NI 43 – 101 TECHNICAL REPORT
Updated Mineral Resource Estimate for the Cauchari-Olaroz Project, Jujuy Province, Argentina

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1.0 SUMMARY

1.1 INTRODUCTION

This report titled "Updated Mineral Resource Estimate for the Cauchari-Olaroz Salars, Jujuy Province, Argentina" (the "Report" or "Technical Report"), was prepared by Andeburg Consulting Services Inc. ("ACSI") to provide Lithium Americas Corporation ("LAC" or "Lithium Americas" or "the Company") with a Technical Report that is compliant with National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI-43-101") on the Cauchari-Olaroz Salars (the "Cauchari-Olaroz Project" or "Project" or "Property"), located in the Jujuy Province, Argentina. Lithium Americas Corporation and Ganfeng own the Cauchari-Olaroz Project through a 62.5/37.5 joint venture company ("JV"), Minera Exar S.A. ("Minera Exar"). Lithium Americas is a public company listed on the TSX and NYSE under the symbol "LAC." ACSI understands that the Company may use this Report for internal decision making purposes and it will be filed as required under applicable Canadian, American and Chinese securities laws.

The current Updated Mineral Resource Estimate presented in this Report has been prepared in compliance with the "CIM Standards on Mineral Resources and Reserves – Definitions and Guidelines" as referred to in National Instrument 43-101 – Standards of Disclosure for Mineral Projects ("NI 43-101") as well as CIM Best Practice Guidelines for Resource and Reserve Estimation for Lithium Brines (dated November 1, 2012), in which it is stated that the CIM considers brine projects to be mineral projects, as defined in NI 43-101.

1.2 LOCATION AND OWNERSHIP

The Cauchari and Olaroz Salars are located in the Department of Susques in the Province of Jujuy in northwestern Argentina, approximately 250 kilometers ("km") northwest of San Salvador de Jujuy, the provincial capital. The salars extend in a north-south direction from S23°18' to S24°05' and in an east-west direction from W66°34' to W66°51'. The average elevation of the salars is 3,940 meters. The midpoint between the Olaroz and Cauchari Salars is located along National Highway 52, 55 km west of the Town of Susques. The nearest port is Antofagasta, Chile, located 530 km west of the Project by road.

LAC has negotiated, through its Argentine subsidiary, Minera Exar, mining and exploration permits from relevant mining authorities in Argentina. A total of 60,712 ha of exploration and mining permits have been requested in the Department of Susques; 28,596 ha have been granted to date. The claims are contiguous and cover most of the Cauchari Salar and the eastern portion of the Olaroz Salar. The aggregate annual property payment required by Minera Exar to maintain the Property claims is approximately US$ 29,268 (AR$ 1,200,000).

On March 28, 2016, the Company sold a 50% interest in Minera Exar to SQM for US$25M, and the parties executed a Shareholders Agreement that establishes the terms by which the parties plan to develop the Cauchari-Olaroz Project.

On October 31, 2018, the Company closed a transaction with Ganfeng Lithium and SQM. Ganfeng Lithium agreed to purchase SQM's interest in the Cauchari-Olaroz project. LAC increased its interest in the Project from 50% to 62.5% with Ganfeng holding the remaining 37.5% interest. Ganfeng Lithium also provided the Company with a $100 million unsecured, limited resource subordinated loan facility to fund its 62.5% share of the project expenditures.

On March 28, 2016, Minera Exar entered into a purchase option agreement ("Option Agreement") with Grupo Minero Los Boros ("Los Boros") for the transfer of title to the Minera Exar for certain mining properties that comprised a portion of the Cauchari-Olaroz project. Under the terms of the Option Agreement, Minera Exar paid US$100,000 upon signing, and has a right to exercise the purchase option at any time within 30 months for the total consideration of US$12,000,000 to be paid in sixty quarterly installments of US$200,000.

On November 12th, 2018 Minera Exar exercised the purchase option; as a result, the following royalties will have to be paid to Los Boros:

- US$300,000 (the Company's portion was US$187,500) were payed because the commercial plant construction started (purchase option established payment within 10 days of the commercial plant construction start date); and
- 3% net profit interest (the Company's portion is 1.875%) for 40 years, payable in pesos, annually within 10 business days after calendar year end.

The Joint Venture can cancel the first 20 years of net profit interest in exchange for a one-time payment of US$7M (the Company's portion is US$4.375M) and the next 20 years for an additional US$7M (the Company's portion is US$4.375M).

Minera Exar has granted a right to Jujuy Energia y Mineria Sociedad del Estado ("JEMSE"), a mining investment company owned by the government of Jujuy Province in Argentina, to acquire an 8.5% equity interest in Minera Exar for one US dollar and the provision of management services as required to develop the project. The remaining 91.5% of Minera Exar is split evenly between LAC and SQM under Shareholders Agreement.

1.3 GEOLOGY

There are two dominant structural features in the region of the Cauchari and Olaroz Salars: north-south trending high-angle normal faults and northwest-southeast trending lineaments. The high-angle north-south trending faults form narrow and deep horst-and-graben basins, which are accumulation sites for numerous salars, including Olaroz and Cauchari. Basement rock in this area is composed of Lower Ordovician turbidites (shale and sandstone) that are intruded by Late Ordovician granitoids. Bedrock is exposed to the east, west and south of the two salars, and generally along the eastern boundary of the Puna Region.

The salars are in-filled with flat-lying sedimentary deposits, including the following five primary informal lithological units that have been identified in drill cores:

- Red silts with minor clay and sand;
- Banded halite beds with clay, silt and minor sand;
- Fine sands with minor silt and salt beds;

- Massive halite and banded halite beds with minor sand; and
- Medium and fine sands.

Alluvial deposits intrude into these salar deposits to varying degrees, depending on location. The alluvium surfaces slope into the salar from outside the basin perimeter. Raised bedrock exposures occur outside the salar basin. The most extensive intrusion of alluvium into the basin is the Archibarca Fan, which partially separates the Olaroz and Cauchari Salars. National Highway 52 is constructed across this alluvial fan. In addition to this major fan, much of the perimeter zone of both salars exhibits encroachments of alluvial material associated with fans of varying sizes.

1.4 MINERALIZATION

The brines from Cauchari are saturated in sodium chloride with total dissolved solids ("TDS") on the order of 27% (324 to 335 grams per litre) and an average density of about 1.215 grams per cubic centimetre. The other primary components of these brines include: potassium, lithium, magnesium, calcium, sulphate, HCO_3, and boron as borates and free H_3BO_3. Since the brine is saturated in NaCl, halite is expected to precipitate during evaporation. In addition, the Cauchari brine is predicted to initially precipitate ternadite (Na_2SO_4) as well as a wide range of secondary salts that could include: astrakanite ($Na_2Mg(SO_4)_2 \cdot 4H_2O$), schoenite ($K_2Mg(SO_4)_2 \cdot 6H_2O$), leonite ($K_2Mg(SO_4)_2 \cdot 4H_2O$), kainite ($MgSO_4 \cdot KCl \cdot 3H_2O$), carnalite ($MgCl_2 \cdot KCl \cdot 6H_2O$), epsomite ($MgSO_4 \cdot 7H_2O$) and bischofite ($MgCl_2 \cdot 6H_2O$).

1.5 EXPLORATION AND DRILLING

The following exploration programs were conducted between 2009 and 2018 to evaluate the lithium development potential of the Project area:

- Surface Brine Sampling
- Seismic Geophysical Program
- Gravity Survey
- Time Domain Electromagnetic ("TEM") Survey
- Air Lift Testing Program
- Vertical Electrical Sounding ("VES") Survey
- Surface Water Sampling Program
- Pumping Test Program
- Boundary Investigation
- Reverse Circulation ("RC") Borehole Program – Dual tube reverse circulation drilling was conducted to develop vertical profiles of brine chemistry at depth in the salars and to provide geological and hydrogeological data. The program included installation of 24 boreholes and collection of 1487 field brine samples (and additional Quality Control samples).
- Diamond Drilling ("DD") Borehole Program – 2009-2010 - This program was conducted to collect continuous cores for geotechnical testing (relative brine release capacity ("RBRC"), grain size and density) and geological

characterization. The program included 29 boreholes and collection of 127 field brine samples.

- Diamond Drilling (DD) Borehole Program – 2017-2018 This program was conducted to provide information for the Updated Mineral Resource Estimate and help locate production wells and geological characterization. The program included 49 boreholes and the collection of 3,444 field brine samples.

1.6 MINERAL RESOURCES AND MINERAL RESERVES

The lithium Mineral Resources and Mineral Reserves described in this report occur in subsurface brine. The brine is contained within the pore space of alluvial, lacustrine, and evaporite deposits that have accumulated as a multi-layer aquifer in the structural basin of the salars.

For the Updated Mineral Resource Estimate, the Mineral Resource Evaluation Area extends north to include the Minera Exar property areas, as well as deeper in the brine mineral deposit, with 2017 and 2018 exploration results and areas meeting the criteria of Mineral Resource classification for Mineral Resource estimation. Overall, the Updated Mineral Resource Estimate incorporates information consisting of the following: 1) the prior 2012 Mineral Resource Estimate for lithium and associated database, and 2) the expanded Project database compiled from results of 2017 through 2018 exploration drilling and sampling campaigns and additional sampling in early 2019 as part of data verification.

Except for cut-off grade, the methodology and resource classification scheme for evaluating the updated Mineral Resource Estimate followed the prior 2012 Mineral Resource Estimate criteria for Measured and Indicated. The cut-off grade was set at 300 mg/L concentration of lithium, largely to include results from drilling platform 06.

The Updated Mineral Resource Estimate at the Measured, Indicated, and Inferred Mineral Resource classification (CIM, 2014) for lithium is based on the total amount of lithium in bine that is theoretically drainable from the bulk aquifer volume.

The Mineral Resource Estimate is computed as the overall product of the Resource Evaluation Area and aquifer thickness resulting in an aquifer volume, lithium concentration dissolved in the brine, and specific yield of the resource aquifer volume. This framework is based on an expanded and updated hydrostratigraphic model incorporating bulk aquifer volume lithologies and specific yield estimates for block modeling of the Mineral Resource Estimate. Radial basis function was performed as the main lithium distribution methodology using variogram modeling techniques; the interpolation method was verified with ordinary kriging. The resource block model was validated by means of visual inspection, checks of composite versus model statistics and swath plots. No areas of significant bias were noted.

Table 1.1 summarizes the Mineral Resource Estimate for lithium at the Measured, Indicated, and Inferred confidence level categories. As is accepted standard practice with brine Mineral Resource Estimates for lithium, Table 1.2 provides lithium represented as Li_2CO_3, or Lithium Carbonate Equivalent ("LCE"), at the Measured, Indicated, and Inferred level categories.

TABLE 1.1 SUMMARY OF UPDATED MINERAL RESOURCE ESTIMATE FOR LITHIUM				
Classification	**Aquifer Volume (m^3)**	**Drainable Brine Volume (m^3)**	**Average Lithium Concentration (mg/L)**	**Lithium (tonnes)**
Measured Resource	1.03E+10	1.11E+09	587	651,100
Indicated Resource	4.27E+10	4.70E+09	580	2,726,300
Measured + Indicated	**5.31E+10**	**5.81E+09**	**581**	**3,377,400**
Inferred	1.37E+10	1.59E+09	602	957,400

Notes:

1. *The Mineral Resource Estimate has an effective date of February 13, 2019 and is expressed relative to the Resource Evaluation Area and a lithium grade cut-off of greater than or equal to 300 mg/L.*
2. *The Mineral Resource Estimate is not a Mineral Reserve Estimate and does not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resources will be converted to Mineral Reserves.*
3. *Calculated brine volumes only include Measured, Indicated, and Inferred Mineral Resource volumes above cut-off grade.*
4. *The Mineral Resource Estimate has been classified in accordance with CIM Mineral Resource definitions and best practice guidelines (2012 and 2014).*
5. *Comparisons of values may not add due to rounding of numbers and the differences caused by use of averaging methods.*

TABLE 1.2 SUMMARY OF UPDATED MINERAL RESOURCE ESTIMATE FOR LITHIUM REPRESENTED AS LCE	
Classification	**LCE (tonnes)**
Measured Resource	3,465,700
Indicated Resource	14,511,500
Measured + Indicated	**17,977,200**
Inferred	5,096,000

Notes:

1. *Lithium carbonate equivalent ("LCE") is calculated using mass of LCE = 5.322785 multiplied by the mass of Lithium reported in Table 1.1. The Mineral Resource Estimate represented as LCE has an effective date of February 13, 2019 and is expressed relative to the Resource Evaluation Area and a lithium grade cut-off of greater than or equal to 300 mg/L.*
2. *The Mineral Resource Estimate is not a Mineral Reserve Estimate and does not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resources will be converted to Mineral Reserves.*
3. *Volumes only include Measured, Indicated, and Inferred Mineral Resource volumes above cut-off grade.*
4. *The Mineral Resource Estimate has been classified in accordance with CIM Mineral Resource definitions and best practice guidelines (2012 and 2014).*
5. *Comparisons of values may not add due to rounding of numbers and the differences by use of averaging methods.*

Extensive sampling indicates the brine has a relatively low magnesium/lithium ratio (lower than three, on average), suggesting it would be amenable to conventional lithium recovery processing. The brine is relatively high in sulphate, which is also advantageous for brine processing because the amounts of sodium sulphate or soda ash required for calcium removal would be relatively low.

With further exploration and characterization, deep aquifer volumes at the Inferred Mineral Resource classification may convert to a higher confidence category; other aquifer volumes within property boundaries to the north and south remain open. Prior to conducting an exploratory drilling program, geophysical surveys (seismic and CSAMT / MT) should further delineate exploration targets in these areas. This information will aid in better defining limits of the resource extending to property boundaries.

The Mineral Reserve Estimate was updated in 2017 by Montgomery & Associates (Burga et al., 2017), and the characterization of brine recoverability was considerably enhanced relative to previous estimates. The 2017 Mineral Reserve Estimate for the Project is summarized in Table 1.3. It is the opinion of the independent QPs that the dataset used to develop the numerical model is acceptable and still relevant for use as the basis of the Mineral Reserve Estimate.

TABLE 1.3
LITHIUM MINERAL RESERVE SUMMARY

Classification	Average Lithium Concentration (mg/L)	Mass Cumulated		Brine Volume (m^3)
		Li (tonne)	Li_2CO_3 (tonne)	
Proven Reserves (Years 1-5)[1]	712	35,159	187,000	4.9×10^7
Probable Reserves (Years 6-40)[1]	695	246,474	1,312,000	3.5×10^8
Total (Years 1-40)	**698**	**281,633**	**1,499,000**	**4.0×10^8**

1. *The Mineral Reserve Estimate for lithium remains unchanged from the prior Updated Feasibility Study for Cauchari-Olaroz (Burga et al. 2017). The QPs responsible for the preparation of the Mineral Reserve Estimate have conducted a review of the estimates and consider the Mineral Reserves are current as of the effective date of the Report.*
2. *Ratios of lithium to other metals include: K:Li of 8.2, Mg:Li of 2.4, B:Li of 1.6, SO4:Li of 28.5.*
3. *Lithium Carbonate Equivalent (LCE) is calculated based the following conversion factor: Mass of LCE = 5.323 x Mass of lithium metal.*
4. *The conversion is direct and does not account for estimated processing losses.*
5. *The values in the columns on Lithium Metal and Lithium Carbonate Equivalent above are expressed as total contained metals.*
6. *The effective date of the Mineral Reserve Estimate is March 29th, 2017.*

Mineral Reserve Estimate values of Table 1.3 are based on numerical model predictions of pumped brine (pre-processing). The Measured and Indicated Mineral Resources are inclusive of the Mineral Reserves and are not "in addition" to the Mineral Reserves.

1.7 BRINE PROCESSING

In the 2012 Feasibility Study, LAC developed a process model for converting brine to lithium carbonate. The proposed process follows industry standards: pumping brine from the salar, concentrating the brine through evaporation ponds, and processing the brine concentrate through a hydrometallurgical facility to produce high-grade lithium carbonate. The basis of the anticipated process has been validated by laboratory test work and pilot testing at site and with our partners.

The 2012 process model employed proprietary, state-of-the-art physiochemical estimation methods and process simulation techniques for electrolyte phase equilibrium. The process model has been validated and updated based on the laboratory and pilot test results. Since SQM acquired a 50% interest in Minera Exar in 2016, SQM advanced the process engineering work, employing their proprietary technology and operational experience, the results of which are reflected in the 2017 feasibility study. In 2018, Ganfeng Lithium Co, Ltd and Lithium Americas have continued to refine the process to improve the quality of the product and the reliability of the operation. This updated report uses the 2018 feasibility process to discuss the updated Mineral Resource model.

1.7.1 Lithium Carbonate Production

The process route simulated for the production of lithium carbonate from Cauchari brines resembles the flowsheet presented in Figure 17.1. Primary process inputs include Salar brine, water, lime, soda ash, HCl, NaOH, steam, electricity and natural gas and are based on the Mineral Reserve Estimate from the 2017 report. The evaporation ponds produce salt tailings composed of Na, Mg, Ca, K, and borate salts. The brine concentrate from the terminal evaporation pond is further processed through a series of polishing and impurity removal steps. Soda ash is then added with the purified brine concentrate to produce a lithium carbonate precipitate, that is dried, compacted / micronized, and packaged for shipping.

Operating criteria for the Lithium Carbonate plant is presented Table 1.4.

TABLE 1.4
LITHIUM CARBONATE PLANT OPERATING CRITERIA

Description	Unit	Value
Li_2CO_3 production	tonnes per year	25,000
Annual operation days	days	330
Annual operation hours	hours	7,006
Availability	%	90.4
Utilization (22 h/d)	%	97.2
Plant Overall Efficiency	%	71

1.8 SITE INFRASTRUCTURE AND BUILDINGS

Information in this section has been excerpted and summarized from the Feasibility Study reported in 2017 (Burga et al., 2017). The reader is referred to Burga et al. (2017) for detailed information.

1.8.1 Wells

1.8.1.1 Well Production Equipment Selection

Screened wells will target the largest lithium brine aquifers. Submersible electric pumps are proposed for brine pumping. These pumps will send the brine to evaporation ponds through a network of pipelines and mixing pools.

1.8.2 Evaporation Ponds

An evaporation rate of 2.52 mm per day (920 mm/year) was used as criterion to design the pond system. This rate corresponds to measured evaporation from an environmental monitoring station and test pans at the site where the ponds will be located and a conservative design factor. The pond orientation and placement were based on predominant wind patterns observed in the area.

Brine will be transferred between the successive evaporation ponds using self-priming pumps.

1.8.2.1 Camp

The permanent camp will be located south of National Highway 52, south of the evaporation ponds. The permanent camp is a full habitational and administrative complex to support all workforce activities, with a capacity for approximately 300 people. The permanent camp covers a footprint of 15,000 m^2 of buildings and 35,700 m^2 of external facilities.

The permanent camp includes: administration building, habitational area, dining facilities, medical room, maintenance workshops, spare parts warehouse, laboratory, lockers, gym, soccer field, helipad and parking lots. The habitational area includes single bedrooms with private bathrooms, dormitories with private bathrooms, and large dorm rooms with shared bathrooms.

Temporary modules will be used during construction to accommodate a maximum construction crew capacity of approximately 800 people, and will be expanded and contracted during construction, as required.

1.8.2.2 Other Buildings

Other buildings include:

- A warehouse for spare parts and consumables;
- A steel building for the storage of soda ash;

- A steel building for the storage of solvent extraction plant chemicals designed with appropriate ventilation, safety, and security features;
- Operating facilities for sheltering operators, electrical equipment, and central control rooms; and,
- Product storage facility, designed for protecting the product against dust contamination and deleterious winds.

1.9 MARKET STUDIES AND CONTRACTS

Information in this section has been excerpted and summarized from the Feasibility Study reported in 2017 (Burga et al., 2017). The reader is referred to Burga et al. (2017) for detailed information.

A market study, conducted recently by a third party, was used to establish three pricing scenarios for lithium carbonate (per tonne) used in the economic analysis: Low (US$10,000), Base Case (US$12,000) and High (US$14,000).

Production from the Project will be allocated between the partners of Minera Exar in accordance with their ownership interests. In respect of its interest, LAC has agreed to lithium carbonate Offtake Entitlements with two counterparties, GFL International Co. Ltd. ("Ganfeng") and The Bangchak Petroleum Public Company Limited ("Bangchak"). These offtake entitlements are related to strategic investment agreements by the counterparties, which include both debt facilities for Project construction and equity participation in the Company.

1.10 PERMITTING, ENVIRONMENTAL STUDIES AND SOCIAL OR COMMUNITY IMPACT

Information in this section has been excerpted and summarized from the Feasibility Study reported in 2017 (Burga et al., 2017). The reader is referred to Burga et al. (2017) for detailed information.

1.10.1 Permits and Authorities

The Provincial Department of Mines and Energy, under the Secretariat of Mining and Hydrocarbons, approved LAC's EIR for the exploration work of the Cauchari-Olaroz Project (Resolution No. 25/09 on August 26, 2009). Subsequent updates have been made to accurately reflect the ongoing exploration program (some are awaiting approval).

LAC also obtained a water supply license for the exploration program. This license was granted by Jujuy's Provincial Department of Water Resources.

1.10.2 LAC's Environment and Social Policy

LAC adhered firmly to the Equator Principles[1] ("EP") even before exploration operations began. These principles are a voluntary commitment, which arose from an initiative of the International Finance Corporation ("IFC"), member of the World Bank Group, to stimulate sustainable private sector investment in developing countries. Financial institutions that adopt these principles are bound to evaluate and consider environmental and social risks of the projects they finance in developing countries and, therefore, to lend only to those who show the proper administration of its social and environmental impacts such as biodiversity protection, use of renewable resources and waste management, protection of human health and population movements.

In this context, LAC established from the beginning that the Equator Principles will be the minimum standards for developing the Project, taking the measures that are described in the corresponding section of the report.

1.10.3 Environmental Baseline Studies

Minera Exar engaged Ausenco to carry out baseline environmental and social studies and associated impact assessments required to complete the permit applications.

Ausenco's team carried out environmental baseline field surveys between September 2010 and July 2011. Two subsequent biannual renewals to the EIA for Exploitation were presented to the authorities that required Ausenco to update the environmental baseline database in March 2015 and October 2016.

These surveys contain all the environmental attributes that could be affected by a future mining project, including both inert (air, soil, water, geology) and biotic (flora, fauna, and limnology) components. In addition, socio-economic and cultural assessments were also conducted.

1.10.4 Evaluation of Impacts

The identification, description and assessment of potential environmental and social impacts, both positive and negative, were performed for the construction, operation and closure stages of the Project.

1.10.5 Community Relations Plan

LAC has developed a plan that promotes social and economic development within a sustainability framework. LAC began work on the Community Relations Plan with the Susques Department in 2009. This plan was created to integrate local communities into the Project, by implementing programs aimed at generating positive impacts on these communities and minimising negative impacts. LAC has signed formal contracts with neighboring communities

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1 EP: Credit risk management framework for determining, assessing and managing environmental and social risk in Project Finance transactions.

that own the surface ground where the Project will be developed. According to these contracts, the communities grant LAC traffic and other rights, while LAC ensures them a regular cash flow, to be used as the members of the communities decide.

1.11 CAPITAL AND OPERATING COST ESTIMATE

Information in this section has been excerpted and summarized from the Feasibility Study reported in 2017 (Burga et al., 2017). The reader is referred to Burga et al. (2017) for detailed information. For greater certainty, the capital and operating cost estimates herein rely on the 2017 Mineral Resource and Reserve Estimates and do not incorporate the updated Mineral Resource Estimate provided in this report.

1.11.1 Capital Cost Estimate

Capital expenditures are based on an operating capacity of 25,000 tpa of lithium carbonate. Capital equipment costs have been determined based on over 100 quotes for equipment items and construction services; in addition, an in-house database maintained by an engineering consultancy was used for minor items. Minera Exar and its consultants have verified the validity of these estimated capital expenditures.

The estimates expressed are in current US dollars on a 100% project equity basis. LAC will need to contribute or secure a portion of these costs attributable to its current shareholding in Minera Exar. As of the date of the 2017 report, that was 50%, however, as of the date of this report, that interest is 62.5%. No provision has been included to offset future cost escalation since expenses, as well as revenue, are expressed in constant dollars.

Capital costs include direct and indirect costs for:

- Brine production wells;
- Evaporation and concentration ponds;
- Lithium carbonate plant;
- General site areas, such as electric, gas, and water distribution;
- Stand-by power plant, roads, offices, laboratory and camp, and other items;
- Off-site infrastructure, including gas supply pipeline and high voltage power line; and
- Contingencies, salaries, construction equipment mobilization, and other expenses.

The capital investment for the 25,000 tpa lithium carbonate project, including equipment, materials, indirect costs and contingencies during the construction period is estimated to be US$425 million. This total excludes interest expense that might be capitalized during the same period. Disbursements of these expenditures start in year 1 (2017). These capital expenditures are summarized in Table 1.5.

TABLE 1.5 LITHIUM CARBONATE PLANT CAPITAL COSTS SUMMARY	
Item	**US$ M**
Direct Cost	
Brine Wells and Piping	14.8
Evaporation Ponds	129.1
Lithium Carbonate Plant and Aux.	121.5
On-Site Infrastructure	26.3
Off-site Services	41.3
Total Direct Cost	**333.0**
Indirect Cost	
Total Indirect Cost	**37**
Total Direct And Indirect Cost	
Total Direct And Indirect	370
Contingencies (15%)	55
Total Capital	**425**

1.11.2 Currency

All values are expressed in current US dollars; the exchange rate between the Argentine peso and the US dollar has been assumed as AR$15.90/US$ for the evaluation of the estimate and economic and financial model as per the conditions in 2017; no provision for currency escalation has been included.

1.11.3 Operating Cost Estimate

The operating cost estimate (±15% expected accuracy) for the Project is estimated at $2,495 per tonne of lithium carbonate (Table 1.6). This estimate is based upon vendor quotations for main costs such as reagents, fuel (diesel and natural gas), transport, and catering & camp services. Reagents consumption rates were determined by pilot plant and laboratory work, as well as computer model runs. Energy consumption was determined on the basis of the specific equipment considered in each sector of the facilities and their utilization rate.

TABLE 1.6 OPERATING COSTS SUMMARY		
Description	**Total 000 US$/Year**	**US$/Tonne Li_2CO_3**
Direct Costs		
Reagents	24,775	991
Maintenance	5,250	210
Electric Power	4,675	187
Pond Harvesting & Tailing Management	8,625	345
Water Treatment System	950	38
Natural Gas	2,125	85
Manpower	4,150	166
Catering, Security & Third Party Services	2,425	97
Consumables	1,275	51
Diesel	1,725	69
Bus-in/Bus-out Transportation	875	35
Product Transportation	3,375	135
Direct Costs Subtotal		**2,409**
Indirect Costs		
G&A	1,895	76
E&C	250	10
Indirect Costs Subtotal		**86**
Operating Costs		
Total Operating Costs		**2,495**

1.12 ECONOMIC ANALYSIS

A sophisticated economic analysis of the Project was conducted to determine its financial viability. Capital and Operational Expenditures presented in previous sections have been used in this model. The forecasted tax schedules, both payments and rebates, were researched using internal and external taxation experts. Prices for lithium carbonate were based on a market study carried out by a qualified third party.

Results obtained include Net Present Values ("NPV") for a range of discount rates, and Internal Rate of Return ("IRR"), as well as Payback ("PB") periods. In order to determine the influence of different input parameters on projected results, a sensitivity analysis has also been carried out. Parameters considered in this analysis were CAPEX, selling prices, production levels, and OPEX.

Evaluation criteria and tax assumptions used in developing the cash flow model are detailed in the corresponding section. The model assumes the current charges for royalties, taxes and payments obligations and a 2.5% return on export value.

1.12.1 Capital Expenditures (CAPEX)

The capital expenditures schedule is presented in Table 1.7.

TABLE 1.7 CAPEX EXPENDITURE SPEND SCHEDULE				
Description	**2017 000 US$**	**2018 000 US$**	**2019 000 US$**	**Total 000 US$**
Brine Extraction Wells	3,780	10,400	4,730	18,910
Evaporation Ponds	32,950	90,630	41,190	164,770
Lithium Carbonate Plant	37,720	103,740	41,150	188,610
Infrastructure & General	10,540	28,990	13,180	52,710
Total	**84,990**	**233,760**	**106,250**	**425,000**

1.12.2 Production Revenues Schedule

The production revenues schedule is presented in Table 1.8.

TABLE 1.8 PRODUCTION AND REVENUE SCHEDULE			
Year	**Total Revenues 000 US$**	**Accumulated 000 US$**	**Li_2CO_3 (t)**
1	0	0	-
2	0	0	-
3	72,000	72,000	6,000
4	168,000	240,000	14,000
5	300,000	540,000	25,000
6	300,000	840,000	25,000
7	300,000	1,140,000	25,000
8	300,000	1,440,000	25,000
12	300,000	2,640,000	25,000
18	300,000	4,440,000	25,000
24	300,000	6,240,000	25,000
32	300,000	8,640,000	25,000
40 (2056)	300,000	11,040,000	25,000
Total		**11,040,000**	**920,000**

Note: *Li_2Co_3 price US$/tonne: $12,000.*

1.12.3 Other Expenses

Other expenses and cash flow items considered in the model include Argentinian transaction tax, Jujuy and private royalties, licenses and permits, export refunds, easement rights, equipment depreciation, sustaining capital, exploration expenses amortization and remediation allowances.

1.12.4 Economic Evaluation Results

Economic evaluation results are presented in Table 1.9.

TABLE 1.9
PROJECT EVALUATION RESULTS SUMMARY[1]

Price Case US$/t Li_2CO_3	High $14,000	Medium $12,000	Low $10,000
CAPEX	425	425	425
Max Negative Cash Flow	265	265	265
Average Yearly Values (US$ M)			
Revenue	350	300	250
OPEX	62.3	62.3	62.3
Other Expenses	8.2	7.2	6.2
EBITDA	282	233	184
Before Taxes (US$ M)			
NPV (6%)	3,064	2,450	1,837
NPV (8%)	2,190	1,728	1,266
NPV (10%)	1,626	1,266	907
DCF (8%) Payback[1]	2Y, 11M	3Y, 4M	3Y, 11M
IRR	39.50%	34%	28.10%
After-Taxes			
NPV (6%)	2,015	1,609	1,204
NPV (8%)	1,420	1,113	807
NPV (10%)	1,042	803	564
DCF (10%) Payback[2]	3Y	3Y, 5M	4Y
IRR	33%	28.4%	23.5%

1. *Presented on a 100% project equity basis. As of the date of this report, LAC currently owns 62.5% of the project.*
2. *Measured form the end of the capital investment period.*

1.13 CONCLUSIONS AND RECOMMENDATIONS

1.13.1 Conclusions

- Brine: The Mineral Resource and Mineral Reserves described in this report occur in subsurface brine. The brine is contained within the pore space of salar deposits that have accumulated in a structural basin.

- Hydrostratigraphic Model, Resource Block Model, and Updated Mineral Resurce Estimate: Comparing the prior 2012 Mineral Resource Estimate to the Updated Mineral Resource Estimate, the percent change is a decrease of less than 1% for total average lithium concentration of Measured + Indicated; the percent change is an increase of 53% for total LCE Measured + Indicated (11,752,000 tonnes LCE vs. 17,977,200 tonnes LCE). The large increase in overall estimated mass of LCE can be attributed to the expansion and deepening of the Resource Evaluation Area based on exploration results obtained in 2017 and 2018. The small decline in total average concentration can be attributed to the updated Mineral Resource Estimate affected by the 2017 and 2018 spatial range of samples collected in the Salar de Orocobre and Archibarca alluvial fan areas of the Project.

- Numerical Model and Mineral Reserve Estimate: It is the opinion of the independent QPs responsible for the Updated Mineral Resource Estimate that the dataset used to develop the 2017 numerical model is acceptable and representative of the Mineral Reserve Estimate.

- Project Economic Viability: Project cash flow analysis for the base case and alternative cases indicates the project is economically viable based on the assumptions used.

1.13.2 Recommendations

- Sample Preparation and Analysis: Sample tag booklets should be used at the site for field sampling.

- A dedicated building should be made to store duplicate samples.

- A selection of low, medium and high grade Li brine duplicates should be selected and submitted to Alex Stewart for analysis.

- QA/QC Standard Operating Procedure Manual: A formal manual should be compiled and followed for the insertion of QA/QC Samples and actions to be taken in the case of a failure.

- The QA/QC program, using regular insertions of blanks, duplicates and standards should be continued. All exploration samples should be analyzed at a certified, independent laboratory.

- Proper certified lithium standards, with values comparable to the grades found on site, be sourced.

- Distilled water should be used for blanks as freshwater in the area can contain trace amounts of lithium.

- If the Patrons made at the Exar lab continue to be used, they should go through round robin testing at external laboratories to obtain a more accurate value.

- The Exar laboratory should implement ISO procedures and be subjected to external audits to maintain quality control.

- Updates to models representing Mineral Resources and Reserves: New conceptual and Mineral Resource and Reserve models should be prepared following installation and testing of the new production well and any additional monitoring wells. The domain of the model should be enlarged so that additional areas can be included as potential new sources for Mineral Reserve estimates. Future modeling activities should include:

    - Comparison of the model hydrostratigraphy against any new borehole data;
    - Comparison of produced brine concentrations against predicted concentrations;
    - Comparison of measured production and monitor well drawdown levels against predicted levels;
    - Comparison of measured production well flow rates against predicted rates; derivation of updated K (hydraulic conductivity), Ss (specific storage), and Sy (specific yield) estimates from analysis of pumping and drawdown information, and comparison with the values used in the model; and incorporation of third party brine pumping from adjacent properties if appropriate and if any occurs in the future.

- Update of Mineral Reserve Estimate: The positive results of the Updated Mineral Resource Estimate justify an update to the Mineral Reserve Estimate prepared in 2017.

- New Well Testing: In addition to the long-term evaluation components recommended above, each new production well should undergo an initial pumping test, on the order of one month of constant-rate pumping, for assessment of long-term performance.

- Project capacity expansion: Given the level of Mineral Resources estimated in this report, we recommend that the Feasibility Study ("FS") update be carried out to explore a production of 40, 000 tpy of lithium carbonate.

2.0 INTRODUCTION AND TERMS OF REFERENCE

2.1 TERMS OF REFERENCE

Lithium Americas Corp. retained Andeburg Consulting Services Inc. ("ACSI") and Montgomery & Associates ("Montgomery" or "M&A") to complete an, independent NI 43-101 compliant Updated Mineral Resource Estimate for the Cauchari-Olaroz Project, located in the Province of Jujuy in Argentina. The supervising Independent Qualified Person ("QP") for the Report is David Burga, P.Geo. of ACSI.

The Updated Mineral Resource Estimate considers lithium brine at the Cauchari-Olaroz Project that is potentially amenable to pumping using production wells. The current Mineral Resource Estimate presented in this report has been prepared in compliance with the "CIM Standards on Mineral Resources and Reserves – Definitions and Guidelines" as referred to in NI 43-101 and Form 43-101F, Standards of Disclosure for Mineral Projects and in force as of the effective date of this report. This is consistent with CIM Best Practice Guidelines for Resource and Reserve Estimation for Lithium Brine (dated November 1, 2012), in which it is stated that the CIM considers brine projects to be mineral projects, as defined in NI 43-101.

In 2017, Lithium Americas commissioned a team of consultants to complete a Feasibility Study in accordance with NI 43-101 for the Project. The following consultants were commissioned to complete the components for the purpose of the Feasibility Study:

- Andeburg Consultants Inc.: Overall project management, property description and location, accessibility, climate and physiography, history, geological setting and mineralization, deposit types, exploration, drilling, sample preparation, data verification, recovery methods, project infrastructure, market studies and contracts, capital and operating costs, and economic analysis;

- Montgomery & Associates: Mineral Reserve Estimate and Mining Methods;

- Ausenco: Property description and location and environmental studies, permitting and social or community impact; and

- Groundwater Insight and Matrix Solutions: Prepared a Feasibility Study in 2012. The data verification sections and Mineral Resource Estimate were incorporated into the 2017 report.

Sections 15 to 23 of the current Technical Report are summarized from the 2017 Feasibility Report. The reader is referred to Burga et al. (2017) for detailed information. The Feasibility Report was based on the prior 2012 Mineral Resource and in due course will be updated based on the March 2019 Mineral Resource Estimate. The financial model and Mineral Reserves have not been updated in light of the Mineral Resource update for the Project. However, the Mineral Resource update does not have a negative impact on or otherwise adversely affect the Mineral Resource inventory that formed the basis of the financial model and Mineral Reserve Estimate. The basis for the Mineral Reserve Estimates and financial model are the Mineral Resource

Estimates that were prepared in 2012, which does not include the current Mineral Resource update for the Project. The primary differences between the prior, 2012 Mineral Resource model and the current Mineral Resource model is to include new information obtained from the 2017-2018 drilling campaign and therefore these changes do not have a negative impact on, or otherwise adversely affect, the Mineral Reserves used for the financial model. The Company is evaluating the necessity of updating the financial model and Mineral Reserves using the Mineral Resource and will make a decision on this matter at a later date.

This report was prepared by the authors, at the request of Lithium Americas Corp., a Vancouver registered company, trading under the symbol of "LAC" on the Toronto Stock Exchange and the New York Stock Exchange with its corporate office at:

300 – 900 West Hastings St
Vancouver, BC
V6C 1E6

This report is considered current as of March 1st, 2019.

2.2 SITE VISITS

Mr. David Burga, P.Geo. (ACSI), a qualified persons under the terms of NI 43-101, conducted a site visit of the Property on January 24, 2017. Mr. David Burga visited the site again between February 19 and 21,2019 to review the drilling work from 2017 and 2018, the QA/QC procedures, interview geologists on site and conduct a verification sampling program. Mr. Daniel Weber, P.G. (M&A), visited the Project on September 8 and 9, 2018, to review site conditions and to verify 2017 and 2018 core logging and description methods. Dr. Rene LeBlanc is a qualified person under the terms of NI 43-101 and visited the Property most recently between November 9-15, 2018.

2.3 SOURCES OF INFORMATION

This Report is based, in part, on internal company technical reports maps, published government reports, company letters, memoranda, public disclosure and public information, as listed in the References at the conclusion of this Report. Sections from reports authored by other consultants have been directly quoted or summarized in this Report and are so indicated where appropriate.

The Mineral Reserve Estimate presented in this report is based on geologic and hydrostratigraphic models for the basin, which were developed using the following information sources:

- Geologic and hydrostratigraphic models for the salar basin, which in turn are based on:
  - Expertise in salar geology held by members of the LAC technical team;
  - Geologic logging of 29 DDH holes and 24 RC holes drilled by LAC;
  - Salar boundary investigations conducted by LAC, which include test pit transects and multi-level monitoring well nests;

- Geophysical surveys conducted by LAC;
- Surface water and brine monitoring programs conducted by LAC;
- Hydraulic and sampling information from pumping tests at five locations on the salar;
- Near-surface distributions of lithium and other dissolved constituents, delineated through collection and analysis of 55 brine samples from shallow, hand-dug pits; and,
- Formation porosity measurements, obtained through the collection and analysis of 832 undisturbed core samples from diamond drill boreholes.

2.4 UNITS AND CURRENCY

Unless otherwise stated all units used in this report are metric. Salt contents in the brine are reported in weight percentages or mass per volume.

All values are expressed in current US dollars; the exchange rate between the Argentine peso and the US dollar has been assumed as AR$15.90/US$ for the evaluation of the estimate and economic and financial model as per the conditions in 2017; no provision for currency escalation has been included.

The coordinate system used by Cauchari for locating and reporting drill hole information is the UTM system. The property is in UTM Zone 19K and the WGS84 datum is used. Maps in this Report use either the UTM coordinate system or Gauss Kruger-Posgar 94 datum coordinates that are the official registration coordinates of the local registry.

The following list shows the meaning of the abbreviations for technical terms used throughout the text of this report.

Abbreviation	Meaning
”	inches
1D	One dimensional
3D	Three dimensional
°C	Celsius degrees
A	Altitude, in masl
ADT	Average Daily Traffic
AET	Actual evapotranspiration
α	alpha, the fitting coefficient of the capillary head curve
Ah	Ampere-hour
Amsl	above mean sea level
AR$	Argentine Pesos
ARAWP	ARA WorleyParsons
ASA	Alex Stewart Argentina
ASL	Alex Stewart Laboratories S.A.
ASTM	American Society of Testing and Materials
AT	After Tax

B	Boron
BIT	Before Interest and Tax
Bls	Below land surface
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
Ca	Calcium
$CaCl_2$	Calcium Chloride
$CaCO_3$	Calcium Carbonate
CAGR	Compound Annual Growth Rate
CaO	Calcium Oxide
CAPEX	Capital Expenditure
$CaSO_4 \cdot 2H_2O$	Gypsum
CC	Curvature coefficient
CEO	Chief Executive Officer
CFR	Cost and Freight
CHP	Combined Heat and Power Unit
CIS	Commonwealth of Independent States
Cl	Chloride
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
cm	Centimeter(s)
COMIBOL	Corporacion Minera de Bolivia (Bolivian Mining Corporation)
CSAMT/MT	Controlled source audio-magnetotellurics/
CU	Uniformity coefficient
δ	delta, the exponent for the relative permeability curve
DC + IC	Direct Costs plus Indirect Costs
DD	Diamond drilling
DDH	Diamond drill hole
Deg	Degrees
DEM	Digital Elevation Model
Dep, Amort & RA	Depreciation, Amortization and Remediation Allowance
DFS	definitive feasibility study, 2017 Burga et al report
DL	Longitudinal Dispersivity
DT	Transverse Dispersivity
Ebitda	Earnings before interest, taxes, depreciation and amortization
EIA	Estudio de Impacto Ambiental (Environmental Impacts Report)
Elevb	Elevation of site b in masl
EP	Exploration Permit
Ep'	Equator Principles
Epan	Pan Evaporation, mm/yr
ET	Evapotranspiration
ETp	potential evaporation
EV	Electric vehicles
FOB	Free on Board
FS	Feasibility study
G&A	General and Administration
g/cm^3	grams per cubic centimeter
g/L	grams per liter

GEC	Geophysical Exploration Consulting
GFL	Jiangxi Ganfeng Limited
GIS	Geographic Information System
h	Hour
h/d	hours per day
H_2S	Hydrogen sulphide
H_3BO_3	Boric acid
ha	hectares
HCO_3	Bicarbonate
HDPE	High Density Polyethylene
HEV	Hybrid electric vehicles
HMS	Hydrologic Modeling System
HSU	Hydrostratigraphic Unit
hPa	hectopascal (100 pascals)
I	Inflow
ICE	Internal combustion engine
ICP	Inductively Coupled Plasma
IFC	International Finance Corporation
IIA	Indicador de Impacto Ambiental (Environmental Impact Indicator)
IIT	Instituto de Investigaciones Tecnológicas (Technology Investigations Institute)
ILO	International Labour Organization
in or ”	inches
INTA	Instituto Nacional de Tecnología Agropecuaria (National Institute of Agricultural Technology)
IRR	Internal Rate of Return
IT	Information Technology
ITT	Instituto de Investigaciones Tecnológicas (Technology Investigations Institute) of the Universidad de Concepción
IUCN	International Union for Conservation of Nature
K	Potassium
K	hydraulic conductivity
$K_2Mg(SO_4)_2 \cdot 4H_2O$	Leonite
$K_2Mg(SO_4)_2 \cdot 6H_2O$	Schoenite
K_2SO_4	Potassium sulfate
$K_2SO_4.CaSO_4 \cdot H_2O$	Syngenite
$K_3Na(SO_4)_2$	Glaserite
KCl	Potash
kg	kilograms
kg/cm^2	kilograms per square centimeter
Kh	Horizontal Hydraulic Conductivity
Kh,SAND	Sand Horizontal Hydraulic Conductivity
km	kilometers
km^2	square kilometers
km/h	kilometers per hour
KR	Recession constant, h

kt	kilotonne
kt/yr	1,000 tonnes per year
KUS$	Thousands of US dollars
Kv	Vertical Hydraulic Conductivity
kWh	kilo watt hour
kriging	a Gaussian process regression method of interpolation governed by prior covariances
Kx	Hydraulic Conductivity in the X direction
Ky	Hydraulic Conductivity in the Y direction
Kz	Hydraulic Conductivity in the Z direction
L/s	Liters per second
L/min	Liters per minute
LAC	Lithium Americas Corp
LC	Least concern
LCE	Lithium carbonate equivalent
Li	Lithium
Li_2CO_3	Lithium Carbonate
LiBOB	Lithium bis(oxalate)borate
LiOH	Lithium hydroxide
LiOH-H20	lithium hydroxide monohydrate
LOM	Life of Mine
lpm	Litres per minute
LSGC	Lower Salt Generation Cycle meters
m	the second fitting exponent for the capillary head curve
m	meters
m/d	meters per day
m/ka	meters every thousand years
masl	meters above sea level
m/s	meters per second
m-1	1/meter
m^2	square meters
m^2/s	square meters per second
m^3	cubic meters
m^3/d	cubic meters per day
m^3/MWh	cubic meter per mega watt hour
m^3/yr	cubic meters per year
mbtc	metres below top of casing
Ma	millions of years
Max	maximum
mbgs	metres below ground surface
Minera Exar	Minera Exar S.A.
ml	milliliters
Mg	Manganese
mg/L	Milligrams per liter
mGal	10^{-3} gal, also called galileo (10^{-3} cm/s^2)
$MgCl_2$	Magnesium chloride

$MgCl_2 \cdot 6H_2O$	Bischofite
$MgCl_2 \cdot KCl \cdot 6H_2O$	Carnalite
$Mg(OH)_2$	Magnesium hydroxide
$MgSO_4 \cdot 7H_2O$	Epsomite
$MgSO_4 \cdot KCl \cdot 3H_2O$	Kainite
MIBC	Methyl Isobutyl Carbinol
mm	millimeters
mm/d	millimeters per day
mm/yr	millimeters per year
mm/yy	month/year
Montgomery	Montgomery & Associates
MP	Mining Permit
MR	Mud Rotary
Msl	mean sea level
MT	Million tonnes
Mton	Million U.S. short ton (s)
MW	Mega Watt
n	the fitting exponent for the capillary head curve
n/a	Not Applicable
Na	Sodium
$Na_2Mg(SO_4)_2 \cdot 4H_2O$	Astrakanite
NaCl	Sodium chloride
Na_2CO_3	Sodium carbonate, soda ash
NaOH	Sodium Hydroxide or Caustic Soda
NI	CanadianNational Instrument
NMR	Nuclear Magnetic Resonance
NPV	Net Present Value
φe	Transport properties include effective porosity
OPEX	Operating Costs
Pe	effective porosity
PEA	Preliminary Economic Assessment
PFS	Preliminary Feasibility Study
PoO	Plan of Operations
ppm	parts per million
Project	The Cauchari-Olaroz Lithium Brine Project, Jujuy Province, Argentina
PVC	Polyvinyl Chloride
RBRC	relative brine release capacity
RC	reverse circulation
Ss	specific storage
Sr	residual saturation
SX	solvent extraction
Sy	specific yield
TDS	total dissolved solids

3.0 RELIANCE ON OTHER EXPERTS

Although copies of the tenure documents, operating licenses, permits, and work contracts were reviewed, an independent verification of land title and tenure was not performed. ACSI has not verified the legality of any underlying agreement(s) that may exist concerning the licenses or other agreement(s) between third parties but has relied on the client's solicitor, Dr. Arturo Pfister, to have conducted the proper legal due diligence for the claims discussed in Section 4.2.

The Updated Mineral Resource Estimate was conducted as a collaborative effort between Montgomery and the Minera Exar project team. The on-site field visit to the Project area was led by Minera Exar representative, Ms. Marcela Casini, and associated field hydrogeologists from Minera Exar. Ms. Casini provided results of the 2017 and 2018 exploration drilling and sampling and the early 2019 samples to Montgomery in digital format, as well as associated data and historical background for prior resource estimates.

A draft copy of this Report has been reviewed for factual accuracy by LAC, and ACSI has relied on LAC's historical and current knowledge of the Property in this regard.

Any statements and opinions expressed in this document are given in good faith and in the belief that such statements and opinions are not false and misleading at the date of this Report.

4.0 PROPERTY DESCRIPTION AND LOCATION

4.1 PROPERTY DESCRIPTION

The Cauchari and Olaroz Salars are located in the Department of Susques in the Province of Jujuy in northwestern Argentina. The salars extend in a north-south direction from S 23° 18’ to S 24° 05’, and in an east-west direction from W 66° 34’ to W 66° 51’. The average elevation of both salars is approximately 3,950 m.

Figure 4.1 shows the locations of both salars, approximately 250 km northwest of San Salvador de Jujuy, the provincial capital. The midpoint between the Olaroz and Cauchari Salars is located directly on National Highway 52, 55 km west of the Town of Susques where the Project field offices are located. The nearest port is Antofagasta, Chile, located 530 km west of the Project by road.

Figure 4.1 Location of the Cauchari-Olaroz Project

Source: *King, Kelley, Abbey, (2012).*

4.2 PROPERTY AREA

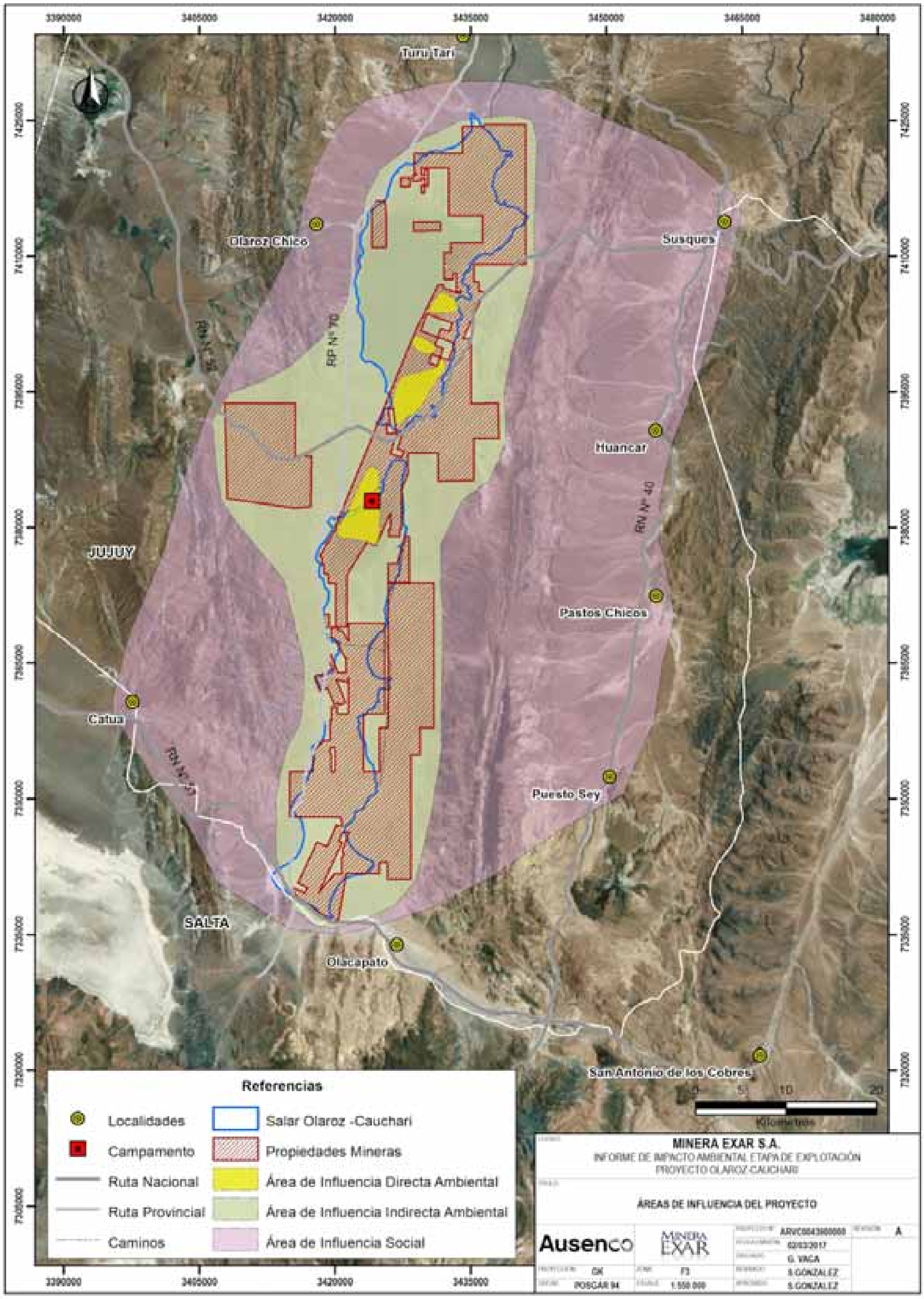
Minera Exar has negotiated mining and exploration permits, and has requested from mining authorities exploration and mining permits covering a total of 60,712 ha in the Department of Susques, of which 28,596 ha have been granted to date. Figure 4.2 shows the location of the

Minera Exar claims in the Cauchari-Olaroz Project. As shown in the figure, the claims are contiguous and cover most of the Cauchari Salar and the eastern portion of the Olaroz Salar. The claims that will be subject to mining activity are indicated on Figure 4.3, and are shown again in Figure 4.4.

The 25 claims that are subject to exploitation and production, totalling an approximate area of 13,621 ha, are presented in Table 4.1. These claims are where the lithium brine will be pumped from during production. The 63 claims that are not subject to exploitation, totalling an approximate area of 65,024 ha requested, are presented in Table 4.2 and will be subject to further exploration or agreements to facilitate exploitation on the project. The annual aggregate property payment (canon rent) required by Minera Exar to maintain the claims referenced in Figure 4.2 is approximately US$ 29,268 (AR$ 1,200,000).

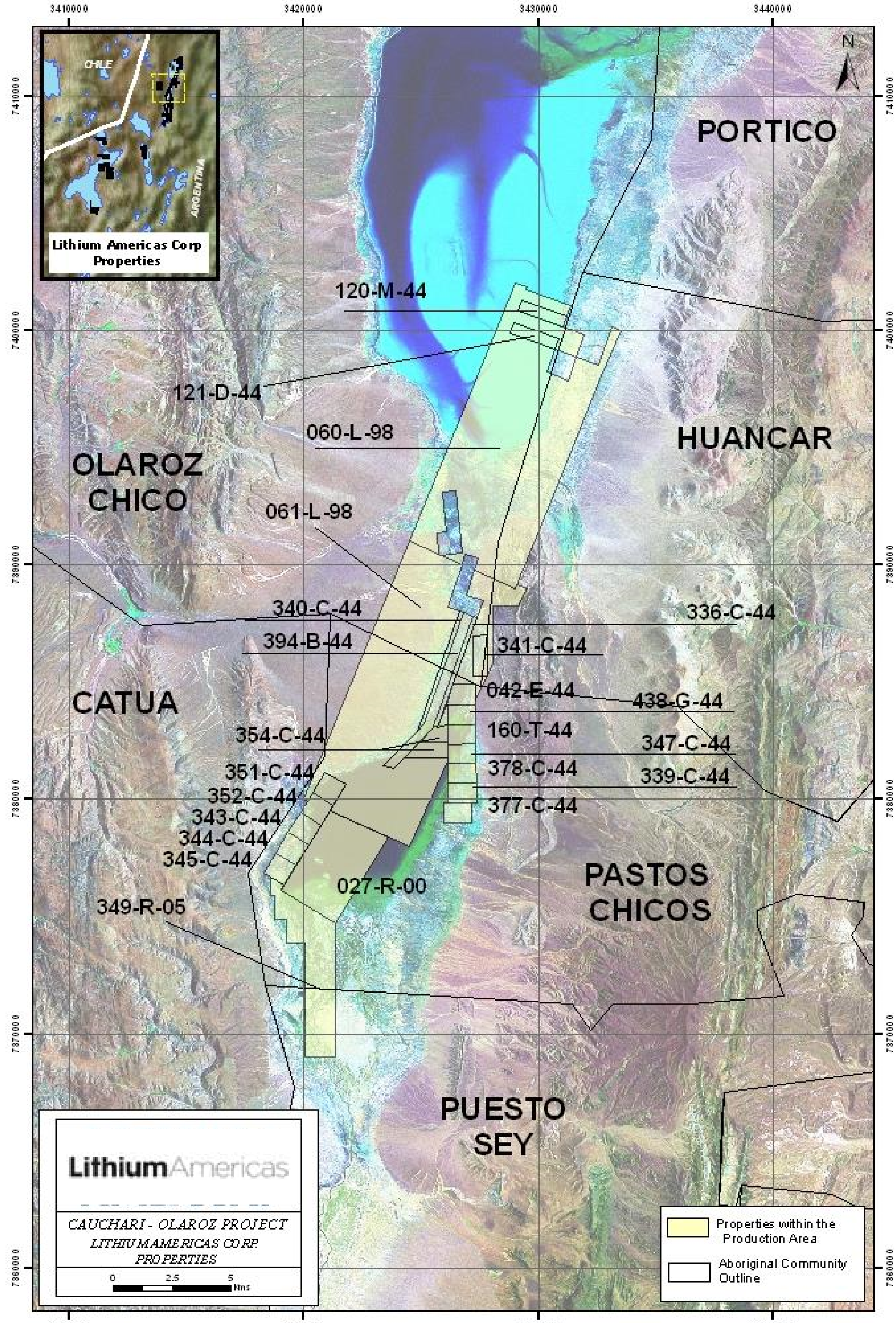
Under Minera Exar's usufruct agreement with Borax Argentina S.A. ("Borax Argentina") signed on May 15th 2011, Minera Exar's acquired Borax Argentina's usufruct rights on properties in the area in exchange for an annual royalty of US$ 200,000 payable in May of each year.

Figure 4.2 LAC Property Claims at the Cauchari-Olaroz Project



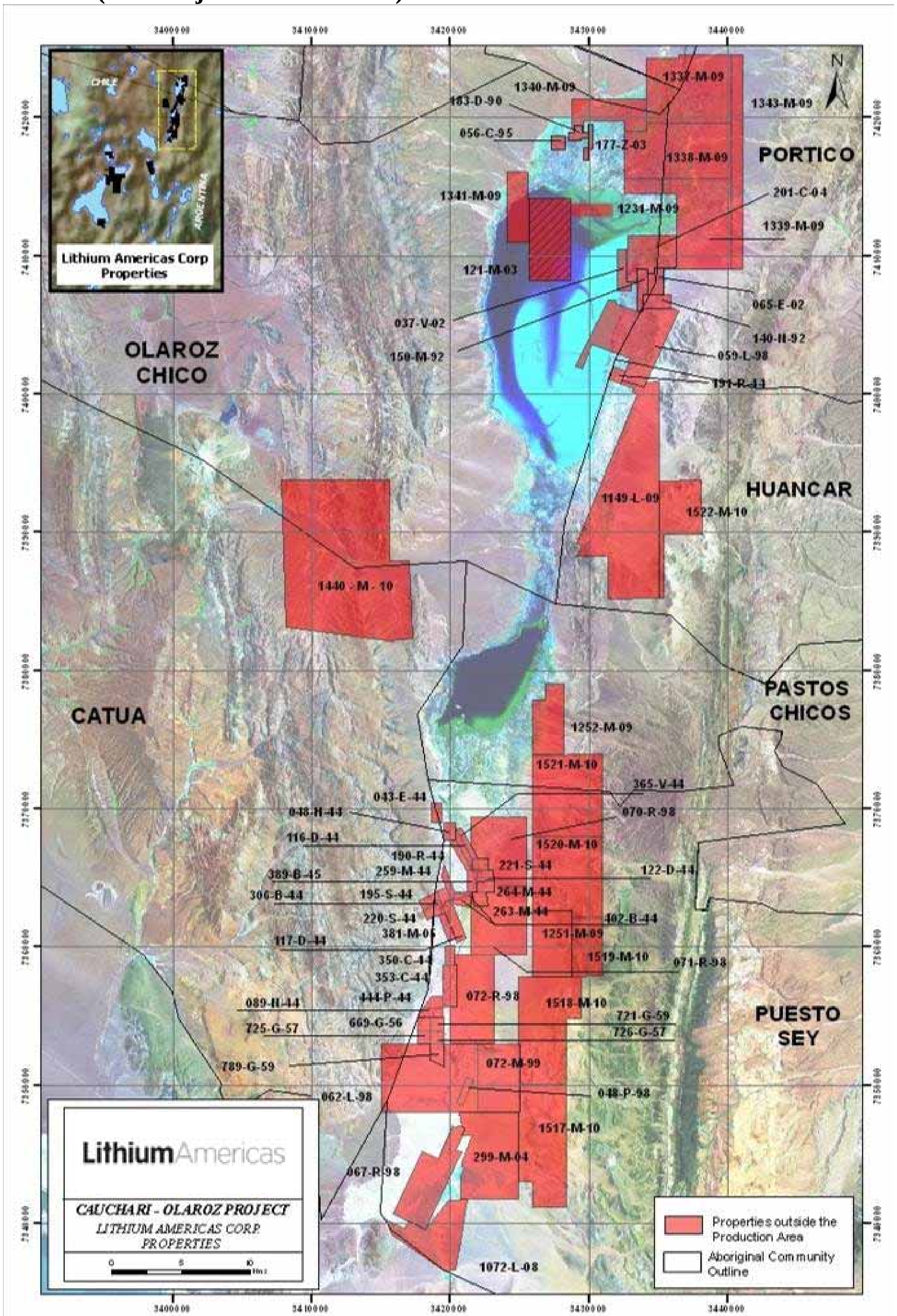
Source: *Minera Exar*

Figure 4.3 LAC Property Claims at the Cauchari-Olaroz Project (Exploitation-Production)



Source: *Minera Exar*

Figure 4.4 Additional LAC Property Claims at the Cauchari-Olaroz Project (Not Subject to Production)



Source: *Minera Exar*

TABLE 4.1 MINERA EXAR S.A. MINERAL CLAIMS SUBJECT TO EXPLOITATION AND PRODUCTION								
Claim	**File**	**Owner**	**Claim**	**Requested**	**Received**	**Aboriginal**	**Contract**	**Status**
Clotilde	121-D-44	Minera Exar S.A.	MP	100	100	Olaroz Chico	Option to Purchase	Opted
Eduardo Daniel	120-M-44	Minera Exar S.A.	MP	100	100	Olaroz Chico	Option to Purchase	Opted
Cauchari Norte	349-R-05	Minera Exar S.A.	EP	998	998	P. Chicos / P. Sey	Option to Purchase	Opted
Delia	42-E-44	Borax Argentina S.A.	MP	100	100	Pastos Chicos	Usufruct Agreement	Opted
Graziella	438-G-44	Borax Argentina S.A.	MP	100	100	Pastos Chicos	Usufruct Agreement	Opted
Montes De Oca	340-C-44	Borax Argentina S.A.	MP	100	99	O. Chico / P. Chicos	Usufruct Agreement	Opted
Luisa	61-L-98	Grupo Minero Los Boros S.A	MP	4,706	3,500	Huancar / O Chico / P. Chicos	Option to Purchase	Opted
Arturo	60-L-98	Grupo Minero Los Boros S.A	MP	5,100	3,500	Huancar / Olaroz Chico	Option to Purchase	Opted
Angelina	59-L-98	Grupo Minero Los Boros S.A	MP	2,346	2,346	O Chico / Portico / Huancar	Option to Purchase	Opted
La Yaveña	27-R-00	Minera Exar S.A.	MP	1,119	1,119	Pastos Chicos	Option to Purchase	Opted
Uno	345-C-44	Borax Argentina S.A.	MP	100	100	Pastos Chicos	Usufruct Agreement	Opted
Tres	343-C-44	Borax Argentina S.A.	MP	100	100	Pastos Chicos	Usufruct Agreement	Opted
Dos	344-C-44	Borax Argentina S.A.	MP	100	100	Pastos Chicos	Usufruct Agreement	Opted
Cuatro	352-C-44	Borax Argentina S.A.	MP	100	100	Pastos Chicos	Usufruct Agreement	Opted
Cinco	351-C-44	Borax Argentina S.A.	MP	100	100	Pastos Chicos	Usufruct Agreement	Opted

TABLE 4.1 MINERA EXAR S.A. MINERAL CLAIMS SUBJECT TO EXPLOITATION AND PRODUCTION								
Claim	**File**	**Owner**	**Claim**	**Requested**	**Received**	**Aboriginal**	**Contract**	**Status**
Zoila	341-C-44	Borax Argentina S.A.	MP	100	100	Olaroz Chico / Huancar	Usufruct Agreement	Opted
Mascota	394-B-44	Borax Argentina S.A.	MP	300	300	O. Chico / P. Chicos	Usufruct Agreement	Opted
Union	336-C-44	Borax Argentina S.A.	MP	300	100	P. Chicos / O. Chico	Usufruct Agreement	Opted
Julia	347-C-44	Borax Argentina S.A.	MP	300	100	Pastos Chicos	Usufruct Agreement	Opted
Saenz Peña	354-C-44	Borax Argentina S.A.	MP	300	100	Pastos Chicos	Usufruct Agreement	Opted
Demasia Saenz Peña	354-C-44	Borax Argentina S.A.	MP	100	59	Pastos Chicos	Usufruct Agreement	Opted
Linda	160-T-44	Borax Argentina S.A.	MP	100	100	Pastos Chicos	Usufruct Agreement	Opted
Maria Teresa	378-C-44	Borax Argentina S.A.	MP	100	100	Pastos Chicos	Usufruct Agreement	Opted
Juancito	339-C-44	Borax Argentina S.A.	MP	100	100	Pastos Chicos	Usufruct Agreement	Opted
Archibald	377-C-44	Borax Argentina S.A.	MP	100	100	Pastos Chicos	Usufruct Agreement	Opted
Total				**17,069**	**13,621**			

TABLE 4.2
MINERA EXAR S.A. MINERAL CLAIMS NOT SUBJECT TO EXPLOITATION

Claim	File	Owner	Claim	Requested	Received	Aboriginal	Contract	Status
Verano I	299-M-04	Luis Austin Cekada and Camilo Alberto Morales	MP	2,488	2,488/2,094	Puesto Sey	Option to Purchase	Opted
San Antonio	72-M-99	Minera Exar S.A.	MP	2,165	900	Puesto Sey	Option to Purchase	Opted
Tito	48-P-98	Minera Exar S.A.	MP	200	100	Puesto Sey	Option to Purchase	Opted
Miguel	381-M-05	Minera Exar S.A.	MP	100	100	Puesto Sey	Option to Purchase	Opted
Chico	1231-M-09	Minera Exar S.A.	MP	300	300	Olaroz Chico	Option to Purchase	Opted
Chico 3 (1)	1251-M-09	Minera Exar S.A.	MP	1,400	1,400	Puesto Sey	Option to Purchase	Opted
Chico 4 (1)	1252-M-09	Minera Exar S.A.	MP	1,100	62	Pastos Chicos	Option to Purchase	Opted
Sulfa 6	70-R-98	Minera Exar S.A.	MP	2,000	1,683	Puesto Sey	Option to Purchase	Opted
Sulfa 7	71-R-98	Minera Exar S.A.	MP	2,000/1,667	1,824	Puesto Sey	Option to Purchase	Opted
Sulfa 8	72-R-98	Minera Exar S.A.	MP	2,000/1,417	1,841	Puesto Sey	Option to Purchase	Opted
Sulfa 9	67-R-98	Minera Exar S.A.	MP	1,336	1,582	Puesto Sey	Option to Purchase	Opted
Becerro de Oro	264-M-44	Minera Exar S.A.	MP	100	100	Puesto Sey	Option to Purchase	Opted
Osiris	263-M-44	Minera Exar S.A.	MP	100	100	Puesto Sey	Option to Purchase	Opted
Alsina	48-H-44	Minera Exar S.A.	MP	100	100	Puesto Sey	Option to Purchase	Opted
Minerva	37-V-02	Minera Exar S.A.	MP	250	229	Olaroz Chico	Option to Purchase	Opted

TABLE 4.2
MINERA EXAR S.A. MINERAL CLAIMS NOT SUBJECT TO EXPLOITATION

Claim	File	Owner	Claim	Requested	Received	Aboriginal	Contract	Status
Irene	140-N-92	Triboro S.A.	MP	200	200	Portico / Olaroz Chico	Option to Purchase	Opted
Jorge	62-L-98	Minera Exar S.A.	MP	2,461	2,351	Catua / P. Sey	Option to Purchase	Opted
Chin Chin Chuli II	201-C-04	Vicente Costa	MP	941	910	Portico / Olaroz Chico	Option to Purchase	Opted
Grupo La Inundada	669-G-56	Minera Exar S.A.	MP	100	100/137	Puesto Sey	Option to Purchase	Opted
Inundada Este	721-G-57	Minera Exar S.A.	MP	100	100	Puesto Sey	Option to Purchase	Opted
Jujuy	725-G-57	Minera Exar S.A.	MP	100	100	Puesto Sey	Option to Purchase	Opted
Inundada Sud	789-G-57	Minera Exar S.A.	MP	100	100	Puesto Sey	Option to Purchase	Opted
Susques	726-G-57	Minera Exar S.A.	MP	100	100	Puesto Sey	Option to Purchase	Opted
Alegria I	1337-M-09	Minera Exar S.A.	MP	3,000	Probably Rejected	Portico	Staked	To be Opted
Alegria 2	1338-M-09	Minera Exar S.A.	MP	3,000	Probably Rejected	El Toro / Portico / O. Chico	Staked	To be Opted
Alegria 3	1339-M-09	Minera Exar S.A.	MP	3,000	Probably Rejected	Portico	Staked	To be Opted
Alegria 4	1340-M-09	Minera Exar S.A.	MP	999	Probably Rejected	Olaroz Chico / El Toro	Staked	To be Opted
Alegria 5	1341-M-09	Minera Exar S.A.	MP	793	Rejected	Olaroz Chico	Staked	To be Opted
Alegria 7	1343-M-09	Minera Exar S.A.	MP	1,277	1,036	Portico	Staked	To be Opted
Cauchari Este	1149-L-09	Minera Exar S.A.	MP	5,860	3,500	Huancar	Staked	Opted
Cauchari Sur (1)	1072-L-08	Minera Exar S.A.	EP	1,599	1,499/612	Puesto Sey	Staked	Opted
Cauchari Oeste	1440-M-10	Minera Exar S.A.	MP	9,751	1,599	Catua / O. Chico	Staked	To be Opted

TABLE 4.2 **MINERA EXAR S.A. MINERAL CLAIMS NOT SUBJECT TO EXPLOITATION**								
Claim	**File**	**Owner**	**Claim**	**Requested**	**Received**	**Aboriginal**	**Contract**	**Status**
Julio A. Roca	444-P-44	Borax Argentina S.A.	MP	100	100	Puesto Sey	Usufruct Agreement	Opted
Elena	353-C-44	Borax Argentina S.A.	MP	300	301	Puesto Sey	Usufruct Agreement	Opted
Emma	350-C-44	Borax Argentina S.A.	MP	100	100	Puesto Sey	Usufruct Agreement	Opted
Uruguay	89-N-44	Borax Argentina S.A.	MP	100	100	Puesto Sey / Catua	Usufruct Agreement	Opted
Avellaneda	365-V-44	Borax Argentina S.A.	MP	100	100	Puesto Sey	Usufruct Agreement	Opted
Buenos Aires	122-D-44	Borax Argentina S.A.	MP	100	100	Puesto Sey	Usufruct Agreement	Opted
Moreno	221-S-44	Borax Argentina S.A.	MP	100	100	Puesto Sey	Usufruct Agreement	Opted
San Nicolas	191-R-44	Borax Argentina S.A.	MP	100	100	Huancar / O. Chico	Usufruct Agreement	Opted
Sarmiento	190-R-44	Borax Argentina S.A.	MP	100	100	Puesto Sey	Usufruct Agreement	Opted
Porvenir	116-D-44	Borax Argentina S.A.	MP	100	100	Puesto Sey	Usufruct Agreement	Opted
Alicia	389-B-44	Borax Argentina S.A.	MP	100	100	Puesto Sey	Usufruct Agreement	Opted
Clarisa Y Demasia Clarisa	402-B-44	Borax Argentina S.A.	MP	119	119	Puesto Sey	Usufruct Agreement	Opted
Ines	220-S-44	Borax Argentina S.A.	MP	100	100	Puesto Sey/Catua	Usufruct Agreement	Opted
Maria Central	43-E-44	Borax Argentina S.A.	MP	100	100	Puesto Sey/Catua	Usufruct Agreement	Opted
Maria Esther	259-M-44	Borax Argentina S.A.	MP	100	100	Puesto Sey	Usufruct Agreement	Opted

TABLE 4.2 **MINERA EXAR S.A. MINERAL CLAIMS NOT SUBJECT TO EXPLOITATION**								
Claim	**File**	**Owner**	**Claim**	**Requested**	**Received**	**Aboriginal**	**Contract**	**Status**
Sahara	117-D-44	Borax Argentina S.A.	MP	300	300	Puesto Sey	Usufruct Agreement	Opted
Paulina	195-S-44	Borax Argentina S.A.	MP	100	100	Puesto Sey/Catua	Usufruct Agreement	Opted
SIBERIA	206-B-44	Borax Argentina S.A.	MP	24	24	Puesto Sey	Usufruct Agreement	Opted
Alegria 6	1342-M-09	Minera Exar S.A.	MP	31	Rejected	Olaroz Chico	Staked	To be Opted
Payo III	1517-M-10	Minera Exar S.A.	MP	2,905	2,890/2,388	Puesto Sey	Option to Purchase	Opted
Payo IV	1518-M-10	Minera Exar S.A.	MP	3,003	2,981	Puesto Sey	Option to Purchase	Opted
Payo V	1519-M-10	Minera Exar S.A.	MP	896	896	Puesto Sey	Option to Purchase	Opted
Payo VI	1520-M-10	Minera Exar S.A.	MP	2,800	2,800	Puesto Sey	Option to Purchase	Opted
Payo VII	1521-M-10	Minera Exar S.A.	MP	2,999	2,999	Puesto Sey / P. Chicos	Option to Purchase	Opted
Payo VIII	1522-M-10	Minera Exar S.A.	MP	1,343	1,343	Huancar	Option to Purchase	Opted
Nelida	56-C-95	Electroquimica El Carmen S.A.	MP	100	100	Olaroz Chico	Usufruct Agreement	Opted
Hekaton	150-M-92	Electroquimica El Carmen S.A.	MP	200	200	Portico / Olaroz Chico	Usufruct Agreement	Opted
Eduardo	183-D-90	Electroquimica El Carmen S.A.	MP	100	100	Olaroz Chico	Usufruct Agreement	Opted
Maria Angela	177-Z-03	Ceballos, Oscar	MP	100	100	Olaroz Chico	Usufruct Agreement	Opted
Victoria I	65-E-02	Electroquimica El Carmen S.A.	MP	300	300	Portico / Olaroz Chico	Usufruct Agreement	Opted
Total				**65,024**	**39,471**			

4.3 SQM JOINT VENTURE

On March 28, 2016, the Company sold a 50% interest in Minera Exar to SQM for US$25M, and the parties executed a Shareholders Agreement that establishes the terms by which the parties plan to develop the Cauchari-Olaroz Project. Following receipt of the contribution, Minera Exar repaid loans and advances from Lithium Americas in the amount of US$15M. The remaining US$10M is for project development costs in the Joint Venture.

