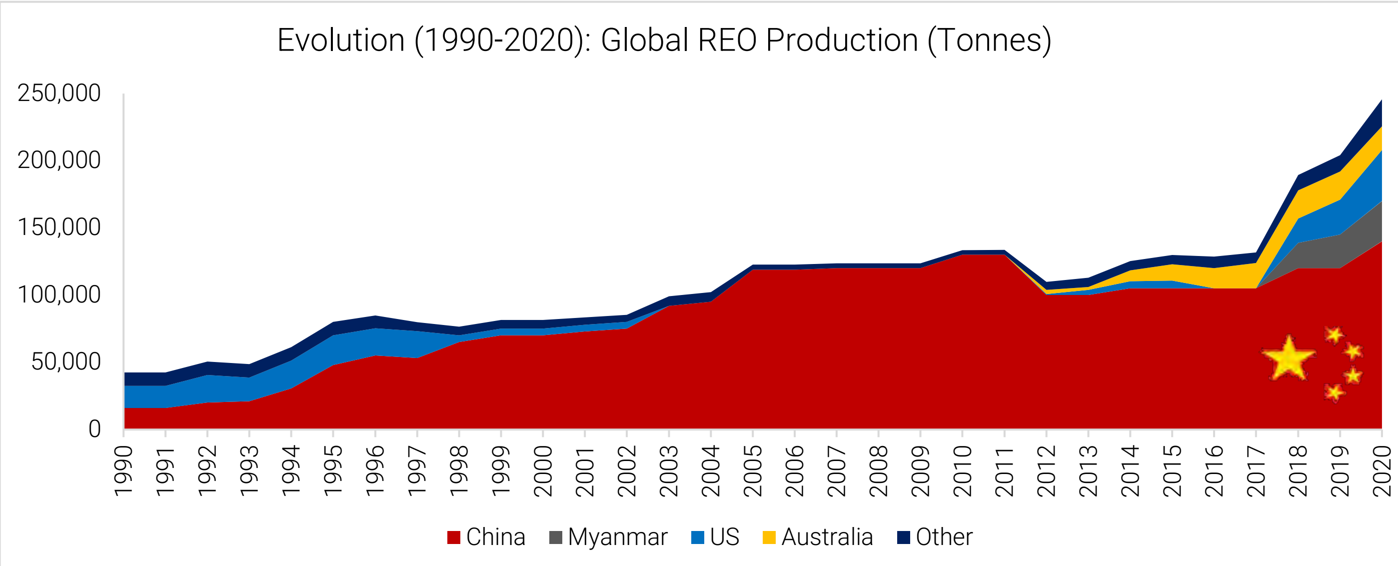
Note: prepared by European Commission

From 2005-2017, China controlled the majority of REE supply in the world (Figure 19-3) and strategically managed its inventory levels of REE to influence market prices (Argus Media, 2019). However, the challenges with China first became evident in 1999, when its government imposed export quotas for REE based products. In 2007, the Chinese government introduced additional legislation, establishing production quotas to control unofficial (illegal) REE production and maintain

[6] The European Union has produced a critical assessment based on supply issues and economic importance for key materials, which is updated on a regular basis. The European Union identified Rare Earth elements as highly critical. Rare Earth elements are key to the manufacture of electronic goods, wind turbines, computer hard-drives, and electric and hybrid vehicles (which use a far greater quantity of rare earth magnets than traditional combustion engines). (Fears, 2020)

the competitive advantage for Chinese state-owned companies. In 2010, China halted all exports of REEs to Japan in retaliation for a minor territorial dispute (Bradsher, 2010)[7]. As a result, REE prices increased substantially from 2010-2012. This price rise was reversed once China saturated the market with REE supply in 2012 (see 19.4 REE Prices section).

Figure 19-3: Rare Earths Oxides supply evolution.



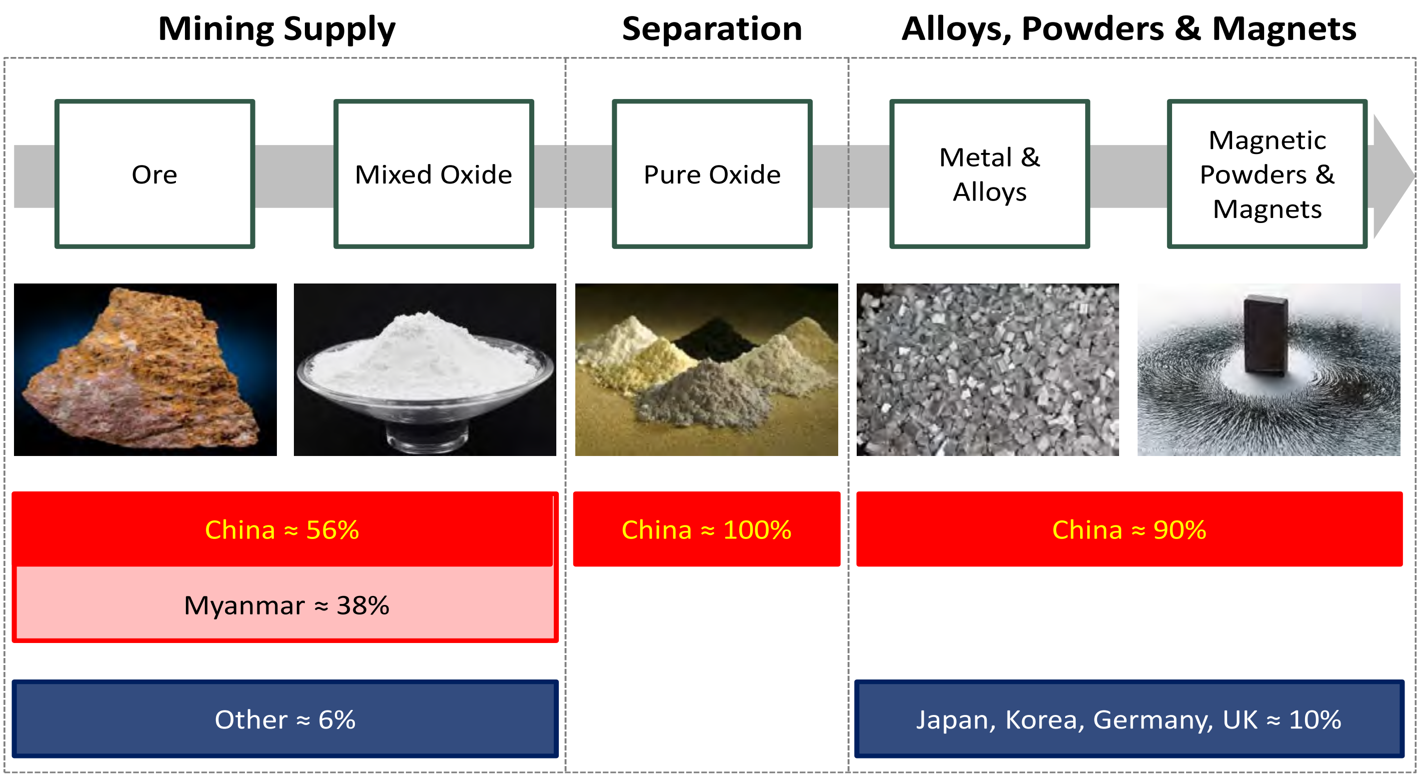
Note: prepared by USGS Geological Survey 1991-2021

In 2011, the first western REE project was put into production by Lynas Rare Earths ('Lynas'). Before Lynas, the only western REE mine was Mountain Pass[8], a California, United States based operation that was developed by Molycorp in 2011. Both Lynas and Mountain Pass experienced operational difficulties from 2012-2015. In 2015, REE prices began to decline, driven mainly by REE oversupply originating from China, resulting in Molycorp declaring bankruptcy the same year and Lynas generating negative cash flows. In 2018, Mountain Pass was reopened by MP Materials, and Lynas strengthened its contribution to the global RE supply (75% production increase).

The industry has been in constant growth from 2015-2019, with total REE demand increasing at a compound annual growth rate (CAGR) of 6.4% over this time frame (Adamas). Despite the increase in demand, only Mountain Pass and Mt Weld out of 65 known REE deposits outside of China (without considering REE by-product producers) have been able to reach production. These two operations, primarily produce LREEs (La, Ce, Pr, Nd & Sm), the most common REE found in the earth crust (USGS Fact Sheet 087-02). HREE (Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y) production is dominated by China. The country leverages its competitive advantage of ionic clays deposits, which are often found with concentrated heavy rare earths elements (HREE) that are easy to extract via mining and processing, and have negligible radioactivity compared to rock deposits. In 2018, Myanmar also commenced ionic clays REE production, with operations located along its border with China. As a result, Myanmar has evolved into the second largest HREE supplier in the world, with all of its production exported to China. (Figure 19-4).

[7] A Chinese trawler was fishing illegally in Japanese waters and was caught. In retaliation, China decided to revoke rare earth exports to Japan.
[8] Mountain Pass operated until 2003, when it was shut down due to solvency problems.

Figure 19-4: Heavy Rare Earths Value Chain and China's Monopoly.



Note: prepared by USGS 2021 / *Argus 2020*

19.2 REE Demand

REE demand growth over the last 3 years has been primarily driven by end use applications. According to Argus Media (2019), there was estimated rare earth oxide ('REO') demand of 168,000 tons in 2018. In 2019, Argus Media (2020) estimates that the glass industry was the highest consumer of REO tonnes, followed next by magnets. The main applications and uses of REEs are presented in Table 19-1 below.

Table 19-1: Applications, Main Usages, Share of REE (In green: major use)

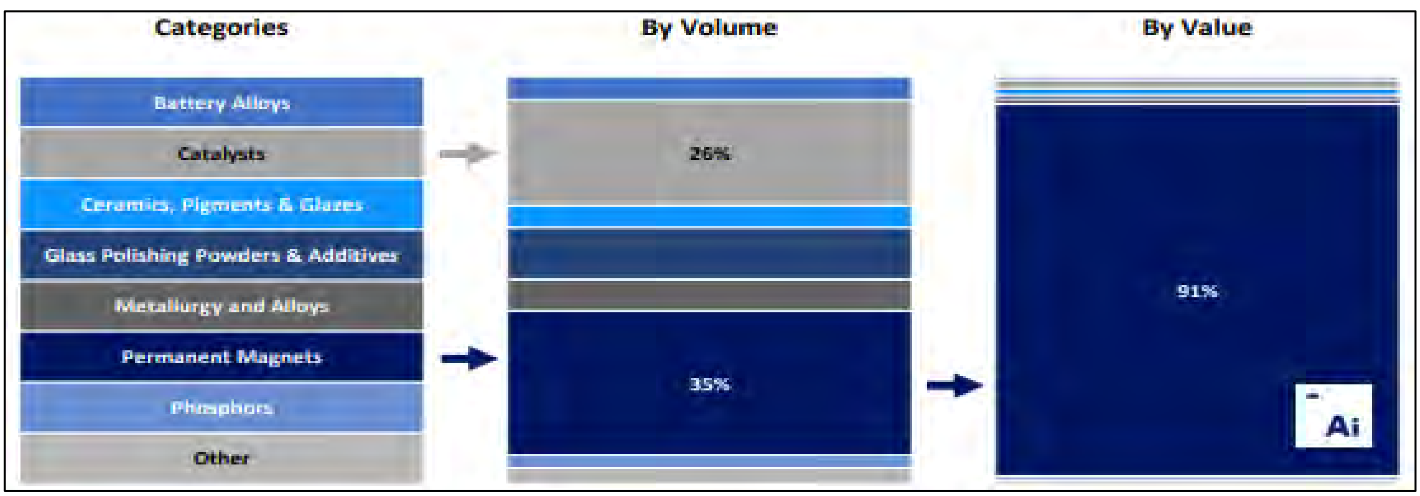
		LREE					HREE									
		La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Yb	Lu	Y	Sc
Magnets	Wind Turbines, EVs, microphones, speakers, communication systems, military applications			x	x	x			x	x						
Glass	Polishing compounds, optical glass, UV resistant glass, X-ray imaging, thermal control mirrors	x	x	x	x	x		x				x	x	x	x	

		LREE					HREE									
		La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Yb	Lu	Y	Sc
Phosphors	CRT/PDP/LCD, medical imaging phosphors, lasers, fibre optics, optical temperature sensors	x	x			x	x	x	x	x		x			x	x
Catalysts	Petroleum refining, chemical processing, catalyst converter, diesel additives	x	x													
Battery Alloys	Ni-MH batteries, fuel cells	x														
Metallurgy	Steel, lighter flints, aluminium and magnesium, cast iron, super alloys	x	x		x								x		x	x
Ceramics	Capacitors, sensors, colorants		x	x	x	x				x		x	x		x	x

Source: Argus Media Group, 2019

Permanent magnets, which are required for applications with a high level of performance, are most commonly composed of NdFeB (containing NdPr). Dy and Tb are added to the magnet's composition to increase its operating temperature from 60 °C up to a maximum of 200 °C (Pavel, C., Marmier, A., Tzimas, E., Schleicher, T., Schüler, D., Buchert, M. and Blagoeva, D., 2016). This characteristic inherent to Dy and Tb is a necessary feature for permanent magnets used in e-mobility, military applications, and electronics, where an operating temperature greater than 180 °C is required (Widmer, Martin, and Kimiabeigi, 2015). According to Adamas (2019), permanent magnets accounted for 35% of REE demand by volume and 91% by value in 2018 (Figure 19-5).

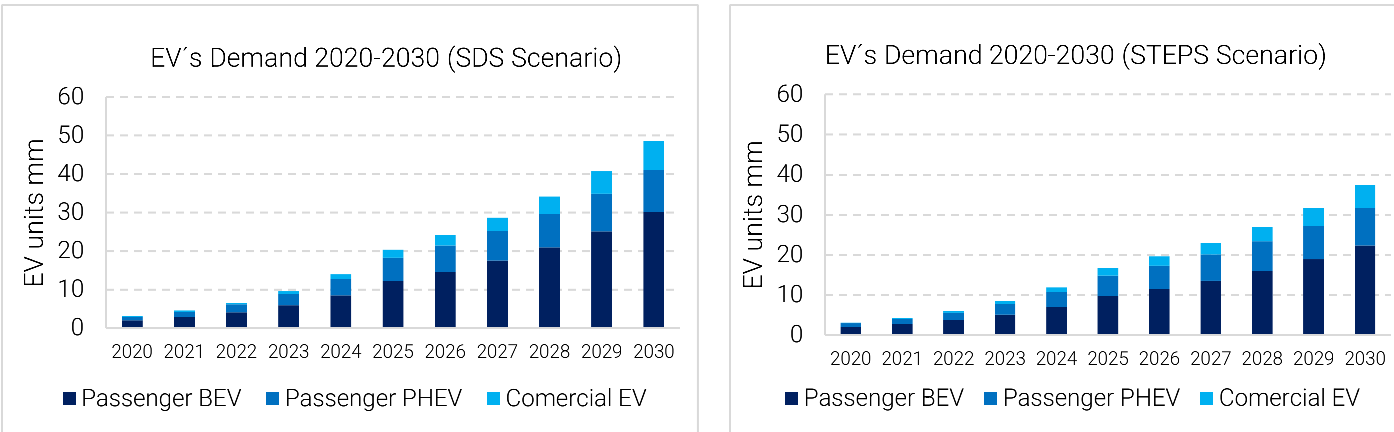
Figure 19-5: REE Applications by volume and by value.



Note: prepared by Adamas, 2019

Adamas forecasts (Figure 19-6) a market increase of approximately five times for magnet REOs by 2030, with an estimated CAGR of 9.7% (starting 2021). The main driver for the demand increase is the forecast exponential increase in electric vehicle (EV) demand from 2021-2030, as outlined by the International Energy Agency (IEA). According to IEA, EV[9] demand is estimated to have a CAGR of 31% in the Sustainable Development Scenario (SDS)[10] and a CAGR of 24% in Stated Policies Scenario (STEPS)[11] from 2020 to 2030.

Figure 19-6: Electric Vehicles Forecast 2020-2030.



Note: prepared by IEA EV Outlook 2021

According to Demeter EU project and University of Birmingham Magnet Materials Research Group, each new electric car is estimated to contain between 2 and 5 kg of Rare Earth magnets (Fears, 2020). The composition of NdFeB magnet is presented in Table 19-2.

Table 19-2: Typical Composition of Sintered NdFeB for Applications at Room Temperature.

Chemical Element	Percentage by weight
Neodymium (Nd) and/or praseodymium (Pr)	29% - 32%
Iron (Fe)	64% - 69%
Boron (B)	1.0 % - 1.2%
Aluminum (Al)	0.2% - 0.4%
Niobium (Nb)	0.5% - 1.0%
Dysprosium (Dy)* and/or Terbium (Tb)	0.8% - 1.2%

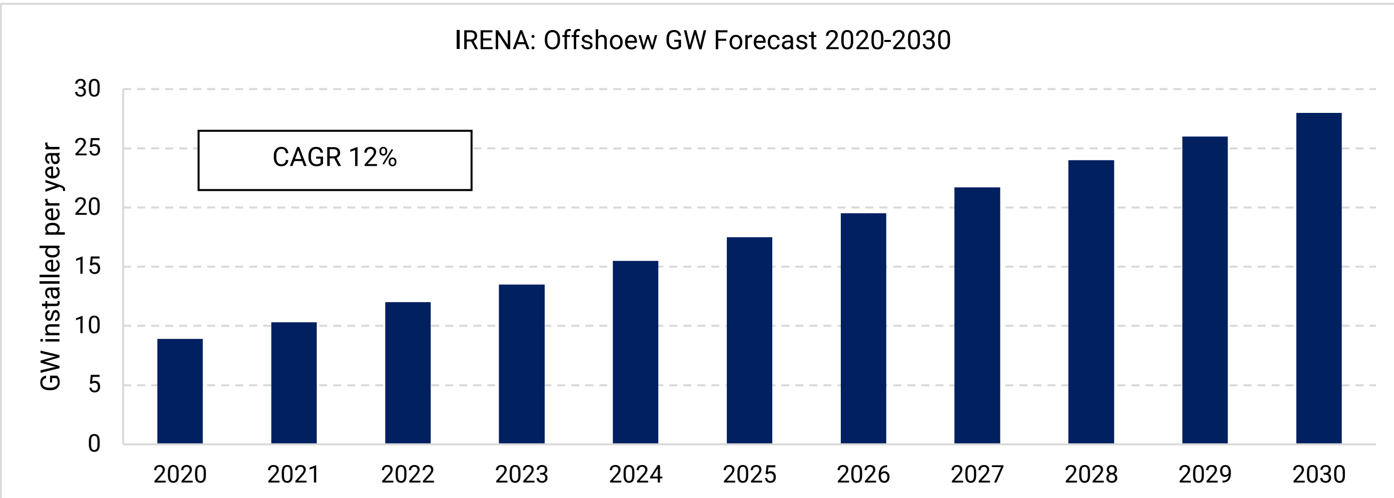
*The Dy content could be increase up to 9% to allow the magnet to operate at high temperatures, i.e. up to 200°C.
Source: Pavel, et al., 2016

The dysprosium loading in an NdFeB magnet for EVs can vary between 3.7% and 8.7%, and as a result the magnet increases its coercivity between 100 and 200°C. However, to avoid demagnetization along the life of the car, the NdFeB in the electric vehicle motor is kept in 7.5% (Pavel, et al., 2016).

[9] Include Passenger Battery Electric Vehicles (BEV), Passenger Plug in Hybrid Electric Vehices (PHEV), and Commercial EV (Light, medium, and heavy duty vehices).
[10] *"The IEA's Sustainable Development Scenario (SDS) outlines a major transformation of the global energy system, showing how the world can change course to deliver on the three main energy-related SDGs simultaneously. To achieve the temperature goal, the Paris Agreement calls for emissions to peak as soon as possible and reduce rapidly thereafter, leading to a balance between anthropogenic emissions by sources and removals by sinks (i.e. net-zero emissions) in the second half of this century. These conditions are all met in the SDS."* (Source: International Energy Agency)
11 *"The Stated Policies Scenario reflects the impact of existing policy frameworks and today's announced policy intentions. The aim is to hold up a mirror to the plans of today's policy makers and illustrate their consequences for energy use, emissions and energy security."* (Source: International Energy Agency)

Another driver of demand growth for NdFeB permanent magnets is from renewable energies, primarily off-shore wind turbines (Argus Media, 2020). According to the International Renewable Energy Agency ('IRENA'), the amount of GW generated by off-shore wind turbines will have a CAGR of 12% from 2020-2030 (IRENA, 2019). Figure 19-6 shows the forecast of off-shore wind power for 2020-2030.

Figure 19-6: Offshore Wind Power GW Forecast 2020-2030.

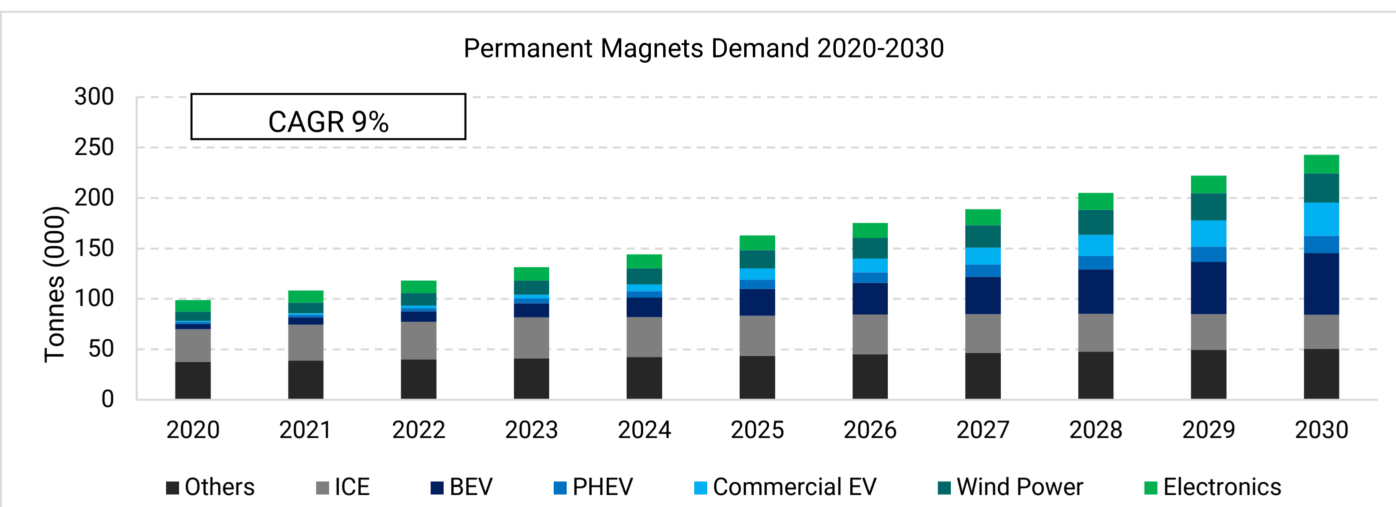


Note: prepared by IRENA FUTURE OF WIND Deployment, investment, technology, grid integration and socio-economic aspects.

AMEC Environment & Infrastructure UK Limited (2014) outlines that offshore wind power (Geared wind turbine systems) had 186.6kg per MW of Nd content and 6.6 kg per MW of Dy content, with proportional Nd use to capacity increases assumed (AMEC Environment & Infrastructure UK Limited, 2014).

Other sources of demand for NdFeB permanent magnets include consumer electronics, industrial applications, air conditioners, and elevator. The demand for permanent magnets is shown in Figure 19-7.

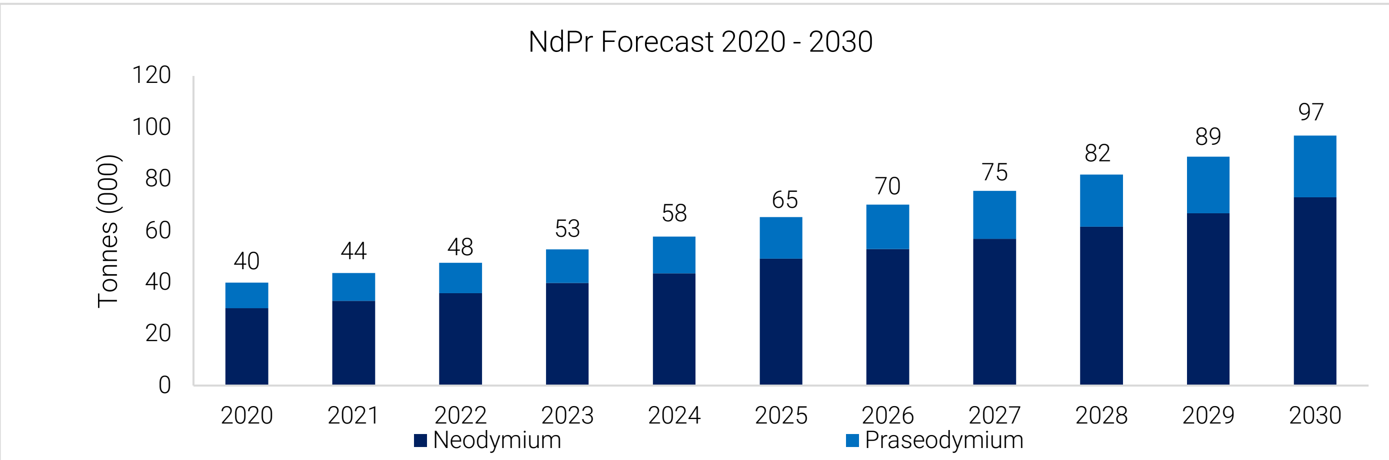
Figure 19-7: Permanent Magnets Forecast 2020-2030.



Note: prepared by Demand based on IEA, IRENA, Pavel, et al., AMEC.

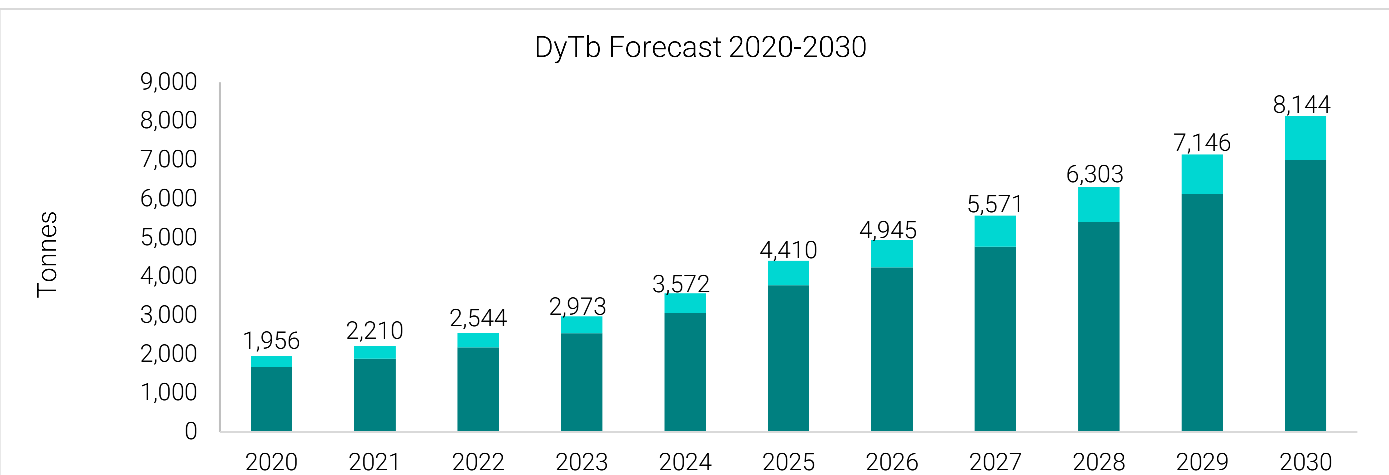
Demand for NdPr and DyTb is derived (Figure 19-8, Figure 19-9) using the NdFeB permanent magnets 2020-2030 forecast (Figure 19-7). Demand considers REE material losses experienced in the production process of NdFeB permanent magnets. In order to produce 1.2 kg of NdFeB permanent magnets, Adamas estimates that there is an additional 0.4 kg of NdFeB alloy that is diverted to waste streams, equivalent to a total of 1.6 kg of NdFeB alloy consumption (Green Car Congress, 2019). Furthermore, 15%-20% of REEs are used to compensate for losses incurred during the production of NdPr, Ferro-Dy and other REE alloys (Green Car Congress, 2019).

Figure 19-8: NdPr forecast 2020-2030.



Note: prepared by NdPr demand based on permanent magnets demand (Figure 19-8).

Figure 19-9: DyTb forecast 2020-2030.



Note: prepared by DyTb demand based on permanent magnets demand (Figure 19-8).

19.3 REE Supply

In 2020, the world REO supply was estimated at 240,000 tonnes (USGS, 2021). In February 2021, China updated its H1 2021 production quota to 84,000 tonnes, which represented an increase of 27% (as compared to H1 2020), and a record level of production (Table 19-3).

Table 19-3: 2020 REO Supply

USGS 2020 Supply	Unit	China	USA	Myanmar	Australia	By-product Supply	Total
Praseodymium	mt	7,287	1,634	1,183	1,034	1,060	12,197
Neodymium	mt	22,411	4,560	4,387	3,622	3,685	38,664
Terbium	mt	244	22	158	16	47	461
Dysprosium	mt	1,109	19	956	39	94	2,198
Other REE	mt	108,949	31,765	23,316	12,289	10,114	186,480
Total	**mt**	**140,000**	**38,000**	**30,000**	**17,000**	**15,000**	**240,000**

*By product producers: India (Tamil Nadu/Kerala), Russia (Lovozero), Brazil (Buona Norte), Vietnam (Dong Pao), Burundi (Rainbow Rare Earths), US (Energy Fuels), Australia (Iluka Resources), Madagascar (Rio Tinto), Thailand (unidentified).
Source: USGS. Basket distribution have been estimated using company public reports and research papers.

China has been increasing production quotas since 2013, following rises in demand, and increases in supply stemming from the Mount Weld start-up (Lynas) and reopening of Mountain Pass (MP Materials). As shown in Table 19-4, the increase in Chinese production has mainly occurred within the LREE industry, where China has the ability to easily modify production levels. In the case of the HREE industry, which is only composed of ionic clays, China has increased mine supply by a minimal 3,170 tonnes in 9 years.

Table 19-4: China's Historic Production Quotas.

Production Quotas	LREE (Tonnes)	HREE (Tonnes)	Total
2021	136,935	21,020	157,955
2020	120,850	19,150	140,000
2019	112,850	19,150	132,000
2018	100,850	19,150	120,000
2017	87,150	17,850	105,000
2016	87,150	17,850	105,000
2015	87,150	17,850	105,000
2014	87,150	17,850	105,000
2013	75,950	17,850	93,800

Source: Ministry of Land Resources (MLR), China

The data presented in Table 19-4 does not include supply from illegal/unofficial mining in China. This additional production comes from ionic clays and is forecast to be 8,000 tonnes in 2021 (Argus, 2019).

Referring to the official production, there are six REE State Owned Enterprises ('SEO') in China: Chinalco Rare Earth & Metal, Northern Rare Earth, Xiamen Tungsten, China Minmetals, Guandong Rare Earth, and Southern Rare Earth (Argus Media, 2019). Table 19-5 shows the distribution of quotas among the SEO and production divided between LREEs and HREEs.

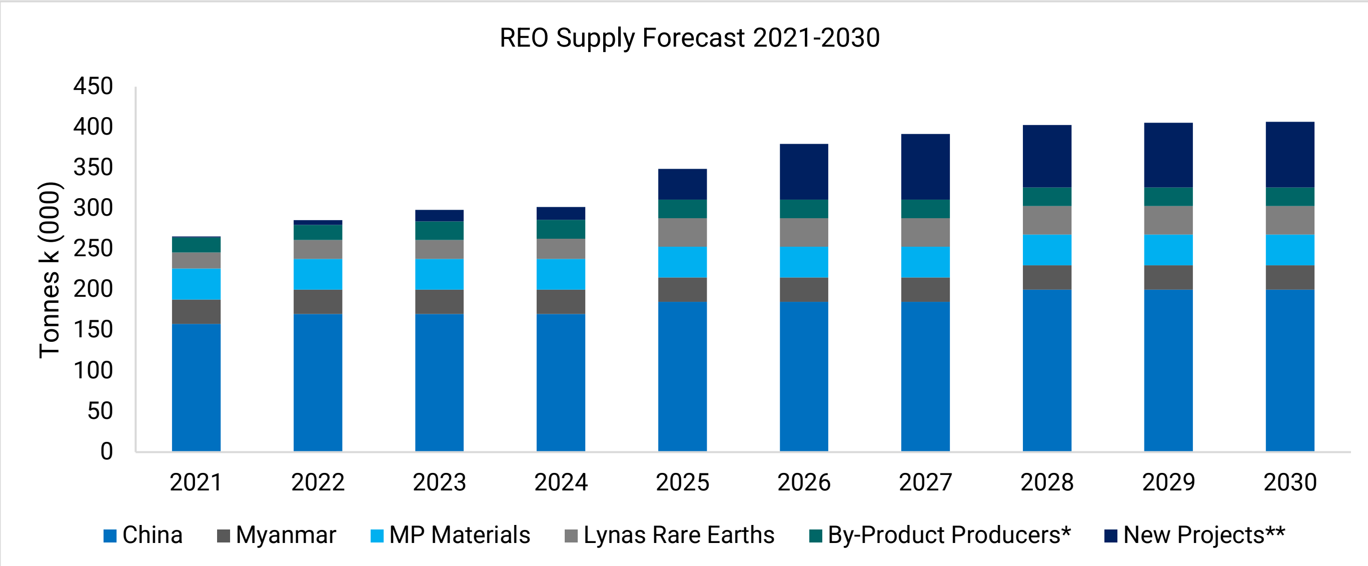
Table 19-5: China's Historic Production Quotas 2020 per SEO.

State Owned Enterprise (SEO)	Unit	H2 2020		H1 2021		Complete Year		Total REO
		Production Quota		Production Quota		Production Quota		
		LREE	HREE	LREE	HREE	LREE	HREE	
Northern Rare Earth	mt	38,175		44,130		82,305		82,305
Southern Rare Earth	mt	18,875	4,250	19,650	5,100	38,525	9,350	47,875
Chinalco Rare Earth & Metal	mt	7,375	1,250	8,730	1,500	16,105	2,750	18,855
China Minmetals	mt		960		1,206		2,166	2,166
Xiamen Tungsten	mt		1,720		2,064		3,784	3,784
Guangdong Rare Earth	mt		1,350		1,620		2,970	2,970
Total	mt	64,425	9,530	72,510	11,490	136,935	21,020	157,955

Note: prepared by Ministry of Land Resources (MLR), China

REO supply forecasts are derived using a number of underlying assumptions from third party data sources. Chinese production quotas have been projected with CAGR of 7% through the decade (2021-2030) up to 290,000 tonnes of REO, using 2021 REO supply as a basis. For Lynas, an increase in production has been assumed following the disclosure of its 2025 plan, which outlines a plan to reach 10,500 tonnes of NdPr production. For MP Materials, an increase in production has been assumed to 50,000 tonnes of REO by 2025 based on their disclosed future capacity. In the case of Myanmar, the production has been forecasted with CAGR of 6% through the decade. Finally, other by-product producers have been forecasted using their respective 2020 production estimates (Table 19-3). Additional supply has been estimated based on a group of new projects that are deemed to have a chance of entering into production. The detail of these projects has been taken from published technical reports and press releases. In addition, Figure 19-10outlines the REO forecast from 2021-2030.

Figure 19-10: 2021-2030 REO Supply Forecast.



*By product producers: India (Tamil Nadu/Kerala), Russia (Lovozero), Brazil (Buona Norte), Vietnam (Dong Pao), Burundi (Rainbow Rare Earths), US (Energy Fuels), Australia (Iluka Resources), Madagascar (Rio Tinto), Thailand (unidentified).
** New Projects: Energy Fuels, Serra Verde, Aclara, Vital Metals, Hasting Tech Metals, Arafura Resources, Peak Resources, Pensana, Northern Minerals, Australian Strategic Materials, Ionic Rare Earths
Note: prepared by Estimated using companies´ public reports and press releases.

19.4 REE Prices

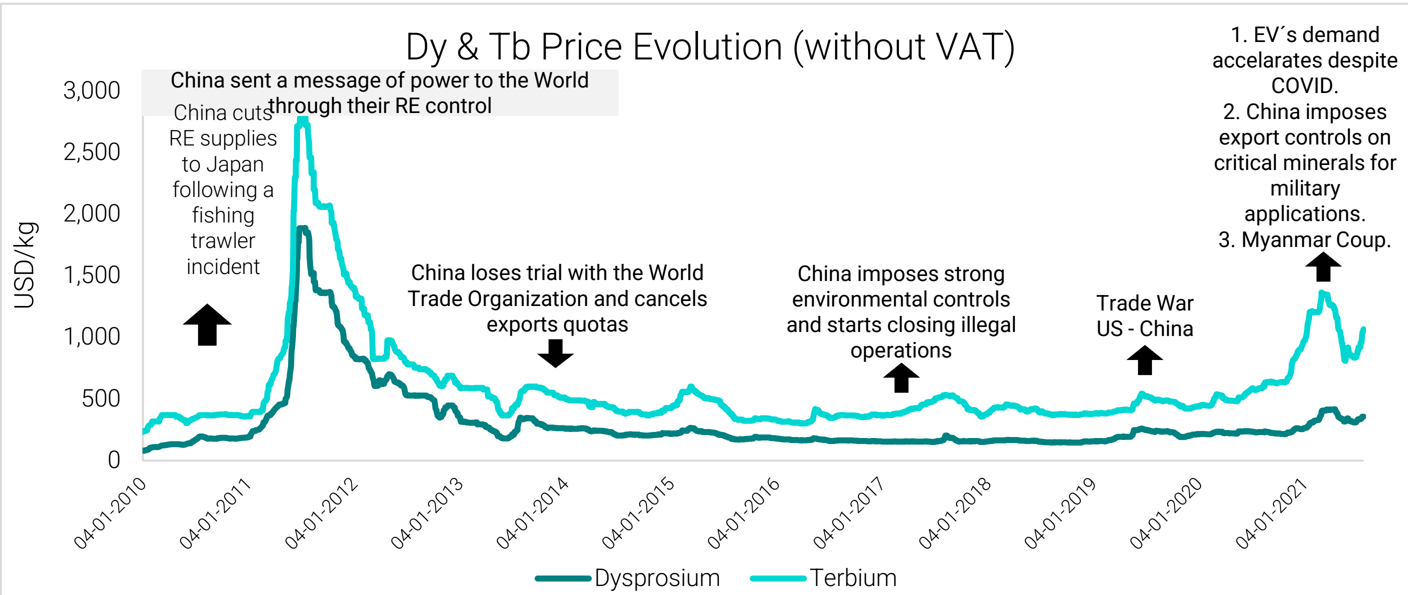
REE prices have been volatile throughout the last decade (2010-2020), driven by China's control of the REE market, which peaked at 97% of global REE production in 2010. Price volatility has decreased as China's dominance in the market has been reduced over the last decade, estimated at 60% in 2021. China's declining portion of global REE supply is resulting in REE prices becoming increasingly influenced by external demand factors, and less susceptible to Chinese production quotas. These external factors include realized demand increases in electric based transportation throughout 2020, as well as a desire by North American and European companies to source REEs from outside of China.

Over the last three years, REE demand has increased significantly, mainly driven by the green energy transition (see section 19.2 REE Demand). The Western (specifically North America and Europe) part of the world is seeking to create an independent REE value chain to mitigate this control that the Chinese have over the REE market, as well as reduce the Chinese REE use due to their low environmental standards. In 2017, the Chinese government imposed environmental measures that led to the closure of several separation plants with illegal operations. This led to significant volatility in the REE prices, with prices returning to historical levels subsequent to the reopening of Mountain Pass in 2019 (Argus, 2019). The increased levels of production from sources outside of China limited the historically volatile nature of REE prices. In mid-2019, tensions between China and the US were on the rise, which again led to a rebound in REE prices, with HREEs experiencing the most positive price impact.

At the beginning of 2020, REE prices fell slightly affected by COVID-19 (Argus Media, 2020). However, in October China announced a legislation regarding export controls. The rest of the world considered that this measure could have a negative impact on critical minerals including REE. In addition to this event, in February 2021 a military coup occurred in Myanmar followed by the declaration of a state of emergency (Reuters Staff, 2021). According to this agency, Myanmar supplies around half of HREE to China, for what is considered a critical provider.

In addition to these speculative market events, the main factor that influenced the upward price movement was on the demand side: the increase in electric mobility during 2020. Despite the pandemic, the EVs sales increased 41% in 2020 even though car sales fell by 6% (IEA, 2021). See Figure 19-11.

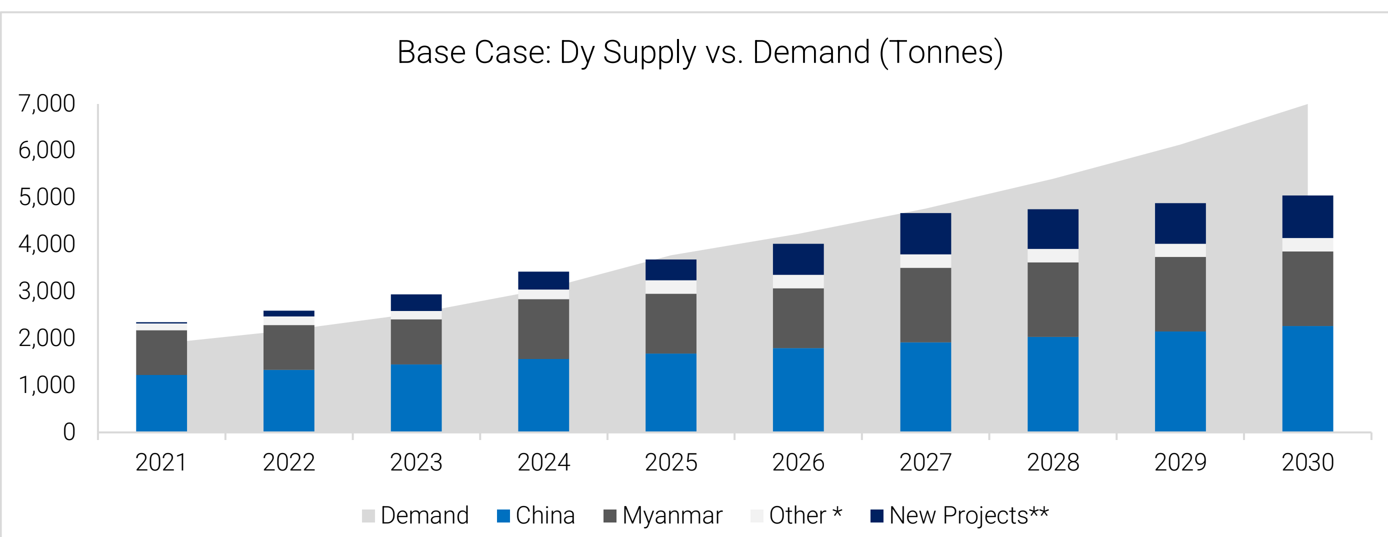
Figure 19-11: 2010-2021 YTD Dy & Tb Price Evolution.



Note: prepared by Asian Metals

Price forecasts for most of REEs (La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Ho, Er, Tm, Yb, Lu, Y) have been sourced from Argus Media. Aclara has estimated the price for dysprosium element. Aclara internal research has indicated that Dy should enter into a supply deficit by 2028, resulting in a sharp price increase by the end of the decade. Figure 19-12shows the Dy demand versus supply forecasted by Aclara.

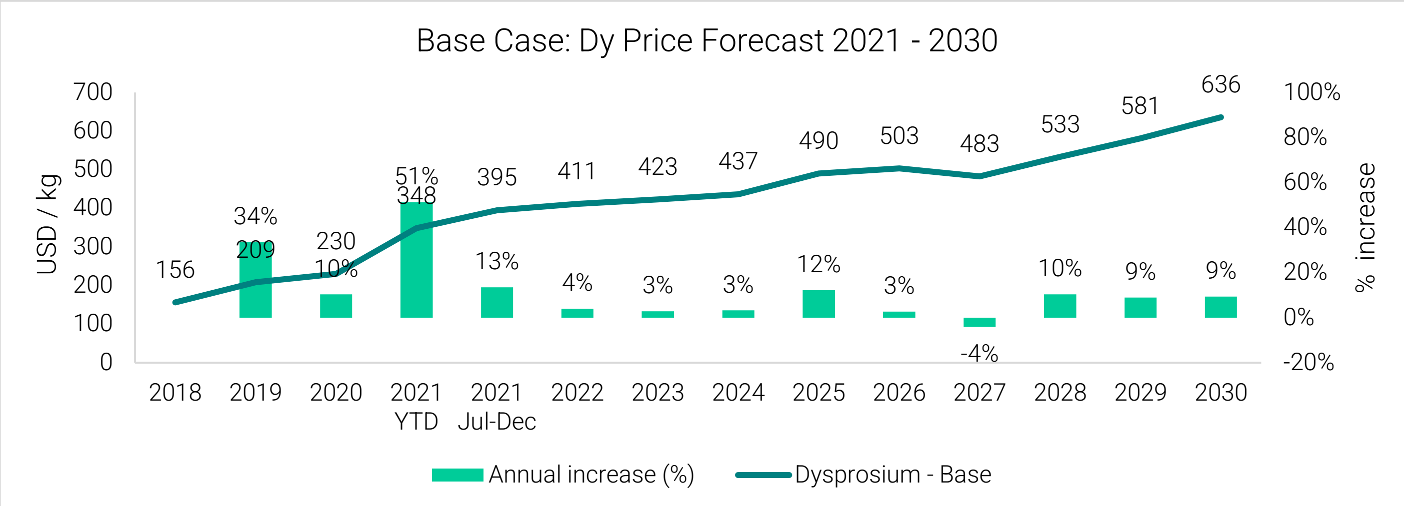
Figure 19-12: Dy & Tb Supply vs. Demand (tonnes)



*Other: Lynas Rare Earths (Mt Weld), MP Materials (Mountain Pass), India (Tamil Nadu/Kerala), Russia (Lovozero), Brazil (Buona Norte), Vietnam (Dong Pao), Burundi (Rainbow Rare Earths), US (Energy Fuels), Australia (Iluka Resources), Madagascar (Rio Tinto), Thailand (unidentified).
** New Projects: Energy Fuels, Serra Verde, Aclara, Vital Metals, Hasting Tech Metals, Arafura Resources, Peak Resources, Pensana, Northern Minerals, Australian Strategic Materials, Ionic Rare Earths
Note: prepared by Supply estimated using companies´ public reports and press releases. Demand based on Figure 19-10.

The nominal base case Dy price forecast is shown in Figure 19-13.

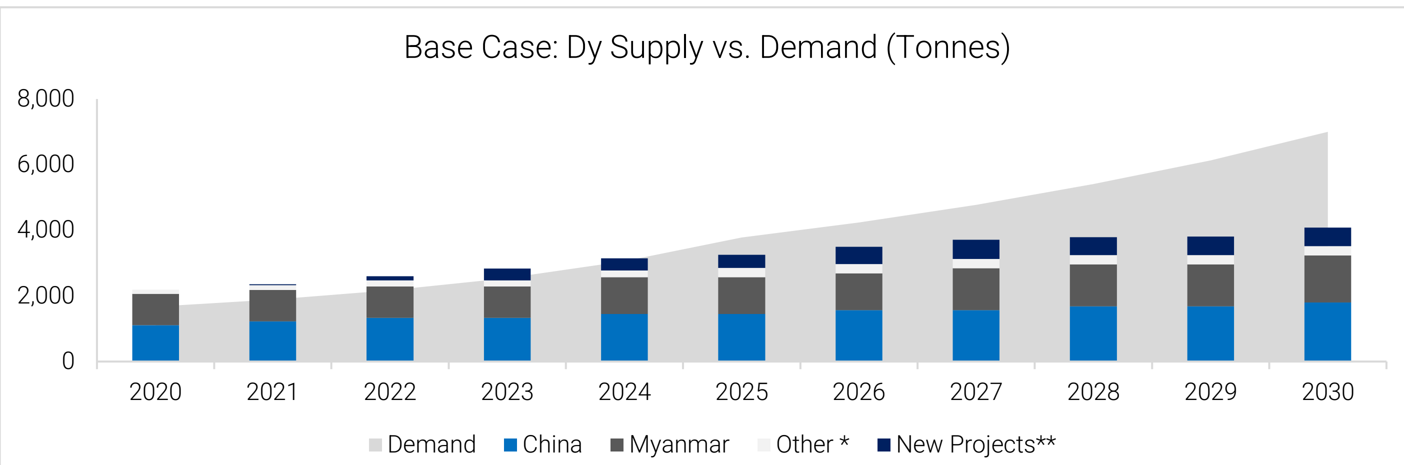
Figure 19-13: Nominal Base Case Dy Price Forecast.



Note: prepared by Historic by Asian Metals. Forecast based on Figure 19-13.

In addition to the base case price scenario, two additional scenarios have been assessed based on the ability of projects to reach production: High case Dy price forecast and low case Dy price forecast. As it has been previously mentioned, only two REE projects outside of China have been able to produce a commercial product in the last 20 years. For this reason, the high case price forecast considers lower supply output coming from projects. In addition to the smaller number of projects, the production CAGR from China and Myanmar have been reduced to 4% and 5%, respectively (Figure 19-14).

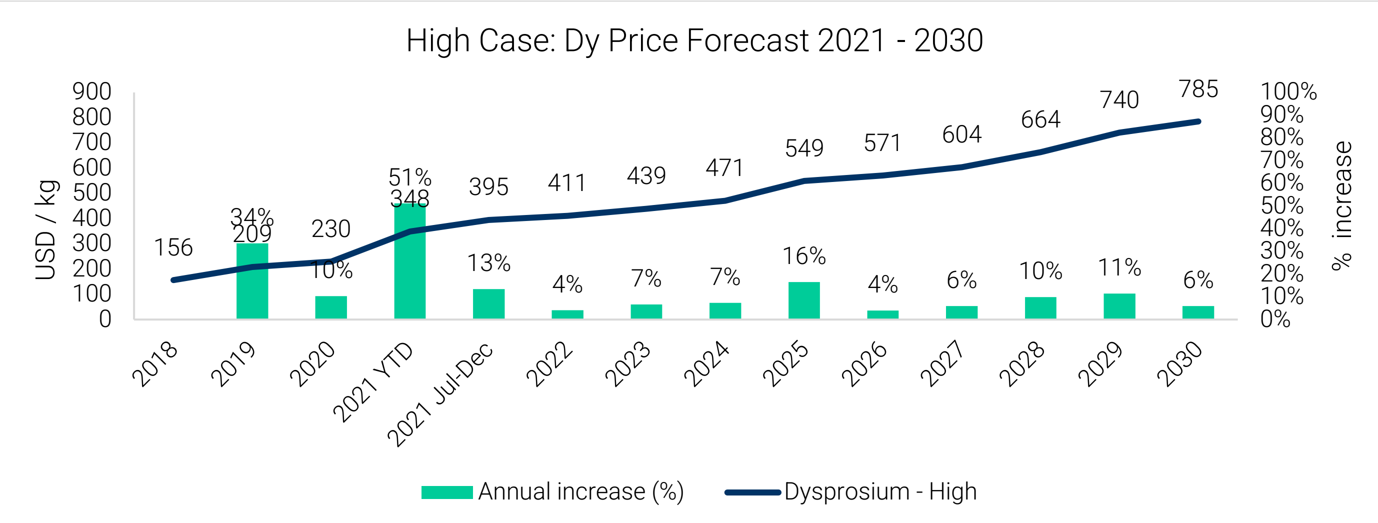
Figure 19-14: Nominal high case Dy price forecast



*Other: Lynas Rare Earths (Mt Weld), MP Materials (Mountain Pass), India (Tamil Nadu/Kerala), Russia (Lovozero), Brazil (Buona Norte), Vietnam (Dong Pao), Burundi (Rainbow Rare Earths), US (Energy Fuels), Australia (Iluka Resources), Madagascar (Rio Tinto), Thailand (unidentified).
** New Projects: Energy Fuels, Serra Verde, Aclara, Vital Metals, Hasting Tech Metals, Arafura Resources, Peak Resources, Pensana,
Note: prepared by Supply estimated using companies´ public reports and press releases. Demand based on Figure 19-10.

The nominal high case Dy price forecast is show in Figure 19-15.

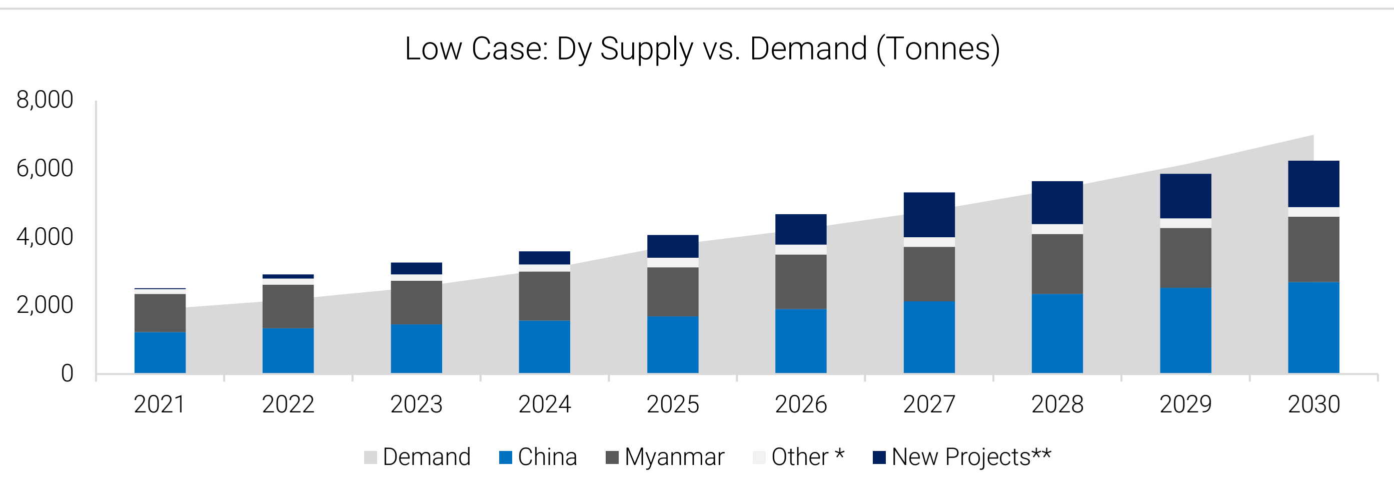
Figure 19-15: Nominal High Case Dy Price Forecast.



Note: prepared by Historic by Asian Metals. Forecast based on Figure 19-15.

On the other hand, the low case price forecast considers that an additional number of projects are able to reach commercial production compared to the base case scenario. In addition, the production output from China and Myanmar has been increased to CAGR 8% and 6%, respectively (Figure 19-16).

Figure 19-16: Nominal Low Case Dy Price Forecast.

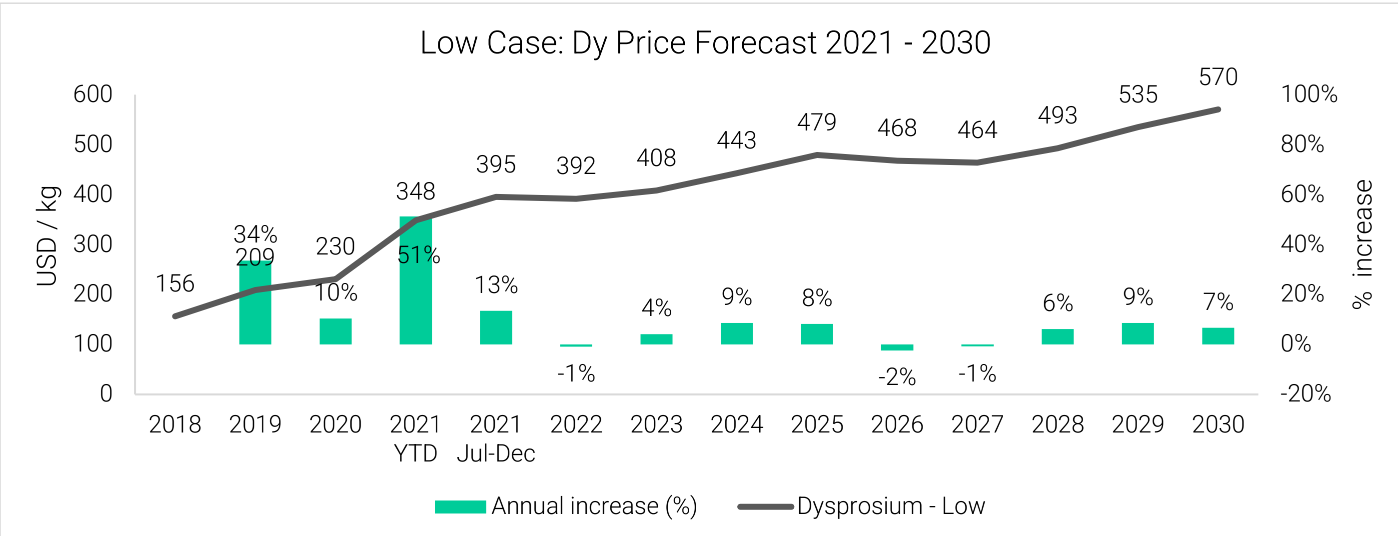


*Other: Lynas Rare Earths (Mt Weld), MP Materials (Mountain Pass), India (Tamil Nadu/Kerala), Russia (Lovozero), Brazil (Buona Norte), Vietnam (Dong Pao), Burundi (Rainbow Rare Earths), US (Energy Fuels), Australia (Iluka Resources), Madagascar (Rio Tinto), Thailand (unidentified).
** New Projects: Energy Fuels, Serra Verde, Aclara, Vital Metals, Hasting Tech Metals, Arafura Resources, Peak Resources, Pensana, Northern Minerals, Australian Strategic Materials, Ionic Rare Earths, ThreeArk Mining, Texas Mineral Resources

Note: prepared by Supply estimated using companies´ public reports and press releases. Demand based on Figure 19-10.