The Joint Venture is governed by a Shareholders Agreement which provides for equal representation by the Company and SQM on its Management Committee, unanimous approval by the Company and SQM on budgets and timing of expenditures, the ability of the Company to take its share of any production in kind, and buyout and termination provisions in the event that SQM chooses not to proceed with the project.

4.4 GANFENG JOINT VENTURE

On October 31, 2018, the Company announced the closing of a transaction with Ganfeng Lithium and SQM. Under the transaction Ganfeng Lithium agreed to purchase SQM's interest in the Cauchari-Olaroz project. LAC increased its interest in the Project from 50% to 62.5% with Ganfeng holding the remaining 37.5% interest. Ganfeng Lithium also provided the Company with a $100 million unsecured, limited resource subordinated loan facility to fund its 62.5% share of the project expenditures.

4.4.1 Los Boros Option Agreement

On March 28, 2016, the Joint Venture entered into a purchase option agreement ("Option Agreement") with Grupo Minero Los Boros ("Los Boros") for the transfer of title to the Joint Venture for certain mining properties that comprised a portion of the Cauchari-Olaroz project. Under the terms of the Option Agreement, the Joint Venture paid US$100,000 upon signing and has a right to exercise the purchase option at any time within 30 months for the total consideration of US$12M to be paid in sixty quarterly installments of US$200,000. The first installment becomes due upon occurrence of one of the following two conditions, whichever comes first: third year of the purchase option exercise date or the beginning of commercial exploitation with a minimum production of 20,000 tons of lithium carbonate equivalent. As a security for the transfer of title for the mining properties under the Option Agreement, Los Boros granted to Minera Exar a mortgage for US$12M.

On November 12th, 2018 Minera Exar exercised the purchase option, as a result, the following royalties will have to be paid to Los Boros:

- US$300,000 (the Company's portion was US$187,500) were payed because of the commercial plant construction started (purchase option established payment within 10 days of the commercial plant construction start date); and
- 3% net profit interest (the Company's portion is 1.875%) for 40 years, payable in pesos, annually within the 10 business days after calendar year end.

The Joint Venture can cancel the first 20 years of net profit interest in exchange for a one-time payment of US$7M (the Company's portion is US$4.375M) and the next 20 years for additional US$7M (the Company's portion is US$4.375M).

4.4.2 Borax Argentina S.A. Agreement

Under Minera Exar's usufruct agreement with Borax Argentina S.A. ("Borax Argentina"), on May 19th 2011 Minera Exar acquired its usufruct rights to Borax Argentina's properties in the area. On execution, the agreement requires Minera Exar to pay Borax Argentina an annual royalty of US$200,000 in May of each year.

4.4.3 JEMSE Arrangement

The Joint Venture has granted a right to Jujuy Energia y Mineria Sociedad del Estado ("JEMSE"), a mining investment company owned by the government of Jujuy Province in Argentina, to acquire an 8.5% equity interest in Minera Exar for one US dollar and the provision of management services as required to develop the project. JEMSE will only acquire this equity position upon completion of the project financing. JEMSE will be required to cover its pro rata share of the financing requirements for the construction of the project. These funds will be loaned to JEMSE by the shareholders of Minera Exar and will be repayable out of one-third of the dividends to be received by JEMSE over future years from the project. The distribution of dividends to JEMSE and other shareholders in the project will only commence once all commitments related to the project and debt financing are met. Should this option be executed, the remaining 91.5% of Minera Exar would be split evenly between LAC and GANFENG.

The above-mentioned agreements with private mineral rights owners are independent of, and do not impinge upon the right of the Provincial Government to charge a royalty of up to 3% of the value of the mineral at well head. A summary of royalties and payments is presented in Table 4.3.

TABLE 4.3
ANNUAL ROYALTIES AND PAYMENTS

Royalties	Value
Borax Argentina S.A.	US$200,000
Los Boros	3% Net Profit or $7MM payment every 20 years
Provincial Government of Jujuy	3% Value of Mineral at Well Head
Aboriginal Program Payments	**US$**
2017-2019 Total Payment	**86,500**
2020 – Onwards Annual Payments (estimated)	**245,000**

4.5 TYPE OF MINERAL TENURE

There are two types of mineral tenure in Argentina: Mining Permits and Exploration Permits ("cateos"). Mining Permits are licenses that allow the property holder to exploit the property, provided environmental approval is obtained. Exploration Permits are licenses that allow the property holder to explore the property for a period of time that is proportional to the size of the property (approximately 5 years per 10,000 ha). Exploration Permits also require Environmental Permits. An Exploration Permit can be transformed into a Mining Permit any time before the expiry date of the Exploration Permit by presenting a report and paying canon rent ("canon"). Mining or Exploration can start only after obtaining the environmental impact assessment permit.

Minera Exar acquired its interests in the Cauchari and Olaroz Salars through either direct staking or exploration contracts with third party property owners. This gives Minera Exar the option to make graduated lease payments over a period of time that varies from 12 months to five years, depending on the contract. A final payment would result in one of the following, depending on the arrangement with the owner:

- Full ownership by Minera Exar; or,
- Minera Exar acquires the right to mine the brines from depth through pumping but the vendor retains the right to mine borax from the surface (Usufruct Contracts).

Minera Exar can abandon a contract on any mineral property at any time.

4.6 PROPERTIES ASSIGNED TO PRODUCTION AND EXPLOITATION

Table 4.1 and Figure 4.2 show the mineral properties where the Mineral Resource and Mineral Reserve has been estimated and where the Project will be developed (i.e., areas affected by exploitation). The exploitation area is comprised of 25 granted mineral properties covering a total of 13,621 ha. Figure 4.3 shows the claims assigned to production and exploitation.

4.7 ADDITIONAL PROPERTIES TO THE PROJECT

Table 4.2 and Figure 4.4 show an additional 63 mineral properties that are outside the area of production. These properties cover a total of 65,024 ha. Of these 63 properties requested, a total of 39,471 ha have been granted to date. Only three of these properties are exploration permits (file # 1072-L-08 (612 ha); file # 1440-M-10 (9,751 ha); and file # 349-R-05 (998 ha)); the rest are mining permits.

4.8 PROPERTY BOUNDARIES

The Minera Exar claims follow the north-northeast trend of the Cauchari and Olaroz Salars. Figure 4.2 shows that the boundaries of the claims are irregular in shape (a reflection of the mineral claim law of the Province of Jujuy). All coordinates are recorded in the Gauss Krueger system with the WGS 84 datum. The coordinates of the boundaries of each claim are recorded in a file in the claims department of the Jujuy Provincial Ministry of Mines and are also physically staked on the ground with metallic pegs in concrete pillars. The entire area of exploitation has been surveyed and physically staked.

4.9 ENVIRONMENTAL LIABILITIES

Minera Exar complies with local and national regulations and adheres to high international environmental guidelines. Review of the Cauchari-Olaroz Project indicates a low probability of significant environmental liabilities. Given the low population density in the region and distance from major urban centers, the potential for negative environmental impacts on humans is minimal.

The potential for environmental impacts to local flora is also minimal, since there is negligible vegetation on the surface of the salars. The vegetation in the vicinity of the Cauchari and Olaroz Salars is typical of the high desert environment (altitude: 4,200 m), predominantly xerophytes and halophyte bushes. Other vegetation includes the yareta, copa-copa, and tola bushes as well as some grasses.

The potential impacts to local fauna due to mine development must be managed to ensure they are minimal. Vicuñas are common in the region. The vicuña was traditionally exploited by local inhabitants for its wool. Past unrestricted hunting resulted in near-extinction of the vicuña, which is now protected under a 1972 international agreement signed between Argentina, Chile, Bolivia, Peru, and Ecuador. It has been observed that vicuñas are present on the Archibarca Fan, part of which would be partially affected by Project development. The impact to vicuñas can be minimized by implementing the actions provided in the Project management plan in the EIA (“Estudio de Impacto Ambiental”). An example strategy to minimize development effects on the vicuñas is to leave passage spaces within processing areas, to minimize habitat fragmentation.

With regard to potential development effects on other species in the area, such as ocultos, small lizards, and birds, a primary concern is the danger associated with accidental confinement in the large processing ponds. This potential should be minimized by methods such as: devices to ward animals away from the ponds, rescuing animals that may become entrapped, and relocation of animals to appropriate areas nearby. Minera Exar regularly file information at government authorities over fauna development.

Minera Exar has prepared an inventory of known archaeological sites in the Department of Susques. An archeological survey of the property identifies all findings that will need to be managed in order to minimize any impact from the Project. This information is also filed with the authorities. Additional information is provided in Section 20.1.

4.10 PERMITS

The Provincial Government of Jujuy (Direccion Provincial de Mineria y Recursos Energéticos) approved the Minera Exar Environmental Impacts Report (the “EIA”) for the Cauchari-Olaroz Project exploration work, by Resolution No. 25/09 on August 26, 2009. There must be subsequents updates every two years to accurately reflect the ongoing exploration program, including a 2009 update for AII reports ("Actualización de Impacto Ambiental") incorporating topographic and geophysical studies, opening loan wells and new exploration wells. In addition, there was an AII for the installation of a brine enrichment pilot plant, and in 2011 the renewal of the AII was presented for the exploration stage, specifying all activities undertaken and planned exploration activities for the 2012-2013 period. An addendum to the AII for Exploration was submitted in May 2014 for the installation, implementation and subsequent operation of a Posco lithium phosphate plant which was approved in July 2014 (Resolution No. 011/2014). Further, in June 2015 and June 2016 two separate AII exploration permit addenda were submitted for on-going exploration work (see table below). These remained in the approval process and, in agreement with the authority, were replaced in the approval process by the update of the AII for exploration submitted in February 2017, and was approved for exploration works, by Resolution No. 008/17 on September 19, 2017. The AII and its updates have been presented to accurately reflect the ongoing exploration program and are detailed in Table 4.4.

TABLE 4.4
EXPLORATION PERMITS FOR CAUCHARI-OLAROZ PROJECT EXPLORATION WORK

Report Submitted	Date Presented	Approvals	Observations
Environmental Impacts Report for Exploration		Resolution No. 25/09, August 26, 2009	
Update to Environmental Impacts Report for Exploration	September 2011	Resolution No. 29/2012, November 08, 2012	The various activities carried out from 2009 to 2011 were updated. This consisted of: seismic reflection, SEV, trenches, construction of embankments, auxiliary roads and drilling platforms, drilling of wells, construction of facilities for trials (pilot plant and laboratory), and camp. It also described the exploration works that were to be developed in the following two years (2012, 2013), consisting of geochemical sampling and exploration wells (10 wells were requested)
Addendum to Environmental Impacts Report for Exploration, Posco Pilot Plant	May 2014	Resolution No. 011/2014, July 15, 2014	Installation, implementation and subsequent operation of the POSCO lithium phosphate plant

TABLE 4.4 EXPLORATION PERMITS FOR CAUCHARI-OLAROZ PROJECT EXPLORATION WORK			
Report Submitted	**Date Presented**	**Approvals**	**Observations**
Environmental Impacts Report for Exploration	June 2015	In evaluation by Authority	Operation of the pilot-scale POSCO plant and the continuation of exploration including perforation of brine well field for the trial to test the hydraulic properties of the different aquifers. A drilling plan for the drilling of 49 wells was also presented as well as the update of the 4 wells drilled up to the time of the presentation of the report.
Environmental Impacts Report for Exploration	June 2016	In evaluation by Authority	Presentation of the proposed work to be carried out over the following months: Phase 1: measurement of hydrogeological variables; Phase 2: pond construction and impermeability tests; Phase 3: drilling of deep wells; Phase 4: pilot plant tests and trials.
Update to Environmental Impacts Report (Exploration)	February 2017	In evaluation by Authority	It was agreed with the Authority that the Environmental Impacts Report for exploration (June 2016) would not be evaluated by the Authority and that this latest Environmental Impacts Report (Exploration, February 2017) would replace it.
Update to Environmental Impacts Report for Exploration	February 2017	Resolution No.008/2017, September 19, 2017	Update of the proposed works to be carried out during next years. This consisted of: seismic reflection, SEV, trenches, measurement of hydrogeological variables; pond construction, impermeability tests; drilling of deep wells; pilot plant tests, construction of embankments, auxiliary roads and drilling platforms, drilling of wells, construction of facilities and camp. It also described the exploration works that were to be developed, consisting of geochemical sampling and exploration wells.

An Environmental Impacts Report ("EIA") for the exploitation phase was presented in December 2011 and approved by Resolution No. 29/2012 on 08 November 2012 based on an initial annual production of 20,000 tonnes of lithium carbonate with a second expansion phase to 40,000 tonnes/year.

A report for the update of the permit was submitted in March 2015 based on the same Project description as in the initial 2011 filing, which has yet to be approved by the Authority. A further request was submitted in February 2017 based on updated Project parameters. It was agreed with the Authority that this would replace the March 2015 submission.

The update to the Environmental Impacts Report ("AII") for Exploitation for the Cauchari-Olaroz Project was approved by Resolution No. 010/2017 on 05 October 2017 by the Authority. During the approbation process by the Authority, the permit for exploitation issued in 2012 for the Project was still valid, as ratified by a letter issued by the Gobierno de Jujuy (NOTA SMeH No 043/20179, issued 16 March 2017), which stated that "construction may commence on the necessary infrastructure approved in this permit, without prejudice to future adaptations and updates that the mining operator performs with respect to the mining project, which are subject to the analysis of this authority."

Exploration permits and reports submitted are summarized in Table 4.5.

TABLE 4.5
EXPLOITATION PERMITS FOR CAUCHARI-OLAROZ PROJECT

Report Submitted	Date Presented	Approvals	Observations
Environmental Impacts Report for Exploitation	December 2011	Resolution No. 29/2012, November 08, 2012	Production of 20,000 tonnes/year of lithium carbonate with a second expansion phase to 40,000 tonnes/year
Biannual Environmental Impacts Report for Exploitation	March 2015	In evaluation by Authority	Biannual update of the Environmental Impacts Report approved in 2012, based on exactly the same project approved in 2012
Biannual of Environmental Impacts Report (Exploitation)	February 2017	In evaluation by Authority	It was agreed with the Authority that the Environmental Impacts Report for exploitation (March 2015) would not be evaluated by the Authority and that this latest document (Exploitation, February 2017) would replace it
Approval Biannual Environmental Impacts Report (Exploitation)	February 2017	Resolution No. 010/2017, October 05, 2017	Production of 20,000 tonnes/year of lithium carbonate with a second expansion phase to 40,000 tonnes/year

Minera Exar has also obtained a license for the extraction of groundwater to meet water supply requirements for the exploration program. This license was granted by the provincial water authority (Direccion Provincial de Recursos Hidricos) in Jujuy and is in good standing, with all applicable tariffs paid to date.

4.11 ABORIGINAL COMMUNITIES

The surface rights of the area subject to exploitation are owned by the aboriginal communities of Pastos Chicos (10-23-2011), Olaroz Chico (12-20-2011), Huancar (12-20-2011) and Puesto Sey (12-14-2011), as shown in Figure 4.3. Ownership of the ground that is not currently proposed for exploitation (Figure 4.4) also includes Portico de los Andes and Catua (2-23-2012).

Minera Exar has completed contracts with each aboriginal community to have the right to develop the mine and use local water resources and transit. The arrangements vary between communities, but they all include the following:

- Aggregate payments of approximately US$86,500 per year between 2017-2019;
- When construction begins aggregate payments of approximately US$245,000 per year and beyond during construction;
- When production begins aggregate payments of approximately US$500,000 per year and beyond during production;

- Joint environmental monitoring programs;
- Priority rights for any job for which a person from the community is qualified;
- Training on site to qualify for the job;
- A school of business training in each community to assist in setting up businesses for the provision of services during construction; and
- Individual infrastructure programs in each community.

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

5.1 TOPOGRAPHY

The Cauchari and Olaroz Salars are bounded on the east and west by mountains that range in elevation from 4,600 m to 4,900 m (Figure 5.1). The Cauchari Salar forms an elongated northeast-southwest trending depression extending 55 km in a north-south direction and approximately 6 km to 10 km in an east-west direction. The Olaroz Salar extends 40 km north-south and 10 km to 15 km east-west. The elevation of the floor of the salars ranges from 3,910 m to 3,950 m. There is negligible vegetation on the surface of the salars.

5.2 ACCESS

The main access to the Olaroz and Cauchari Salars from San Salvador de Jujuy is via paved National Highways 9 and 52, as shown in Figure 4.1. The midpoint between the two salars is located along National Highway 52 (Marker KM 192). Paso Jama, a national border crossing between Chile and Argentina (also on National Highway 52) is 100 km west of the Project. These highways carry significant truck traffic, transporting borate products to market from various salars in northern Argentina. Access to the interior of the Olaroz and Cauchari Salars is possible through a gravel road, Highway 70, which skirts the west side of the salars.

5.3 POPULATION

The Town of Susques, (population of 1,611 according to a 2010 census), 45 km east of the Olaroz Salar, is the nearest population centre (Figure 5.1). Further east lies the provincial capital of San Salvador de Jujuy (population of 257,000 according to a 2010 census) and the settlement of Catua (population of 427 according to a 2010 census) to the southwest. Minera Exar intends to hire local employees for the project.

Figure 5.1 Regional Topography and Population Centres Near the Cauchari-Olaroz Project

Source: *Minera Exar*

5.4 CLIMATE

Cold temperatures and low precipitation in winter and warmer temperatures and more precipitation in the summer characterize the desert, Puna climate (Hoffman, 1971) of the Project site. High winds are common throughout the year. The regional climate is dominated by two semi-permanent high-pressure systems. The Pacific anticyclone, which operates mainly in winter, provides dry air to the region, and the Atlantic anticyclone, which brings warm and moist air to the region mainly in the summer. In the summer, when these pressure systems converge on the continent, the South American Continental Low brings moist air to the region that is orographically lifted forming clouds and precipitation.

However, evaporation is much greater than precipitation resulting in a net-deficit water balance. This climate has contributed to the formation of the lithium brines over thousands of years and favours the recovery of lithium through solar evaporation of brine.

It is expected that any mining activity on the property can be conducted year round.

5.4.1 Regional Meteorological Stations

Several regional meteorological stations are located in surrounding communities and provide historical temperature and precipitation records that are used to validate site-collected data and assess the potential long-term variability of climate at the site. The period of record and location of the most representative of these weather conditions are shown in Table 5.1. A map illustrating the location of the stations closest to the project site (Susques, Olacapato and San Antonio de los Cobres) is presented in Figure 7.14.

TABLE 5.1
CLIMATE RECORDS IN NORTHWEST ARGENTINA

Station	Latitude	Longitude	Elevation	Period
Coranzuli	23.03 S	66.40 W	4,100 m	1972/96
Castro Tolay	23.35 S	66.08 W	3,430 m	1972/90
Susques	23.43 S	66.50 W	3,675 m	1972/96
Mina Pan de Azucar	23.62 S	66.03 W	3.690 m	1982/90
Olacapato	24.12 S	66.72 W	3,820 m	1950/90
San Antonio de Los Cobres	24.22 S	66.32 W	3,775 m	1949/90
Salar de Pocitos	24.38 S	67.00 W	3,600 m	1950/90

5.4.2 On-site Meteorological Station

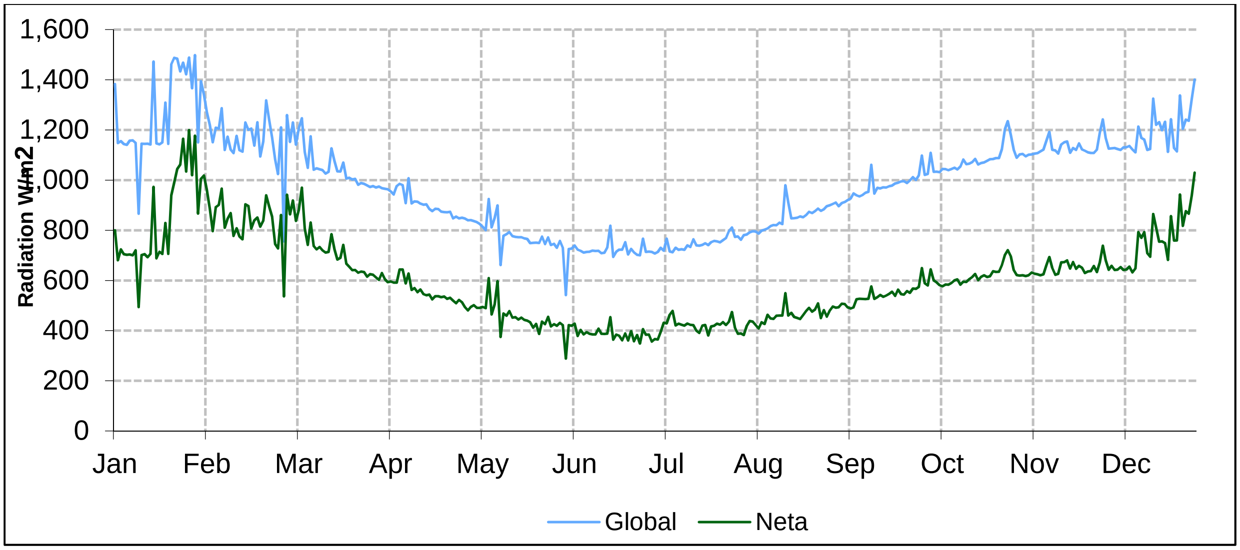
In May 2010, Minera Exar installed a Vaisala-brand automated meteorological station (model MAWS301) adjacent to the site offices on the Cauchari Salar. Parameters include solar radiation, temperature, precipitation, humidity, and wind speed and direction. Data was quality controlled to support the engineering design of the Project.

In 2016, Hatch provided an updated meteorological report summarizing data collected by the on-site meteorological station. The findings of this report are summarized in addition to the information from the previous 2012 technical report (King, et al., 2012) in the following sections.

5.4.2.1 Solar Radiation

Figure 5.2 shows the records of maximum solar radiation (global and direct), recorded between January and December 2011. Incoming solar radiation remains high throughout the year but is strongest between November and March. The maximum global solar radiation lies in the range of between 541.4 and 1,498.5 W/m^2, while the maximum direct solar radiation varies between 288.4 and 1,199.6 W/m^2.

Figure 5.2 Solar Radiation Between January and December 2011, Vaisala Station



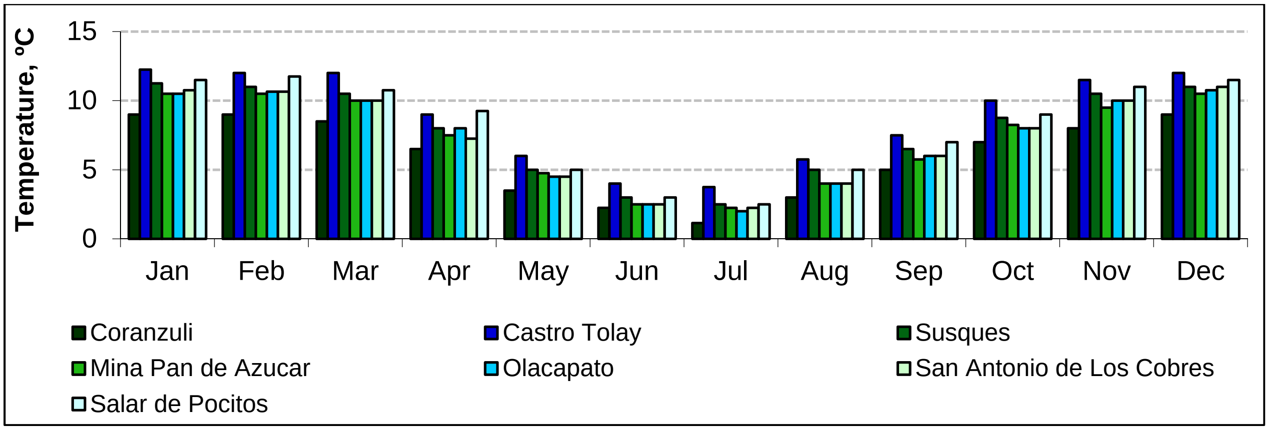
Source: *King, Kelley, Abbey, (2012)*

5.5 TEMPERATURE

Diurnal temperature variations can be as much as 20°C, and is a function of the dry air and high altitude. Seasonal temperature variation is significant, with winter minimum temperatures dropping down to -30°C and summer maximum temperatures reaching to 25°C.

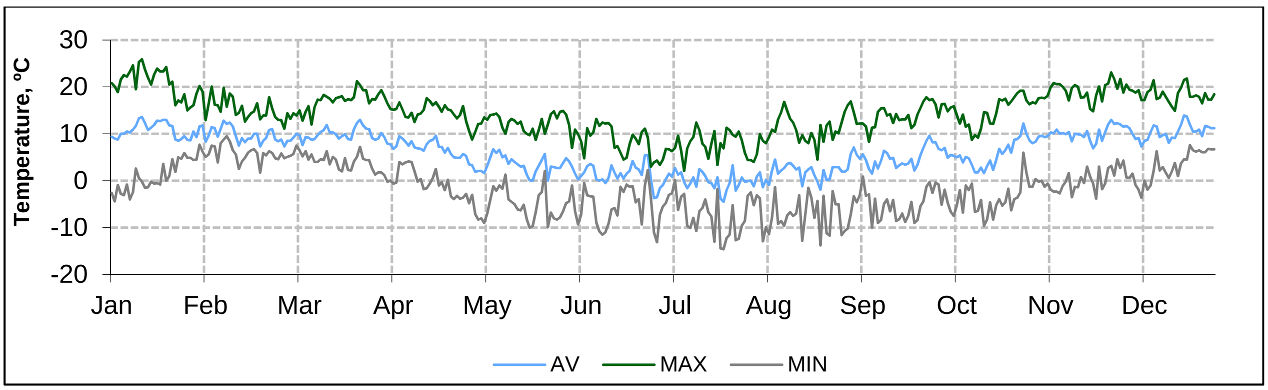
The mean monthly temperatures recorded by the regional meteorological stations is presented in in Figure 5.3. Temperature data collected at site by the Vaisala station in 2011 is presented in Figure 5.4.

Figure 5.3 Mean Monthly Temperature Recorded by Regional Meteorological Stations



Source: *King, Kelley, Abbey, (2012).*

Figure 5.4 Daily Temperature, Vaisala Station, Cauchari, 2011



Source: *King, Kelley, Abbey, (2012).*

The temperature record provided by the Vaisala weather station compares well to the data collected by the regional meteorological stations. The average diurnal temperature range during the period from January to December 2011 was 17.7°C. Extreme temperatures during this period had a maximum of 25.9°C (January 11, 2011) and a minimum of -14.6°C (July 22, 2011). The average temperature during this period was 6.3°C. Table 5.2 shows average temperatures, the absolute minimum temperatures and the absolute maximum temperatures.

TABLE 5.2
TEMPERATURE DATA

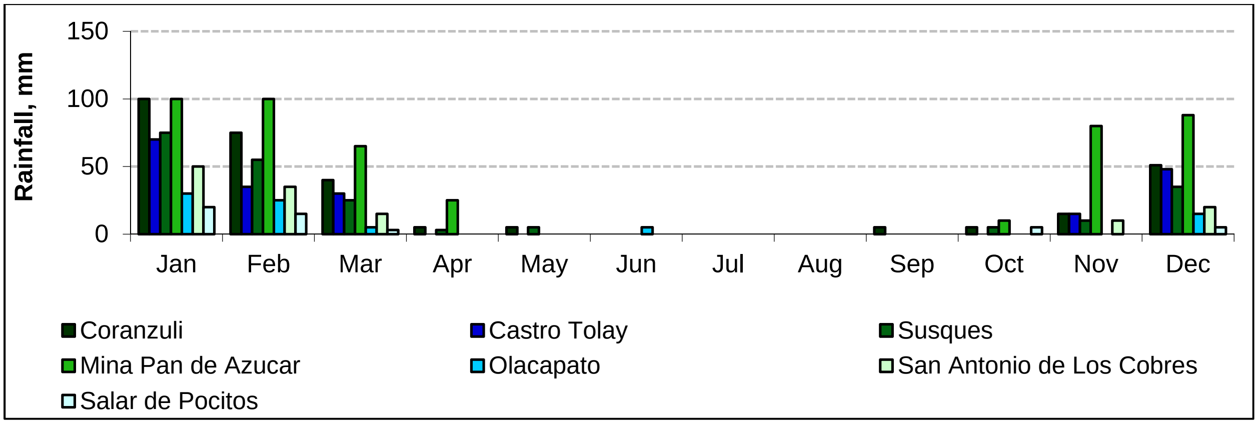
Temperature (°C)	2012 Feasibility Study	Vaisala Station (2011-2016)
Average	6.3	6.4
Absolute Minimum	-14.6	-18
Absolute Maximum	25.9	25.9

5.6 PRECIPITATION

The wet season occurs between December and March when the South American Continental Low brings hot and humid air from the jungles of the Amazon, resulting in convective cloud development and rainfall. Very little precipitation occurs between May and October.

Rainfall data collected by the Vaisala meteorological station is presented in Table 5.3. Regional rainfall data are shown in Figure 5.5.

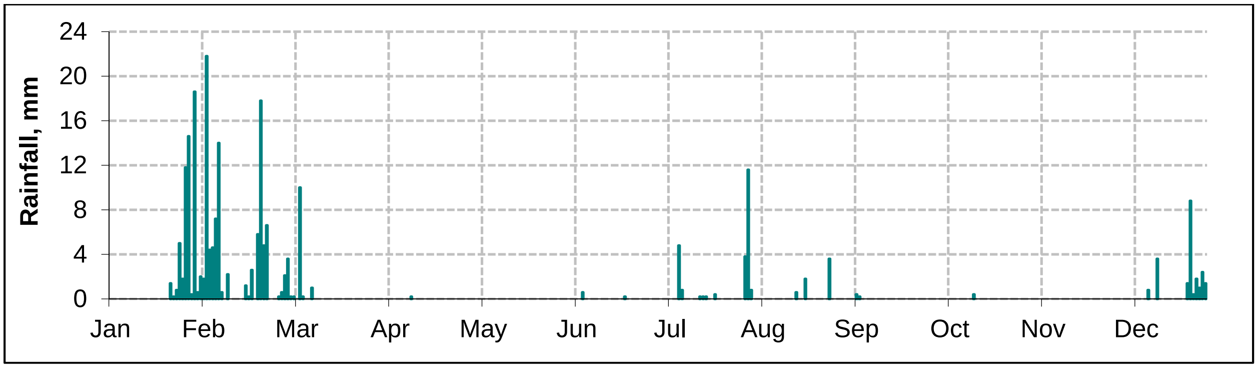
Figure 5.5 Average Monthly Rainfall Recorded by Regional Meteorological Stations Near the Cauchari- Olaroz Salars



Source: *King, Kelley, Abbey, (2012).*

The rainfall data collected by the Vaisala weather station during 2011 (Figure 5.6) shows a wet winter and summer, which is a result of a strong El Niño Southern Oscillation (Houston, 2006a) that began in May 2010 and persisted throughout 2011.

Figure 5.6 Rainfall Data Collected at the Cauchari Salar, 2011

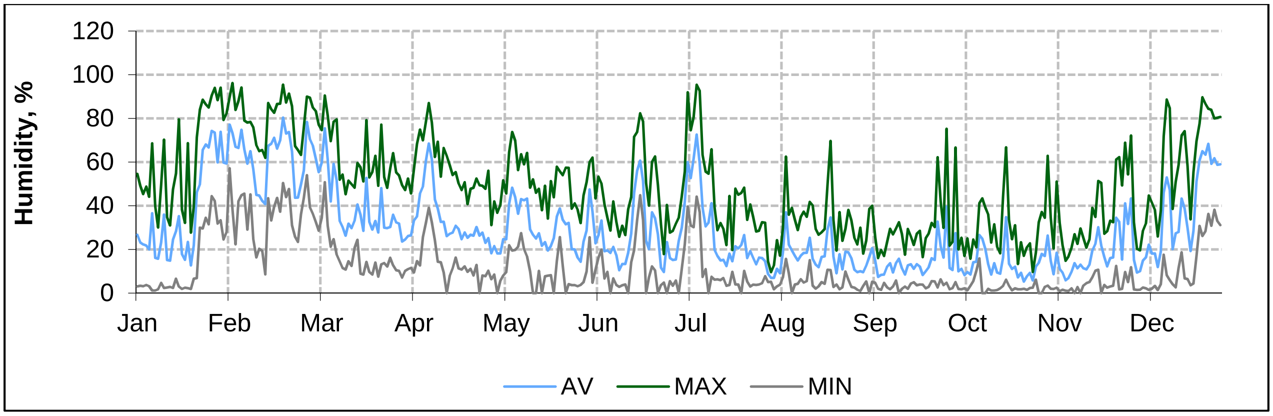


Source: *King, Kelley, Abbey, (2012).*

5.7 HUMIDITY

The air at the Cauchari salar is extremely dry for most of the year. However, humidity between November and March increases due to the incursion of the South American Continental Low, as described above. The humidity record collected at the project site is presented in Figure 5.7. The average humidity for the period of record between 2011 and 2016 is 26.1%.

Figure 5.7 Daily Humidity Collected at Cauchari Salar, 2011

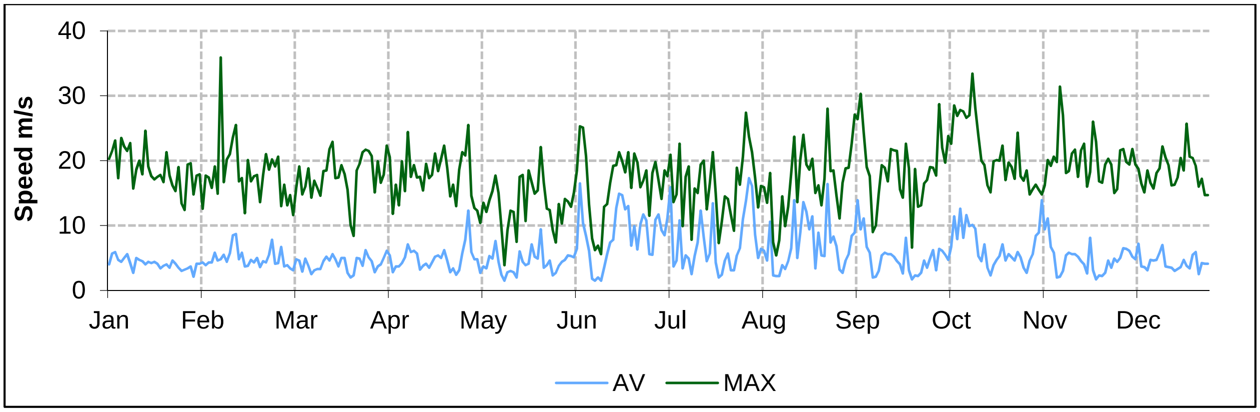


Source: *King, Kelley, Abbey, (2012).*

5.8 WINDS

The Cauchari-Olaroz area is characterized by high winds throughout the year. The Puna desert is typically dominated by a low-level jet stream, which arises as a secondary branch of the subtropical jet stream that is generated as a result of the horizontal surface and intertropical convergence of trade winds (Hadley, Holton, 2004). This process forces air molecules to higher levels of the atmosphere. The air transported to the upper atmosphere eventually descends at great speed, causing high velocity wind speeds near surface. The intensities of these low flows, which can reach speeds of 35.9 m/s (129 km/h), are often observed in the salt flats of Olaroz and Cauchari (Figure 5.8). Table 5.3 shows a comparison of average and maximum wind speeds recorded at the Project site.

Figure 5.8 Daily Intensity of Winds, Vaisala Station, Cauchari, 2011



Source: *King, Kelley, Abbey, (2012).*

TABLE 5.3 WIND SPEED DATA AT CAUCHARI SALAR IN M/S		
Wind Speed	**2012 Feasibility Study (2011 data)**	**Updated Data (2011-2016)**
Average	5.5	5.5
Maximum	35.9	43.2

5.9 EVAPORATION

Evaporation at the Project site was measured directly using evaporation pans and estimated mathematically using surrogate meteorological parameters. Calculated evaporation data was used to validate the direct evaporation pan measurements. In general, there was good correlation between measured and calculated evaporation. Nevertheless, the more conservative calculated evaporation rate is used for design purposes.

5.9.1 Evaporation Pan Measurements

Two cylindrical tanks (type Class A pan evaporimeters as per WMO No. 168, 1994) were installed at the Pilot Plant in the Cauchari salar and direct measurements of evaporation of water and brine were conducted on a daily time step by qualified personnel. Average water evaporation was 8.4 mm/day, or 3,060 mm/yr. Average brine evaporation was 5.6 mm/day or 2,040 mm/yr.

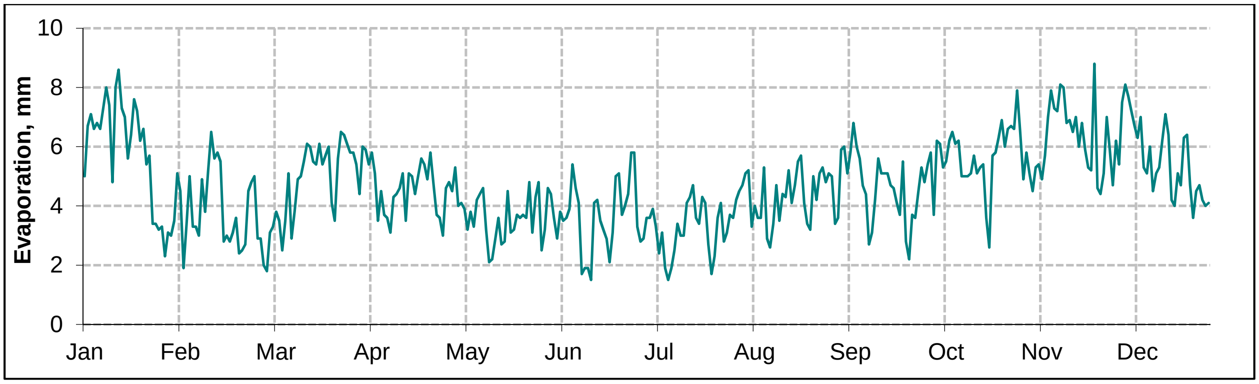
To account for the relatively short period of record of one year, factors were applied to water and brine evaporation data, resulting in an average evaporation rate for water of 7 mm/day, (2,554 mm/yr) and 3.5 mm/day for brine (1,273 mm/yr).

5.9.2 Calculated Evaporation Using Site-Collected Parameters

Monitoring of evaporation from pans is complex to perform in the Puna desert because the water in the pans is subject to freezing during the night, which can introduce error (WMO, 1971). Therefore, to validate the evaporation pan data, evaporation was calculated using surrogate meteorological parameters collected at the Vaisala station installed on the Cauchari Salar. The dominating processes controlling evaporation (and considered in the equation) are solar radiation, humidity, wind speed and temperature.

The daily calculated record of evaporation for 2011 are shown in Figure 5.9.

Figure 5.9 Daily Calculated Evaporation at the Cauchari Salar, 2011



Source: *King, Kelley, Abbey, (2012).*

5.9.3 Calculated Evaporation Using Regional Downscaled Evaporation Data

In December of 2015, Hatch (Morales, et al. 2015) conducted a statistical analysis to estimate the rate of evaporation for brine from a Class A type pan at Cauchari-Olaroz using evaporation data obtained by the General Directorate of Water ("DGA") in Chile. An estimation of the evaporation rate was made by accounting for the Project elevation and using a 3rd order polynomial fit of the data. The calculated monthly and annual average is presented in Table 5.4.

TABLE 5.4
AVERAGE THEORETICAL MONTHLY EVAPORATION FOR CAUCHARI SALAR

Month	Average Evaporation (mm/day)	Variation from Annual Average (%)
January	6.7	19.9
February	6.2	11.6
March	6.0	8.2
April	5.4	-3.6
May	4.3	-21.8
June	3.3	-40.4
July	3.6	-35.7
August	4.0	-28.6
September	5.2	-6.7
October	6.7	21
November	7.7	39.5
December	7.6	36.7
Annual Average	**5.6**	

Using this technique, the average evaporation rate of fresh water was estimated to be 5.6 mm/day. A correction factor of 0.8 was applied to transpose the pan evaporation data to pond evaporation (pans evaporate more water relative to ponds), providing a value of 4.48 mm/day. A second correction factor of 0.6 was then applied to transpose fresh water evaporation to brine evaporation (brines evaporate more slowly than fresh water), providing a value of 2.52 mm/day, which is the rate of brine evaporation used to design the pond capacity and surface area.

Table 5.5 shows a comparison of evaporation data.

TABLE 5.5
EVAPORATION DATA (MM/DAY)

Type	Factored Evaporation Pan	Calculated Using Vaisala Station Data (2011-2016)	Hatch Evaporation Study[1]
Water	7	8	4.48
Brine	3.5	N/A	2.52 (used for engineering design)

(1) Morales, et al., 2015.

5.10 METEOROLOGY SUMMARY

A summary of the meteorological data collected at the Vaisala meteorological station located in the Cauchari salar between January and December 2011 is presented in Table 5.6.

TABLE 5.6 SUMMARY OF METEOROLOGICAL DATA COLLECTED AT CAUCHARI SALAR, 2011												
Month	**Temperature (°C)**			**Humidity (%)**			**Pressure (hPa)**	**Wind, (m/s)**		**Solar Radiation (W/m^2)**		**Precipitation (mm)**
	Av	**Max**	**Min**	**Av**	**Max**	**Min**		**Av**	**Max**	**Global Max**	**Net Max**	
Jan	10.8	25.9	-4.4	37.0	94.1	1.2	637.6	4.1	24.6	1,498.5	1,199.6	57.2
Feb	9.7	20.1	1.7	62.7	96.2	8.6	638.6	5.0	35.9	1,318.1	966.4	98.3
Mar	9.9	21.2	1.3	40.7	90.5	7.1	638.4	4.0	22.9	1,246.3	969.7	15.2
Apr	7.0	18.0	-4.8	33.3	87.1	-	639.1	4.9	25.5	1,007.7	643.5	0.2
May	3.4	14.9	-10.0	28.8	73.8	-	639.9	4.3	22.1	924.6	609.3	-
Jun	1.6	13.2	-13.1	26.9	82.4	-	638.1	7.8	25.3	818.1	453.6	0.8
Jul	-0.1	12.4	-14.6	28.2	95.4	-	637.7	7.2	27.4	811.4	478.5	10.4
Aug	1.6	16.8	-13.8	16.7	69.7	-	638.3	7.7	28.0	979.7	549.1	18.4
Sep	4.9	17.8	-10.2	14.3	75.3	-	639.7	5.2	30.3	1,098.2	649.5	0.6
Oct	5.7	19.2	-9.6	13.2	66.8	-	637.6	6.4	33.4	1,235.2	721.0	0.4
Nov	9.9	23.1	-3.8	17.7	68.9	-	638.3	5.2	31.4	1,242.1	738.4	-
Dec	10.5	21.8	-3.6	36.4	89.7	1.4	638.4	4.6	25.7	1,400.4	1,030.1	21.6
Year Value	6.2	25.9	-14.6	29.7	96.2	0.0	638.5	5.5	35.9	1,498.5	1,199.6	223.1

Note: *av = average.*

5.11 EXISTING INFRASTRUCTURE

National Highway 52, a paved, well-maintained highway, passes through the Property. A high-pressure natural gas pipeline is located 52 km south of the Project. An existing 345 kV transmission line is located approximately 60 km south of the Project. Currently a 300 MW solar powered plant, which will be linked to the Argentine Interconnection System ("SADI"), is under construction and expected to be commissioned during second half 2019.

Facilities at the site include a construction camp (capacity for 554 persons), modular offices for operation and project management activities to support the activities of hydrogeology, drilling, site management, health and safety, the pilot plant, maintenance, human resources and community relations, amongst others. Additionally, a storage building (720 m^2 covered area), contractors' facilities, a pilot plant and laboratory. The aforementioned facilities have water supply, a site generated power supply and an effluents treatment plant. Several production wells are operative and others under construction together with the roads and platforms to move around the different areas of the property and project as well as internal roads and platforms to develop the in-progress production wells. Two solar evaporation ponds were completed that are part of the project and are fed by seven (7) production wells.

6.0 HISTORY

Historically, Rio Tinto has mined borates on the western side of the Cauchari salar, at Yacimiento de Borato El Porvenir. Grupo Minero Los Boros S.A. mines a few thousand tonnes per year of ulexite on the east side of the Olaroz Salar. No other mining activity (including lithium production) has been recorded at the properties comprising the Cauchari-Olaroz Project. LAC acquired Mining and Exploration Permits across the Cauchari and Olaroz Salars during 2009 and 2010. The Company completed a resource exploration program in 2009 and 2010 targeting both lithium and potassium.

In 2010, the Company filed a Measured, Indicated and Inferred Resource report for both lithium and potassium (King, 2010b). An amended Inferred Resource report was filed later that year (King, 2010a). In 2012, the Company filed a NI 43-101 complaint feasibility study that presented a Mineral Resource and Mineral Reserve Estimate, proposed processing technology, environmental and permitting assessment, costing and economic analysis. In 2017, LAC filed a NI 43-101 compliant Feasibility Study, which is summarized in Section 15 of this Report. For reference purposes, the 2012 Mineral Resourece Estimate is provided in Table 6.1. All past Mineral Resource Estimates are superseded by the Mineral Resource Estimate presented in Section 14 of this Report.

TABLE 6.1
LITHIUM MINERAL RESOURCE SUMMARY

Classification	Average Lithium Concentration (mg/L)	Mass Cumulated[1] (cut-off 354 mg/L)		Brine Volume (m^3)
		Li (tonne)	Li_2CO_3 (tonne)	
2012 Measured Mineral Resource	630	576,000	3,039,000	9.1×10^8
2012 Indicated Mineral Resource	570	1,650,000	8,713,000	2.9×10^9
Total	**585**	**2,226,000**	**11,752,000**	$\mathbf{3.8 \times 10^8}$

Note:

1. *The 2012 Mineral Resources are expressed relative to a lithium grade cut-off of ≥ 354 mg/L, which was identified as a brine processing constraint by LAC engineers.*
2. *Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resource will be converted to Mineral Reserves.*
3. *Lithium carbonate equivalent ("LCE") is calculated based the following conversion factor: Mass of LCE = 5.323 x Mass of lithium metal.*
4. *The values in the columns on Lithium Metal and Lithium Carbonate Equivalent above are expressed as total contained metals within the relevant cut-off grade.*

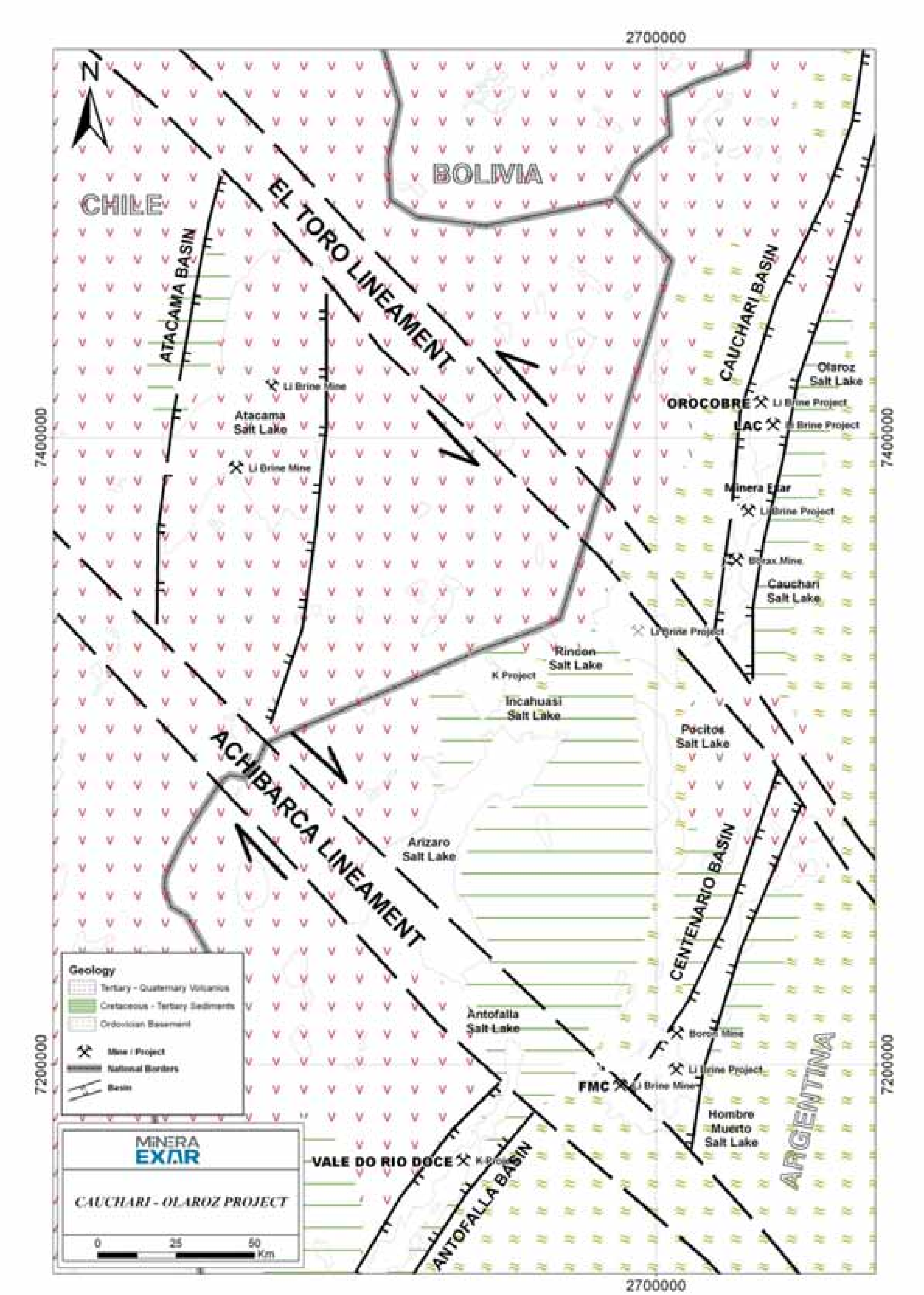
7.0 GEOLOGICAL SETTING AND MINERALIZATION

7.1 REGIONAL STRUCTURAL FEATURES

There are two dominant structural features in the region: north-south trending, high-angle normal faults and northwest-southeast trending lineaments. The high-angle north-south trending faults form narrow and deep horst-and-graben basin systems (Figure 7.1). These basins have formed primarily in the eastern and central sectors of the Puna Plateau, through compressional Miocene-age orogeny (Helvaci and Alonso, 2000),and have been accumulation sites for numerous salars, including Olaroz and Cauchari.

The northwest-southeast trending lineaments cause displacement of the horst-and-graben basins. The El Toro Lineament and the Archibarca Lineament occur in the vicinity of the LAC Project. The Cauchari Basin, which contains the Olaroz and Cauchari Salars, is located north of the El Toro Lineament in the northeast of the Figure 7.1 map area. Between the El Toro and Archibarca Lineaments, the basin is displaced to the southeast and is known as the Centenario Basin. South of the Archibarca Lineament, the basin is displaced to the northwest and is known as the Antofalla Basin. Collectively, these three displaced basin segments contain a lithium brine mine (in Salar Hombre Muerto) and several lithium brine exploration projects (Figure 7.1). Two additional lithium brine mines are located in the Atacama Basin, approximately 150 km west of the Cauchari Basin, between the El Toro and Archibarca Lineaments.

Figure 7.1 Regional Geology in the Vicinity of the LAC Project



Source: *Minera Exar.*

7.2 REGIONAL GEOLOGY

The regional geology of the Olaroz and Cauchari Salars is shown in Figure 7.1. The basement rock in this area is composed of Lower Ordovician turbidites (shale and sandstone) intruded by Late Ordovician granitoids. It is exposed to the east, west, and south of the two salars, and generally along the eastern boundary of the Puna Region.

Throughout the Puna Region, a wide range of rock types unconformably overlies the basement rock. In most of the Chilean and Argentina-Chile border area of the region, the basement rock is overlain by Tertiary-Quaternary volcanics, including ignimbritic tuffs covered by andesites (six to three million years) and recent basaltic flows (0.8 - 0.1 million years) ranging up to several tens of metres in thickness. In some areas, including to the south and east of the Project area, the basement rock is overlain by Cretaceous-Tertiary continental and marine sedimentary rocks such as conglomerates, sandstones, and siltstones, as well as tuffs and oolitic limestones.

Salars formed in the basins of the Puna region have thick layers of Pleistocene halite beds. Jordan et al. (2002) studied the Atacama Salar in Chile and found high rates of sedimentation and accumulation for halite and clastic material (around 0.6 m/ka). If a similar sedimentation rate is assumed for the 400 to 500 m of evaporites and clastics in the Cauchari and Olaroz Salars, then accumulation began in the Pleistocene-Holocene.

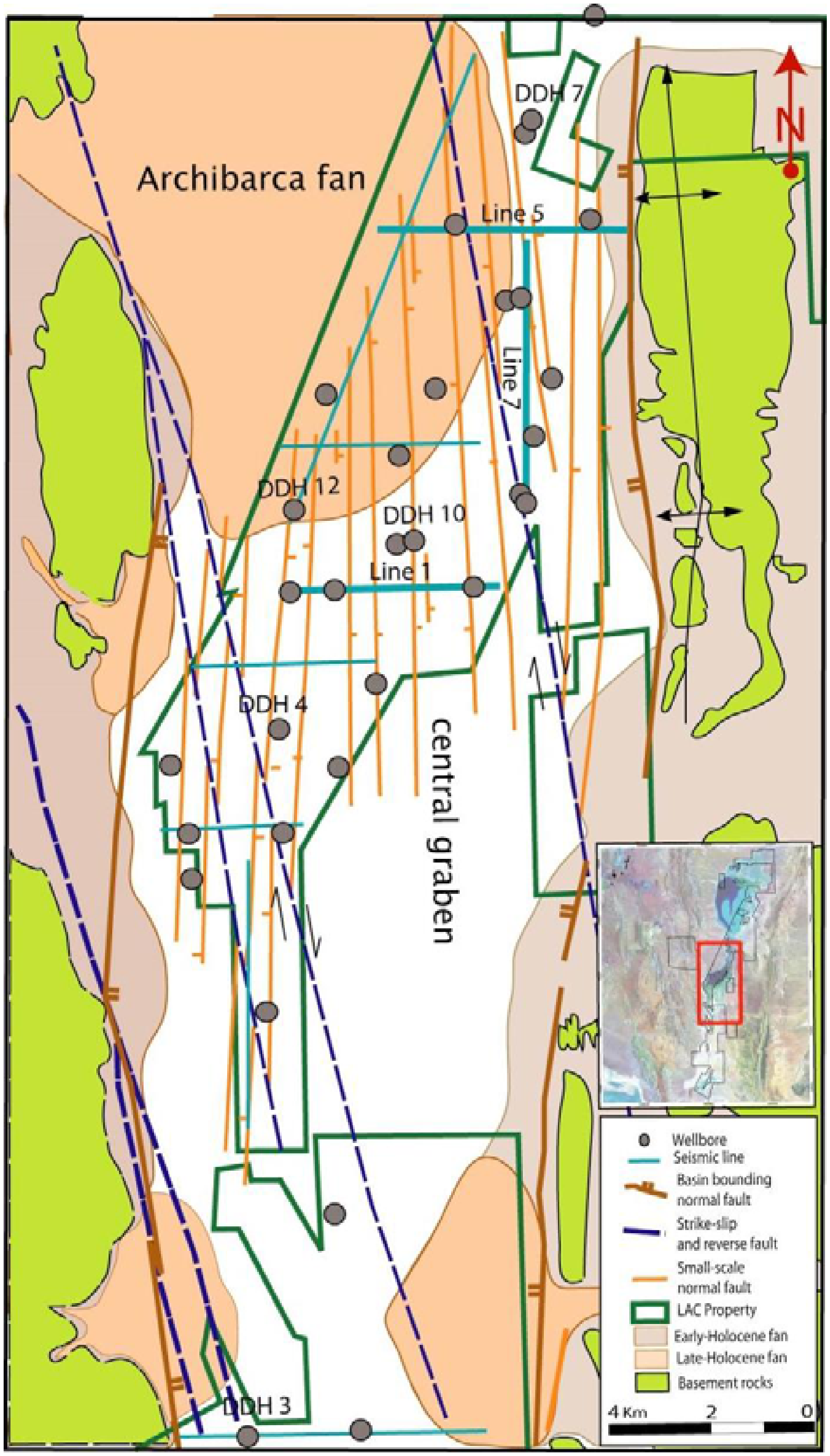
7.3 GEOLOGY OF THE OLAROZ AND CAUCHARI SALARS

7.3.1 Salar Structural Setting

Figure 7.2 shows structural features in the central area of the Cauchari Basin (northern area of the Cauchari Salar), which is the focus of this Mineral Reserve Estimate. These features are interpreted from the seismic lines and boreholes shown in the figure.

Several small-scale, north-south trending, normal faults occur within the Cauchari Salar, between the basin border normal faults. These intra-salar features form a series of small-scale horst-and-graben domains within the larger horst-and-graben basin formed by the basin border normal faults. Cutting across the salar basin is a series of out-of-sequence, south-southeast trending, reverse faults that have a strong right-lateral component in the LAC Project area. These reverse faults are likely related to displacement along the El Toro Lineament.

Figure 7.2 Structural Features in the Central Area of the Cauchari Basin



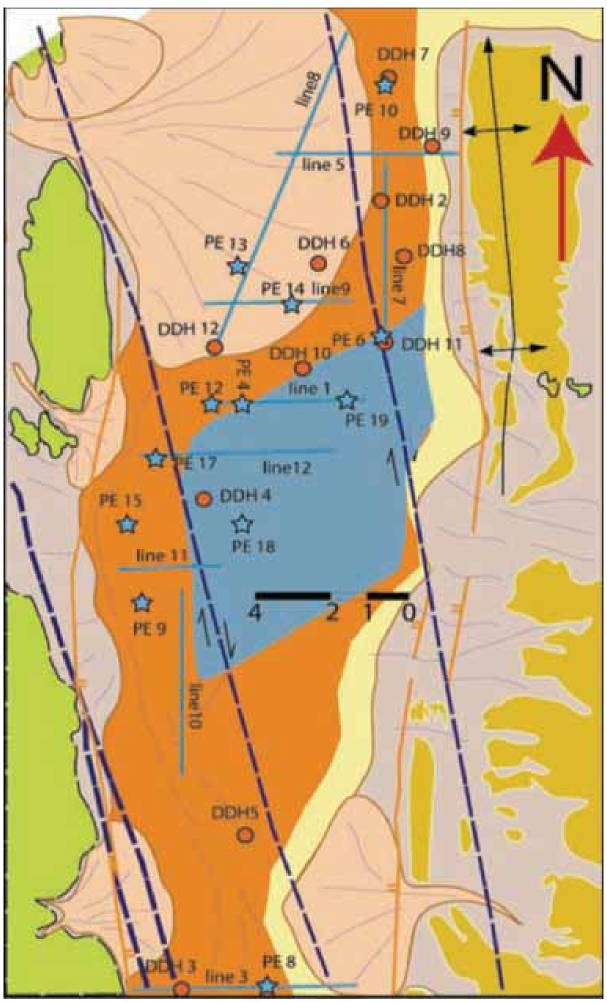
Source: *King, Kelley, Abbey, (2012).*

7.4 SALAR SURFACE SEDIMENTS AND MINERALIZATION

The surface distribution of alluvium, salar sediments, and basement rock in the central zone of the Cauchari Basin is shown in Figure 7.3. This zone is shown because it is the focus of the Mineral Reserve Estimate (Section 15). Flat-lying salar deposits occur throughout the salars, at the lowest ground surface elevation in the basin. Alluvial deposits intrude into these salar deposits to varying degrees, depending on location. The alluvium surface slopes upward from the salar surface and extends outside the basin perimeter. Raised bedrock exposures also occur outside the salar basin.

The most extensive intrusion of alluvium into the basin occurs on the Archibarca Fan (Figure 7.2), which partially separates the Olaroz and Cauchari Salars. Route 52 is constructed across this alluvial fan (Figure 7.4). The Archibarca Fan developed during the late-Holocene. In addition to this major fan, much of the perimeter zone of both salars exhibits encroachments of alluvial material forming fans of varying sizes. Alluvium deposition is interpreted to range from early- to late-Holocene.

Figure 7.3 Surficial Geology in the Central Area of the Cauchari Basin



	Recent sediments (mainly salted muds with a halite rough polygon crust)
	Mud flat with borates and gypsum
	Young alluvial fans
	Old bahadas and alluvial fans
	Cenozoic volcanics and pyroclastic rocks
	Ordovician thin bedded fine sands and shales

Source: *King, Kelley, Abbey, (2012).*

Figure 7.4 Boundary Between the Cauchari and Olaroz Salars

Source: *King, Kelley, Abbey, (2012).*

A range of dominant sediment types and characteristic mineral assemblages are found across the surface of the Olaroz and Cauchari Salars. In the Olaroz Salar and the southern part of the Cauchari Salar, particularly in marginally-elevated areas, buff clays occur, interlayered with dirty calcite travertine sand with irregular calcite cementation produced mainly by hydrothermal activity (calcareous sinters). Ulexite concretions with or without gypsum and mirabilite are occasionally associated with the carbonate deposits.

Borax is common throughout both salars. It occurs as small rounded concretions in red and brown clays along a narrow and discontinuous strip on the western border of Cauchari Salar and in the eastern and central area of Olaroz Salar. In some areas of central Olaroz Salar, surficial borax alters to form evaporitic ulexite. When this mineral occurs in significant concentrations it forms large ulexite concretions or “papas” that expand the associated black or red clays, creating a hummocky surface. In the subsurface, borax commonly occurs as concretions and as an in-filling of corrosion holes in halite. In some locations, borax has been replaced by ulexite and/or tincal.

Gypsum is the primary sulphate mineral in the surficial muds and the crystals commonly have a small bladed habit. In some locations, mirabilite and trona are associated with the gypsum-bearing layers. Trona is more abundant in the Cauchari Salar, although neither salar is known to contain exploitable amounts.

Halite occurs throughout the surface of both salars, but is more dominant on the Olaroz Salar where a well-formed, polygonal-cracked, salt hardpan is present (Figure 7.5). In contrast, the surface layer across much of the Cauchari Salar consists of a thin, red silt / halite, polygonal-cracked crust over brine-saturated red plastic silt (Figure 7.6).

Figure 7.5 Halite Polygons on the Olaroz Salar

Source: *King, Kelley, Abbey, (2012).*

Figure 7.6 Red Silt Crust on the Surface of the Cauchari Salar

Source: *King, Kelley, Abbey, (2012).*

Distinctive accessory minerals occur within the red surface silt of the Cauchari Salar. Gypsum and minor glaserite are the main accessory phases in the southern area of the salar. In the central area, halite is a primary accessory mineral and gypsum is secondary. Ulexite, mirabilite, and trona are the primary accessory phases in the northern area of Cauchari.

In the zone where the recent alluvial fans merge with the salar sediments, the salar sediments often exhibit evidence of biological activity (bioturbation and rootlets) and are typically devoid of borate concretions and gypsum.

7.5 SALAR LITHOSTRATIGRAPHIC UNITS

The following five informal lithological units are interpreted from the drill core:

- Unit 1. Red silts with minor clay and sand;
- Unit 2. Banded halite beds with clay, silt, and minor sand;
- Unit 3. Fine sands with minor silt and salt beds;
- Unit 4. Massive halite and banded halite beds with minor sand; and
- Unit 5. Medium and fine sands.

Figure 7.7 illustrates an example of correlation between these lithological units. The lithological units were correlated using the tuff horizons shown in the figure, and the contact between the recent silts and the upper salt beds. These units are described briefly in the following sections.

7.5.1 Unit 1 – Red Silts with Minor Clay and Sand

This unit consists of layers of massive red to grayish-brown silt with some clay, alternating with layers of fine sand with minor clay and medium to coarse sands, and trace gravel. At the surface, this unit exhibits mud cracks, as well as bioturbation and mottled structures with organic matter. At depth, the silt layers contain phreatic carbonate concretions, mottled structures, bioturbation, and occasional gypsum crystals. These layers are relatively thin, typically ranging from less than one metre up to four metres.

Borate concretions often occur throughout this unit. Halite crystals occur at some locations (for example in DDH4 and DDH10) but are absent in others (DDH12). X-ray diffraction ("XRD") analysis of the clays in this unit (Cravero, 2009a and 2009b) shows that they are predominantly illite with minor kaolinite, smectite, and chlorite. Glass shards and magnetite are also present, indicating that the dominant source for this unit is the Ordovician volcanic basement rocks.