The nominal high case price forecast is show in Figure 19-17.

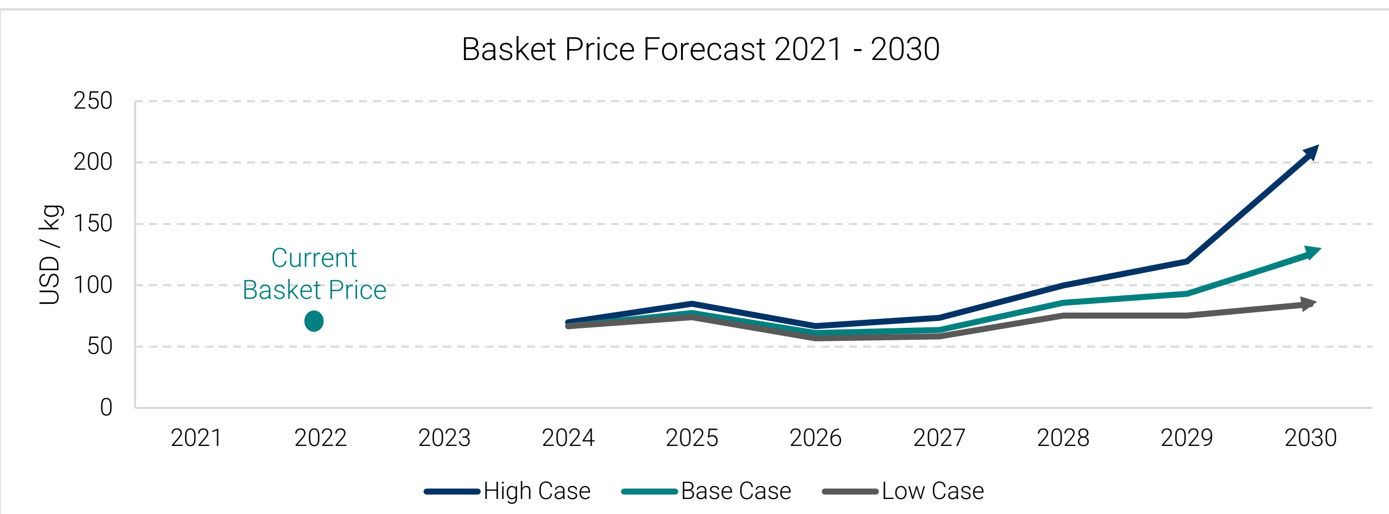
Figure 19-17: Nominal Low Case Dy Price Forecast.



Note: prepared by Historic by Asian Metals. Forecast based on Figure 19-17.

Based on the three Dy price scenarios and the set of prices sourced by Argus Media, Figure 19-18 presents the forecast of Penco Basket Price throughout the decade. From 2030 prices have been considered flat.

Figure 19-18: Basket Price Forecast 2021-2030.



Note: Basket price has been calculated using the distribution of each element as a percentage of the total rare earth element oxides multiplied by the price projection of each element.
Source: prepared by Argus Media (La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Ho, Er, Tm, Yb, Lu, Y) & by CRU (Dy).

Prices considered in this chapter have been sourced from reputable agencies such as Argus Media and CRU group. Both entities have a long trajectory in the commodity markets and specialty metals markets, and are widely recognized for their research in the rare earth industry.

19.5 Contracts

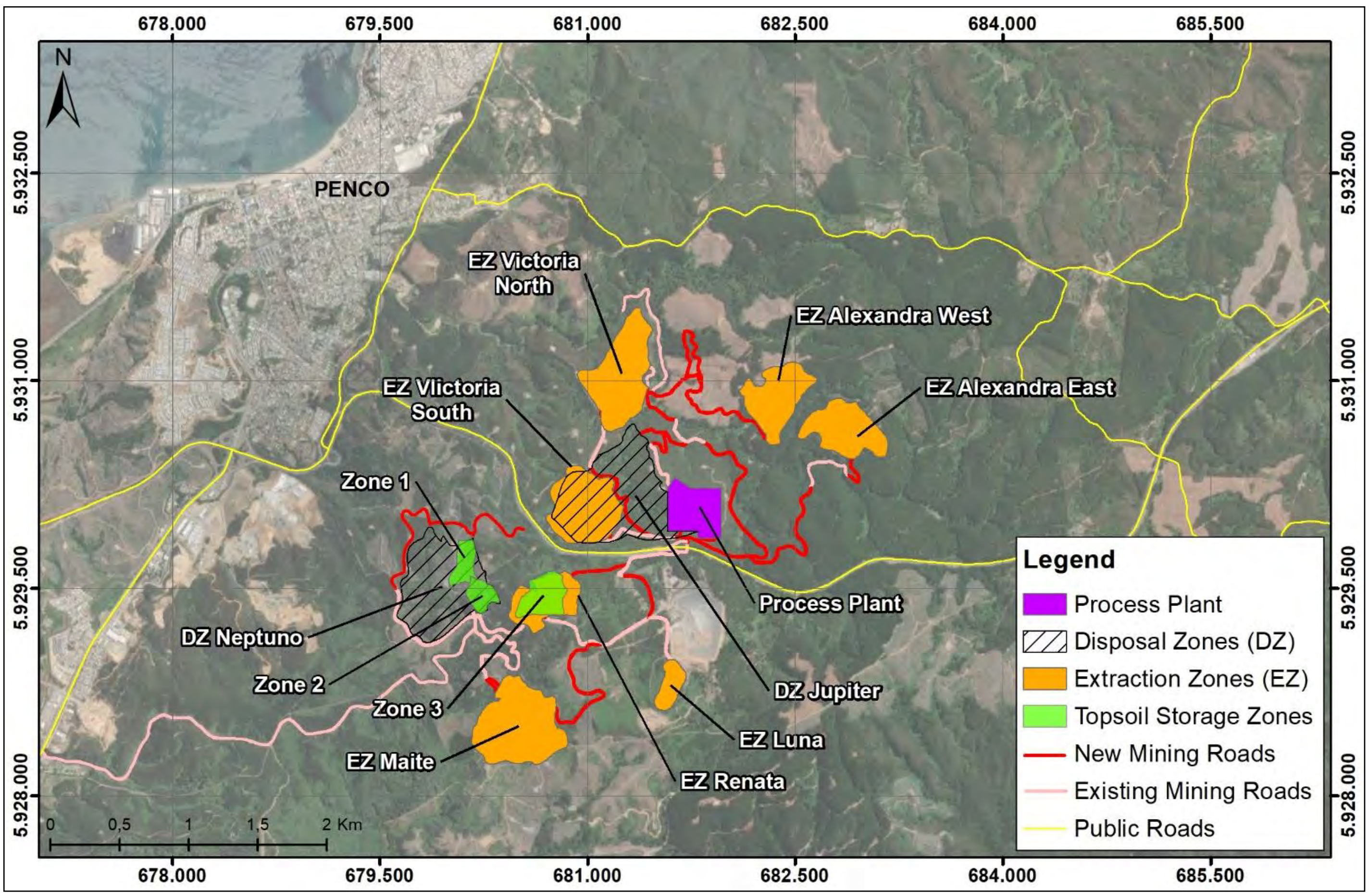
Aclara has not yet entered into any commercial agreements for its REE product, including hedges or offtake agreements, as at the issuance of this report. The company has been in conversation with several OEM and forecasts a separation fee of $5/kg.

20 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT

20.1 Environmental Considerations

Penco Module is located in the Biobio Region, within Penco and Concepcion districts, southeast of the city of Penco. Figure 20-1 shows the different areas that comprise the Penco Module (extraction zones, waste disposal facilities, process plant areas) and their location with respect to populated areas, the closest one being Neptuno Waste Disposal Area, located approximately 1 km from the border of Penco urban area.

Figure 20-1: Penco Module Development Areas



Note: prepared by Ausenco, 2021.

Penco Module has already been submitted (as BioLantánidos Project[12]) to the Environmental Impact Assessment System (SEIA in Spanish), by means of an Environmental Impact Assessment (EIA), to apply for the necessary Environmental License (RCA, in Spanish called Environmental Qualification Resolution) as for commencement of construction and later operation. The EIA provides the authority with a detailed project description, identifies, characterizes and evaluates the impacts on different environmental components, as well as indicating the applicable mitigation, repair and/or compensation measures. Currently, the EIA is undergoing its second round of review by the relevant authorities (*Consolidated Report of Request for Clarifications, Rectifications and / or Extensions*, ICSARA in Spanish), for which REE will present, in November 2021, the corresponding answers and additional studies requested, a document called Addendum N°2 (also called Complementary Addendum). Despite REE aims to properly address all issues raised by the authorities with this next submission, it is possible that a third round of review could be opened by the authority for which an Addendum N°3 would need to be presented.

It should be noted that the project description submitted for environmental approval includes one additional extraction area (Renata Extraction Zone), which is not part of the financial project described in Chapters 16 and 18 of this document. This area has been considered by REE for possible future development and, therefore, has been included in the EIA so that the assessment covers the full extent of the environmental impacts as well as optimizing the process of obtaining the Environmental License (RCA).

Another difference corresponds to the transmission line that will supply energy to the Penco Creek water intake. Due to changes arising from the environmental approval process, the transmission line presented in the project description of the EIA (2.6 km transmission line connecting to an existing line in Route O-390, north of the Project) will need to be modified and, as indicated be REE, will be eliminated from the environmental permitting process in Addendum N°2. Despite this change, the current PEA project description still includes the original infrastructure within the CAPEX estimations.

As indicated by REE, design and engineering for the new transmission line is still in progress and will be submitted for a supplementary environmental approval process, during Q2 of 2022, along with other optimizations in the Process Plant that could result from the PFS and FS engineering. It is unlikely that these changes will cause any additional environmental impacts, since the transmission line is planned to go underground, parallel to the water pipeline and using the same trench, and any optimizations will take place within the process plant area (equipment location, dosage of reagents, etc.), maintaining the same extraction process described in the EIA, therefore, no new areas will be impacted.

20.1.1 Baseline and Supporting Studies

All environmental studies up to this point are part of the EIA (Base Line Chapter) and its Addendums. In accordance with article 18, letter e) of the of the Environmental Impact Assessment System Regulation (D.S. N°40/2012, RSEIA), an EIA must present a baseline, which describes in detail the environmental characteristics of the area affected by the Project, in order to subsequently assess the impacts on environmental variables. Baseline studies presented in the EIA are:

- Climate, meteorology and air quality.
- Noise and vibrations.
- Geology, geomorphology and natural risks.
- Hydrography, hydrology, hydrogeology and water quality.
- Edaphology.

[12] In August 2021, REE Uno SpA changed the trading name of the Project from Biolantánidos to Aclara. See Section 6.1for further reference

- Vascular flora, nonvascular flora and vegetation.
- Terrestrial fauna and limnology.
- Archaeology and palaeontology.
- Landscape.
- Protected areas.
- Tourism and natural attractions.
- Current land uses and land-use planning instruments.
- Economic activities, equipment and infrastructure.
- Human environment.

All baseline studies have been developed by qualified professionals, according to the recommendations of methodological guidelines and the applicable environmental regulations (Table 20-1).

Impacts on environmental components are categorized between “significant” and “non-significant”. EIA results indicate that significant impacts will apply to flora and vegetation, terrestrial fauna and soil, as a direct consequence of the reduction of soil availability and vegetation removal in different Project areas and also because of the presence of protected species of flora and fauna, which are currently under a conservation category (vulnerable, endangered, etc.). Table 20-1 presents the main results of the baseline studies and impact assessment for the environmental components that are subject to impacts categorized as significant in the EIA.

Due to specific queries from one environmental authority (Environmental Assessment Service, SEA in Spanish) the possible impact on indigenous communities that participate in occasional traditional activities near the Project area has been raised as a sensitive issue, although this has not yet been identified as a significant impact in the EIA. This topic is further addressed in Section 20.4.2.

Table 20-1: Main Baseline and Impact Assessment Results for Environmental Components with Significant Impacts

Component	Main Baseline And Impact Assessment Results
Soil	The Project area is classified as Soil Class VII, corresponding to soils unsuitable for agricultural development, but suitable for forestry or livestock activities, the first of them being one of the main economic activities in the Biobío Region. Correspondingly, the Project development area is currently mostly occupied by woodlands used for timber production. Penco Module will cause permanent loss of soil as a natural resource, that could otherwise be used in agricultural or forestry activities, because of the excavation and removal of soil for construction and operation of different Project areas. The impact also takes into account its ability to sustain ecosystems caused by the loss of soil surface and increased chances of erosion, compaction and/or degradation. The total surface of impacted soil is 241 ha, caused by the installation of temporary and permanent infrastructure but mainly because of the operation of Extraction Zones (138 ha) and Disposal Zones (84 ha).

Flora and vegetation	The Project development area is mostly occupied by woodlands of nonindigenous species (pines and eucalyptus) used for timber production and a minor percentage of native forest. Within this area 195 species were identified, of which 89 correspond to native species. Of these, 15 species are under conservation status, with two species classified as Endangered (EN), two classified as Vulnerable (VU) and one classified as Nearly Threatened (NT). The remaining ones are classified as Least Concern (LC). The endangered species are *Gomortega keule (Queule*) and *Pitavia punctata* (*Pitao),* which are also regarded as Natural Monuments (and therefore additionally protected) under Chilean legislation. The impacts on flora and vegetation are two: the loss of native forest surface and the possible loss of individuals of these protected species. For the first, the Project construction and operation will require cutting approximately 4,62 ha of native forest, however, steps have been taken to ensure that the habitat of protected species, in particular individuals of *Queule* and *Pitao* (known under Chilean legislation as preservation forest) will not be affected. Regarding the second impact, Queule and Pitao are Natural Monuments and therefore cannot be cut or altered, but 5 individuals from other conservation categories will be affected by the Project. In order to minimize the effect on flora and vegetation and to avoid areas categorized as preservation forest, additional baselines studies have been undertaken and the Project locations have been also adjusted to ensure a minimum distance of 30 m from any protected individual or preservations forests. Additionally, as established by Law Nº20.283, it is a legal requirement that any surface of native forest to be cut must be compensated by, at least, an equal surface. In terms of the loss of individuals from conservation categories, the corresponding permits and plans will be presented.
Terrestrial fauna	Within the Project development area, 73 species of fauna (amphibians, reptiles, birds and mammals) were identified in different types of environments. Of these, 23 are under conservation status, with 4 of them classified as Vulnerable (VU) and the rest classified as Nearly Threatened (NT) or Least Concern (LC). Based on these categories, but also considering other criteria such as being endemic and have low mobility, a total of 29 species were determined to be of special sensibility to the Project development. The significant impacts on terrestrial fauna are two: the possible loss of individuals from protected species and the loss and/or modification of the habitats occupied by protected species. The loss of individuals is particularly relevant in low mobility species, such as amphibians, reptiles and small mammals, but could also occur on larger mammals due to collision with moving vehicles along the Project access and internal roads. The loss/modification of habitats is caused by the cutting of native and plantation forests for the Project areas, which removes the available food and shelter for different species.

Source: Biolantánidos EIA, 2020.

Other impacts were also described for the following environmental components: air quality, noise levels, geology, geomorphology and natural risks, hydrology, water quality, aquatic ecosystems, landscape, road infrastructure, and human environment. All of these have been characterized as non-significant.

In compliance with environmental regulations, these significant environmental impacts must be addressed by implementing mitigation, reparation and/or compensation measures (in that preference order). For Penco Module, Table 20-2 summarizes the measures considered, at this stage, to address the significant impacts mentioned previously.

Measures to address the non-significant impacts are not mandatory and have not been proposed at this stage.

Table 20-2: Main Mitigation, Reparation and Compensation Measures for Significant Impacts

Component	Type Of Measure	Mitigation, Reparation And Compensation Measures
Soil	Reparation	• Rescue, collection and re disposition of soil at the affected areas. • Soil properties improvement.

Terrestrial fauna	Mitigation	• Relocation and Rescue plan. • Controlled disturbance plan. • Poles Isolation installation • Environmental native fauna education and training program, including speed limit restrictions, traffic signs placement and informative guides.
	Compensation	• Intervened areas revegetation ZE and ZD with native vegetation. • Processing plant Revegetation. • Slope revegetation at Luna Extraction Zone.
Flora and vegetation	Compensation	• Plantation of native forest. • Training workers on native forest protection. • Plantation of native forest. • Germplasm collection, Nursery and Replant of Citronella mucronate Apart from the measures required to address the significant impacts, Penco Module will also undertake the following voluntary commitments: • Native forest preservation protection plan • Reproduction and propagation tests of *Copihues* • Species Enrichment in Conservation Category • Enrichment with Companion Species • Studies to increase specific knowledge in aspects that contribute to the conservation and rehabilitation of species • Rescue and Conservation of Germplasm • Multipurpose Rehabilitation Area

Source: Biolantánidos EIA, 2020.

It should be noted that these mitigation, reparation and compensation measures could be modified or complemented once the Addendum N°2, which is currently being developed, is submitted to SEIA for review.

20.1.2 Environmental Monitoring

In accordance with letter f) of Article 12 of Law No. 19,300, letter k) of Article 18 and Article 105 of D.S. No. 40/2012 (SEIA Regulation), the EIA needs to present a Monitoring Plan, which aims to ensure that the relevant environmental components that were the subject of environmental assessment evolve as projected. This plan includes not only the environmental components associated with significant impacts, but also the monitoring of water quality parameters which, in this case, are associated with a non-significant impact.

This plan specifies the environmental component that will be subject to measurement and control, the associated environmental impact and measures, the location of the control points, the parameters that will be used to characterize the state and evolution of the component, the limits allowed or committed, the duration and frequency of the monitoring plan for each parameter, the method or procedure for measuring each parameter, and the deadline and frequency for the delivery of monitoring reports to the corresponding environmental authority.

Below, Table 20-3 summarizes the monitoring activities indicated in Penco Module EIA.

Table 20-3: Monitoring Plan for Environmental Components (significant and non-significant environmental impacts)

Component	Impact	Mitigation, Reparation Or Compensation Measure	Monitoring Parameters
Soil	Loss of soil as a natural resource	Rescue, collection and disposal of soil in the intervened areas	Testing for soil thickness, density and electrical conductivity of the stored soil.
		Improvement of soil properties	Testing the replaced soil properties for the following parameters: pH, macro nutrients (N, P, K), texture, density, organic material, water retention properties, morphological characteristics.
Flora and vegetation	Loss of area covered by native forests	Native Forest Afforestation of the equivalent of lost native forest	Measurement for the following parameters: density of individuals, success rate, phytosanitary status, and vegetation cover.
	Loss of individuals from threatened species	Collection of Germplasm, Viverization and Replanting of Individuals	Counting of individuals of each planted species.
Terrestrial fauna	Possible loss of individuals from protected species	Rescue and Relocation Plan for Amphibians, Reptiles and Micromammals	Counting of rescued individuals and comparison with the relocated populations in terms of parameters of interest such as male/female/juvenile proportions.
		Controlled Disturbance Plan for Amphibians, Reptiles and Micromammals	Counting of individuals to verify the absence of protected species within disturbed areas.
		Training and environmental education of native fauna, including vehicle speed restriction, installation of signage and informative guides	Records of trainings, delivery of educational material, installation of informative signage, and installation of signage with speed limits.
	Loss or modification of habitat occupied by protected species	Revegetation of intervened areas ZE and ZD with native vegetation	Measurement for the following parameters: density of individuals, success rate, phytosanitary status, and vegetation cover.
		Revegetation of Processing Plant area	
		Revegetation of slopes in Luna Extraction Zone	

Water and Sediment Quality	Modification of water quality in streams associated with Project works	Not applicable	Testing of water quality in Penco Creek and restores water in disposal areas for sets of parameters and analysis against the DS 90/2000 and NCh 1,333 Regulations.

It should be noted that these monitoring activities could be modified or complemented once the Addendum N°2, which is currently being developed, is submitted to SEIA for review.

20.1.3 Water Management

20.1.3.1 Water Supply

The water supply for the Project will be sourced from Penco Creek by a catchment and drive system, where the water will be driven to the Processing Plant through a 2 km pipeline. The water intake at the catchment includes a side spillway for the restitution of water that is not picked up by the system, towards its natural course.

The impulsion system for PEA purposes has been dimensioned for a maximum 35 m^3/h flowrate (9.7 l/s), which is the amount presented in the EIA for environmental approval and the amount of water rights granted for the Project. The requirement of just the Process Plant is 11.7 m^3/h (3.25 l/s).

The EIA includes a specific study and analyzed compliance with the established environmental flow. Environmental flow, as defined by the authority in the context of the SEIA, is the amount of water, timing and water quality needed to maintain freshwater and estuarine ecosystems, as well as the livelihoods and well-being of the people who depend on the ecosystem[13] and includes the concept of ecological flow[14]. For a project under evaluation in the SEIA, the environmental flow can limit the exercise of the water use rights. In the case of Penco Module, Table 20-4 presents the average monthly flow and the environmental flow in contrast with the Project water requirements and the resulting surplus flow for Penco Creek. Since no information on flow measurements is publicly available for Penco creek, average monthly flows have been estimated by probabilistic analysis, from available information on nearby water courses. Currently, Penco Module is undertaking periodic flow measurements at Penco creek and as indicated by REE, the results so far are consistent with the average monthly flow estimations.

Table 20-4: Environmental Flow for Penco Creek

Flow (L/S)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Average Monthly Flow	34.7	30.1	30.8	53,8	105.9	232.3	257.5	236.6	196.5	121.2	72	54.9
Required Flow Project	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
Environmental Flow Estero Penco	15	15	15	15	24	28	28	28	37.4	37.4	37.4	15
Surplus Flow	**10**	**5.4**	**6.1**	**29.1**	**72.2**	**194.6**	**219.8**	**198.9**	**149.4**	**74.1**	**24.9**	**30.2**

[13] Methodology Guide to Determine the Environmental Flow for Hydroelectric Power Stations in SEIA (SEA, 2016).
[14] Ecological flow is the minimum amount of water required to prevent abiotic effects (such as decrease in wet perimeter, depth, current speed, increases in nutrient concentration, etc.), from significantly altering the natural conditions of the water channel, the development of the biotic and abiotic components of the system, and the dynamics and functions of the ecosystem.

Note: prepared by BioLantánidos Project EIA, Addendum N°1, Annex 4.4, Environmental Flow Study, and Annex 4.9,1, Hydrology Study Penco Creek, 2020.

Since there is no current data-based estimation of the monthly low flows for the creek, an environmental restriction has been set to guarantee that the water taken by the Project will be limited by the environmental flow required for each month. Aware of the possibility that water from Penco creek could potentially be unavailable for the Project during drought periods, REE is currently studying alternative sources, aiming to have a back-up plan in place by the end of 2022.

20.1.3.2 Runoff and Pit Water Management

The Project considers hydraulic infrastructure to prevent runoff from entering extraction and disposal areas during construction, operation and closure phases, and to collect and dispose off runoff and pit water that eventually generate within these areas. Main infrastructure considered is the following:

- Evacuation channels: designed to collect water that enters extraction zones and placed on each slope foot, these channels will collect the rainwater that falls on the surface and slope of each Extraction Zone bank (terrace) and drive it towards the contour channels, by which in turn will discharge into nearby ravines (natural water courses. These channels, designed for a return period of 100 years, will reduce infiltration, lowering the pressure and saturation in order to ensure the stability of the deposits.

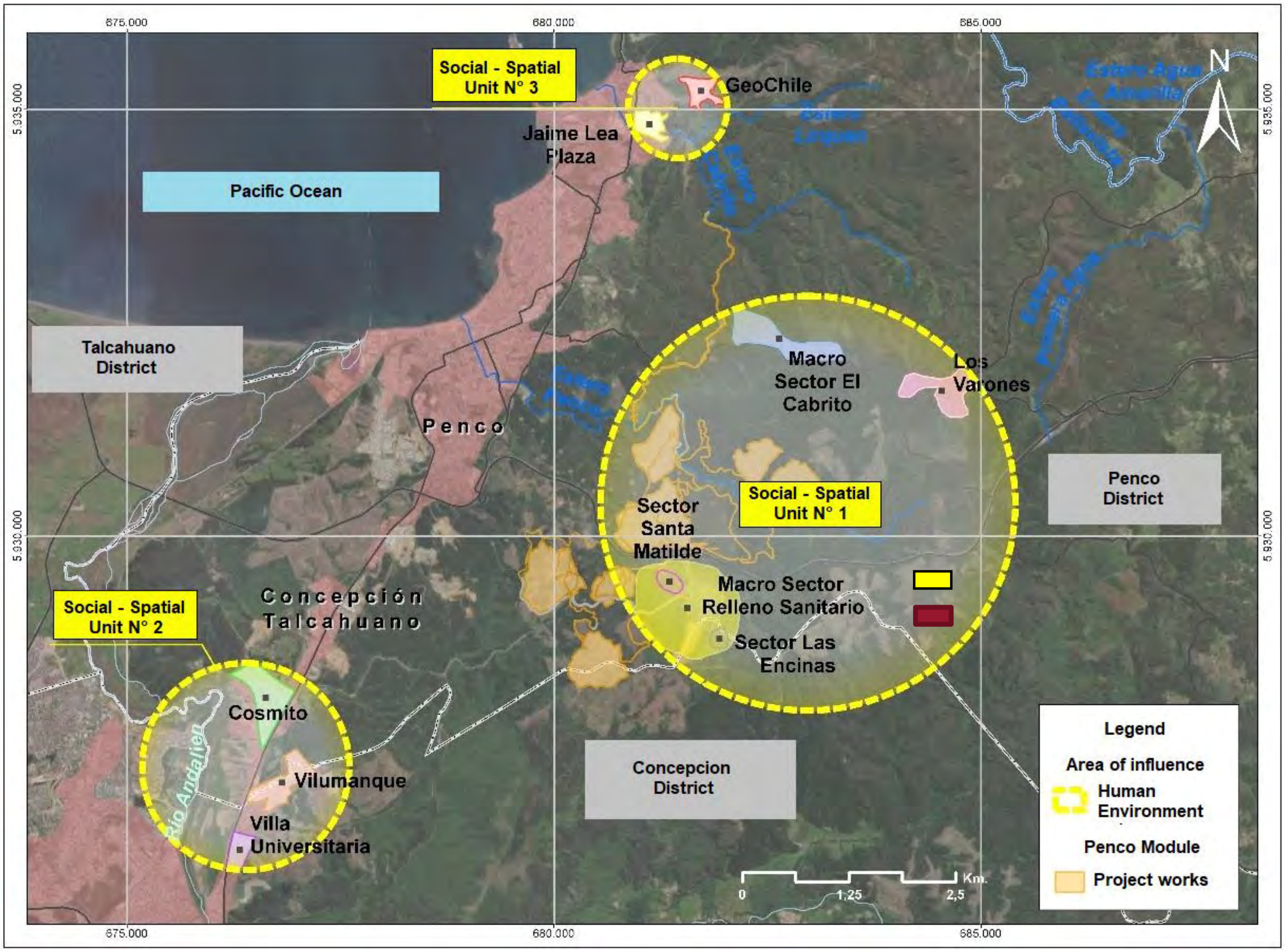
- Contour channels: designed to prevent surface runoff from entering the Extraction and Disposal Zones, these channels will be located upstream and bordering these areas, to receive runoff from surrounding hills and nearby streams, but also from the evacuation channels. These channels, designed for a return period of 100 years, will restore rainfall water into the natural water courses and minimize the water entering the Extraction and Disposal Zones. Restitution works (corrugated steel gutters) will be in place for the discharge into nearby ravines.

The cross section and materials used for the contour channels have been designed to control erosion caused by elevated flow velocities (0.5 m/s). In sections where the expected flow velocity is greater than 1 m/s, additional measured to prevent erosion will be implemented, such as concrete covers and energy dissipators (bleachers and falls), which will also control erosion on the natural ravines at the discharge point. So far, the environmental authority has not made any requests for additional infrastructure to control erosion at the discharge point, but it is possible that it can be requested at a later stage while applying for the corresponding sectoral permit.

Figure 20-2 shows the evacuation and contour channels in Neptuno Disposal Zone as an example of the planned location of the hydraulic infrastructure. Additional details on the infrastructure design criteria and construction are provided in Section 18.5

In terms of water quality, the Project is not expecting an impact from the discharged water. The water management infrastructure mentioned above will help minimize surface runoff entering the disposal zones thus reducing infiltration, helped also by the level of compaction that the waste will have in the disposal zones (with expected negligible infiltration flows). As a result, it is expected that a large proportion of the discharged water corresponds to surface runoff that would naturally occur on site. Regarding pit water, physicochemical testing was conducted on some of the process input material. The results indicate that the future disposed material would not present any hazardous characteristics, according to current legislation. In Addendum N°1 a complete characterization was carried out consisting of Total Rock, SPLP (Synthetic Precipitation Leaching Procedure), mineralogy and pH analysis. Although specific values of Manganese (Mn), Ammonium (NH_4) and Sulfate (SO_4) slightly exceeded the maximum permissible concentrations of reference water standards (D.S N°90/2000 and NCh 1.333) it is highly unlikely that laboratory conditions (acid rainwater in agitation for 18 hours) will be replicated on the field. Considering these facts, the concentrations of any contaminants are expected to be much lower and under full compliance with relevant water reference standards and Aclara will also periodically monitor the quality of the discharged water. As a complement, the environmental authority has requested REE to include additional contingency and emergency measures to address any potential non-compliance of the water standards. REE has also indicated that additional testing will be conducted as samples of the material to be disposed become available from process pilot testing.