7.5.2 Unit 2 – Banded Halite Beds with Clay, Silt and Minor Sand

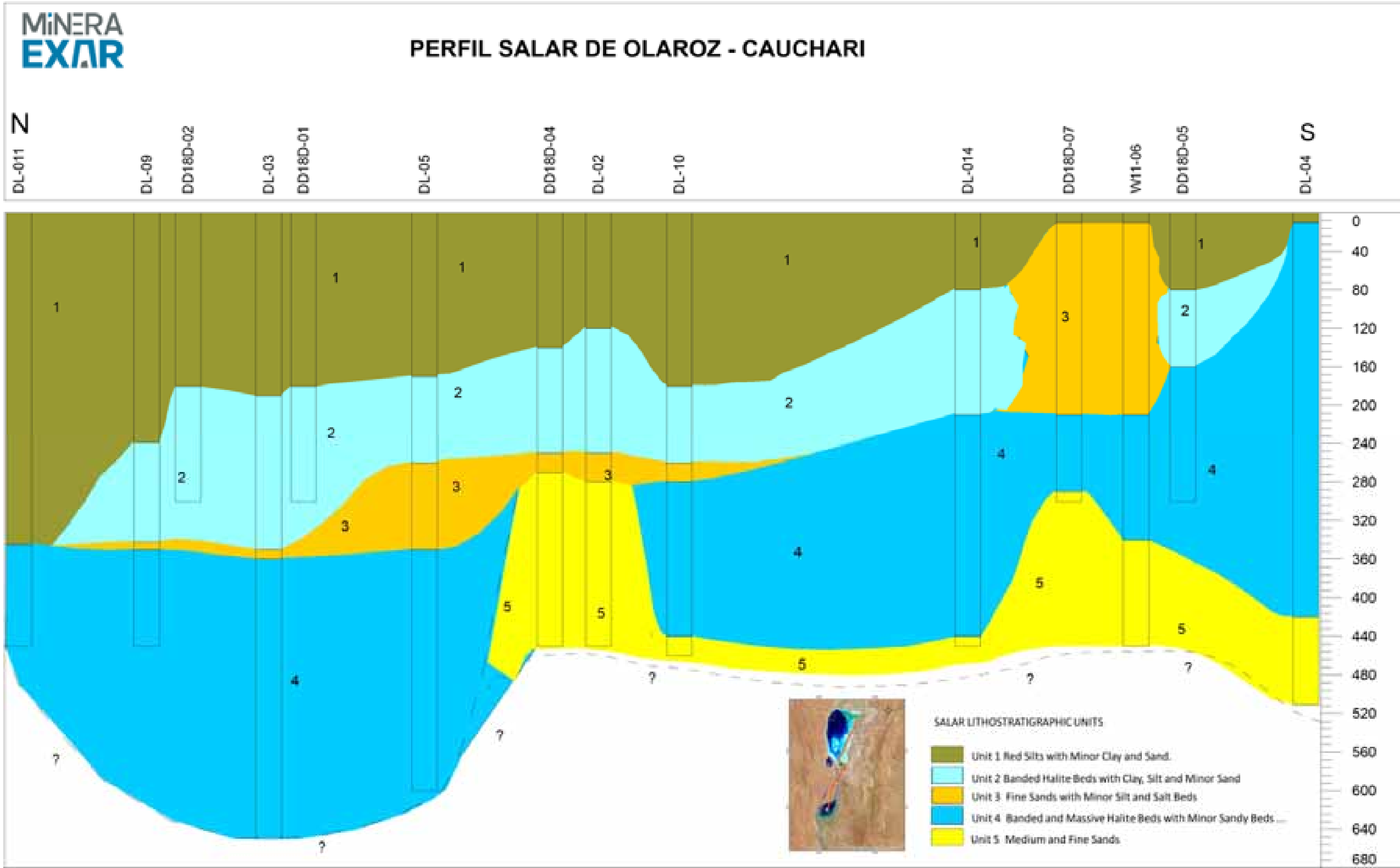
This unit is characterized by banded halite with reddish clay or silt partitions alternating with massive fine-grained sand beds. The sand beds may contain halite crystals or may be cemented by halite. This unit may also contain occasional layers of thinly bedded clays, evaporites, silts, and sands. The individual beds of this unit vary in thickness from a few centimetres to a few metres. Unit 2 is generally more clayey than Unit 1. The evaporites in Unit 2 are comprised mainly of halite and occasionally halite with gypsum. Borehole logs show that Unit 2 is typically between 50 m and 60 m in thickness.

Some of the thick sand beds in this unit are friable and devoid of halite cement. These sands were likely deposited in water, and may have been mobilized from the surrounding old alluvial fans. The green color of some sand beds is characteristic of material derived from volcanic sources. While this unit is relatively thin in some locations (e.g., DDH12), it is well-developed and dominated by massive and banded salt beds in boreholes located in the central area of the salar. The relatively thin occurrence of Unit 2 in DDH12 (see Figure 7.3) is due to the close proximity of the Archibarca Fan clastic source (see Figure 7.2).

7.5.3 Unit 3 – Fine Sands with Minor Silt and Salt Beds

This unit is composed of massive light grey to grayish-brown, fine-grained, clean sand inter-layered with evaporite (primarily halite) beds. The layers are tens of metres thick and are typically friable. This unit also contains occasional thin red silt horizons (20 cm to two metres thick). Structures indicating biological activity are uncommon in this unit, although some of the silt layers are mottled (e.g., in DDH10).

Figure 7.7 Correlation of Lithostratigraphic Units in the Cauchari Basin



Source: *Minera Exar.*

The sand composition in this unit is a mixture of quartz, feldspar, and mafic minerals (pyroxene, biotite, and amphibole), with abundant magnetite and volcanic glass. Other minerals commonly present in the sand include halite and gypsum, with lesser amounts of borate, ulexite, and narrow beds of tincal. The sand beds of this unit often contain a component of well-sorted aeolian sand (identifiable as rounded particles) mixed with sub-angular finer sand. The aeolian sands were likely re-worked and mixed with alluvial materials and dispersed into the basin by surface water.

7.5.4 Unit 4 – Banded and Massive Halite Beds with Minor Sandy Beds

This unit is dominated by banded halite beds and dark to light grey massive halite beds alternating with sandy layers. These primary layers typically range from 1 to 3 m in thickness, although a continuous 100 m layer of halite beds was observed at the DDH3. Layers of red clay and irregular halite mixes are also common in this unit. Thin silt horizons between 0.25 m and 1 m in thickness are occasionally observed.

The banding in the banded halite beds is caused by layers of grey or brownish-grey silts or sands that are typically cemented by halite and contain halite and gypsum crystals. The massive halite layers of this unit occasionally occur as a sintered sponge of halite crystals, with high porosity due to crystal corrosion. Borate concretions are common in the upper section of this unit. In the southern Cauchari Salar, several carbonate horizons ranging up to six metres in thickness were observed in this unit, with karstic solution cavities in-filled with loose sand.

7.5.5 Unit 5 – Medium and Fine Sands

This unit is composed of massive, thick-bedded, fine-grained, light to dark-green sand layers, alternating with massive light-red silt layers. The grain size of the sand is coarser in the lower levels of the unit. The sand mineralogy indicates volcanic source rocks.

Bioturbation by invertebrates is observed at some locations in this unit. Halite and gypsum crystals occur infrequently. Only boreholes DDH4, DDH10 and DDH12 penetrated deep enough to encounter this unit.

7.5.6 Sedimentation Cycles

Sedimentation cycles were evaluated for the salar sediments, as a supportive step for understanding, delineating and grouping the important hydrostratigraphic units. The energy level and RBRC curves help to explain the vertical variations observed in the salar sediments. The RBRC curves show the distribution of measured RBRC, expressed over 10 m intervals. The collection and analysis of the RBRC samples are described in Sections 11.9.2. The energy level curves represent a qualitative measure of depositional energy, expressed over five metre intervals. The lithology-based scale used to rank the energy level is summarized below:

- 0 - Massive halite beds (> 5 cm thick);
- 1 - Halite in thin beds (< 5 cm), including banded halite with thin sand, silt, or clay partitions;

- 3 - Silt with root marks or bioturbation; silty clay beds with or without halite crystals and borate concretions; silt or clay with plant remains; thin and irregular clay or halite bedding;
- 4 - Silt with or without halite crystals and borate concretions;
- 5 - Fine-grained sands;
- 7 - Medium-grained sands; and
- 8 - Coarse-grained sand with or without gravel.

This scale is qualitative and was developed as an aid for interpreting sedimentary cycles in the salar. The exclusion of Levels 2 and 6 is intended to represent a large energy level increase between Levels 1 and 3, and Levels 5 and 7, relative to the other levels.

The energy level measurements in DDH10 exhibit a repeating pattern, between the upper 130 m of the borehole and the lower part of the borehole. This pattern is considered to represent two distinct sedimentation cycles: an Upper Salt Generation Cycle ("USGC") and a Lower Salt Generation Cycle ("LSGC"), with the division between the two occurring at approximately 130 mbgs. These cycles are used as an aid to interpret the progression of sediment deposition throughout the Project area, and to support the development of a hydrostratigraphic model.

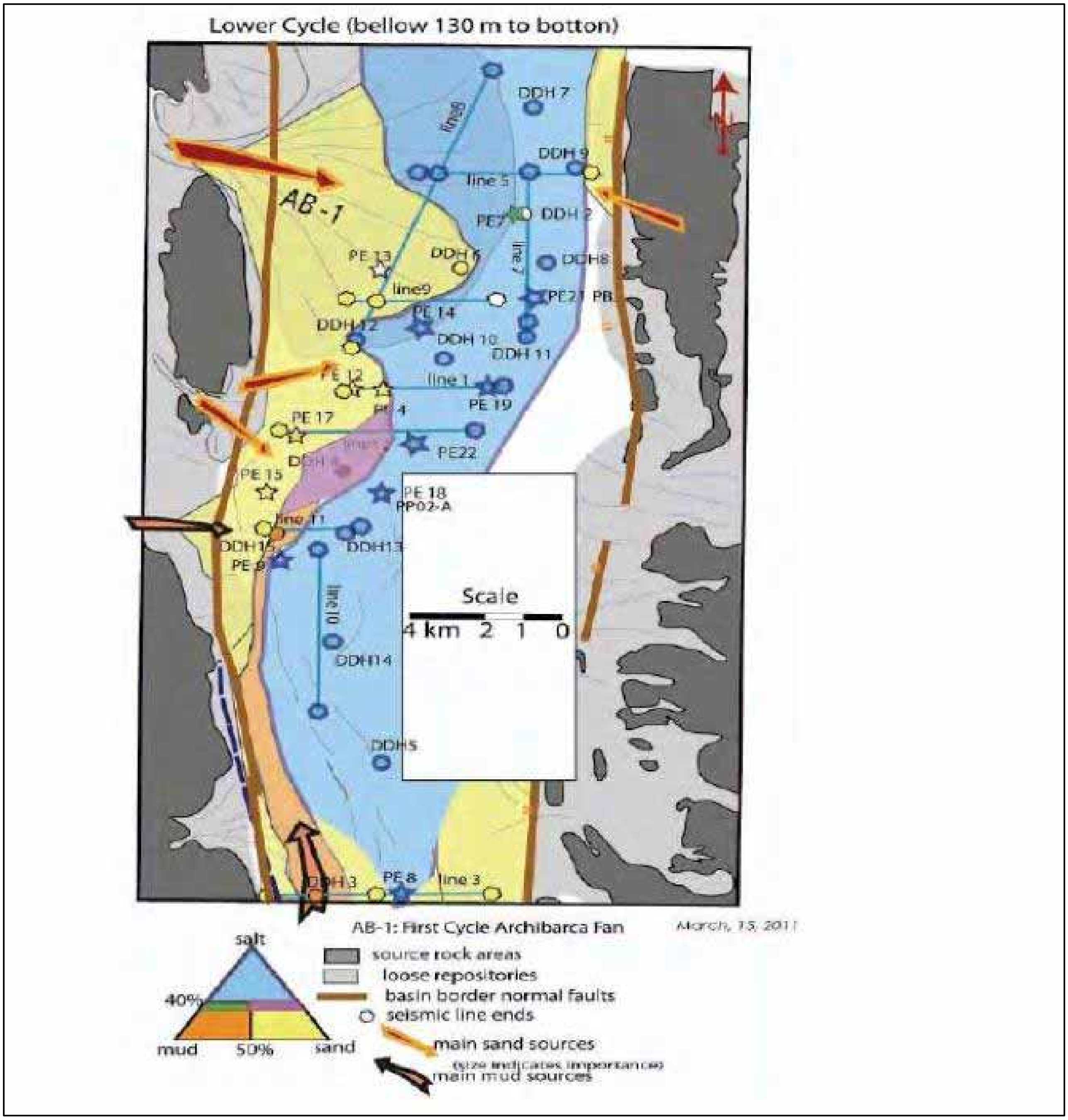
7.5.7 Sedimentary Facies Analysis and In-filling History

The figures referred to in this subsection are from a sedimentology report prepared on behalf of Lithium Americas by Dr. Gerardo Bossi. A report excerpt containing the figures is provided in Appendix 1.

The distribution of dominant geologic materials within the LSGC (defined as > 130 mbgs) is shown in Figure 7.8. Materials are divided into fractions of three end members that exhibit unique porosity profiles: sand, silt, and halite. Isopleth maps of salt and sand thickness within the LSGC are shown in Figure 7.9 and Figure 7.10, respectively. These maps were used to infer the primary locations where salt deposition occurred within the basin, and where sand entered the basin.

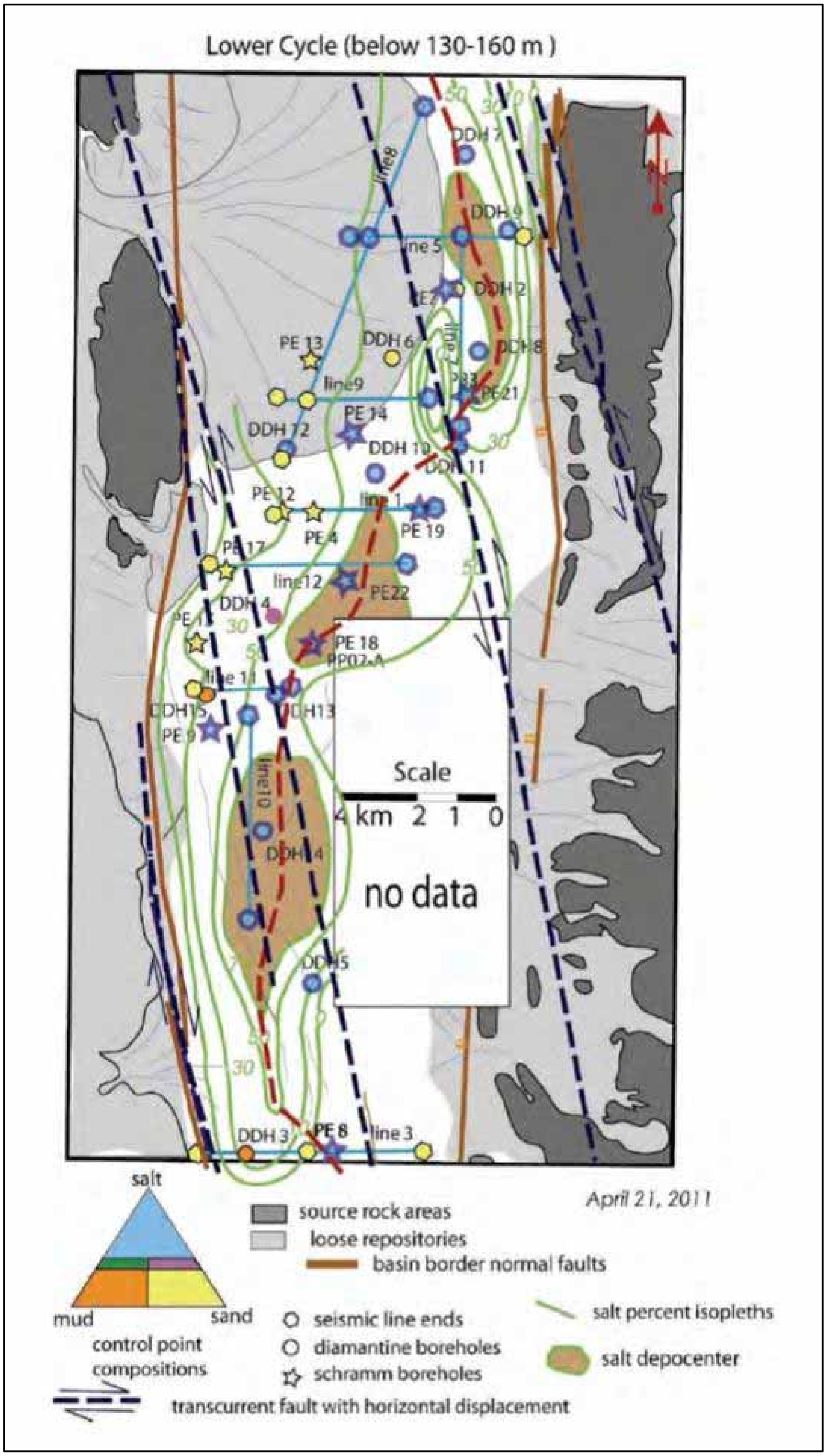
A central elongated salt deposition zone dominates the LSGC, as shown in Figure 7.8. This salt body is continuous, but irregular in the fraction that it comprises of the LSGC. As shown in Figure 7.9, elongated zones of relatively more dominant salt deposits occur in the southern, central, and northern areas of the salar. The northern zone is displaced towards the east, due to the strong influence of clastic sedimentation associated with the Archibarca Fan.

Figure 7.8 Facies Map of the Lower Salt Cycle showing Line 1 Crossing a Thick Salt Succession



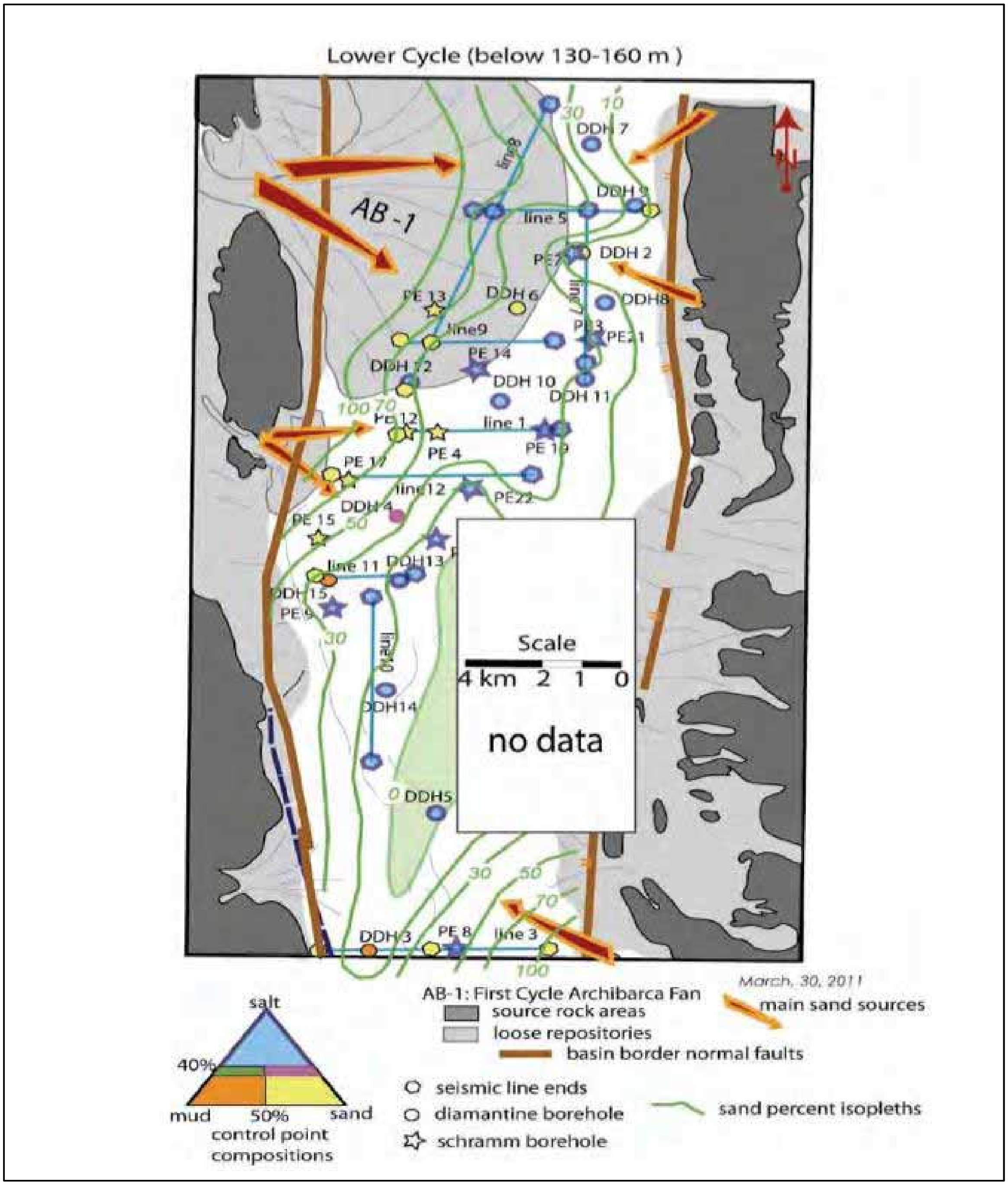
***Source**: Bossi, (2011)*

Figure 7.9 Isopleth Curves of Salt Percent in the Facies Triangle



***Source**: Bossi, (2011)*

Figure 7.10 Main Salt Sources of the Lower Cycle



***Source**: Bossi, (2011)*

Clastic contributions to the LSGC originated from various locations around the salar (Figure 7.10). However, the main sand source was located in the mountains to the west of the salar, and is responsible for the LSGC occurrence of the Archibarca Fan. The influence of this source is indicated by the increasing sand fraction in the vicinity of the fan (Figure 7.10). The main mud source is south of the salar, with an additional source located to the west.

The distribution of materials in the LSGC is related to the equilibrium between subsidence and clastic supply. Brine became concentrated in the dropped zones, and extensive halite beds were formed through evaporation. Conversely, the horsts were relatively elevated and primarily received muds (silts) or sands. LSGC deposits were formed during the Late/Middle Pleistocene when the Puna region was situated at lower altitudes. At that time, cooler climatic conditions and rain-shadow effects associated with the eastern Pampean Ranges resulted in enhanced aridity. Climatic conditions cycled between relatively wet and dry periods.

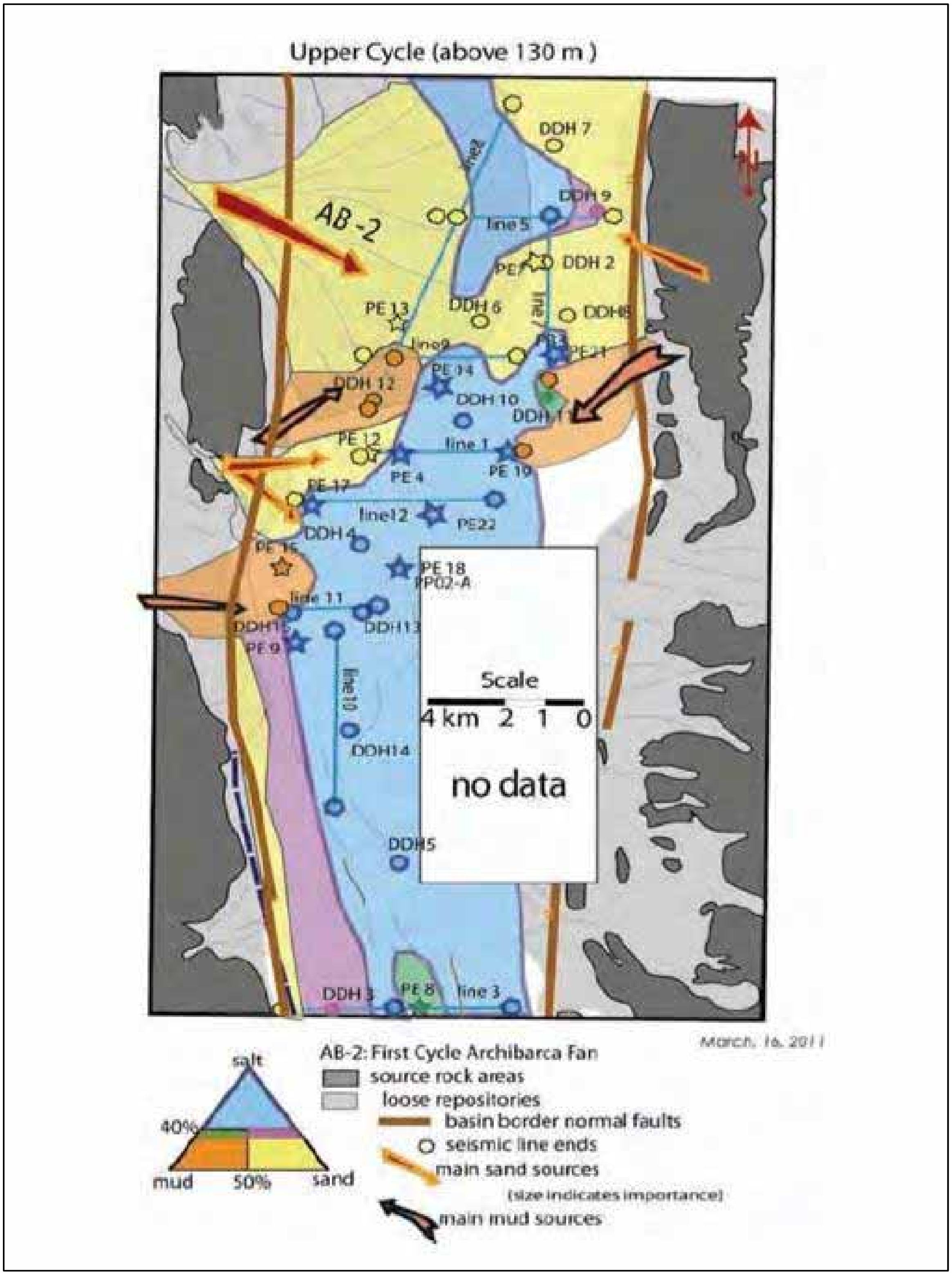
The wet periods were characterized by the development of permanent shallow lakes with high evaporation rates and the dry periods by ephemeral lagoons. Saltpan formation was enhanced during the wet periods, and the salt deposited at these times tends to be white to grey in colour, and lacking in clastic components. Conversely, banded halite and associated reddish-coloured clastic materials were likely crystallized and deposited in drier periods.

The distribution of materials in the USGC (defined as <130 mbgs) is shown in Figure 7.11. For these more recent deposits, the supply of clastic sediments is greater, particularly in association with the Archibarca Fan. Consequently, the saltpan is located mainly in the southern area of the salar with a minor isolated zone in the north, probably connected with the Olaroz Basin.

The distribution of salt in the LSGC follows a relatively regular pattern (Figure 7.12), probably due to the smoothing effect of the final subsidence stage. The two southern loci of salt deposits in the LSGC (Figure 7.9) unify into one in the USGC (Figure 7.12,) that occupies a broader zone in the central area of the basin. A remnant small salt zone persists in the northeastern area of the salar close to the eastern border and in front of the Archibarca Fan.

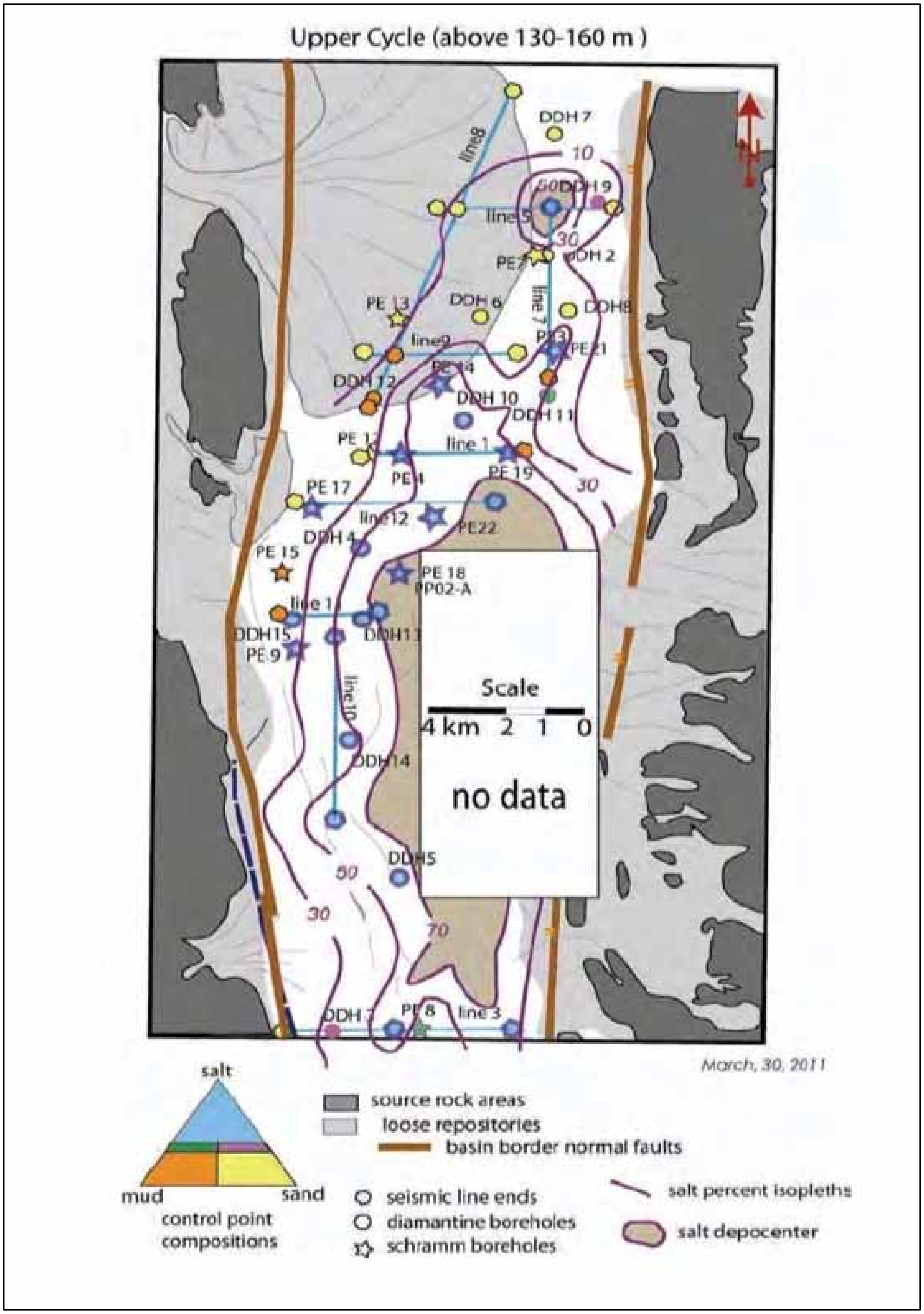
Figure 7.13 shows locations where sand entered the salar basins during the USGC deposition period. Similar to the LSGC, the primary location is at the Archibarca Fan (below the present-day fan), as indicated by the high sand fraction extending into the salar. Secondary locations occur at another fan system originating from the eastern mountains, and at two locations along the western basin border south of the Archibarca Fan. Penetration of the Archibarca Fan into the basin reaches a maximum during the period represented by the USGC. During this period, most mud still originated from the south with minor contributions from the mountains located on the western border.

Figure 7.11 Facies Map of the Upper Cycle



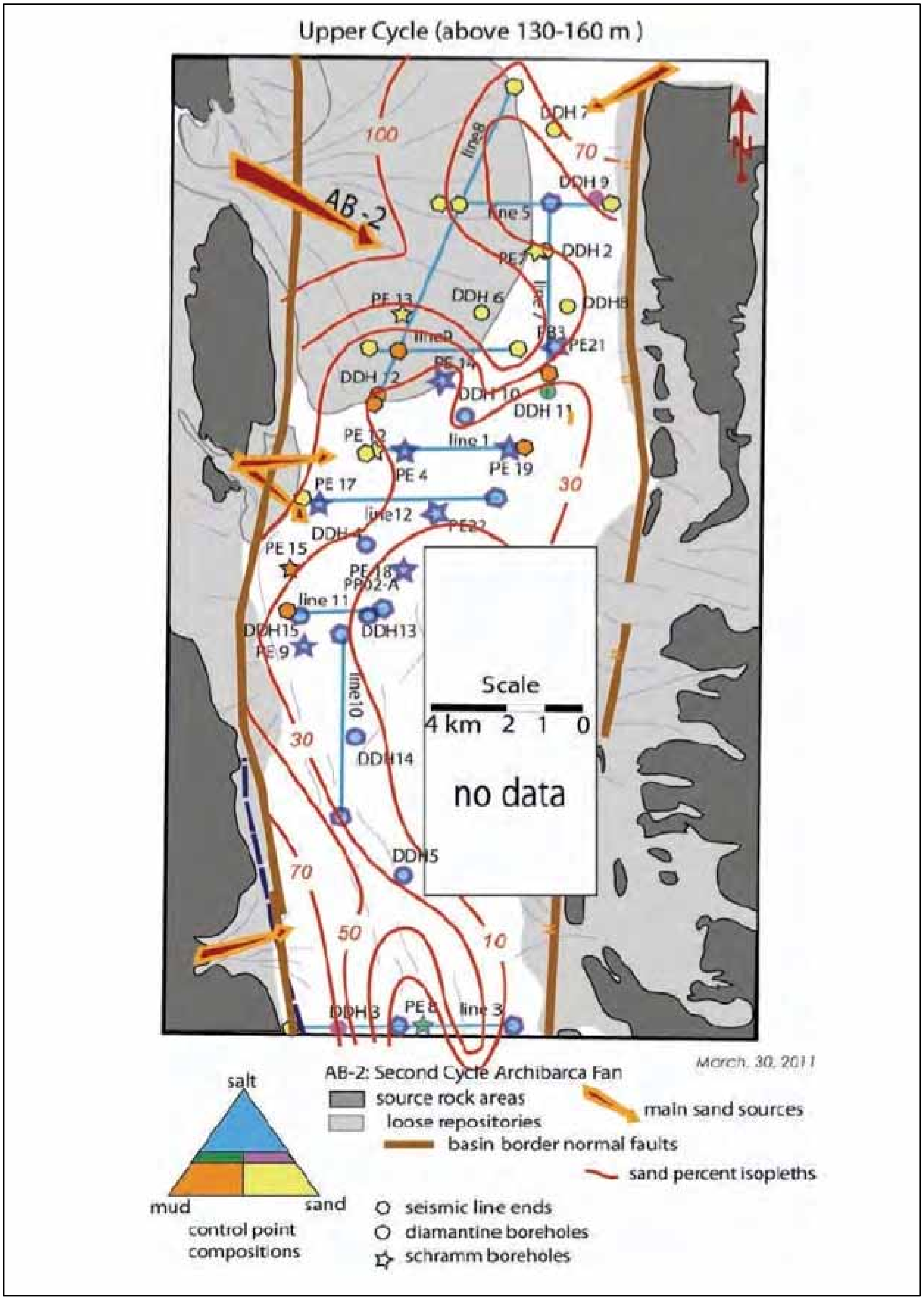
***Source**: Bossi, (2011)*

Figure 7.12 Salt Percent Isopleths of the Upper Cycle



***Source**: Bossi, (2011)*

Figure 7.13 Isopleth Map of Sand Percents of the Upper Cycle Sedimentation Stage



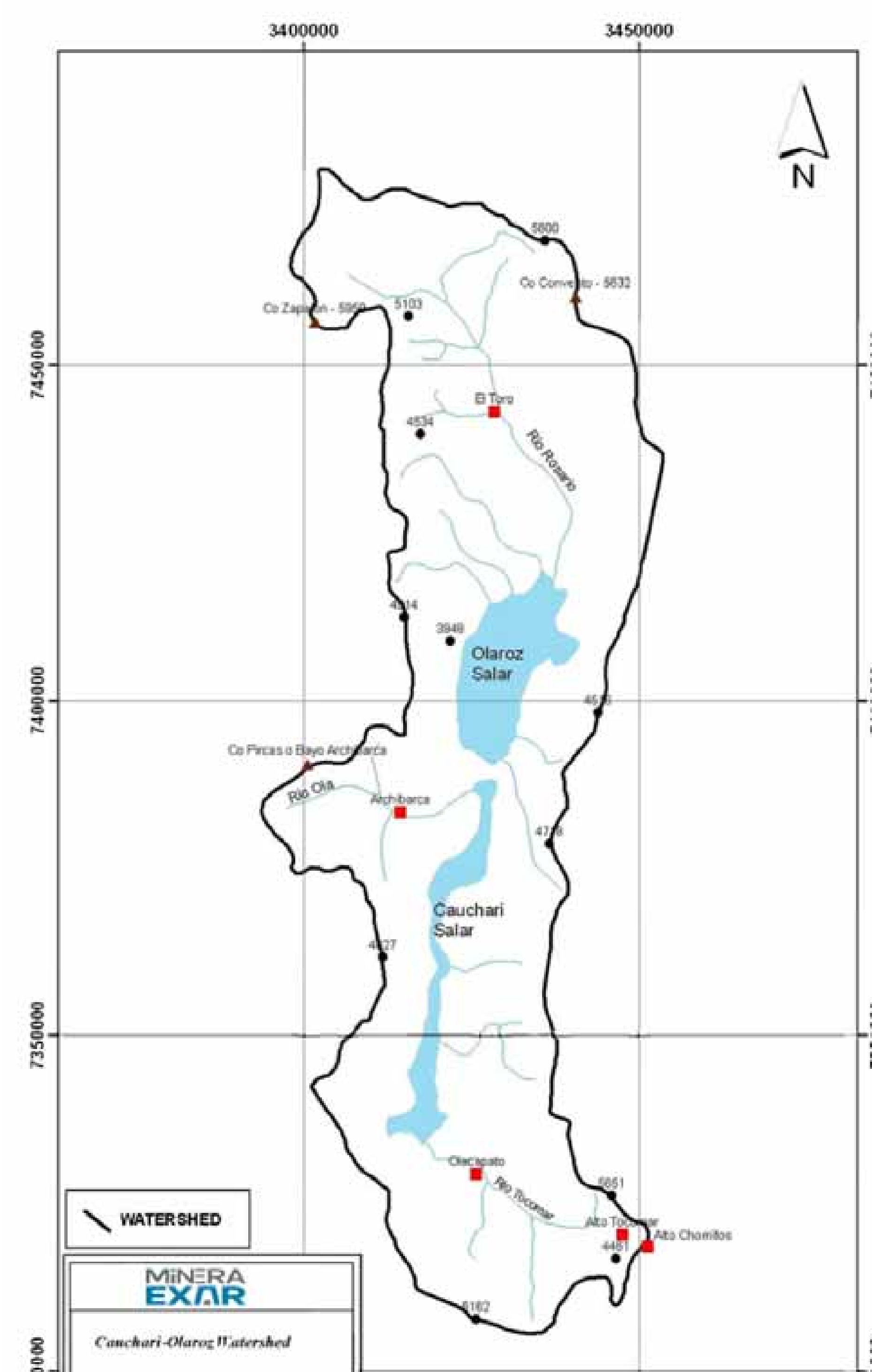
Source: *Bossi, (2011)*

7.6 SURFACE WATER

The Cauchari-Olaroz watershed is shown in Figure 7.14. The watershed is an elongated depression with a length of approximately 150 km in a north-south direction and a width of 30 to 40 km in an east-west direction, and covering approximately 4,500 km^2. The surface water network within the watershed eventually flows into the Olaroz or Cauchari Salars. There is no surface water outflow from the salars.

The primary surface waterways within the watershed basin are Rios El Rosario, Ola, and Tocomar. Rio Rosario, which is locally called Rio El Toro, originates in the northern part of the watershed, at an elevation of 4,500 m. The river flows south-southeast for 55 km, past the village of El Toro, before it enters into the Olaroz Salar. Flow was measured at approximately 200 L/s just above the Highway 74 bridge crossing (some 5 km southeast of the village of El Toro) at an elevation of 4,010 m on November 7, 2009 at the end of the dry season (Figure 7.15). Rio Rosario was dry on that same date, at a location some 15 km further south into the Olaroz Salar, at an elevation of approximately 3,940 m.

Figure 7.14 Cauchari-Olaroz Watershed



Note: *black dot with a number beside = meteorological station, red square = town.*
Source: *Minera Exar*

Figure 7.15 Rio Rosario Just Above the Highway 74 Bridge Crossing

Source: *King, Kelley, Abbey, (2012).*

Rio Ola, which is locally called Rio Lama, originates just south of Cerro Bayo Archibarca, at an elevation of around 4,500 m, and flows east for 20 km. It enters the salars on top of the Archibarca Fan that separates Olaroz from Cauchari on the western flank of the basin. On the Archibarca Fan, where Rio Ola flows immediately adjacent to National Highway 52, flow was estimated at approximately 5 L/s on November 7, 2009 (Figure 7.16).

Figure 7.16 Rio Ola at Archibarca

Source: *King, Kelley, Abbey, (2012).*

Rio Tocomar, which is locally called Rio Olacapato, originates some 10 km west of Alto Chorillo at an elevation of around 4,360 m. The river flows west for approximately 30 km before it enters the Cauchari Salar from the southeast. Flow was measured at 30 L/s at a location eight kilometres west of Alto Tocomar at an elevation of 4,210 m on November 6, 2009 (Figure 7.17). Rio Tocomar was dry in the villages of Olacapato and Cauchari on that same date.

Figure 7.17 Rio Tocomar Eight Kilometers Below Alto Tocomar

Source: *King, Kelley, Abbey, (2012).*

In addition to the surface waterways noted above which enter the salars, there is an area in the central southern part of the Cauchari Salar some 15 km north of the village of Cauchari, where surface water originates from an array of springs. Discharge from these springs is naturally channelled into a central stream that flows north for several kilometres and then gradually seeps back underground. Flow in the stream was measured at approximately 10 L/s on November 8, 2009.

Chemistry and flow monitoring results from the Surface Water Sampling Program conducted throughout the Cauchari-Olaroz watershed are presented in Section 9.8.

7.7 HYDROGEOLOGY AND GROUNDWATER

7.7.1 Overview

The technical considerations for the transition from a brine Mineral Resource Estimate to a brine Mineral Reserve Estimate are discussed in Section 14. A key component of this transition is the prediction of brine extraction over a production period. Previous Mineral Resource Estimates (King, 2010a and 2010b) relied on specific yield ("Sy") as the primary hydrogeological parameter, as estimated by RBRC measurements. Sy was used in conjunction with a hydrostratigraphic model that described its distribution throughout the Resource Zone.

The Mineral Reserve Estimate procedure has evolved, and although it continues to require the use of Sy, additional hydrogeological parameters have been incorporated in an effort to improve the accuracy of the estimate. These additional parameters include: Effective Porosity ("Pe"), Hydraulic Conductivity (“K”), and Specific Storage (“Ss”). The characterization of these parameters is provided below. A description of the updated hydrostratigraphic model is provided in Section 14.

7.7.2 Porosity

The three principal measures of porosity are as follows:

- Total Porosity (“Pt”): The total volume of pore space in an earth material, expressed as a percentage of sample volume.
- Drainable Porosity (“Pd”) or Specific Yield (Sy): Pd is the total volume of pore space in an earth material that drains, under the influence of gravity, expressed as a percentage of sample volume. Pd is comparable to Sy, which is the term used more often for aquifer interpretation. Sy is defined as the volume of water released from a unit volume of unconfined aquifer per unit decline in the water table. For this Project, Sy has been estimated with a laboratory test known as RBRC.
- Effective Porosity (“Pe”): This is the total volume of connected pore spaces in an earth material, expressed as a percentage of sample volume. Pe is the portion of the material through which active flow can occur. Some of the pores that would retain water as a sample (or in situ material) is drained could still conduct flow if the material were re-saturated. Consequently, Pe is generally expected to be larger than Sy. Further, the difference between Pe and Sy will generally be greater for finer-grained materials, in which a relatively higher proportion of pore water is resistant to drainage, due to capillary retention.

The latter two of these measures (Sy and Pe), are used in the Mineral Reserve Estimate. Sy is used in the numerical groundwater model to describe the release of brine from sediments that become unsaturated, primarily due to drawdown caused by pumping. The characterization of Sy using the RBRC method supported the Mineral Resource Estimate. It is also included herein, due to its role in the Mineral Reserve Estimate, in Section 15 (hydraulic and transport properties), 11.1 (sampling method and approach) and 11.8 (geotechnical analyses).

A summary of RBRC results grouped according to the general units in the previous and updated hydrostratigraphic models is provided in Table 7.1. The previous approach was re-evaluated for the current Mineral Reserve Estimate and the values were carried forward, with one exception: data for two of the previous units were grouped together, on the basis of similar features. Despite this simplification of the four general units, the overall complexity of the current hydrostratigraphic model is considerably more complex, due to the frequency of repeating layers, as described in Section 14.

Typical literature values are also shown in Table 7.1 for comparison. The measured values are similar to literature values with the exception of halite, which may be more porous at the site than the halite described in the literature. This may be due to solution cavities, fracturing, and/or sand and mud inclusions within the halite matrix.

TABLE 7.1 SUMMARY OF RBRC RESULTS FOR THE PRIMARY HYDROSTRATIGRAPHIC UNITS							
4-Unit Hydro-stratigraphic Model[1]	**5-Unit Hydro-stratigraphic Model[2]**	**Literature Values for Sy[3]**		**Sampling Results for Sy[4]**			
		Low	**High**	**# of Samples**	**Mean**	**Median**	**Standard Deviation**
Sand	Sand	10	35	69	24.9	28.2	9.1
Sand Mix	Sand Mix	5	35	109	16.0	16.9	9.3
Mud	Silt Mix	5	20	49	14.0	12.0	10.2
	Clay	0	5	241	5.2	2.8	5.4
Halite	Halite	0	5	241	5.2	2.8	5.4

(1) update for current Mineral Reserve Estimate.
(2) used for previous Resource Estimate (King, 2010b).
(3) comparable to RBRC. From Beauheim (1991), Johnson (1967), Bear (1972), Freeze and Cherry (1979), Van der Leeden et. al. (1990).
(4) as estimated by RBRC testing.

In addition to Sy, Pe is also required for the numerical groundwater model. As indicated in the definition above, it is used to describe the movement of fluid through the saturated zones of the model domain. Between these two parameters, Sy is more important near a given production well where the drawdown cone (and the unsaturated thickness) is greatest. As saturated thickness increases with distance from the well, the relative importance of Pe increases.

For the modelling conducted herein, Pe values for the four general hydrostratigraphic units were assumed to be the same as Sy. This approach is conservative because, as stated earlier in this section, Pe is expected to be greater than Sy. Consequently, the use of Sy values for Pe will tend to over-predict flow velocities through the salar sediments. This will tend to decrease the predicted travel times from the claim boundaries to the production wells. In turn, this will shorten the predicted time that a given well can pump before it exceeds the pumping constraint (Section 16).

7.7.3 Hydraulic Conductivity (K)

This parameter describes the quantity of groundwater flow that occurs through a given earth material under a standardized hydraulic gradient (unity). Estimates of K are required for all zones of the numerical model domain based on the reference fluid density. Hydraulic Conductivity was assessed through pumping tests conducted at the following locations:

- PB-I, on the Archibarca Fan, a principal source of groundwater recharge to the salar;
- PB-03A, PB-04 and PB-06A, on the edge of the alluvial fans about Cauchari Salar; and
- PB-01, near the centre of Cauchari Salar, where halite and mud content is relatively high.

Pumping test methods and results are provided in Section 9.10. Bulk values of horizontal Hydraulic Conductivity (Kh) range from 6.3 × 10^{-7} ms^{-1} at the centre of the salar to 2.8 × 10^{-5} ms^{-1} at the edge of the salar. Bulk values of vertical Hydraulic Conductivity (Kv) for the geological sequences above and below the production aquifers at the edge of the salar were estimated to be in the range of 1 × 10^{-9} to 1 × 10^{-7} ms^{-1}. Bulk Kh and Kv values on the Archibarca Fan were estimated to be 7.6 × 10^{-4} ms^{-1} and 2.5 × 10^{-5} ms^{-1}, respectively.

Estimates of sand unit Kh were obtained by dividing the measured aquifer Transmissivity (T) values from pumping tests by the cumulative thickness of the sand units at each pumping test location. Values for Kh SAND within and about the edge of the salar are estimated to range from 5.5 × 10^{-6} to 6.2 × 10^{-5} ms^{-1}. Kh SAND measurements at PB-I on the Archibarca Fan are one to two orders of magnitude higher.

The Kh values of the low permeability units are not directly available from pumping test analysis. For the purposes of the numerical groundwater model, the initial Kh values for mud (clay/silt) and halite were obtained from typical literature values, and were then further evaluated through the model calibration process. The following ranges in values were considered representative of site conditions:

$$\text{Mud } K_H = 1\times10^{-6} \text{ to } 1\times10^{-8}\ \frac{\text{m}}{\text{s}} \left[K_V = 1\times10^{-6} \text{ to } 1\times10^{-8}\ \frac{\text{m}}{\text{s}}\right]$$; and

$$\text{Halite } K_H = 1\times10^{-8} \text{ to } 1\times10^{-10}\ \frac{\text{m}}{\text{s}} \left[K_V = 1\times10^{-9} \text{ to } 1\times10^{-11}\ \frac{\text{m}}{\text{s}}\right]$$

It is noted that the ratio of Kh in the productive aquifers to Kv in the overlying and underlying low permeability materials ranges from approximately 30 on the alluvial fan to in excess of 1,000 at non-fan locations on the edge of the salar. This significant contrast means that brine flow within the salar is strongly influenced by geologic layering. Consequently, it is expected that when flow is induced by pumping, it is primarily horizontal through the higher permeability units, with some vertical leakage through the low permeability units. It is further noted that Kh generally increases with increasing distance from the center of the salar, as halite and mud content decreases and sand content increases.

7.7.4 Specific Storage (Ss)

Ss is a confined aquifer property that describes the volume of water released per unit volume of earth material per unit decline in hydraulic head. The water is released by two mechanisms: (1) compaction of the material matrix due to decrease in fluid pressure and a corresponding increase in effective stress; and (2) expansion of fluid due to decreased pressure. Ss is a key input parameter for groundwater modelling. In conjunction with K, it influences the amount of drawdown observed at a given pumping rate and the shape of the drawdown cone. The Ss of an aquifer is determined by dividing the aquifer Storage Coefficient (S) by aquifer thickness.

The bulk Ss values determined from the pumping test program (Section 9.10) are summarized in Table 7.2 Typical values from the literature are provided Table 7.3, for comparison. The Ss values determined through the pumping tests were not allocated between individual hydrostratigraphic units, due to the complex bedded geology and the lumped nature of Ss as a hydraulic property. The values at PB-01 are consistent with values for fractured rock and slightly higher than the literature values reported for the halite. The remaining values fall between the minimum literature Ss values for unconsolidated sand deposits and the maximum literature values for consolidated deposits, possibly indicating a degree of cementation and compaction.

TABLE 7.2
PUMPING TEST RESULTS FOR STORAGE COEFFICIENT (S) AND SPECIFIC STORAGE (SS)

Location	Saturated Thickness (m)	S Min.	S Max.	Ss Min. (m^{-1})	Ss Max. (m^{-1})
PB-01	153.5	3.00E-05	5.75E-05	6.32E-07	7.82E-07
PB-04	242	1.30E-04	3.00E-03	1.57E-06	1.53E-05
PB-03	139	1.90E-05	2.90E-03	2.23E-06	4.32E-06
PB-06	143.5	8.50E-04	5.50E-03	3.14E-06	2.79E-05
PB-I	30	2.75E-04	3.80E-2	9.17E-06	1.27E-03

TABLE 7.3
LITERATURE VALUES FOR SPECIFIC STORAGE (SS)

Porous Material	Min. Ss	Max. Ss	Source
Medium Hard Clay	9.2E-04	1.2E-03	AQTESOLV Professional User Manual
Dense Sand	6.2E-05	1.3E-04	
Dense Sandy Gravel	4.9E-05	1.0E-04	
Fissured Rock	3.3E-06	6.9E-05	
Sandstone	2.7E-06	4.0E-06	Robson and Banta (1990)
Claystone		2.8E-06	30% porosity (Beauheim and Roberts, 2002; Beauheim et al., 1991; Beauheim and Holt, 1990)
Halite	9.5E-08	3.6E-07	1% porosity (Beauheim and Roberts, 2002; Beauheim et al., 1991; Beauheim and Holt, 1990)
Anhydrite		1.4E-07	1% porosity (Beauheim and Roberts, 2002; Beauheim et al., 1991; Beauheim and Holt, 1990)

7.8 WATER BALANCE

7.8.1 Objectives and General Methodology

A surface water hydrologic model was developed for the Cauchari-Olaroz watershed, with the following objectives: 1) to develop a quantitative water balance that would advance the understanding of site hydrology, and 2) to provide estimates of lateral recharge into the domain of a numerical groundwater model. The groundwater model is used in support of Mineral Reserve estimation, as described in Section 15.

The hydrologic model was developed using HEC-HMS, a numerical simulation program supported by the U.S. Army Corps of Engineers. The program includes a database management system, data entry utilities, a computation engine, results reporting tools, and a graphical user interface (USACE, 2006). HEC-HMS partitions precipitation into evapotranspiration, overland runoff, and infiltration. Infiltration is routed through a reservoir that is analogous to the local groundwater system, before being discharged to the catchment watercourse.

The HEC-HMS model was calibrated against spot flow measurements, using climate records from 2010. Once an acceptable match was made to recent observed conditions, a long-term simulation was run to estimate a water balance for the system. Key model outputs included long-term estimates of flow entering the salar from surrounding watershed areas, as a combination of surface water and groundwater.

7.9 METEOROLOGICAL DATA SOURCE

Climate data have been collected within and around the Cauchari-Olaroz watershed area by several organizations. Relevant and available stations can be grouped into two general categories:

- Off-site, operated within or near the salar watershed, by the Argentine National Weather Service (Servicio Meteorologico Nacional - SMN); and
- On-site, operated within the salar, by LAC.

The locations of these climate stations are shown in Figure 7.14, and station specifications are summarized in Table 7.4. As shown in the table, the SMN climate stations have extensive data records of 30 to 80 years. The temporal resolution of these data is limited to monthly values. Conversely, the data records of the LAC stations are limited to the relatively recent period of Project operation. However, the hourly frequency of these data provides a useful indication of short term temporal variability.

TABLE 7.4 METEOROLOGICAL STATION SUMMARY							
LAC – Meteorological Stations							
Station	**Starting Date**	**End Date**	**Long (deg)**	**Lat (deg)**	**Altitude (m)**	**Annual Precip (mm)**	**Recording Frequency**
MetBoros	09/02/2010	13/04/2011	-66.63	-23.46	3925	NA	Hourly
MetSulfatera	09/02/2010	31/03/2011	-66.80	-23.72	3923	NA	Hourly
Vaisala	09/05/2010	27/02/2011	-66.76	-23.70	3935	NA	Hourly
SMN Climate Stations							
La Quiaca	01/01/1908	31/12/1987	-65.60	-22.37	3442	335	Monthly
Olacapato	01/01/1950	31/12/1990	-66.72	-24.12	4040	71	Monthly
San Antonio de los Cobres	01/01/1949	31/12/1990	-66.33	-24.24	3775	115	Monthly
Susques	01/01/1972	31/12/1996	-66.36	-23.41	3675	188	Monthly

Note: *precip = precipitation.*

Table 7.5 summarizes monthly averages for temperature and precipitation data from the Susques, Olacapato, and San Antonia de los Cobres climate stations. SMN also published monthly potential evapotranspiration estimates for each station. For all three SMN stations, potential evapotranspiration exceeds precipitation. The three stations also exhibit a similar seasonal distribution of precipitation, with the highest occurring from December through March. The dry season starts in March/April and minimal precipitation occurs until December.

TABLE 7.5 MONTHLY CLIMATE SUMMARIES FOR SMN STATIONS													
Susques (3,675 masl, 01/01/1972 – 31/12/1996)													
Months	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total (mm)**
Temperature (°C)	11.3	11.2	10.5	8.1	4.9	3	2.5	4.6	6.6	8.9	10.4	11.1	n/a
Precipitation (mm)	72	51	22	1	1	0	0	0	0	1	8	32	188
Evapotransp. Potential (mm)	72	62	62	45	28	17	15	27	38	55	64	72	557
Olacapato (3,820 masl, 01/01/1950 – 31/12/1990)													
Temperature (°C)	10.8	10.7	9.9	7.5	4.2	2.2	1.6	3.9	5.9	8.2	9.9	10.6	n/a
Precipitation (mm)	30	20	4	0	0	1	0	0	0	0	0	9	64
Evapotransp. Potential (mm)	72	62	61	44	26	14	11	25	37	54	64	72	542
San Antonio de los Cobres (3,775 masl, 01/01/19 – 31/12/1990)													
Temperature (°C)	11.0	10.8	10.0	7.5	4.2	2.3	1.7	3.9	6	8.2	10	10.8	n/a
Precipitation (mm)	48	32	13	0	0	0	0	0	0	0	4	18	115
Evapotransp. Potential (mm)	73	62	61	43	26	14	12	25	37	53	64	72	542

7.10 MODEL COMPONENTS

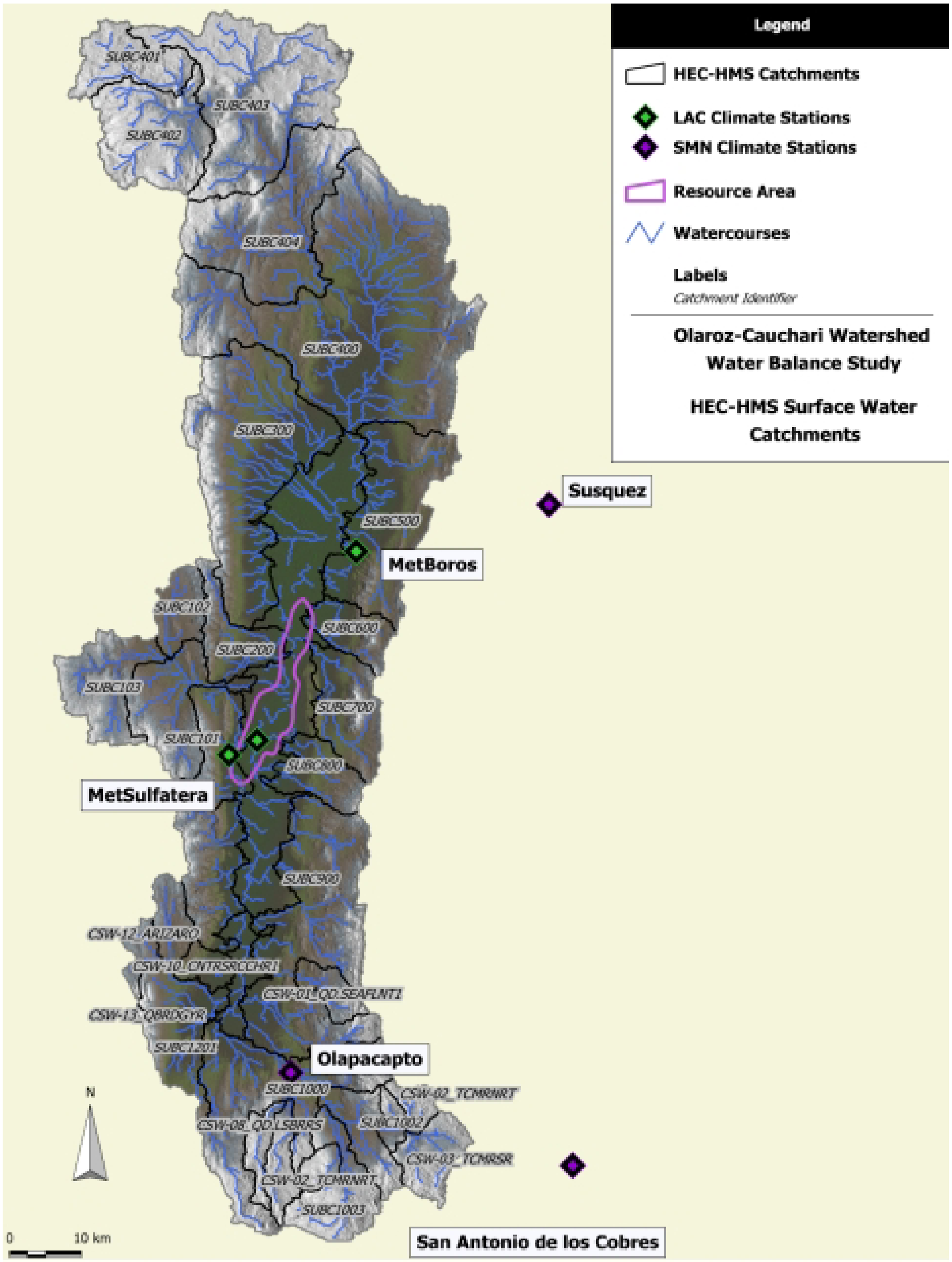
7.10.1 Temporal Considerations

HEC-HMS can be run at a range of time steps, from minutes to days. For the Cauchari-Olaroz watershed, the model was run with a one day time step.

7.10.2 Spatial Considerations

HEC-HMS is a catchment-based model, in which the study watershed is divided into separate catchments over which relatively consistent infiltration and soil-water storage values can be assumed. The Cauchari-Olaroz watershed was divided into 31 catchments (Figure 7.18), using a 30 m Digital Elevation Model ("DEM") supplied by LAC. Where streamflow monitoring measurements were available, catchments were defined relative to the monitoring locations, to allow comparison of simulated and observed flows. Otherwise, catchments were defined based on topographically-delineated drainage patterns. The catchments range in area from approximately 3 km^2 to 860 km^2, with an average area of 170 km^2.

Figure 7.18 HEC-HMS Surface Water Catchments



Source: *King, Kelley, Abbey, (2012).*

7.10.3 General Long-Term Time Series Precipitation Dataset

A two-step method was used to generate synthetic long term daily precipitation records for each catchment area in the model. In the first step, the MODAWEC weather generator (Liu et al.,

2009) was used to distribute the monthly precipitation totals from selected SMN stations, on the basis of the wet days in one year at a selected LAC climate station. The SMN Olacapato station was used for the monthly data because it is located within the Cauchari-Olaroz watershed. The LAC Met Boros station was used for the wet days distribution, because it had the longest data record of the three LAC stations and is located just north of the Resource Zone. In the second step, the synthetic long term daily precipitation dataset was adjusted for each catchment area. This adjustment accounted for altitude differences between the various catchments and the reference station, and used the method of Houston (2009), as per:

Mean annual precipitation (mm) for Site B

$$P_b = P_a \cdot e^{\left[-0.0012 \cdot \left(Elev_b - Elev_a\right)\right]}$$

Where:

- Pa : mean annual precipitation (mm) for reference station
- Elevb : Elevation of Site B in masl
- Eleva : Elevation of reference station in masl

The daily precipitation records obtained by this method were entered into the model for each catchment in the Cauchari-Olaroz watershed. This approach does not account for year-to-year variability in the number of wet days per month. However, since this method retains the overall precipitation amounts from the long term SMN station, it was considered an acceptable approximation.

To further evaluate these precipitation records, they were compared against National Institute of Agricultural Technology ("INTA") rainfall isohyets for the salar watershed. This comparison indicated that INTA precipitation values were higher for some catchments, with the largest differences occurring at low elevations. This potential difference was considered in the catchment outflow results used in the groundwater model, as described in Section 7.7.6.

It should be noted that since the 2017 Mineral Reserve Estimate is based on the 2012 Mineral Resource model, no updates to precipitation records were made.

7.10.4 Snow Accumulation and Melt

Snow processes are a minor consideration in the water balance because the Cauchari Olaroz watershed typically experiences freezing conditions during the dry season. However, they were included in the model for completeness.

7.10.5 Storage

HEC-HMS partitions liquid precipitation between overland runoff, evapotranspiration, and infiltration. In the model, liquid precipitation (defined as either rainfall or snow) is input to a "storage reservoir" with a user-specified saturation point. Infiltration and overland runoff are generated only when the storage reservoir is saturated and liquid precipitation occurs at a rate faster than a user-specified saturated infiltration rate. Below the saturation point, water is removed from storage by evapotranspiration only.

7.10.6 Evapotranspiration

HEC-HMS translates potential evapotranspiration (PET) into actual evapotranspiration (AET) based on the water content of the storage reservoir. When the reservoir is saturated, AET is equal to PET. When the reservoir is empty (i.e., water content is zero) AET falls to zero, where it remains until the reservoir is replenished by precipitation. The method of Houston (2009) was used to adjust the SMN evaporation values for the elevation of each catchment, as per:

Pan Evaporation in mm/yr

$$E_{pan} = 4{,}364 - (0.59 \cdot A)$$

Where:

A : altitude (m above sea level)

Epan values were calculated for each catchment in the model, and converted to PET using a factor of 0.9.

7.10.7 Baseflow

Water identified as infiltration by the model is allocated to baseflow. The model routes this water through two linear storage elements, using a selected technique based on the following equations (Schroeter and Watt, 1980):

Outflow

$$Q_t = C \cdot Q_{t-1} + (1 - C) \cdot I_{t-1} \quad \text{and} \quad C = e^{(\frac{-dt}{KR})}$$

Where:

- dt : time step
- KR : recession constant, h
- I : inflow.

The two linear storage elements provide a means of modelling baseflow recession after a precipitation event. A different recession constant can be specified for each element, to fit the behavior of the groundwater system. Baseflow discharges are then combined with any direct runoff, to create the catchment outflow hydrograph. An approximation inherent in this approach is that there is no ability to represent subsurface routing of infiltration directly from an upstream to a downstream catchment. In other words, infiltration must first discharge as baseflow in the first catchment before it is transferred to the next.

7.10.8 Model Calibration

Model calibration is the process whereby the model parameters are adjusted to achieve an acceptable match between simulated output and observed conditions. Calibration of the HEC-HMS model was based primarily on the 2010 streamflow monitoring measurements, which were taken approximately every month. The calibration task involved adjusting the following:

- Water storage reservoir parameters, that control the partitioning between runoff, infiltration, and evaporation;
- Evapotranspiration rates (specifically, the relationship between pet and aet); and
- Linear storage element coefficients, which control the rate of baseflow recession.

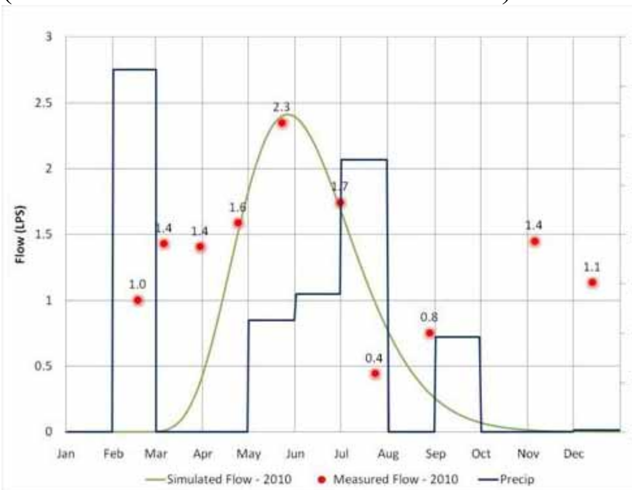
Initially, these model parameters were set to the same value for each catchment. During model calibration, the parameter values were adjusted for the catchments with available streamflow measurements. Once a reasonable match was achieved between simulated and measured streamflows, the parameter values from gauged catchments were applied to similar un-gauged catchments. Plots of observed versus simulated flows and precipitation are shown for the following:

- Figure 7.19 and Figure 7.20 for streams south of Cauchari,
- Figure 7.21 to Figure 7.24 for streams in the vicinity of Olacapato,
- Figure 7.25 and Figure 7.26 for streams west of Cauchari; and
- Figure 7.27 for a stream to the north of Olaroz.

For locations south of Cauchari and in the vicinity of Olacapato, the seasonality of streamflow is well represented by the model, with peak flow occurring in the months of May/June. However, the observed flows at these locations are relatively high in the months of November and December, which is not replicated in the simulated flows. Since no significant rainfall event was captured by the Project stations during this period, it is likely that this flow is in response to isolated precipitation events in the vicinity of Olacapato, or to possible stream gauging errors.

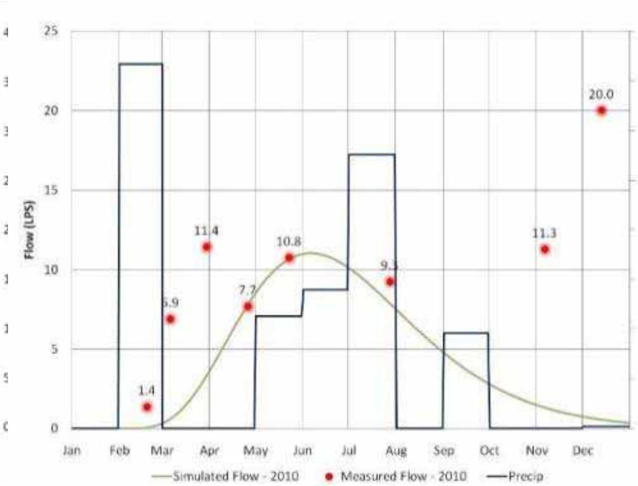
The simulated flows to the west of Cauchari and the north of Olaroz provide a good match to observed conditions. The seasonality of streamflow is well predicted, with peak flow occurring in the months of May/June, before receding through July to December. The lack of precipitation data for December 2009 or January 2010 is the probable cause of the mismatch between observed and simulated values in February and March 2010.

Figure 7.19 CSW-01_QD.SEAFLNT1
(in the south area of the Cauchari Salar)



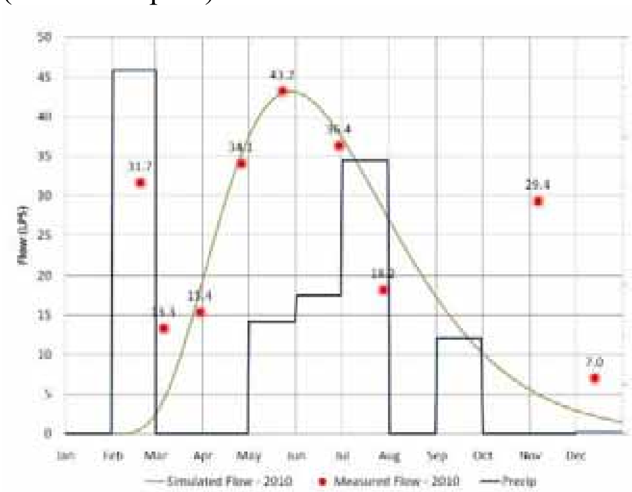
Source: *King, Kelley, Abbey, (2012).*

Figure 7.20 CSW-02_TCMRNRT
(in the south area of the Cauchari Salar)



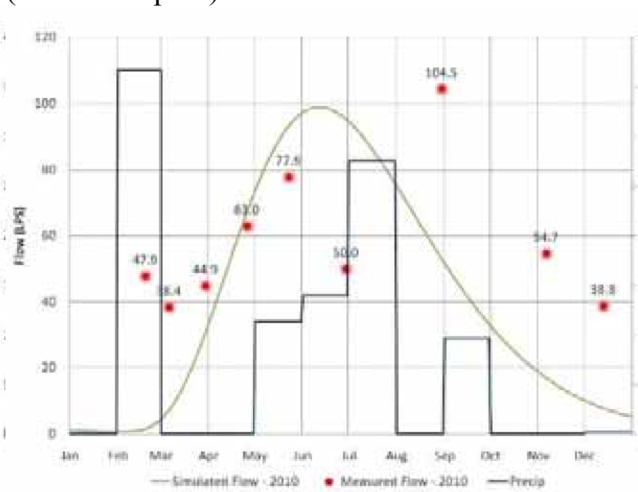
Source: *King, Kelley, Abbey, (2012).*

Figure 7.21 CSW-03_TCMRSR
(near Olacapato)



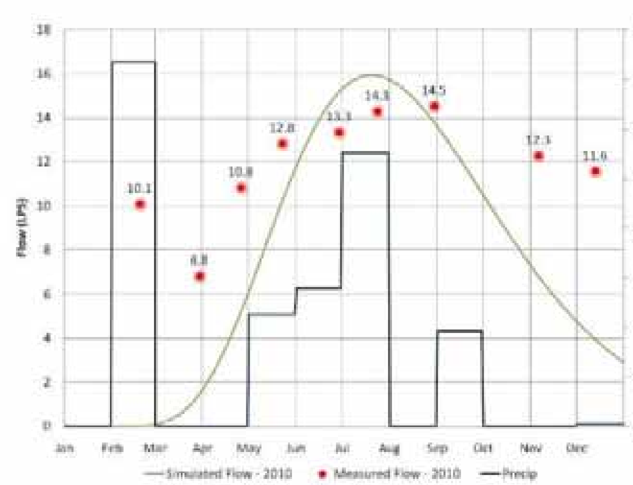
Source: *King, Kelley, Abbey, (2012).*

Figure 7.22 CSW-04_R.TCMRR2PNT
(near Olacapato)



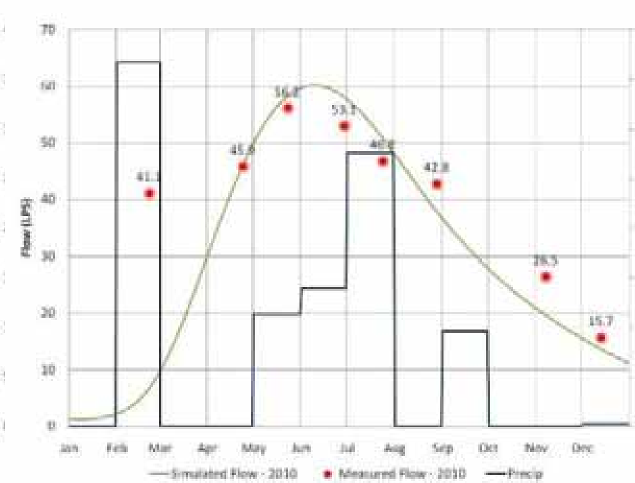
Source: *King, Kelley, Abbey, (2012).*

Figure 7.23 CSW-05_RANTC
(near Olacapato)



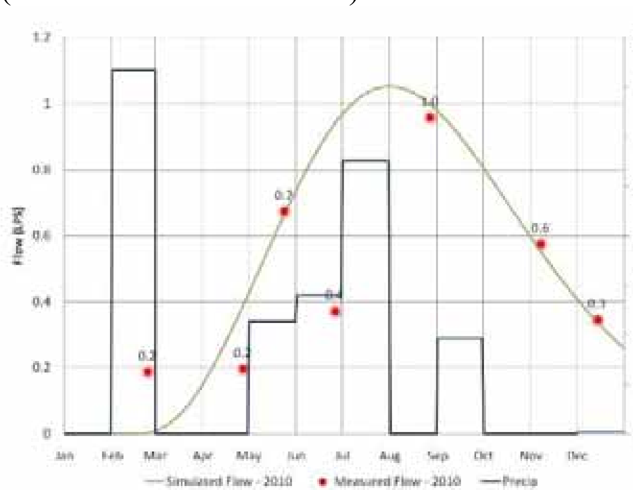
Source: *King, Kelley, Abbey, (2012).*

Figure 7.24 CSW-07_RQVR
(near Olacapato)



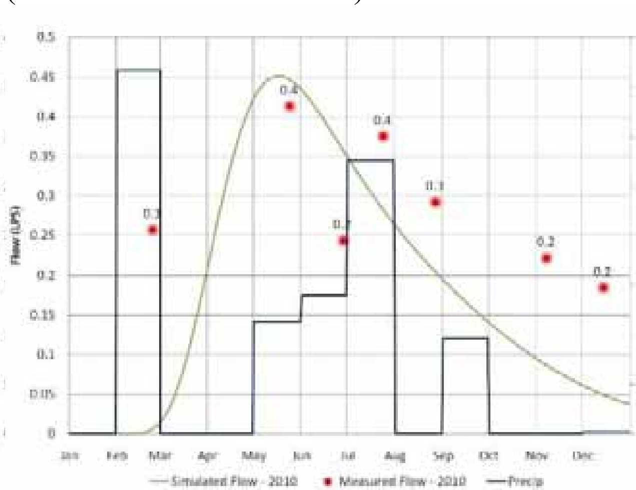
Source: *King, Kelley, Abbey, (2012).*

Figure 7.25 CSW-12_ARIZARO
(west of the Cauchari Salar)



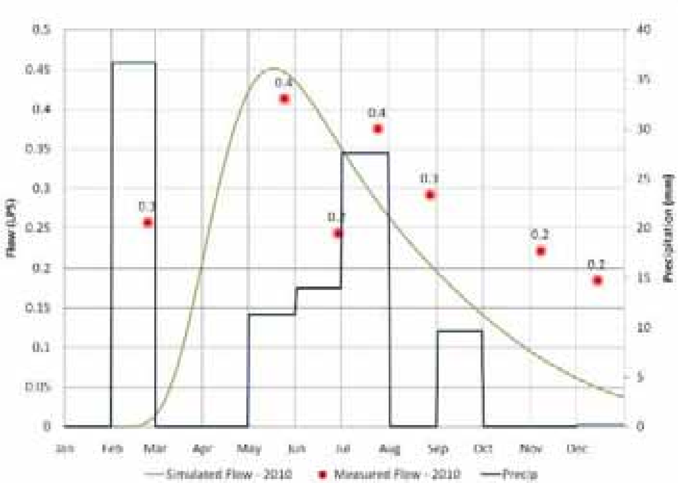
Source: *King, Kelley, Abbey, (2012).*

Figure 7.26 CSW-13_QBRDGYR
(west of the Cauchari Salar)



Source: *King, Kelley, Abbey, (2012).*

Figure 7.27 OSW-01_RRSRPNTR
(north of the Olaroz Salar)



Source: *King, Kelley, Abbey, (2012).*

7.10.9 Water Balance Results

After the model was calibrated with recent streamflow data, it was used to run a long-term water balance. The simulation period for the water balance was from 1950 to 1990, corresponding with the data record from the SMN Olacapato station. Table 7.6 shows the water balance for each of the 31 catchments in the hydrologic model. As expected, evapotranspiration ("ET") is the major component of the water budget that removes water, comprising between 81% and 98% of precipitation.

Estimated precipitation varies significantly throughout the Cauchari-Olaroz watershed. The portion of precipitation that is available for catchment outflow (i.e., surplus precipitation, or precipitation minus ET) ranges from 1 to 8 mm/year. The variation in outflow is primarily due to differences in precipitation between catchments. Mass balance error, which is defined as the percent difference between precipitation and outflow + ET, is minor for all catchments; the highest error is 3%.

TABLE 7.6 CAUCHARI-OLAROZ CATCHMENT WATER BALANCE (1950-1990)					
Catchment	**Area (km^2)**	**Precipitation (mm)**	**Catchment Outflow (mm)**	**ET (mm)**	**Error (%)**
CSW-01_QD.SEAFLNT1	46	33	1	32	0
CSW-02_TCMRNRT	29	29	1	27	0
CSW-03_TCMRSR	82	33	2	31	0
CSW-05_RANTC	29	27	2	24	0
CSW-07_RQVR	52	22	4	18	0
CSW-08_QD.LSBRRS	39	21	1	20	0
CSW-10_CNTRSRCCHR1	37	59	8	50	2
CSW-12_ARIZARO	31	35	1	34	0
CSW-13_QBRDGYR	3	28	1	27	0
SUBC1000	311	45	4	41	0
SUBC1001	80	29	1	28	0
SUBC1002	25	38	6	32	0
SUBC1003	123	29	1	28	0
SUBC101	155	40	3	37	0
SUBC102	66	45	5	40	0
SUBC103	137	32	2	31	0
SUBC1200	226	42	2	39	3
SUBC1201	197	43	4	39	0
SUBC1300	106	51	7	44	0
SUBC200	96	45	4	41	0
SUBC300	455	56	7	47	3
SUBC400	860	43	4	39	0
SUBC401	108	22	1	21	0
SUBC402	208	27	1	26	0
SUBC403	408	26	1	25	0
SUBC404	318	36	2	34	0
SUBC500	284	55	7	47	3
SUBC600	74	50	6	44	0
SUBC700	132	53	7	45	0
SUBC800	88	46	5	41	0
SUBC900	427	49	4	43	3
Combined Cauchari-Olaroz Catchment Areas	**5,232**	**41**	**4**	**37**	

7.10.10 Catchment Outflow Results

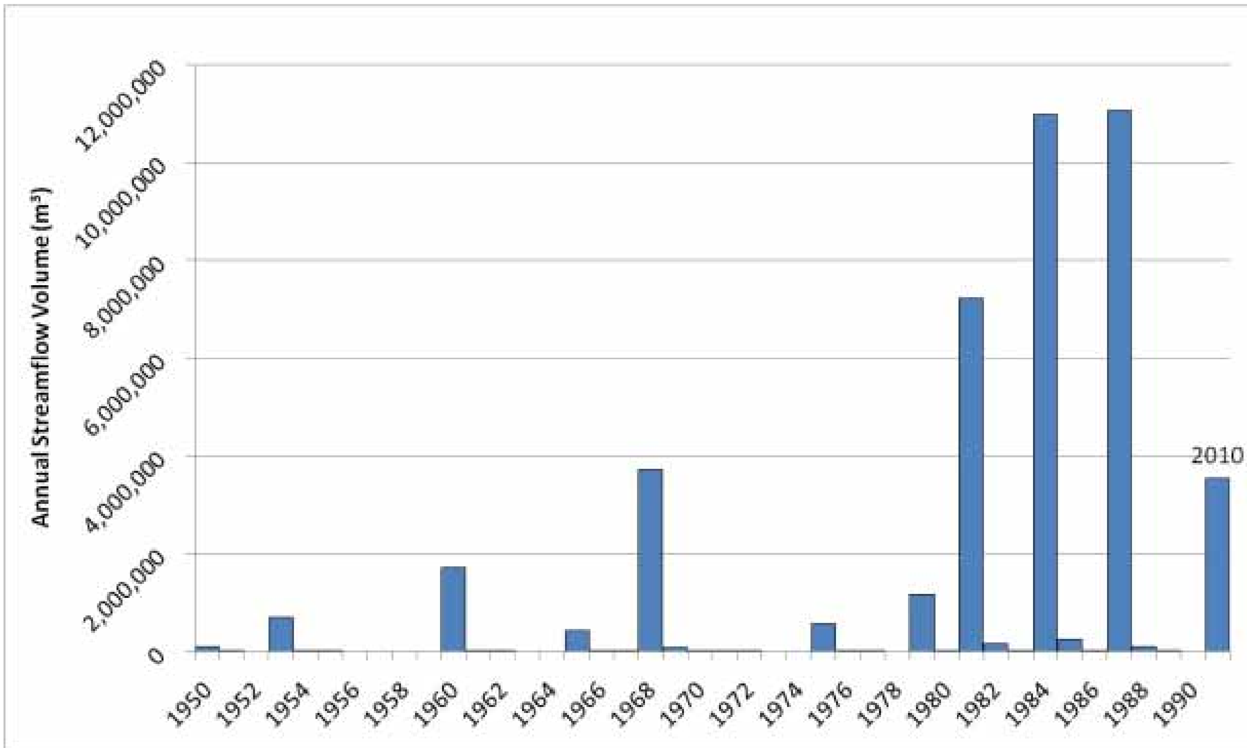
The long-term water balance was used to determine typical lateral recharge rates to the salar, for input to the groundwater model used to calculate of the Mineral Reserve Estimate (Section 15). The outflows from 31 catchments were lumped into nine catchments that contribute flow directly to the salar. These lumped values are shown in Figure 7.28, and were used as lateral recharge (inflow) to the sides of the numerical groundwater model. Two additional catchments on the Archibarca Fan were also isolated and input to the groundwater model, to better discretize flow conditions on the fan.

INTA rainfall isohyets indicated that precipitation values for the salar watershed may be higher than those simulated (see Section 7.7.3). To assess the possible effects of higher rainfall, a ±50% range in recharge was evaluated in the groundwater model. Recharge variability was found to primarily impact the shallow aquifer systems and not the deep aquifers that host the lithium brine resource. Results indicated that the Mineral Reserve Estimate is relatively insensitive to rainfall variability in this range with only a 0.1% variation in the reserve.

As noted previously, HEC-HMS does not differentiate between surface outflow and subsurface outflow (i.e., groundwater). Consequently, the HEC-HMS outflow includes both components. In practice, however, the surface water component of outflow in the groundwater model is minimal. The primary surface water inputs to the Cauchari-Olaroz salar enter at the north and south ends, considerably removed from the groundwater model domain.

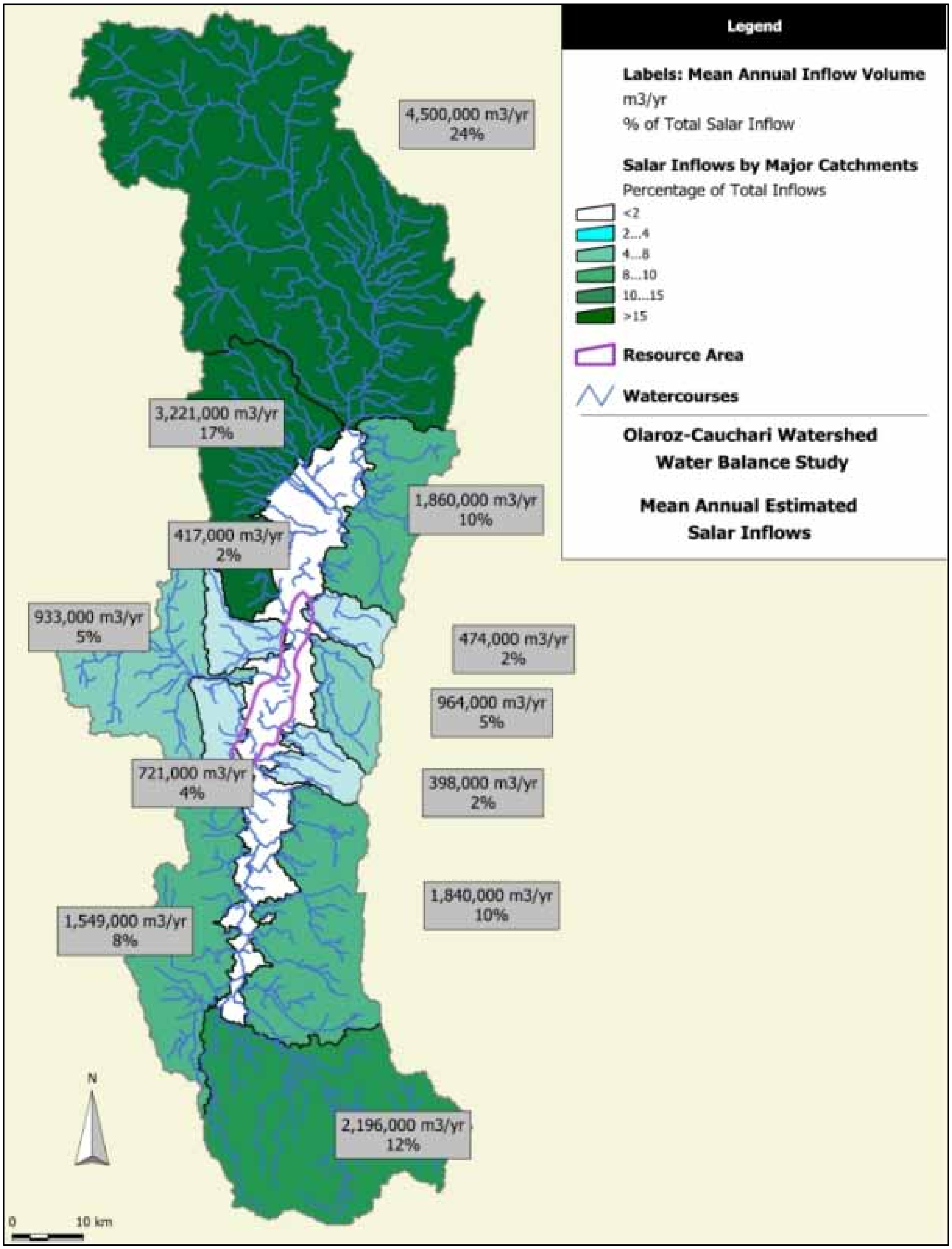
Figure 7.28 shows the estimated freshwater outflow from the catchments contributing to the Archibarca Fan, to provide an indication of annual variability. The Archibarca Fan is located on the boundary between the Olaroz and Cauchari Salars, and is within the groundwater model domain. Annual outflows from the fan are highly variable due to variations in precipitation. Before 1980, high outflow events (defined herein as > 500,000 m^3/year) occur approximately every five to seven years. Between 1980 and 1988, high flow events were more frequent, occurring approximately every three years. Figure 7.29 shows the estimated solar water inflow to the catchment basin areas.

Figure 7.28 Annual Freshwater Outflow Totals for Areas Contributing to the Archibarca Fan



Source: *King, Kelley, Abbey, (2012).*

Figure 7.29 Mean Annual Outflows From Lumped Catchments Around the Cauchari-Olaroz Salar



Source: *King, Kelley, Abbey, (2012).*

7.11 MINERALIZATION

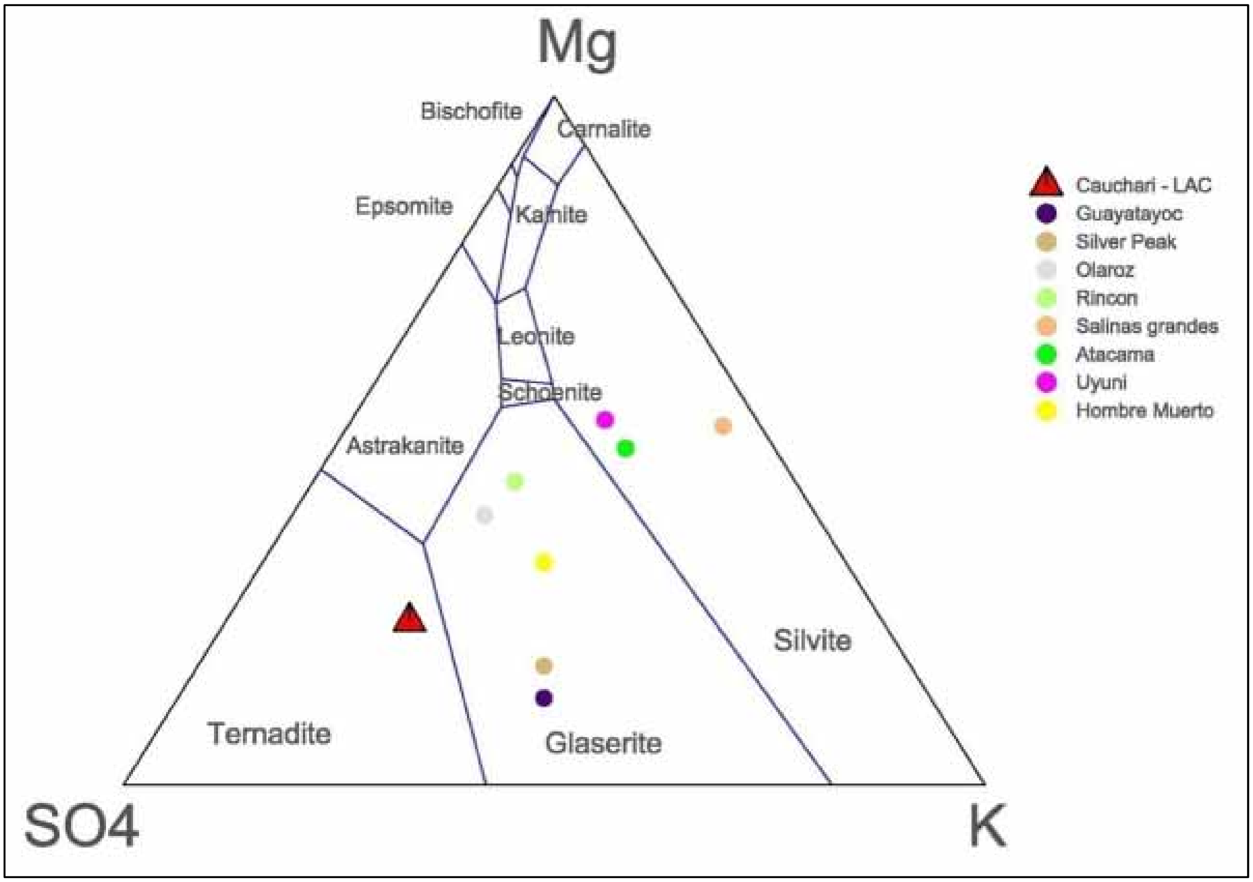
The brines from Cauchari are saturated in sodium chloride with total dissolved solids (TDS) on the order of 27% (324 to 335 g/L) and an average density of about 1.215 g/cm^3. The other primary components of these brines are common to brines in other salars in Argentina, Bolivia, and Chile, and include: potassium, lithium, magnesium, calcium, sulphate, HCO_3, and boron as borates and free H_3BO_3.

A Janecke Projection comparing the chemistry of several brine deposits is shown in Figure 7.30. This type of figure can be used as a visualization tool for mineral crystallization. The diagram represents an aqueous five-component system (Na+, K+, Mg++, SO_4=, and Cl–) saturated in sodium chloride. The aqueous system can be represented in this simplified manner, due to the higher content of the ions Cl–, SO_4=, K+, Mg++, Na+ compared with other elements (e.g., Li, B, Ca). In Figure 7.30, each corner of the triangle represents one of three pure components (Mg, SO_4 and K_2), in mol%. The sides of the triangle represent sodium chloride-saturated solutions, with two reciprocal salt pairs ($MgCl_2$ + Na_2SO_4), (Na_2SO_4+KCl) and a quaternary system with a common ion ($MgCl_2$+KCl+NaCl).

The inner regions of the diagram show expected crystallization fields for minerals precipitating from the brine. Since the brines are saturated in NaCl, halite precipitates during evaporation in all the cases. In addition, the Cauchari brine is predicted to initially precipitate ternadite (Na_2SO_4). The brines of Guayatayoc, Silver Peak, Hombre Muerto, Olaroz, and Rincon would initially precipitate glaserite ($K_3Na(SO_4)_2$). Atacama, Uyuni, and Salinas Grandes brines would initially precipitate silvite (KCl).

In addition to the primary minerals indicated in the diagram, a wide range of secondary salts may precipitate from these brines, depending on various factors including temperature and dissolved ions. The additional salts could include: astrakanite ($Na_2Mg(SO_4)_2 \cdot 4H_2O$), schoenite ($K_2Mg(SO_4)_2 \cdot 6H_2O$), leonite ($K_2Mg(SO_4)_2 \cdot 4H_2O$), kainite ($MgSO_4 \cdot KCl \cdot 3H_2O$), carnalite ($MgCl_2 \cdot KCl \cdot 6H_2O$), epsomite ($MgSO_4 \cdot 7H_2O$), and bischofite ($MgCl_2 \cdot 6H_2O$).

Figure 7.30 Janecke Classification of Brines



References as per Table 8.1, with the addition of information from Houston (2010b) for Salinas Grandes and Guayatayoc.
Source: *King, Kelley, Abbey, (2012).*

8.0 DEPOSIT TYPES

The Cauchari and Olaroz Salars are classified as "Silver Peak, Nevada" type terrigenous salars. Silver Peak, Nevada in the USA was the first lithium-bearing brine deposit in the world to be exploited. These deposits are characterized by restricted basins within deep structural depressions in-filled with sediments differentiated as inter-bedded units of clays, salt (halite), sands and gravels. In the Cauchari and Olaroz Salars, a lithium-bearing aquifer has developed during arid climatic periods. On the surface, the salars are presently covered by carbonate, borax, sulphate, clay, and sodium chloride facies. A detailed description of the geology of the Olaroz and Cauchari Salars is provided in Section 7. Table 8.1 compares the average Cauchari brine composition measured in weight percent with other natural brine deposits.

Cauchari and Olaroz have relatively high sulphate contents and therefore both salars can be further classified as "sulphate type brine deposits". Section 10 provides detailed further discussion of the chemistry of Cauchari and Olaroz.

It should be noted that the Qualified Person has been unable to verify the information for other properties listed in Table 8.1 and that the information is not necessarily indicative of the mineralization on LAC's Cauchari-Olaroz Property that is the subject of the Technical Report.

TABLE 8.1
COMPARATIVE CHEMICAL COMPOSITION OF NATURAL BRINES

Company	Location	Category	Weight Percent (wt %)					Density (g/cm^3)	Ratios				
			Li	K	Mg	SO4	B		Mg/ Li	K/ Li	SO4/ Li	SO4/ Mg	SO4/ K
Comibol (state)	Uyuni, Bolivia (A)	Inferred	0.035	0.720	0.650	0.850	0.020	1.211	18.57	20.57	24.29	1.31	1.18
SQM	Atacama, Chile (B)	Probable Proven	0.150	1.850	0.960	1.650	0.064	1.223	6.40	12.33	11.00	1.72	0.89
Lithium Americas Corp.	Cauchari – Olaroz, Argentina (F)	Proven	0.060	0.450	0.130	1.580	0.090	1.220	2.37	8.08	28.28	11.96	3.50
		Probable	0.050	0.440	0.130	1.560	0.090	1.220	2.37	8.11	28.49	12.00	3.51
Rincon Lithium	Rincon, Argentina (E)	Inferred	0.033	0.656	0.303	1.015	0.040	1.220	9.18	19.88	30.76	3.35	1.55
Zhabuye Lithium	Zhabuye, China (C)	Inferred	0.097	2.640	0.001	5.240	0.286	1.297	0.01	27.22	54.02	5,240.00	1.98
FMC	Hombre Muerto, Argentina (A)	Proven/ Probable	0.062	0.617	0.085	0.853	0.035	1.205	1.37	9.95	13.76	10.04	1.38
Rockwood	Atacama, Chile (A)	Proven/ Probable	0.150	1.850	0.96	1.650	0.064	1.223	6.40	12.33	11.00	1.72	0.89
CITIC Guoan	West Taijinair, China (C)	Inferred	0.021	8.256	0.689	14.974	0.031	1.226	32.98	395.21	716.80	21.73	1.81
Orocobre	Olaroz, Argentina (D)	Inferred	0.057	0.490	0.159	n.a.	0.058	n.a.	2.77	8.55	n.a.	n.a.	n.a.
Rockwood	Silver Peak, USA (A)	Proven/ Probable	0.023	0.530	0.030	0.710	0.008	n.a.	1.30	23.04	30.87	23.67	1.34

TABLE 8.1 COMPARATIVE CHEMICAL COMPOSITION OF NATURAL BRINES														
Company	**Location**	**Category**	**Weight Percent (wt %)**					**Density (g/cm^3)**	**Ratios**				
			Li	**K**	**Mg**	**SO4**	**B**		**Mg/ Li**	**K/ Li**	**SO4/ Li**	**SO4/ Mg**	**SO4/ K**
Western Mining Group	East Taijinair, China (C)	Inferred	0.064	6.861	1.378	14.131	0.084	1.263	21.60	107.53	221.48	10.25	2.06

(A) *Data from Roskill, 2009*
(B) *SQM: US SEC report Form 20 F 2009*
(C) *Data from Dr. Haizhou Ma, Institute of Salt Lakes, China*
(D) *Orocobre JORC report quoted by Houston and Ehren (2010)*
(E) *Fowler and Pavlovic, 2004*
(F) *Present 43-101 Report.*

9.0 EXPLORATION

9.1 OVERVIEW

The following exploration programs have been conducted to evaluate the lithium development potential of the Project area:

- Surface Brine Program – Brine samples were collected from shallow pits throughout the salars to obtain a preliminary indication of lithium occurrence and distribution.
- Seismic Geophysical Program – Seismic surveying was conducted to support delineation of basin geometry, mapping of basin-fill sequences, and siting borehole locations.
- Gravity Survey – A limited gravity test survey was completed to evaluate the utility of this method for determining depths to basement.
- TEM Survey – TEM surveying was conducted to attempt to define fresh water / brine interfaces around the salar perimeter.
- VES Survey – A VES survey was conducted to attempt to define fresh water and brine interfaces, and extensive fresh water occurrences.
- Surface Water Sampling Program – An ongoing program is conducted to monitor the flow and chemistry of surface water entering the salars.
- Pumping Test Program – Pumping and monitoring wells were installed and pumping tests were conducted at five locations, to estimate aquifer properties related to brine recovery and fresh water supply.
- Reverse Circulation (RC) Borehole Program – Dual tube reverse circulation drilling was conducted to develop vertical profiles of brine chemistry at depth in the salars and to provide geological and hydrogeological data.
- Diamond Drilling (DD) Borehole Program – This program was conducted to collect continuous cores for geotechnical testing (RBRC, grain size and density) and geological characterization. Some of the boreholes were completed as observation wells for future brine sampling and monitoring.

Details of the drilling programs are discussed in Section 10.

9.2 SURFACE BRINE PROGRAM

In 2009, a total of 55 surface brine samples were collected from shallow hand-dug test pits excavated throughout the Project area. Results from this early program indicated favourable potential for significant lithium grades at depth. Additional exploration work was initiated on the basis of these results. A full description of the Surface Brine Program is provided in the Inferred Resource Estimate Report for the Project (King, 2010a).

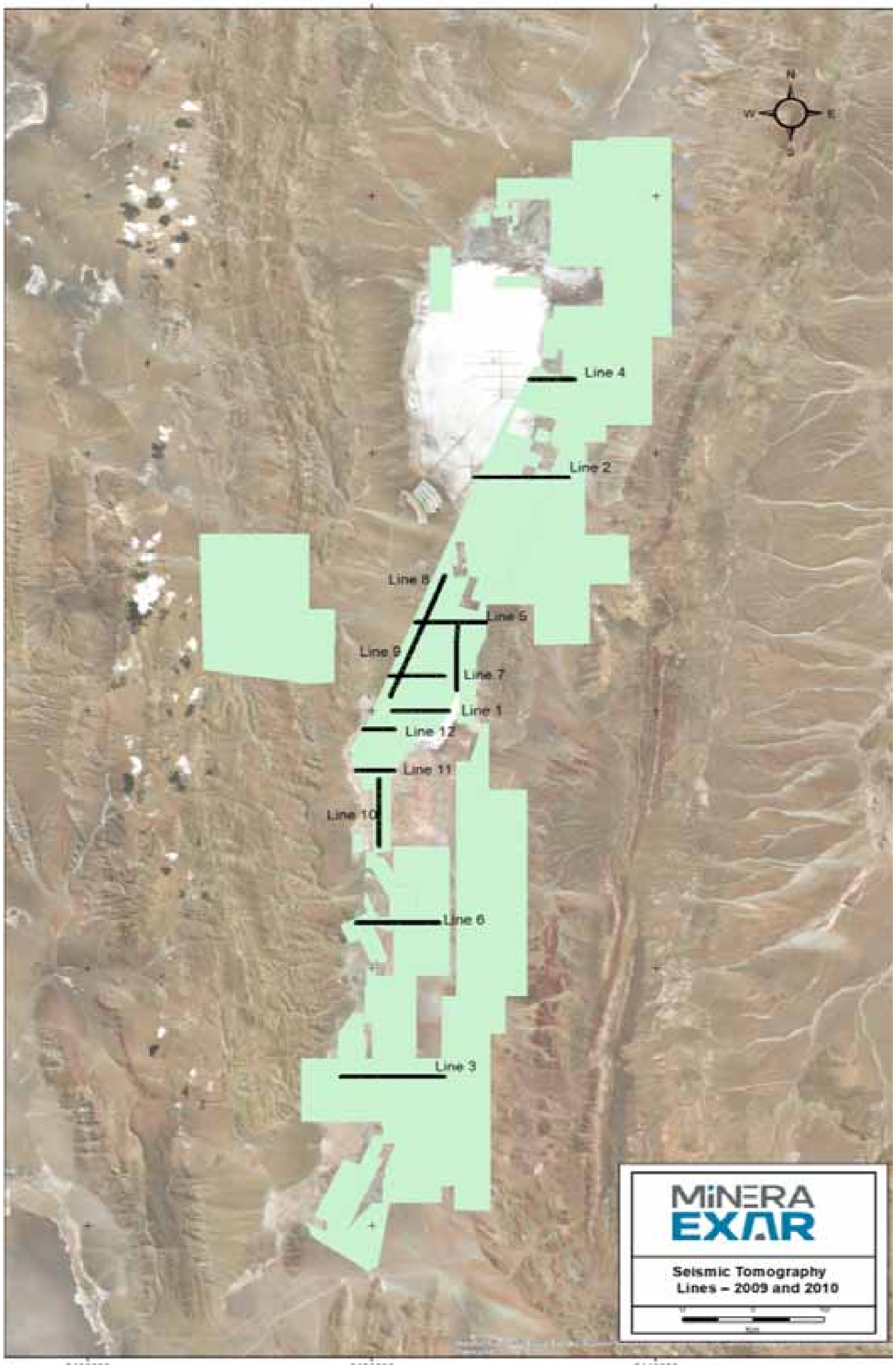
9.3 SEISMIC GEOPHYSICAL PROGRAM

A high resolution seismic tomography survey was conducted primarily on the Cauchari Salar and to a lesser extent on the Olaroz Salar, during 2009 and 2010. The survey was contracted to Geophysical Exploration Consulting (GEC) of Mendoza, Argentina. Measurements were conducted along 12 survey lines, as shown in Figure 9.1. Nine lines are oriented east-west (1, 2, 3, 4, 5, 6, 9, 11, and 12), two lines (7 and 10) have a north-south orientation, and Line 8 is a northeast trending diagonal line parallel to the western property boundary and covering the Archibarca Fan. A total of 62,500 m of seismic survey data was acquired.

The survey configuration utilized a five-metre geophone separation, and a semi-logarithmic expanding drop-weight source array symmetrically bounding the central geophone array. The geophone array comprised 48 mobile measurement sites utilizing Geode Geoelectrics 8 Hz geophones. Symmetrically surrounding the 48 geophones were accelerated, 150 kg drop-weight sites moving away from the geophone array as follows: 15, 30, 60, 90, 120, 150, 250, 500, 750, and 900 m. Based on standard methods for depth resolution, the outer drop-weight positions would provide sufficient velocity detail to depths on the order of 500 to 600 m. The seismic survey data supported the identification of drilling sites for the RC and DD Programs in 2009 and into 2010. The seismic inversions are shown in Figure 9.2.

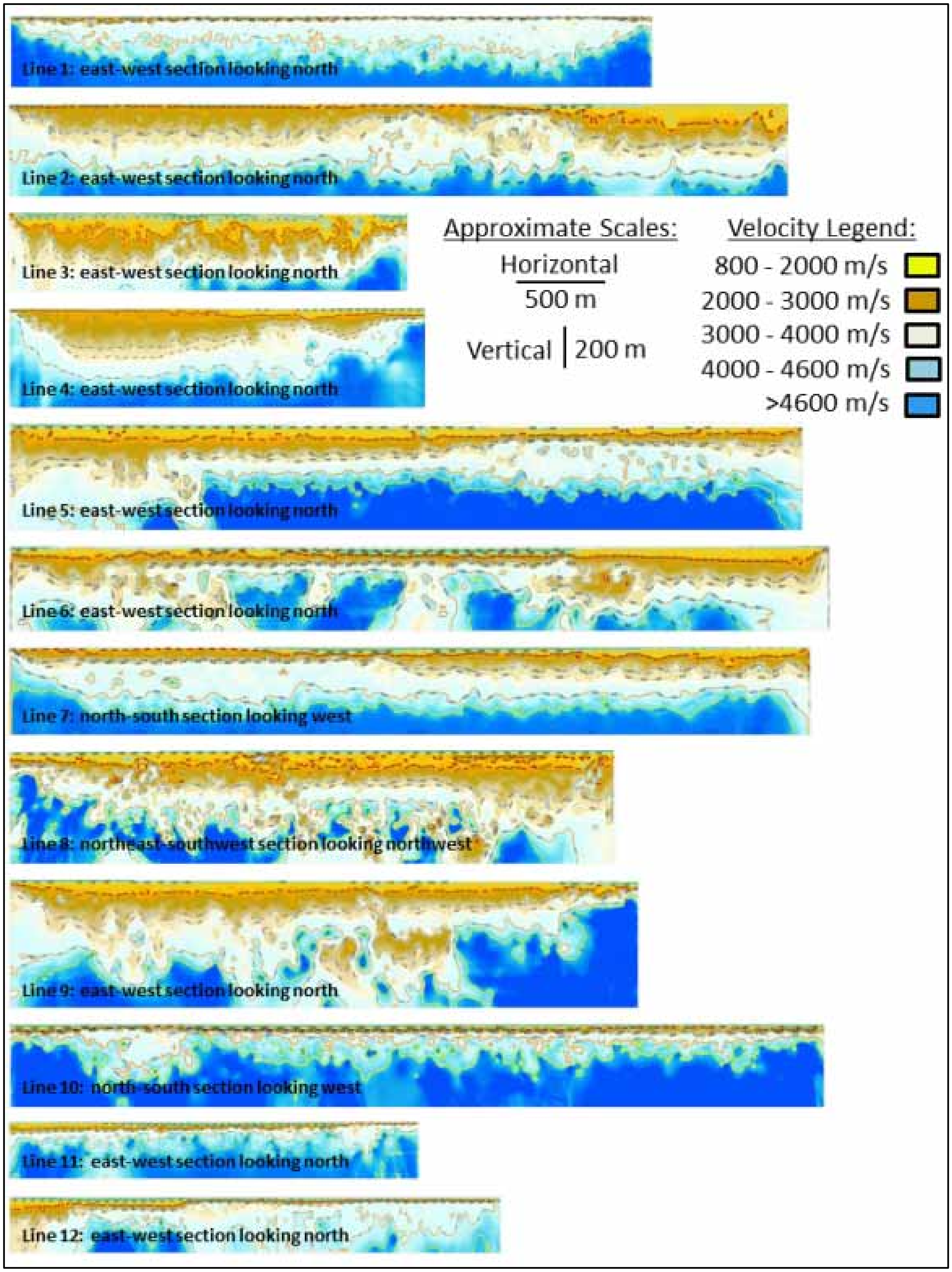
The maximum interpreted depth of the salars for each of the twelve seismic lines ranged from approximately 300 to 600 m. This variance in the apparent depth of the basin is attributed to two factors: 1) actual basin depth, and 2) property limitations which restricted the placement of the source hammer, and therefore the depth of exploration.

Figure 9.1 Seismic Tomography Lines – 2009 and 2010



Source: *Minera Exar.*

Figure 9.2 Seismic Tomography Results for the 12 Survey Lines in Figure 9.1



Source: *King, Kelley, Abbey, (2012).*

9.4 GRAVITY SURVEY

A reconnaissance gravity survey was completed at the Cauchari Salar during July of 2010. The survey was a test to evaluate the effectiveness of the gravity method to define basement morphology and grabens that could represent favourable settling areas for dense brine. Data were collected at 200 m intervals along the two survey profiles shown in Figure 9.3. These profiles extended to outcrop locations outside the salar limits, to facilitate final gravity data processing and inversion.

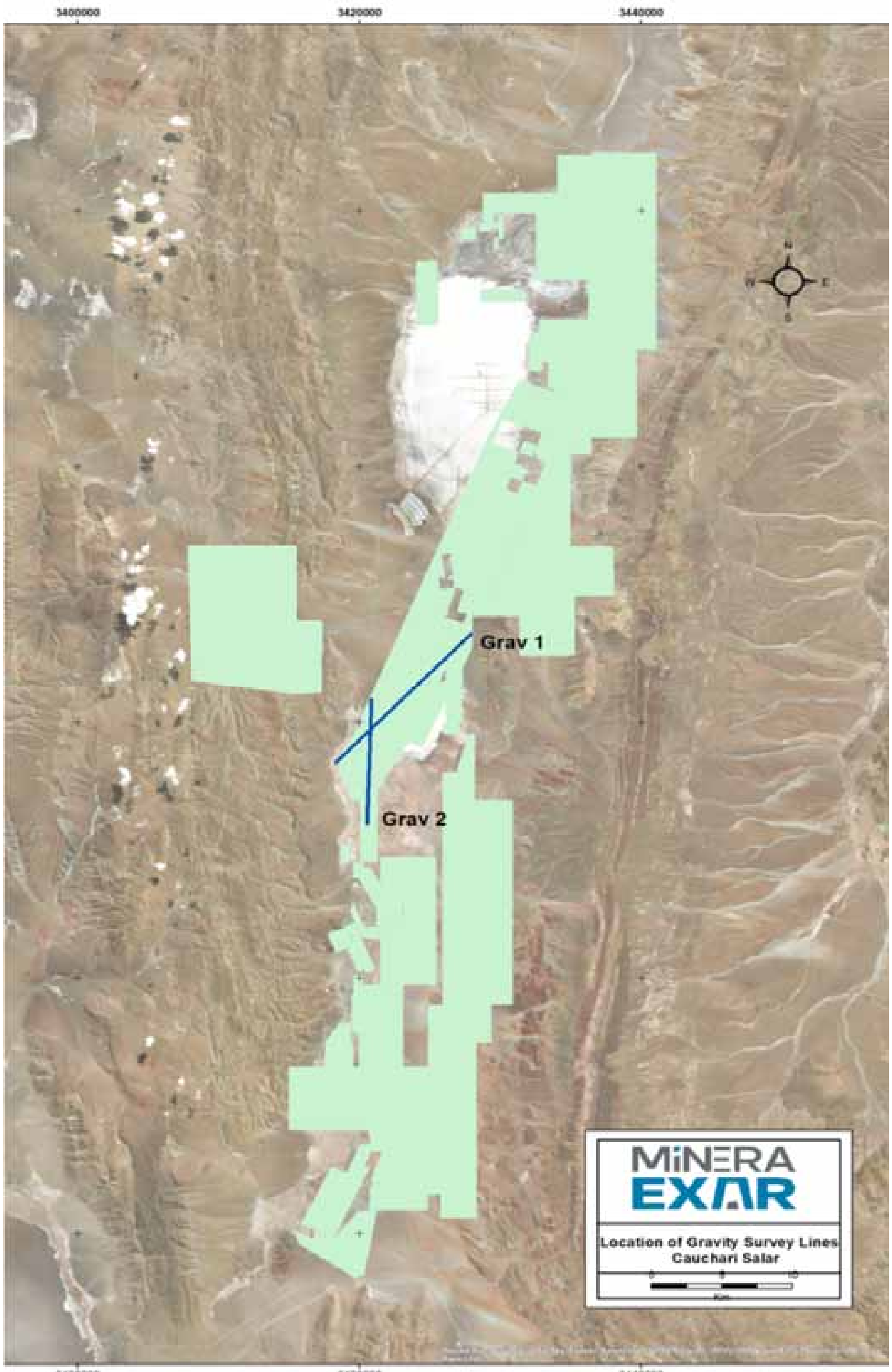
Instrumentation used for the survey was a La Coste and Romberg #G-470 gravimeter with an accuracy of ± 0.01 mGal. The gravity survey field procedure included repetition of survey control points at intervals of less than five hours, to minimize instrument drift control errors. Initial gravity data processing was completed with Oasis software, using the Gravity and Terrain Correction module. Inversions were also produced with Oasis software, using the gravity module GM-SYS.

Differential GPS measurements provided the station control with an accuracy level of ± 1 cm. A GPS base station using a Trimble DGPS 5700 model was employed in two locations within five kilometres of the survey lines and operated continuously during the measurement of the survey GPS points along the gravity traverses. A Trimble model R3 was used for the gravity station placement.

Modelling results for the northeast oriented gravity survey line (GRAV 1) are shown in Figure 9.4. The image shows the location of boreholes, the input densities used for model generation, and the calculated Bouger results from the field data. The upper profiles indicate an excellent fit of observed and modeled data based on the coloured model shown in the lower part of the figure. The lower red portion is the modeled depth to basement, or denser lithologies, using the starting model densities and the observed field data. There is good correlation between the gravity and seismic results which indicate changes in density and velocity, respectively, at approximately 300 m depth. It is interpreted that this approximate depth represents an increase in compaction of the sand-salt mix encountered during drilling.

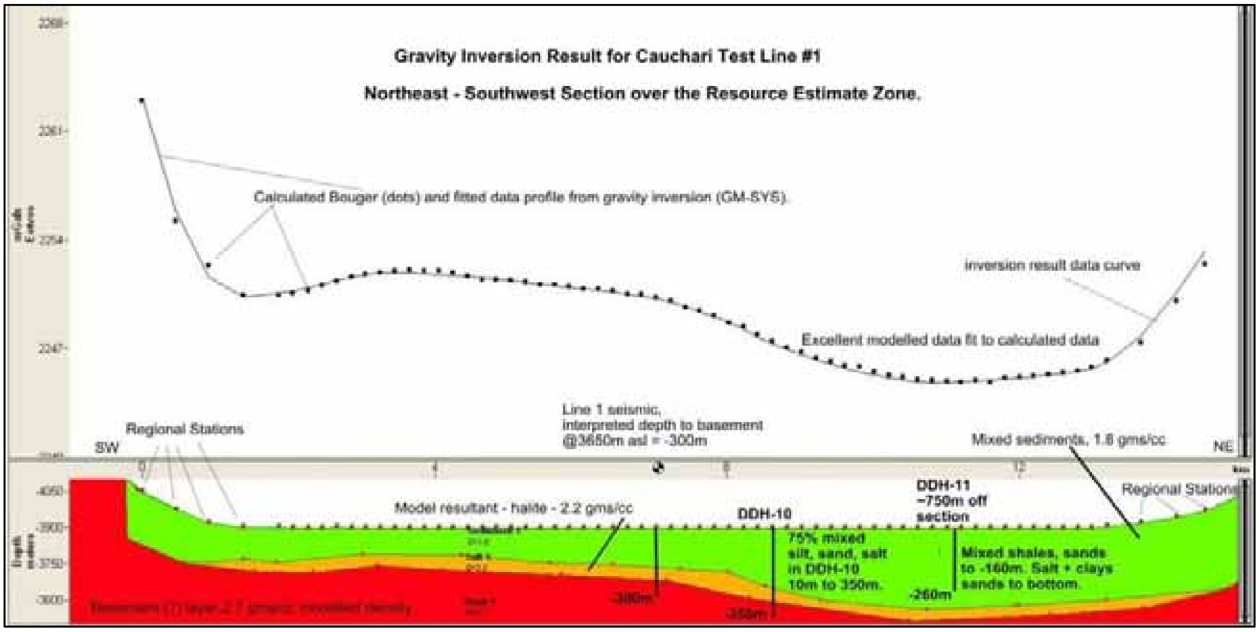
Modelling results for the north-south gravity profile (GRAV 2) across the southwest portion of the Mineral Resource Estimate zone are shown in Figure 9.5. Drilling results for DDH-4 show a change at 160 m depth to thick and dense halite with low porosity. This is marginally higher than the red area indicated by the gravity inversion modelling program. Similarly, for DDH-12, the intersection of the massive halite is slightly different from the model results, but is within acceptable limits. Overall an excellent fit is apparent between the observed and modeled data as seen in the profile on the upper section of the figure. This image demonstrates that the gravity method is effective for identifying relative density changes associated with different lithologies or increased compaction with depth in the salar.

Figure 9.3 Location of Gravity Survey Lines at the Cauchari Salar



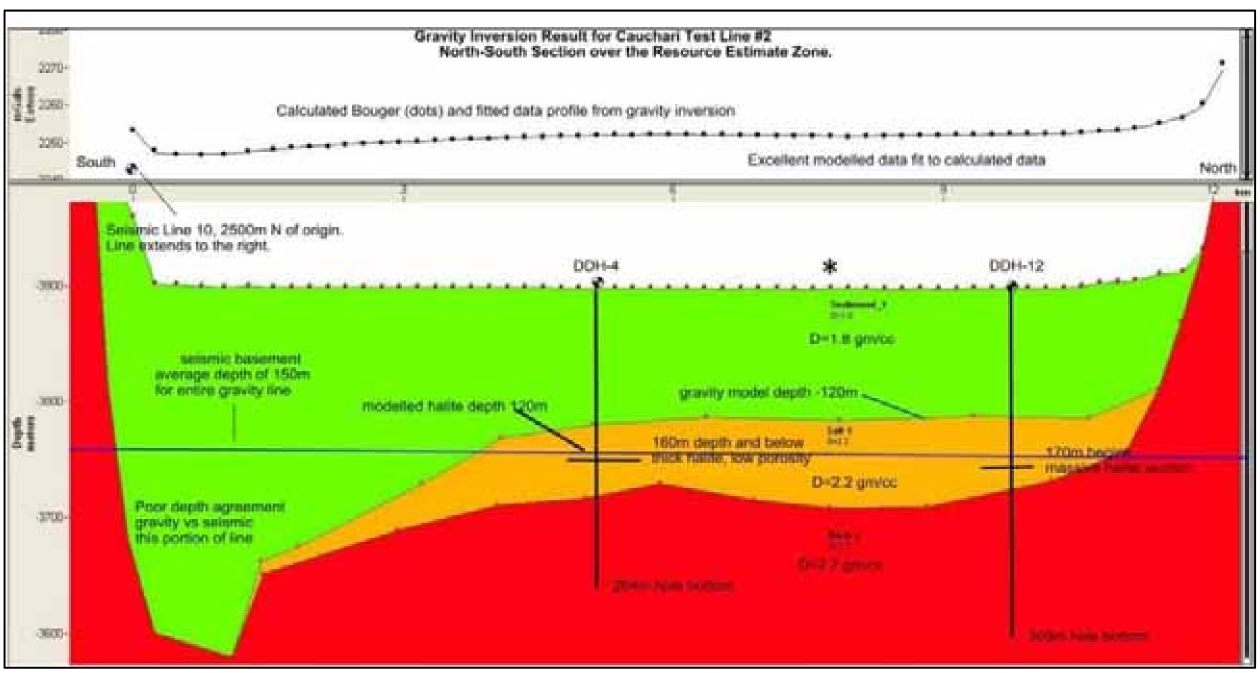
Source: *Minera Exar.*

Figure 9.4 Modeling Results for the Northeast Oriented Gravity Line (Grav 1) Over the Mineral Resource Estimate



Source: *King, Kelley, Abbey, (2012).*

Figure 9.5 Modeling Results for the North-South Gravity Line (Grav 2) Across the Southwest Portion of the Mineral Resource Estimate



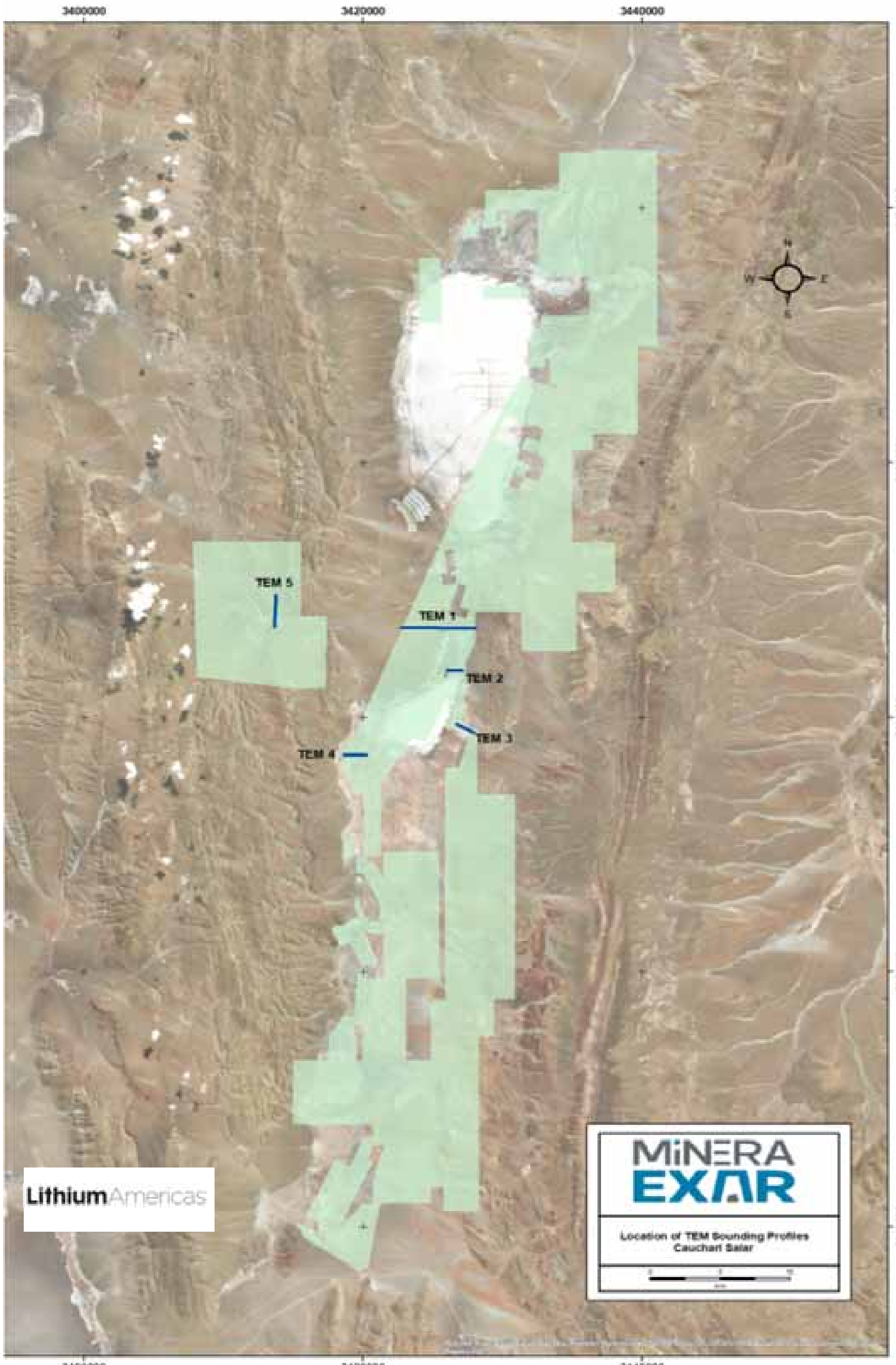
Source: *King, Kelley, Abbey, (2012).*

9.5 TEM SURVEY

A Time Domain Electromagnetic (TEM) survey was conducted in the Cauchari Salar during July, 2010, along the five TEM lines shown in Figure 9.6. The main objective of the survey was to test the applicability of this method for determining resistivity contrasts that may relate to changes in groundwater salinity. In general, it is expected that saline brines will be more conductive (lower resistivity), whereas areas of fresh water will be less conductive (higher resistivity). The TEM survey parameters included:

- The use of Zonge GDP-16 Rx and GGT-20 Tx instrumentation;
- In-loop sounding configuration using 200 m × 200 m square transmitting loops and a base transmitting frequency of 4 Hz;
- Soundings completed at 100 m station intervals from 45 ms to 48 ms; and
- Completion of a total of 12.6 linear survey kilometres.

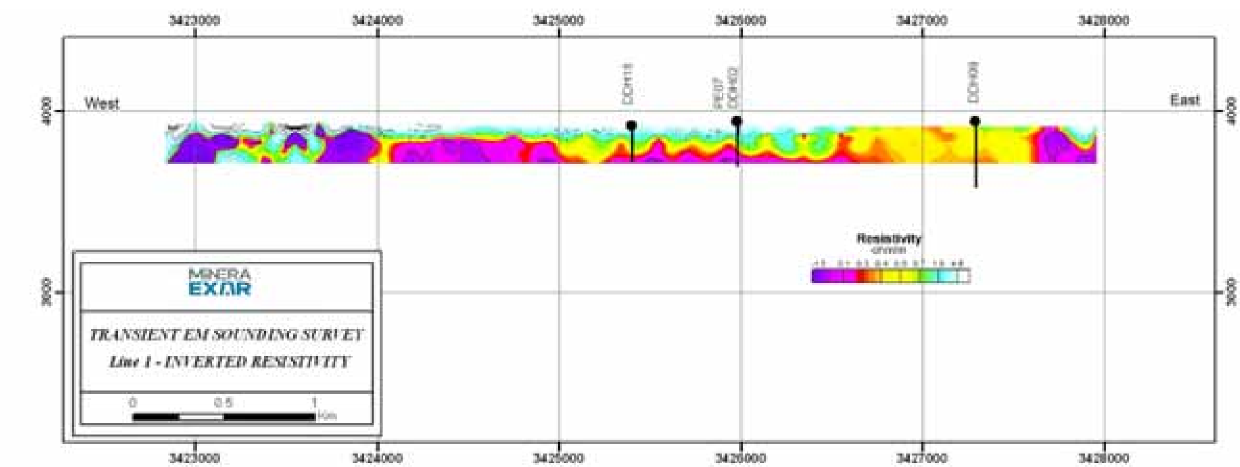
Figure 9.6 Location of TEM Sounding Profiles Conducted at the Cauchari Salar



Source: *Minera Exar.*

Line TEM 1 (Figure 9.7) – Borehole logs and brine sampling results for PE-07 and DDH-02 indicate that the top of the brine aquifer is at approximately 40 m depth. This is reasonably consistent with the low resistivity values seen in the inversion at this location where the resistivity drops in the presence of brine. For DDH-09, there is sand present to approximately 60 m depth, followed by variable salt, silt, and sand past the bottom of the TEM inversion depth. The resistivity section is supported by the logging results. Notably on this TEM line is the area on the west (left) side of the image, which corresponds to a portion of the alluvial Archibarca Fan, where fresh water inflow occurs. The higher resistivity values in this area are consistent with the inflow of freshwater. The profile also shows two low resistivity anomalies that may be attributable to occurrence of brines at depth, possibly related to structures that intersect the TEM profile orthogonally at these locations.

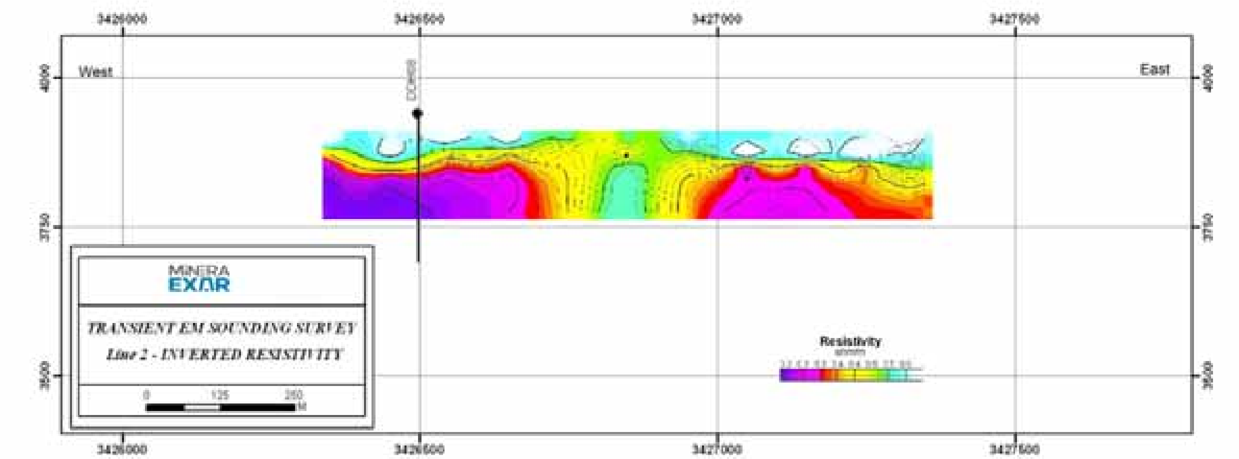
Figure 9.7 Survey Results for Line TEM 1



***Source: :** Minera Exar.*

Line TEM 2 (Figure 9.8) – This TEM image shows a typical layered model in the vicinity of DDH-08 where sandy layers containing the brine resource are situated at 20 m depth. The deeper, low resistivity region associated with DDH-08 is associated with the sandy brine-containing layers continuing to depth. Further to the east (right) there is indication of another low resistivity, high conductivity source. The higher resistivity values in the center of the image may be associated with compacted halite, possibly related to a horst.

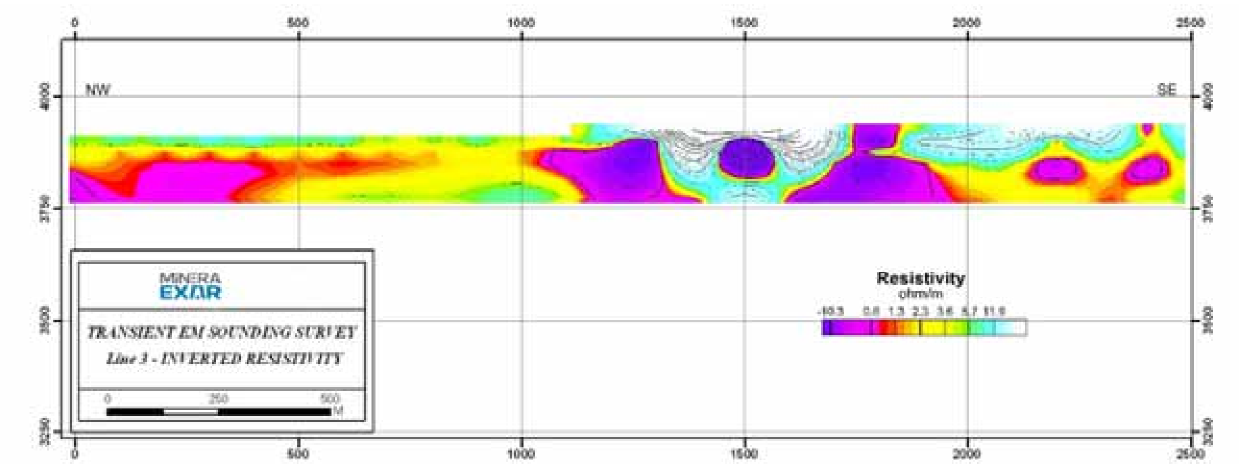
Figure 9.8 Survey Results for Line TEM 2



Source: *Minera Exar.*

Line TEM 3 (Figure 9.9) – This northwest-southeast oriented line is situated in the eastern sector of the Cauchari Salar, where no drilling has occurred. It was selected to investigate the possibility of fresh water inflow and/or the presence of brine. The resistivity data suggest that both scenarios occur. Higher resistivity values are likely attributable to fresh water inflow from one of the alluvial fans in the area. The lower resistivity values may be related to brines, with typical resistivity values of < 1.0 ohm/m, associated with interpreted structural features within the basin.

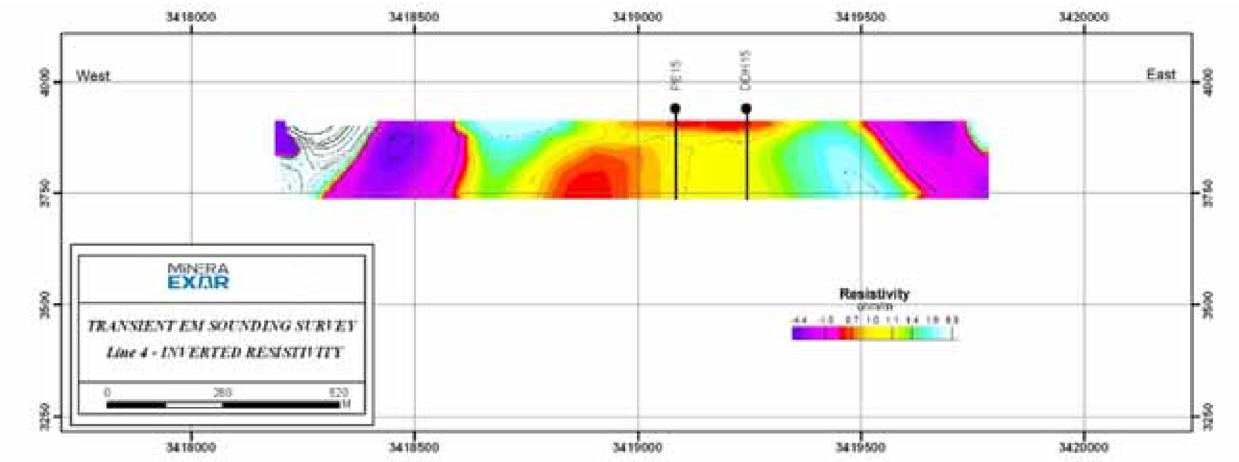
Figure 9.9 Survey Results for Line TEM 3



Source: *Minera Exar.*

Line TEM 4 (Figure 9.10) – This line is situated along the western margin of the Cauchari Salar. PE-15 is cased from the surface to a depth of 65 m. Sampling results indicate the presence of a brine aquifer at the bottom of the casing. The resistivity values suggest continuity of the brine to surface. Below 65 m the lithology is characterized by high halite content. The resistivity values at this point are around 1 ohm/m, which is slightly more resistive than sandy brine responses, and consistent with high halite content. Further to the west (left) of the boreholes, a low resistivity zone may indicate brine in a structural feature along the margin of the salar. The higher resistivity at the left end of the section may indicate fresh water moving into the salar.

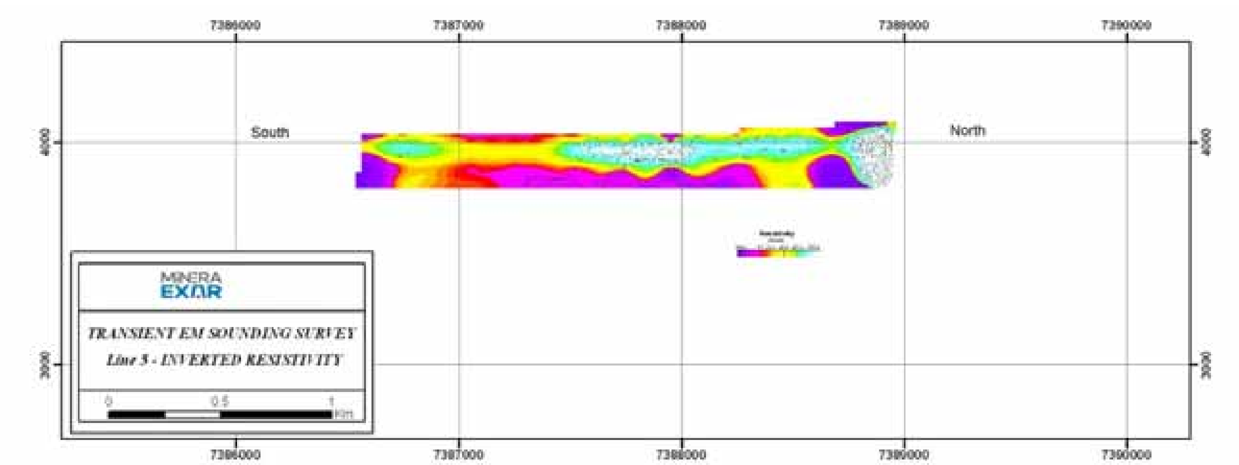
Figure 9.10 Survey Results for Line TEM 4



Source: *Minera Exar.*

Line TEM 5 (Figure 9.11) – This line was located to investigate groundwater composition under the Archibarca Fan. The central portion of the inversion shows an area of higher resistivity extending from the surface to a depth of approximately 75 m. Laterally, this zone could approach one kilometre in width. The resistivity values decrease under this interpreted body of fresh water, but not to the degree that would indicate brine presence. They may represent either background resistivity, or the transition to more saline water at depth. Some of the resistivity zones on this TEM line are greater than 1,000 ohm/m, clearly indicating a highly resistive environment that is in contrast with the conductive brines of Cauchari. The higher resistivity values on the right side of the section may relate to the near-surface occurrence of bedrock.

Figure 9.11 Survey Results for Line TEM 5



Source: *Minera Exar.*

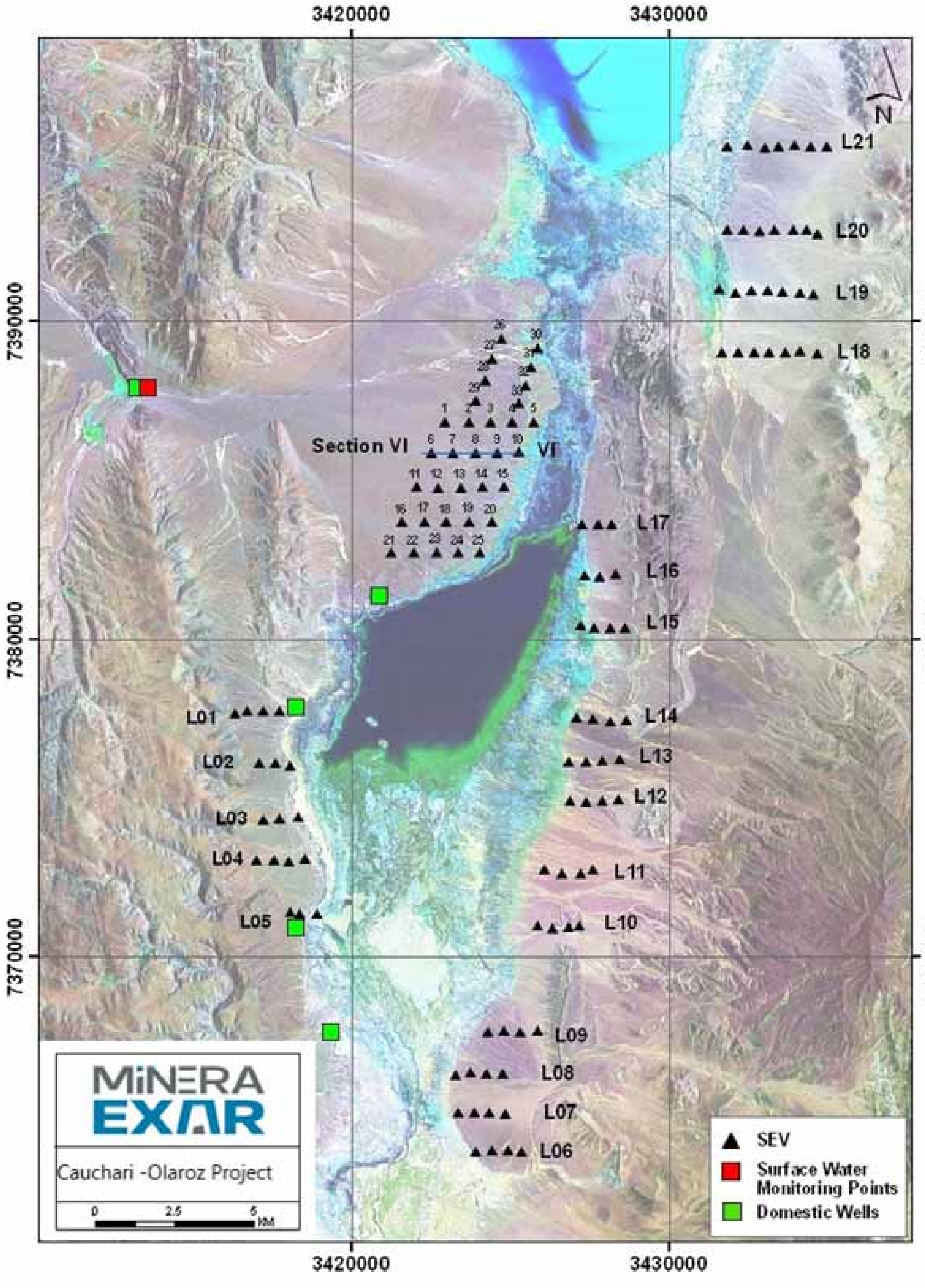
In conclusion, the TEM survey results indicate that the method can be used to determine resistivity contrasts within the salar. However, resolution may be limited to depths on the order of 75 m – 100 m, due to the broad presence of low resistivity materials, as indicated by ambient resistivity values of near sub-ohm/m in many areas of the salar.