Figure 20-2: Evacuation and Contour Channels in Neptuno Disposal Zone



Note: prepared by Aclara, 2020.

20.1.4 Emissions and Wastes

The activities that will take place during the construction, operation and closure phases of Penco Module will generate different wastes and emissions. Table 20-5 presents a summary of these wastes and emissions and the proposed management measures, all of which constitute non-significant environmental impacts in the context of the on-going environmental assessment.

Table 20-5: Wastes and Emissions of Penco Module

Type Of Waste/Emission	Management
Atmospheric emissions	The main emissions are particulate material (SPM, PM10 and PM2.5), mainly caused by excavations and transport activities along unpaved roads during the construction and operation phases of the Project, but also combustion gases from the operation of vehicles and machinery. These emissions were analyzed by atmospheric modelling (CALPUFF), using the highest emission year, to assess the potential impact on the surrounding population, particularly in 32 different receptors located closest to the Project. According to the atmospheric emissions modelling results, none of these receptors will have significant impacts on the air quality because the increases in particulate material and gases concentrations are considerably lower than the maximum limits established in the applicable air quality regulations. The analyzed emissions will also be managed and minimized mainly by the application of dust suppressor and road wetting, which will lower the calculated emissions. In addition, the Penco Module area is regulated by the Atmospheric Prevention and Decontamination Plan for the Municipalities of Metropolitan Concepcion (D.S. Nº6/2018). Under this regulation, if the expected atmospheric emissions surpass the amounts established by the Plan (which are lower than the air quality standards), the environmental authority will request REE to present a Compensation Plan, to compensate 120% of the project emissions.
Liquid wastes	According to the Project EIA, the only liquid wastes correspond to sewage coming from temporary sanitary facilities during the construction and closure phases and the permanent ones located at the processing plant during the operation phase. These liquid wastes will be managed by means of a septic tank or a modular treatment plant and the resulting effluent will be either infiltrated into the ground or used for irrigation but will not be discharges into any water ecosystems. In terms of industrial liquid wastes, the production process is a closed process, therefore it does not generate any liquid wastes or discharges to the environment. Any recovered aqueous solutions will be reincorporated into the production process.
Solid wastes	Municipal and industrial solid wastes produced during the construction, operation and closure phases will be stored in appropriate containers or stockpiled in specially designated areas within the temporary construction facilities or the process plant, to be later picked up by authorized contractors and subsequent disposal in authorized landfills. Industrial solid wastes that have a potential for being recycled will be separated to be disposed off-site accordingly.
Hazardous wastes	Hazardous wastes generated during construction and operation phases (used paints, thinners and solvents, used motor oils, contaminated cloths and containers) will be stored in a separate facility that will comply with special regulatory requirements to minimize volatilization, mobilization, lixiviation or any other transport mechanism that could cause contamination or a health hazard. These wastes will be stored for a maximum period of 6 months and will be disposed off-site by an authorized contractor to an authorized final disposal facility.

Type Of Waste/Emission	Management
Mining wastes	Mining waste from the Penco Module comprises the waste rock generated during the extraction process and the exhausted material (tailings[15]) that will be generated by the Process Plant. Both of which will be disposed of at the Disposal Zones (DZ) Jupiter and Neptuno. Article 23 of DS 148/2004, Sanitary Regulations for Hazardous Waste Management, defines massive mining waste as non-hazardous, therefore, hazardous wastes regulations do not apply to these wastes. To verify the non-hazardous characteristics of these mining wastes, the corresponding total rock and SPLP analysis were carried out on minerals, the results of which confirm that there is no presence of extrinsic toxicity conditions for the elements specified in the standard (As, Cr, Hg, Pb, Se, Ba, Cd and Ag). However, specific values of Manganese (Mn), Ammonium (NH4) and Sulfate (SO4) were observed that slightly exceed the maximum permissible concentrations of D.S N°90/00 and NCh 1.333 under laboratory conditions (acid rainwater in agitation for 18 hours). It is highly unlikely that these conditions will be replicated on the field. Therefore, the concentrations of any contaminants are expected to be much lower and under full compliance with relevant water reference standards. To further confirm these results, additional testing will be conducted as samples of the material to be disposed become available from process pilot testing.

20.2 Closure and Reclamation Planning

Law 20,551, Closure of Mines and Mining Facilities (Ley 20.551, *Regula el Cierre de Faenas e Instalaciones Mineras*) is the law that regulates mine closure in Chile. The objectives of this law are:

- To protect the life, health and safety of people and the environment (Art. 2).
- To mitigate the negative environmental effects of the industry (Art. 2).
- To ensure the physical and chemical stability of the places or areas in which mining is developed (Art. 2).
- To establish guarantees for the effective closure of mining facilities (Title XIII).
- To create a post-closure fund for the monitoring and control of closed operations (Title XIV).

Law 20,551 also states that every mining project must have a Closure Plan that has been approved by SERNAGEOMIN. A preliminary Closure Plan document must be submitted as part of the EIA (as Sectorial Environmental Permit 137 (PAS 137). The Closure Plan submitted as part of PAS 137 is reviewed and commented on by the Environmental Evaluation Service (SEA) from an environmental point of view.

Once the EIA is approved and the RCA issued, Sectorial Permits (Permiso Sectorial, PS) for construction and operation must be submitted to SERNAGEOMIN for review; this review focusses on technical and safety aspects rather than environmental aspects. For Aclara these permits are:

- Permit for the Construction of the Tailings Deposit (related to PAS 135)[16]
- Authorization of the mine exploitation method.

[15] According to Chilean legislation, D.S. N° 248/2006 (Regulation for the Project Approval for the Design, Construction, Operation and Closure of Tailings Deposits), exhausted mineral coming from the process plant does not classify as tailings.
[16] Despite that the disposed material does not constitute tailings under Chilean legislation, the disposal zones present characteristics similar to a tailings deposits, therefore, the same permit will apply.

- Permit to build a waste rock dump.
- Authorization of the process plant (crusher, heap leach and other facilities).

These three PSs must be approved by SERNAGEOMIN before the Closure Plan permit can be approved. The Closure Plan submitted to SERNAGEOMIN must include more detailed information than the document submitted as part of the EIA. Once the Closure Plan is approved, the Project construction can begin.

SERNAGEOMIN has issued technical guidelines for mining companies preparing closure plans so that the plans comply with the requirements. These guidelines are classified in three groups:

- Closure Plan Guidelines:
  - Guideline for Closure Plan for Explorations and Prospections
  - Guideline for Closure Plan for Mine Facilities under 5,000 t/m
  - Guideline for Closure Plan for Mine Facilities between 5,000 t/m and 10,000 t/m
  - Guideline for Closure Plan for Mine Facilities over 10,000 t/m.
- Technical Criteria Guidelines:
  - Guideline for Risk Assessment for Mine Closure
  - Guide for Physical Stability on Mine Closure
  - Guide for Chemical Stability for Mine Closure.
- Financial Criteria Guideline:
  - Guideline for the Estimation, Determination and Provision of the Financial Guarantee.

The SERNAGEOMIN guidelines are not mandatory, but they do define the technical standards that will be used by reviewers and assessors.

20.2.1 Closure and Reclamation Plans

20.2.1.1 Overall Closure Measures

In order to limit risks of unauthorized access to the site, access road controls and signage will be put in place. Other measures include:

- Road closure: The roads not to be used during the closure phase will be closed or blocked to prevent access, where appropriate, by means of parapets or berms, to prevent the entry of vehicles and people into the area. Roads that do not need to be blocked will be enabled for use considering the forestry activity that occurs in the area and the need to care and maintain revegetated areas.

- Signage: informative and preventive signage will be placed in the extraction zones that will not be occupied as disposal areas, where there are slopes exposed at 45 °, warning of the risks of falling of different levels
- Waste management: solid waste that can be assimilated to municipal wastes, generated from the dismantling of equipment, will be taken to an authorized final disposal site by authorized contractors. Along with the dismantling of equipment, a general cleaning of the area will be carried out.

20.2.1.2 Plant Decommissioning

The closure plan considers decommissioning, dismantling and removal of facilities, pumps and other non-permanent structures on the site. The dismantling activities includes the following:

- Plant equipment and facilities that operated with acidic solutions will be subjected to a cleaning and washing process with industrial water, to neutralize the acidity.
- Dismantling and removal of the equipment inside the Processing Plant will be carried out. The equipment will be dismantled after de-energizing, trying to preserve the different parts and elements to allow their reuse, recycling or sale, or proceed to their final disposal in an authorized site, as appropriate.
- Metallic structures that make up the facilities will be disassembled and destined for recycling and/or final disposal in an authorized site.
- Concrete structures will be demolished to ground level. The debris generated will be destined for authorized final disposal sites. The remnants of foundations will be covered with a 30 cm thick layer of material, to later be revegetated with native species.

20.2.1.3 Extraction Zones (ZE)

The actions aimed at ensuring the physical stability of the slopes of the extraction zones will be implemented during the operation phase of the Project, with regard to the slope angles and structure of the banks or terraces, according to the structural stability. Therefore, it is considered that the final slopes that result from the operation will be maintained.

The extraction zones will be used as disposal zones as the work progresses. Once the final stage has been reached, topsoil will be replaced and then revegetated during the same operation phase, an activity that will continue until the closing phase for those final disposal areas to be completed.

With regard to chemical stability, the mineralogical composition of the material that will be extracted from the mine, processed in the plant and later taken to the disposal areas, is quite homogeneous and is composed mainly of clays (40%), quartz (30 %), micas (10%) and iron oxides (9%), and it does not present any type of sulfides (eg Pyrite), which is the main producer of acidity and acid water formation.

20.2.1.4 Disposal Zones (ZD)

Actions aimed at ensuring the physical stability of the slopes of the disposal areas will be developed during the operation phase of the Project, fillings and compacting the material in layers using machinery, thus generating a stable structural fill.

Regarding the revegetation plan, after the final outlining of the disposal area, the following stages are considered:

- Incorporation of a 20 cm thick layer of a mixture made up of previously removed topsoil (coming from the temporary topsoil storage areas) and chips generated from vegetation cutting (maximum 5 cm in diameter).
- Planting herbaceous seeds.
- Cover with a 1 cm thick layer of the same topsoil mix.
- Revegetation with shrubs.
- Revegetation with tree species.

These closure activities are projected to have already been implemented for the disposal zones whose operation has been completed within the 11-year duration of the Project's operation phase, following the sequence defined in the operation schedule. Given that these activities will be carried out throughout the operation phase of the Project, it is estimated that the closure phase itself will last 1 year.

Although to date there is no detailed schedule for these progressive closures, the proposed philosophy is aligned with good industry practices and with one of the relevant elements promoted by Law 20,551.

20.2.1.5 Topsoil Storage Areas

Once the stored material has been removed, Topsoil Storage Zones 1 and 2 will be covered with topsoil and revegetated.

20.2.1.6 Monitoring and maintenance activities

The considered monitoring program aims to visually detect any anomaly or deterioration, cracks, leaks, deformations or erosion of slopes in the disposal and extraction areas.

Activities include a monthly supervision during the first year, a quarterly supervision during the second year and a semi-annual supervision during the third year. Additionally, in the event of the occurrence of a major seismic or climatic event that occurs during the first 3 years since Project closure, an inspection will be carried out immediately after the event.

On the other hand, the disposal areas will be monitored to verify water quality, the correct surface drainage of rainwater, the characteristics of the infiltrated water monitored by piezometers and the deposits settlements monitored by means of sliding plates and inclinometers, as well as when earthquakes of interest are recorded.

20.2.2 Closure Cost Estimate

The methodology used to estimate the Project closure costs corresponds to the one currently and officially used by SERNAGEOMIN to evaluate the costs presented by mining companies in their Closure Plans, within the framework of Law 20,551, which is a conservative methodology. This methodology was approved by Resolution No. 0798 of March 29, 2017 (Internal Guideline for Estimating the Cost of Closure Plans) and provides an order of magnitude of the closure costs of a mining site.

This calculation methodology is based on the construction characteristics, surface and materiality of the site's facilities in its closure phase. The information used in this estimate was obtained from the Environmental Impact Study of the Penco Module and adjusted from the modifications made during engineering.

Table 20-6 presents the direct closure costs estimation as a result of applying the aforementioned methodology. Values are presented in UF (Unidad de Fomento), which corresponds to a local monetary unit with a current exchange rate of 1 UF = CLP 30.000.

Table 20-6: Direct Closure Costs Estimation

Item	Closure Component	Unit	Quantity	Unit Cost (Uf/Unit) (#)	Subtotal (Uf)
1	Steel buildings and structures	ton	450.0	40.04	18,017
2	Concrete structures	m^3	3,600.0	3.60	12,977
3	Offices and camps	m^2	5,795.0	0.92	5,359
4	Open pits and extraction zones (ZE)	ml	8,954.0	3.36	30,048
5	Ballast or sterile waste disposal facilities (ZD)	ha	72.0	127.30	9,166
6	Roads	ml	14,960.0	0.24	3,590
7	Medium voltage transmission lines	ml	4,620.0	0.21	961
8	Covering	ha	60.0	539.20	32,352
8	Revegetation	m^2	1,400,000.0	0.14	202,763
9	Contaminates soils removal (*)	m^3	1,360.0	11.46	15,586
10	Hazardous industrial wastes (**)	ton	22.5	4.74	107
Direct Closure Costs Subtotal (UF)					330,926
Geographic Zone Factor (***)					**0.96**
Direct Closure Costs Total (UF)					**317,689**

(*) Estimated considering 20% of the Process Plant surface as contaminated soil and 0.05 m deep (13,56 ha x 0,2 x 0,05 m).
(**) Estimated considering 5% of the total tons for Steel structures and buildings.
(***) Factor defined by SERNAGEOMIN that corrects the costs of materials and supplies based on the geographic location of the project.
(#) Unit costs have been rounded to two decimals, which could slightly vary the subtotal number.

On the other hand, Table 20-7 presents the calculation of indirect closure costs, also based on the same methodology:

Table 20-7: Penco Module Indirect Closure Costs Estimation

Indirect Closure Costs	Valorization (Uf)
Basic and detailed engineering	22,238
Acquisitions	9,531
Construction management	31,769
Total Indirect Cost	**63,538**

Finally, regarding contingencies, given the existing engineering level, a percentage of 25% could be justified to SERNAGEOMIN. In this way, the total cost of closing the Penco Module is summarized below in Table 20-8.

Table 20-8: Penco Module Closure Costs Estimation

Item	Total (Uf)	Total (Mm Usd)
Direct Closure Costs	317,689	11.90
Indirect Closure Costs	63,538	2.40
Subtotal	**381,226**	**14.30**
Contingencies (25%)	95,307	3.58
Total Cost	**476,533**	**17.88**

(*) Exchange rate: 1 UF= CLP 30.000; 1 USD$ = 800 CLP.

Regarding the required financial guarantee to the State, REE declares that it will be constituted by means of an insurance policy instrument, as accepted by Law 20,551.

20.3 Permitting Considerations

Permits required by any Project that enters the SEIA are classified in two categories: Sectoral Environmental Permits (in Spanish, PAS) and Sectoral Permits (PS). All applicable PAS need to be presented within the EIA and cover the environmental aspects of matters such as water discharges, waste storage facilities, relevant mining and hydraulic infrastructure, forest management plans, among others. On the other hand, PS cover non-environmental topics and need to be applied for individually with the corresponding government authority, after the RCA has been granted.

Below are the permits required for the execution of the Project, in its construction, operation and closure phases. The identification of the applicable permits from the lists presented in Sections 20.3.2 and 20.3.3, will be part of a Permit Master Plan, containing the technical requirements and schedule for each permit, that will be developed in greater detail once the environmental authority issues the RCA for the Project.

20.3.1 Environmental Permits

In accordance with the requirements of article 18 letter l of the SEIA Regulation, the Project EIA must contain the list of Sectoral Environmental Permits (PAS) and pronouncements applicable to the Project or activity, as well as the technical and formal contents to comply with the requirements for each permit, in accordance with the provisions of Title VII of the SEIA Regulation. Table 20-9 presents the details of the PAS applicable to the Project, indicating which of these permits require a subsequent application with the corresponding authority to obtain the associated Sectoral Permit.

Table 20-9: Applicable Sectoral Permits

Environmental Sectorial Permits (Pas)		
PAS	**Applicability**	**Requires Further Application With Sectoral Authority?**
Article 135.- Permit for the construction and operation of tailings deposits.	The Project will have disposal areas in which the sterile and processed mineral will be disposed of in the Processing Plant.	Yes
Article 137.- Permission for approval of the closure plan for a mining site.	The Project corresponds to a mining operation with different areas: Extraction Zones, Disposal Zones, Plant and internal roads, as well as temporary facilities, corresponding to the mining site. Under regulatory compliance, the Project must submit to the SERNAGEOMIN a closure plan for the final phase of its operation.	Yes
Article 138.- Permission for the construction, repair, modification and expansion of any public or private work for the evacuation, treatment or final disposal of drains, sewage of any nature.	The Project will use a septic tank in the construction phase and a sewage treatment plant in the operation and closure phases, to treat household sewage.	Yes
Article 140.- Permission for the construction, repair, modification and expansion of any garbage and waste treatment plant of any kind or for the installation of any place intended for the accumulation, selection, industrialization, trade or final disposal of garbage and waste of any kind.	The Project includes, in its different phases, areas enabled for the temporary disposal of household solid waste and non-hazardous industrial waste.	Yes
Article 142.- Permit for any site for the storage of hazardous waste.	The Project contemplates in its different phases areas enabled for the temporary disposal of hazardous waste.	Yes
Article 146.- Permit to hunt or capture specimens of animals of protected species for research purposes, for the establishment of breeding centers or hatcheries and for the sustainable use of the resource.	Enabling the Project requires conducting rescue and relocation fauna is associated with low mobility.	Yes
Article 148.- Permission to cut native forest.	The Project will intervene in areas with the presence of native forest.	Yes
Article 149.- Permission to cut plantations on lands of preferably forestry aptitude.	The Project will intervene in areas with the presence of forest plantations.	Yes
Article 155.- Permit for the construction of certain hydraulic works.	The Project will have hydraulic works associated with the disposal areas with a capacity greater than $2m^3$/ s.	Yes

Article 156.- Permission to make channel modifications.	The Project considers making changes to the channels due to works of crossing roads by channels, and for the enabling of hydraulic works related to contour channels that will be enabled in the disposal areas and in the extraction areas.	Yes
Article 157.- Permission to carry out regularization or defense works of natural channels.	The Project will intervene natural channels due to the creation of an intake in the Penco Creek.	Yes
Article 160.- Permission to subdivide and urbanize rural land.	The Project considers the construction of habitable facilities on rural lands.	Yes
Article 161.- Permission for industrial or warehousing facilities.	The Project is located in a rural area regulated by a Planning Instrument	Yes

20.3.2 Mining Permits

Sectoral Permits associated with mining operations are granted by SERNAGEOMIN. At this stage, several permits are considered applicable to the Project, but the most relevant ones, based on their engineering requirements and processing times, are:

- Permit for the Construction of the Tailings Deposit (related to PAS 135)[17]
- Authorization of Open Pit Exploitation Method
- Mineral Treatment or Benefit Plants Project Approval
- Authorization of the Project Mine Closure Plan (related to PAS 137) (for approval, the previous three permits are required.

Depending on the level of engineering and the amount of information provided, these permits can have extended processing times (up to one year) and need to be obtained before construction. Several other permits and notifications are also required to be presented at the beginning of the construction or operation phases, such as the notification for starting the construction works on the tailings deposit or the approval for the Occupational Accident and Illness Prevention Program, among others, but none of them relate to the design of infrastructure, deposits or the mining process.

20.3.3 Additional Permits and Authorizations

Other Sectoral Permits are granted by different government authorities, for which REE needs to apply after obtaining the Environmental License. At this stage, the following permits are considered applicable to the Project, with the most relevant ones, based on their engineering requirements and processing times, listed below:

- Project approval for the Construction, Repair, Modification and Expansion of any Public or Private Work Designed for the Management of Sludge from Sewage Treatment Plants, the Evacuation, Treatment or Final Disposal of Drainage, Sewage of Any Nature and Waste Industrial or Mining (related to PAS 138).
- Approval for the Project for Accumulation or Treatment of Industrial Waste (related to PAS 140).

[17] Despite that the disposed material does not constitute tailings under Chilean legislation, the disposal zones present characteristics similar to a tailings deposits, therefore, the same permit will apply.

- Approval for the Hazardous Waste Storage Facility Project (related to PAS 142).
- Authorization of Intervention of Species Classified as Endangered, Vulnerable, Rare, Insufficiently Known or Out of Danger (related to PAS 146)
- Forest Management Plan for Cutting Native Forest (related to PAS 148).
- Management Plan for the Cutting of Plantations in Preferentially Forest Aptitude Lands (related to PAS 149).
- Approval for the water intake hydraulic works Project and construction (related to PAS 155).
- Authorization of Channel Modification and Regularization Works (related to PAS 156).
- Authorization to Carry out Regularization or Defense Works of Natural Channels (related to PAS 157).
- Favorable Report for Construction (IFC) (related to PAS 160).
- Authorization of a Favorable Health Report (related to PAS 161).
- Authorization for the Project Design of a Private Drinking Water Supply System.
- Building Permit.

The approval times for these permits vary, but they all need to be obtained before construction starts. Several other permits are also required but need to be presented during construction or at the start of the operation. Most of these additional permits relate to the authorization for the operation of waste storage, wastewater and drinking water facilities, waste transport, permits for minor support infrastructure like fuel tanks, electric systems, gas systems and roads.

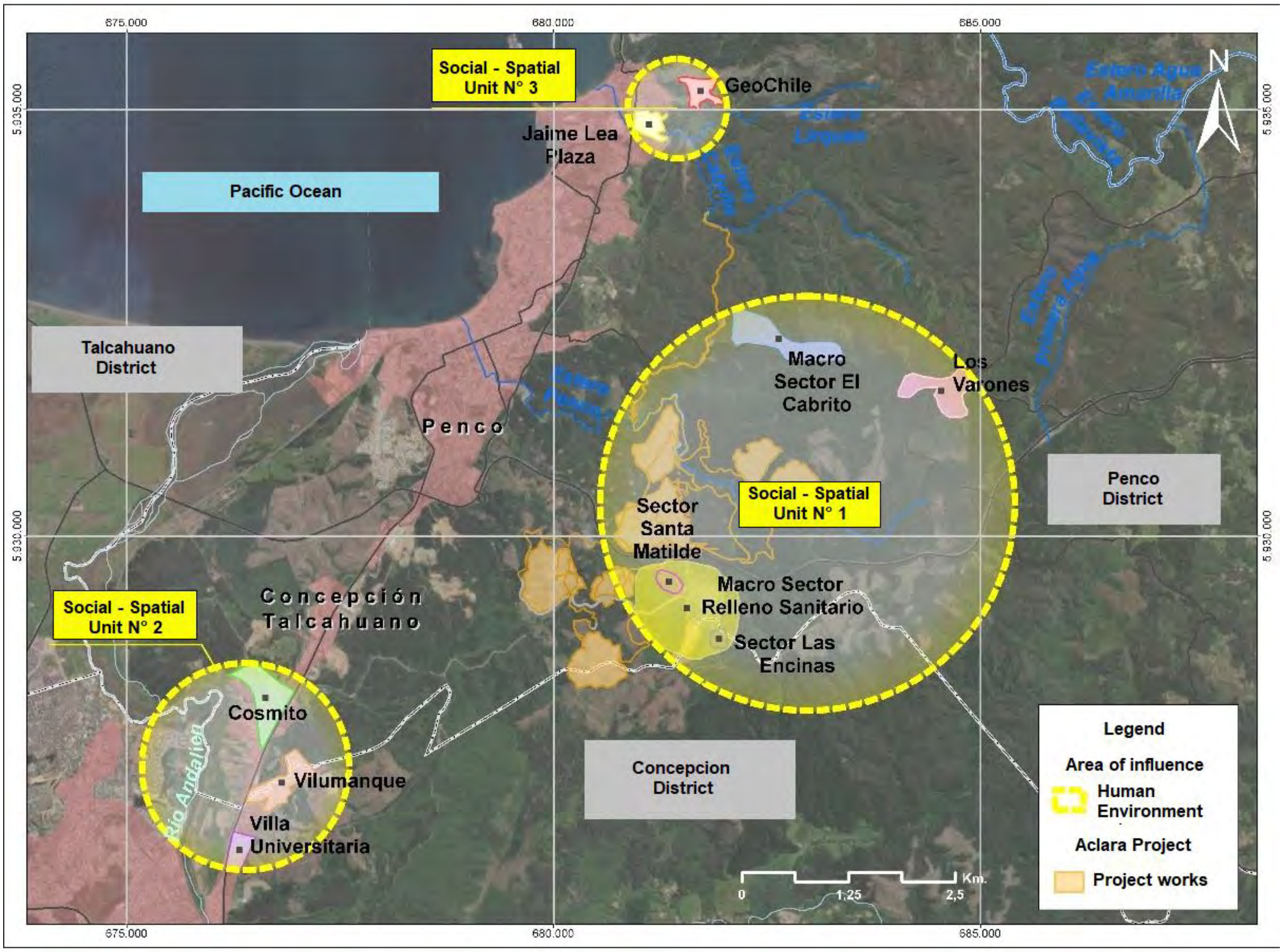
20.4 Social Considerations

20.4.1 Human Environment

In accordance with the provisions of Article 18 letter e.10) of the SEIA Regulation, the Human Environment was characterized according to the five (5) dimensions of analysis: geographical, demographic, anthropological, socioeconomic and social welfare. The results presented in Annex 3.4 of Addendum N°1 of the EIA, considered 3 different socio-spatial units groping 8 settlements that are closest to the Project, of which 3 are located in the rural sector of Penco district (Relleno Sanitario sector (hamlets Santa Matilde and Las Encinas), and hamlets El Cabrito and Los Varones) and the remaining 5 in the urban area (villages Villa Universitaria, Vilumanque, Cosmito, Jaime Lea Plaza and GeoChile). Figure 20-3 shows the location of these human settlements around the Project area.

The characterization methodology used both a quantitative and qualitative approach. In the first case, descriptive statistical tools were used based on secondary sources, specifically the 2017 Census (INE), while the second of them consisted of obtaining primary information from field surveys. At the same time, from June 8 to June 10, 2020, an additional field survey, using semi-structured interviews, was carried out to inquire about the indigenous (Mapuche) organizations existing in the city of Penco.

Figure 20-3: Human Environment in the Area of Influence



Note: prepared by BioLantánidos EIA, 2020.

20.4.2 Indigenous Communities and Indigenous Consultation

The Project is not located on indigenous lands or in areas of indigenous development. However, in the district of Penco two indigenous organizations called "Koñintu Lafken Mapu Indigenous Association" and "Mapuche Cultural Group Lawen Mahuida" were identified, both being Mapuche ethnic groups.

Koñintu Lafken Mapu corresponds to an indigenous organization with 75 members, created under Law No. 19,253 and listed within the National Indigenous Development Corporation (CONADI) Register of Indigenous Communities and Associations. On the other hand, the Mapuche Cultural Group Lawen Mawida has between 30 and 50 members and corresponds to a functional organization not listed within the Registry of Indigenous Communities and Associations from CONADI.

As for the celebration of ceremonies and rites, Koñintu Lafken Mapu carries out activities in the areas El Tranque (between 1 to 1.3 km west of the route of the water pipeline and 1 to 1.4 km west of the ZE Victoria Norte) and Los Queules (12 m north of the water pipeline route and 120 m north of the same ZE), for the collection of medicinal herbs along the Penco Creek, mainly during the spring - summer season. Lawen Mawida uses an existing forest road, adjacent to Penco Creek, up to km 1.2, where they carry out workshops to identify native and medicinal plants, an area located 0.6 km west of the ZE Victoria Norte and 0.5 km west of the water pipeline route.

As per ahe above, the EIa concluded that the activities carried out by both indigenous communities in the aforementioned sites will not be affected by the Project. Despite one of the activities being located close to the underground water pipeline location, the activity occurs along the Penco creek and the movement of the indigenous community members along the forest access road will not be interrupted, nor will the specific sites in which they carry out their cultural practices. As part of the environmental licensing process, to this date CONADI has expressed its conformity with the information provided in the EIA and has confirmed the inexistence of significant impacts on the indigenous communities. However, the Environmental Assessment Service (SEA), has requested an anthropological characterization of the study area and the communities to assert there is no effect on indigenous cultural practices, to rule out an eventual Indigenous Consultation Process, which could extend the environmental licensing process, and to determine the appropriate mitigation and/or compensation measures, if applicable. REE has already conducted the anthropological characterization, including interviews with members of the indigenous communities, to present the results in the Addendum N° 2 submission in November 2021, and expects this will confirm CONADI's assessment on the nonexistence of significant impacts.

20.4.3 Community Relations Plan (CRP) and Stakeholder Communications Strategy

During the environmental assessment process, two Community Consultation Process (PAC) were carried out. These are legal requirements for any EIA as stated by Law 19.300, and the issues raised by the community and subsequent observations must be attended by the owner of the Project. The first PAC process was carried out in early 2019, while the second process was carried out in early 2021. Currently, in the development of Addendum N°2, REE indicates that all the observations issued by the community are being addressed.

In addition, REE has been implementing its own Stakeholder Communications Strategy, by carrying out stakeholder identification, through primary and secondary sources, stakeholder mapping and the development of a Community Relations Plan (CRP), which aims at guiding the proper development of a relationship with the main stakeholders and to propose the actions to be carried out during the evaluation, construction and operation stages. This plan will be developed in accordance with the applicable regulations, the Community Relations Policy of the Project, the Performance Standards on Environmental and Social Sustainability of the International Finance Corporation (IFC), and the Sustainable Development Goals (SDG) of the United Nations.

CRP will be implemented during the environmental assessment, construction, operation and closure stages and has the following objectives:

- Initiate voluntary dialogue with the community.
- Form a representative, validated and informed counterpart to the Project.
- Generate strong and externally auditable agreements.
- Creation of a Participation Plan agreed upon with the stakeholders.

In addition, a strategy of relationship with stakeholders through participation meetings is already being carried out, aimed at establishing an open, voluntary, official and permanent dialogue space between the Project and the stakeholders (community and local authorities) and to generate and validate information with the stakeholders involved in the process.

CRP activities began in August 2020, but the first meeting was held on March 23rd, 2021, because of COVID-19 restrictions. Up to this date, 6 meetings have been held and meetings records can be found on the Penco Module website . Specific topics are covered in each meeting (Project description, water, soil, fauna, flora and vegetation, radioactivity, etc.).

REE has indicated that the work with the community undertaken so far shows that groups opposed to the Project are based on groups of non-governmental organizations that are of very extreme position but are not a large majority.

20.5 Comments on Environmental Studies, Permits and Social or Community Impact

The Project is about to present Addendum N°2 for assessment. The environmental licensing process usually comprises only two Addendums, but in this case, it is considered possible that SEA could instruct a new round of review and the presentation of an Addendum N°3, due to the fact that SEA opened a second Community Consultation Process (PAC) because of changes to environmental impacts that were introduced at Addendum N°1. The other possibility is that after Addendum N°2, the authority uses the available information to vote, but if not satisfied with the provided answers, it could potentially reject the Project.

The two most relevant topics in the context of environmental assessment are flora-vegetation and human environment. In terms of flora and vegetation, the Project must ensure that species in the Conservation Category, such as the Queule and the Pitao, and their habitats are not affected. Regarding the Human Environment, despite that CONADI has already given its approval of the Project in terms of the inexistence of significant impacts to indigenous communities, SEA has yet to confirm that an Indigenous Consultation Process will not be required, which could extend the environmental licensing process. To avoid this, the sufficiency of information must be ensured, and Addendum N°2 (planned for November 2021) must be presented as robust in technical terms as possible to rule out both significant impacts.

Water management is also an important part of the Project, with measures been taken to ensure the water ecosystems will be impacted as little as possible. Surface runoff will be diverted away from the extraction and disposal areas and restituted downstream to its natural course and, from the information available so far, contamination of the water ecosystems is unlikely to occur.

Regarding mine closure, the revegetation and progressive closure of extraction and disposal zones during the operation phase is considered to be a positive aspect that will reduce environmental liabilities and provide better conditions for the restoration of the impacted ecosystems.

In terms of the relationship with the surrounding community Penco Module is located close to the city of Penco. Although this may mean an environment of generalized risk for any initiative, thanks to the work that has been developed so far, it has been possible to ratify that the groups opposed to the Project are based on groups of non-governmental organizations that are of very extreme position but are not a large majority.

21 CAPITAL AND OPERATING COSTS

21.1 Capital Costs

21.1.1 Overview

Capital cost is defined as the capital expenditure required to engineer, design, procure, construct and commission the works required for the Project Scope within its defined battery limits. The capital is split into Mine direct costs and Plant directs costs, inclusive of Project Indirect costs and contingency.

The estimate conforms to AACE Class 5 guidelines for a Concept Estimate with an expected accuracy range of -15% to -30% on the low side of the range and +20% to +50% on the high side of the range.

21.1.2 Capital Cost Summary

Table 21-1 provides a summary of the estimate for overall initial capital cost. The costs are expressed in Q3 2021, American dollars and include all mining, process plant, Project indirect (including owner costs) and contingency.

Table 21-1: Capital Costs Summary

Description	M USD
Direct Costs:	
Mine Cost	$ 4.43
Process Plant	$ 64.91
Subtotal Direct Costs (D)	$ 69.35
Project Indirect Costs	$ 21.88
Subtotal Indirect Costs (I)	$ 21.88
Subtotal Base Estimate (D)+(I)	$ 91.23
Contingency	$ 27.37
Total Initial Costs	$ 118.6

21.1.3 Basis of Estimate

All costs are expressed in US dollars (USD). The estimate base date is the third quarter 2021.

Escalation/Normalization:

Normalization - Estimated costs in the body of the estimate represent Q3 2021 constant US dollars. If base estimated costs were from previous dates, the costs have been escalated to represent Q3 2021 constant US dollars.

Further escalation has been excluded from the estimate. In other words, no escalation beyond Q3 2021 (to the mid-points of expenditure) has been included in the estimate.

The economic indexes and exchange rates used are presented in Table 21-2:

Table 21-2: Exchange Rate

Item	Rate
CLP/USD	800

The estimate is based on an EPCM execution approach.

The following parameters and qualifications were considered:

- The estimate was based on Q3 2021 pricing;
- Mining equipment and mine initial development is a third-party service;
- No allowance has been made for exchange rate fluctuations; and
- There is no escalation added to the estimate.

Data for the estimates have been obtained from numerous sources, including:

- Budgetary equipment quotes;
- Data from similar recently completed studies and projects;
- Concept level engineering design (to define the process flow diagram);
- Preliminary mine schedules;
- Topographical information obtained from site survey; and
- Geotechnical investigations.

21.1.4 Mine Capital Costs

Mine initial direct capital cost includes the costs presented in Table 21-3:

Table 21-3: Mine Capital Costs

Description	M USD
Offices	$ 0.05
Canteen	$ 0.04
Workshop	$ 0.30
Change House	$ 0.05
Software	$ 0.35
Monitoring Equipment & ZD Control	$ 0.25
Surveying Equipment	$ 0.02
Roads	$ 2.22
Water Drainage	$ 0.26
Pre-stripping	$ 0.40
Soil disposition	$ 0.49
Total Mine Initial Direct Costs	$ 4.43

21.1.5 Process Capital Costs

Process plant initial direct capital cost includes the costs presented in Table 21-4:

Table 21-4: Process Plant Capital Costs

Description	M USD
Mechanical Equipment	$ 37.09
Earthworks	$ 1.85
Concrete	$ 3.71
Structural Steel	$ 5.56
Piping	$ 7.42
Electrical	$ 7.42
Instrumentation	$ 1.85
Total Process Plant Initial Direct Costs	$ 64.91

Process plant capital cost was developed as follows:

- A list of mechanical equipment was identified;
- Source of prices for mechanical equipment supply is based on referential and budgetary quotations and database prices;

- Installation cost for mechanical equipment was based on database and benchmark installation costs; and
- Earthworks, concrete, structural steel, piping, electrical and instrumentation costs were estimated by factorization from mechanical discipline.

21.1.6 Project Indirect Costs

Indirect costs are those that are required during the Project delivery period to enable and support the construction activities. Table 21-5 presents the Project indirect cost summary.

Table 21-5: Project Indirect Costs Summary

Description	M USD
EPCM	$ 9.79
Temporary Facilities	$ 0.65
Third Party Services	$ 2.60
Catering and Lodging	$ 0.53
Freights & Logistics	$ 2.48
Vendor Representatives	$ 0.50
Spares	$ 0.42
Commissioning & Start-up	$ 0.67
First Fills	$ 0.15
Owner Costs	$ 4.10
Total Project Indirect Costs w/Owner	$ 21.88

Basis of estimate for each major item of Project Indirect Costs is presented in the next sections. Project Indirect costs were estimated based on the experience with similar-sized projects and under a EPCM execution strategy.

21.1.6.1 Engineering and procurement support services

The engineering and procurement support services were estimated based on the estimate of a rough order of magnitude quantity of hours required which were costed at an average market rate.

The estimate considers a 70,000 MH @ 65 USD/ MH. These hours would cover the following activities:

- Detail engineering;
- Support to procurement activities (requisitions, technical evaluations);
- Support in to prepare bidding documentation for construction contracts; and
- Field visits (engineering personnel and contracts).

21.1.6.2 Construction Management Services

The construction management services include the staff and all the expenses required for the right supervision of the execution of the Project. Vehicles, transportation, equipment, safety consumables, IT and communications expenses, and other minor items are included.

The staff includes the positions of project administration, project services (scheduling, cost control, change management), field engineering, procurement support, contracts, site services (logistics, TI, human resources, industrial relations, finance), quality assurance, HSE, field construction supervision, commissioning and start up.

This service was estimated 25 people for 14 months, with a total of 66,500 MH at an average rate of 75 USD/MH. A 5% additional was included to cover reimbursable expenses.

21.1.6.3 Temporary Facilities

This item was estimated as 1% of the total direct cost based on benchmark information. This account includes the cost to cover the following items:

- temporary offices;
- warehouse;
- work areas and bays including clearing, excavation, ground preparation and ground finishes for work areas and fencing;
- temporary roads, walk paths and parking areas – Included in temporary office rate;
- temporary utilities, including the materials and installation of the distribution systems for temporary power, light and communication, water, fire, air, steam and sanitary, fuel. Includes only for the initial construction of temporary utilities and temporary facilities. – Included in temporary office rate. Included in temporary office rate;
- weather protection, temporary facilities required to protect permanent plant equipment and materials during adverse weather – Included in temporary office rate; and
- minor temporary construction as gang boxes, plan sheds, construction and safety signs, barricades, safety nets and any other minor temporary construction item not covered elsewhere. – Included

21.1.6.4 Third Parties Services

It was calculated as 4% of the direct cost based on historical information. It includes the following services:

- security services;
- surveying;
- testing, including tests for: soil, concrete, x-rays for pipes and structures;
- factory inspection;

- first aid medical services;
- warehousing;
- management of hazardous and non-hazardous waste;
- induction and training courses;
- certification services; and
- final clean-up.

21.1.6.5 Catering and lodging

Includes catering and lodging costs for indirect personnel at a rate of 4 USD/MH. Catering and lodging for direct labour is included in the direct costs.

21.1.6.6 Freights and logistics

Includes the cost of freight required to transport the equipment or materials to project warehouses.

The calculation basis for freight and logistics costs is as follows:

- Local transport: 2.0% of the Ex-Fab cost
- International origin (Off-shore): 11% of Ex-Fab cost, which includes the following items:
  - Ex Fab to port
  - Cargo handling in port (FOB)
  - Transport agency
  - Sea freight with insurance (CIF)
  - Customs
  - Local freight to project warehouse

This percentages were applied over Mechanical equipment. The assumption for the other disciplines was to apply a 2% (local freight) over the 40% of the overall discipline cost.

21.1.6.7 Vendor representatives

This item considers the cost of vendor personnel required for the supervision of installation, commissioning, start up and testing of electromechanical equipment. Training services for operation and maintenance personnel are also included in this cost. This cost was estimated as 2% of the supply of mechanical foreign equipment cost + 20% of additional provision to cover vendor representatives for electrical main equipment.

21.1.6.8 Spares

Includes the spare parts required for start-up and for one year of operation. Operation manuals are also included. Capital spare parts are not included (is an estimate exclusion). Spare were estimated as 2% of the supply of mechanical foreign equipment cost + 20% of additional provision to cover spares for electrical main equipment.

Spare parts one year of operation: 3% of the supply cost mechanical + electrical equipment.

21.1.6.9 Commissioning and start-up

It considers the costs of the direct crews, as well as the construction equipment and materials required for commissioning and start up activities. This cost was estimated as a 2% of the mechanical equipment supply + 20% allowance.

21.1.6.10 First Fills

It includes the items required for the initial fills and lubricants required in the start-up stage of the Project. Initial fills were estimated as 0.7% of the foreign Mechanical Equipment supply cost.

21.1.6.11 Site Camp

A site camp is not required. The Project is located close to an urban center, and lodging will be outside of the Project facilities.

21.1.6.12 Owner (Corporate) Capital Costs

Owners' costs were estimated as 10 people for 24 months at a rate of $90 USD/MH. These costs cover Project staff such as salaries and expenses. Other corporate costs are excluded of the estimate.

21.1.7 Contingency

The estimate includes an amount of contingency that represents the 30% of the sum of direct and project indirect costs. This amount is in the range expected for a AACEI Class 5 estimate.

For this Capex, the contingency was estimated as 30% of the base estimate based on the following considerations:

- A list of mechanical equipment was developed by engineering;
- A 60% of the supply prices for mechanical equipment are supported for referential and budgetary quotes. The balance comes from recent data base price escalated to Q3 2021;
- Civil, concrete, structural, piping, electrical and instrumentation works were factored from mechanical discipline based on similar sized-projects; and
- Indirect accounts were estimated based on a factorization methodology.

21.1.8 Sustaining Capital

The sustaining costs for the mine area are shown in Table 21-6:

Table 21-6: Mine Sustaining Costs

Description	M USD	
Roads	$	3.34
Water Drainage	$	1.05
Pre-stripping	$	16.18
Soil disposition	$	2.03
Sub Total		**22.59**
Contingency	**$**	**6.78**
Total	**$**	**29.37**

21.2 Operating Costs

21.2.1 Overview

The operating costs (OPEX) is presented in Q2 2021, United States dollars (USD), and are estimated at an overall accuracy of ±30%, which is the standard for a preliminary economic assessment. The operating costs were defined using database.

The operating costs do not include:

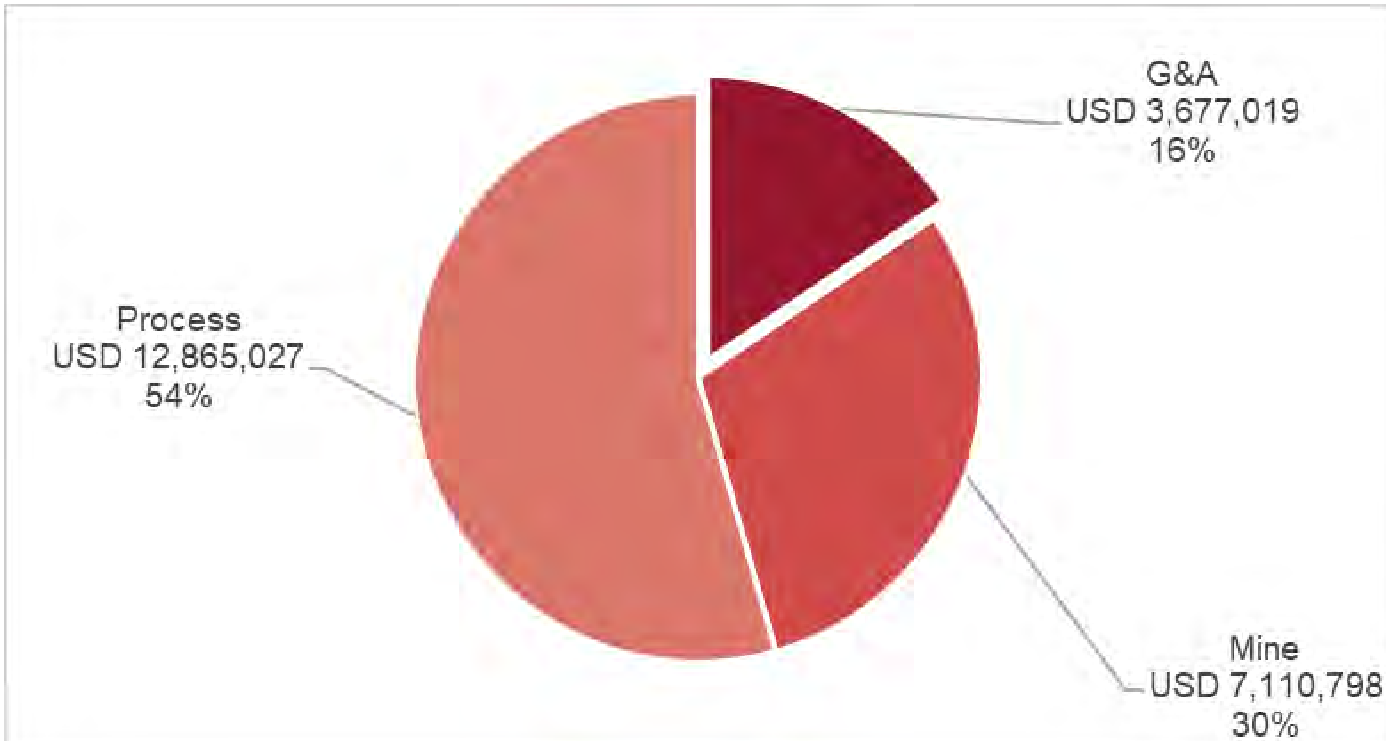
- any provision for inflation;
- any provision for changes in exchange rates;
- contingency; and
- exploration activities;

The total operating cost for mining, processing and G&A is estimated at MUSD 23.65 per year which represents 13.39 USD per tonne of mineral treated. See Table 21-7 and Figure 21-1 for a break down of the operating costs.

Table 21-7: Operating Costs

Item	USD/y	USD/t
G&A	3,677,019	2.08
Mine	7,110,798	4.03
Process	12,865,027	7.28
TOTAL	**23,652,844**	**13.39**

Figure 21-1: Total Operating Costs Breakdown



21.2.2 Basis of Estimate

The plant operating costs are based on an annual treatment of 1,766,016 dry ton per year. The grade and recovery considered is obtained from the average grade of the mining plan, which is shown in Table 21-8. The cost of primary reagent and supplies are presented in Table 21-9

Table 21-8: Grade and Recovery Average LOM

Element	Grade (ppm)	Recovery (%)
Y	367	46.39
La	335	13.35
Ce	672	2.31
Pr	75	14.68
Nd	316	15.33
Sm	53	19.10
Eu	2.7	36.55
Gd	52	23.68

Element	Grade (ppm)	Recovery (%)
Tb	9.1	32.72
Dy	64	36.36
Ho	14	39.35
Er	40	40.35
Tm	5.7	38.49
Yb	36	36.28
Lu	5.2	37.91
TOTAL	**2,045**	**18.49**

Table 21-9: Principal Reagent and Supplies Cost

Supplies and Reagent	Unit	Value
Ammonium Sulfate Solid	USD/t	330
Ammonium Bicarbonate Solid	USD/t	450
Flocculant	USD/t	2650
Sulphuric Acid	USD/t	170
$Ca(OH)_2$ Solid	USD/t	180
Energy	USD/MWh	84.7
Diesel	USD/m^3	0.86
Fresh water	USD/m^3	0.5
RO Water	USD/m^3	0.65
Potable Water	USD/m^3	0.5

21.2.3 Mine Operating Costs

Mining Opex costs were estimated by building up the cost estimate over the 12-year LOM (excluding pre-stripping and labour) and presents an average annual cost of MUSD 6.19, which is equivalent to 3.51 USD/t of processed mineral.

The basis for the estimate is that the open pit operation will be a contractor-operated mine. Mine operating cost forecasts are included in Table 21-10. The following assumptions were made:

- Contractor's Open Pit Mining Costs include the sum of operating and maintenance labour, supervisory labour, parts and consumables, fuel and miscellaneous operating supplies.
- Mining costs include:

- o Salaries and wages: based on an estimate of staff and labour numbers and using labour rates current for Chile. The staff on the part of the contractor-operated mine is approximately 96 and the staff on the part of the owner are 22.
- o Consumables: includes tires, spare parts, lubricants are included in the contractor's rate.

The total mine operating cost during commercial production period is MUSD 69.6. This amounts to 3.51 USD/t per total tonne of mined material (including re-handling and excluding pre-stripping and labour) during this period.

Table 21-10: Cost during Life of Mine

Item	LOM Total USD
Loading	8,143,845
Hauling	17,500,115
Ancillary	7,617,910
Total Mine Direct Cost	**33,261,870**
Geotechnics	17,001,860
General expenses (15%)	11,609,494
Profit of Collaborating Company (10%)	7,739,663
Total general	**36,351,017**
Total mine	**69,612,888**

Table 21-11: Average Annual Cost (for 1,766,016 annual ton)

Item	Annual Cost, USD	Unit Cost, USD/t
Loading	724,331	0.41
Hauling	1,556,497	0.88
Ancillary	677,553	0.38
General	3,233,135	1.83
Total (without labour)	**6,191,515**	**3.51**
Labour	919,282	0.52
Total (with labour)	**7,110,798**	**4.03**

21.2.4 Process Operating Costs

21.2.4.1 Labour

Labour costs include all mining, processing, and G&A costs (Table 21-12). Costs were estimated from a breakdown of staffing positions, estimated at 129 in total: 49 in G&A, 22 in mining and 58 in process plant. Costs consider salary and company cost (22% of salary).

Table 21-12: Total Labour

Department	Position	Shift	Number of Employees / Shift	Number of Employees	Total Annual Rate (USD/y)	Annual Company Cost (USD/y)
G&A	Management					
G&A	Plant Manager	5x2	1	1	147,000	179,605
G&A	Secretary	5x2	1	1	12,300	15,028
G&A	Management and Finance					
G&A	Superintendent	5x2	1	1	99,000	120,958
G&A	Contador	5x2	1	1	22,800	27,857
G&A	Procurement	5x2	1	1	22,800	27,857
G&A	Finance and accounting	5x2	1	1	22,800	27,857
G&A	RRHH	5x2	1	1	22,800	27,857
G&A	Environment and HSEC					
G&A	Superintendent	5x2	1	1	99,000	120,958
G&A	Environment	5x2	1	1	45,000	54,981
G&A	HSEC	7x7	1	4	91,200	111,428
G&A	Generals					
G&A	Security	7x7	2	8	Services	Services
G&A	Cleaning staff	6x1	4	4	Services	Services
G&A	Catering Staff	7x7	4	16	Services	Services
Mining	Superintendency Mine and Geology					
Mining	Superintendent	5x2	1	1	99,000	120,958
Mining	Cost Control Engineer and statistics	5x2	1	1	22,800	27,857
Mining	General Mine Supervisor	7x7	1	4	180,000	219,924

Department	Position	Shift	Number of Employees / Shift	Number of Employees	Total Annual Rate (USD/y)	Annual Company Cost (USD/y)
Mining	Mine planning	5x2	1	1	45,000	54,981
Mining	Long Term Planner	5x2	1	1	22,800	27,857
Mining	Short Term Planner	5x2	1	1	22,800	27,857
Mining	Surveyor	5x2	1	1	22,800	27,857
Mining	Geotechnical	7x7 (D)	1	2	90,000	109,962
Mining	Senior Geologist	5x2	1	1	45,000	54,981
Mining	Operational Geologist	7x7	1	4	91,200	111,428
Mining	Samplers	7x7	1	4	66,000	80,639
Mining	Senior Geologist of Mining Resources	5x2	1	1	45,000	54,981
G&A	Processes and engineering					
G&A	Superintendent	5x2	1	1	99,000	120,958
G&A	Process Engineering	5x2	2	2	90,000	109,962
G&A	Quality and control					
G&A	Laboratory manager	5x2	1	1	22,800	27,857
G&A	Sampler	7x7	1	4	66,000	80,639
Process	Plant Superintendency					
Process	Superintendent	5x2	1	1	99,000	120,958
Process	Maintenance Area					
Process	Maintenance manager	5x2	1	1	45,000	54,981
Process	Maintenance planner	5x2	1	1	16,500	20,160
Process	Mechanical manager	7x7	1	4	91,200	111,428
Process	Mechanical	7x7	2	8	132,000	161,278
Process	Electric	7x7 (D)	1	2	33,000	40,319
Process	Instrumentalist	7x7 (D)	1	2	33,000	40,319
Process	Production Area					
Process	Production manager	5x2	1	1	45,000	54,981
Process	100/200 Area					
Process	Area plant Operator	7x7	2	8	132,000	161,278

Department	Position	Shift	Number of Employees / Shift	Number of Employees	Total Annual Rate (USD/y)	Annual Company Cost (USD/y)
Process	300/400 Area					
Process	Shift manager	7x7	1	4	91,200	111,428
Process	Area plant Operator	7x7	2	8	132,000	161,278
Process	Equipment mobile Operator	7x7	1	4	66,000	80,639
Process	500/600 Area					
Process	Area plant Operator	7x7	2	8	132,000	161,278
Process	Equipment mobile Operator	7x7	1	4	66,000	80,639
Process	Logistics					
Process	Head of area	5x2	1	1	45,000	54,981
Process	Logistics, Sales and Dispatch	5x2	1	1	16,500	20,160
G&A			25	49	862,500	1,053,803
Mining			12	22	752,400	919,282
Process			20	58	1,175,400	1,436,104
TOTAL			57	129	2,790,300	3,409,189

21.2.4.2 Power

Power costs were calculated from an estimate of annual power consumption and using a unit cost of 84.7 USD/MWh (Table 21-13). Power consumption was derived from preliminary equipment list. The average on-line power draw is estimated at 5.5 MW (4.0 MW without RO Plant). Annual energy consumption is estimated at 48,282 MWh (35,387 MWh without RO Plant). The energy consumption of the RO plant is considered in the price to obtain RO water (0.65 USD/m^3).

Table 21-13: Power Cost

Area	Power, kW	Annual Cost, USD (84.7 USD/MWh)
0000: General	204.88	152,015
0100: Mineral Stacking and Feeding	328.44	243,693
0200: Mineral Leaching	1,584.60	1,175,729
0300: Impurities Precipitation	326.60	242,328
0400: Carbonation and Drying	1,223.32	907,669
0500: Water Recuperation System (without RO Plant)	371.80	275,865
TOTAL without RO Plant	**4,039.64**	**2,997,300**

21.2.4.3 Reagent and Supplies

The reagents and inputs were obtained from a steady state mass balance for the conditions indicated in section 21.3.2Table 21-14 shows the expenses considered in reagents and supplies.

Table 21-14: Reagent and Supplies

Item	Unit	Unit Cost	Usage					
			Consumption	Unit	Rate	Unit	USD/y	USD/t
Fresh Water	USD/m^3	0.50	102,772	t/a	58.19	l/t	51,386	0.029
Sulphuric Acid	USD/t	170	1,878	t/a	1.06	kg/t	319,266	0.18
Ammonium Sulfate Solid	USD/t	330	2,013	t/a	1.14	kg/t	664,180	0.376
Ammonium Bicarbonate Solid	USD/t	450	3,442	t/a	1.95	kg/t	1,548,993	0.88
Ca(OH)2 Solid	USD/t	180	767	t/a	0.43	kg/t	137,970	0.078
Flocculant	USD/t	2,650	213	t/a	0.12	kg/t	564,729	0.32
RO Water	USD/m3	0.65	1,642,828	t/a	0.93	m3/t	1,066,806	0.60
Potable Water	USD/m3	0.50	8,760	t/a	4.96	l/t	4,380	0.0025
						Total	4,357,710	2.47

21.2.4.4 Spares and Maintenance Cost

Annual maintenance costs were estimated at 2% of total installed costs for mechanical equipment, and spares were estimated at 4% of total installed cost mechanicals equipment. These costs are presented in Table 21-15.

Table 21-15: Spare and Maintenance

Item	Unit	Value
Maintenance (2%)	USD/a	560,493
Spares (4%)	USD/a	1,120,985
Installed costs for mechanical equipment	USD	28,024,629
Total	USD/a	1,681,478

21.2.4.5 Laboratories and Chemicals Analysis

The Project has considered the hiring of a laboratory service and analysis of a plant and mine sample. Table 21-16 shows the associated costs for both areas.

Table 21-16: Laboratories and Chemicals Analysis

Item	Unit	Value
Process		
ICP Cost	USD	43
Sample preparation	USD	15
Samples point	un	9
Samples per day	un	3
Daily Cost	USD/d	1,566
Annual Cost	USD/y	571,590
Mine		
Analysis Cost	USD	15
Sample preparation	USD	15
Samples point	un	30
Samples per day	un	1
Daily Cost	USD/d	900
Annual Cost	USD/y	315,000
TOTAL Laboratories and Chemicals Analysis	USD/y	886,590

21.2.4.6 Packing Cost

Table 21-17 shows the packaging costs.