9.6 VERTICAL ELECTRICAL SOUNDING SURVEY (VES)

A Vertical Electrical Sounding (VES) survey was conducted at perimeter locations on the Cauchari-Olaroz Salar, from November 2010 to May 2011. The extended survey period was due to recurring weather conditions that were unfavourable for surveying. The objectives of this program were to: 1) explore potential shallow fresh water sources on the Archibarca Fan, for future industrial purposes; and 2) evaluate salar boundary conditions related to the configuration of the brine/fresh water interface.

The survey was conducted using a 4-point light HP, which provides a simultaneous reading of intensity and potential that directly yields apparent resistivity. Data collected in the field were interpreted using RESIX 8.3 software, producing a graph of points representing the field measurements, and a solid line curve corresponding to the physical-mathematical model. Survey locations are shown on Figure 9.12.

Figure 9.12 Map of VES Survey Area



Source: *Minera Exar.*

The VES results enable the differentiation of the following five zones on the Archibarca Fan and the salar perimeter locations, as shown in Figures 9.14 through Figure 9.16:

- An upper unsaturated layer, with relatively high resistance;
- An upper saturated aquifer containing fresh water;
- A lower conductive layer, interpreted as containing brine;
- An interface or mixed zone, grading from fresh water to brine; and
- A lower resistive zone, only detected in three VES lines and in which the degree of saturation and water salinity is unknown.

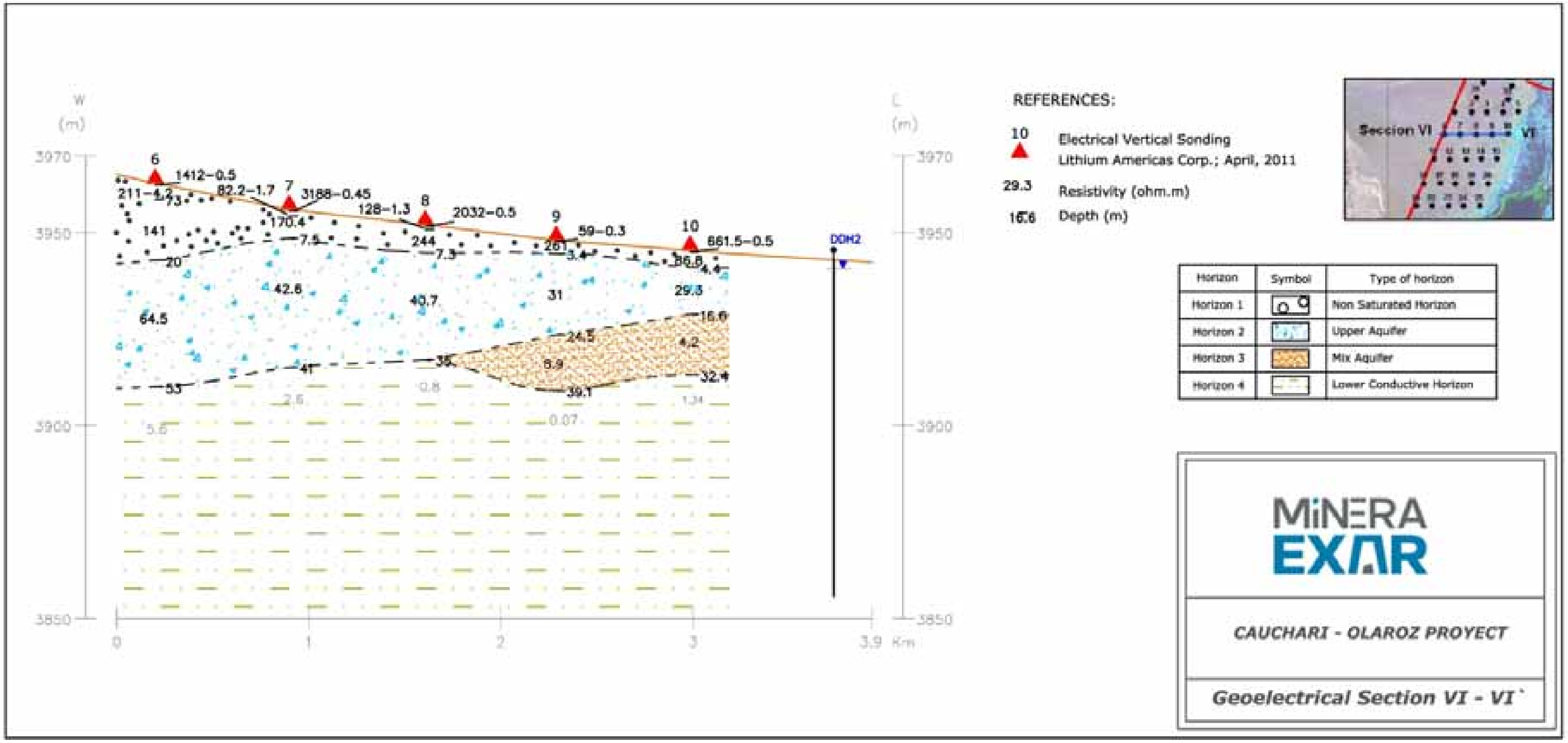
The first three of these were encountered on most lines and are interpreted to be relatively continuous on the Archibarca Fan and the salar perimeter. The latter two were discontinuous. On the Archibarca Fan, the VES results indicate the occurrence of fresh water to an average depth of 50 m below surface. Below the fresh water layer, a gradational interface often occurs between shallow fresh water and deeper brine, from approximately 20 to 70 m depth.

The upper zone, interpreted as fresh water, is present throughout the investigated area of the fan and has potentially favourable characteristics for water supply. This zone is a target for expansion of the freshwater supply at PB-I (see Section 9.10). The occurrence of freshwater on the Archibarca Fan indicates with the inflow of fresh water into the shallow sandy fan sediments from upgradient areas. The VES results are consistent with existing drilling results, and are useful for evaluating the potential thickness of the freshwater wedge.

Additional potential zones of freshwater were also identified on other smaller alluvial fans and also other non-fan perimeter locations (e.g., Figure 9.13, Figure 9.14, Figure 9.15 and Figure 9.16). The water supply potential of these additional zones appears to be lower than that of the Archibarca, due to more limited lateral and/or vertical extent of the interpreted fresh water zone. Nevertheless, these occurrences may yield useful quantities of fresh water, and would be worthwhile to evaluate further, depending on final water supply results from the Archibarca Fan.

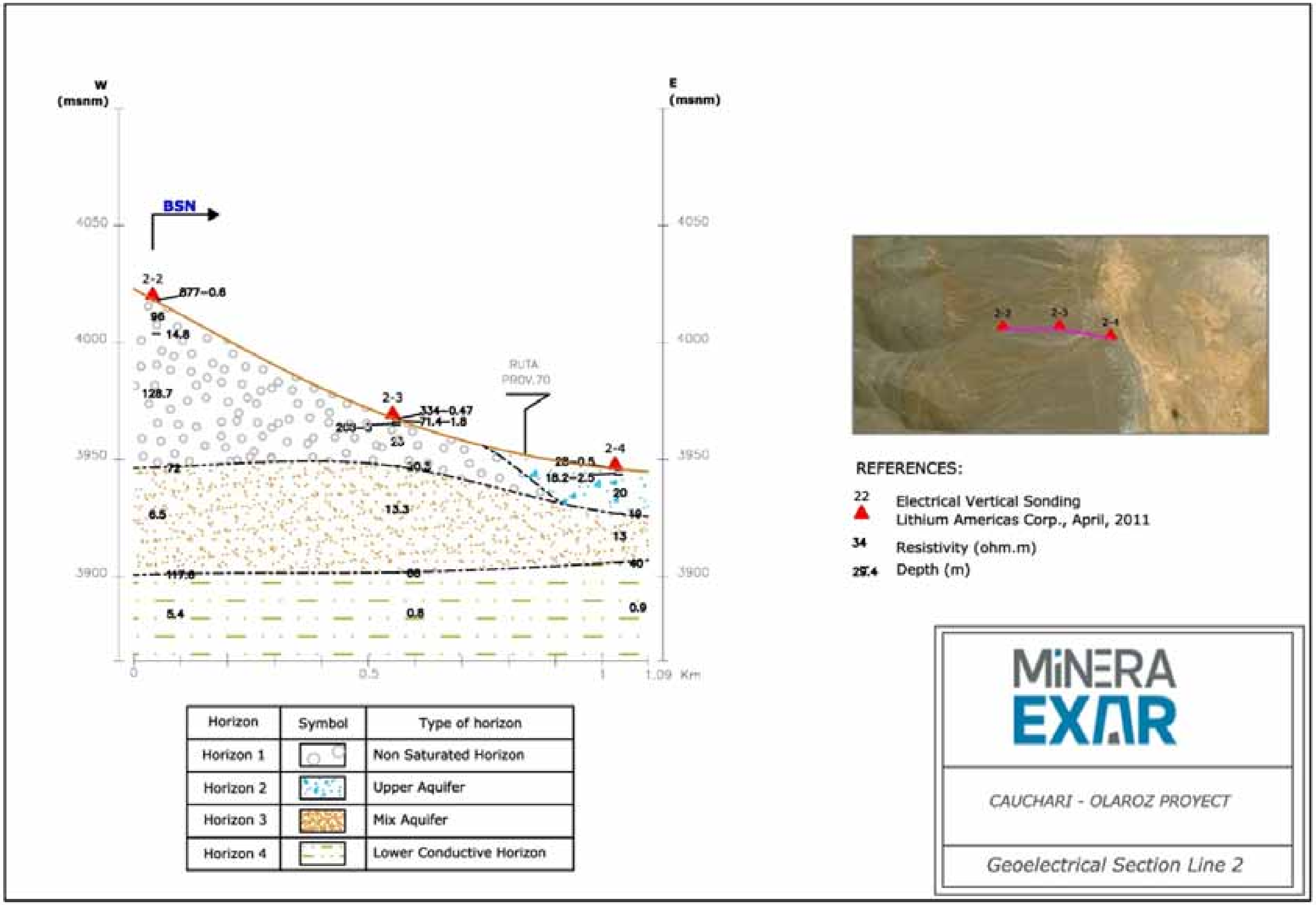
The VES results are also useful for general delineation of the fresh water/brine interface on the salar boundary. They were used to identify follow-up sampling locations at perimeter drilling and test pitting locations (see Section 9.7). Subsequently, the VES results and the follow-up sampling were used to define grade boundary conditions along the salar perimeter.

Figure 9.13 VES Survey Interpretation on the Archibarca Fan, Along Line VI



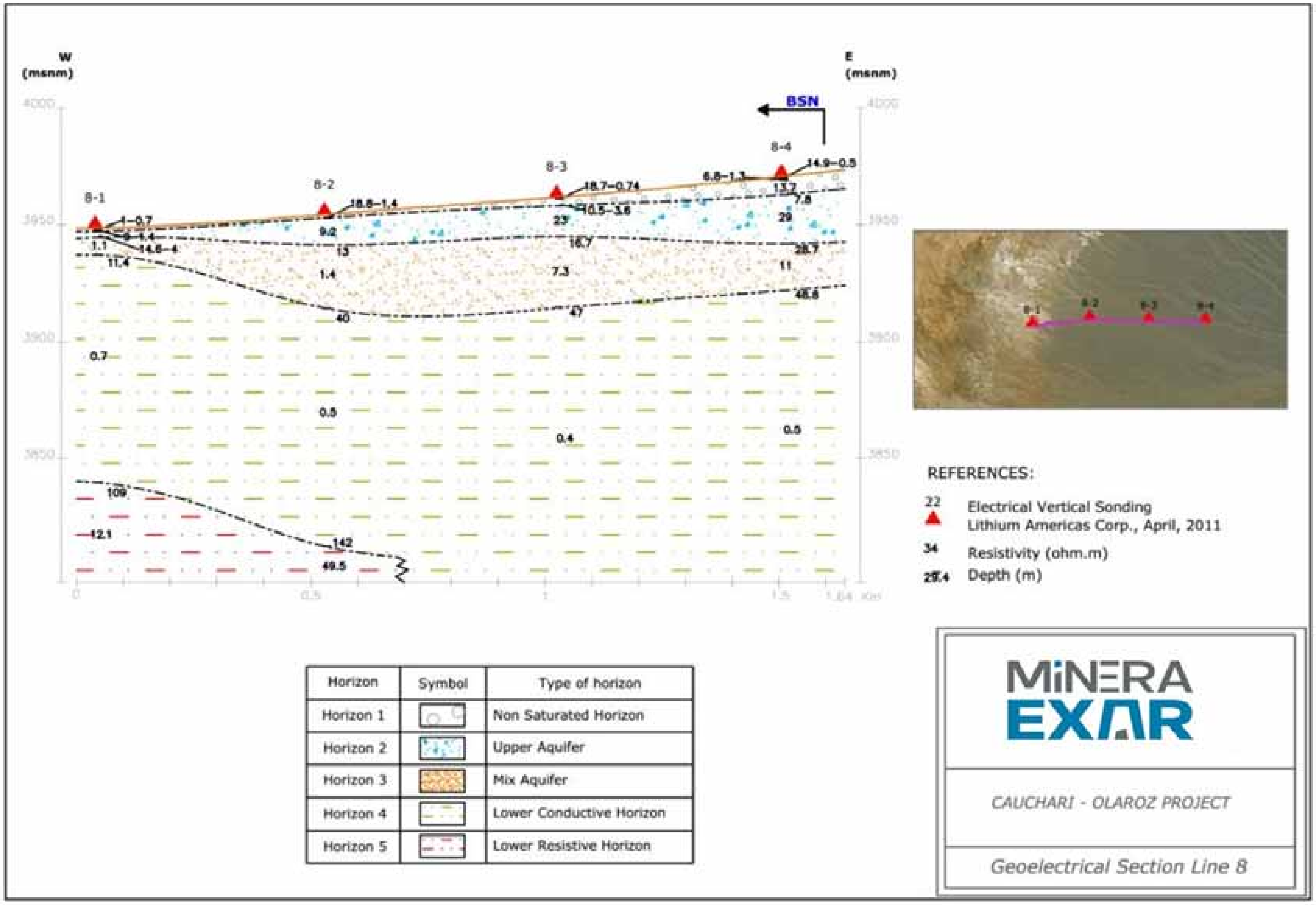
Source: *Minera Exar.*

Figure 9.14 VES Survey Interpretation Along Line 2



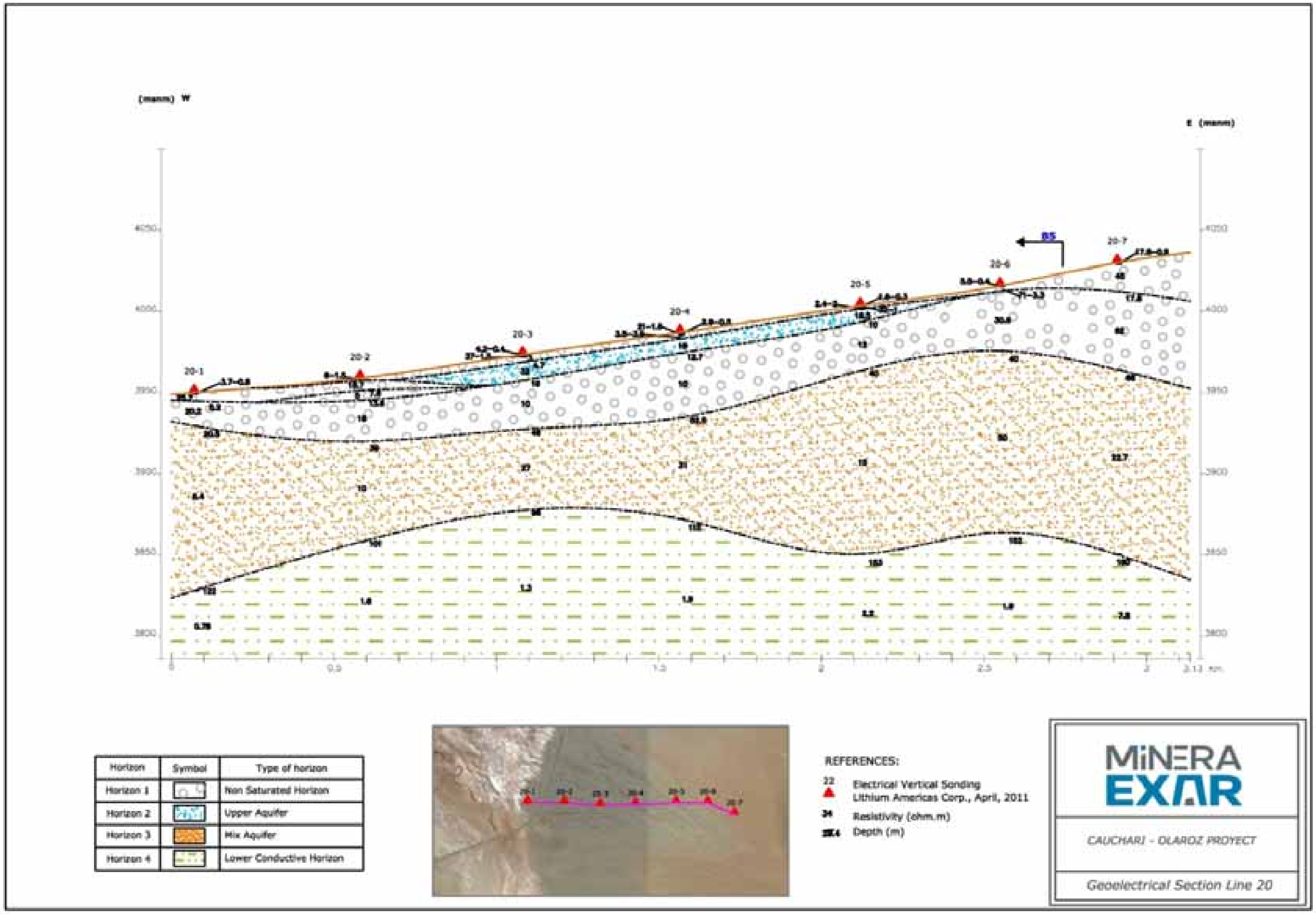
Source: *Minera Exar.*

Figure 9.15 VES Survey Interpretation Along Line 8



Source: *Minera Exar.*

Figure 9.16 VES Survey Interpretation Along Line 20



Source: *Minera Exar.*

9.7 BOUNDARY INVESTIGATION

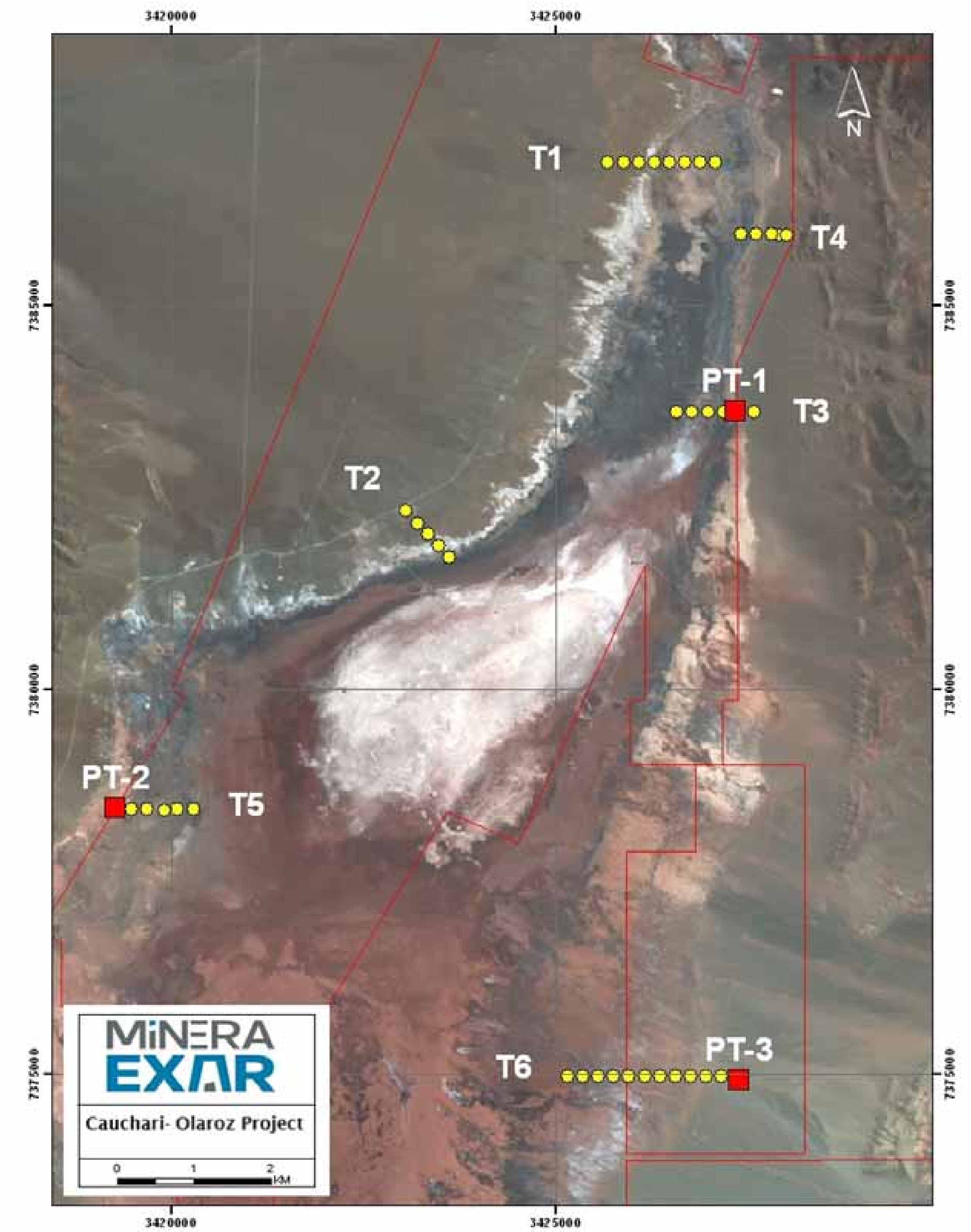
The Boundary Investigation was conducted to further assess the configuration of the fresh water/brine interface, at the salar surface and at depth, at selected locations on the salar perimeter. Data from this program were interpreted in conjunction with the VES survey (described in the previous section). Information from these two programs supported the extension of the hydrostratigraphic model and the lithium grade interpolation to the outer boundaries of the salar, and the evaluation of numerical model boundary conditions for lithium (Section 15).

Test pits and monitoring wells advanced for the Boundary Investigation are shown in Figure 9.17, and were advanced in two successive steps. In the first step, test pits were excavated along lateral transects at salar boundary locations (T3 through T6) or on the edge of the Archibarca Fan (T1 and T2). The purpose of the test pits was to identify the shallow transition zone from brine to fresh water. Test pits were excavated until water was reached, and water samples were collected from the bottom of the pits.

Water samples were sent to Alex Stewart Laboratory for major ion analysis. Field parameters, including conductivity, density, and temperature, were also measured, and were used for real-time assessment of whether the transition zone was captured by the transect. For the salar perimeter transects, the capability to fully capture the transition zone was limited by the edge of the LAC claim boundary (T3, T4, and T5) or by difficult access conditions (T6). A summary of test pit transect data for Total Dissolved Solids (TDS) and lithium is provided in Table 9.1.

The goal of the second step of the investigation was to install multi-level monitoring well nests at the locations identified as central to the fresh water/brine transition zone. In execution, the nests could not be installed directly on the shallow transition zones, due to access restrictions. Well nests were installed on three of the test pit transects and, within each nest the wells were screened at different levels, to enable an evaluation of depth trends in brine strength and lithium grade. Drilling was completed by Andina Perforaciones SRL using rotary methods. A summary of well specifications and sampling results for TDS and lithium is provided in Table 9.2.

Figure 9.17 Boundary Investigation Map Showing Test Pit Transects and Multi-level Monitoring Well Nests



Source: *Minera Exar.*

TABLE 9.1 TEST PIT TRANSECT RESULTS FOR TDS AND LITHIUM					
Transect Test Pit	**TDS (mg/L)**	**Lithium (mg/L)**	**Transect Test Pit**	**TDS (mg/L)**	**Lithium (mg/L)**
T1-1	1,120	ND	T4-3	23,260	33
T1-2	1,420	ND	T4-4	110,980	175
T1-3	720	ND	T4-5	215,740	402
T1-4	64,860	112	T5-1	12,560	18
T1-5	114,740	194	T5-2	30,220	52
T1-6	175,340	328	T5-3	106,080	240
T1-7	256,540	631	T5-4	128,500	261
T1-8	182,680	327	T5-5	227,200	442
T2-1	1,100	ND	T5-6	292,580	619
T2-2	3,640	ND	T6-1	No water	
T2-3	2,780	ND	T6-2	4,200	ND
T2-4	2,300	ND	T6-3	6,280	ND
T2-5	59,500	101	T6-4	7,580	ND
T3-1	No water		T6-5	21,,640	25
T3-2	33,300	45	T6-6	26,860	29
T3-3	84,260	140	T6-7	26,980	34
T3-4	207,920	301	T6-8	22,460	26
T3-5	251,160	362	T6-9	22,200	26
T3-6	237,180	472	T6-10	26,000	35
T4-1	No water		T6-11	No water	
T4-2	No water		ND – below detection limit.		

TABLE 9.2 TEST PIT TRANSECT RESULTS FOR TDS AND LITHIUM					
Drill Hole ID	**Depth of Screened Interval (m)**	**Casing Diameter (in)**	**Lithology of Screened Interval**	**TDS[1] (mg/L)**	**Lithium[1] (mg/L)**
PT1	59.0–63.0	4.0	Medium to fine sand	265,380 263,120 267,920	559 541 545
PT1A	39.5–43.5	4.0	Sand and Gravel	243,520 243,140 246,260	471 464 457

TABLE 9.2 TEST PIT TRANSECT RESULTS FOR TDS AND LITHIUM					
Drill Hole ID	**Depth of Screened Interval (m)**	**Casing Diameter (in)**	**Lithology of Screened Interval**	**TDS[1] (mg/L)**	**Lithium[1] (mg/L)**
PT2	39.0–49.0	4.5	Medium to fine sand	190,120 190,640 189,520	372 365 365
PT2A	21.5–29.5	4.5	fine gravel sandy clay matrix	119,280 128,040 123,400	230 250 237
PT2B	11.5–15.5	4.0	fine gravel sandy clay matrix	39,160 39,100 46,040	76 76 87
PT2C	3.5–5.5	4.0	clay	99,600 55,540	197 111
PT3	47.5–77.5	2.0	Inter-bedded sand and clay	19,940 18,920	38 36
PT3 2”	11.5–33.5	4.5	Coarse sand and gravel	18,700	35
PT3 4”				Dry well	

(1) Triplicate, duplicate or single samples were collected.

9.8 SURFACE WATER MONITORING PROGRAM

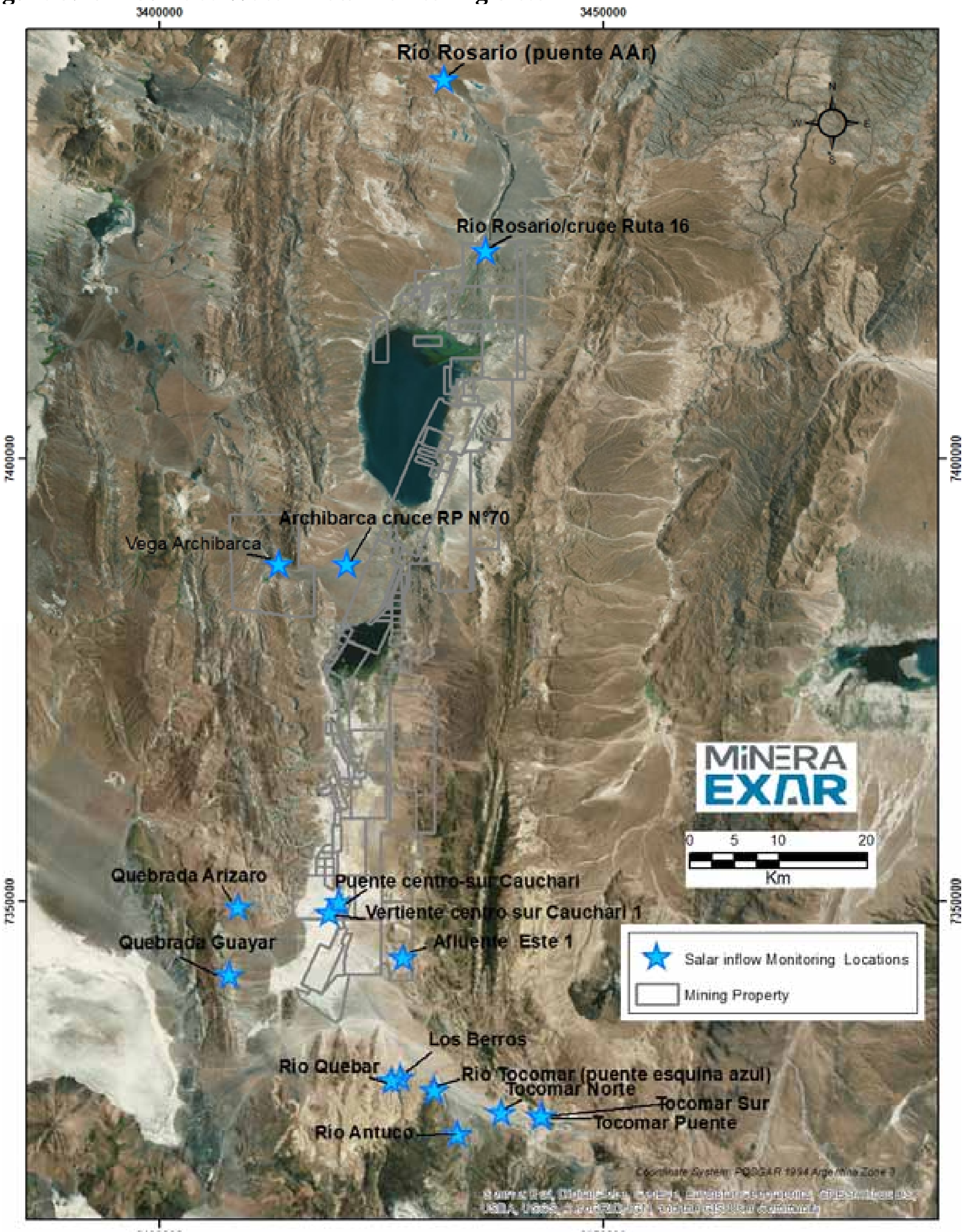
A Surface Water Monitoring Program was initiated in early 2010 to record the flow and chemistry of surface water in the vicinity of the Cauchari-Olaroz Salars. Measurements were taken at each monitoring location for pH, conductivity, dissolved oxygen, and temperature. A subsequent Surface Water Monitoring Program, measuring identical parameters was initiated in 2017 with the new drilling and was ongoing as of the effective date of this report. Flow rates are being monitored monthly. Measurements were made by monitoring flow velocity across a measured channel cross-sectional area at each site. Where the flow was too small to measure, it was estimated qualitatively. Monitoring locations are shown in Figure 9.18. Table 9.3 shows the results of this program for every month and the results with different methodologies used to measure the flows. The following methods were used to estimate the flow rates:

- Volumetric Method - consisting in a section of a known volume and measurement of time;
- Float Method - recording the time it takes a float to pass along a known volumetric section of stream; and
- Flow meter - a mechanical spinner tool which measuring the velocity of surface water passing through a known section of stream width.

These parameters are somewhat elevated in surface water inflows at the north and south ends of the salars, relative to other surface water inflows.

The data acquired from this program supported the water balance calibration and numerical groundwater modeling.

Figure 9.18 Surface Water Flow Monitoring Sites



Source: *Minera Exar.*

TABLE 9.3 AVERAGE SURFACE WATER FLOW RATES										
Year	**2017**			**2018**			**2019**			
Month	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Monthly Average (l/s)**
Tocomar Norte										
April				9.46	8.8					9.13
May				7.25	7.34					7.30
June	11.30	13.47	3.33	6.43	9.52					8.81
July			6.62		4.53	3.335				4.83
August	8.65	13.36		7.80	5.33					8.78
September			9.77	26.14	20.21					18.71
October	8.93	8.65	15.61	18.13	12.78					12.82
November	7.58	10.21	14.88	8.71						10.35
December	5.92	9.74		8.34	14.87					9.72
January					9.67			20.83		15.25
February				7.92	8.6		7.66	3.47		6.91
March				8.4	8.8					8.60
Tocomar Sur										
April					51.40	49.40				50.40
May					24.62	29.42				27.02
June		66.83	62.66		29.27	28.53				46.82
July					45.08	44.01				44.55
August		46.00	29.02		46.89					40.64
September			46.12		40.64	40.27				42.34
October		36.14	34.37		22.28	28.49				30.32
November		30.32	23.84		23.34	21.45				24.74
December			8.03		33.55	31.97				24.51

Table 9.3 **Average Surface Water Flow Rates**										
Year	**2017**			**2018**			**2019**			
Month	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Monthly Average (l/s)**
January					38.29	45.30				41.80
February					28.08	33.60		46.22	62.66	42.64
March					64.30	48.90		34.63	30.72	44.64
Tocomar Puente										
April					102.8	96.45				99.63
May					84	63.46				73.73
June		194.15	40.64		81.45	81.22				99.36
July			234.99		161.6	135.07				177.22
August		82.28	62.17		147.34	152.9				111.17
September			113.10		44.07	49.33				68.83
October			73.11		42.90	49.86				55.29
November			64.59		43.75	43.02				50.45
December		30.68	51.68		25.75	26.61				33.68
January					55.49	82.88		41.01	40.64	55.01
February					37.36	27.8		47.62		37.59
March					90.42	60.2				75.31
Afluente Este 1										
April					4.99	4.15				4.57
May					2.65					2.65
June		16.55	11.45		2.74					10.25
July			6.18							6.18
August		27.33			5.38					16.36
September	6.47	8.34	4.15		7.98					6.74
October		11.31	7.37		7.75					8.81

Table 9.3 Average Surface Water Flow Rates										
Year	**2017**			**2018**			**2019**			
Month	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Monthly Average (l/s)**
November		9.54	9.58		5.21					8.11
December		5.37			7.72					6.54
January					11.05			26.13		18.59
February					1.84	1.38		5.86		3.03
March					1.33					1.33
Afluente Este 1R										
April				0.75						0.75
May				0.54						0.54
June	0.60			0.52						0.56
July	0.92			0.59						0.76
August	0.67			0.56						0.62
September	1.17			1.59						1.38
October	0.81			1.33						1.07
November	0.87			0.85						0.86
December	0.68			1.53						1.10
January				0.57						0.57
February				0.53						0.53
March				0.43			0.52			0.48
Los Berros										
April				2.40		1.74				2.07
May				0.60						0.60
June	10.53			8.77						9.65
July						27.22				27.22
August	11.76	11.76			23.43					15.65

TABLE 9.3 AVERAGE SURFACE WATER FLOW RATES										
Year	**2017**			**2018**			**2019**			
Month	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Monthly Average (l/s)**
September	4.65			6.15						5.40
October	1.33		1.74	3.78						2.28
November	0.16			1.08						0.62
December	0.19			0.17						0.18
January										
February				5.97				4.68	4.83	5.16
March				7.29						7.29
Puente Centro Sur Cauchari										
April					11.36	10.98				11.17
May				1.70						1.70
June			0.33		20.45					10.39
July						16				16.00
August					11.03					11.03
September	6.96		15.29		15.91					12.72
October	0.77				18.16					9.46
November					3.35					3.35
December					2.23					2.23
January					2.73			9.66		6.19
February				10.60	2.90					6.75
March				5.29	5.85					5.57
Quebrada Arizaro										
April				0.33						0.33
May				0.52						0.52
June	0.92			0.85						0.88

Table 9.3 **Average Surface Water Flow Rates**										
Year	**2017**			**2018**			**2019**			
Month	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Monthly Average (l/s)**
July										
August	0.83	0.83		1.35						1.00
September	0.96			1.20						1.08
October	0.60			1.35						0.97
November	0.199203 19			0.25						0.22
December	0.12			0.12						0.12
January				2.94						2.94
February				1.35			2.55			1.95
March				0.53						0.53
Quebrada Guayar										
April				0.38						0.38
May				0.40						0.40
June	1.28			0.33						0.80
July	1.79			0.24						1.01
August	1.15	1.15		0.22						0.84
September	0.38			0.22						0.30
October	0.39			0.21						0.30
November	0.29			0.29						0.29
December	0.31			0.24						0.27
January				0.27						0.27
February				0.46						0.46
March				0.31			0.60			0.45

TABLE 9.3
AVERAGE SURFACE WATER FLOW RATES

Year	2017			2018			2019			
Month	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Monthly Average (l/s)**
Río Antuco										
April					12.00	11.19				11.60
May					4.58	7.5				6.04
June		29.46	7.6		4.00					13.69
July			15.53		8.53	9.8				11.29
August		27.91			13.89					20.90
September			10.62		12.03					11.32
October		16.36	15.28		17.05					16.23
November			12.88		12.78					12.83
December		12.60	13.45		11.15	14.11				12.83
January						9.44		10.64	7.60	9.23
February					15.4	13.27		11.15		13.27
March					9.35	5.9				7.63
Río Quebar										
April					56.37	39.80				48.09
May					35.40	29.32				32.36
June		85.50	22.08		66.04	77.42				62.76
July			76.56		67.63	65.20				69.80
August		86.32	33.86		38.61	42.90				50.42
September			65.09		44.85	44.15				51.36
October		51.86	52.57							52.22
November		51.05	55.63		41.71					49.46
December		20.1	33.82		20.82	22.68				24.36
January					20.39	39.81		34.71		31.64

TABLE 9.3
AVERAGE SURFACE WATER FLOW RATES

Year	2017			2018			2019			
Month	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Monthly Average (l/s)**
February					57.80	35.47				46.64
March					76.65	89.25				82.95
Río Rosario (Puente Aar)										
April					334	255				294.50
May			276.67		288.95	228.811				264.81
June					427.33	338.56				382.95
July					393.19	418.76				405.98
August		331.18	224.52		577.86					377.85
September			114.36		391.75	380.72				295.61
October		33.15	42.37		229.39	235.13				135.01
November		32.27	36.61		131.01	119.09				79.75
December		704.3	459.59		96.87	73.03				333.45
January					92.40	67.90				80.15
February					439	426.17		548.11	216.15	407.36
March					973	781		315.80	231.41	575.30
Río Tocomar (Puente Esquina Azul)										
April					114.75	117.55				116.15
May					159.6	159.79				159.70
June										
July						12.67				12.67
August										
September										
October										
November										

TABLE 9.3
AVERAGE SURFACE WATER FLOW RATES

Year	2017			2018			2019			
Month	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Volume-tric (l/s)**	**Float (l/s)**	**Flow Meter (l/s)**	**Monthly Average (l/s)**
December										
January										
February								14.43		14.43
March					151.2	157.6				154.40

9.9 BRINE LEVEL MONITORING PROGRAM

The static level of subsurface brine was monitored every month from an array of accessible wells within the salars. Monitoring was also conducted at domestic water wells just outside the Cauchari Salar. Measurements were taken with a Solinst Model 101 Water Level Meter. Some wells with difficult access used a Solinst Levelogger, model 3001, which records brine levels once a day.

Table 9.4 shows the average depth to static levels observed in the monitoring wells between 2010-2019. Variations in average fluid density and electrical conductivity monitored during sampling and testing were found to be negligible.

The data from the Brine Level Monitoring Program was used to calibrate the numerical groundwater model to long term static conditions. Extensive monitoring of dynamic brine levels (i.e., in response to pumping) was also conducted, for the Pumping Test Program described in Section 9.10.

TABLE 9.4
STATIC WATER LEVEL MEASUREMENTS FOR THE PERIOD FROM JANUARY 2010 TO FEBRUARY 2019

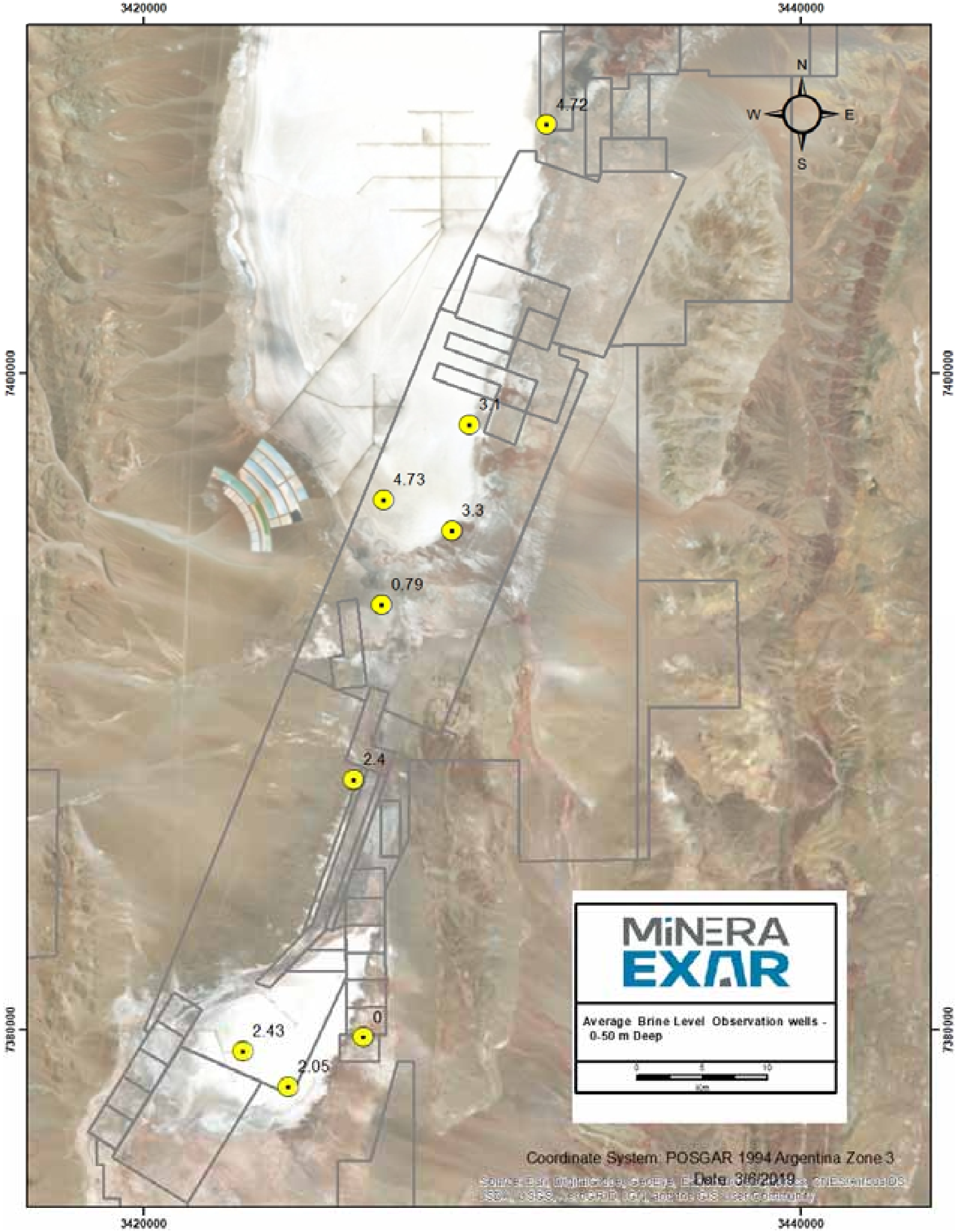
Borehole ID	Monitoring Period mm/yy	Average Water Level (m below ground surface)
DL-001	12/17 - 02/19	6.02
ML-001	10/17 - 02/19	7.98
SL-001	09/17 - 02/19	2.05
W-01	02/18 - 02/19	7.95
DL-002	12/17 - 02/19	14.43
ML-002	01/18 - 02/19	12.56
SL-002	10/17 - 02/19	4.73
W-02	02/18 - 02/19	13.34
ML-003	09/17 - 02/19	11.96
DL-003	09/17 - 02/19	14.51
DL-003B	01/18 - 02/19	26.39
DL-004B	03/18 - 02/19	12.47
ML-004	09/17 - 02/19	4.52
SL-004	09/17 - 02/19	2.35
SL-004B	03/18 - 02/19	2.43
DL-005	03/18 - 02/19	17.22
ML-005	12/17 - 02/19	16
W-05	02/18 - 02/19	23.81

TABLE 9.4 STATIC WATER LEVEL MEASUREMENTS FOR THE PERIOD FROM JANUARY 2010 TO FEBRUARY 2019		
Borehole ID	**Monitoring Period mm/yy**	**Average Water Level (m below ground surface)**
DL-006	12/17 - 02/19	11.46
ML-006	11/17 - 02/19	3.11
SL-006	09/17 - 02/19	0.79
SL-007	09/17 - 02/19	3.11
ML-007	12/17 - 02/19	8.67
DL-007	12/17- 02/19	15.90
DL-008	03/18 - 02/19	14.1
ML-008	10/17 - 02/19	Artesian
DL-009	12/17 - 02/19	18.42
ML-009	12/17 - 2/19	7.68
SL-009	09/17 - 02/19	4.72
DL-010	01/18 - 02/19	8.66
ML-010	09/17 - 02/19	5.39
SL-010	12/17 - 11/18	3.3
DL-011	01/18 - 02/19	13.01
ML-011	10/17 - 02/19	5.46
DL-012	01/18 - 02/19	5.70
ML-012	04/18 - 02/19	11.96
DL-013	01/18 - 02/19	8.85
ML-013	01/18 - 02/19	7.06
SL-013	01/18 - 02/19	Artesian
SL-014	01/18 - 02/19	2.41
ML-014	01/18 - 02/19	9.53
DL-014	01/18 - 02/19	12.72
DDH-04A	01/10 - 01/19	3.22
DDH-05	01/09 - 01/19	1.92
DDH-06A	02/10 - 02/19	3.69
DDH-07	01/10 - 02/19	1.54
DDH-08	02/10 - 02/19	1.05
DDH-09A	04/10 - 02/19	2.64
DDH-11	06/10 - 02/19	9.36
DDH-12A	05/10 - 02/19	5.72

TABLE 9.4 STATIC WATER LEVEL MEASUREMENTS FOR THE PERIOD FROM JANUARY 2010 TO FEBRUARY 2019		
Borehole ID	**Monitoring Period mm/yy**	**Average Water Level (m below ground surface)**
DDH-13	06/10 - 01/19	4.23
DDH-14	07/10 - 12/18	7.39
DDH-15	08/10 - 12/18	2.09
DDH-16	07/10 - 02/19	10.90
DDH-17	08/10 - 02/19	Artesian
DDH-18	08/10 - 02/19	4.21
DDH-1	08/10 - 02/29	11.40
PP-20	03/14 - 02/19	18.00

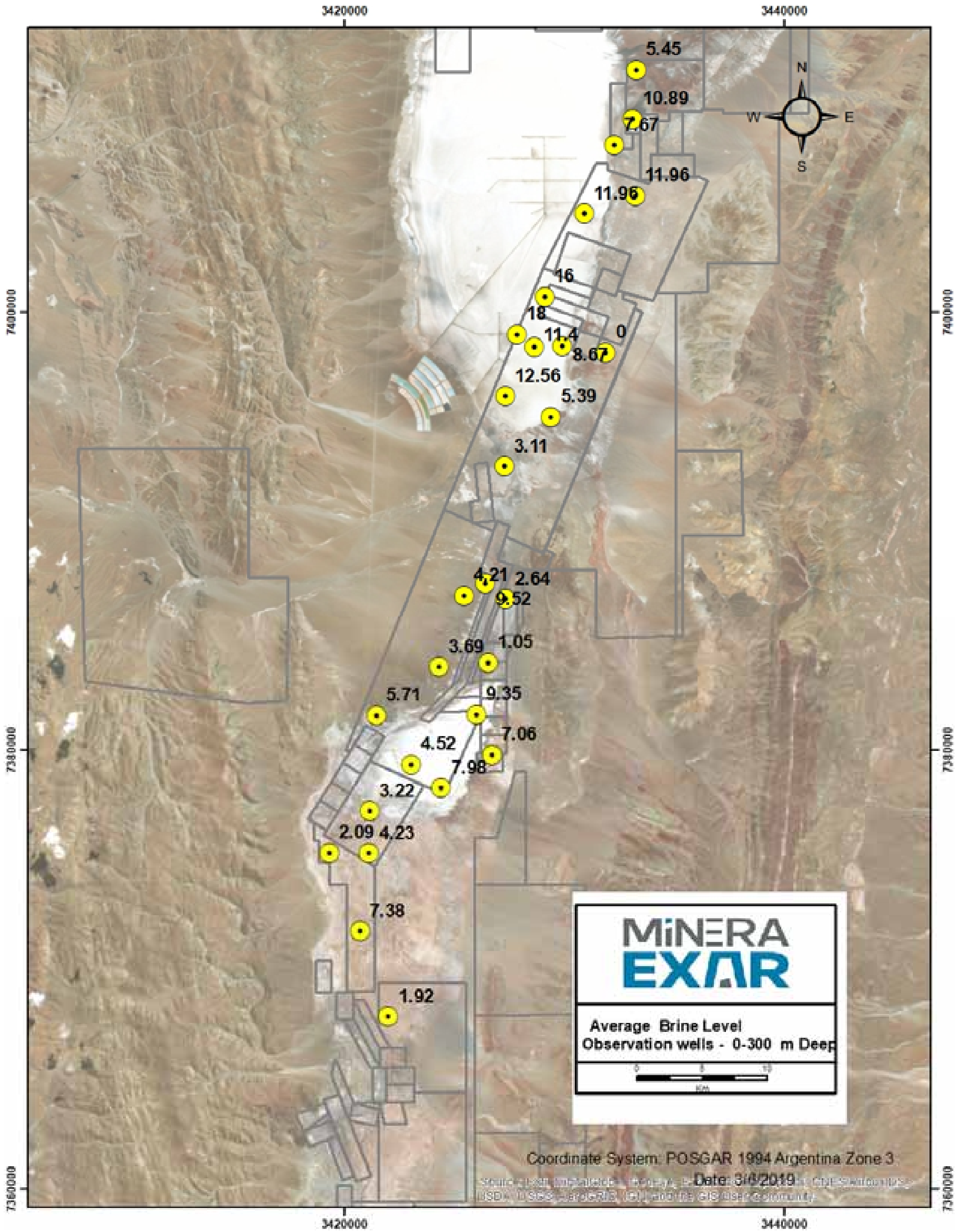
Figure 9.19, Figure 9.20 and Figure 9.21 show the average depth of water levels for observation wells drilled in the shallow part of the aquifer (50 m deep), intermediate parts of the aquifer (250 to 300 m deep) and in the deeper parts of the aquifer (450 and 600 m deep).

Figure 9.19 Average Depth to Static Water Levels at Shallow Wells (50 m)



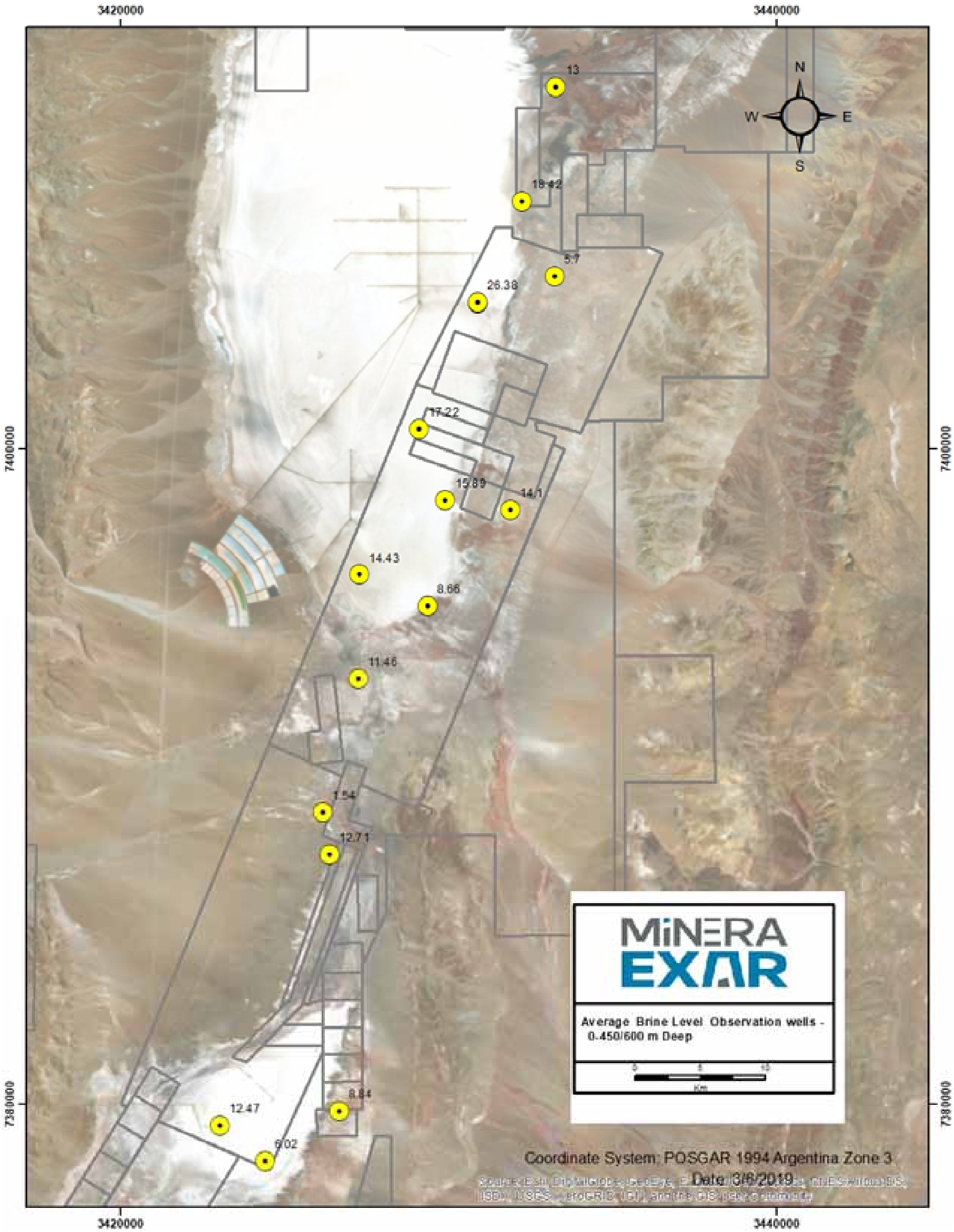
Source: *Minera Exar.*

Figure 9.20 Average Depth to Static Water Levels at Intermediate Depth Wells (250 - 300 m)



Source: *Minera Exar.*

Figure 9.21 Average Depth to Static Water Levels at Deep Wells (450 - 600 m)



Source: *Minera Exar.*

9.10 PUMPING TEST PROGRAM

9.10.1 Overview

A total of seven pumping wells and associated observation wells were installed at the site from 2011 to 2019 at the locations shown in Figure 9.23.

Based on exploration results in 2017-2018, production wells drilled after the 2011 production wells penetrate deeper parts of the aquifer. Deeper production wells increases the depth of the extractable part of the aquifer.

The pumping tests were conducted with two main objectives. The first objective was to develop broad-scale estimates of K (from Transmissivity (T)) and Ss (from Storativity (S)), for use in the numerical groundwater model. These parameters are defined in Section 7.7. The second objective was to assess hydraulic interconnections between hydrostratigraphic units, to assist in understanding the overall flow system and in developing the groundwater model.

Drilling and testing in 2011 was conducted by Andina Perforaciones of Salta, Argentina, under field supervision by Conhidro of Salta, Argentina; in 2018-2019 by Hidrotec Perforaciones and Wichi Toledo The drilling method was direct rotary. Field supervision of the pumping tests was provided by Minera Exar. The constant rate pumping tests were preceded by step tests, to determine appropriate pumping rates for the constant rate tests.

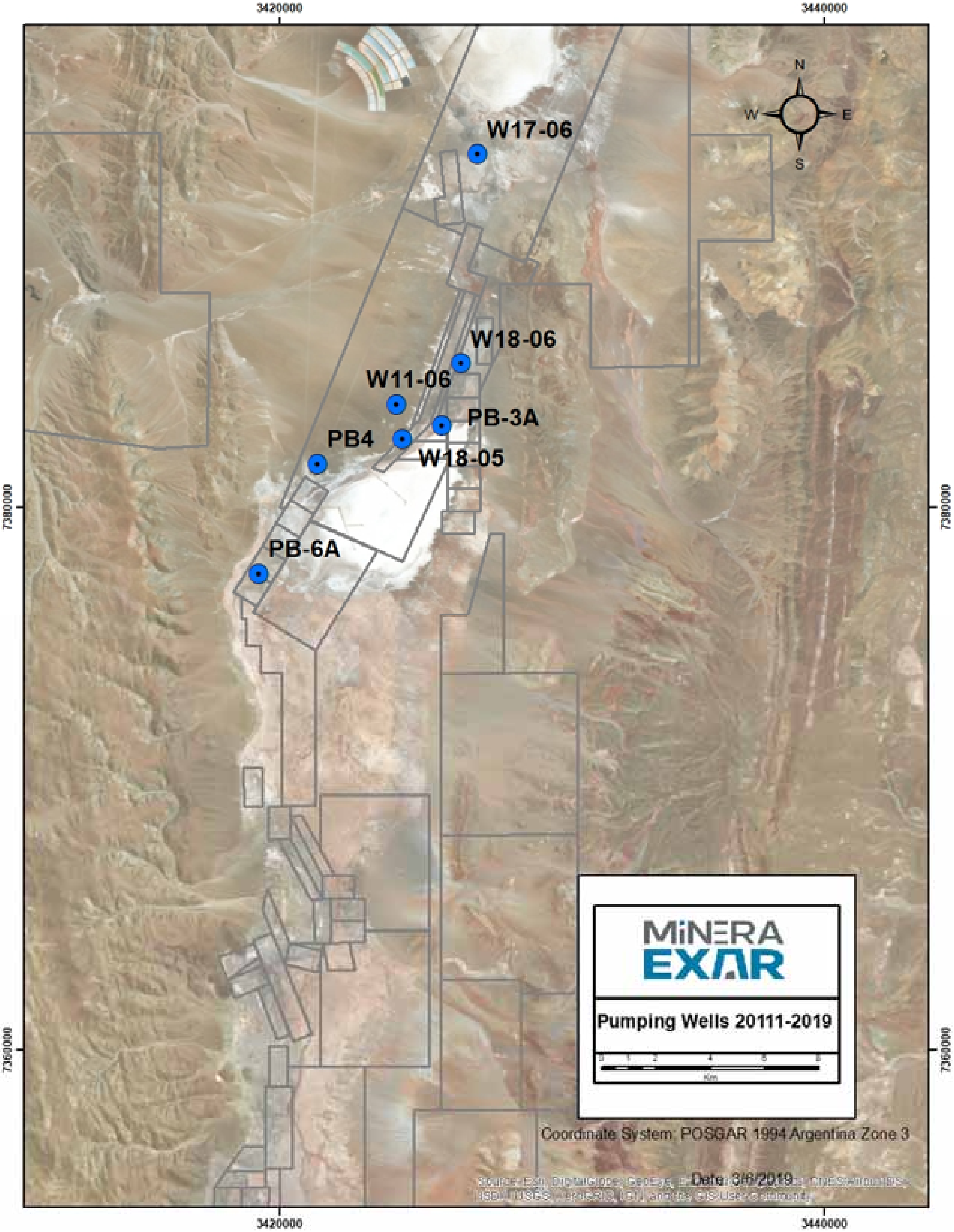
The 2011 pumping test analysis was conducted independently by both Conhidro and Matrix Solutions Inc.; in 2018-2019 the pumping test analysis is being conducted by Minera Exar with technical review by Montgomery.

9.10.2 Pumping Test Battery Setup and Testing

Details of the setup and testing of the pumping test batteries are provided in the following tables and figures:

- Pumping test locations are shown in Figure 9.22.
- The conceptual hydraulic interpretation for each battery is summarized in Table 9.5 through Table 9.9 for each test of the test batteries.
- A summary of step tests and constant rate tests is provided in Table 9.10 and Table 9.11, respectively.

Figure 9.22 Pumping Test Locations



Source: *Minera Exar.*

TABLE 9.5 **CONCEPTUAL SETUP FOR ANALYSIS OF PB-01 AQUIFER TEST DATA**				
Conceptual Component	**Unit Name (for Pump Test Interpretation)**	**Interpretation of Hydrogeological Setting**	**Observation Wells**	
			Single Aquifer	**Multiple Aquifers**
Overlying Geology	Aquifer-Aquitard Complex	The pumped aquifer complex is overlain by 75.5 m of aquitard material. An alternating sequence of aquitard and aquifer material extends to ground surface. Expected to behave as a leaky aquitard under pumping conditions.		PB-01 PP-01A PP-01C PP-01B
Pumped Aquifer	Confined Aquifer Complex	139 m of alternating layers of salt, sand and clay +6 sand/salt aquifer units (22.5 m) +2 clay/silt/salt aquitard units (6.5 m) +5 salt aquitard units (110 m)		PB-01 PP-01A PP-01C PP-01B
Underlying Geology	Confined Aquifer	The pumped aquifer complex is underlain by 6 m of salt followed by 153 m of alternating layers of sand, salt and clay: +11 sand/salt aquifer units (49 m) +2 clay/salt aquitard units (35 m) +3 salt aquitard units (87 m)		
	Unknown	121 m of unproven material. Geological model indicates sand, minor mud and salt		
	Bedrock	Inferred from gravity survey		

TABLE 9.6 **CONCEPTUAL SETUP FOR ANALYSIS OF PB-03A AQUIFER TEST DATA**				
Conceptual Component	**Unit Name (for Pump Test Interpretation)**	**Interpretation of Hydrogeological Setting**	**Observation Wells**	
			Single Aquifer	**Multiple Aquifers**
Overlying Geology	Aquifer - Aquitard Complex	The pumped aquifer is overlain by 66 m of interpreted aquitard material, followed by 16 m of interpreted aquifer material that extends to ground surface. Expected to act as a leaky aquitard under pumping conditions	PF-03B PT-1 PT-1a DDH-02	PF-03A DDH-08A DDH-11 PB-01

Table 9.6 **Conceptual Setup for Analysis of PB-03A Aquifer Test Data**				
Conceptual Component	**Unit Name (for Pump Test Interpretation)**	**Interpretation of Hydrogeological Setting**	**Observation Wells**	
			Single Aquifer	**Multiple Aquifers**
Pumped Aquifer	Confined Aquifer Complex	140 m of salt and sand layers (primary materials) and sand, salt, clay, and silt (secondary materials) +4 sandy aquifer units (69 m) +9 salt units (71 m)	PB-03 PP-03C PP-03B PE-14 PB-03A ¾”	DDH-08 DDH-08A DDH-11 PE-07 PF-03A PB-01
Geology	Aquitard – Aquifer Complex	33 m of salt, followed by sand. Geological model implies 53 m of sand to bedrock		DDH-08 DDH-11 PE-07
	Bedrock	Inferred from gravity survey		

Table 9.7 **Conceptual Setup for Analysis of PB-04 Aquifer Test Data**				
Conceptual Component	**Unit Name (for Pump Test Interpretation)**	**Interpretation of Hydrogeological Setting**	**Observation Wells**	
			Single Aquifer	**Multiple Aquifers**
Overlying Geology	Aquifer - Aquitard Complex	The pumped aquifer is immediately overlain by 16.5 m of aquitard material. An alternating sequence of aquitard and aquifer material (34 m) extends to ground surface. Expected to behave as a leaky aquitard under pumping conditions.	PP-4A	
Pumped Aquifer	Confined Aquifer Complex	242 m of alternating layers of sand, silt, clay and salt* +26 sandy aquifer units (67 m) +10 silt/clay units (75 m), +16 salt units (100 m)	PB-04 ¾” PP-4B PE-04 PE-14 PE-17 PE-13	DDH-12A
Underlying Geology	Unknown	67 m of unknown material. Geological model implies sand, minor mud and salt		DDH-12A
	Bedrock	Inferred from gravity survey		

TABLE 9.8 **CONCEPTUAL SETUP FOR ANALYSIS OF PB-06A AQUIFER TEST DATA**				
Conceptual Component	**Unit Name (for Pump Test Interpretation)**	**Interpretation of Hydrogeological Setting**	**Observation Wells**	
			Single Aquifer	**Multiple Aquifers**
Overlying Geology	Aquifer - Aquitard Complex	The pumped "aquifer" is overlain by 58m of an alternating sequence of aquitard and aquifer material that extends to ground surface. Expected to act as a leaky aquitard under pumping conditions	PT-2C PT-2B PT-2A PT-2 CGW-05	DDH-13 DDH-15
Pumped Aquifer	Confined Aquifer Complex	216.3 m of 5 layers of sand and gravel (primary materials) and clay (secondary material)	PE-15 PE-17[a] PE-17 PB-06A PB-06A ¾" PP-6	DDH-13 DDH-15
Underlying Geology	Bedrock	Inferred from gravity survey		

TABLE 9.9 **CONCEPTUAL SETUP FOR ANALYSIS OF PB-I AQUIFER TEST DATA**				
Conceptual Component	**Unit Name (for Pump Test Interpretation)**	**Interpretation of Hydrogeological Setting**	**Observation Wells**	
			Single Aquifer	**Multiple Aquifers**
Overlying Geology	Unsaturated Aquifer	21.5 m of coarse gravel, medium-fine sand and occasional lenses of red clay	PB-I PP-I	
Pumped Aquifer	Saturated Aquifer	26.5 m of coarse gravel, medium-fine sand and occasional lenses of red clay	PB-I PP-I	
Underlying Geology	Unknown	Sandy silt and red clay at 48-51 m depth. Unknown material at depth. Geological model implies alternating layers of mud, sand and salt to bedrock at depth		

TABLE 9.10 **RECORD OF STEP TESTS, FOR PUMPING RATE DETERMINATION**			
Test Name	**Test Phases**	**Date Start**	**Date Finish**
PB1 2-hr Constant Rate Step Test	1.9, 3.9, 5.9 L/s	01/02/2011 8:30	01/02/2011 14:30
	Recovery	01/02/2011 14:30	01/02/2011 18:50
PB4 90-min Step Test	5.3, 9, 20 L/s	08/04/2011	08/04/2011
	Recovery	No data	No data
PB4 Constant Rate Step Test	Step I (3.1 L/s)	18/04/2011 10:00	19/04/2011 09:00
	Step II (6.3 L/s)	19/04/2011 09:00	20/04/2011 09:00
	Step III (12.2 L/s)	20/04/2011 09:00	21/04/2011 23:00
	Step IV (19.7 L/s)	21/04/2011 23:00	22/04/2011 00:00
	Recovery	22/04/2011 12:00	27/04/2011 12:00
PB-03A 24-hr Constant Rate Step Test	2.0, 7.4, 15.5, 25.2 L/s	14/06/2011 16:00	18/06/2011 16:00
	Recovery	18/06/2011 16:01	
PI-01 2-hr Step Test	1.4, 2.7, 4.5 L/s (Step III: 25.5 h)	04/07/2011 15:11	04/07/2011 20:50
	Recovery	04/07/2011 20:51	
PB-06A 24-hr Step Test	6.2, 10.1, 15.1, 22.0 L/s (Step IV: 17 h)	05/09/2011 11:00	09/09/2011 4:00
	Recovery	09/09/2011 4:00	
PB-I 24-hrs Step Test	4.5, 6.2, 12.5, 15.7, 22.5 L/s (Step 1: 5 min)	05/09/2011 16:00	10/09/2011 10:00
	Recovery	10/09/2011 10:00	

TABLE 9.11 **RECORD OF CONSTANT RATE PUMPING TESTS**			
Test Name	**Test Phases**	**Date Start**	**Date Finish**
PB1 8-day Pump Test	Constant (4 L/s)	19/03/2011 18:00	26/03/2011 14:00
	Recovery	No data	No data
PB-4 30-day Constant Rate Test	Constant (20 L/s)	06/05/2011 8:02	06/06/2011 8:00
	Recovery	06/06/2011 8:00	
PB-03A 27-day Constant Rate Test	Constant (12 L/s)	20/08/2011 13:01	16/09/2011 15:00
	Recovery	16/09/2011 15:00	
PB-06A 13-day Constant Rate	Constant (22 L/s)	09/10/2011 11:00	21/10/2011 5:00
	Recovery	21/10/2011 6:10	

TABLE 9.11 RECORD OF CONSTANT RATE PUMPING TESTS			
Test Name	**Test Phases**	**Date Start**	**Date Finish**
PB-I 3-day Constant Rate Test	22.6 L/s Recovery	12/09/2011 19:00 16/09/2011 3:00	16/09/2011 3:00
PB-I 7-day Constant Rate Test	26.9 L/s Recovery	18/09/2011 18:00 25/09/2011 18:00	25/09/2011 18:00

9.11 PUMPING TEST ANALYSIS AND RESULTS

9.11.1 Overall Summary

A summary of the data, interpretations and analytical methods for the pumping tests is provided in Table 9.12. Overall observations of the analysis are as follows:

- Analyses within AQTESOLV Professional indicated that the drawdown observations were best reproduced by analytical models that represent confined aquifer systems. A fit to the drawdown data with unconfined analytical models could not be achieved. These interpretations are consistent with the pumping well completions below 50 – 60 m depth, the interpretation of overlying aquitards, and field observations of hydraulic head at 0 to 10 m depth.