Table 21-17: Packing Cost

Item	Unit	Value
Container	USD/y	56,986
Unit	un/y	28
Unit cost	USD/un	2,000
Pallet de 1t	USD/y	5,243
Unit	un/y	655
Unit cost	USD/un	8
Big bag de 1000 kg	USD/y	6,553
Unit	un/y	655
Unit cost	USD/un	10
TOTAL Packing Cost	USD/y	68,782

21.2.4.7 Spent Mineral Transport

A waste transportation cost of 0.81 USD/t has been considered.

Table 21-18: Spent Mineral Transport Cost

Item	Unit	Value
Annual dry spent mineral	t/y	1,766,016
Unit cost	USD/t	0.81
Total Spent Mineral Transport	USD/a	1,437,063

21.2.5 General and Administrative Operating Costs

21.2.5.1 Labour

The G&A labour cost is detailed in section 21.2.4.1

21.2.5.2 Mobile Equipment

The process considers the rental of pickup truck for key personnel and front loaders for handling material and waste mineral within the plant. Additionally, the use of skid steer leader and forklift. **Table 21-19**shows the cost of mobile equipment.

Table 21-19: Mobile Equipment Cost

Vehicle Type	Number	Fuel Usage (L/h)	Operating Time (h/y)	Fuel L/y	Annual Cost (USD/y)
Pickup Trucks (25,000 USD/y each)	10	278,251	278,251	278,251	278,251
Front Loader Mineral (0.41 USD/t)	Hire Service				724,632
Front Loader Ripio (0.41 USD/t)	Hire Service				724,632
Skid steer Loader	1	8	1,095	8,760	7,534
Forklift	2	8	2,190	17,520	15,067
TOTAL				59,130	1,750,117

21.2.5.3 General Operating Cost

Table 21-20 shows the cost of catering services, security service, workers transportation and PPE.

Table 21-20: General Operating Cost

Item	Unit	Value
Catering	USD/a	280,000
Daily workers	un	80
Catering services	USD/un	10
Security Service	USD/a	206,100
Personal transportation and PPE	USD/a	387,000
Total workers	un	129
Unit cost	USD/un	3,000
Total General Cost	USD/y	873,100

21.2.6 Operating Cost Estimate Summary

Table 21-21 shows the total operating costs for mineral processing at an annual rate of 1,766,016 dry tons.

Table 21-21: Operating Cost Summary

Item	USD/y	USD/t
G&A	3,677,019	2.08
Labour	1,053,803	0.60
Mobile equipment	1,750,117	0.99
Other	873,100	0.49
Mine	7,110,798	4.03
Labour	919,282	0.52
Loading	724,331	0.41
Hauling	1,556,497	0.88
Ancillary	677,553	0.38
General and Contractor	3,233,135	1.83
Process	12,865,027	7.28
Labour	1,436,104	0.81
Power	2,997,300	1.70
Reagent and supplies	4,357,710	2.47
Spent mineral transportation	1,437,063	0.81
Spare and maintenance	1,681,478	0.95
Laboratory and packing	955,372	0.54
TOTAL	23,652,844	13.39

21.3 Comments on Capital and Operating Costs

21.3.1 Comments on Capital Cost Estimate Summary

The following are the Capital Cost exclusions:

- Any kind of study not explicitly described;
- Any kind of provisions not explicitly described in this document;
- Cost to obtain permits;
- Costs for Prefeasibility and Feasibility studies;
- Costs for industrial relations problems / strikes or union mobilizations of any kind;
- Sunk costs;.
- Capital Spares;.
- Contribution to the communities;
- General sales tax (IGV);
- Other taxes such as, stamps, municipal, etc.;
- Variation of costs due to fluctuations in exchange rates (Forex);
- Variation of costs for changes or adjustments to the Base Currency;
- Project financing and interest charges;
- Pilot plant and other testwork;
- Exploration activities;
- Force majeure events;
- Mining licenses, royalties, etc.;
- Costs of land ownership;
- Cost for land acquisition;
- Cost for rights of way and water;
- Cost due to archaeological findings;
- Closing costs; and

- Escalation cost.

21.3.2 Comments on Operating Cost Estimate Summary

The following are the Operating Cost comments:

- The operating costs presented correspond to an average year with treatment of 1,766,016 dry tons of mineral to the Plant. This annual cost could vary each year depending on the mining plan.
- Currently, tests are being developed to validate optimizations in the processes, which could affect the consumption of reagents and supplies.

22 ECONOMIC ANALYSIS

22.1 Cautionary Statement

The results of the economic analyses discussed in this section represent forward- looking information as the results depend on inputs that are subject to known and unknown risks, uncertainties and other factors that may cause actual results to differ materially from those presented here. Information that is forward-looking includes:

- Mineral Resource estimates;
- Assumed rare earths prices and exchange rates;
- The proposed mine production plan;
- Projected mining and process recovery rates;
- Assumptions as to mining dilution and ability to mine in areas previously exploited using open pit mining methods as envisaged;
- Sustaining costs and proposed operating costs;
- Assumptions as to closure costs and closure requirements;
- Assumptions as to environmental, permitting and social risks.

Additional risks to the forward-looking information include:

- Changes to costs of production from what is assumed;
- Unrecognized environmental risks;
- Unanticipated reclamation expenses;
- Unexpected variations in quantity of mineralized material, grade or recovery rates;
- Geotechnical or hydrogeological considerations during mining being different from what was assumed;
- Failure of mining methods to operate as anticipated;
- Failure of plant, equipment or processes to operate as anticipated;
- Changes to assumptions as to the availability of electrical power, and the power rates used in the operating cost estimates and financial analysis;
- Ability to maintain the social licence to operate;
- Accidents, labor disputes and other risks of the mining industry;

- Changes to interest rates;
- Changes to tax rates.

Calendar years used in the financial analysis are provided for conceptual purposes only. Permits still have to be obtained in support of operations, and approval for development to be provided by Aclara Board.

Furthermore, readers are cautioned that the PEA is preliminary in nature. It includes inferred Mineral Resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as Mineral Reserves, and there is no certainty that the PEA will be realised.

22.2 Methodology Used

An engineering economic model was developed to estimate annual pre-tax and post-tax cash flows and sensitivities of the Project based on a 5% discount rate. It must be noted, however, that tax estimates involve many complex variables that can only be accurately calculated during operations and, as such, the after-tax results are only approximations. Sensitivity analysis were performed to assess the impact of variations in rare earth oxides prices, head grades, operating costs and capital costs. The capital and operating cost estimates were developed specifically for this Project and are summarized in Section 21 of this Report (presented in Q3 2021 USD). The economic analysis has been run with no inflation (constant dollar basis).

22.3 Financial Model Parameters

The economic analysis was performed using the following assumptions:

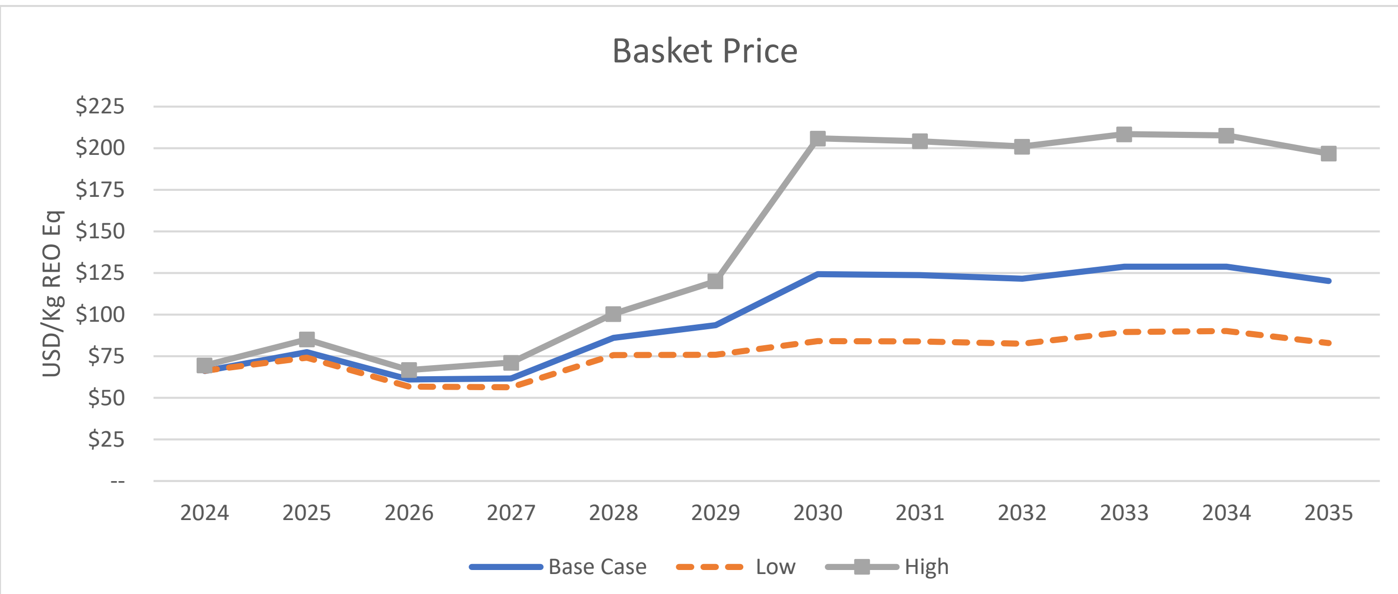
- Construction starts on January 1st, 2023
- Ramp-up production start-up in Q1 2024 and full process plant production will be achieved in Q4 2024
- Mine life of 12 years
- Cost estimates in constant Q3 2021 USD
- No price inflation or escalation factors were taken into account
- Results are based on 100% ownership
- Capital costs funded with 100% equity (i.e., no financing costs assumed)
- All cash flows discounted to beginning of construction Jan 1, 2023
- All rare earths products are assumed sold in the same year they are produced
- Project revenue is derived from the sale of Rare Earth Concentrates
- No binding contractual arrangements currently in place
- The capital and operating cost estimates were developed specifically for this Project and are summarized in Section 21 of this Report (presented in Q3 2021 USD).

- Project Site purchase cost of USD 10 M that will be sold at the end of the LOM
- Separation Fee of 5 USD/Kg REO as detailed in Section 19 of this Report

22.3.1 Rare Earth Oxides Price Forecast

Base case for rare earth oxides prices was based on a study done by a third party consultant and detailed in Section 19 of this Report. The forecasts used are meant to reflect the rare earth oxides prices expectation over the life of the Project. Additionally, it´s been defined a Low and High Price scenarios forecast. The basket price, based on REO Eq production is detailed in Figure 22-1.

Figure 22-1: Rare Earth Oxides Basket Price for the LOM



Note: Basket price has been calculated using the distribution of each element as a percentage of the total rare earth element oxides multiplied by the price projection of each element.
Source: prepared by Argus Media (La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Ho, Er, Tm, Yb, Lu, Y) & by CRU (Dy).

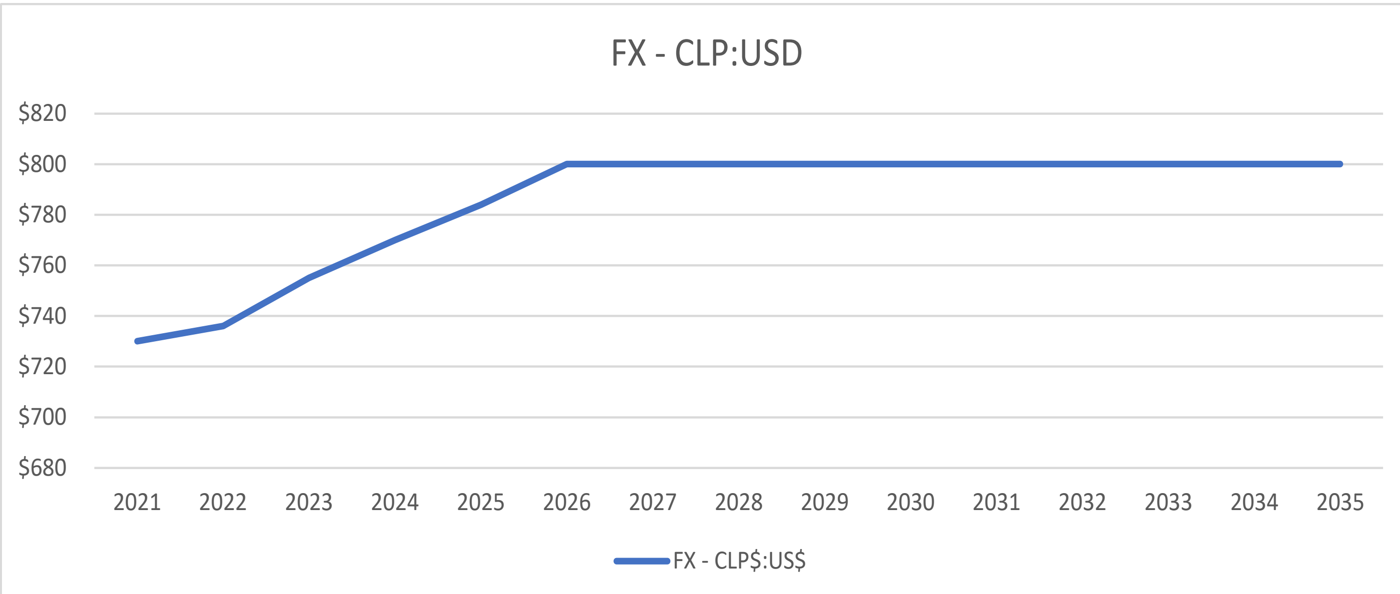
22.3.2 Discount Rate

The discount rate of 5% is based on an unlevered weighted average cost of capital ("WACC") analysis assuming an unlevered beta of 0.90, which is based on a selected range of rare earths peers comparable to Aclara in size and stage. The discount rate is calculated as the sum of a market risk premium of 5% (multiplied by the assumed unlevered beta), a risk free rate of 1.58% (US 10-year treasury bond yield), and a country risk premium of 0.86% (Chile's credit default swap spreads over comparable US 10-year treasury bond), adjusted for inflation of 2.5% (breakeven inflation rate based on US 10-year TIPS). Based on a sensitivity analysis of the unlevered beta and the market risk premium, the resulting real WACC is estimated as being between approximately 4-5%. The higher end of that range (5%) was used as the discount rate, given that it results in a relatively more conservative economic analysis than the lower end.

22.3.3 Exchange Rate Forecast

Consensus exchange rate forecast was used for the economic analysis. The exchange rate forecast is shown in Figure 22-2.

Figure 22-2: Exchange Rate



Note: prepared by Ausenco, 2021

22.3.4 Taxes

The Project has been evaluated on an after-tax basis to provide an approximate value of the potential economics. The tax model was compiled by Ausenco and Aclara with assistance from third-party taxation professionals. The calculations are based on the tax regime as of the date of the PEA study and include estimates for Aclara's expenditures, and related impacts to various tax pool balances between the PEA study and the assumed construction start date.

At the effective date of this report, the Project was assumed to be subject to the following tax regime:

- The Chilean corporate income tax system consists of 27% income tax.
- The opening balance of USD2 M of tax losses carry forward corresponds to the closing balance of June 2021.
- The opening balance of USD 48.9 M of Undepreciated Capital Cost corresponds to the closing balance of June 2021 and projected future expenses before Construction date by Aclara. An assumption has been made that the entire pool available to the legal entity can be utilized to offset taxable income generated by this particular Project
- A Tax credit due to R&D expenses of USD1.9 M
- Total undiscounted tax payments are estimated to be USD 80 M over the life of mine.

22.3.5 Working Capital

A high-level estimation of working capital has been incorporated into the cash flow based on Accounts Receivable (0 days), Inventories (30 days) and Accounts Payable (30 days).

22.3.6 Closure Costs, Remediation Cost and Salvage Value

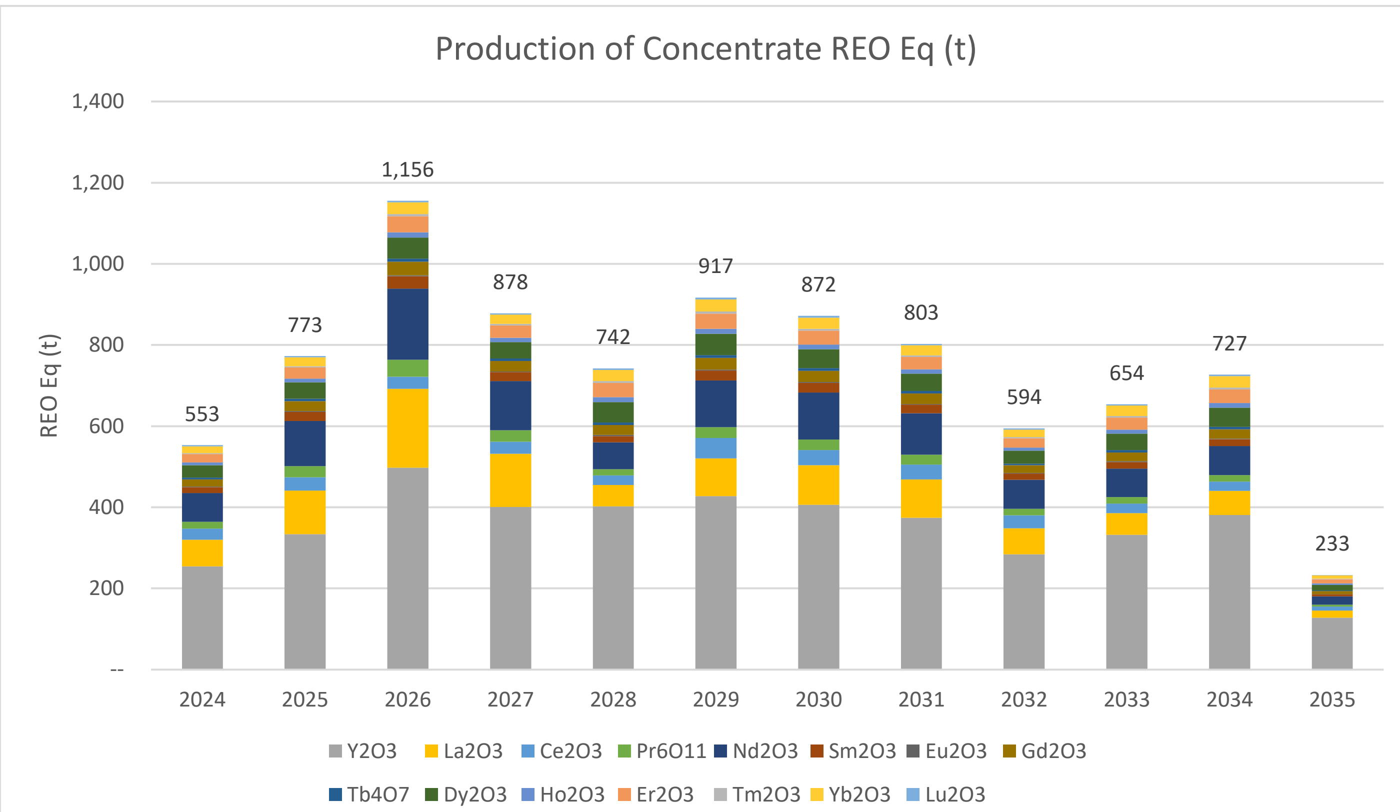
Closure costs and salvage value are applied at the end of the life of mine. Closure costs were estimated as USD 18 M at the end of the LOM as it is detailed in Section 20 of the Report.

Salvage value were estimated as USD 15 M and includes the sale of the Project site at purchase value and an 8% of the total direct cost of the process plant.

22.3.7 Concentrate Production

Aclara will produce a rare earths carbonate concentrate which the REO content is shown graphically in Figure 22-3 and Table 22-1 . The concentrate produced will have a 92.6% REO content.

Figure 22-3: Production REO



Note: prepared by Ausenco, 2021

Table 22-1: Production REO

Year	% of Total REO	Total LOM	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Y2O3	47.4%	4,222	254	333	498	401	402	428	406	374	284	332	381	128
La2O3	11.6%	1,031	66	108	194	131	52	93	98	95	64	54	60	18
Ce2O3	4.0%	353	27	33	29	29	24	51	37	37	32	23	22	9
Pr6O11	2.9%	260	17	27	42	29	15	26	26	24	16	16	16	5
Nd2O3	12.5%	1,113	70	112	176	121	66	115	115	103	72	70	72	21
Sm2O3	2.6%	227	15	22	31	22	16	25	24	21	15	16	16	5
Eu2O3	0.2%	22	2	2	2	2	2	2	2	2	1	2	2	1
Gd2O3	3.1%	280	18	25	34	26	24	29	28	26	19	22	23	7
Tb4O7	0.7%	66	4	6	7	6	6	7	6	6	4	5	6	2
Dy2O3	5.5%	489	30	41	52	41	50	52	47	43	32	41	47	14
Ho2O3	1.3%	118	7	9	13	10	12	12	11	10	8	10	11	3
Er2O3	4.0%	352	20	27	39	31	35	37	34	31	23	30	34	10
Tm2O3	0.5%	47	3	4	5	4	5	5	5	4	3	4	5	1
Yb2O3	3.1%	279	17	22	29	22	27	30	28	24	18	26	28	8
Lu2O3	0.5%	40	2	3	4	3	4	4	4	4	3	4	4	1
TOTAL REO	100%	8,901	553	773	1,156	878	742	917	872	803	594	654	727	233

22.4 Economic Analysis

The economic analysis was performed assuming a 5% discount rate. Cash flows have been discounted to the beginning of the construction January 01,2023 assuming that the Project execution decision will be made and major project financing would be carried out at this time.

For the Base Case Price Scenario, the pre-tax net present value discounted at 5% (NPV5%) is USD 228 M, the internal rate of return IRR is 25.0%, and payback is 4.8 years. On an after-tax basis, the NPV5% is USD 178 M, the IRR is 23.0%, and the payback period is 4.7 years. A summary of the Project economics is included in Table 22-2 and shown graphically in Figure 22-4 to Figure 22-6. The cashflow on an annualized basis is provided in Table 22-3.

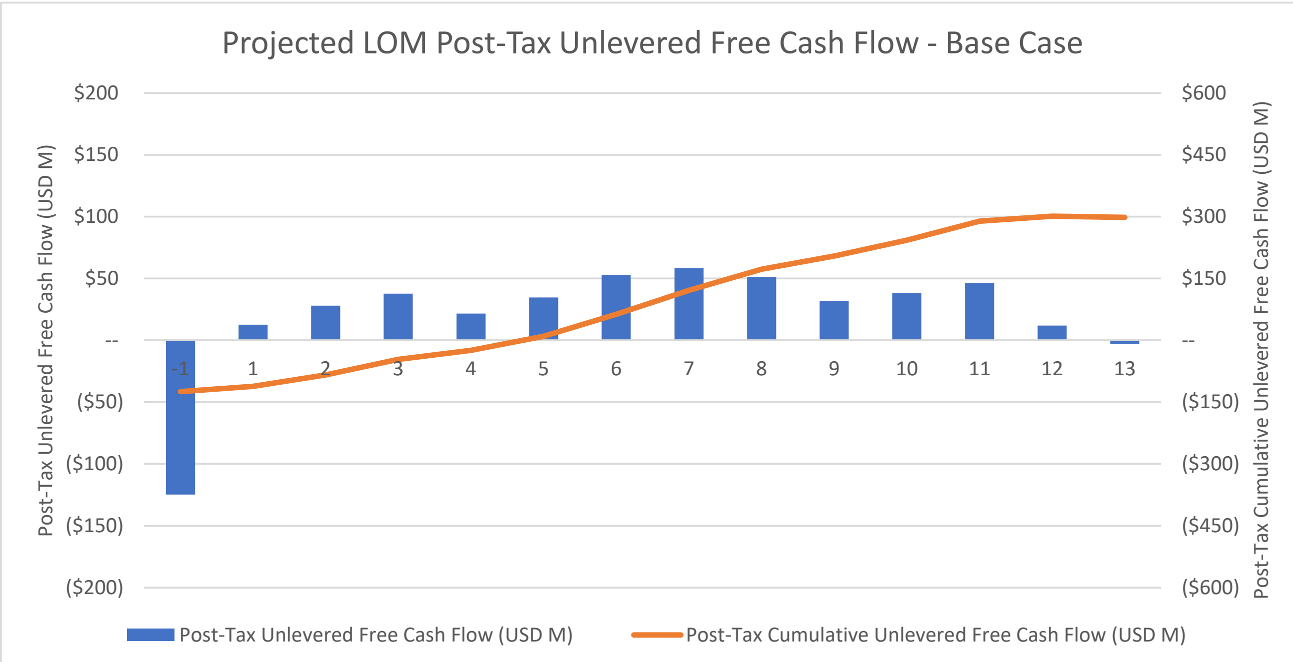
Table 22-2: Summary Results

Price Scenario	Base Case	Low Price	High Price
General	**LOM Total / Avg.**	**LOM Total / Avg.**	**LOM Total / Avg.**
Basket Price* (USD/Kg REO)	$96	$75	$138
Mine Life (years)	12	12	12
Total Waste Tonnes Mined (kt dry)	7,309	7,309	7,309
Total Process Plant Feed Tonnes (kt dry)	19,856	19,856	19,856
Strip Ratio	0.368	0.368	0.368
Production	**LOM Total / Avg.**	**LOM Total / Avg.**	**LOM Total / Avg.**
Process Plant Head Grade Extraction Value REE (ppm)	378	378	378
Metallurgic Efficiency (%)	98%	98%	98%
Production REO (t)	8,901	8,901	8,901
Total Average Annual Production REO (t)	774	774	774
Operating Costs	**LOM Total / Avg.**	**LOM Total / Avg.**	**LOM Total / Avg.**
Mining Cost (USD/t Mined dry)	$3.11	$3.11	$3.11
Processing Cost (USD/t Processed dry)	$7.13	$7.13	$7.13
G&A Cost (USD/t Processed dry)	$2.20	$2.20	$2.20
Treatment & Transport Costs (USD/kg REO)	$5.03	$5.03	$5.03
Total Operating Costs** (USD/t Processed dry)	$13.59	$13.59	$13.59
Cash Costs*** (USD/kg REO)	$36	$36	$36
AISC**** (USD/kg REO)	$39	$39	$39
Capital Costs	**LOM Total / Avg.**	**LOM Total / Avg.**	**LOM Total / Avg.**
Initial Capital (USD M)	$119	$119	$119
Purchase Land Cost (USD M)	$10	$10	$10
Sustaining Capital (USD M)	$29	$29	$29
Closure Costs (USD M)	$18	$18	$18
Salvage Costs (USD M)	$15	$15	$15
Financials	**LOM Total / Avg.**	**LOM Total / Avg.**	**LOM Total / Avg.**
EBITDA LOM (USD M)	$539	$350	$906
Avg. EBITDA LOM (USD M)	$47	$30	$79
Pre-Tax NPV (5%) (USD M)	$228	$104	$467
Pre-Tax IRR (%)	25.0%	17.1%	34.9%
Pre-Tax Payback (years)	4.8	5.3	4.1
Post-Tax NPV (5%) (USD M)	$178	$87	$354
Post-Tax IRR (%)	23.0%	16.2%	31.9%
Post-Tax Payback (years)	4.7	5.3	4.0

Notes:
* Basket price has been calculated using the distribution of each element as a percentage of the total rare earth element oxides multiplied by the price projection of each element, which have been sourced by Argus Media (La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Ho, Er, Tm, Yb, Lu, Y) and CRU (Dy).
** Operating Cost differs from what is presented in Section 21 of the Report due to Economic Analysis shows Operating Cost for the LOM Avg, but Section 21 presents cost for a single year for design purposes

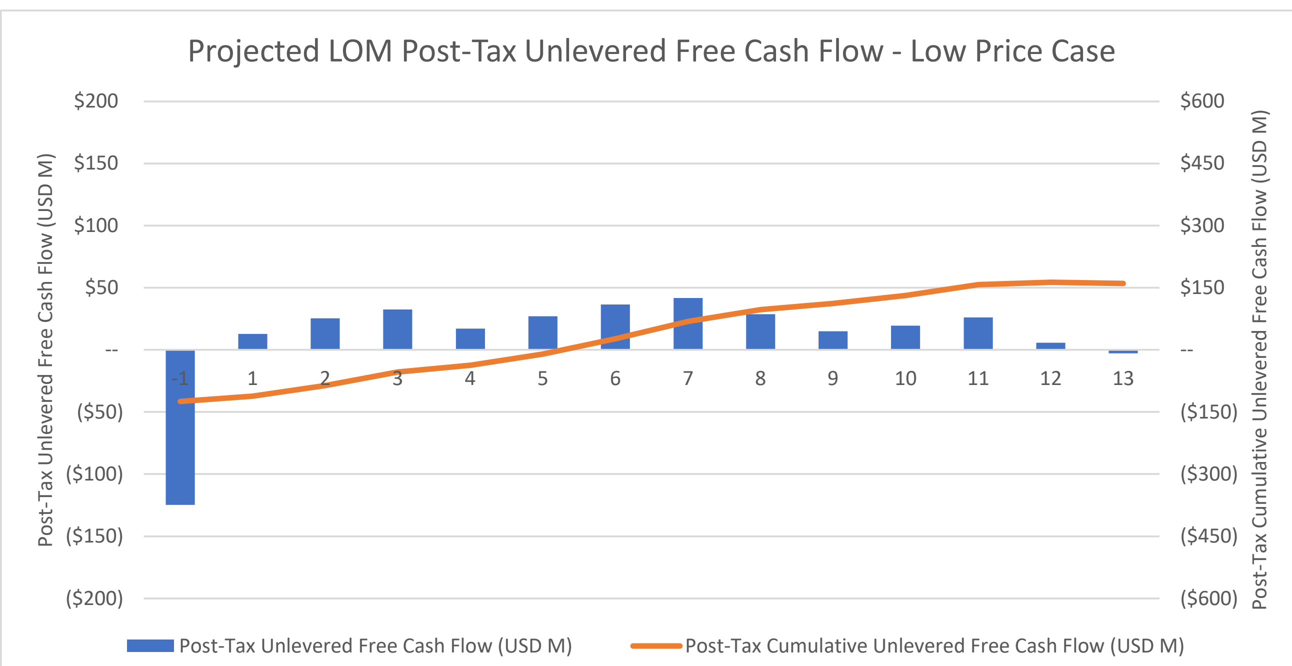
***Cash costs consist of mining costs, processing costs, mine-level general & administrative expenses, treatment and transportation costs.
**** AISC includes cash costs plus sustaining capital, closure cost and salvage value.

Figure 22-4: Projected LOM Post-Tax Unlevered Free Cash Flow Base Case Price Scenario



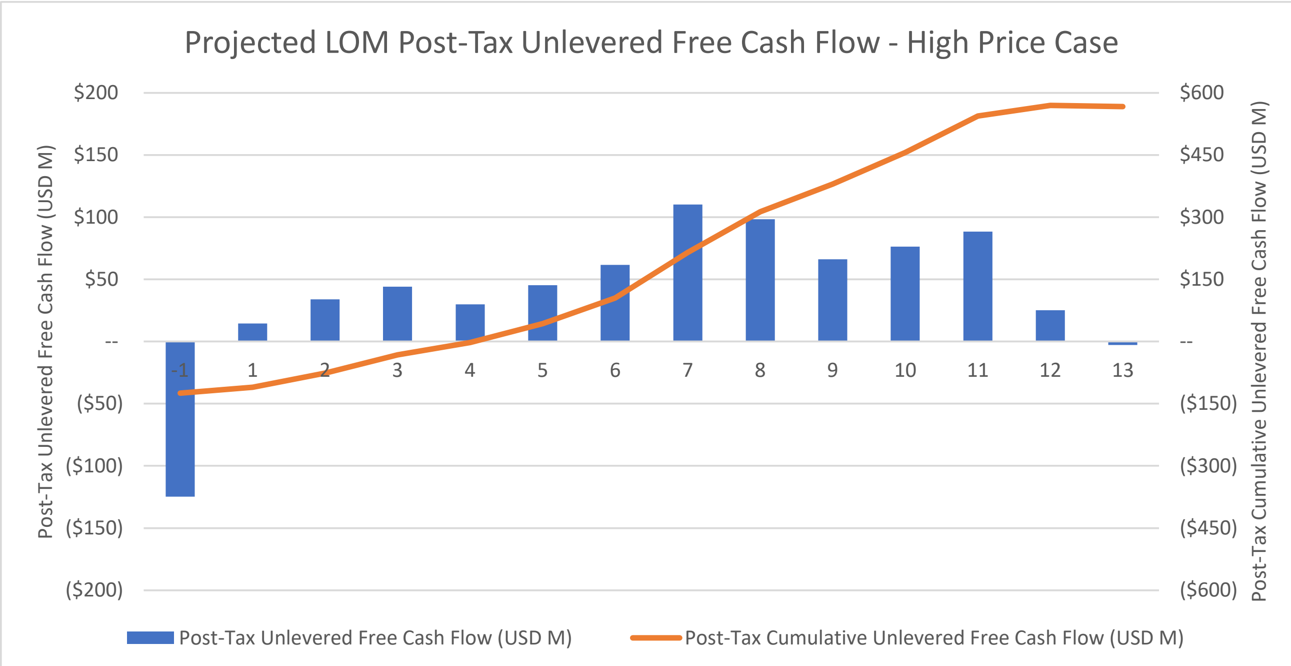
Note: prepared by Ausenco, 2021

Figure 22-5: Projected LOM Post-Tax Unlevered Free Cash Flow Low Price Scenario



Note: prepared by Ausenco, 2021

Figure 22-6: Projected LOM Post-Tax Unlevered Free Cash Flow High Price Scenario



Note: prepared by Ausenco, 2021

22.4.1 Sensitivity Analysis

A sensitivity analysis was conducted on the base case pre-tax and after-tax NPV, IRR and Payback of the Project, using the following variables: rare earth oxides price, discount rate, desorption efficiency and initial capital costs, and operating costs. Table 22-4 shows the pre-tax sensitivity analysis findings, and Table 22-5 shows the results post-tax.

Analysis revealed, as shown in Figure 22-7, that the Project is most sensitive to changes in Rare Earths oxides prices, extraction efficiency, initial capital cost, and to a lesser extent, operating costs and exchange rates.

Table 22-3: Projected LOM Post Tax Unlevered Free Cash Flow

	Unit	LOM	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Mining Summary																	
Resource Mined - Dry	kt	19,856	--	--	1,324	1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766	875	--
Waste Mined - Dry	kt	7,309	--	--	787	485	238	887	329	1,101	458	395	385	1,286	657	301	--
Strip Ratio	w:o	0.37x	--	--	0.59x	0.27x	0.13x	0.50x	0.19x	0.62x	0.26x	0.22x	0.22x	0.73x	0.37x	0.34x	--
Production Summary																	
Resource Sent to Plant	kt	19,856	--	--	1,324	1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766	875	--
REE Total Grade	ppm	2,045	--	--	1,764	2,047	2,642	2,259	1,312	2,049	2,049	2,130	1,982	2,062	2,174	1,945	--
Desorption Efficiency	%	18.5%	--	--	20.0%	18.1%	20.9%	18.6%	26.9%	21.4%	20.3%	18.0%	14.3%	15.1%	15.9%	11.5%	--
REE Extraction Value	ppm	378	--	--	352	370	552	419	354	438	416	383	284	312	347	224	--
Metallurgic Efficiency	%	97.9%	--	--	97.9%	98.0%	98.1%	98.0%	97.7%	97.9%	97.9%	97.9%	97.9%	97.8%	97.7%	97.8%	--
REE Recovered	ppm	370	--	--	345	362	542	411	345	429	408	376	278	305	339	219	--
REO Eq Recovered	ppm	448	--	--	418	438	655	497	420	519	494	455	337	370	412	267	--
Production REO Eq	t	8,901	--	--	553	773	1,156	878	742	917	872	803	594	654	727	233	--
Concentrate Produced	t	9,612	--	--	597	834	1,248	948	801	990	941	867	642	706	785	252	--
Revenue																	
Basket Price	USD/Kg	96	--	--	$66	$77	$61	$62	$86	$94	$124	$124	$122	$129	$129	$120	--
Exchange Rate	CLP$:USD	$800	$755	$755	$770	$784	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800
Gross Revenue	$M	857	--	--	$37	$60	$71	$54	$64	$86	$108	$99	$72	$84	$94	$28	--
Operating Costs																	
Mine Operating Costs	$M	($84)	--	($0)	($6)	($7)	($6)	($7)	($7)	($8)	($8)	($8)	($8)	($9)	($8)	($4)	--
Mill Processing Costs	$M	($142)	--	--	($10)	($13)	($13)	($13)	($13)	($13)	($13)	($13)	($13)	($13)	($13)	($6)	--
G&A Costs	$M	($44)	--	--	($3)	($4)	($4)	($4)	($4)	($4)	($4)	($4)	($4)	($4)	($4)	($2)	--
Treatment & Transportation																	
Treatment Cost	$M	($48)	--	--	($3)	($4)	($6)	($5)	($4)	($5)	($5)	($4)	($3)	($4)	($4)	($1)	--
Transportation Cost	$M	($0)	--	--	($0)	($0)	($0)	($0)	($0)	($0)	($0)	($0)	($0)	($0)	($0)	($0)	--
EBITDA																	
EBITDA	$M	$539	--	($0)	$15	$33	$42	$26	$36	$56	$80	$71	$45	$56	$65	$15	--
Capital Expenditures																	
Initial Capital & Purchase Land Cost	$M	($129)	--	($125)	($1)	($1)	($1)	--	--	--	--	--	--	--	--	--	--
Sustaining Capital	$M	($29)	--	--	($4)	($3)	($3)	($4)	($2)	($3)	($2)	($2)	($2)	($3)	($2)	($0)	--
Closure Cost	$M	($18)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	($18)
Salvage Value	$M	$15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	$15
Change in Working Capital																	
Change in Working Capital	$M	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pre-Tax Unlevered Free Cash Flow																	
Pre-Tax Unlevered Free Cash Flow	$M	$378	--	($125)	$10	$28	$38	$22	$35	$53	$78	$69	$43	$52	$63	$15	($3)
Pre-Tax Cumulative Unlevered Free Cash Flow	$M	$378	--	($125)	($115)	($87)	($49)	($27)	$7	$60	$138	$207	$251	$303	$366	$381	$378
Unlevered Cash Taxes																	
Total Tax Movement	$M	($80)	--	--	$3	--	--	--	--	--	($19)	($18)	($11)	($14)	($17)	($3)	--
Post-Tax Unlevered Free Cash Flow																	
Post-Tax Unlevered Free Cash Flow	$M	$298	--	($125)	$13	$28	$38	$22	$35	$53	$58	$51	$32	$38	$47	$12	($3)
Post-Tax Cumulative Unlevered Free Cash Flow	$M		--	($125)	($112)	($84)	($46)	($25)	$10	$63	$121	$173	$204	$243	$289	$301	$298

Table 22-4: Pre-Tax Sensitivity Analysis – Base Case Price Scenario

Pre-Tax NPV Sensitivity To Discount Rate

Discount Rate	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
1.0%	$103	$222	$342	$462	$581
3.0%	$71	$175	$279	$383	$487
5.0%	$46	$137	$228	$319	$410
8.0%	$15	$90	$166	$241	$316
10.0%	($1)	$65	$132	$199	$266

Pre-Tax IRR Sensitivity To Discount Rate

Discount Rate	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
1.0%	9.8%	18.0%	25.0%	31.5%	37.6%
3.0%	9.8%	18.0%	25.0%	31.5%	37.6%
5.0%	9.8%	18.0%	25.0%	31.5%	37.6%
8.0%	9.8%	18.0%	25.0%	31.5%	37.6%
10.0%	9.8%	18.0%	25.0%	31.5%	37.6%

Pre-Tax Payback Sensitivity To Discount Rate

Discount Rate	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
1.0%	7.1	5.9	4.8	3.8	3.0
3.0%	7.1	5.9	4.8	3.8	3.0
5.0%	7.1	5.9	4.8	3.8	3.0
8.0%	7.1	5.9	4.8	3.8	3.0
10.0%	7.1	5.9	4.8	3.8	3.0

Pre-Tax NPV Sensitivity To FX

FX	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	$38	$129	$220	$311	$402
(10.0%)	$42	$133	$224	$315	$406
--	$46	$137	$228	$319	$410
10.0%	$48	$139	$230	$321	$412
20.0%	$51	$142	$233	$324	$415

Pre-Tax IRR Sensitivity To FX

FX	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	9.0%	17.3%	24.4%	30.9%	37.0%
(10.0%)	9.5%	17.7%	24.8%	31.2%	37.3%
--	9.8%	18.0%	25.0%	31.5%	37.6%
10.0%	10.1%	18.2%	25.3%	31.7%	37.8%
20.0%	10.3%	18.4%	25.5%	31.9%	38.0%

Pre-Tax Payback Sensitivity To FX

FX	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	7.3	6.0	4.9	3.9	3.0
(10.0%)	7.2	5.9	4.8	3.9	3.0
--	7.1	5.9	4.8	3.8	3.0
10.0%	7.1	5.8	4.7	3.8	3.0
20.0%	7.0	5.8	4.7	3.7	2.9

Pre-Tax NPV Sensitivity To Opex

Opex	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	$85	$176	$267	$358	$449
(10.0%)	$65	$156	$247	$338	$429
--	$46	$137	$228	$319	$410
10.0%	$26	$117	$208	$299	$390
20.0%	$7	$98	$189	$280	$371

Pre-Tax IRR Sensitivity To Opex

Opex	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	13.6%	21.3%	28.2%	34.5%	40.5%
(10.0%)	11.7%	19.7%	26.6%	33.0%	39.1%
--	9.8%	18.0%	25.0%	31.5%	37.6%
10.0%	7.8%	16.3%	23.5%	30.0%	36.1%
20.0%	5.7%	14.5%	21.9%	28.5%	34.7%

Pre-Tax Payback Sensitivity To Opex

Opex	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	6.5	5.3	4.2	3.3	2.8
(10.0%)	6.8	5.6	4.5	3.5	2.9
--	7.1	5.9	4.8	3.8	3.0
10.0%	7.6	6.2	5.1	4.1	3.1
20.0%	8.2	6.4	5.3	4.3	3.4

Pre-Tax NPV Sensitivity To Capex

Initial Capex	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	$71	$162	$253	$344	$435
(10.0%)	$58	$149	$240	$331	$422
--	$46	$137	$228	$319	$410
10.0%	$33	$124	$215	$306	$397
20.0%	$21	$112	$203	$294	$385

Pre-Tax IRR Sensitivity To Capex

Initial Capex	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	13.6%	22.7%	30.7%	38.2%	45.3%
(10.0%)	11.5%	20.1%	27.6%	34.6%	41.1%
--	9.8%	18.0%	25.0%	31.5%	37.6%
10.0%	8.3%	16.1%	22.8%	28.9%	34.6%
20.0%	6.9%	14.4%	20.8%	26.6%	32.1%

Pre-Tax Payback Sensitivity To Capex

Initial Capex	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	6.6	5.2	4.0	3.0	2.5
(10.0%)	6.8	5.6	4.4	3.4	2.8
--	7.1	5.9	4.8	3.8	3.0
10.0%	7.5	6.1	5.1	4.2	3.3
20.0%	7.8	6.3	5.3	4.4	3.6

Pre-Tax NPV Sensitivity To Desorption Efficiency

ΔDes. Efficienc	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(-) 10.0%	$7	$89	$170	$252	$334
(-) 5.0%	$26	$113	$199	$285	$372
--	$46	$137	$228	$319	$410
(+) 5.0%	$65	$161	$256	$352	$447
(+) 10.0%	$84	$185	$285	$385	$485

Pre-Tax IRR Sensitivity To Desorption Efficiency

ΔDes. Efficienc	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(-) 10.0%	5.7%	13.9%	20.7%	26.9%	32.6%
(-) 5.0%	7.8%	16.0%	22.9%	29.2%	35.1%
--	9.8%	18.0%	25.0%	31.5%	37.6%
(+) 5.0%	11.7%	19.9%	27.1%	33.7%	40.0%
(+) 10.0%	13.5%	21.8%	29.1%	35.9%	42.4%

Pre-Tax Payback Sensitivity To Desorption Efficiency

ΔDes. Efficienc	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(-) 10.0%	8.2	6.5	5.4	4.5	3.6
(-) 5.0%	7.6	6.2	5.1	4.1	3.3
--	7.1	5.9	4.8	3.8	3.0
(+) 5.0%	6.8	5.6	4.5	3.5	2.8
(+) 10.0%	6.5	5.3	4.2	3.2	2.7

Table 22-5: Post-Tax Sensitivity Analysis – Base Case Price Scenario

Post-Tax NPV Sensitivity To Discount Rate

Discount Rate	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
1.0%	$94	$182	$270	$357	$445
3.0%	$65	$143	$220	$296	$373
5.0%	$40	$110	$178	$246	$313
8.0%	$12	$70	$128	$185	$241
10.0%	($4)	$49	$101	$152	$202

Post-Tax IRR Sensitivity To Discount Rate

Discount Rate	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
1.0%	9.5%	16.6%	23.0%	29.0%	34.6%
3.0%	9.5%	16.6%	23.0%	29.0%	34.6%
5.0%	9.5%	16.6%	23.0%	29.0%	34.6%
8.0%	9.5%	16.6%	23.0%	29.0%	34.6%
10.0%	9.5%	16.6%	23.0%	29.0%	34.6%

Post-Tax Payback Sensitivity To Discount Rate

Discount Rate	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
1.0%	7.1	5.8	4.7	3.7	2.9
3.0%	7.1	5.8	4.7	3.7	2.9
5.0%	7.1	5.8	4.7	3.7	2.9
8.0%	7.1	5.8	4.7	3.7	2.9
10.0%	7.1	5.8	4.7	3.7	2.9

Post-Tax NPV Sensitivity To FX

FX	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	$34	$104	$172	$240	$307
(10.0%)	$38	$107	$175	$243	$311
--	$40	$110	$178	$246	$313
10.0%	$43	$112	$180	$248	$315
20.0%	$44	$114	$182	$250	$317

Post-Tax IRR Sensitivity To FX

FX	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	8.8%	16.0%	22.4%	28.4%	34.0%
(10.0%)	9.2%	16.4%	22.8%	28.7%	34.3%
--	9.5%	16.6%	23.0%	29.0%	34.6%
10.0%	9.7%	16.9%	23.3%	29.2%	34.8%
20.0%	10.0%	17.0%	23.4%	29.4%	35.0%

Post-Tax Payback Sensitivity To FX

FX	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	7.2	6.0	4.8	3.8	3.0
(10.0%)	7.2	5.9	4.8	3.8	3.0
--	7.1	5.8	4.7	3.7	2.9
10.0%	7.0	5.8	4.7	3.7	2.9
20.0%	7.0	5.7	4.6	3.6	2.9

Post-Tax NPV Sensitivity To Opex

Opex	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	$71	$139	$207	$275	$342
(10.0%)	$56	$124	$193	$260	$328
--	$40	$110	$178	$246	$313
10.0%	$25	$95	$163	$231	$299
20.0%	$9	$80	$149	$217	$284

Post-Tax IRR Sensitivity To Opex

Opex	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	12.8%	19.7%	25.9%	31.8%	37.3%
(10.0%)	11.2%	18.1%	24.5%	30.4%	36.0%
--	9.5%	16.6%	23.0%	29.0%	34.6%
10.0%	7.8%	15.1%	21.6%	27.6%	33.3%
20.0%	6.0%	13.5%	20.1%	26.2%	31.9%

Post-Tax Payback Sensitivity To Opex

Opex	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	6.4	5.2	4.2	3.2	2.7
(10.0%)	6.7	5.5	4.4	3.5	2.8
--	7.1	5.8	4.7	3.7	2.9
10.0%	7.5	6.1	5.0	4.0	3.1
20.0%	8.0	6.4	5.3	4.2	3.3

Post-Tax NPV Sensitivity To Capex

Initial Capex	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	$61	$130	$198	$266	$333
(10.0%)	$51	$120	$188	$256	$323
--	$40	$110	$178	$246	$313
10.0%	$30	$100	$168	$236	$303
20.0%	$19	$89	$158	$226	$293

Post-Tax IRR Sensitivity To Capex

Initial Capex	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	13.0%	21.1%	28.6%	35.5%	42.1%
(10.0%)	11.1%	18.7%	25.5%	32.0%	38.0%
--	9.5%	16.6%	23.0%	29.0%	34.6%
10.0%	8.1%	14.8%	20.9%	26.5%	31.7%
20.0%	6.9%	13.3%	19.0%	24.3%	29.3%

Post-Tax Payback Sensitivity To Capex

Initial Capex	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(20.0%)	6.5	5.2	4.0	2.9	2.5
(10.0%)	6.8	5.5	4.3	3.3	2.7
--	7.1	5.8	4.7	3.7	2.9
10.0%	7.4	6.1	5.1	4.1	3.2
20.0%	7.7	6.3	5.3	4.4	3.6

Post-Tax NPV Sensitivity To Desorption Efficiency

ΔDes. Efficiency	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(-) 10.0%	$9	$73	$135	$196	$257
(-) 5.0%	$25	$92	$157	$221	$285
--	$40	$110	$178	$246	$313
(+) 5.0%	$55	$128	$199	$270	$341
(+) 10.0%	$70	$146	$220	$295	$369

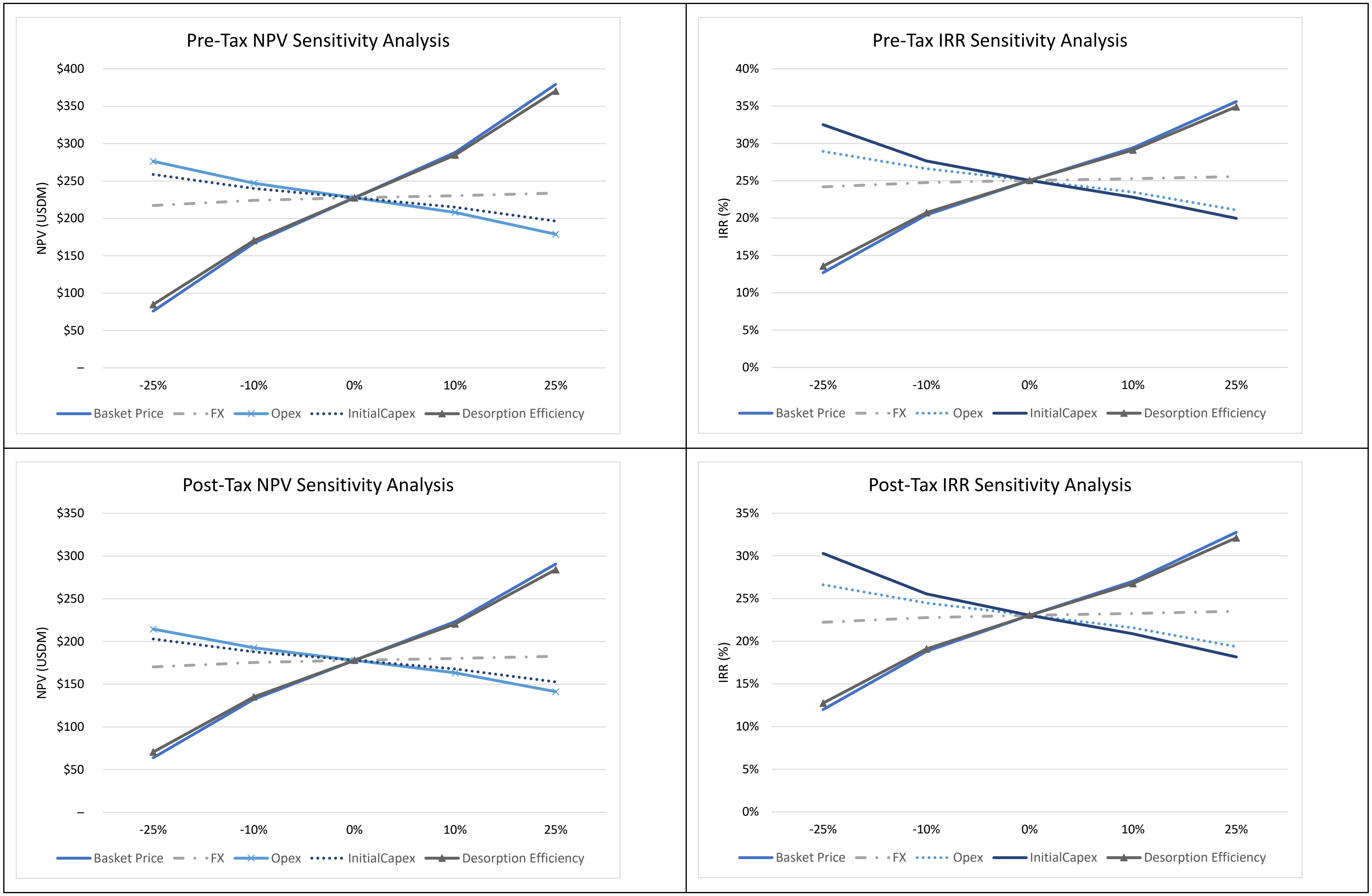
Post-Tax IRR Sensitivity To Desorption Efficiency

ΔDes. Efficiency	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(-) 10.0%	6.0%	13.0%	19.1%	24.7%	30.0%
(-) 5.0%	7.8%	14.8%	21.1%	26.9%	32.3%
--	9.5%	16.6%	23.0%	29.0%	34.6%
(+) 5.0%	11.1%	18.3%	24.9%	31.1%	36.8%
(+) 10.0%	12.6%	20.0%	26.8%	33.1%	39.0%

Post-Tax Payback Sensitivity To Desorption Efficiency

ΔDes. Efficiency	Basket Price (US$/kg REO) (30.0%)	(15.0%)	--	15.0%	30.0%
(-) 10.0%	8.0	6.4	5.4	4.4	3.5
(-) 5.0%	7.5	6.1	5.1	4.1	3.2
--	7.1	5.8	4.7	3.7	2.9
(+) 5.0%	6.8	5.5	4.4	3.4	2.8
(+) 10.0%	6.5	5.2	4.1	3.1	2.6

Figure 22-7: Sensitivity Analysis



Source: Ausenco, 2021

23 ADJACENT PROPERTIES

This section is not relevant to this Report.

24 OTHER RELEVANT DATA AND INFORMATION

This section is not relevant to this Report.

25 INTERPRETATION AND CONCLUSIONS

25.1 Introduction

The QPs note the following interpretations and conclusions in their respective areas of expertise, based on the review of data available for this Report.

25.2 Mineral Tenure, Surface Rights, Water Rights, Royalties and Agreements

25.2.1 Mineral Tenure

The results of the PEA indicate that all the mineral tenure over the Project are 100% owned by REE UNO SpA and have been granted or are in process of being granted by the respective court.

25.2.2 Surface Rights

REE UNO SpA owns mostly of the surface land were the Project is located. REE UNO SpA owns 541 hectares of surface land. There is only one extraction area, called “Luna”, which land is not owned by REE. However, the surface land which covers “Luna” it’s ensured, because REE obtained the written permission from the owner of the surface land.

Further still, REE and the owner of the surface Land where Luna is located, agreed in the terms, conditions and compensations for establishing an occupancy easement.

25.2.3 Water rights

The results of the PEA indicate that Project to operate needs 9.7 l/s of water, and the hydric resource for the entire Project development is ensured by a water use right owned by REE.

25.3 Geology and Mineralization

The geology of the area is relatively well-known, and the work exhibits detailed geology with proper administration of samples and analyses. The project and control of mineralization are well understood, and the anisotropies, used in orebody and UG models, are acceptable. Improvements to the work performed by Aclara are not necessary at this time.

25.4 Exploration, Drilling and Analytical Data Collection in Support of Mineral Resource

Considering the novelty of the project, all exploration works including drilling, sampling, security, storage, analyses and overall data collection have been well developed and appropriately carried out throughout. Despite some caveats present in extraction value samples —mostly related to the particularity of the methodology, the numerous elements involved or the nature of the reference material—, the QA/QC is deemed sufficient and providing acceptable control of the sampling campaigns. Thus, Ausenco believes the database is appropriate for resource estimation.

The geological characteristics of the area show good possibilities of finding more prospects of this type. Geochemical maps show other anomalies to the NE and the geological environment to the north and south of the Project is very similar. Thus, exploration must prioritize looking for more GG following what has been learned in past drill and geologic campaigns.

25.5 Mineral Resource Estimates

- Ausenco considers that the database information, QA/QC and models, as far as the review could be carried out, are complete, ordered and can be used in a resource estimate, considering the observations made regarding the topography and the generation of the models.
- The geology of the Project is well understood and with the contribution of the 2021 drilling campaign, the geology and grade for REYT can be better understood. The grades of economic interest are concentrated within the garnet granite and also the diorite presents some grades with economic interest.
- The statistical analysis detected two groups of total rare earths, with strong correlations between their grades. The group 1 was defined by Dy, Tb, Lu, Y, Gd, Er, Ho, Yb, Tm, and the Group 2 includes Nd, Pr, La, Sm and Ce. This information is relevant due to their strong correlation with the elements of their groups and can be validating elements, of the behaviours of the grades of the other elements.
- It was detected that the grades are associated with the horizons by lithologies, highlighting that the horizons within the Garnet Granite lithology presenting the best grades, particularly Horizon B. Except, the Luna sector, the best grades are the B2 and C1 horizons.
- The resource estimate for the Penco Module is within the tolerances of acceptable bias for this type of study.
- Mineral Resources consider geology, mining, processing and economic constraints, and have been confined within appropriate LG pit shells, and therefore are classified in accordance with the 2014 CIM Definition Standards for Mineral Resources and Mineral Reserves. An open pit extraction scenario is appropriate to the style of mineralization. Assumptions used in the LG shell are appropriate to the envisaged process route and mine plan.
- The declaration of mineral resources measured and indicate for the Penco Module deposit is 20.68 million tons with an average grade of REYT 2,045 (ppm), with an NSR of 27 USD/t.
- Victoria Norte is the sector with the best REYT grade with 2,379 (ppm) and a NSR of 28 USD/t.
- The mineral resources herein are not mineral reserves as they do not have demonstrated economic viability.