- The PB-01 and PB-04 aquifer parameters determined from the analytical solutions were tested in simple three-dimensional 3 km × 3 km box models constructed with FEFLOW. The observed drawdown behaviour was adequately reproduced within these models when constant head boundary conditions were assigned to the model boundaries. Additional information on pumping test hydrographs and graphical analyses are provided in Appendix 3.

- Hydraulic pumping responses of more than a few tens of centimetres were limited to within 100 m of the pumping wells. There was no discernible change in groundwater elevations at observation wells located more than two kilometres from the pumping wells.

- In shallow observation wells above the main production aquifer, hydraulic responses were limited to a few tens of centimetres or less. These responses were interpreted as the effects of downward leakage to the production aquifer.

- The rate of decline in the late-time drawdown was consistent with analytical models for leaky aquifers-aquitards and/or inflow from groundwater recharge boundaries.
- The recovery of the groundwater levels following shutdown of the pumping wells occurred much faster than would be predicted by any of the analytical methods in AQTESOLV.

- The aquifer tests were conducted during a period of flat to rising groundwater levels. Under flat to decreasing conditions, drawdown during the pumping tests may have been somewhat larger. Consequently, T and S estimates from these analyses may be biased high. This potential effect is accommodated by additional contingency production wells in the projected production wellfield (Section 16, Figure 16.1).

- The drawdown data were not corrected for density effects. However, variations in average fluid density and electrical conductivity with pumping were monitored and found to be negligible.

- The majority of the observation wells more than 100 m from the pumping wells are large diameter exploration boreholes that are open along most of their penetrated depths. Consequently, T and S estimates based on these wells are not as reliable as those from the discretely screened monitoring wells that were installed for the Pumping Test Program.

- Shutdown of the pumping wells typically resulted in the generation of orange foam within the well-bore. This foam distorted the dip-meter recovery measurements and precluded an analysis of aquifer parameters from the recovery data. The interpretations presented herein are largely derived from drawdown data only.

Observations pertaining to specific pumping wells are provided in the following sections.

Table 9.12
Summary of Constant Rate Aquifer Test Data and Interpretations

Pumping Test Well	Aquifer Geometry (m)	Test Type	Observation Well	Location Relative to Pumped Aquifer (Italics Indicates observation well is partially penetrating)	Horizontal Distance from Pumping Well (m)	Max WL Change in Obs Well (m)	Transmissivity (m^2/s)	Storage Coefficient (-)	Vertical Hydraulic Conductivty of Overlying Aquitard (m/s)	Analysis Solution Method
PB-01	139 [90] (154)	8 Day Constant Rate (4 L/s)	PB-01	*Above / Within*	0.0	41.27	9.7E-05	5.4E-05	-	Papadopulos and Cooper (1967)
			PP-01A	*Above / Within*	14.2	25.50	1.0E-04	3.1E-05	-	Cooper and Jacob (1946)
			PP-01C	*Above / Within*	29.8	18.99	9.8E-05 to 1.2E-04	3.8E-05 to 5.7E-05	-	Dougherty and Babu (1984)
			PP-01B	*Above / Within*	71.3	12.93	9.8E-05 to 1.2E-04	3.8E-05 to 5.7E-05	-	Dougherty and Babu (1984)
PB-03A	140 [86.8] (139)	27 Day Constant Rate (12 L/s)	PB-03A 3/4"	*Above / Within*	0.0	31.97	6.8E-04	1.8E-05	-	Dougherty and Babu (1984)
			PB-03	*Within*	24.0	11.21	3.9E-04	2.3E-03	-	Hantush (1962)
			PP-03C	*Within*	24.6	8.92	5.1E-04	7.6E-04	-	Hantush (1960)
			PF-03B	Above	40.8	0.12	-	-	-	-
			PF-03A	*Above / Within*	41.1	9.08	5.6E-04	3.9E-04	2.2E-07	Hantush and Jacob (1955)/Hantush (1964)
			PP-03B	*Within*	67.5	8.92	5.8E-04	3.9E-04	-	Hantush and Jacob (1955)/Hantush (1964)
			DDH-08	*Within & Below*	1118.7	0.69	2.1E-03	1.2E-03	-	Dougherty and Babu (1984)
							3.9E-04	4.8E-04	-	Hantush and Jacob (1955)/Hantush (1964)
			DDH-08A	*Above / Within*	1128.6	0.51	3.3E-03	2.9E-03	-	Dougherty and Babu (1984)
							1.1E-03	1.7E-03	-	Hantush and Jacob (1955)/Hantush (1964)
			DDH-11	*Above, Within, Below*	1363.6	1.59	4.0E-04	4.1E-04	-	Hantush and Jacob (1955)/Hantush (1964)
			PT-1	Above	1486.9	N.A.	-	-	-	-
			DDH-02	*Above / Within*	2623.0	0.10	-	-	-	-
			PE-07	*Within & Below*	2903.7	0.19	2.5E-03	2.6E-03	-	Hantush and Jacob (1955)/Hantush (1964)
			PE-14	*Within*	2903.7	0.28	3.1E-03	1.1E-03	-	Papadopulos and Cooper (1967)
							4.2E-04	3.9E-04	-	Hantush and Jacob (1955)/Hantush (1964)
			DDH-09	*Unknown (Collapsed)*	4174.0	0.10	-	-	-	-
			DDH-09A	*Above, Within, Below*	4174.0	-1.50	-	-	-	-
PB-04	240.5 [85.5] (242.5)	30 Day Constant Rate (20 L/s)	PB-04 3/4"	Within	0.0	50.40	4.7E-04	1.1E-04	-	Dougherty and Babu (1984)
			DDH-12A	*Within / Below*	23.8	15.80	3.8E-04 to 9.9E-04	2.6E-04 to 2.2E-03	1.45E-07 to 1.85E-09	Range for different interpretation methods
			PP-4A	Above	29.4	0.05	-	-	-	-
			PP-4B	*Within*	44.7	8.42	1.1E-03 to 1.4E-03	1.3E-04 to 3.3E-04	3.3E-08	Cooper and Jacob (1946) and Hantush and Jacob(1955) / Hantush(1964) methods only
			PE-04	*Within*	1823.3	0.60	3.60E-04	6.1E-04	-	Theis (1935)/Hantush (1961)
			PE-14	*Within*	1896.3	0.56	3.6E-03 to 6.1E-03	2.0E-03 to 3.4E-03	-	Theis (1935)/Hantush (1961), Cooper and Jacob (1946)
			PE-13	*Above / Within*	2268.5	0.08	-	-	-	-
PB-06A	216.3 [84] (143.5)	11 Day Constant Rate (22 L/s)	PB-06A	*Above / Within*	0.0	40.20	2.3E-03	1.2E-03	-	Theis (1935)/Hantush (1961)
			PB-06A 2"	*Above / Within*	0.1	45.47	9.4E-04	1.5E-04	-	Papadopulos-Cooper (1967)
			PP-6	*Above / Within*	57.5	0.95	4.1E-03	4.5E-03	8.6E-06	Hantush and Jacob (1955)/Hantush (1964)
			PT-2C	Above	901.0	0.34	-	-	-	-
			PT-2B	Above	901.1	0.81	-	-	-	-
			PT-2A	Above	901.2	0.36	-	-	-	-
			PT-2	Above	901.4	0.21	-	-	-	-
			PE-15	*Within*	909.5	0.49	1.7E-03	4.0E-03	1.5E-07	Hantush and Jacob (1955)/Hantush (1964)
			CGW-05	Above	972.7	0.08	-	-	-	-
			PE-17A	*Within*	1081.2	0.32	1.1E-03	3.6E-03	2.4E-07	Hantush and Jacob (1955)/Hantush (1964)
			PE-17	*Within*	1118.5	0.35	1.0E-03	2.5E-03	1.4E-07	Hantush and Jacob (1955)/Hantush (1964)
PB-I^	26.5 [24] (51.3)	4 Day Constant Rate (22.6 L/s)	PB-I	Within	0.0	3.8	2.11E-02	-	-	Recovery
			PP-I	Within	15.0	0.75	1.69E-02	3.8E-02	-	Neuman (1974), Drawdown
							2.29E-02	-		Recovery

^From Conhidro (2012). Values at other sites estimated from drawdown data by AquaResource. Independent interpretations by Conhidro for other sites similar to those presented herein

Aquifer Geometry : saturated thickness of pumped aquifer and aquitard complex as determined from well logs and geological models, [m of stainless steel screen], (m of gravel pack)

Grey Text Italics: Parameter interpretations strongly influenced by well completion / efficiency

9.12 OBSERVATIONS FOR PB-01

A Dougherty-Babu (1984) confined aquifer method provided an excellent match to the observed drawdown at PP-1B, PP-1C (to hour 28) and the middle-time (28 h) response at PB-01 with T and S values of 1.2×10^{-4} m²/s and 3.8×10^{-5}, respectively. This method incorporates well-bore storage and well-skin effects.

These aquifer parameters did not reproduce the PP-1A observations in the southwest direction or the early time data at the observation and pumping wells. Analysis of PP-1A data yielded slightly lower T and S values of 1.0×10^{-4} m²/s and 3.0×10^{-5}, respectively. The variability at PP-1A could be associated with well completion effects and/or a decrease in permeable aquifer material in the southwest direction.

The mismatch of the models at early time is characteristic of well-bore storage and skin effects. A more detailed model with a better fit to the early time data found an effective well radius of 4.0 m, a skin factor of 2.4, an aquifer T of 7.5×10^{-5} m²/s, and an S of 8.62×10^{-3}. The large well radius and high S value imply considerable fracturing and/or dissolution of the halite matrix around the pumping well. The positive skin factor and lower T values imply significant hydraulic losses between the well screen and the permeable aquifer layers.

At the 28th hour of the eight-day PB-01 pumping test, drawdown at the pumping well suddenly increased while the surrounding observation wells recovered to a new equilibrium level approximately 10 m lower than the starting water level. This response is attributed to the sudden isolation of PB-01 from the permeable aquifer units connecting to the observation wells. Possible explanations for this behaviour are as follows:

- The only connection between PB-01 and the observation wells is via sand units and/or fractures at 40-50 m depth, which dewatered during the 28th hour of the pumping test.
- The gravel pack was fluidized (perhaps by dissolution of halite), and the formation collapsed against the well-screen and blocked the aquifer contact.

9.12.1 Observations for PB-03A

The observation data collected directly at the pumping well were best interpreted using solutions for non-leaky confined aquifers. The data from observation wells were best interpreted using solutions for leaky-confined aquifers, which could account for characteristics such as storage in the aquitard(s) (e.g., Hantush, 1960), partial penetration and lack of storage in the aquitard(s) (e.g. Hantush-Jacob, 1955; Hantush, 1964).

T ranged from 2.9×10^{-4} to 1.1×10^{-3} m^2/s and S ranged from 1.9×10^{-5} to 2.9×10^{-3}. The inferred hydraulic conductivity of the overlying aquitard (K') ranged from 4.9×10^{-8} to 1.1×10^{-6} at PB-03A.

9.12.2 Observations for PB-04

A confined aquifer response was observed at PB-04. The inferred T and S values for the 30-day test are in the range of 3.8×10^{-4} m²/s to 1.0×10^{-3} m²/s and 1.3×10^{-4} to 2.1×10^{-3}, respectively. The late-time and recovery observations exhibit characteristic leaky aquitard and/or recharge boundary condition effects.

9.12.3 Observations for PB-06

The observation data collected at the pumping well were best interpreted using solutions for non-leaky confined aquifers. The data from observation wells located further away were best interpreted using solutions for leaky-confined aquifers, which could account for characteristics such as storage in the aquitard(s) (e.g., Hantush, 1960), partial penetration and lack of storage in the aquitard(s) (e.g., Hantush-Jacob, 1955;Hantush, 1964). Values of T ranged from 4.5×10^{-4} to 4.1×10^{-3} m²/s, while S ranged from 1.9×10^{-4} to 5.5×10^{-3}. The hydraulic conductivity of the aquitard (K') ranged from 6.4×10^{-8} to 2.4×10^{-5} m/s.

At PP-6, recovery was observed at approximately 600 minutes. Drawdown resumed around the 9000 minute mark and continued until pumping stopped. Possible explanations include aquifer disconnection at PP-6 (i.e., sudden change in well-screen efficiency at PP-6 and/or PB-06) or possible leakage of pumping test water back into the aquifer.

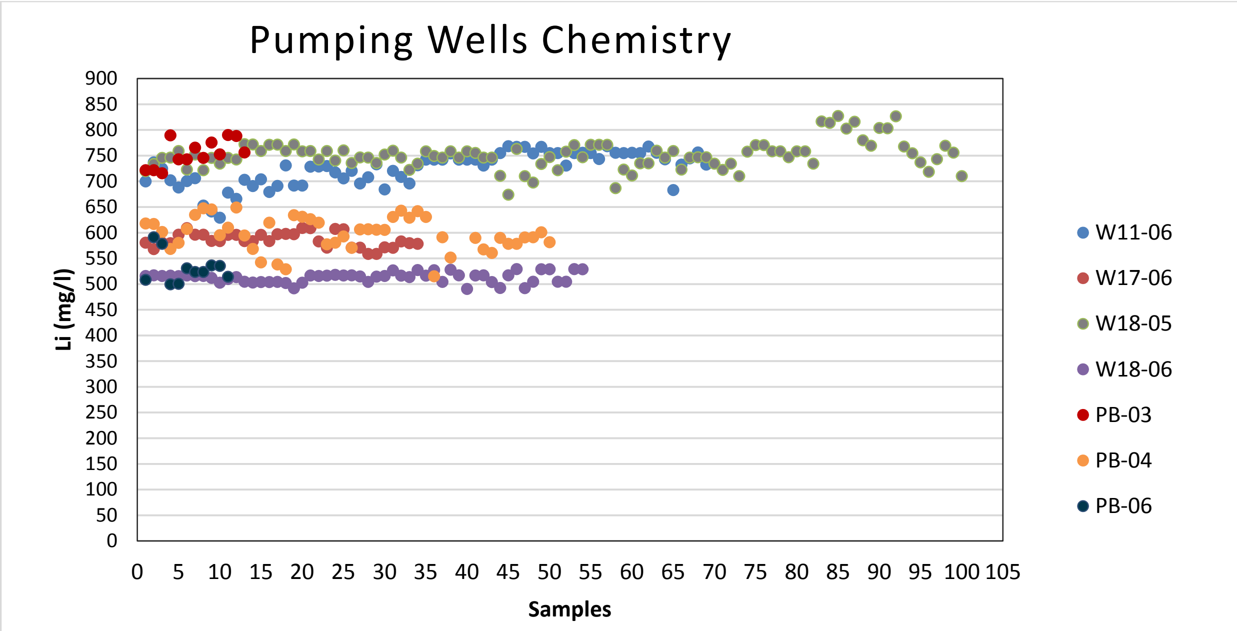
9.12.4 Observations for PB-I

An unconfined aquifer response was observed at PB-I, which was evaluated for the purposes of fresh water supply. The unconfined response is consistent with the shallow depth of the well and the generally sandy nature of the Archibarca Fan. The inferred T and S values for the 4-day test were 1.69×10^{-2} m²/s and 3.8×10^{-2}, respectively. Recovery monitoring data were available for this well, due to the lower dissolved solids content of the water relative to the brine wells. The T values for the recovery phase were 2.1×10^{-2} and 2.3×10^{-2} m²/s.

9.13 CHEMISTRY OF SAMPLES COLLECTED DURING PUMP TESTS

A plot of lithium results for samples collected during 2018-2019 pumping tests is provided in Figure 9.23. The record of concentration is relatively stable for each well. Observations and interpretations based on the pumping tests conducted on the pumping wells drilled in 2017 and 2018 will be made when all of the pumping wells are completed later in 2019.

Figure 9.23 Lithium Concentrations in Samples Collected During Pump Tests



* *Data points show samples taken hourly at the beginning of the pumping test and daily after two days. In some cases, the pumping test stopped due to mechanical reasons and the sampling resumed when the pumping re-started.*

Source: *Minera Exar.*

10.0 DRILLING

10.1 REVERSE CIRCULATION (RC) BOREHOLE PROGRAM 2009-2010

The objectives of this program were to: 1) develop vertical profiles of brine chemistry at depth in the salars, and 2) provide geological and hydrogeological data. This program was conducted between September 2009 and August 2010 and the drilling is summarized in Table 10.1. Twenty-four RC boreholes (PE-01 through PE-22, plus two twin holes) were completed during this period, for total drilling of 4,176 m. Borehole depths range from 28 m (PE-01) to 371 m (PE-10).

TABLE 10.1
BOREHOLE DRILLING SUMMARY FOR THE RC BOREHOLE PROGRAM CONDUCTED IN 2009 AND 2010

RC Borehole	Drilling Interval		Drilling Length (m)	RC Borehole	Drilling Interval		Drilling Length (m)
	From (m)	To (m)			From (m)	To (m)	
PE-01	-	28	28	PE-13	-	209	209
PE-02	-	40	40	PE-14	-	144	144
PE-03	-	90	90	PE-14A	144	228	84
PE-04	-	187	187	PE-15	-	205	205
PE-05	-	210	210	PE-16	-	64	64
PE-06	-	165	165	PE-17	-	246	246
PE-07	78.9	249	170.1	PE-17A	-	220	220
PE-08	-	194	194	PE-18	-	312	312
PE-09	-	198	198	PE-19	-	267	267
PE-10	-	371	371	PE-20	-	204	204
PE-11	-	80	80	PE-21	-	222	222
PE-12	-	36	36	PE-22	-	230	230
Total Boreholes: 24 / Total drilling: 4,176 m							

Note: *RC = reverse circulation.*

Major Drilling, a Canadian drilling company with operations in Argentina, was contracted to carry out the RC drilling using a Schramm T685W rig and support equipment. The holes were initially drilled using ODEX and open-hole RC drilling methods at 10”, 8”, and 6” diameters. No drilling additives were used. A change was later made from ODEX and open-hole RC drilling to tri-cone bits of 17½” 16”, 9½”, 7⅞”, 6”, and 5½” diameters. Bit diameters were selected based on ambient lithological conditions at each borehole, with the objective of maximizing the drilling depth.

During drilling, chip and brine samples are collected from the cyclone at one-metre intervals. Occasionally, lost circulation resulted in the inability to collect samples from some intervals. Brine sample collection is summarized in Table 10.2. A total of 1,487 brine samples were collected from 15 of the RC boreholes, and submitted for laboratory chemical analyses. For each brine sample, field measurements were conducted on an irregular basis, for potassium (by portable XRF analyzer), and regularly for electrical conductivity, pH and temperature. Sample collection, preparation and analytical methods are described in Sections 11.1.3, 11.2.2 and 11.2.4, respectively.

TABLE 10.2
SUMMARY OF BRINE SAMPLES COLLECTED AND SUBMITTED FOR LABORATORY ANALYSIS FROM THE RC AND DDH BOREHOLE PROGRAMS

Description	Brine Samples
Total Field Samples	1,614
Total RC Borehole Program Field Samples	1,487
Total DDH Borehole Program Field Samples	127
Total Samples (Including QC)	2,390
Total Field Duplicates	260
Total Blanks	263
Total Standards	253

Note: *RC = reverse circulation, DDH = diamond drill hole.*

Air-lift flow measurements were conducted at six-metre intervals in six RC boreholes, when circulation was adequate. Daily static water level measurements were carried out inside the drill string at the start of each drilling shift, using a water level tape. Boreholes were completed with steel surface casing, a surface sanitary cement seal, and a lockable cap.

Average concentrations and chemical ratios of brine samples are shown in Table 10.3, for sampled intervals in 14 of the 15 sampled RC boreholes. Results for PE-3 (a flowing artesian well) are not included in the table because it receives freshwater from the alluvial cone adjacent to its position on the eastern margin of the Olaroz Salar. The sampled brines have a relatively low Mg/Li ratio (lower than most sampling intervals), indicating that the brines would be amenable to a conventional lithium recovery process. RC borehole logs are provided by King (2010b), including available brine sampling results.

TABLE 10.3
BRINE CONCENTRATIONS (MG/L) AND RATIOS AVERAGED ACROSS SELECTED DEPTH INTERVALS FOR RC PROGRAM BOREHOLES

Borehole	Depth (m)	Length (m)	B	K	Li	Mg	SO_4	Mg/Li	K/Li	SO_4/Li
PE-04	11-32	21	795	5,987	692	2,458	20,498	4	8.652	29.621
	59-79	20	1,033	7,225	759	1,993	24,114	3	9.519	31.770
	83-187	89	935	6,226	623	1,844	22,568	3	9.994	36.246
PE-06	18-21	3	729	7,060	834	2,737	18,234	3	8.465	21.872
	54-165	111	1,261	6,982	870	2,031	16,731	2	8.025	19.240
PE-07	78-108	20	824	3,520	380	907	14,388	2	9.263	37.867
	109-113	4	1,078	5,328	768	1,924	16,961	3	6.938	22.075
	117-136	19	1,019	3,887	448	1,151	13,238	3	8.676	29.530
	145-205	54	1,054	4,558	579	1,461	16,420	3	7.872	28.351
	207-248	38	1,030	4,205	490	1,080	15,326	2	8.582	31.247
PE-09	72-105	33	921	4,229	530	1,482	17,379	3	7.979	32.800
	109-163	54	809	4,998	646	2,126	23,746	3	7.737	36.755
	164-197	33	827	5,998	741	1,734	16,445	2	8.094	22.196
PE-10	60-152	92	1,041	4,051	396	174	17,495	0	10.230	44.183
	152-234	82	1,398	6,072	598	1,144	20,401	2	10.154	34.106
PE-13	102-105	3	655	3,963	505	1,383	16,225	3	7.848	32.129
	108-120	12	751	4,433	533	1,379	20,465	3	8.317	38.431
PE-14	147-179	32	860	6,572	733	1,918	23,359	3	8.966	31.853
	179-192	13	874	6,287	681	1,821	20,763	3	9.232	30.499
	192-228	36	861	6,152	712	1,842	21,222	3	8.640	29.813
PE-15	62-92	30	981	5,096	527	1,174	16,079	2	9.670	30.527
	103-132	29	762	3,719	465	1,066	16,639	2	7.998	35.758
	144-156	12	883	4,794	582	1,238	13,966	2	8.237	24.017

TABLE 10.3 BRINE CONCENTRATIONS (MG/L) AND RATIOS AVERAGED ACROSS SELECTED DEPTH INTERVALS FOR RC PROGRAM BOREHOLES										
Borehole	**Depth (m)**	**Length (m)**	**B**	**K**	**Li**	**Mg**	**SO_4**	**Mg/Li**	**K/Li**	**SO_4/Li**
	168-189	21	888	5,079	606	1,224	12,575	2	8.381	20.744
PE-17	78-84	6	968	3,910	537	1,623	17,021	3	7.281	31.716
	87-91	4	901	3,572	481	1,442	16,137	3	7.426	33.531
	103-107	4	669	4,229	482	1,121	18,481	2	8.774	38.322
	110-111	1	863	5,446	648	1,702	23,544	3	8.404	36.333
	154-156	2	1,044	4,026	472	935	12,167	2	8.530	25.805
	171-174	3	968	4,269	507	1,109	12,965	2	8.420	25.573
PE-18	140-260	120	1,396	7,216	717	1,489	27,284	2	10.064	38.064
PE-19	26-30	4	1,154	5,152	404	761	17,275	2	12.752	42.733
	42-62	20	1,182	7,601	911	3,050	20,347	3	8.344	22.343
	64-132	68	817	6,347	738	2,456	18,160	3	8.600	24.604
	145-267	122	757	5,957	655	1,906	21,467	3	9.095	32.755
PE-20	18-30	12	717	6,712	747	2,706	21,407	4	8.985	28.644
	60-127	64	821	5,759	650	1,778	22,117	3	8.860	34.013
	129-150	19	794	6,389	698	2,183	21,572	3	9.153	30.887
	155-204	49	795	6,193	691	2,193	21,464	3	8.962	31.040
PE-21	92-112	20	1,255	5,619	661	1,298	22,085	2	8.501	33.389
	113-134	21	1,235	5,587	735	1,412	22,605	2	7.601	30.761
	135-222	87	1,233	7,162	825	1,694	22,086	2	8.681	26.769
PE-22	72-89	17	1,095	6,414	656	1,456	26,397	2	9.777	40.248
	90-197	107	1,136	7,216	696	1,482	26,604	2	10.368	38.232
	198-230	32	1,051	7,036	733	1,913	24,928	3	9.599	34.002

Note: *RC = reverse circulation.*

10.2 DIAMOND DRILLING (DDH) BOREHOLE PROGRAM 2009-2010

The objectives of this program were to collect: 1) continuous cores for mapping and characterization, 2) geologic samples for geotechnical testing, including Relative Brine Release Capacity (RBRC), grain size and density, 3) brine samples using low-flow pumping methods, and 4) information for the construction of observation wells for future sampling and monitoring. The drilling reported herein was conducted between October 2009 and August 2010. DD Borehole Program drilling is summarized in Table 10.4. Twenty-nine boreholes (DDH-1 through DDH-18, plus twin holes) were completed, for a total of 5,714 m of drilling. Borehole depths range from 79 m (DDH-2) to 449.5 m (DDH-7).

TABLE 10.4
BOREHOLE DRILLING SUMMARY FOR THE DDH PROGRAM CONDUCTED IN 2009 AND 2010

DDH Borehole	Drilling Interval		Drilling Length (m)	DDH Borehole	Drilling Interval		Drilling Length (m)
	From (m)	To (m)			From (m)	To (m)	
DDH-1	-	272.45	272.45	DDH-10B	-	36.80	36.80
DDH-2	-	78.90	78.90	DDH-11	165	260.80	95.80
DDH-3	-	322.00	322.00	DDH-12	-	309.00	309.00
DDH-4	-	264.00	264.00	DDH-12A	-	294.00	294.00
DDH-4A	-	264.00	264.00	DDH-13	-	193.50	193.50
DDH-5	-	115.50	115.50	DDH-13A	-	20.50	20.50
DDH-6A	-	338.50	338.50	DDH-13B	-	20.50	20.50
DDH-6	-	129.00	129.00	DDH-13C	-	20.50	20.50
DDH-7	371	449.50	78.50	DDH-13D	-	20.50	20.50
DDH-8	-	250.50	250.50	DDH-14	-	254.50	254.50
DDH-8A	-	252.50	252.50	DDH-15	-	206.50	206.50
DDH-9	-	362.50	362.50	DDH-16	-	270.00	270.00
DDH9A	-	352.00	352.00	DDH-17	-	79.00	79.00
DDH-10	-	350.50	350.50	DDH-18	-	203.50	203.50
DDH-10A	-	258.00	258.00				
Total Boreholes: 29 / Total Drilling: 5,714 m							

Note: *DDH = diamond drill hole.*

Major Drilling, a Canadian drilling company with operations in Argentina, was contracted to carry out the drilling using a Major-50 drill rig and support equipment. The boreholes were drilled using triple tube PQ and HQ drilling methods. During drilling, core was retrieved and stored in boxes for subsequent geological analysis. Borehole logs are provided by King (2010b). Undisturbed samples were taken from the core in PVC sleeves (two inch diameter and five inch length) at selected intervals, for laboratory testing of geotechnical parameters including: RBRC, grain size, and particle density. A total of 832 undisturbed samples were tested.

On completion of exploration drilling, selected DD boreholes were converted to observation wells to enable brine sample collection as a means of supplementing the brine data collected through the RC Borehole Program. The observation wells were prepared by installing Schedule 80, 2-inch diameter, PVC casing and slotted (1 mm) screen in the boreholes. The wells were completed with steel surface casing, a surface sanitary cement seal and lockable cap. Brine sampling was conducted from March to August, 2010. Samples were initially collected with a low-flow pump. However, later samples were collected with a bailer, due to technical difficulties with the low-flow setup. Analytical results are summarized in Table 10.5.

TABLE 10.5
BRINE CONCENTRATIONS (MG/L) AVERAGED ACROSS SELECTED DEPTH INTERVALS FOR DDH PROGRAM BOREHOLES

Borehole	Depth (m)	Length (m)	B	K	Li	Mg	SO4	Mg/Li
DDH-01	15-55	40	610	4,847	523	1,147	9,039	2.20
	70-105	40	765	5,253	596	1,399	10,901	2.35
	140-170	30	832	5,518	634	1,528	11,694	2.41
	205-260	55	839	5,558	636	1,463	11,572	2.30
DDH-04	15-190	175	668	4,968	544	1,039	23,038	1.91
DDH-06	100-115	15	674	3,961	515	1,100	15,934	2.14
	118-136	18	667	5,860	627	1,353	18,552	2.16
	140-190	51	719	6,698	732	1,579	20,853	2.16
DDH-08	20-75	50	611	3,735	408	1,409	10,537	3.46
	80-205	125	822	5,232	588	1,223	16,971	2.08
DDH-12	65-70	5	696	4,120	464	927	16,834	2.00
	170-185	10	800	5,050	545	1,161	17,888	2.13
	225-285	25	827	5,249	565	1,223	17,819	2.16
DDH-13	50-140	90	872	5,940	650	1,921	20,955	2.96

10.3 DIAMOND DRILLING (DDH) BOREHOLE PROGRAM 2017-2018

The objectives of this program were to collect: 1) continuous cores for mapping and characterization of the shallow, intermediate and deeper parts of the aquifer; 2) geologic samples for geotechnical testing and grain size analysis; 3) brine samples using a bailer; and 4) information for the construction of observation wells for future sampling and monitoring. The drilling reported in Table 10.6 was conducted between July 2017 and February 2018.

The program included drilling 50 m, 200 m and 450 to 600 m deep, smaller diameter wells from the same drilling platform. Shallow and intermediate depth boreholes were competed in the same borehole. The shallowest wells use 1” diameter PVC casing. The deeper borehole was drilled 15 m away from the shallow and intermediate well locations. The intermediate and deep wells were cased using Schedule 80, 2-inch or 2.5-inch diameter, PVC casing and slotted (1 mm) screen in the boreholes. The wells were completed with steel surface casing, a surface sanitary cement seal and lockable cap. Brine sampling was conducted prior to pump testing. Sample collection, preparation and analytical methods are described in Section 11.

Major Drilling, a Canadian drilling company with operations in Argentina, and Ideal Drilling, a Bolivian company, were contracted to carry out the drilling program.

The deep boreholes were drilled using HQ-diameter size, triple-tube core recovery methods. During drilling, core was retrieved and stored in metal boxes for subsequent geological analysis. The shallow and medium depth boreholes were drilled with tricone 5 ½” diameter rotary methods. Description of continuous core from the deep borehole served as overall characterization of lithologies for the location of the platform.

All borehole locations and their associated platforms are presented in Figure 10.1. Brine sample collection is summarized in Section 14.2.2.

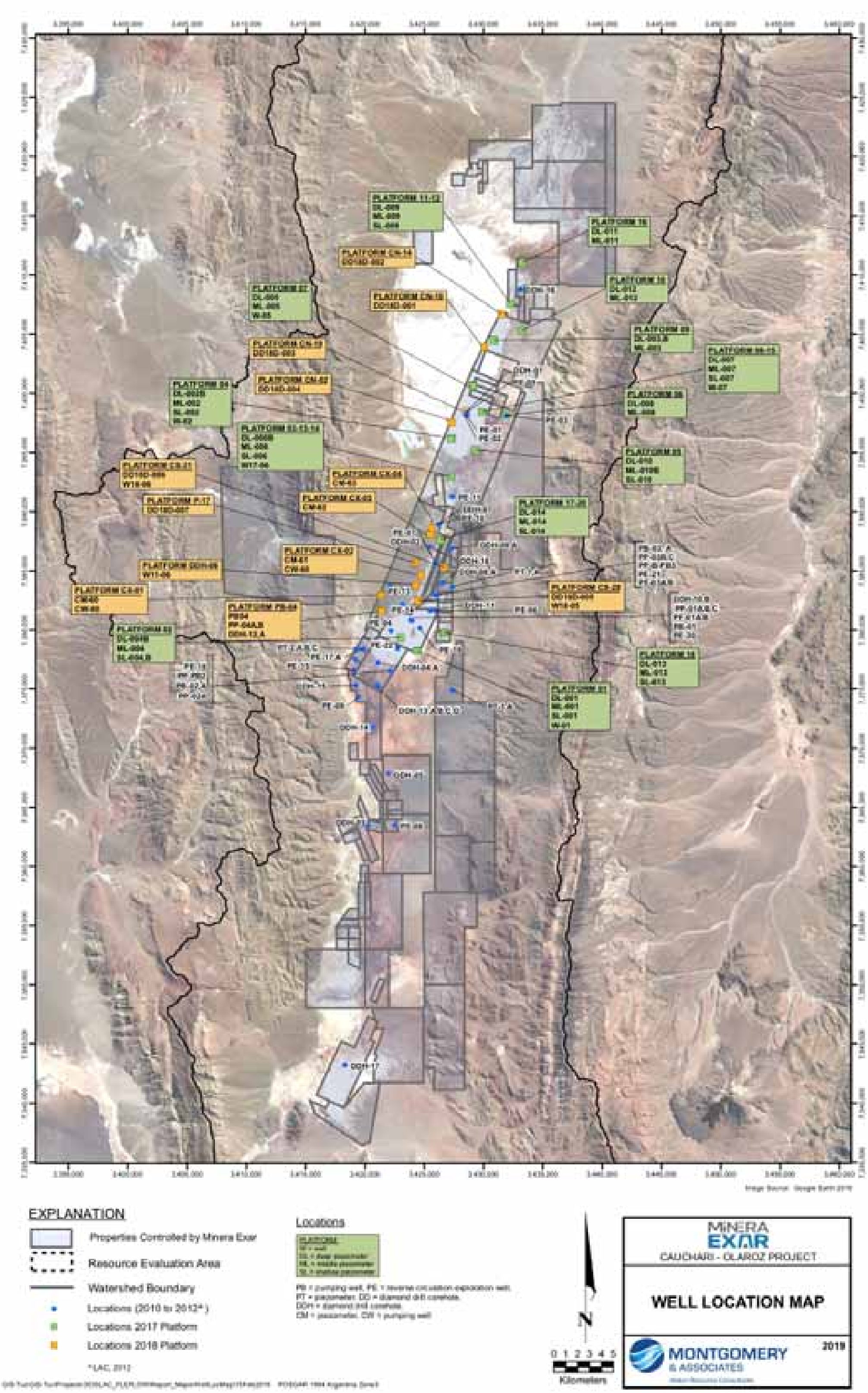
TABLE 10.6 BOREHOLE DRILLING SUMMARY FOR THE DDH PROGRAM CONDUCTED IN 2017 AND 2018									
DDH Borehole ID	**Piez-ometer Name**	**Screen Diameter**	**Platform**	**Contractor**	**Depth (m)**	**Screen Top (mbtc)**	**Screen Base (mbtc)**	**Coord-X-GK-Posgar Zona 3**	**Coord-Y-GK-Posgar Zona 3**
DD17S-001	ML-001	2"	1	IDEAL	200	109.40	174.80	3424377.00	7378282.00
DD17S-001	SL-001	1"	1	IDEAL	50	23.80	47.73	3424377.00	7378282.00
DD17D-001	DL-001	2.5"	1	IDEAL	450	265.50	444.00	3424392.00	7378275.00
DD17D-002B	DL-002	2"	4	IDEAL	450	343.36	444.24	3427266.00	7396185.00
DD17S-002	ML-002	2"	4	IDEAL	189.1	109.20	168.70	3427273.00	7396180.00
DD17S-002	SL-002	1"	4	IDEAL	50	23.80	47.73	3427273.00	7396180.00
DD17S-003	ML-003	2"	9	IDEAL	200	151.72	193.30	3430870.00	7404487.00
DD17D-003	DL-003	2.5"	9	IDEAL	650	292.60	636.10	3430861.00	7404476.00
RC17D-003	DL-003 B	2.5"	9	Major	648	221.20	642.00	3430859.00	7404497.00
RC17S-004	ML-004	2"	2	Major	200	122.75	194.00	3422991.00	7379367.00
RC17S-004	SL-004	1"	2	Major	50	23.80	47.73	3422991.00	7379367.00
DD17D-004	DL-004	2.5"	2	IDEAL	650	427.68	617.57	3423010.00	7379367.00
RC17D-004 B	DL-004 B	2.5"	2	Major	550	196.92	547.30	3423006.00	7379355.00
RC17S-004 B	SL-004B	2.5 "	2	IDEAL	50	14.30	50.00	3423001.00	7379362.00
DD17D-005	DL-005	2.5"	7	IDEAL	604.55	309.25	576.77	3429086.00	7400627.00
RC17S-005	ML-005	2"	7	Major	192	115.00	186.40	3429092.00	7400696.00

TABLE 10.6 BOREHOLE DRILLING SUMMARY FOR THE DDH PROGRAM CONDUCTED IN 2017 AND 2018									
DDH Borehole ID	**Piez-ometer Name**	**Screen Diameter**	**Platform**	**Contractor**	**Depth (m)**	**Screen Top (mbtc)**	**Screen Base (mbtc)**	**Coord-X-GK-Posgar Zona 3**	**Coord-Y-GK-Posgar Zona 3**
W-05	W-05	12"	7	Major	300	119.00	293.00	3429106.00	7400625.00
RC17S-006	ML-006	2"	3 13 14	Major	200	122.70	194.00	3427230.00	7392980.00
RC17S-006	SL-006	1"	3 13 14	Major	50	23.80	47.73	3427230.00	7392980.00
DD17D-006B	DL-006	2.5	3 13 14	IDEAL	450	255.90	443.95	3427245.00	7393001.00
RC17S-007	SL-007	1"	8 15	Major	50	23.80	47.73	3429894.00	7398465.00
RC17S-007	ML-007	2"	8 15	Major	200	110.10	175.50	3429894.00	7398465.00
DD17D-007	DL-007	2.5"	8 15	IDEAL	450	217.10	436.70	3429885.00	7398456.00
RC17S-008	ML-008	2.5"	6	Major	160	86.10	151.50	3431846.00	7398167.00
DD17D-008	DL-08	2"	6	Major	447	267.30	439.56	3431865.00	7398168.00
RC17S-009	SL-009	2"	11 12	Major	50	23.80	47.73	3432230.00	7407612.00
RC17S-009	ML-009	2.5"	11 12	Major	200	122.90	194.00	3432230.00	7407612.00
DD17D-009	DL-09	2.5"	11 12	Major	450	218.00	444.05	3432221.00	7407596.00
RC17S-010 B	ML-010	2.5"	5	Major	200	115.97	187.1	3429367.00	7395232.00
RC17S-010 B	SL-010	2"	5	Major	50	23.80	47.73	3429367.00	7395232.00
DD17D-010	DL-10	2.5"	5	Major	450	230.10	444.40	3429348.00	7395235.00
RC17S-011	ML-011	2.5"	16	Major	200	101.00	166.00	3433260.00	7411045.00

TABLE 10.6 BOREHOLE DRILLING SUMMARY FOR THE DDH PROGRAM CONDUCTED IN 2017 AND 2018									
DDH Borehole ID	**Piez-ometer Name**	**Screen Diameter**	**Platform**	**Contractor**	**Depth (m)**	**Screen Top (mbtc)**	**Screen Base (mbtc)**	**Coord-X-GK-Posgar Zona 3**	**Coord-Y-GK-Posgar Zona 3**
DD17D-011	DL-011	2.5"	16	IDEAL	450	235.80	444.00	3433255.00	7411065.00
RC17S-012	ML-012	2.5"	10	Major	200	128.94	194.39	3433213.00	7405310.00
DD17D-012	DL-012	3"	10	Major	451.65	204.34	436	3433225.00	7405308.00
RC17S-13	SL-13	1"	18	IDEAL	50	23.8	47.6	3426671.00	7379792.00
RC17S-13	ML-013	2"	18	IDEAL	200	122.7	194	3426671.00	7379792.00
DD17D-013	DL-013	2.5"	18	IDEAL	450	279.18	443	3426658.00	7379792.00
DD17D-014	DL-014	2.5"	17 20	IDEAL	431.35	238	425.03	3426361.00	7387640.00
RC17S-014	ML-014	2.5"	17 20	IDEAL	200	104.75	194.9	3426381.00	7387647.00
RC17S-014	SL-014	1"	17 20	IDEAL	26.7	2.9	26.7	3426361.00	7387640.00
DD18D-001	Cemented	2.5"	CN-10	IDEAL	300	Cemented	Cemented	3430069.00	7403904.00
DD18D-002	Cemented	2.5"	CN-14	IDEAL	300	Cemented	Cemented	3431478.00	7406690.00
DD18D-003	Abandoned	2.5"	CN-19	IDEAL	13	Abandoned	Abandoned	3428499.00	7398500.00
DD18D-004	Cemented	2.5"	CN-02	IDEAL	300	Cemented	Cemented	3427303.00	7397557.00
DD18D-005	Cemented	2.5"	CS-28	IDEAL	300	Cemented	Cemented	3424500.00	7382499.00
DD18D-006	Cemented	2.5"	CS-31	IDEAL	300	Cemented	Cemented	3426650.00	7385299.00
DD18D-007	Cemented	2.5"	P-17	IDEAL	300	Cemented	Cemented	3424250.00	7385700.00

Note: *DD = diamond drilling, DDH = diamond drill hole, mbtw = metres below top of well.*

Figure 10.1 Borehole Locations and Associated Drilling Platforms



Source: *Minera Exar.*

11.0 SAMPLE PREPARATION, ANALYSES AND SECURITY

11.1 SAMPLING METHOD AND APPROACH

Minera Exar established the following procedures for sample preparation, analyses and security at the Project from 2010 to 2012. These procedures are discussed in the 2017 Feasibility Study, authored by Burga et al. Drilling, brine sampling and pumping tests for the 2017-2018 campaigns were supervised by Minera Exar personnel.

Drilling was subject to daily scrutiny and coordination by Minera Exar geologists. On the drill site, the full drill core boxes are collected daily and brought to the core storage warehouse where the core is laid out, measured, logged for geotechnical and geological data, and photographed.

The core storage facilities at the Project are enclosed in a separate warehouse and well protected. Core boxes are placed on core racks and covered with a black PVC sheet to protect the integrity of the core. Drill core was not sampled for RBRC during the 2017-2018 drilling campaign, but the core was well logged to include the lithological data required for the Mineral Resource Estimate.

11.2 ROTARY DRILLING SAMPLING METHODS

Rotary drilling was conducted by Hidrotec and Wichi Toledo for the purpose of installing pumping wells for testing purposes. Minera Exar personnel recorded the time it took to advance 1 m and sampled the cuttings by placing them in a rock chip tray (Figure 11.1) and brought back to the field office for logging. Samples were not taken during rotary drilling for chemical analysis.

Figure 11.1 Rock Chip Tray with Dry and Wet Samples

Source: *King, Kelley, Abbey, (2012).*

11.3 DIAMOND DRILLING BOREHOLE SOLIDS SAMPLING METHODS

Diamond drilling was done by Major Drilling and Ideal Drilling. During diamond drilling, PQ or HQ diameter cores were collected through a triple tube sampler. The cores were taken directly from the triple tube and placed in wooden or metal core boxes for geologic logging, sample collection, and storage. During the 2009-2011 drilling, undisturbed geologic samples were collected by driving a two inch diameter, five inch long PVC sleeve sampler into the core at three metre intervals (Figure 11.2 and Figure 11.3). The DD boreholes were used to help select the pumping well locations.

During the 2009-2011 drilling campaigns, a total of 1,244 undisturbed samples were collected from the cores of DDH-1 through DDH18. Undisturbed samples were shipped to D.B. Stephens & Associates Laboratory in the USA for analysis of geotechnical parameters, including: RBRC (total of 832 samples), particle size (total of 58 samples), and dry bulk density (total of 36 samples). Geotechnical analytical methods are described in Section 11.2.4. RBRC samples were not collected during the 2017-2018 drilling campaign.

Figure 11.2 Collecting an Undisturbed Sample from Sand Core

Source: *King, Kelley, Abbey, (2012).*

Figure 11.3 Collecting an Undisturbed Sample from Halite Core

Source: *King, Kelley, Abbey, (2012).*

11.4 DIAMOND DRILLING BOREHOLE BRINE SAMPLING METHODS

Samples were further analyzed in the field laboratory for confirmation of field parameters. After analysis of field and field laboratory parameters, brine samples were split into three, 250 ml, clean, plastic sample bottles. The three bottles were tagged with pre-printed tag numbers. Two bottles were used per sample, one for density and one for geochemistry, which was shipped to ASL in Jujuy or sent to onsite Exar laboratory. One sample was maintained in the Minera Exar field office, as a backup.

11.5 SAMPLING PREPARATION, ANALYSIS AND SECURITY

There is an established and firm chain of custody procedure for Project sampling, storage, and shipping. Samples were taken daily from the drill sites and stored at the on-site facility. All brine samples were stored inside a locked office, and all drill cores were stored inside the core storage area on site. Brine samples were taken by Minera Exar staff to the on-site laboratory or transported to Jujuy in a company truck. Solid samples were periodically driven in Project vehicles to Jujuy, approximately three hours from the site. In Jujuy, solid samples were delivered to a courier (DHL) for immediate shipment to the appropriate analytical laboratory.

Brine samples were analyzed by Alex Stewart Argentina S.A. (ASA) and the internal Exar laboratory. ASA is an ISO 9001 and ISO 14001 certified laboratory with facilities in Jujuy and Mendoza, Argentina and headquarters in England. The internal Exar laboratory handles samples from the pilot processing plant and hydrogeology and is not a certified laboratory.

Analytical methods for all brine samples are described in Section 11.6.1. Quality Assurance/Quality Control (QA/QC) for brine samples collected is discussed in Section 12.

D.B. Stephens and Associates Laboratory in Albuquerque, New Mexico, USA was used for the geotechnical property analyses of the undisturbed core samples from the DD Borehole Program in the 2009-2011 drilling campaigns. D.B. Stephens and Associates is certified by the US Army Corps of Engineers and is a contract laboratory for the U.S. Geological Survey.

11.5.1 Brine Samples from the Piezometers

Piezometers were installed for sampling prior to pump testing. These samples were collected at 20 m intervals using bailers. Bailers would be manually lowered to the desired depth, pulled up one meter quickly to fill the bailer then lowered slowly to obtain a sample at the desired depth. Brine from the bailer would be used to rinse out a plastic bucket and then the remainder of the brine would be emptied into the bucket. Brine from the bucket would be used to rinse out three 250 ml bottles before being filled with a sample and marked with the borehole and depth. Back at the field office, samples would be logged into a field book and assigned a unique sample code and any identifying information about the borehole would be removed from the bottle using rubbing alcohol. Data from the logbook is then entered into the sampling database.

Samples were not filtered after collection because the pumping wells produced brine with negligible suspended solids.

11.5.2 Brine Samples from the Pumping Test Program

In 2017-2018 each well had a pump test to help define the pumping rate and lithium concentration. 2018 pumping production wells helped define the lithium concentration and flow rate in each location where the production wells are being drilled. The first test is well development which lasts for 7 days, during which the pump is steadily ramped up to clean the well, generally starting with 20 hz then ramping up when to clear silt and sediment. Prior to taking samples the well is developed to clean all the fine sediments in the area immediately next to the screen. The development lasts from 3 to 7 days. The well is considered developed when the percentage of solids during pumping is less than 0.1 ml measured in an Imhoff cone (Figure 11.4). Measurements are taken with the frequency shown in Table 11.1. The parameters measured include dynamic water level, flow (m3/h), and turbidity. If the well cleans quickly then the pumping rate is ramped up more quickly. After the test is done, recovery is measured using a water level tape with readings being taken with the same frequency shown in Table 11.1 until 95% recovery is achieved. During and after the pumping tests, technicians measure the drawdown and recovery of nearby wells.

TABLE 11.1
SUMMARY PUMPING TEST MEASUREMENT FREQUENCY

Time	Frequency of Samping
0-5 minutes	Every 30 seconds
5-10 minutes	Every minute
10-30 minutes	Every 2 minutes
30-60 minutes	Every 5 minutes
1 – 2 hours	Every 10 minutes
2 – 3 hours	Every 20 minutes
3 – 4 hours	Every 30 minutes
4 hours – end	Hourly

Figure 11.4 Measuring Sediment in an Imhoff Cone

Source: *Minera Exar.*

Once the water level has recovered to 95%, a short sampling pump test (2-4 hours) is conducted. This test is to find the maximum pumping rate without draining the well. The well is allowed to recover afterwards.

An 8-12 hour pumping rate test follows, which is broken up into 4 parts at 25% of the maximum pumping rate, 50% of the maximum pumping rate, 75% of the maximum pumping rate and 100% of the maximum pumping rate. This test is to see which rate the well stabilizes at. The well is allowed to recover afterwards.

The final pump test is a constant rate pump test that is conducted for a minimum of 7 days. This test is meant to keep a constant rate, and the pumping rate is not adjusted. Water measurements are taken with the same frequency listed on Table 11.1. Brine sampling is done at 10 min, 30 min, 60 min, 2 h, and then every 4 hours to the end of the test. Brine from a valve on the side of the hose coming out of the well would be used to rinse out a plastic bucket and then filled again. Brine from the bucket would be used to rinse out three 250 ml bottles before being filled with a sample and marked with the borehole and date. Back at the field office, samples would be logged into a field book and assigned a unique sample code and any identifying information about the borehole would be removed from the bottle using rubbing alcohol. Data from the logbook is then entered into the sampling database.

11.6 BRINE ANALYSIS

11.6.1 Analytical Methods

ASA in Jujuy and the on-site Exar laboratory were the primary laboratories for analysis of brine samples. In order to provide a quick response, ASA employed Inductively Coupled Plasma ("ICP") as the analytical technique for the primary constituents of interest, including: sodium, potassium, lithium, calcium, magnesium, and boron. Samples were diluted by 100:1 before analysis. Density was measured via pycnometer and sulphates were measured using the gravimetric method. The argentometric method was used for assaying chloride and volumetric analysis (acid/base titration) was used for carbonates (alkalinity as $CaCO_3$).

In the internal Exar laboratory a 20 g sample is taken from the 250 ml bottle. The sample is entered into the laboratory database. Sulphates were measured using the gravimetric method and volumetric analysis (acid/base titration) was used for calcium, magnesium and chloride. Brine samples were diluted before being passed through the AA spectrometer which analyzes Li, Na, and K.

The laboratory can process 40 samples per day. A Laboratory Information Management System is to be installed in the coming year.

11.6.2 Sample Security

There is an established and firm chain of custody procedure for Project sampling, storage and shipping. Samples were taken daily from the drill sites and stored at the core storage facility on site. Brine samples are taken by Exar personnel to the on-site analytical laboratory or by truck to the Alex Stewart facility in Jujuy.

During the 2009-2011 drilling campaigns, solid samples were periodically driven in Project vehicles to Jujuy, approximately three hours from the site. In Jujuy, solid samples were delivered to a courier for immediate shipment to the appropriate analytical laboratory.

11.7 SAMPLE PREPARATION ANALYSIS AND SECURITY CONCLUSIONS AND RECOMMENDATIONS

The field sampling of brines from the piezometers and pumping tests is being done to industry standards. Security procedures are adequate for the sampling program. The recommendation is made that sample books with dedicated tickets be used for future sampling. It is also recommended that a separate building be dedicated to the storage of the duplicate sample bottles and that a selection of samples of low, medium and high grade lithium be submitted to Alex Stewart for analysis.

11.8 GEOTECHNICAL ANALYSIS

11.8.1 Overview

D.B. Stephens and Associates Laboratory carried out selected geotechnical analyses on undisturbed samples from the geologic cores (DDH-1 through DDH-18), from the 2009-2011 drilling campaigns as summarized in Table 11.2. RBRC results were used in the Resource Estimate (King, 2010b) to estimate the volume of recoverable brine present in various geological materials. A summary of RBRC results, and the approach used for incorporation into the Mineral Resource Estimate, is provided in Section 7.7. No RBRC testing was done for the 2017-2018 drilling campaigns.

TABLE 11.2
SUMMARY OF GEOTECHNICAL PROPERTY ANALYSES

Analysis	Procedure
Dry bulk density	ASTM D6836
Moisture content	ASTM D2216, ASTM D6836
Total porosity	ASTM D6836
Specific gravity (fine grained)	ASTM D854
Specific gravity (coarse grained)	ASTM C127
Particle size analyses	ASTM D422
Relative brine release capacity	Developed by D.B. Stephens (see Section 11.2.4.2.2)

11.9 ANALYTICAL METHODS

11.9.1 Specific Gravity

Specific gravity testing was conducted for four formation samples (012714, 012715, 012716, and 012743). Density results for these samples ranged from 2.47 g/cm^3 to 2.75 g/cm^3. It was subsequently determined that these values could be skewed due to the high salt content. Consequently, no attempt was made to apply these measured values to the remaining samples, and an assumed particle density of 2.65 g/cm^3 was used for all other samples.

11.9.2 Relative Brine Release Capacity (RBRC)

The RBRC method was developed by D.B. Stephens and Associates Laboratory, in response to some of the unique technical challenges in determining porosity for brine-saturated samples (Stormont, et al., 2010). The method predicts the volume of solution that can be readily extracted from an unstressed geologic sample. The result is used by LAC as an estimate of Sy.

According to the RBRC method, undisturbed samples are saturated in the laboratory using a site-specific brine solution. The bottom of the samples are then attached to a vacuum pump using tubing and permeable end caps, and are subjected to a suction of 0.2 to 0.3 bars for 18 to 24 hours. The top of the sample is fitted with a perforated latex membrane that limits atmospheric air contact with the sample, to avoid evaporation and precipitation of salts. Depending on the pore structure of the material, there may be sufficient drainage so that a continuous air phase is established through the sample. The vacuum system permits testing multiple samples simultaneously in parallel. After extraction, the samples are oven dried at 110 °C.

The volumetric moisture (brine) content of the sample is calculated based on the density of the brine, the sample mass at saturation, and the sample mass at "vacuum dry". The difference between the volumetric moisture (brine) content of the saturated sample and the volumetric moisture (brine) content of the 'vacuum dry' sample is the specific yield or "relative brine release capacity".

11.9.3 Particle Size Analysis

Particle size analyses were carried out on 58 undisturbed samples after the drainable porosity testing was completed. Uniformity and curvature coefficients (Cu and Cc) were calculated for each sample and samples were classified according to the USDA soil classification system.

11.9.4 Exar Porosity Test Lab

In addition to the on-site analytical laboratory, the project site also has a porosity test lab. This lab tests total porosity (as opposed to drainable porosity) which helps to distinguish between types of halites and clays and silts. Samples dried in an oven at 70 degrees Celsius, weighed, measured and then put through a gas pycnometer. Volume, porosity and density are obtained. Samples are photographed and given a bar code and the equipment is calibrated at the end of each day.

The lab also conducts grain size analysis on the gravel pack used by the drillers for well construction.

It should be noted that results from the Exar Porosity Test Lab should not be used for Mineral Reserve Estimate Purposes.

11.10 GEOTECHNICAL ANALYSIS RECOMMENDATIONS

For the update to the definitive feasibility study ("DFS") it is recommended that several undisturbed core samples from the 2017-2018 drilling campaigns be obtained and independently submitted for geotechnical and RBRC property analysis.

12.0 DATA VERIFICATION

12.1 OVERVIEW

The Data Verification for data obtained prior to the 2017-2018 drilling campaigns are elaborated in the 2017 Feasibility study (Burga et al., 2017).

12.2 SITE VISITS

Mr. D. Burga visited the site and the Minera Exar office on January 24 and 25, 2017 and again between February 18 and 21, 2019. Project features inspected and reviewed during these visits, which are relevant to data verification, included the following:

- Several drill hole locations were visited and several active pumps were observed;
- 23 brine samples were obtained from 10 wells;
- Review of Minera Exar sampling procedures;
- Inspection of the 2017-2018 Project database;
- Inspection of digital laboratory certificates for the Minera Exar brine dataset, and the Project database;
- The sample storage facility and security systems were observed and are considered appropriate; and
- Tours of the Exar Analytical Lab and the Exar Grain Size Analysis were conducted.

Mr. D. Burga conducted interviews with Minera Exar employees who were present during the drilling and pump testing of the new wells.

Digital copies of the lab certificates were obtained directly from Alex Stewart and compared to the Minera Exar database.

12.3 2017-2018 SITE VISIT AND DUE DILIGENCE SAMPLING

Mr. D. Burga collected 23 brine samples during his site visit from 10 wells during the site visit. Each sample consisted of three 250 ml plastic bottles. 4 samples were taken from pumping well sites (PB-06, W18-05, W11-06, and PB-03). For the pumping well samples, a valve was opened on the main pipe coming out of the well, a plastic pail was rinsed with brine, filled again and then the brine was used to rinse out each sample bottle before being filled with the sample. 19 samples were taken from various depths in six different observation piezometers (DL-014, ML-014, DL-005, W-05, DL-09, and ML-09). A bailer was lowered to the desired depth, pulled up a meter and lowered again to obtain a sample at that depth then pulled back to the surface. A small amount of brine was used to rinse out a plastic pail and then dumped out and the remainder of the brine from the bailer was emptied into the pail. Each bottle was marked with the well and depth and brought back to field office where each sample was given a sample code, entered into a log book and identifying well information was removed from the sample bottles with rubbing alcohol.

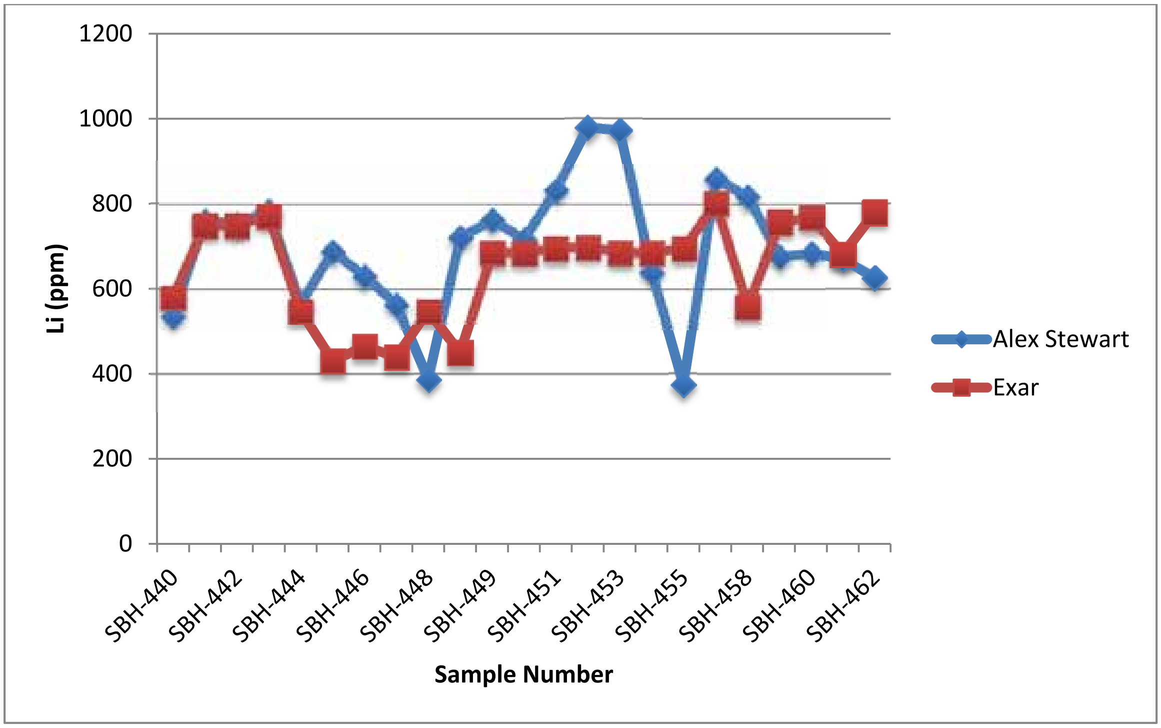
The samples were taken by Mr. Burga directly to Alex Stewart Laboratories in Jujuy for chemical analysis. The samples were analyzed for lithium using and ICP with an OES finish.

Results of the site visit due diligence samples are listed in Table 12.1 and presented graphically in Figure 12.1.

TABLE 12.1
RESULTS OF DUE DILIGENCE SAMPLING

ACSI Sample No.	Well No.	Depth (m)	Li (mg/L) Alex Stewart	Li (mg/L) Minera Exar
SBH-440	PB-06A	-	537	580
SBH-441	W18-05	-	760	750
SBH-442	W11-06	-	753	750
SBH-443	PB-03A	-	784	772
SBH-444	DL-014	100	565	548
SBH-445	DL-014	200	689	430
SBH-446	DL-014	300	631	464
SBH-447	DL-014	370	564	440
SBH-448	ML-014	100	387	548
SBH-449	ML-014	115	721	449
SBH-450	DL-005	100	763	686
SBH-451	DL-005	200	717	685
SBH-452	DL-005	300	833	696
SBH-453	DL-005	320	979	699
SBH-454	W-05	100	973	686
SBH-455	W-05	200	639	685
SBH-456	W-05	300	375	696
SBH-457	ML-09	100	859	801
SBH-458	ML-09	200	817	559
SBH-459	DL-09	100	676	757
SBH-460	DL-09	200	685	769
SBH-461	DL-09	300	669	681
SBH-462	DL-09	400	626	780

Figure 12.1 Due Diligence Sample Results for Lithium: February 2019



The results for the due diligence sampling were similar in tenor between ASA and the internal Exar laboratories, with the samples from ASA being higher than the Exar labs in 16 of 23 samples. During the on-site interviews one of the hydrogeologists indicated that sample SBH465 was taken at the bottom of an observation well that had drillers mud in it that would have settled at the bottom, because of its density, thus diluting the sample. This is a possible explanation for the difference, the Minera Exar sample had 696 mg/L Li and the ASA sample taken by ACSI had 375 mg/L.

12.4 QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

LAC implemented and monitored a thorough quality assurance and quality control program (QA/QC or QC) for the brine sampling undertaken at the Project over the 2017-2018 period. QA/QC protocol included the insertion of QC samples into every batch of samples. QC samples included one standard, one blank and one field duplicate. Check assaying is also conducted on the samples at a frequency of approximately 5%.

A total of 4,182 samples, including QC samples, were submitted during LAC's brine sampling program at the Project (2017 through 2018), as shown in Table 12.2. A total of 105 check samples were also submitted for check assaying.

TABLE 12.2 QA/QC SAMPLING		
Samples	**No. of Samples**	**Percentage (%)**
Blanks	29	0.70%
Standards	545	13.03%
Duplicates	164	3.92%
Normal	3,444	82.35%
Total	**4,182**	**100%**
Check Samples	105	2.51%

12.5 PERFORMANCE OF BLANK SAMPLES

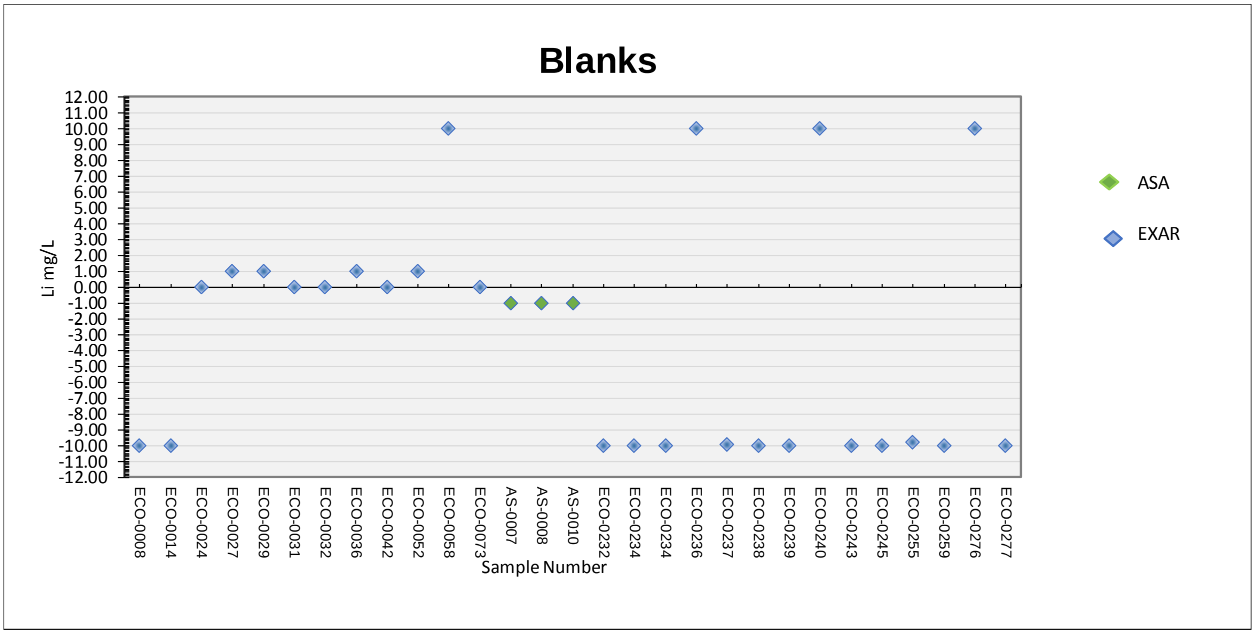
Blank samples were inserted to monitor possible contamination during both preparation and analysis of the samples in the laboratory. The blank material used was initially distilled water and then switched to tap water which is sourced from a fresh water well that contains trace amounts of lithium.

Blank samples were inserted at an average rate of approximately 1 in 120 samples, with a total of 29 blank samples submitted. Three of the samples were submitted to ASA with the remainder of the samples submitted to the internal Exar laboratory.

At the time of the site visit there was not a set of Standard Operating Procedures that set tolerance limits for QA/QC samples. It is recommended that the tolerance limit used for the blank samples be 2 times the minimum detection limit (mdl) for the internal Exar AA samples and 10 times the lower detection limit for ASA AA samples (the Exar lab uses AA with a mdl 10 mg/L and ASA uses AA with a mdl 1 mg/L). It should be noted that at times the Exar laboratory used 10, 1, 0 and -10 mg/l as the lower limit depending on dilution used. ASA used -1 mg/L denoting dilution at the sample preparation stage.

The results of the blank sampling are shown graphically in Figure 12.2. There were no failures for the blank samples.

Figure 12.2 Performance of Lithium Blank Samples



12.6 CERTIFIED REFERENCE MATERIALS

Certified Reference Materials ("CRM") are used to monitor the accuracy of a laboratory. LAC did not use CRM for their QA/QC sampling program. Standards ("Patrons") were prepared at the uncertified on-site laboratory by Exar staff and were submitted at an average frequency of 1 in 7 samples. These Patrons were prepared by taking high grade lithium brines and diluting it to prepare high, medium and low grade samples. These Patrons were prepared in 50 L batches and when they were used up a subsequent batch was prepared. The first round of Patron samples were analyzed solely at the Exar laboratory. The second and third rounds of Patron samples were analyzed at both the Exar and ASA laboratories. At the time of this report, the third round of Patron samples was being used. A total of 545 standards were used during the 2017-2018 drilling campaigns. The standards/Patrons results are summarized in Table 12.3.

TABLE 12.3 RESULTS OF DUE DILIGENCE SAMPLING			
Round 1 – Created March 2017			
Name	**Target Value (mg/L)**	**Lab Exar Value (mg/L)**	**Avg of All Samples (mg/L)**
Patron A	1,500	1345	1382
Patron B	1,100	1144	1163
Patron C	850	876	894
Standard A	550	579	615
Round 2 – Created April 2018			
Name	**Target Value (mg/L)**	**Lab Exar Value (mg/L)**	**ASA Value (mg/L)**
Patron AA	1200	1151	1121
Patron BB	1,000	923	933
Patron CC	750	751	740
Patron DD	540	523	542
Round 3 – Created October 2018			
Name	**Target Value (mg/L)**	**Lab Exar Value (mg/L)**	**ASA Value (mg/L)**
Patron 1	540	528	-
Patron 2	770	804	-
Patron 3	1000	1152	-
Patron 4	1200	1296	-

For the purposes of the QA/QC review, all of the Exar samples for each Patron were averaged to find a mean value and standard deviation. Patrons were submitted randomly in the sample stream and were plotted as a different series to check bias with regards to the Exar results. The results for each Patron are shown graphically in Figure 12.3 through Figure 12.10.

Figure 12.3 Performance of Patron A

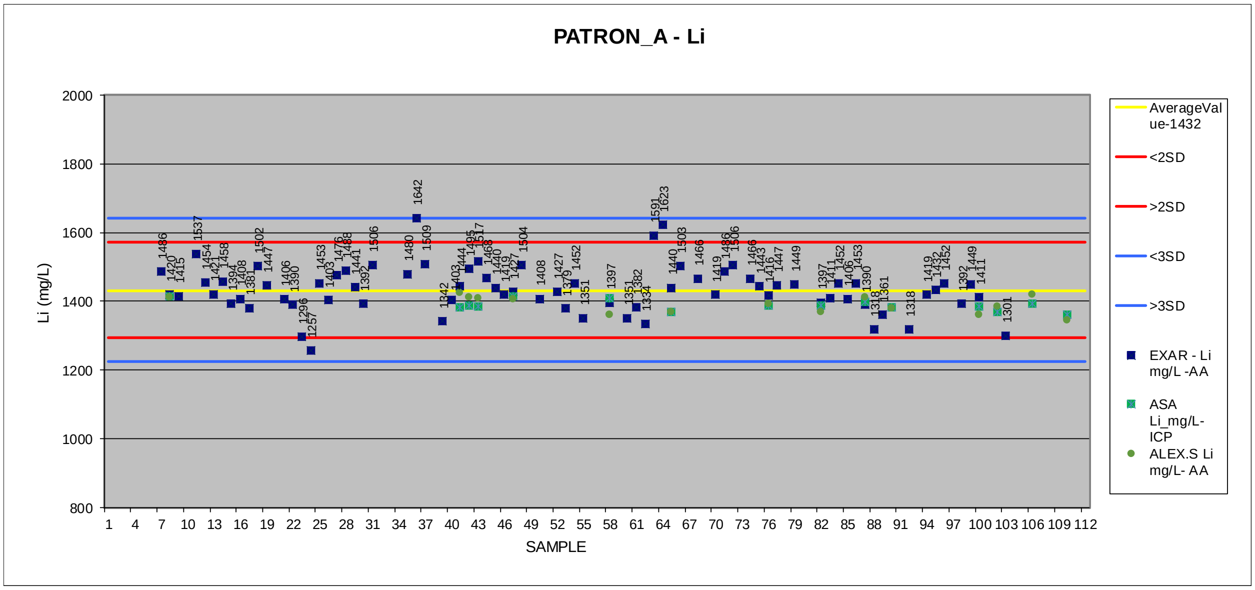


Figure 12.4 Performance of Patron B

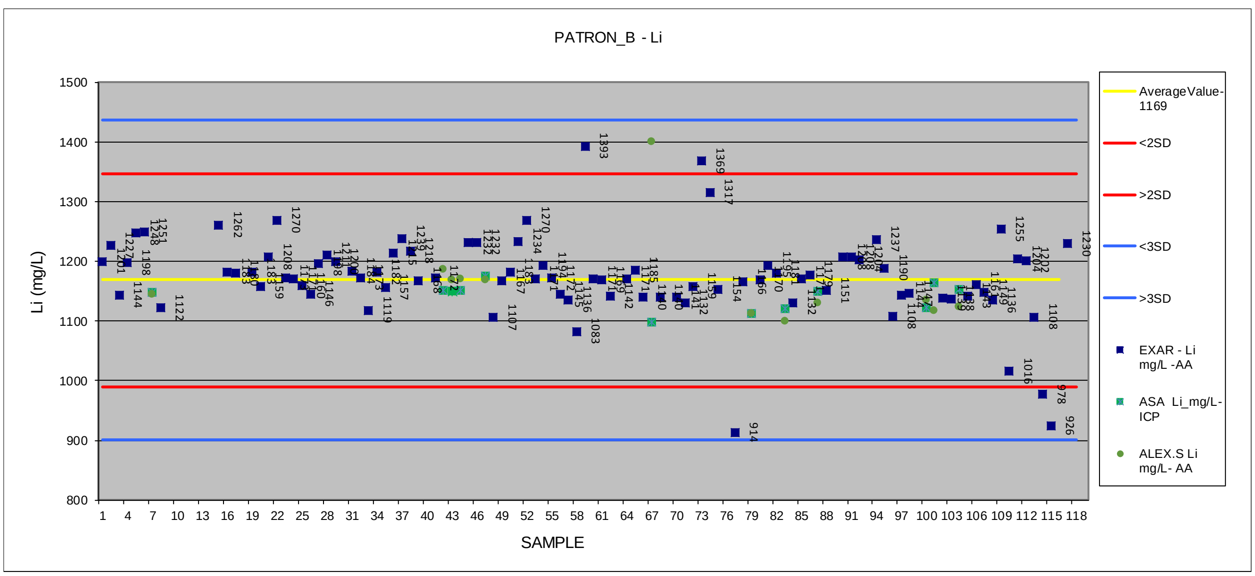


Figure 12.5 Performance of Patron C

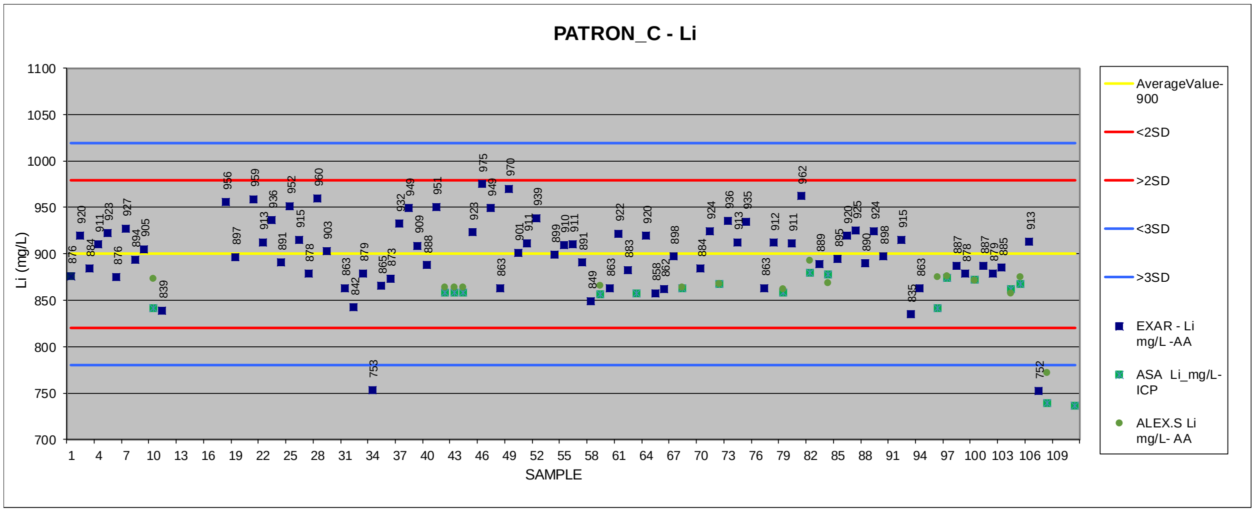


Figure 12.6 Performance of Estandar A

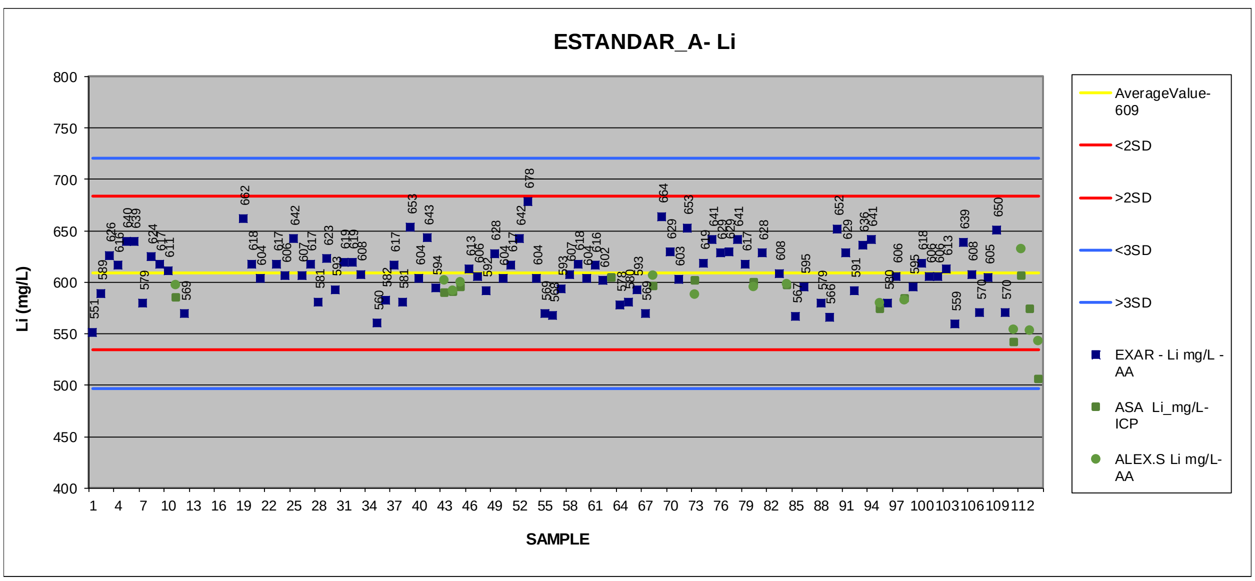


Figure 12.7 Performance of Patron AA

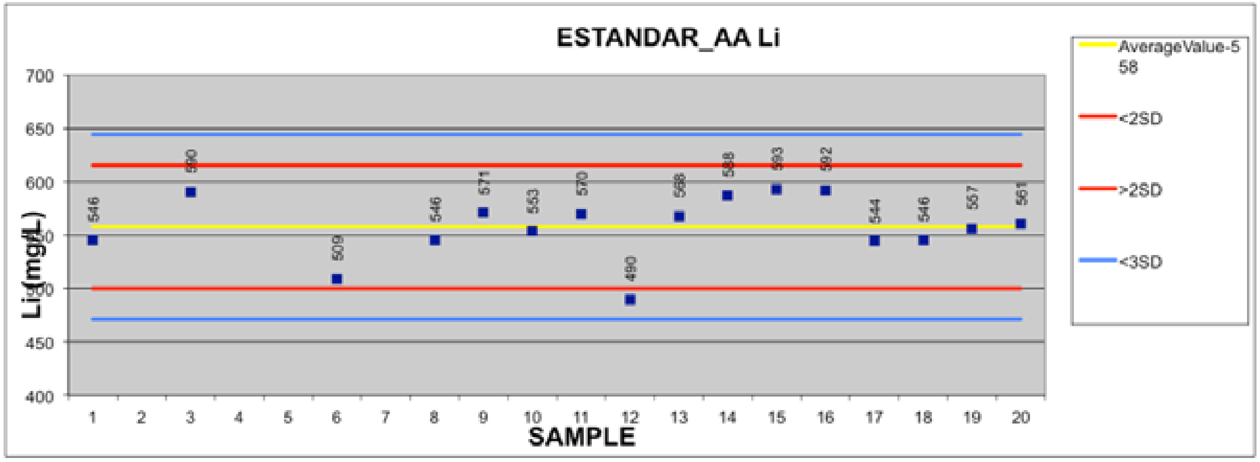


Figure 12.8 Performance of Patron BB

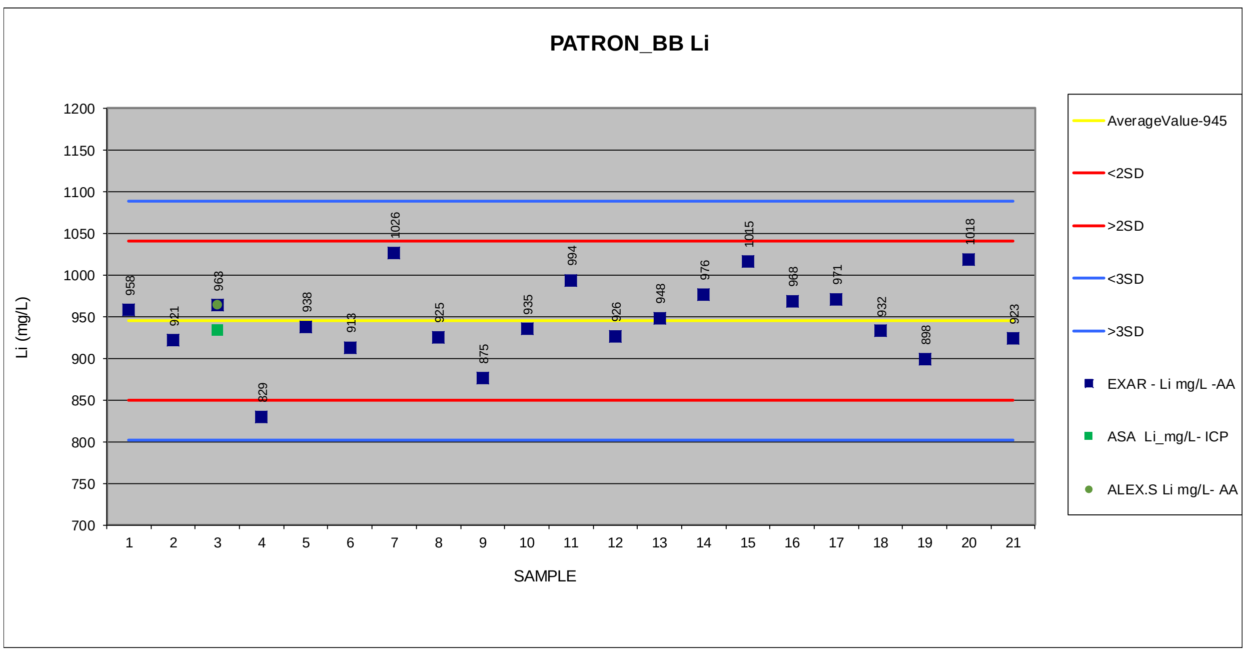


Figure 12.9 Performance of Patron CC

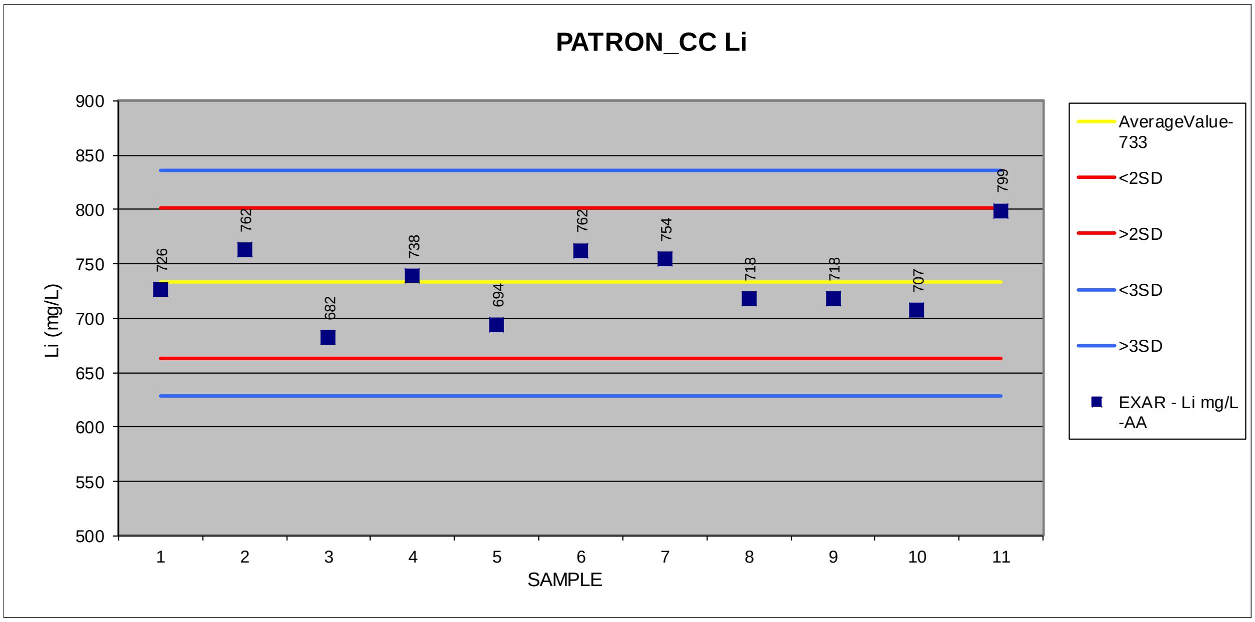
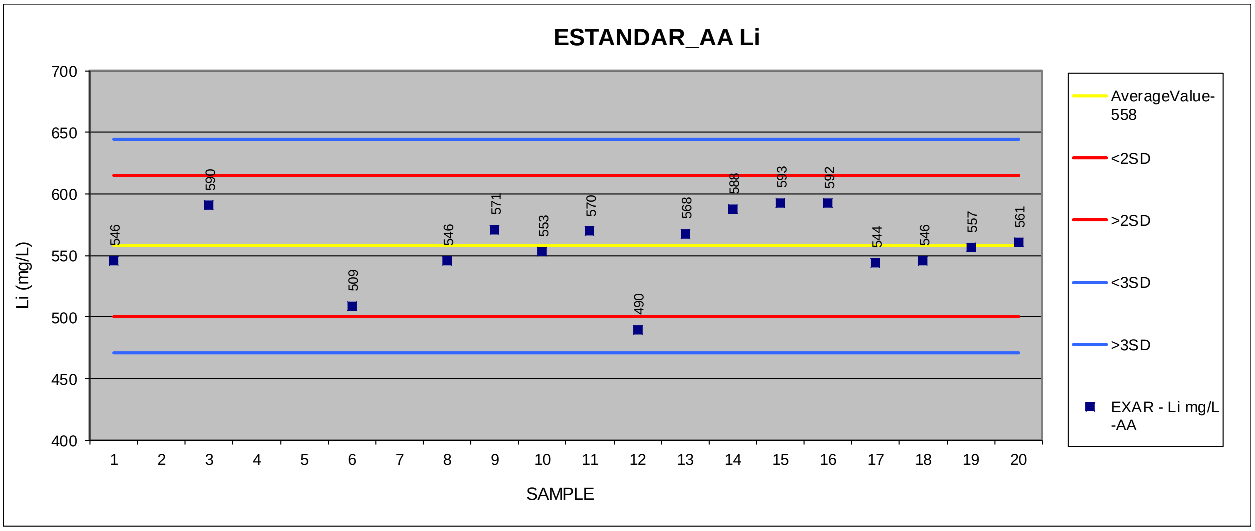


Figure 12.10 Performance of Estandar AA



Although there were no Standard Operating Procedures in place, a failure should be considered a result that is greater than +/- 3 standard deviations. None of the results for the standards were outside of this range indicating consistent results from the Exar laboratory. As seen in Figure 12.3, Figure 12.4 and Figure 12.5, the analytical results for lithium from Alex Stewart, for both AA and ICP, were slightly below the average.

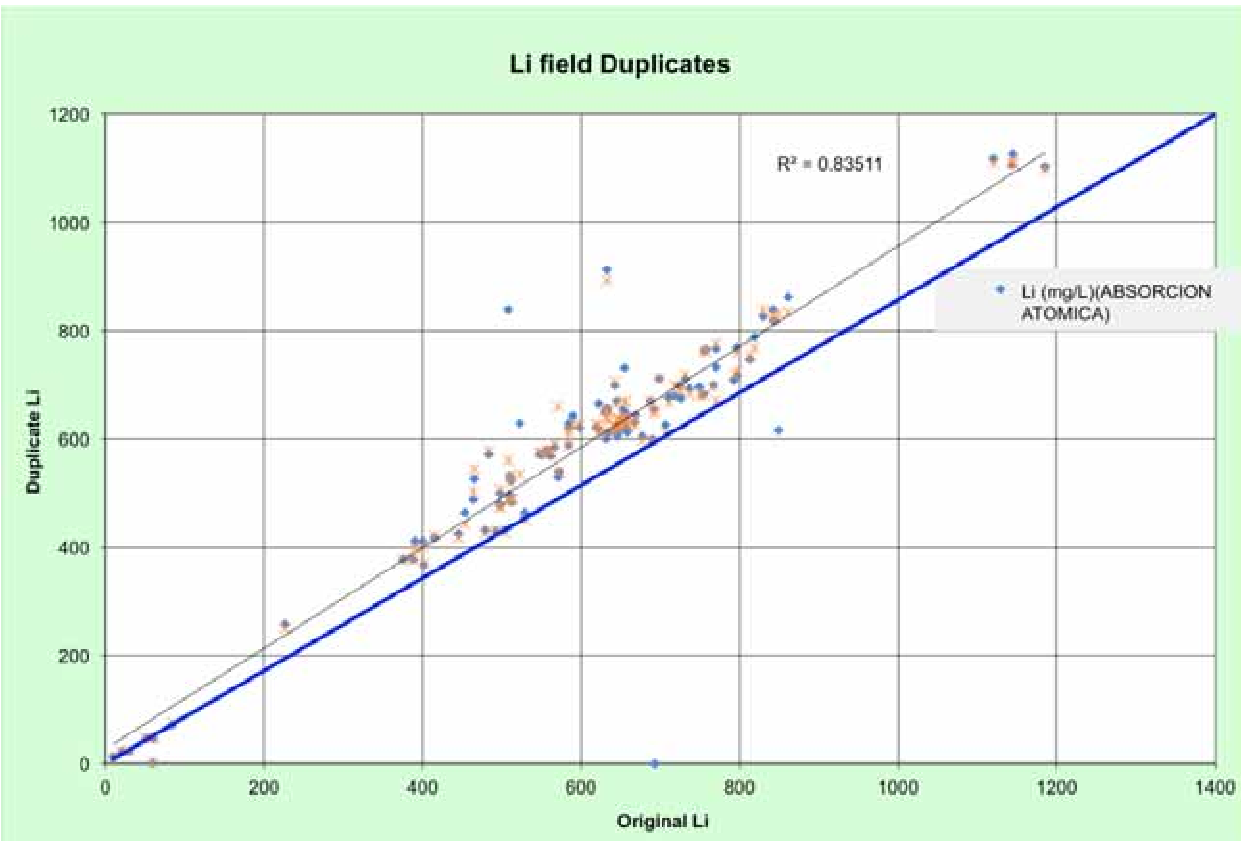
12.7 DUPLICATES

As part of their regular QA/QC program, LAC routinely used duplicate samples to monitor potential mixing up of samples and data precision. Duplicate samples were collected in the field by Minera Exar personnel and preparation involved filling an additional three bottles of brine at the same depth. The original and duplicate samples were tagged with consecutive sample numbers and sent to the laboratory as separate samples. Duplicate samples were collected at a rate of approximately 1 in 20 samples.

A total of 164 duplicate samples were taken representing 3.92 % of total samples.

The results of duplicate sampling are shown graphically in Figure 12.11. Data precision was good with a correlation coefficient value of 0.83511.

Figure 12.11 Duplicate Samples – Minera Exar Laboratory



12.8 CHECK ASSAYS: EXAR VS. ALEX STEWART

LAC routinely conducted check analyses at ASA to evaluate the accuracy of the Exar laboratory.

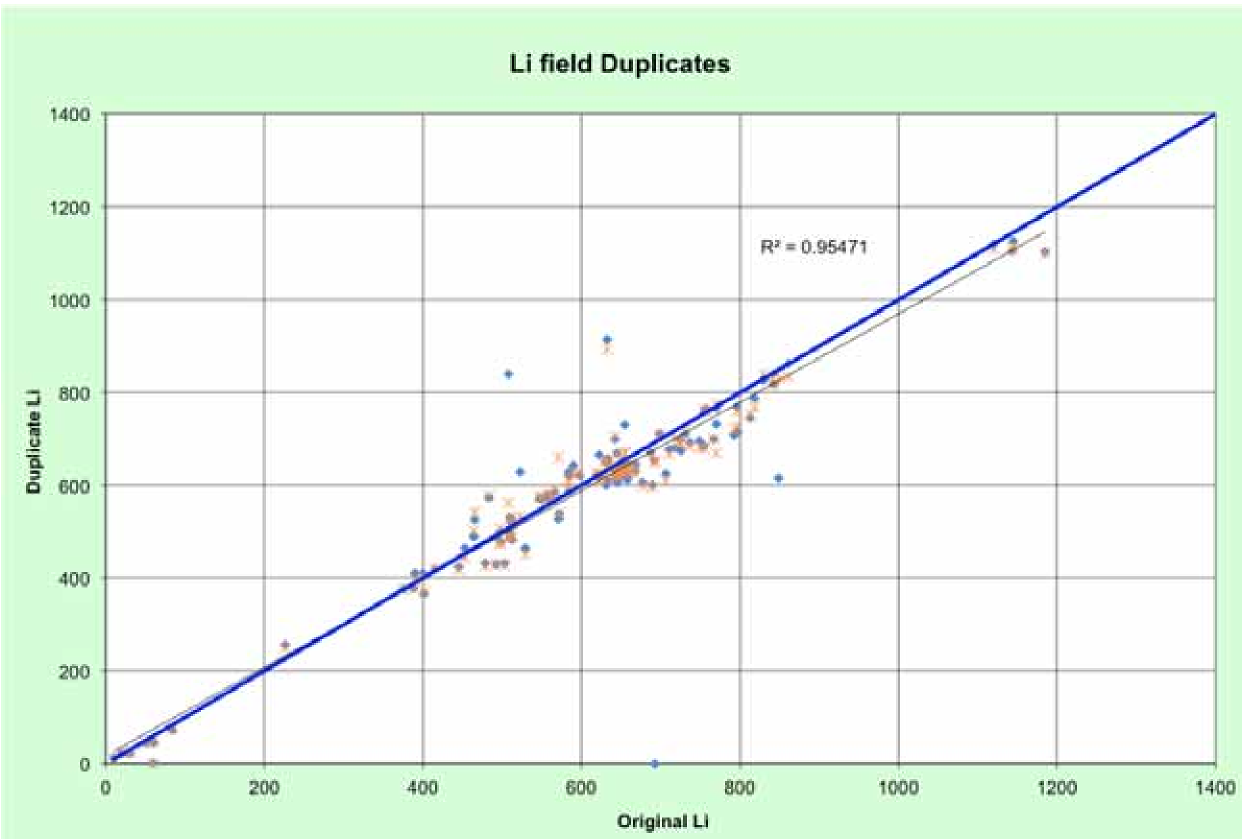
Duplicate samples were collected and sent to a second laboratory to verify the original assays and monitor any possible deviation due to sample handling and laboratory procedures. LAC uses the ASA laboratory in Jujuy, Argentina, for check analyses.

A total of 105 check samples were sent to a third party laboratory for check analysis, equating to approximately 2.5% of the total samples taken during the sampling program.

Correlation coefficient is high (0.95471) for Lithium, showing strong overall agreement between the original Exar analysis and the ASA check analysis.

The results of the check sampling program are shown by way of scatter diagrams in Figure 12.12.

Figure 12.12 Check Assays – Minera Exar Laboratory vs. ASA Laboratories



12.9 CONCLUSIONS AND RECOMMENDATIONS

Mr. David Burga has personally met, and had technical discussions with, most of the technical experts working on the Project on behalf of LAC. These individuals are competent professionals, with experience within their respective disciplines. Their interpretations demonstrate a conservative approach in assigning constraints on the estimate, which increases the technical strength of the results.

The field sampling of brines from the pumping tests is being done to industry standards. The quality control data based upon the insertion of standards, field blanks and field duplicates indicates that the analytical data is accurate, and the samples being analyzed are representative of the brine within the aquifer.

The following recommendation are made with regards to QA/QC procedures:

- Proper certified lithium standards, with values comparable to the grades found on site, be sourced;
- Standard Operating Procedures should be implemented that lay out the frequency of QA/QC sample insertion and how samples should be treated in the case of a failure of a QA/QC sample;
- Analytical samples should be submitted to Alex Stewart or another internationally accredited laboratory;
- Distilled water should be used for blanks as freshwater in the area can contain trace amounts of lithium;
- If the Patrons made at the Exar lab continue to be used, they should go through round robin testing at external laboratories to obtain a more accurate value; and
- The Exar laboratory should implement ISO procedures and be subjected to external audits to maintain quality control.

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

In the 2012 Feasibility Study, LAC developed a process model for converting brine to lithium carbonate based on evaporation and metallurgical testing. The proposed process follows established industry processes that consist of:

- Pumping brine from the aquifers;
- Concentrating the brine through evaporation ponds; and
- Processing the brine through a variety of chemical processes to produce lithium carbonate.

The 2012 process model employed proprietary, state-of-the-art physiochemical estimation methods and process simulation techniques for electrolyte phase equilibrium. This process model was developed and tuned to bench scale results on salar brine that is expected to be representative of the production wells at Cauchari-Olaroz. The model output the mass and energy balances required to develop the key equipment and understand the operating costs.

Since the execution of the JV agreement between LAC and SQM in 2016, SQM has advanced the process engineering work, employing their proprietary technology and operational experience. SQM's work is reflected in the 2017 DFS study. This update uses the same processing information and costing as the 2017 NI 43-101 DFS study.

On 31 October 2018, a series of transactions with SQM, Ganfeng Lithium and LAC transitioned the partnership for the development of the Cauchari-Olaroz lithium project from SQM to Ganfeng Lithium. Ganfeng Lithium is a wold leader in the production of high-grade lithium chemicals for the energy storage industry. Ganfeng Lithium, Minera Exar and Lithium America's teams are optimizing the process for the specific composition of the salar brine.

For the 2017 DFS study, tests were conducted in multiple qualified laboratories and in pilot facilities located at the Project site to further refine the process for the production of lithium carbonate at the site. Testing objectives included:

- Determine the brine composition as the brine is evaporated, determine the type of salts which are formed during the process, the entrainment of brine in the salt, and any seasonal effects on the brine.

- Determine the amount of CaO required to remove SO_4 in the ponding process and avoid excessive lithium losses.

- Test the purification processes in the chemical plant and validate that it can produce high-grade lithium carbonate.

- Further update and refine the process model, the project operating and capital cost.

The main process changes that impact the economics in the 2017 DFS versus the 2012 study are:

1) elimination of potash production, and
2) the addition of a precipitation step to reduce KCl before lithium carbonate production.

The following outlines the testing work completed during the previous 2012 Feasibility Study that is the basis for the revised Technical Report.

13.1 TESTS – UNIVERSIDAD DE ANTOFAGASTA, CHILE

In late 2010 and early 2011, Universidad de Antofagasta (Chile) conducted evaporation testing on raw, CaO-treated and CaC_2-treated brines. The objective of the testing was to understand if $CaCl_2$, when used in addition to CaO, would cost-effectively remove sulfate from the brine during natural evaporation.

A temperature-regulated and air flow-regulated evaporation chamber was used. A photo of one chamber is show in Figure 13.1. The brine is contained in the tubs in the base of the chamber, while heat lamps (shown top left) are used to simulate solar radiation. Dry, cool air is circulated through the chamber using an electric fan to simulate the environment expected at the site. Digital thermometers are shown in the pan. Samples of the brine and salt were taken to determine the change in salt precipitated from the brine during natural evaporation. These samples were analyzed for composition.

Figure 13.1 Evaporation Pans and Lamps

The site is located at more than 4,000 m above sea level. To simulate the effect of lower air pressure, a series of dry air, negative pressure evaporation tests were carried out in parallel with the evaporation pans. The negative pressure test apparatus is shown in Figure 13.2. These tests were done to simulate the effect of brine evaporation at elevation under natural conditions.

Figure 13.2 Dry Air Evaporation Tests

Figure 13.3 Li Concentration Changes in the Brine During the Evaporation Process

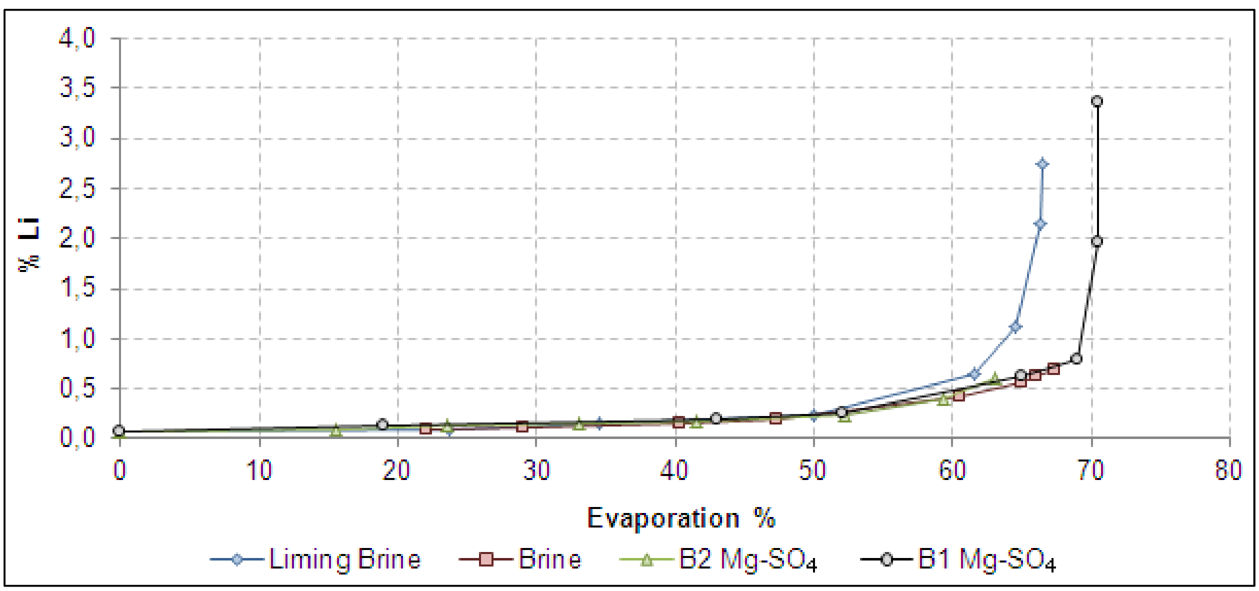


Figure 13.3 shows the change of Li ion concentration in the brine as water is evaporated in an example test. The y-axis is the weight percent lithium, while the x-axis represents the percentage of the initial brine mass evaporated. In brines treated with either CaO and $CaCl_2$ concentrations close to 4% Li were achieved with minimal lithium loss.

Results suggested treatment with CaO alone (i.e. liming) is ideal. CaO has a lower cost than $CaCl_2$, and the increase in brine pH removes the Mg at the same time. Limed brine precipitated Sylvinite with KCl (Potash) concentrations up to 20%. This suggests that fertilizer-grade potash could be produced by floatation at Cauchari (although potash production is not contemplated at this time). The precipitation of KCl and NaCl from solution purifies the brine naturally during evaporation and reduces the cost of operation and equipment in the processing plant after evaporation in the ponds.

Testing of the CaO treated brine resulted in 60% reduction in sulfate ions. This reduction in sulfate ion is sufficient to produce concentrated lithium brines by natural solar evaporation and $CaCl_2$ treatment is not necessary.

13.2 TESTS – MINERA EXAR, CAUCHARI SALAR

13.2.1 Salar de Cauchari Evaporation Pan and Pilot Pond Testing

To validate the bench scale tests obtained at Universidad de Antofagasta, Chile, and obtain brine evaporation rate data at the site, pilot ponds and Class A evaporation pans were installed at the site. These ponds and pans continue in operation to allow correlation of the Class A pan, brine pan and pilot pond test data to determine the scale up factor of the full-scale ponds.

The first seven months of evaporation pan testing at the Salar de Cauchari pilot facility:

- validated the composition of Cauchari brine exposed to the Project site seasonal environmental conditions;
- Obtained concentrated brine for additional pilot and bench scale testing; and
- Obtained precipitated salts to determine the entrainment of brine in the salt during the different salt regimes precipitated during concentration.

A total of 6 pilot ponds totalling 11,180 m^2 were constructed as is the liming equipment for treating the brine. Pre-concentration, liming, settling, and concentration ponds were represented. Over 20,000 liters of 1% Li brine was generated over a 7-month period. These ponds continue to operate and provide material for pilot testing at the site and with equipment vendors. The pilot ponds can be seen in Figure 13.4

These ponds were installed with liners that consist of a geotextile underlay with a polyethylene waterproofing liner on top of the underlay. This minimizes the leakage from the ponds. Samples of the brine and salt are taken regularly and analyzed for composition and brine entrainment in the salt. This validates the process model used for the ponding operation, and allows for the estimation of the shape factor for the full scale ponds.

Pond pilot testing:

- Validated the continuous operation of evaporation ponds;
- Provided data for all seasonal environmental effects (wind, temperature, rain, etc.);
- Provided concentrated brine for the purification pilot plant;
- Developed the operating philosophy of the ponds and lime system; and
- Train the staff (engineers and operators) who will work in the commercial operation.

Salar testing results were consistent with prior laboratory and mathematical model results. The test data has been used to update the mathematical process model and ensure accurate design information. Minera Exar's project site evaporation and analytical results were independently validated by testing at ASA (Mendoza, Argentina).

The pond process showed better performance when liming was performed after pre-evaporation while using more than 10% lime excess. It was verified that the use of $CaCl_2$ was not necessary because the Ca from the CaO reduced sulfate ions sufficiently to avoid downstream $LiKSO_4$ precipitation at a lower operating cost than $CaCl_2$ addition.

Figure 13.4 Current Pilot Ponds

13.2.2 Liming Tests – Minera Exar, Cauchari Salar

Lime ratio, sedimentation, and flocculent performance testing with locally-sourced CaO were performed at Minera Exar's Laboratory. The testing is designed to determine the quantity of CaO needed to remove the sulfate and magnesium ions from solution and estimate the loss of brine during natural settling in the pond system.

Figure 13.5 Sedimentation Rate of Limed Pulps with Different Amounts of Excess Lime

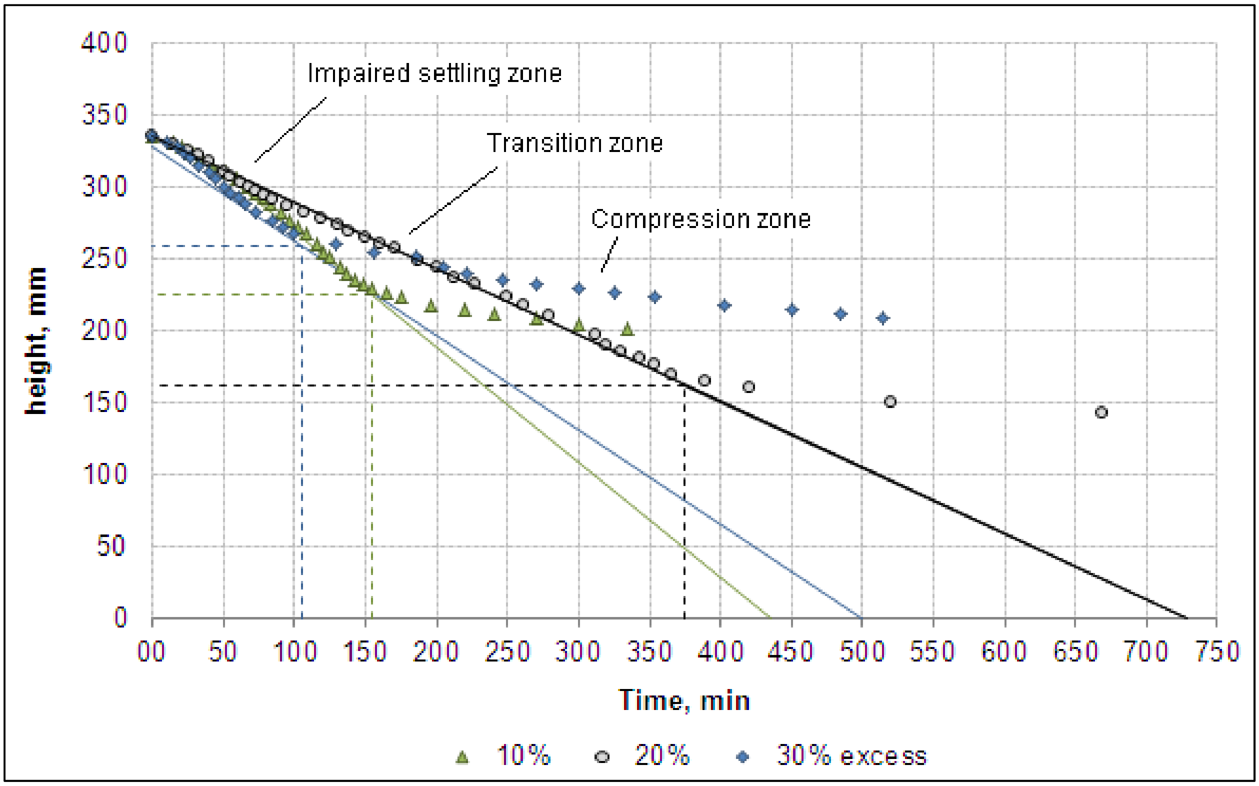


Figure 13.5 shows the sedimentation rate data from example tests. The time is shown on the x-axis, while the y-axis shows the depth of solids during natural settling. Three tests are shown here with a 10% (green triangle), 20% (green circle) and 30% (blue diamond) excess of CaO added to the brine. The excess is estimated based on the mass of sulfate in the initial brine. The solid lines plotted on the diagram is the initial settling rate which is used to design settling equipment.

The lime ratio required to precipitate of 99.6% of Mg ions and 60% of SO_4 ions was utilized for cost estimation.

13.3 SOLVENT EXTRACTION TESTS – SGS MINERALS AND IIT, UNIVERSIDAD DE CONCEPCIÓN

Solvent extraction ("SX") bench tests were performed at SGS Minerals in Lakefield, Canada, and Instituto de Investigaciones Tecnológicas (Technology Investigations Institute) of the Universidad de Concepción (ITT).

This testing determined:

- The most effective organic reagents for the extraction of boron from the brine;
- The pH effect on the extraction of boron;
- Extraction isotherms for extraction and re- extraction required in the project;

- The extraction and re-extraction kinetics in the system;
- The phase separation rate at two temperatures previously defined; and
- The required number of extraction and re-extraction stages.

Typical brine feed to SX is shown in Table 13.1.

TABLE 13.1 **COMPOSITION OF THE BRINE USED FOR TESTING SX**							
Li (g/L)	**B (mg/L)**	**Ca (mg/L)**	**K (g/L)**	**Na (g/L)**	**Mg (mg/L)**	**SO4 (g/L)**	**pH**
10.5	5,565	266	32.3	65.4	< 0.02	26.0	11

Several organic extrant formulations were tested. A mixture capable of 97% boron removal is the subject of a pending LAC patent application.

Tests at both institutions showed that the extraction process should be performed at pH $\leq$ 4, and re-extraction of the extractant should occur at basic pH. The process uses HCl to adjust the brine pH for extraction, and a solution of NaOH for re-extraction of the boron from the organic mixture.

Figure 13.6 and Figure 13.7 show the isotherms in a McCabe-Thiele diagram. These diagrams have been used to determine the number of extraction and re-extraction steps. In Figure 13.6, the x-axis is the boron concentration in the aqueous phase, while the y-axis is the concentration of boron in the organic phase during extraction. In Figure 13.7, the x-axis is the boron concentration in the organic phase, while the y-axis is the boron concentration in the aqueous phase during re-extraction. The bold, straight line is the operating line for the proposed equipment, while the thin, stair-steps are the individual operating stages. Perfect extraction efficiency was not assumed to design the equipment to develop a realistic sizing.

Figure 13.6 Extraction Isotherm at 20 ºC Using Mixed Extractants

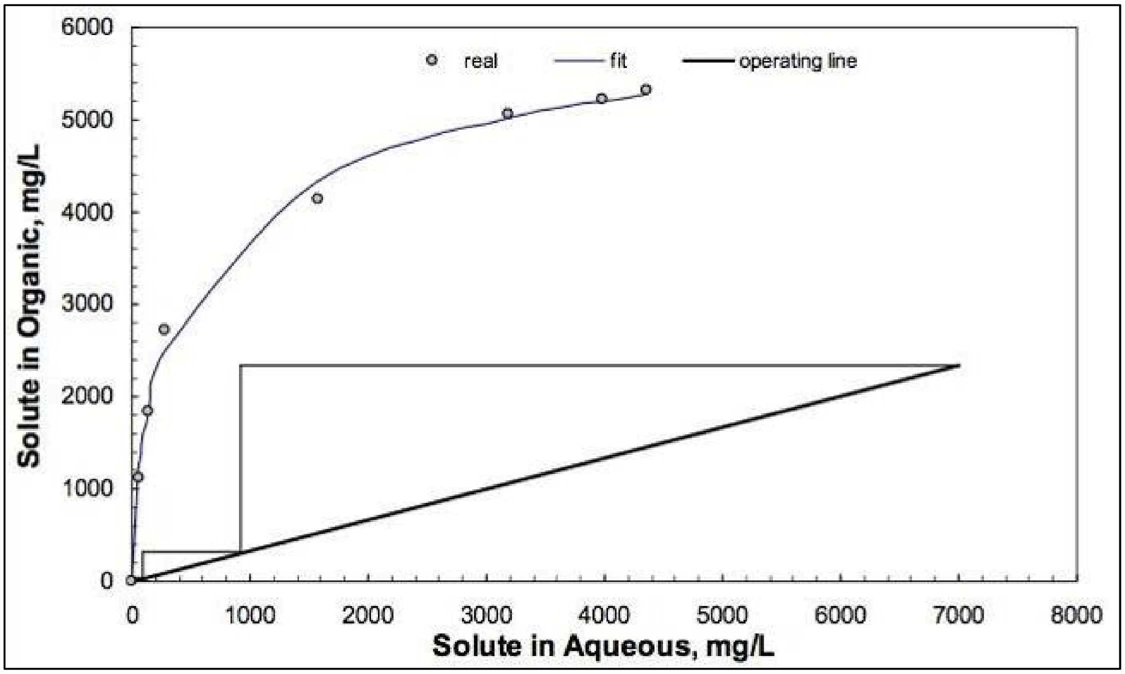
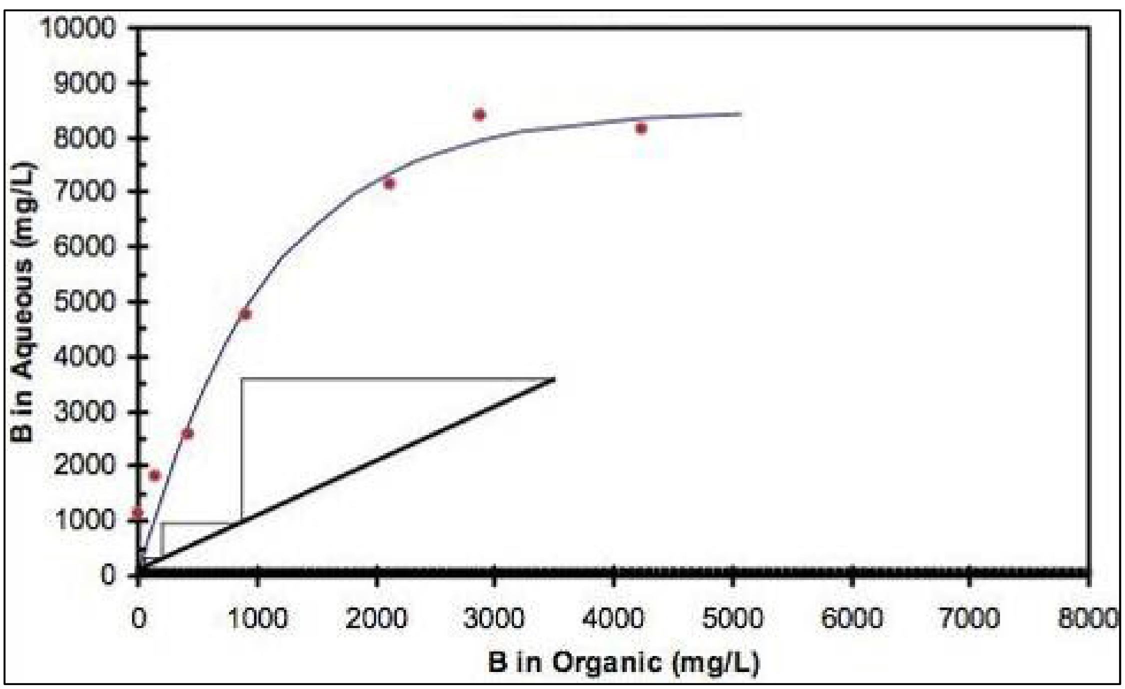


Figure 13.7 Re-extraction Isotherm at 20 ºC Using Mixed Extractants



13.4 CARBONATION TESTS – SGS MINERALS (CANADA)

Carbonation tests were conducted by SGS Minerals on boron-contaminated brine.

The following tests were conducted:

- Removal of remaining Mg using NaOH solution;
- Removal of remaining Ca using a solution of Na_2CO_3; and
- Carbonation reaction of Li using Na_2CO_3 solution to precipitate Li_2CO_3.

Differing reagent dosage, residence time, and temperatures were investigated. NaOH was found to be effective to remove the remaining Mg, and careful control of the Na_2CO_3 solution was required to remove the Ca without loss of Li. The test results of these carbonation tests were used to set the temperature, residence time and dosage of reagent ranges for the pilot plant tests.

13.5 PILOT PURIFICATION TESTING – SGS MINERALS

SGS Minerals piloted removal of contaminants and lithium carbonate production. The pilot program used 10,000 liters of concentrated brine obtained from the Salar de Cauchari pilot pond system. Results were used for plant design in the study. The pilot plant includes solvent extraction for B removal, regeneration of solvent, removal of the Ca and Mg impurities, and lithium carbonate precipitation and washing.

The main objectives of the pilot plant were to:

- Test the continuous process developed from bench testing; and
- Validate and obtain parameters and design criteria for the development of the industrial plant engineering.

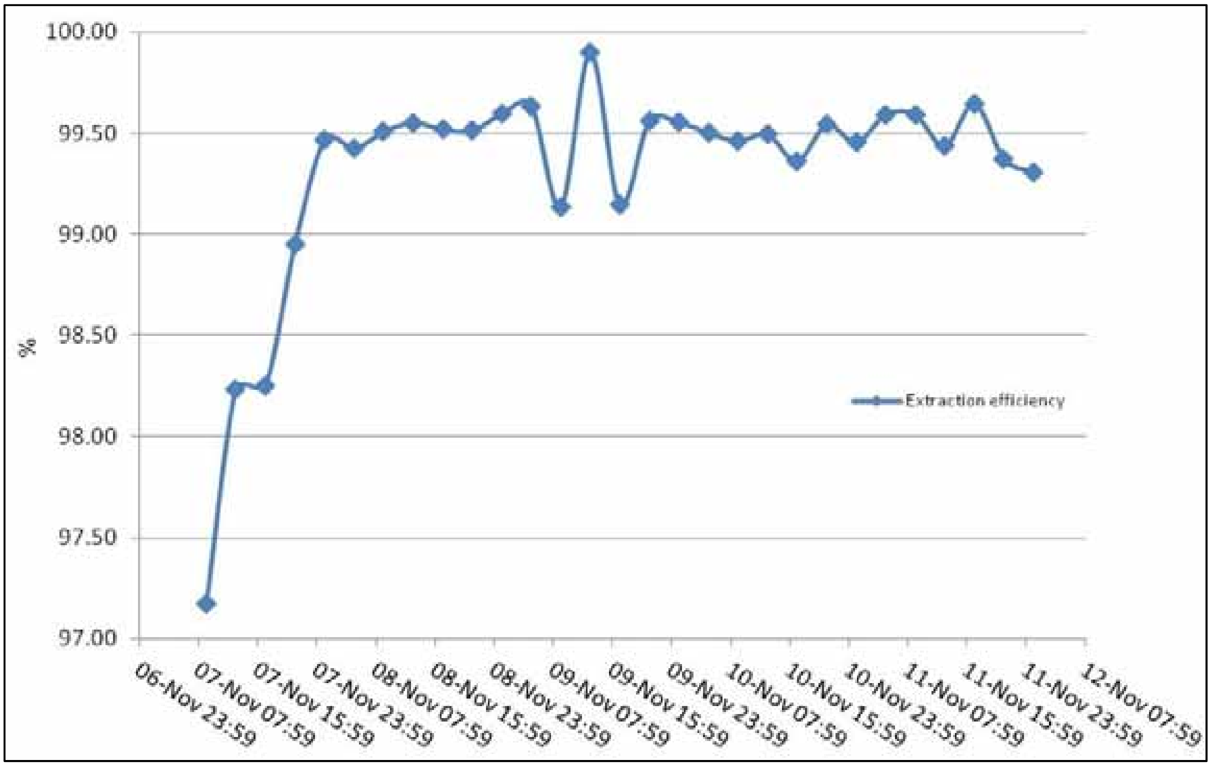
Figure 13.8 shows the equipment for the pilot plant where the first tests were performed. The solvent extraction banks are on the left of the photograph, and the other reactors and filters are shown in the center and right of the image.

Figure 13.8 Pilot Plant (SX-Purification-Carbonation-Filtration-Washing Pulp)

This plant was subsequently installed in the Salar de Cauchari for further testing and training of the operators at site. The pilot plant will provide data for brines of varying compositions from seasonal effects and final lithium concentration. The results of the pilot plant test work will be incorporated to the engineering for the final facility to ensure a robust, reliable operation capable of producing the demanded product quality at the committed rate.

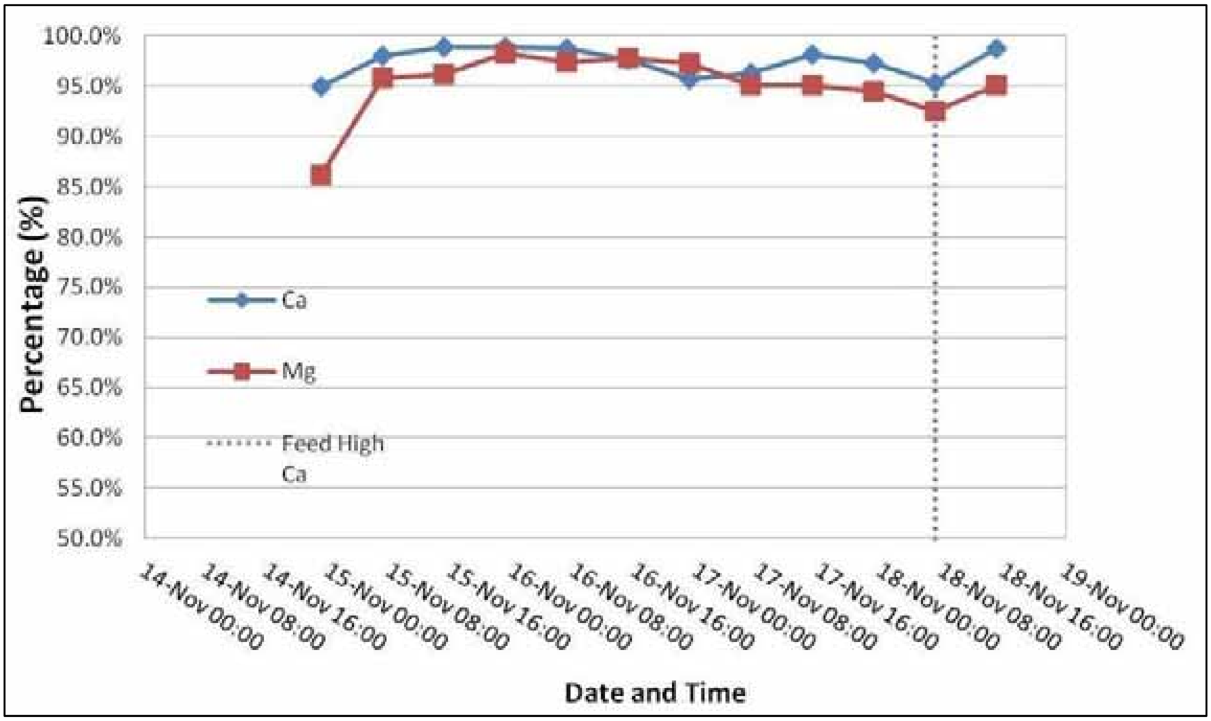
The SX pilot plant achieved an extraction efficiency of over 99.5% as shown in Figure 13.9. The x-axis in figure 13.9 shows the date and time of the run, while the y-axis shows the percent of the boron mass in the feed that was removed during the test. The solvent extraction process was operated for 5 days during this test with no loss of boron removal efficiency.

Figure 13.9 SX Process Boron Extraction Efficiency



Mg and Ca polishing testing succeeded in obtaining over 95% removal efficiency, as shown in Figure 13.10. The x-axis is the date and time, while the y-axis shows the removal efficiency as a percentage of the mass of Ca or Mg in the feed brine. The Ca and Mg precipitation maintains the 95% removal efficiency over 4 days of operation in this test.

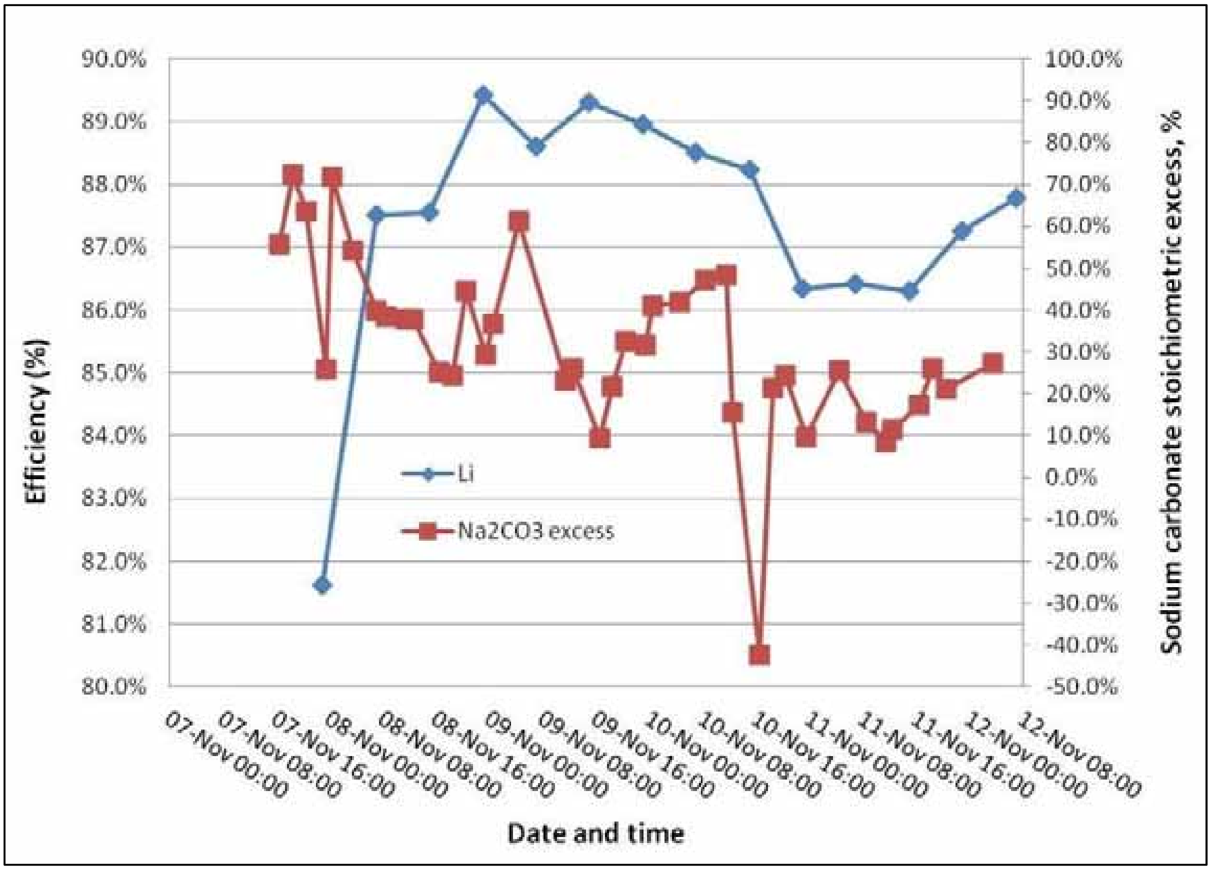
Figure 13.10 Ca and Mg Precipitation Efficiency



13.5.1 Lithium Carbonate Precipitation

Figure 13.11 demonstrates that over 86% recovery of lithium carbonate at acceptable excess-soda ash ratios were obtained. In figure 13.11, the x-axis is the date and time of the test, while the left y-axis shows the percent of lithium mass precipitated during the tests, and the right y-axis shows the excess sodium carbonate being fed to the reactor. During this testing, excess soda ash varied from -40% to 70%. The optimum excess is between 5-20% soda ash based on the lithium.

Figure 13.11 Li Precipitation Efficiency



Washing of lithium carbonate filter cake with soft water resulted in sufficient product purity for the intended markets and use.

Control of lithium carbonate crystal habit and particle size via precipitation reaction parameters was effective in minimizing impurities. The lithium carbonate was then dried and packaged. A sample of dried lithium carbonate was shipped to the United States for micronization testing.

14.0 MINERAL RESOURCE ESTIMATES

14.1 OVERVIEW

Minera Exar, operating as a subsidiary of a joint venture between LAC and GFL, commissioned Montgomery to update the lithium brine Mineral Resource Estimate for the Cauchari-Olaroz lithium brine project, Jujuy Province, Argentina. The following updated Mineral Resource Estimate has an effective date of February 13, 2019, and represents a Measured, Indicated and Inferred Mineral Resource for lithium. The Project area consists of parts of Salar de Olaroz ("SdO") basin in the north and Salar de Cauchari ("SdC") basin in the south. Figure 14.1 shows the Project area highlighting properties controlled by Minera Exar, the extents of the defining the updated Measured, Indicated, and Inferred Mineral Resource Estimate ("Resource Evaluation Area"), and the watershed boundary of the basin.

LAC has previously filed the following NI 43-101 technical reports on the Project providing prior Mineral Resource Estimates for lithium.

- King, M., 2010a. Amended Inferred Resource Estimation of Lithium and Potassium at the Cauchari and Olaroz Salars, Jujuy Province, Argentina. Report prepared for Lithium Americas Corp. Effective Date: February 15, 2010.

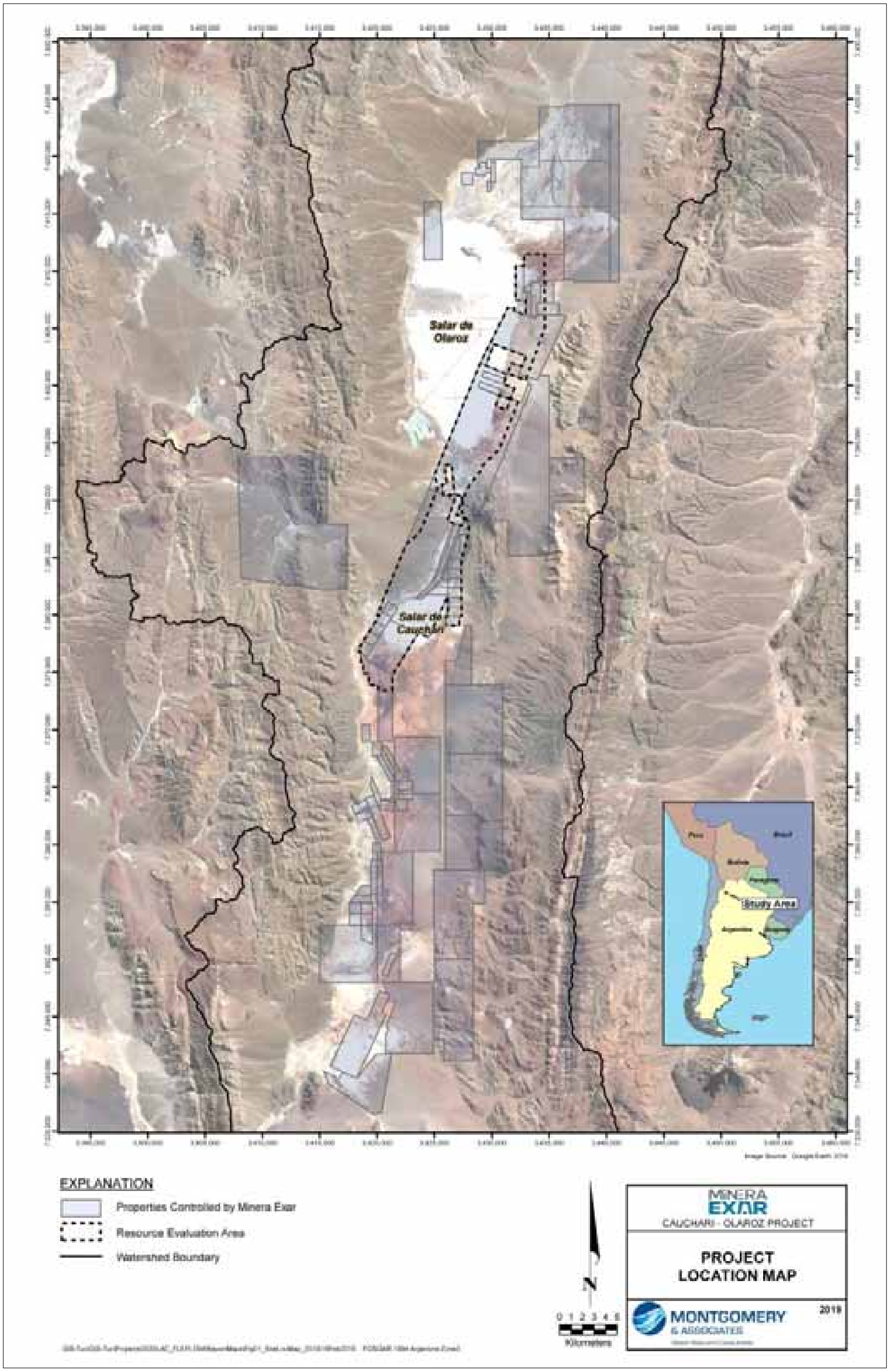
- King, M., 2010b. Measured, Indicated and Inferred Resource Estimation of Lithium and Potassium at the Cauchari and Olaroz Salars, Jujuy Province, Argentina. Report prepared for Lithium Americas Corp. Effective Date: December 6, 2010.

- King, M., Kelley, R., and Abbey, D., 2012. Feasibility Study Reserve Estimation and Lithium Carbonate and Potash Production at the Cauchari-Olaroz Salars, Jujuy Province, Argentina. Report prepared for Lithium Americas Corp. Effective Date: July 11, 2012.

- Burga, E., Burga, D., Rosko, M., King, M., Abbey, D., Sanford, T., Smee, B., and Leblanc, R., 2017. Updated Feasibility Study Reserve Estimation and Lithium Carbonate Production at the Cauchari-Olaroz Salars, Jujuy Province, Argentina. Report prepared for Lithium Americas Corp. Effective Date: March 29, 2017. Filing Date, January 15, 2018.

For purposes of this section, the prior Resource Estimate provided in King and others (2012) and subsequently included again in Burga et al. (2017) are referred to as LAC (2012) and LAC (2017), respectively. The updated Mineral Resource estimate incorporates: 1) samples and interpretations used from the prior LAC (2012) Mineral Resource Estimate for lithium, and 2) an expanded Project database compiled from results of 2017 through 2018 exploration drilling and sampling campaigns and additional depth-specific sampling in early 2019 as part of data verification.

Figure 14.1 Location Map for Updated Mineral Resource Estimate



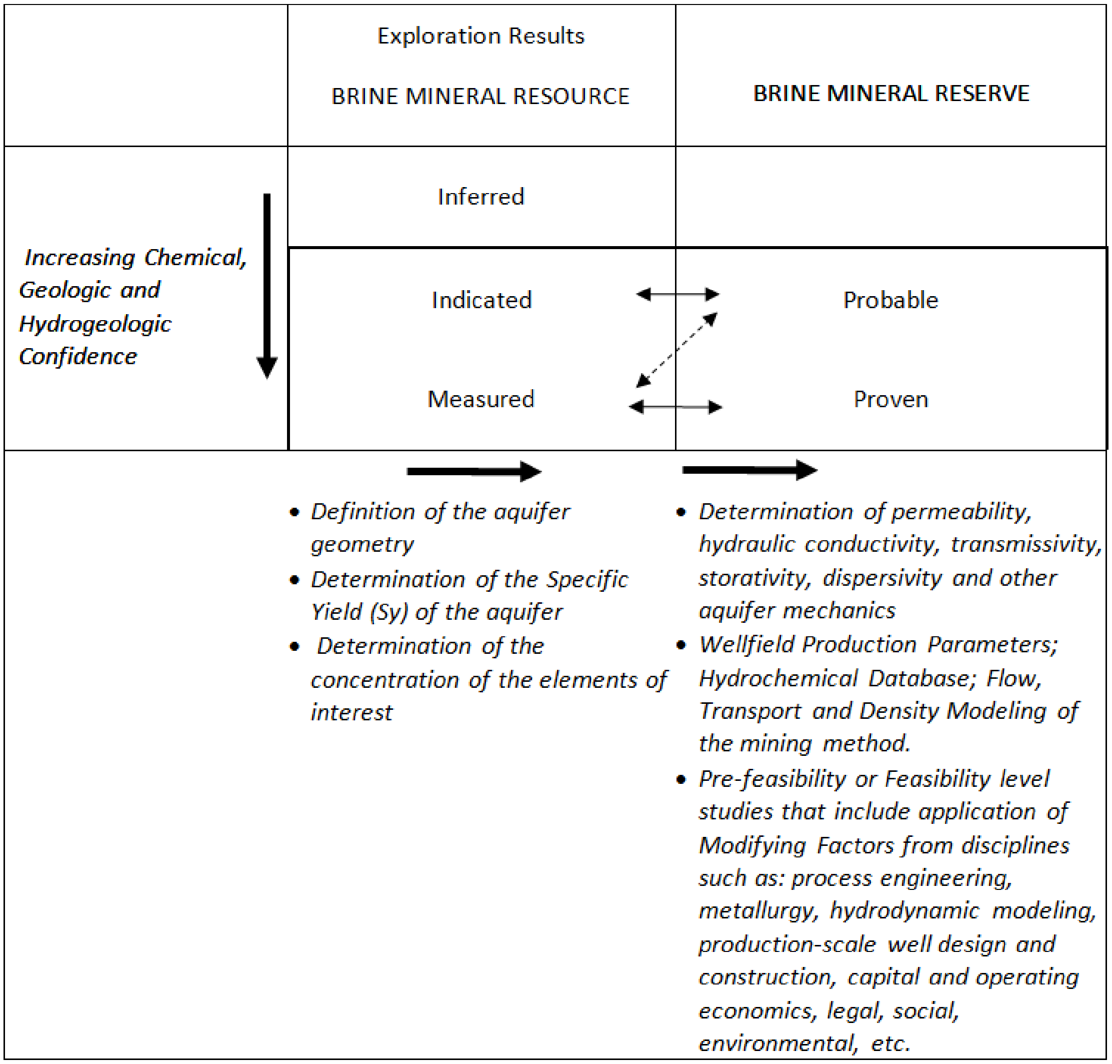
14.1.1 Statement for Brine Mineral Prospects and Related Terms

Lithium occurs as a dissolved mineral species in subsurface brine of the Project area. The brine is contained within an aquifer comprised of alluvial, lacustrine, and evaporite deposits that have accumulated in the SdC and SdO structural basin. Mineral Resource estimation for brine mineral deposits is based on knowledge of the geometry of the brine aquifer, the variation in specific yield (the yield of drainable fluid obtained under gravity flow conditions from the interconnected pore volume and also referred to as drainable porosity), and concentration or grade of dissolved mineral species such as lithium in the brine aquifer.

Following CIM standards and guidelines for technical reporting, classification standards for a Mineral Resource are applied as indicators of confidence level categories: Measured, Indicated, and Inferred. According to these standards, "Measured" is the most confident category and Inferred is the least confident (CIM, 2012 and 2014). To estimate the Mineral Reserve, in addition to economic, process, and other potentially modifying aspects, further information is necessary for permeability (hydraulic conductivity), transmissivity, storativity, diffusivity and the overall groundwater flow regime in order to predict how the resource will change over the life of mine plan (CIM, 2012 and 2014). The evaluation framework used by Montgomery for brine Mineral Resource and Mineral Reserve estimation, based on CIM standards and best practice guidelines, is shown in Figure 14.2.

As a liquid mineral deposit, a Mineral Resource Estimate for lithium occurring as a dissolved mineral species in a brine aquifer is determined by quantifying the brine volume and associated mass able to drain by gravity effects. The Mineral Resource Estimate is computed as the product of the estimated resource area and resource thickness or aquifer volume, lithium concentration dissolved in the brine (grade), and specific yield of the resource. The brine Mineral Resource Estimate, sometimes referred to as the static or in situ model of the brine aquifer, can be advanced to a Mineral Reserve Estimate by projecting the producing capacity of the proposed operating facilities and site-wide lithium grade to be extracted from the aquifer volume comprising the Mineral Resource Estimate. The brine Mineral Reserve Estimate, sometimes referred to as the dynamic model of the brine aquifer, involves flow, transport and density numerical modeling for simulating an extraction wellfield using production-scale wells as the mining method of the Project.