25.6 Mine Plan

The conclusions of the different aspects and technical studies addressed by the mining discipline are shown below.

25.6.1 Geotechnical Considerations

- In the case of silty clays, in dry conditions, the maximum interramp height achievable is 24 m (6 benches). By incorporating a 10 m catch bench, the height can be increased up to 32 m, i.e., a maximum configuration of 6 benches, a catch bench, and 2 additional benches. By including the effect of groundwater, conservatively, the design is restricted to a maximum height of 12 m; if a greater height is required, a catch bench should be included, and the maximum possible height should be evaluated.

- In the case of maicillo slopes, in dry conditions, the maximum interramp height achievable is 60 m (15 benches). By incorporating a 10 m catch bench, it is possible to reach a maximum height of 76 m, i.e. a maximum configuration of 15 benches, a catch bench, and 4 additional benches. By including the effect of groundwater, conservatively, the design is also constrained to a maximum height of 32 m; if a greater height is required, a catch bench should be included, and the maximum possible height should be evaluated.

25.6.2 Mining Operations Considerations

- The operating widths (25 m) included at the mining phases selection are those used by the industry in the movement of materials, considering the safety berms.

25.6.3 Mine Phases

- The identified interferences generated between the boundaries of final pits (5 sectors) and existing or projected facilities of the Project are the Itata route, the preservation forest and the property boundary.

25.6.4 Mine Extraction Sequence Definition

- Since the Jupiter landfill considers an area of Victoria Sur, it was decided to mine the Victoria Sur sector first, thus speeding up the commissioning of the Jupiter disposal area.
- The final sequence obtained, following the plans indicated in the previous point, corresponds to Victoria Sur - Victoria Norte - Luna - Maite - Alexandra.

25.6.5 Annual Production Plan

- Mine production plan with 12 periods LOM is generated (considering pre-stripping), process plant feed of 12 periods with 10 in regime and decreasing extraction value vector.
- Regarding the mined material, in period 10 there is an increase in the mining rate, due to the high waste / mineralized material ratio of the phases of the Alexandra sector, which is the only sector in operation in the indicated period.

25.6.6 Waste Disposal Facility and Stockpile Design

- Together, the waste disposal facilities, Jupiter and Neptuno, have a total capacity of approximately 21.2 million cubic meters.. At the end of Mine Life, the total occupied volume will be 18.7 million cubic meters.
- Regarding the temporary topsoil stockpiles, the three projected sectors together have a capacity of 1.5 million cubic meters, while the estimated volume of topsoil to be managed corresponds to approximately 1.0 million cubic meters (without considering the volumes of topsoil for additional infrastructure) corresponding to the mined material from the pits, preparation of disposal zones, and the processing plant foundation area. This volume considers a 50-cm-thick layer and a 12% percentage for swelling.

- The definition of the movement of mineralized material, waste and process filtered tailings to the different destinations contained in the mine plan; the determination of their corresponding haulage distances (considering slope and horizontal routes), and the organizational chart necessary for a safe operation that achieves the objectives of the plan, will allow establishing a better understanding regarding the development of the mine's capital and operating cost estimation.

25.6.7 Waste Disposal Facilities Fill Sequence

- According to analysis made, it is not necessary to use Sector 3 of the topsoil stockpile for the process of depositing and subsequently returning the topsoil to its sector of origin.
- Filling the Jupiter Waste Disposal Facility is prioritized over depositing at Neptuno to reduce the transport distance.
- seventy-nine percent of the projected available capacity of the Neptuno Waste Disposal Facility and 100% of the Jupiter is used.
- The permanent topsoil stockpile zone contains the material mined from the following zones: Process Plant, Jupiter and Neptuno
- As its name indicates, the temporary topsoil stockpile zone is used dynamically throughout the life of the Project, receiving material from the deposits where mining begins and reclaiming it to return the topsoil to those where mining is exhausted.
- To calculate volume of the process plant filtered tailings, a swelling factor of 12% and a moisture content of 20% have been considered.

25.7 Metallurgical Testwork and Processing

The design of the process to produce rare earth concentrates is initially based on the results of laboratory tests developed at the University of Concepcion. These tests defined the parameters, and operating conditions and with which a first process design is postulated, which is tested in a pilot plant and , the results of which allowed to verify the parameters, test the equipment technologies and verify that the design. However, the results were not as expected, so Aclara decided to modify the process to reduce the losses of rare earths in all its unit operations. The tests continued at the University of Toronto where each chemical and thermodynamic variable, susceptible to being modified or optimized, was studied. The new modified process considers that the extraction of rare earths is in two-step; countercurrent using a solution of ammonium sulfate ($(NH_4)_2SO_4$) as leaching agent, subsequently the enriched solution goes to a process of selective precipitation of pollutants using a solution of Ammonium bicarbonate (NH_4HCO_3) controlled by pH and then, this solution without contaminants, continues the process of precipitation of rare earth carbonates using again the ammonium bicarbonate solution (NH_4HCO_3) as precipitant, but in this case at a more basic pH . The product (rare earth carbonates) is dried and packed with the option to be calcinated, but this has not been studied in this calcination report. This last design was corroborated with tests on a larger scale in Peru (Chapi) using various sectors of exploitation of the mine, the results of which are consistent with those obtained at the University of Toronto.

The results obtained in the different tests carried out define operating parameters for the process and also confirm the proposed new design: Leaching is carried out with ammonium sulfate in an equivalent concentration of 0.15 Molar mol/L at a pH between 3.0 and 4.0 and the required time. to produce rare earth extraction is 7 minutes. The precipitation of impurities (aluminum, iron) is achieved with ammonium bicarbonate at a controlled pH between 5.5 and 6.0 and a required time of 30 minutes. Rare earth carbonate precipitation is also carried out with ammonium bicarbonate, but at a higher pH between 7.0 and 7.5 and a reaction time of 120 minutes.

The proposed process design does not generate liquid industrial waste, so it considers recirculating all of the discarded liquids once they have been treated. The design considers a plant that treats this liquid waste and obtains water of sufficient quality that allows it to be reused again in the process. This recovered water will contain elements such as potassium, magnesium, sodium, and others in a maximum allowable concentration, in order to obtain lanthanide carbonates with the defined quality of 92% (dry basis). The mass balance generated for this evaluation did not include the impact of these ions (K, Na, Mg and others) which, according to the mass balance, would be part of the recirculation and leaching solution. Aclara asked the University of Toronto to carry out a preliminary exploration test of the extraction of rare earths, where these elements preliminarily identified are included in the mass balance (K, Na, Mg and others). The results indicate that there is an effect on extraction, being greater when these elements exist in the leaching solution. Therefore, there is a degree of uncertainty regarding the effective extraction that would occur when incorporating these elements in the recirculation solution, and it is unknown what would be the impact on the quality of the product.

25.8 Infrastructure

The infrastructure for this Project consists of open pit mines or extraction zones, disposal zones and processing plant. Infrastructure to support the Penco Module will consist mainly of site civil work, site facilities/building, a water system, and site electrical.

25.9 Environmental, Permitting and Social Considerations

The Project, submitted for Environmental Assessment in 2018, is moving forward with the development and presentation of Addendum N°2. This document corresponds to the responses to inquiries from relevant government services and raised by the community as a result of the Community Participation Processes. Within this document, the most relevant issues are associated with flora and vegetation and the indigenous human environment.

Flora and vegetation are very sensitive due to the presence of Queule and Pitao, defined under Chilean law as natural monuments. In this regard, a specific study (known as Expert Report) has been presented where specific protection measures are committed to guarantee these and other protected species and forest formations are not affected, ensuring that the Project does not represent a threat to the continuity of the species at a local and national level, as established in Law 20.283, Recovery of Native Forest and Forest Development.

Regarding the indigenous human environment, the Project is not located on indigenous land or indigenous development areas, but two indigenous organizations participate in traditional activities in the Project surroundings. As a result, one environmental authority (SEA) has expressed concern about the possible effects of the Project over these indigenous activities and is requiring more information to rule out an eventual Indigenous Consultation, as defined by article 6 of the International Labour Organization (ILO) Convention 169, which could impact the environmental licensing process timeframes.

Although it is expected that after Addendum N°2 the environmental authority will proceed with considering the Project and issuing the corresponding Environmental License (RCA), it is possible that a new round of review will be opened, which would require a new Addendum to be presented (Addendum N°3). To minimize this possibility, Addendum N°2, which is to be submitted by November 2021, should be presented with the highest sufficiency of information possible, in order to obtain a vote for its approval by the Environmental Assessment Commission during the year 2021.

In addition to the above, a strategic approach with the different government technical services that will review the Addendum and technically pronounce in favor or against the Project has been undertaken, It is recommended to maintain this contact with the authorities in order to have a better understanding of their concerns about the Project and finding the best way to resolve them.

Regarding the communities, although there are positions against the Project by community leaders and some non-governmental organizations, the territorial work started in August 2020 through periodic meetings with different stakeholders at the local level should be continued. As the pandemic has allowed fewer restrictions, face-to-face meetings and field visits have been held, which should intensify in the coming months.

25.10 Capital and Operating Costs

25.10.1 Capital Cost

Capital cost were estimated under a AACE Class 5 methodology for a Concept Estimate. The expected accuracy range of the estimate is -15% to -30% on the low side of the range and +20% to +50% on the high side of the range, based on the information available to produce a capital cost estimate and the maturity level of Project definition. Direct costs were estimated based on a preliminary mechanical equipment list and the other commodities were estimated by factorization of mechanical equipment costs. Supply prices for mechanical equipment are based on referential quotes and database information. Indirect costs were estimated by each major account based on benchmark information. Contingency is based on the percentage expected for a Class 5 estimate.

There were no available a detailed Project execution plan and an execution schedule at this stage.

Among the main exclusions it is important to mention that escalation cost, land acquisition, Project financing and interest charges, and closing cost are not included as part of the capital estimate. Impact on capital cost due to loss of productivity or work absenteeism caused by a sanitary emergency in a pandemic situation is not included.

The total Initial capital cost is $118.6 MUSD and the total Sustaining capital cost is $29.37 MUSD.

25.10.2 Operating Cost

The operating cost estimate is presented at a ±30% accuracy, using a base date of Q2, 2021, and considering an annual treatment of 1,766,016 dry tons of ore, with an average REE grade of 2,045 ppm and 18.49 % average recovery.

Operating costs are estimated at 23.65 MUSD/a, or 13.39 USD/t.

25.11 Economic Analysis

The economic analysis was performed assuming a 5% discount rate. Cash flows have been discounted to beginning of the construction January 01,2023 assuming that the Project execution decision will be made and major project financing would be carried out at this time.

For the Base Case Price Scenario, the pre-tax net present value discounted at 5% (NPV5%) is USD 228 M, the internal rate of return IRR is 25.0%, and payback is 4.8 years. On an after-tax basis, the NPV5% is USD 178 M, the IRR is 23.0%, and the payback period is 4.7 years.

Readers are cautioned that the PEA is preliminary in nature. It includes or inferred Mineral Resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as Mineral Reserves, and there is no certainty that the PEA will be realised.

26 RECOMMENDATIONS

26.1 Introduction

The economic analysis of this PEA study demonstrates, on a preliminary basis, that further development of the Penco Module Project through additional engineering and de-risking is warranted. Table 26-1 summarises the proposed budget to advance the project through the prefeasibility study (PFS) stage. The recommended work program is divided into two phases with a total cost of 6.1 M USD.

Table 26-1: Recommendations Cost

Recommendations	Cost (USD)
Phase 1	1,489,600
Drilling and Mineral Resource Estimations	489,600
Metallurgical Testwork	1,000,000
Phase 2	4,605,000
Metallurgical Testwork	3,000,000
Mining methods studies	140,000
Geotechnical Considerations (including drill and excavator)	460,000
Site Infrastructure studies	265,000
Process Plant Prefeasibility Study	740,000
Total	6,094,600

26.2 Phase 1

26.2.1 Drilling and Mineral Resource Estimations

- With respect to QA/QC, it is important to advance towards the certification of the reference materials used for desorption (prepared and assayed by AGS), as well as the use of certified blanks instead of quartz, and resuming the insertion of check samples for interlaboratory analysis.
- Conduct drilling in sectors categorized as inferred resources within areas with good grades.
- Increase the number of samples for density analysis.

- Aclara plans to drill a further 60 drill holes (approximately 1,800 m). This program is estimated with all-in drilling costs of 272 USD/m, to be approximately 489,600 USD.

26.2.2 Metallurgical Testwork

As it is a novel process, it is necessary to simulate the proposed flowsheet on a laboratory scale for the next phase of engineering, to verify:

- Parameters defined in the process.
- Verify the chemical equilibrium of the different solutions generated in the process obtained in the mass balance.
- Verify the effect on the extraction of lanthanides due to the different elements present in the recirculation solution.
- Verify the solubilities of the polluting elements in the stage of precipitation of impurities and rare earth.
- Verify the solubilities of the Lanthanides in the impurity precipitation and carbonation stages.
- Verify the water recovery design
- Check product quality

The estimated cost to perform the testing and laboratory analysis activities is 1,000,000 USD.

26.3 Phase 2

26.3.1 Metallurgical Testwork

The following stage recommends pilot-scale tests in order to verify the obtaining of the product in commercial quality, process parameters, plant yield, reagent consumption, equipment efficiency, washing efficiency, materiality, waste management, among others. The estimated cost to carry out the pilot tests for a period of approximately 3 months is 3,000,000 USD.

26.3.2 Mining methods studies

- The recommendations associated with the mining methods studies have been estimated a cost of 140,000 USD.
- The following recommendations can be addressed from the study:

26.3.2.1 Pit Optimization

- The economic, financial and technical parameters that were considered in the pit limit analysis must be updated according to conclusions and recommendations of this study, and of recent market information to face the future engineering stage of the Project.

26.3.2.2 Mine Design

- Operational mine designs for the final pit and mining phases must be considered in the next stage of the study.

26.3.2.3 Mine Extraction Sequence Definition

- Based on the results obtained and on the restrictions mentioned in the section of Mining Extraction Sequence, it is recommended to analyze into the potential benefit of performing free mining sequence, coexistence in the exploitation of different mining sectors in order to maximize the asset value.

26.3.2.4 Annual Production Plan

- Study of the optimal process plant throughput in order to maximize the financial results of the Proj*ect.*

26.3.2.5 Waste Disposal Facilities and Stockpile Fill Sequence

- Considering minimizing the hauling costs of the material moved, it is recommended to analyse other locations for the disposal of the waste, filtered tailings and topsoil stockpiles.

26.3.3 Geotechnical Considerations

- For design purposes, the use of the dry condition slope geometries presented in Section 16.2 is recommended; however, in the event that groundwater is found in the slopes, the geometry proposed should be considered preliminarily, but the water levels and conditions observed on site should be verified, since the assumption indicated in this report may be too conservative.
- In the following stages of the study, the water tables considered should be verified to determine their potential impact on the designs and stability.
- The database and soil tests should be reviewed to define strength and deformation properties to supplement the stability analyses with displacement and deformation analyses.
- Conduct retrospective analyses of nearby civil works or mining sites with the same type of residual soils.
- In the following stages, the proposed designs for the pits defined in the mining zones must be analyzed, cross-checking these designs with the available geological models. This will allow us to better specify the results obtained in this technical note.
- The cost of geotechnical studies including geotechnical drills and excavator, in five extraction zones, two disposition zones and the processing plant area, is estimated at 460,000 USD.

26.3.4 Site Infrastructure

The following activities are recommended to be considered for the next stage of engineering:

- Geotechnical site investigations to characterize constructability of the material that will be used in waste disposal facilities. The estimated cost is 65,000 USD.

- Further development of the waste disposal facilities design incorporating the seismic hazard assessment recently carried out for the Project into the stability analysis. In addition, it is recommended to complete a runout analysis for an appropriate estimation of the impacted areas and losses qualification. The estimated cost is 100,000 USD.
- The access and mining roads, water intake and electrical supply should be further analysed, reviewed, and engineered. The estimated cost is 100,000 USD.
- To advance the energy supply agreement with the power distribution company in the Project zone to confirm the connection points and conditions of energy supply.

26.4 Process Plant Prefeasibility Study

The estimated cost of the Pre-feasibility (PFS) study for the Process Plant is also included in the budget to get a complete estimation of the costs related to the PFS study completion. The estimated cost is 740,000 USD.

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28 SIGNATURE AND DATE PAGE

CERTIFICATE OF QUALIFIED PERSON
Alejandro Solar Hormazábal

I, Alejandro Solar, Mining Engineer, certify that I am employed as a Mining Senior Engineer within Ausenco Chile Ltda. ("Ausenco"), with an office address of Av. Las Condes 11283, Las Condes, Santiago. This certificate applies to the technical report "Amended and Restated NI 43-101 Technical Report Preliminary Economical Assessment for Penco Module Project," that has an effective date of September 15, 2021 (the "Technical Report").

I graduated from the Universidad de Chile of Chile in 1966 as a Civil Mining Engineer. I am a Competent Person registered with the Chilean Mining Commission Member number 0447. I have practiced my profession for 26 years. I have had direct involvement in mineral resource and reserves estimation, operation and construction of mine, and mining project evaluations for copper and non-metal mining.

I have read the definition of "Qualified Person" set out in the National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for those sections of the Technical Report that I am responsible for preparing.

I have not visited the Penco Module Project. I am responsible for sections 1.15, 1.16, 21.1.4, 21.1.8 and 21.2.3 of the Technical Report.

I am independent of Aclara Resources Inc. as independence is defined in Section 1.5 of NI 43-101. I have had no previous involvement with Penco Module Project.

I have read NI 43-101, and the sections of the Technical Report for which I am responsible have been prepared in compliance with that Instrument. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the Technical Report not misleading.

Dated: December 2nd, 2021

"Signed and sealed"

Alejandro Solar, Competent Person in Mining Resources and Reserves Nr. 0447.

CERTIFICATE OF QUALIFIED PERSON
Gavin Andrew Beer

I, Gavin Andrew Beer MAusIMM(CP), certify that I am employed as a Consultant Metallurgist with Met-Chem Consulting Pty Ltd ("Met-Chem"), with an office address of 16 Rowan Place, Woodlands, Western Australia, 6018. This certificate applies to the technical report titled "Amended and Restated NI 43-101 Technical Report Preliminary Economic Assessment for Penco Module Project," that has an effective date of September 15, 2021 (the "Technical Report").

I graduated from Murdoch University, Western Australia in 1983 with a Bachelor of Science in Extractive Metallurgy. I am a Member and Chartered Professional of the Australasian Institute of Mining and Metallurgy 109895. I have practiced my profession for 32 years. I have been directly involved in the design, construction and operation of metallurgical processes and operations, with the last 12 years almost exclusively within the critical minerals sector (rare earths and lithium). I have held the position of General Manager Metallurgy for two rare earth companies and have consulted to more than 20 other rare earth companies. I am presently retained as a Consultant Metallurgist to three rare earth companies, one of which has an Ionic Clay type deposit similar in mineralogy to the Penco Module Project.

I have read the definition of "Qualified Person" set out in the National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for those sections of the Technical Report that I am responsible for preparing.

I have not visited the Penco Module Project. I am responsible for sections 1.8,1.12, 1.15, 1.16, 1.18, 1.19.7, 1.19.10, 1.19.11, 1.20.2.2, 1.20.3.1,1.20.3.5, 3.4, 7.2.2, 13, 17, 21, 22, 25.7, 25.10, 25.11, 26.2.2, 26.3.1 and 26.4 of the Technical Report.

I am independent of Aclara Resources Inc as independence is defined in Section 1.5 of NI 43-101. I have had no previous involvement with Penco Module Project.

I have read NI 43-101 and the sections of the Technical Report for which I am responsible have been prepared in compliance with that Instrument. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the Technical Report not misleading.

Dated: December 2nd, 2021

"Signed and sealed"

Gavin Andrew Beer BSc

CERTIFICATE OF QUALIFIED PERSON
Luis Oviedo Hannig

I, Luis Oviedo, geologist, certify that I am consultant of geology and resources for Ausenco Chile Ltda. ("Ausenco"), with an office address of Santa Magdalena 10 of 26, Providencia, Santiago. This certificate applies to the technical report "Amended and Restated NI 43-101 Technical Report Preliminary Economical Assessment for Penco Module Project," that has an effective date of September 15, 2021 (the "Technical Report").

I graduated from the University de Chile in 1977 with a geologist title. I am Competent Person registered with the Chilean Mining Commission Member number 013. I have practiced my profession for 45 years. I have been directly involved in the geology, modelling and mineral resource estimation, for copper, gold, Silver, iron in numerous countries.

I have read the definition of "Qualified Person" set out in the National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for those sections of the Technical Report that I am responsible for preparing.

I visited the Penco Module Project on two occasions; the first visit was on 3 December 2020 for a duration of two days. The second visit was on 28 July 2021 for a duration of 1 day. I am responsible for sections 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.9, 1.10, 1.19.2, 1.19.3, 1.19.4, 1.19.5, 1.20.2.1, 3.2, 4, 5, 6, 7 ,8, 9, 10, 11, 12, 14.1, 14.2, 14.4, 14.5, 14.12, 14.16, 14.17, 14.18, 25.2, 25.3, 25.4, 25.5, and 26.2.1 of the Technical Report.

I am independent of Aclara Resources Inc. as independence is defined in Section 1.5 of NI 43-101. I have had no previous involvement with Penco Module Project.

I have read NI 43-101 and the sections of the Technical Report for which I am responsible have been prepared in compliance with that Instrument. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the Technical Report not misleading.

Dated: December 2nd, 2021

"Signed and sealed"

Luis Oviedo, Competent Person in Geology and Resources Nr. 013.

CERTIFICATE OF QUALIFIED PERSON
Francisco Castillo Merlez

I, Francisco Castillo, Mining Engineer, certify that I am employed as a Principal Resources Engineer within Ausenco Chile Ltda. ("Ausenco"), with an office address of Av. Las Condes 11283, Las Condes, Santiago. This certificate applies to the technical report Amended and Restated NI 43-101 Technical Report Preliminary Economical Assessment for Penco Module Project, that has an effective date of September 15, 2021 (the "Technical Report").

I graduated from the University of Santiago de Chile in 2011 with a Bachelor of Engineering Science in Mining engineering. I am Competent Person registered with the Chilean Mining Commission Member number 0179. I have practiced my profession for 20 years. I have been directly involved mineral resource and reserves estimation, operation and construction of mine, and mining project evaluations for copper, gold, Silver, iron in numerous countries.

I have read the definition of "Qualified Person" set out in the National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for those sections of the Technical Report that I am responsible for preparing.

I visited the Penco Module Project between 3-4 December 2020 for a visit duration of 2 days. I am responsible for sections 1.1 1.9, 1.10, 1.11, 1.13.1, 1.13.4, 1.13.5, 1.13.6, 1.19.5, 1.19.6, 1.19.8, 1.20.3.2, 2, 3.1, 3.5, 14.3,14.6, 14.7, 14.8, 14.9, 14.10, 14.11, 14.13, 14.14, 14.15, 14.16, 14.17, 14.18, 16, 18.1, 18.2, 18.6, 18.7, 18.8, 25.5, 25.6, 25.8, 26.2.1 and 26.3.2 of the Technical Report.

I am independent of Aclara Resources Inc. as independence is defined in Section 1.5 of NI 43-101. I have been involved with the I have had no previous involvement with Penco Module Project.

I have read NI 43-101 and the sections of the Technical Report for which I am responsible have been prepared in compliance with that Instrument. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the Technical Report not misleading.

Dated: December 2nd, 2021

"Signed and sealed"

Francisco Castillo, Competent Person in Mining Resources and Reserves Nr. 0179

CERTIFICATE OF QUALIFIED PERSON

Scott C. Elfen, P.E.

I, Scott C. Elfen, P.E., do hereby certify that:

1. I am the Global Lead Geotechnical and Civil Services of Ausenco Engineering Canada Inc., 855 Homer Street, Vancouver, BC V6B 2W2, Canada.
2. I graduated from the University of California, Davis with a Bachelor of Science degree in Civil Engineering (Geotechnical) in 1991.
3. I am a Registered Civil Engineer in the State of California (No. C56527) by exam since 1996 and I am also a member of the American Society of Civil Engineers (ASCE), Society for Mining, Metallurgy & Exploration (SME) that are all in good standing.
4. I have practiced my profession continuously for 24 years and have been involved in geotechnical, civil, hydrological, and environmental aspects for the development of mining projects; including feasibility studies on numerous underground and open pit base metal and precious metal deposits in North America, Central and South America, Africa and Australia.
5. I have read the definition of "qualified person" set out in National Instrument 43-101 *Standards of Disclosure for Mineral Projects* ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
6. I am responsible for the preparation of portions of Sections 1.13.2, 1.20.3.3, 1.20.3.4, 18.3, 26.3.3, and 26.3.4 of the technical report titled, "Amended and Restated NI 43-101 Technical Report Preliminary Economic Assessment for Penco Module Project" that has an effective date of 15 September, 2021 (the "Technical Report").
7. I have not visited Penco Module.
8. I am independent of Aclara Resources Inc. applying all of the tests in Section 1.5 of NI 43-101.
9. I have had no prior involvement with the property that is the subject of the Technical Report.
10. I have read NI 43-101, Form 43-101F1 Technical Report ("Form 43-101F1") and the Technical Report and confirm the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
11. As of the Effective Date, to the best of my knowledge, information and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 2nd day of December, 2021.

"Signed and Sealed"

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Scott C. Elfen, P.E.

CERTIFICATE OF QUALIFIED PERSON
Scott Weston, P. Geo.

I, Scott Weston, P. Geo., certify that:

1. I am employed as Vice President, Business Development with Hemmera Envirochem Inc, a wholly owned subsidiary of Ausenco Engineering Canada ("Ausenco"), with an office address of 4730 Kingsway, Burnaby, BC, Canada.

2. This certificate applies to the technical report titled, *"Amended and Restated NI 43-101 Technical Report Preliminary Economic Assessment for Penco Module Project,"* (the "**Technical Report**"), that has an effective date of September 15, 2021 (the "**Effective Date**").

3. I graduated from University of British Columbia, Vancouver, BC, Canada, 1995 with a Bachelor of Science, Physical Geography, and Royal Roads University, Victoria, BC, Canada, 2003 with a Master of Science, Environment and Management

4. I am a Professional Geoscientist of Engineers and Geoscientists British Columbia; 124888.

5. I have practiced my profession for 25 years.

6. I have read the definition of "Qualified Person" set out in the National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") for those sections of the technical report that I am responsible for preparing.

7. I have not visited Penco Module.

8. I am responsible for section 1.13.3, 1.14, 1.19.9, 3.3, 18.4, 18.5, 20, and 25.9 of the technical report.

9. I am independent of Aclara Resources, Inc. ("Aclara") as independence is described by Section 1.5 of NI 43–101.

10. I have been involved with Penco Module.

11. I have read the NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

12. As of the Effective Date of the Technical Report, to the best of my knowledge, information and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated: December 2nd, 2021

"Signed and Sealed"

Scott Weston, P. Geo.

CERTIFICATE OF QUALIFIED PERSON
Manuel A. Hernandez

I, Manuel A. Hernández do hereby certify that:

1. I am a Civil Mining Engineer, Associate Mining Consultant of CRU Strategies Consultores Limitada, the Chilean division of CRU International Limited, with address Cerro el Plomo 5420 Of 601, Las Condes, Santiago, Chile.
2. This certificate applies to the Technical Report titled "Amended and Restated NI 43-101 Technical Report Preliminary Economic Assessment for Penco Module Project", Effective Date: 15th September 2021, prepared for Aclara Resources Inc. (the "Technical Report").
3. I graduated with a Bachelor of Science degree in Civil Mining Engineering from the Universidad de Chile, Santiago, Chile, in 1986 and a Civil Mining Engineer degree in 1987.
4. I am a fellow of the Australasian Institute of Mining and Metallurgy (FAusIMM) and hold a South African Mine Manager Certificate of Competency.
5. I have worked as a mining engineer for a total of over 40 years. My relevant experience for the purpose of the Technical Report is:
    - Managed CRU Strategies Latin America for four years leading numerous market studies for mining projects and operations .
    - Managed Coffey Consulting (Chile & Perú) for 6 years leading consulting work on projects and operations including the effect of contaminants on concentrates and effects on planning and loss of value in LOM plans.
6. I have read the definition of "qualified person" set out in National Instrument 43-101 - *Standards of Disclosure for Mineral Projects* ("NI 43-101") and confirm that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
7. I have not visited the site relating to this Technical Report.
8. I am responsible for the preparation of Section 19 (Market studies and contracts) and 1.17 of the Technical Report.
9. I am independent of the issuer.
10. I have read NI 43-101 and Form 43-101F1 and the sections of the Technical Report I am responsible for have been prepared in compliance with that instrument and form.
11. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of the Technical Report I am responsible for contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this December 2nd, 2021.

"Signed and sealed"

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Manuel Hernández
Civil Mining Engineer, FAusIMM. Member 306576