Figure 14.2 Methodology for Evaluating Brine Mineral Resources and Mineral Reserves[a]



a — based on CIM (2012 and 2014)

14.2 DEFINITION OF RESOURCE-BEARING FORMATIONS

14.2.1 Geology

Based on reporting in LAC (2012 and 2017), there are two dominant structural features in the region of SdO and SdC: north-south trending high-angle normal faults and northwest-southeast trending lineaments. The high-angle north-south trending faults form narrow and deep horst-and-graben basins, which are accumulation sites for numerous salars in the region, including Olaroz and Cauchari. Basement rock in this area is composed of Lower Ordovician turbidites (shale and sandstone) that are intruded by Late Ordovician granitic rocks. Bedrock is exposed to the east, west and south of SdO and SdC, and generally along the eastern boundary of the Puna Region of Argentina.

The salars are in-filled with flat-lying sedimentary and evaporite deposits, including the following five primary informal lithological units that have been identified in drill cores:

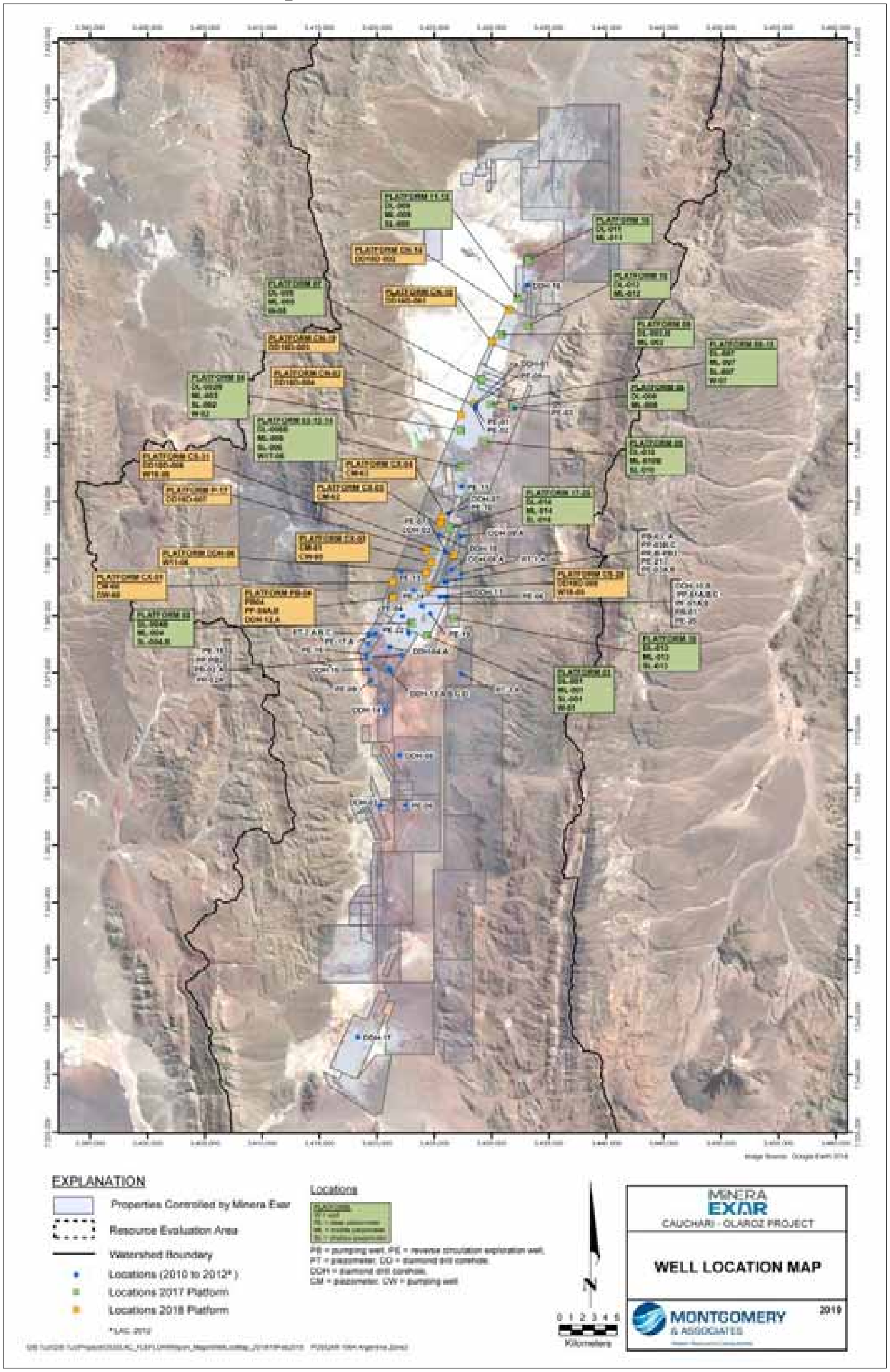
- Red silts with minor clay and sand;
- Banded halite beds with clay, silt and minor sand;
- Fine sands with minor silt and salt beds;
- Massive halite and banded halite beds with minor sand; and
- Medium and fine sands.

Alluvial deposits intrude into these salar deposits to varying degrees, depending on location. The alluvium surfaces slope into the salar from outside the basin perimeter. Raised bedrock exposures occur outside the salar basin. The most extensive intrusion of alluvium into the basin is the Archibarca alluvial fan system, which partially separates SdO and SdC on the western boundary. In addition to this significant alluvial fan deposit, much of the perimeter zone of both salars exhibits encroachments of alluvial material associated with alluvial fan systems of varying degree (Figure 14.1).

14.2.2 Drilling and Sampling

Exploration drilling and sampling programs conducted between 2009 and 2011 evaluated the lithium development potential of the Project area and supported the prior 2012 Mineral Resource Estimate (LAC 2012 and 2017). A map showing exploration wells and boreholes used to evaluate the prior resource estimate and the updated resource estimate is shown on Figure 14.3.

Figure 14.3 Well Location Map



For the 2017 and 2018 exploration programs, Minera Exar provided the following additional drilling and sampling information of the Project area for analysis of the updated Mineral Resource Estimate:

- **Reverse Circulation (RC) Borehole Program:** Reverse circulation drilling was conducted to develop vertical profiles providing geological and hydrogeological information. The program included installation of 27 boreholes: 19 boreholes completed as shallow wells and eight boreholes completed as deep wells. The program included description of rotary drill cuttings samples, pumping tests, and collection of 90 depth-specific brine samples collected using bailer methods at 15 well locations.

- **Diamond Drilling (DD and DDH) Borehole Program:** This program was conducted to collect continuous cores for lithologic description, geotechnical testing (total porosity, grain size and density) and brine sampling. The program included 19 boreholes often with multiple screened-interval completions and collection of 195 depth-specific brine samples using bailer methods.

- **Additional Depth Specific Brine Sampling Program:** Samples totaling 71 depth-specific bailer samples were collected in 2017 and 2018 at 14 RC and DDH locations drilled between 2009 and 2011. With the 2017 and 2018 depth specific samples, six additional depth-specific bailer samples were collected and incorporated into the data set in February 2019 as confirmatory samples.

14.3 MINERAL RESOURCE ESTIMATE METHODOLOGY

14.3.1 Background

The development of the prior Mineral Resource Estimate reported in LAC (2012) used Leapfrog Hydro modeling software; volume and mass calculations for the Resource Evaluation Area were developed using GIS software. The Resource Evaluation Area was defined as Measured or Indicated based on the continuity demonstrated by exploration drilling and sampling data. The regions of the prior 2012 Measured and Indicated Mineral Resource Estimate are shown on Figure 14.4 for slice depth of 150 m and include a section through SdC. According to LAC (2012), the methodology for defining the Measured and Indicated categories were as follows:

- **Indicated Mineral Resource:** The lateral extent of the Indicated Mineral Resource is defined by whichever of the following is less laterally extensive: (1) the LAC claim boundary, (2) the location of the lithium iso-surface for the cut-off grade, or (3) a smoothed 1.5 km buffer around the exploration data points. The base of the zone is defined by the shallowest of the following: (1) the deepest chemistry sample in an exploration well in a 5 km search radius, or (2) the interpreted surface of the basement rock underlying the salar sediments.

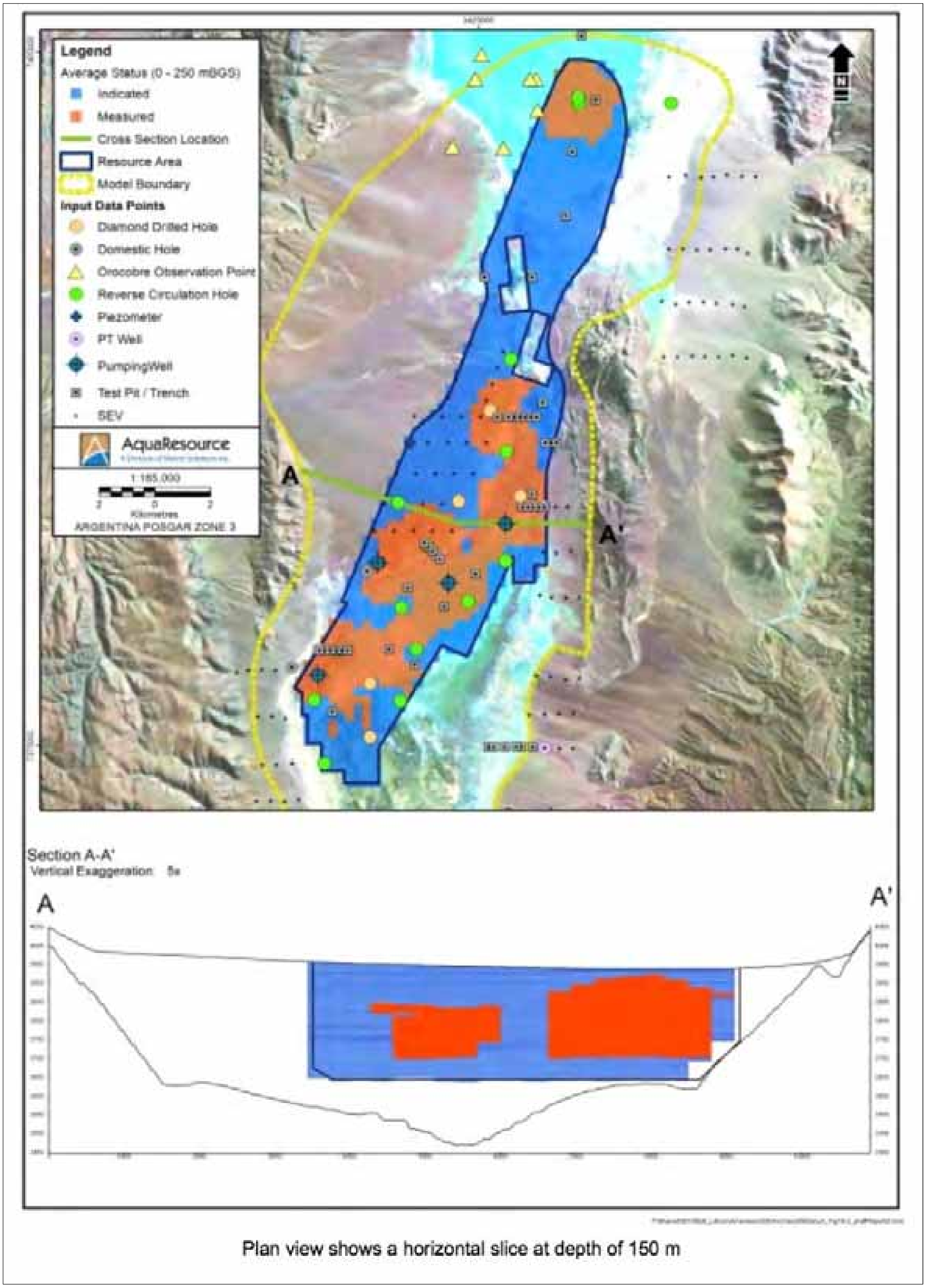
- **Measured Mineral Resource:** the Measured Mineral Resource is defined if there is: (1) at least one measurement of grade within 30 m vertically and 1,250 m horizontally, and (2) adequate knowledge of grade continuity, as defined by the presence of at least four independent locations of grade measurement at any depth within a 1,500 m search radius.

The 2012 Mineral Resource Estimate was calculated relative to a lithium concentration of 354 mg/L cut-off grade. Reportedly, this value was identified as a processing engineering constraint for the 2012 Mineral Reserve Estimate. Results for the prior 2012 Mineral Resource Estimate are given in Table 14.1.

The development of the updated Mineral Resource Estimate was conducted as a collaborative effort between Montgomery and the Minera Exar project team starting in September 2018. Verification of 2017 and 2018 core logging and description methods were conducted on-site at the Project during the period September 8 and 9, 2018 by Montgomery QPs: Michael Rosko and Daniel Weber. The on-site field visit to the Project area was led by Minera Exar representative M. Casini and associated field hydrogeologists from Minera Exar. Results of 2017 and 2018 exploration drilling and sampling were provided to Montgomery in digital format in the software platform Strater (v.5, Golden Software) and Microsoft Excel spreadsheets. These data were subsequently compiled in a database using Microsoft Access to update the hydrostratigraphic framework.

The updated Mineral Resource Estimate incorporates: (1) samples and analytics used from the previous 2012 Mineral Resource Estimate, and (2) an expanded Project database compiled from results of 2017 and 2018 exploration drilling and sampling campaigns, and recent depth specific brine sampling in early 2019 for data verification. Sample verification and sample QA/QC was conducted by an independent QP in coordination with the Minera Exar team. To obtain the updated Mineral Resource Estimate, the previous models and expanded database were analyzed and processed by Montgomery using Leapfrog Geo 4.4 and Leapfrog EDGE geologic modeling and resource estimation software (Seequent, 2018).

Figure 14.4 Plan and Section Views of the 2012 Measured and Indicated Mineral Resource Estimate



Source: *LAC (2012)*

TABLE 14.1 SUMMARY OF 2012 LITHIUM MINERAL RESOURCE ESTIMATE (LAC, 2012)				
Description	**Average Lithium Concentration (mg/L) [a]**	**Mass Cumulated (Li Cut-off Grade 354 mg/L)**		**Brine Volume (m^3) [b]**
		Lithium (tonne)	**LCE (tonne)**	
2012 Measured Resource	630	576,000	3,039,000	9.14×10^8
2012 Indicated Resource	570	1,650,000	8,713,000	2.89×10^9
Total	**585**	**2,226,000**	**11,752,000**	**3.81×10^9**

(a) mg/L = milligrams per liter
(b) m^3 = cubic meter
Notes:
1. *The 2012 Mineral Resource Estimate is expressed relative to a lithium grade cut-off of ≥ 354 mg/L, which was identified as a brine processing constraint by LAC engineers (LAC, 2012).*
2. *Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resource will be converted to Mineral Reserves.*
3. *Lithium carbonate equivalent ("LCE") is calculated based the following conversion factor: Mass of LCE = 5.322785 multiplied by the mass of lithium metal.*
4. *The values in the columns on Lithium Metal and Lithium Carbonate Equivalent above are expressed as total contained metals within the relevant cut-off grade.*
5. *Calculated brine volume includes Measured and Indicated Mineral Resource volumes above and below cut-off grade.*

14.3.2 Hydrostratigraphic Framework

A generalized hydrostratigraphic framework of the hydrostratigraphic model developed for the 2012 Mineral Resource Estimate is presented in Figure 14.5. The framework is comprised of five primary units distributed across 24 layers representing a multi-layered, brine aquifer system. The primary units are based on the lithologic interpretation of core and rotary drill-cutting samples from boreholes, geophysical surveys, results of hydraulic testing at the site, as well as consideration of the interpreted in-filling history of the salar basin.

Interpretation of the 24 layers includes the following descriptive comments (LAC 2012):

- Laterally, not all units exist at all locations, as they may pinch out laterally between sections and boreholes.
- Characterization was extended to the margins of the salar basin at a minimum thickness of 0.1 m to facilitate numerical modeling of groundwater flow regimes across natural flow boundaries.
- Hydraulic properties were assigned to zones of inferred sedimentary homogeneity in each hydrostratigraphic unit, as interpreted from pumping tests.

- The recent coarse-grained alluvial fan deposits and finer-grained mud, salted mud, and lesser sand and salt (halite) tend to be the units that occur at the surface, and in the near surface zone.

- A mud complex consisting of silt and clay with sandy lenses and discontinuous sand beds is persistent in the subsurface under recent salar sediments.

- The mud complex is separated from an underlying salt complex by a discontinuous unit of sand with minor mud and salt content.

- Alternating units of salt (halite) and sand/mud characterize the salt complex.

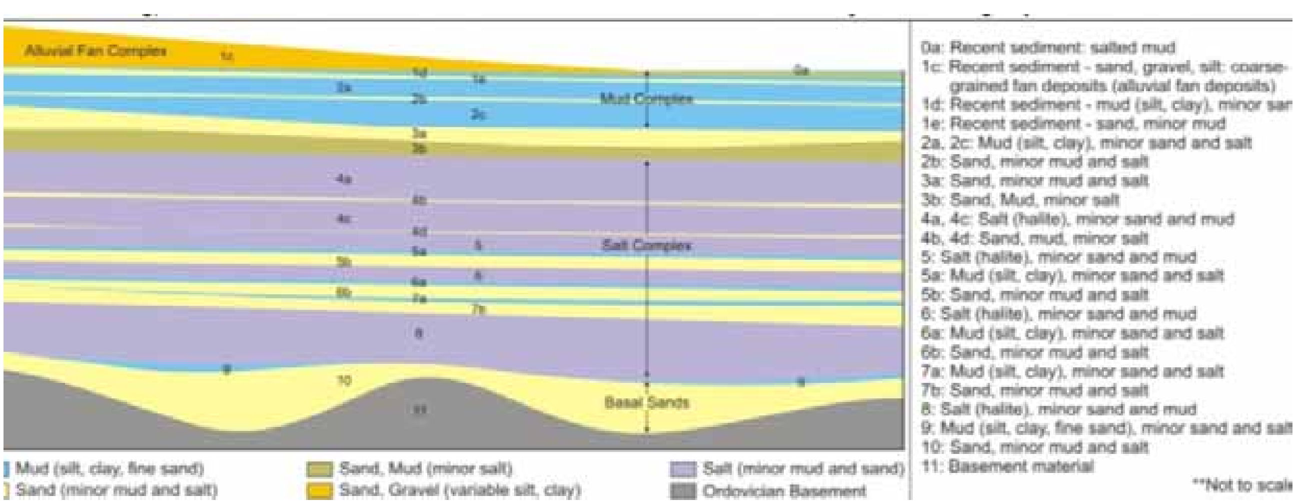
- A laterally discontinuous mud body is interpreted to overlie a basal sand deposit.

- The basal sand is interpreted to be persistent across most of the model.

- Geophysical data help to define a series of horst and graben structures bounded by normal faults that control the basin-filling history, and in turn control the position of the salt hardpan surfaces.

- The broad graben basin is interpreted to have an asymmetric shape; the eastern border normal fault is interpreted to have a greater component of dip-slip than the western fault. Consequently, the basin is deeper in the center and the east.

Figure 14.5 Generalized Framework for Hydrostratigraphic Model Used for the 2012 Mineral Resource Estimate



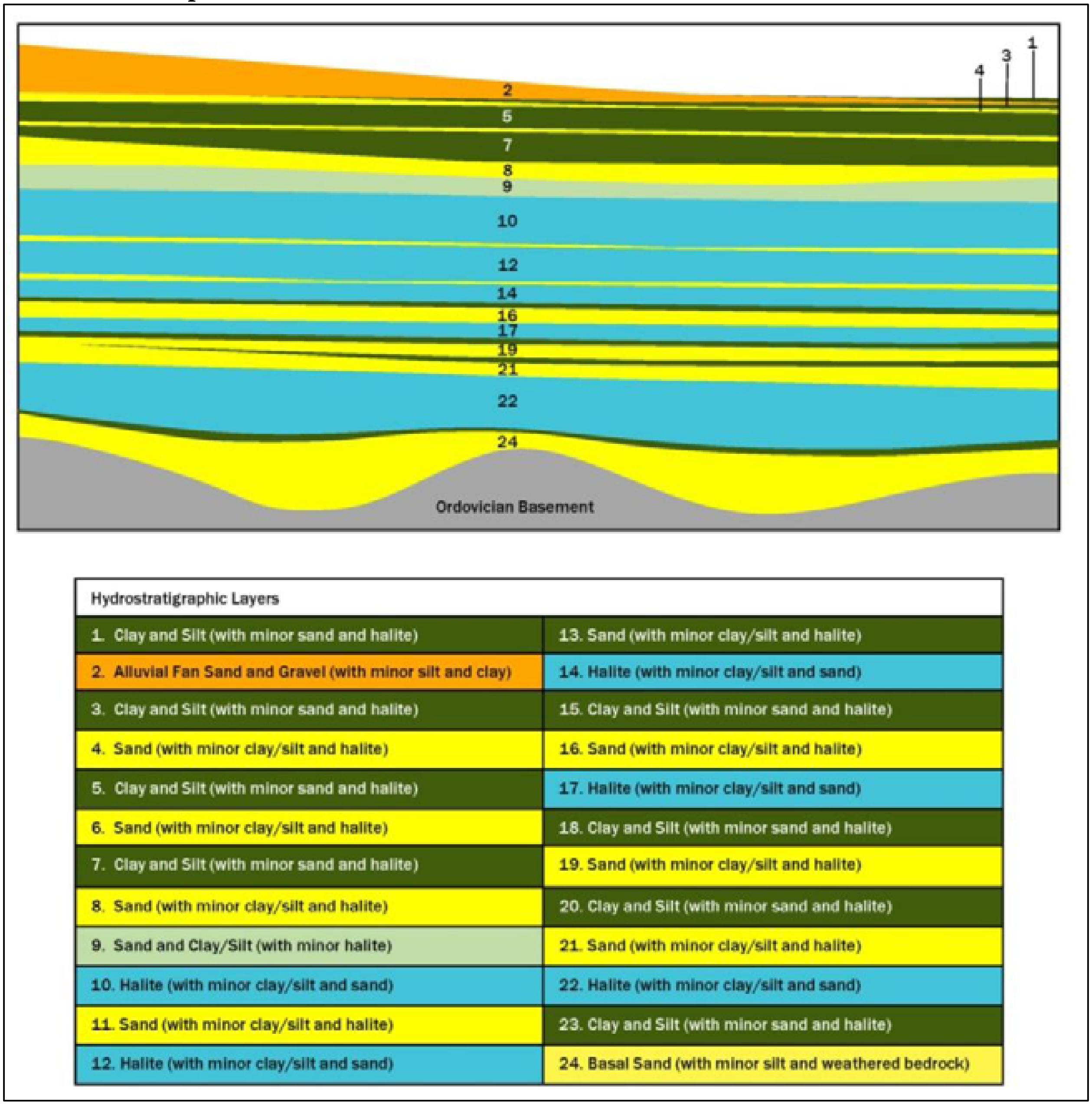
Source: *LAC (2012)*

As part of data processing for the updated Mineral Resource Estimate, Montgomery used the 24-layer model represented in the 2012 FEFLOW model to integrate and update the hydrostratigraphic nomenclature according to additional lithologic data collected during the 2017 and 2018 exploration drilling and sampling campaigns. The updated Mineral Resource Estimate uses six hydrostratigraphic units distributed across 24 layers representing a multi-layered, brine aquifer system. Table 14.2 shows the comparison of hydrostratigraphic interpretation and nomenclature used in the prior 2012 Mineral Resource Estimate versus the updated Mineral Resource Estimate. Figure 14.6 shows the updated hydrostratigraphic nomenclature and adjusted color scheme to correlate with colors in Minera Exar lithologic logs.

TABLE 14.2
SUMMARY OF HYDROSTRATIGRAPHIC UNITS ASSIGNED IN 2012 AND UPDATED MINERAL RESOURCE ESTIMATES

2012 Lithostratigraphic Unit a	2012 Stratigraphic Group a	2012 Resource Estimate Hydrostratigraphic Unit a	Updated Resource Estimate Hydrostratigraphic Unit
Recent sediments	Alluvial Fan Complex	Sand	Alluvial Fan Sand and Gravel (with minor silt and clay)
Recent Sediments; Unit 1: Red silts with minor clay and sand; Unit 2: Banded halite beds with clay, silt, and minor sand	Mud Complex	Mud (Clay and Silt Mix)	Clay and Silt (with minor sand and halite)
Unit 3: Fine sands with minor silt and salt beds	Sand layer between mud and salt complex	Sand	Sand (with minor clay/silt and halite)
Unit 3: Fine sands with minor silt and salt beds	Sand/mud layer between mud and salt complex	Sand Mix	Sand and Clay/Silt (with minor halite)
Unit 4: Massive halite and banded halite beds with minor sand	Salt Complex	Halite	Halite (with minor clay/silt and sand)
Unit 5: Medium and fine sands	Basal Sands	Sand	Basal Sand (with minor silt and weathered bedrock)
(a) source: LAC (2017)			

Figure 14.6 Generalized Framework for the Hydrostratigraphic Model Used for the Updated Mineral Resource Estimate



14.3.3 Hydrostratigraphic Model

The 2012 hydrostratigraphic model representing the prior Resource Evaluation Area of the Project involves a complex layering scheme. In order to assess the reliance of this framework for the updated Mineral Resource Estimate method, the 2012 hydrostratigraphic model was analyzed in Leapfrog Geo using the 2012 FEFLOW layers used for modeling the 2012 Mineral Reserve Estimate. To illustrate the results, sections A-A’ and B-B’, located on Figure 14.7, are provided from the hydrostratigraphic models representing the prior and updated hydrostratigraphic model analysis, Figure 14.8 and Figure 14.9 respectively. Results show the reported 2012 hydrostratigraphic model Section A-A’ shown on Figure 14.8 compares well to the same section location of the 2012 model using the FEFLOW layers as processed in Leapfrog Geo and shown on Figure 14.9.

After similar verification methods of the 2012 hydrostratigraphic model, its 3D extents were expanded using the updated database of drilling and sampling results from the 2017 and 2018 exploration campaigns provided by Minera Exar to Montgomery. Additionally, publicly available results were used as off-property control points of the Resource Evaluation Area in SdO and SdC (Orocobre Limited, 2011 and Advantage Lithium, 2018). The 2017 and 2018 exploration campaigns included several wells in SdO to expand the model in the north and wells drilled to greater depths in both SdC and SdO to better characterize the deep salar sediments. The updated hydrostratigraphic model boundary is delineated in SdC using the prior model boundary and in SdO by either the mapped salar sediments or the Minera Exar property boundary, whichever has the greatest lateral extent. Several of the wells extended deeper than the previous 2012 basement contact resulting in the basement contact to be deepened along the eastern part of the basin. The section shown on Figure 14.10 representing the updated hydrostratigraphic model, also evaluated to Section A-A’ for comparison to the 2012 model (Figure 14.8), illustrates the deepened basement contact on the east side of the basin.

The complexity of the hydrostratigraphic layers and differences between SdC and SdO basins are shown on the SW-NE Section B-B’ in Figure 14.11, which bisects the basin and extends further NE beyond the prior 2012 model domain (Figure 14.7). Hydrostratigraphic units in SdC to the southwest are generally more varied and coarse-grained compared to SdO in the northeast which shows more halite with minor clay/silt and sand lenses. Although the 24-layer hydrostratigraphic framework was used to expand the model further NE into SdO, the section shows the complexity of translating this layering strategy outside of the original modeled area which relied on prior exploration in SdC.

Figure 14.7 Location Map of Representative Hydrostratigraphic Sections

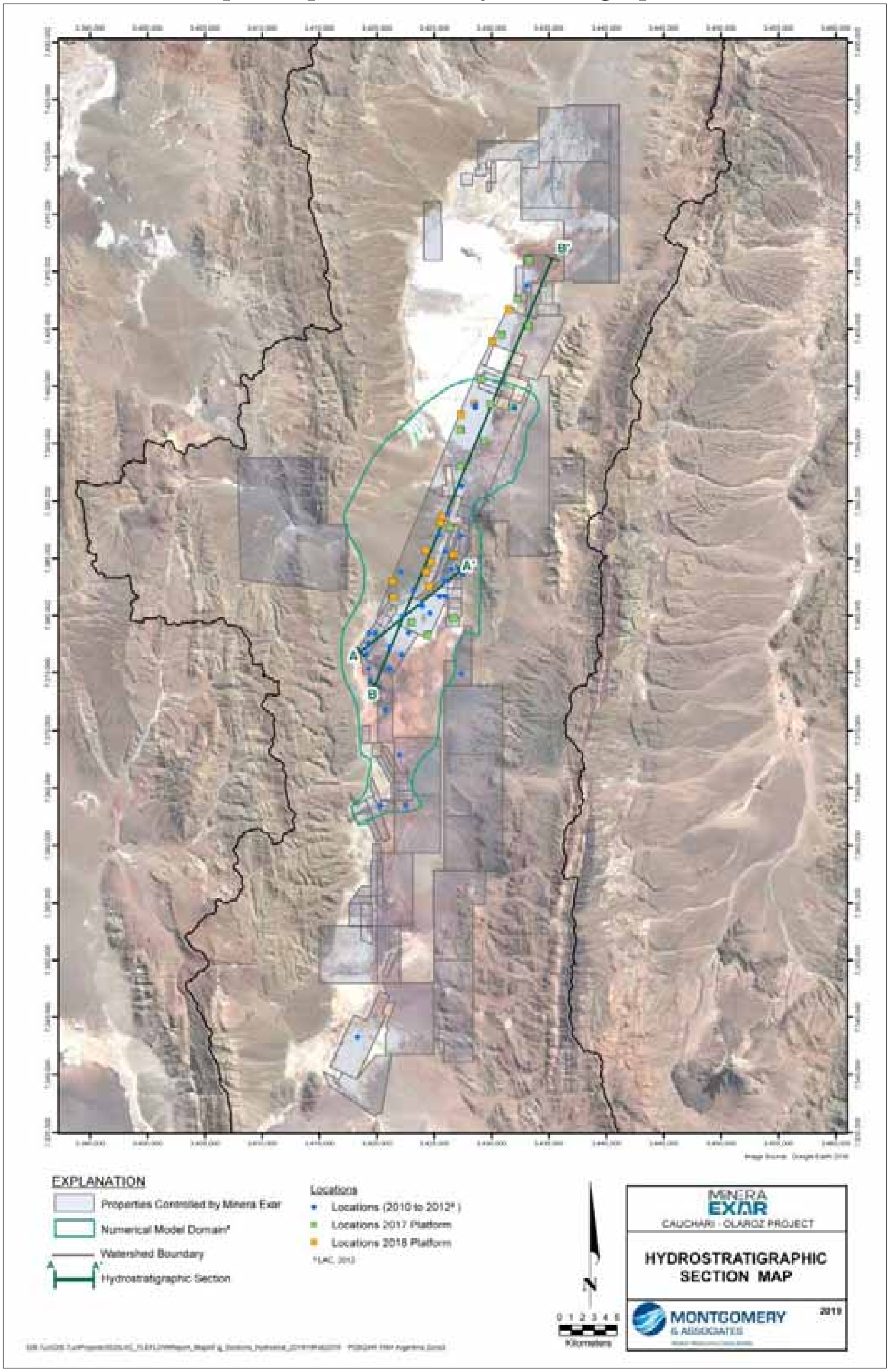
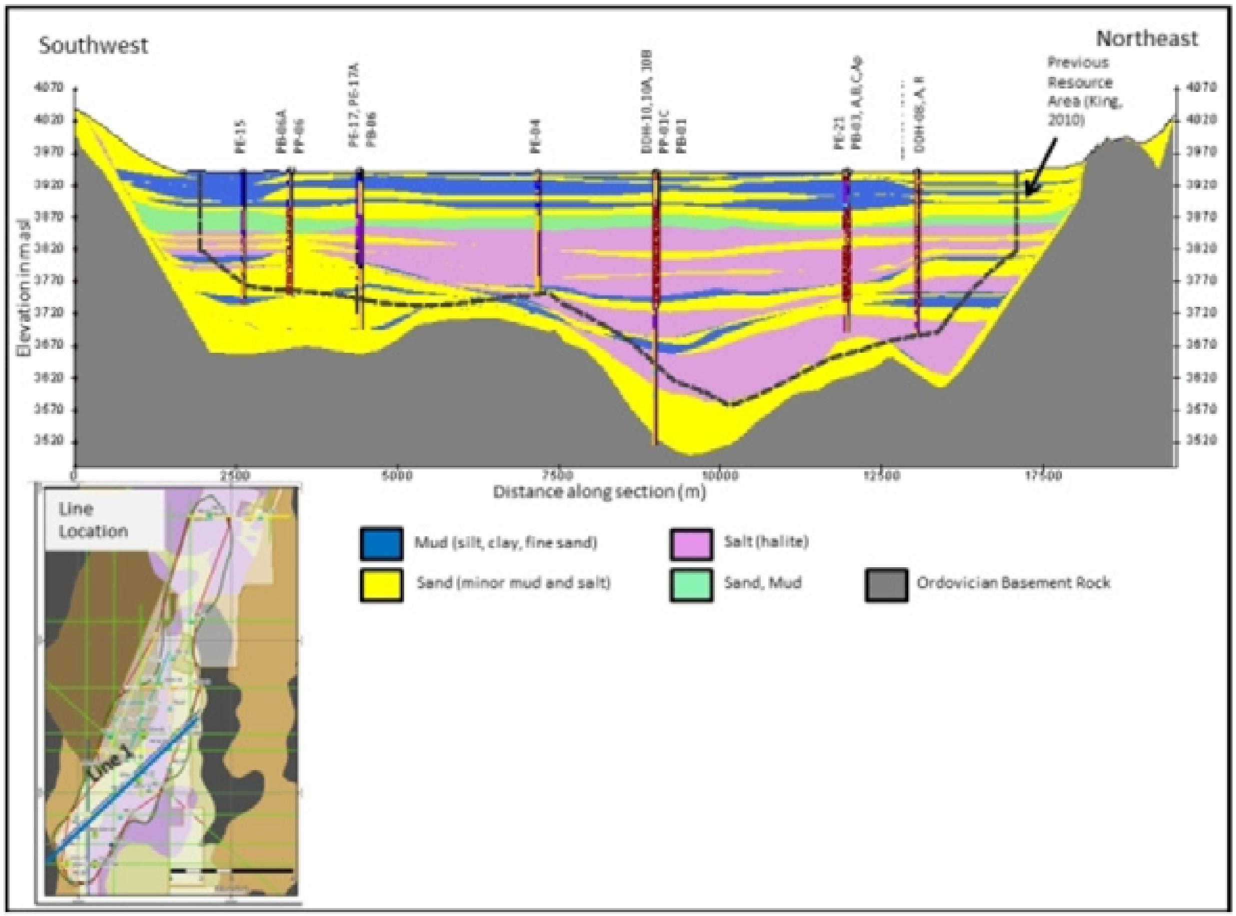


Figure 14.8 Section A-A' of the Hydrostratigraphic Model Used for the 2012 Mineral Resource Estimate



Source: *LAC (2012)*

Figure 14.9 Section A-A' of the Hydrostratigraphic Model Used for the 2012 Mineral Resource Estimate Processed in Leapfrog Geo

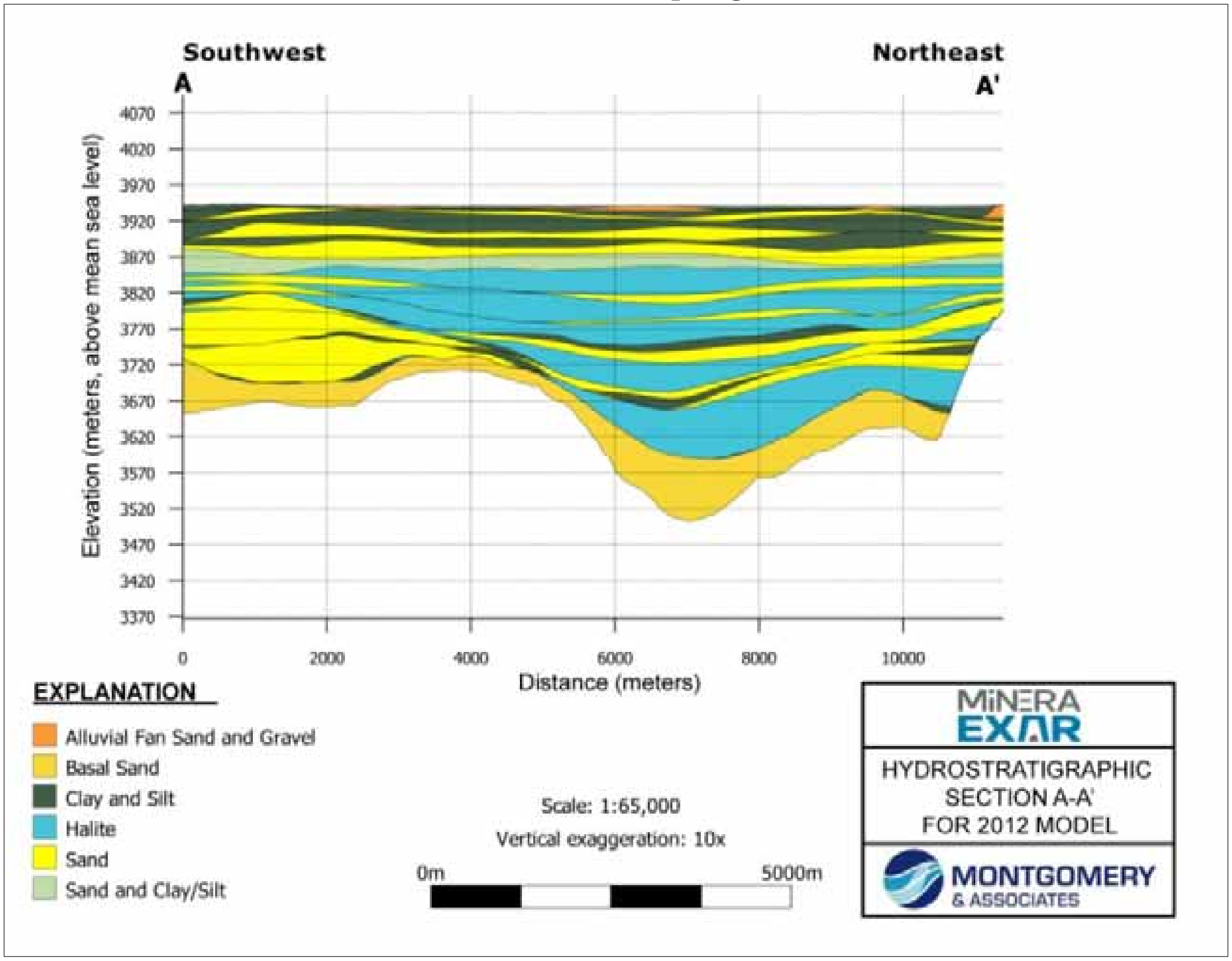


Figure 14.10 Section A-A' of the Updated Hydrostratigraphic Model Used for the Updated Mineral Resource Estimate

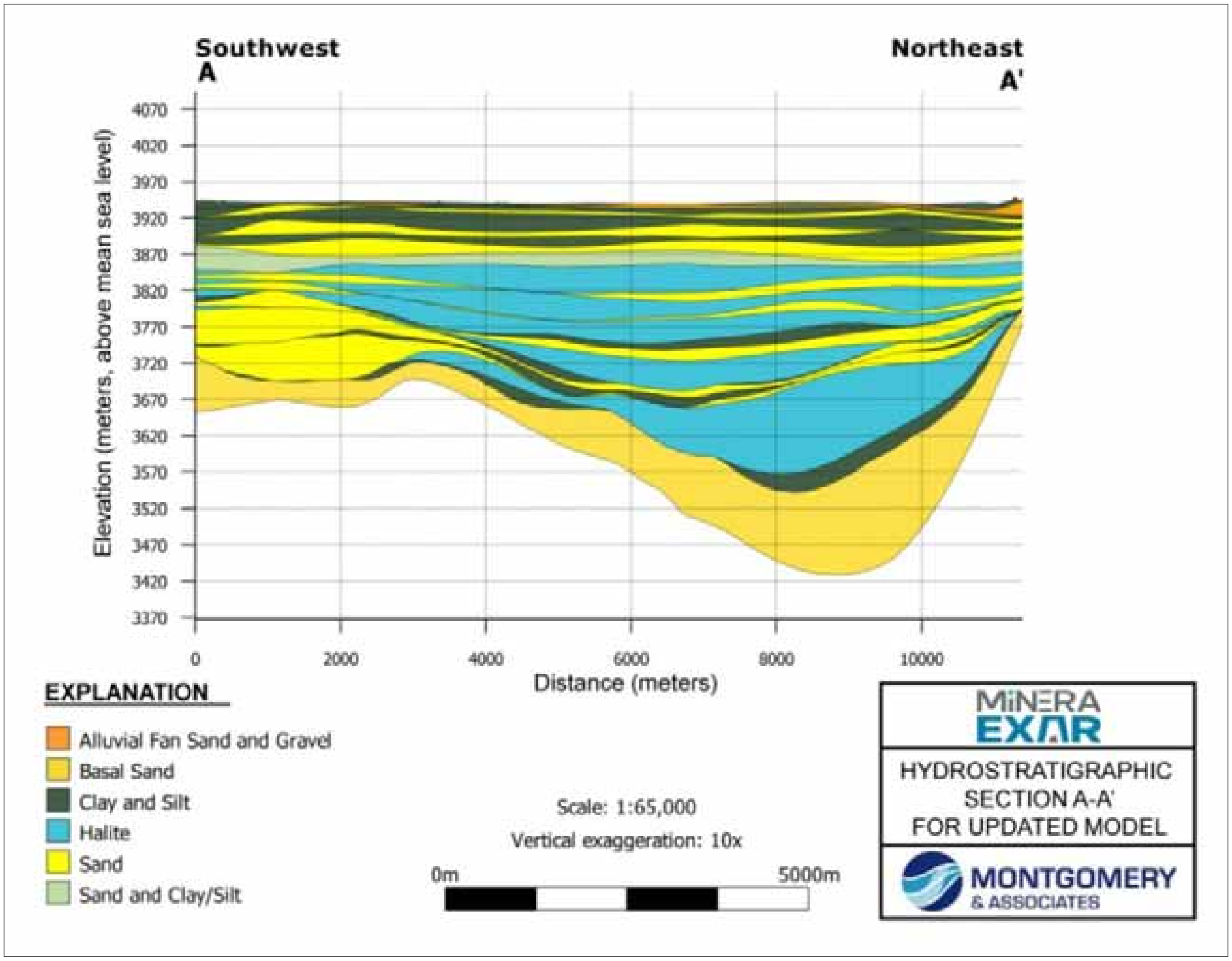
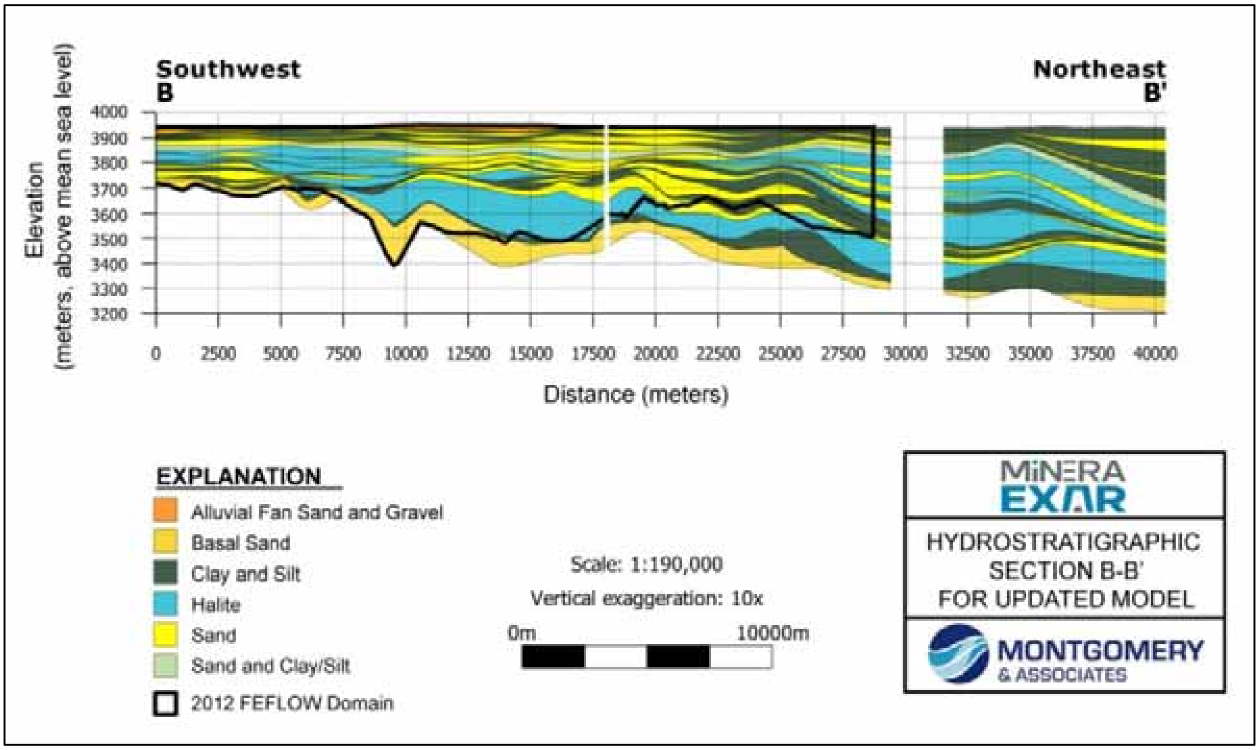


Figure 14.11 Section B-B' of the Hydrostratigraphic Model Used for the Updated Mineral Resource Estimate



14.3.4 Specific Yield

Specific yield ("Sy") or drainable porosity is the total volume of pore space in saturated media that drains, under the influence of gravity, expressed as a percentage of sample volume. In standard terms of aquifer mechanics, Sy is defined as the volume of water released from a unit volume of unconfined aquifer per unit decline in the water table. Sy has been estimated with laboratory RBRC methods as reported in the 2012 Mineral Resource Estimate (LAC, 2012). Results were used to estimate representative Sy values for each of the six primary unit types in the hydrostratigraphic model.

In the 2012 FEFLOW model (LAC, 2012), the upper two model layers included variation in Sy to represent mapped surface geology and numerical parameter estimation results from steady-state calibration of the 2012 FEFLOW model. Deeper model layers generally had more uniform Sy based on the lithology of the primary unit. The finer-grained, primary units at depth (Halite, Clay and Silt) were modeled with a uniform Sy estimate based on the dominant lithology, while the Sy of the Sand unit varied with approximate correlation to depth and potential effects of lithostatic loading. The representative values of Sy for each layer remained unchanged from the 2012 FEFLOW model and were distributed similarly in the Leapfrog model for the updated Mineral Resource Estimate. Table 14.3 provides parameter values for Sy.

TABLE 14.3 **SUMMARY OF HYDROSTRATIGRAPHIC UNITS AND ASSIGNED SPECIFIC YIELD ESTIMATES FOR THE UPDATED MINERAL RESOURCE ESTIMATE**		
Primary Unit	**Minor Units**	**Specific Yield Estimate for Primary Unit (percent)**
Alluvial Fan Sand and Gravel	Silt and Clay Lenses	24.9
Clay and Silt	Sand and Halite Lenses	5.6
Sand[a]	Clay/Silt, and Halite Lenses	24.9 / 16.0 / 12.1
Sand and Clay/Silt	Minor Halite Lenses	16.0
Halite	Clay/Silt and Sand Lenses	5.9
Basal Sand	Silt and Weathered Bedrock	13.7
(a) Sand unit modeled similarly to the LAC 2012 model where Sy generally decreases with depth: hydrostratigraphic model layers 4, 8, 11, and 16 were assigned values of specific yield of 24.9 percent; layer 13 was assigned 16.0 percent; layers 6, 19, and 21 were assigned 12.1 percent.		

14.3.5 Lithium Concentrations

The lithium concentrations from the depth-specific bailer samples obtained at 2017 and 2018 boreholes were spatially analyzed and compared to the distribution of lithium in the resampled resource grid from the 2012 FEFLOW model and the 2012 Mineral Resource Estimate (LAC, 2012). Measured concentrations in the 2017 and 2018 samples often differed from values predicted by the prior 2012 resource grid. Therefore, the updated Mineral Resource Estimate required a re-interpolation of lithium concentrations to resolve the additional sampling results; incorporating the lithium concentrations in the updated Mineral Resource Estimate model followed and expanded upon methods used in the 2012 Mineral Resource Estimate model. In summary, the updated lithium concentrations database included the following:

- Concentration measurements from original samples used in LAC (2012) and recent sampling locations with bailer samples were assigned a discrete depth (if represented as a depth interval).

- Data analysis was conducted to evaluate the quality and representativeness of the data. Sample verification and the sample QA/QC was conducted by Minera Exar and independent QP and provided to Montgomery.

- Publicly available results were used for off-property northern control points in SdO of the Resource Evaluation Area in the prior 2012 Mineral Resource Estimate (Orocobre Limited, 2011); similarly for the updated Resource Evaluation Area, publically available results were used for off-property control points in SdC to the east and west of the Resource Evaluation Area (Advantage Lithium, 2018).

- Spatial correlation of lithium concentration data points was assessed with semi-variogram analysis to prepare iso-surfaces using two different methods in Leapfrog EDGE: Radial Basis Function ("RBF") and Ordinary Kriging.

In total, 1,880 lithium concentrations are represented in the 3D geologic model for the updated Mineral Resource Estimate. Locations of representative fence sections of the distribution of initial lithium concentrations are shown on Figure 14.12 for the updated Mineral Resource Estimate. For comparison purposes, the fence sections for the 2012 and the updated initial lithium concentrations are shown on Figure 14.13 and Figure 14.14, respectively.

Figure 14.12 Location Map of Representative Fence Sections for Lithium Concentrations

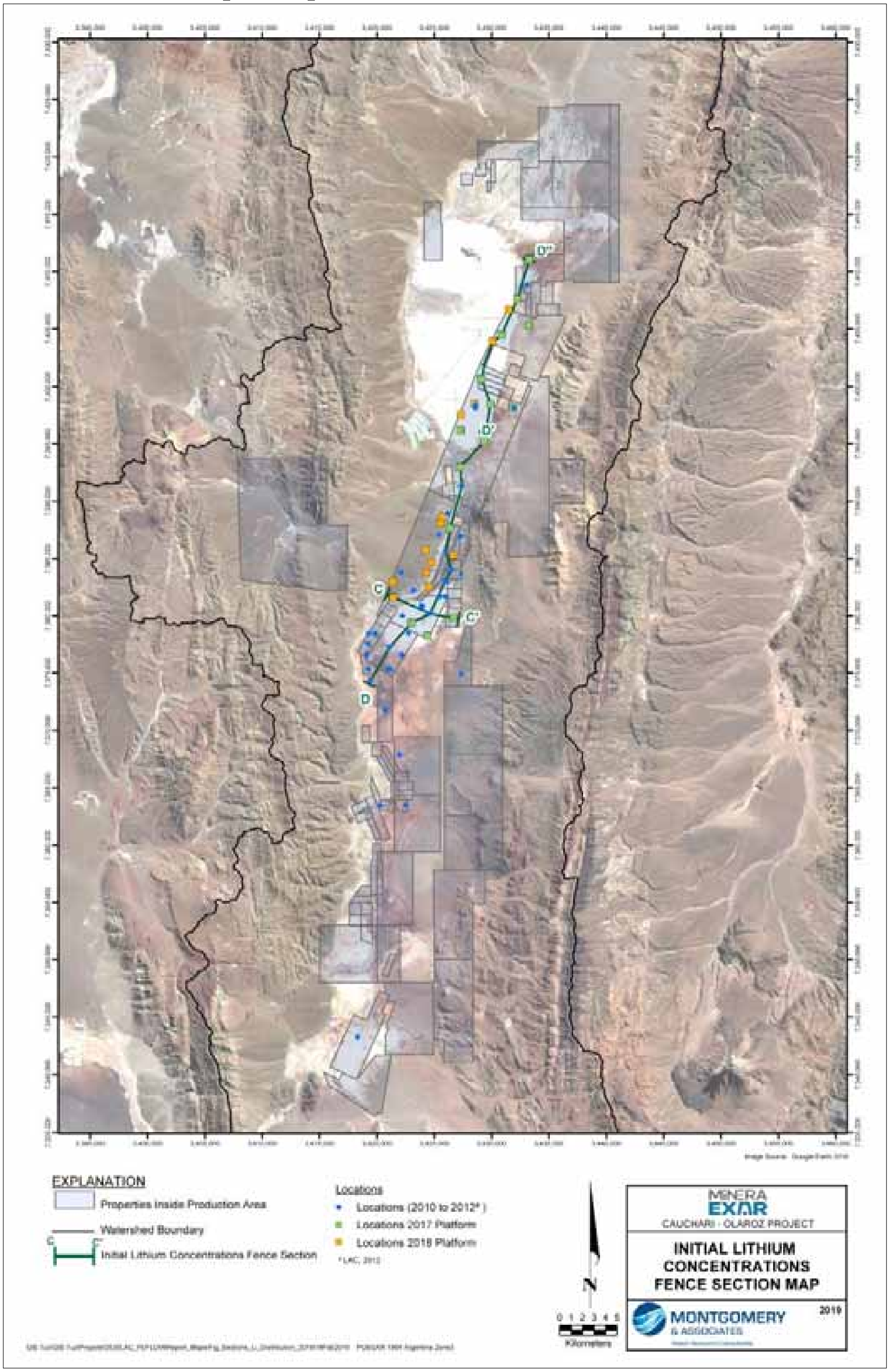


Figure 14.13 Representative Fence Sections of Initial Lithium Concentrations in the 2012 Mineral Resource Estimate Processed in Leapfrog Geo

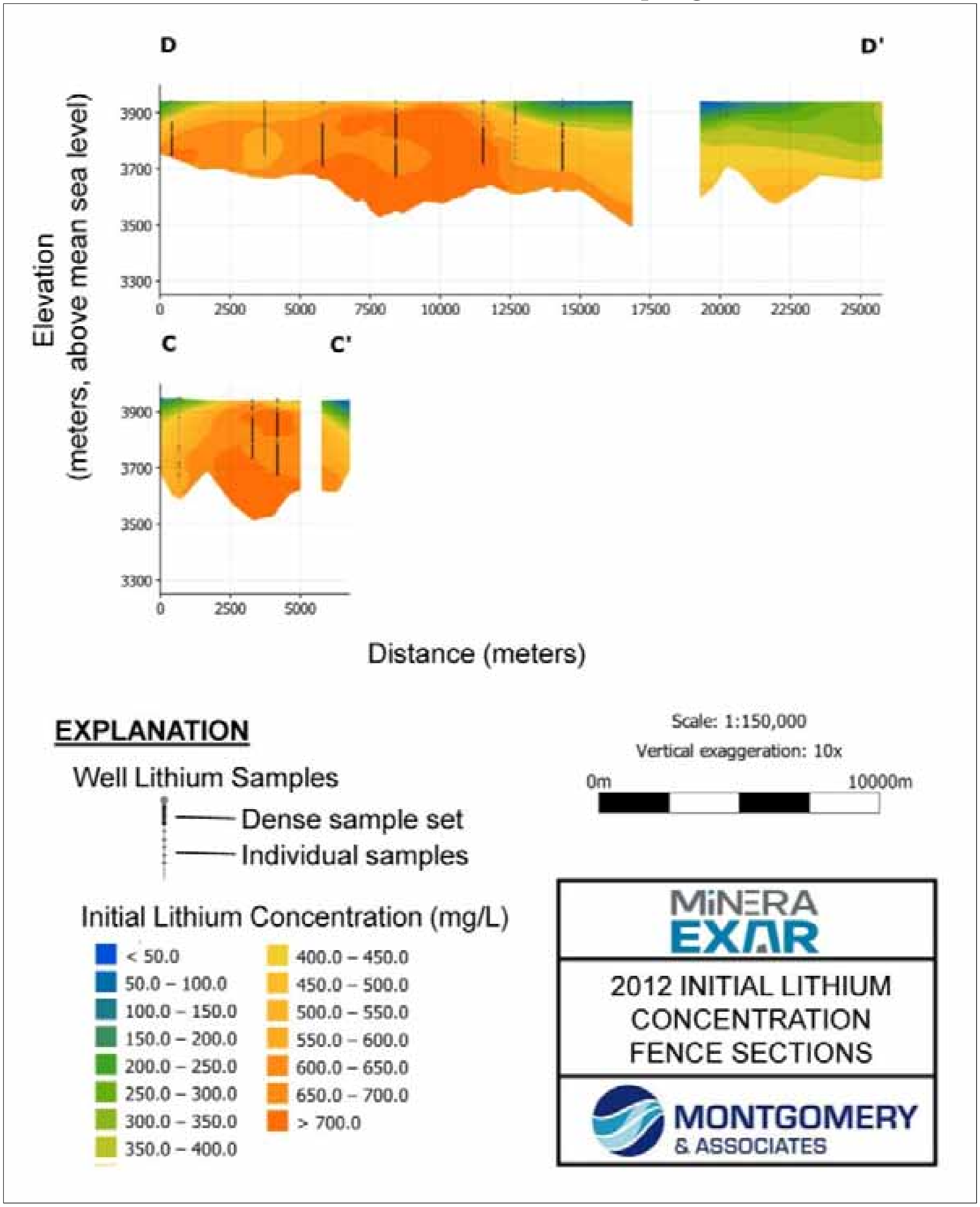
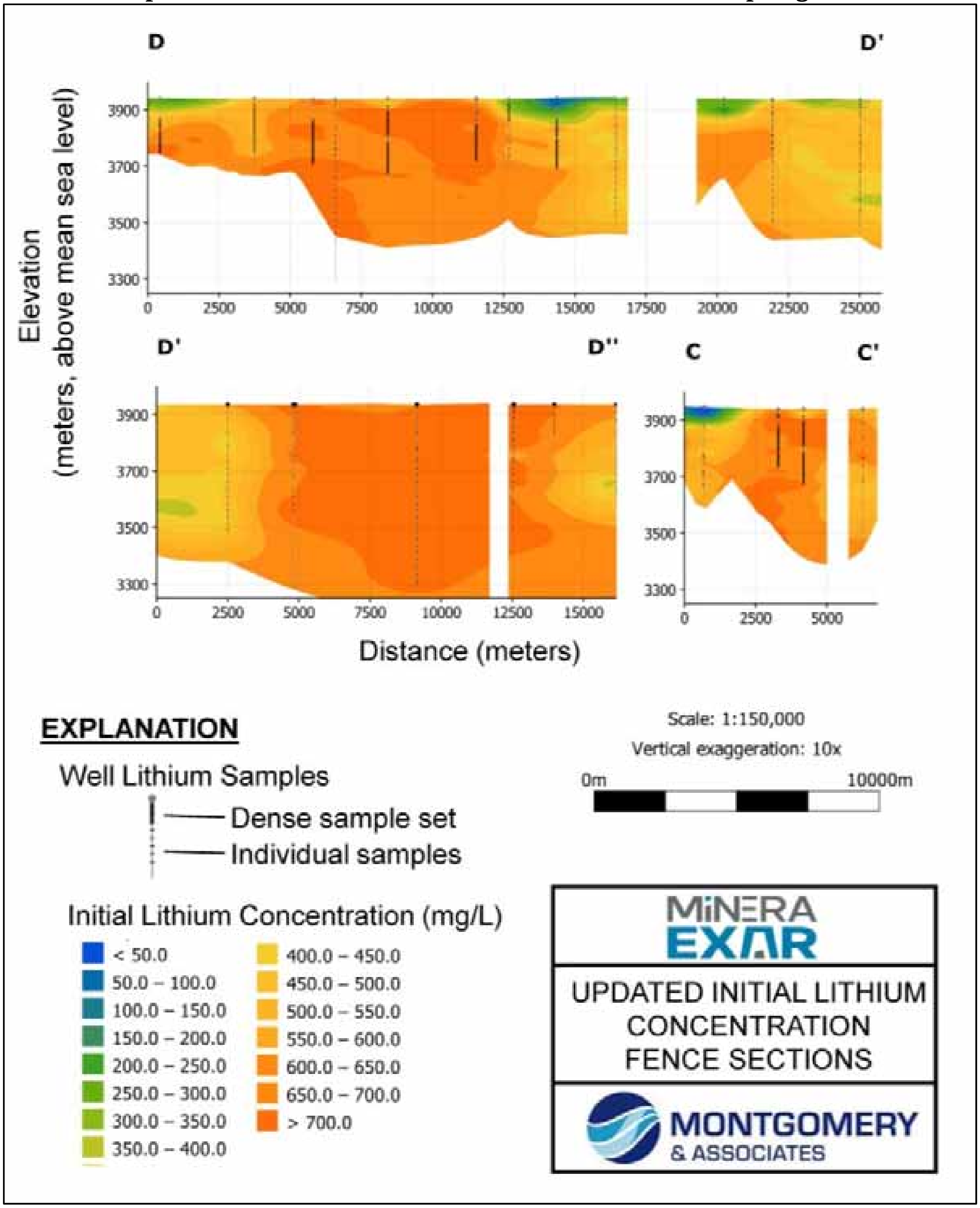


Figure 14.14 Representative Fence Sections of Initial Lithium Concentrations in the Updated Mineral Resource Estimate Processed in Leapfrog Geo

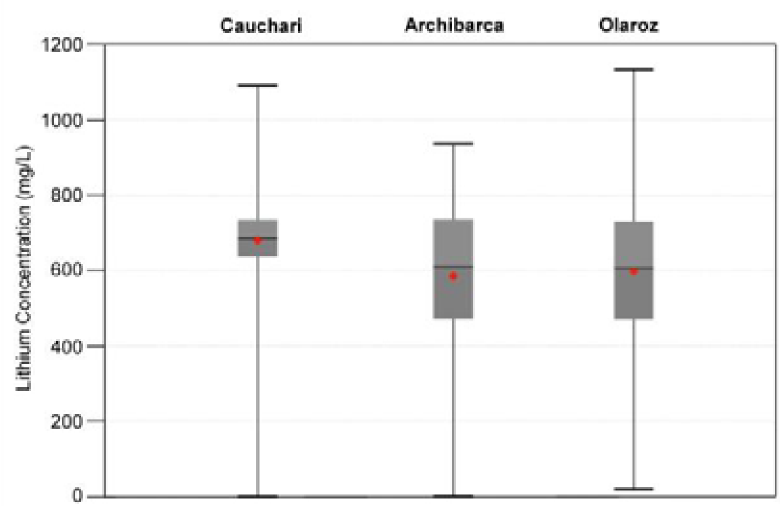


14.3.6 Exploratory Data Analysis and Domain Analysis

The Exploratory data analysis ("EDA") of the lithium concentrations involved the univariate statistics of the samples using histograms, box plots, and probability plots, and spatial correlations based on data posting, trend analysis, hydrostratigraphic units, and relative location in the Project area. Box plots of the lithium concentrations grouped by samples located in SdC, Archibarca, or SdO are shown in Figure 14.15. Although the variance and spatial trend of the distribution of lithium concentrations differs slightly in these three areas, the Resource Evaluation Area was modeled as one domain recognizing the following: 1) the distribution of lithium concentrations are not dependent on the hydrostratigraphic units, 2) the hydrostratigraphic units are continuous through the three areas, and 3) modeling the three areas as sub-domains, even with soft boundaries, produces disconnects in the lithium concentration contours which affect gridding required for numerical modeling of the Mineral Reserve Estimate. The perimeter of the Resource Evaluation Area was modeled as a soft boundary to incorporate outside control points.

As part of the EDA for the updated Mineral Resource Estimate, the box plots showing mean and median concentrations are informative as they show the influence of 2017 and 2018 samples collected in SdO and Archibarca relative to the SdC samples, which dominated the sample database used for the prior 2012 Mineral Resource Estimate. Additionally, the SdC sample population shows a smaller range of the upper and lower quartile, indicating less dilution effects of shallow samples collected in the SdO area and the fresh water influx of the basin margin in the Archibarca area.

Figure 14.15 Box Plots of Lithium Concentrations – SdC, Archibarca, and SdO Areas



	Cauchari	Archibarca	Olaroz
Number of Data	1165	558	157
Mean	680	584	597
Maximum	1090	936	1133
Upper quartile	735	736	731
Median	686	609	607
Lower quartile	636	471	470
Minimum	0.2	1	19
Variance	15743	44766	26753
CV	0.18	0.36	0.27

14.3.7 Mineral Resource Block Model Variography, Methods, and Validation

Variogram models were developed in three orthogonal directions based on experimental variograms. No outlier restrictions were applied, as measured sample concentrations do not show anomalously high values. Analysis of the lithium distributions did not show a dependency on hydrostratigraphic units. Therefore, the model domain was distinguished by the Resource Evaluation Area with a soft boundary accounting for samples outside of the Resource Evaluation Area. Categories were applied within the model domain to subdivide the resource categories (Measured, Indicated, and Inferred) and the hydrostratigraphic sequences in order to apply variations in Sy.

The resource block model within the Resource Evaluation Area, composed of 6,896,092 blocks, was defined with a block size of x = 100 meters, y = 100 meters, and z = 1 meter. The block size was chosen to apply the specific yield to the units within the hydrostratigraphic model imposed by incorporating the parameterization in the 2012 FEFLOW model.

The spatial correlations for the lithium concentrations were reviewed in Leapfrog EDGE using experimental variograms with the parameters shown in Table 14.4. The spatial variability was modeled using three experimental directions adjusted to a 3D ellipsoidal model using one spherical structure and three experimental variogram directions. The experimental semi-variograms of lithium and theoretical model is shown in Figure 14.16.

TABLE 14.4
EXPERIMENTAL VARIOGRAM PARAMETERS

Axis	Variogram Parameters			Tolerance	
	Lag (meters)	Maximum Number of Lags	Azimuth (degrees)	Dip (degrees)	Angular (degrees)
Major	500	50	114.45	0	20
Semi-major	500	50	24.45	0	75
Minor	5	100	0	90	5

The interpolation methodology for estimating the Lithium resource was Radial Basis Function ("RBF") to produce iso-surfaces which were then evaluated to the resource block model. Figure 14.17 shows the initial lithium concentrations on plan maps for elevations of 3,900, 3,800, and 3,700 meters.

The RBF interpolation method was verified with ordinary kriging. The model was validated using a series of checks including comparison of univariate statistics, verification with ordinary kriging, evaluation of the model to the original sample points to verify values, and swath plots to detect any spatial bias. Swath Plots in the X, Y, and Z directions are shown on Figure 14.18 and provide a general perspective on the modeled concentrations compared to the samples. The model was interrogated where the swath plots showed the modeled concentrations differed from the sample concentrations. Upon examination and verification, differences were often attributed to: 1) the swath fully intersecting the Resource Evaluation Area in the specified direction, 2) variability of the number and distribution of sample data available in a given swath, and 3) the resource model incorporating soft boundary control points outside the Resource Evaluation Area.

Figure 14.16 Experimental Semi-Variograms of Lithium with Theoretical Model

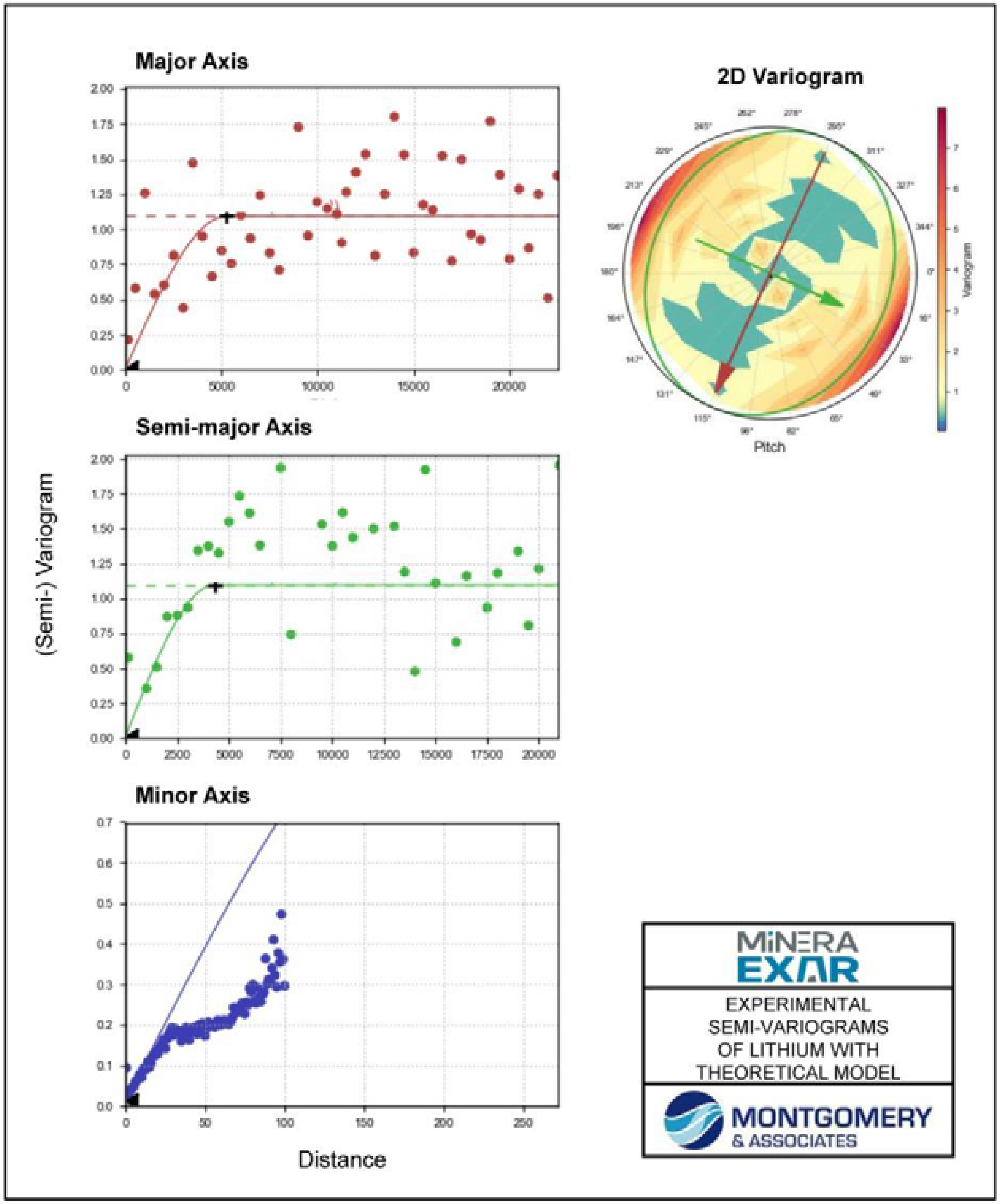


Figure 14.17 Representative Elevation Maps of Initial Lithium Concentrations for Updated Mineral Resource Estimate

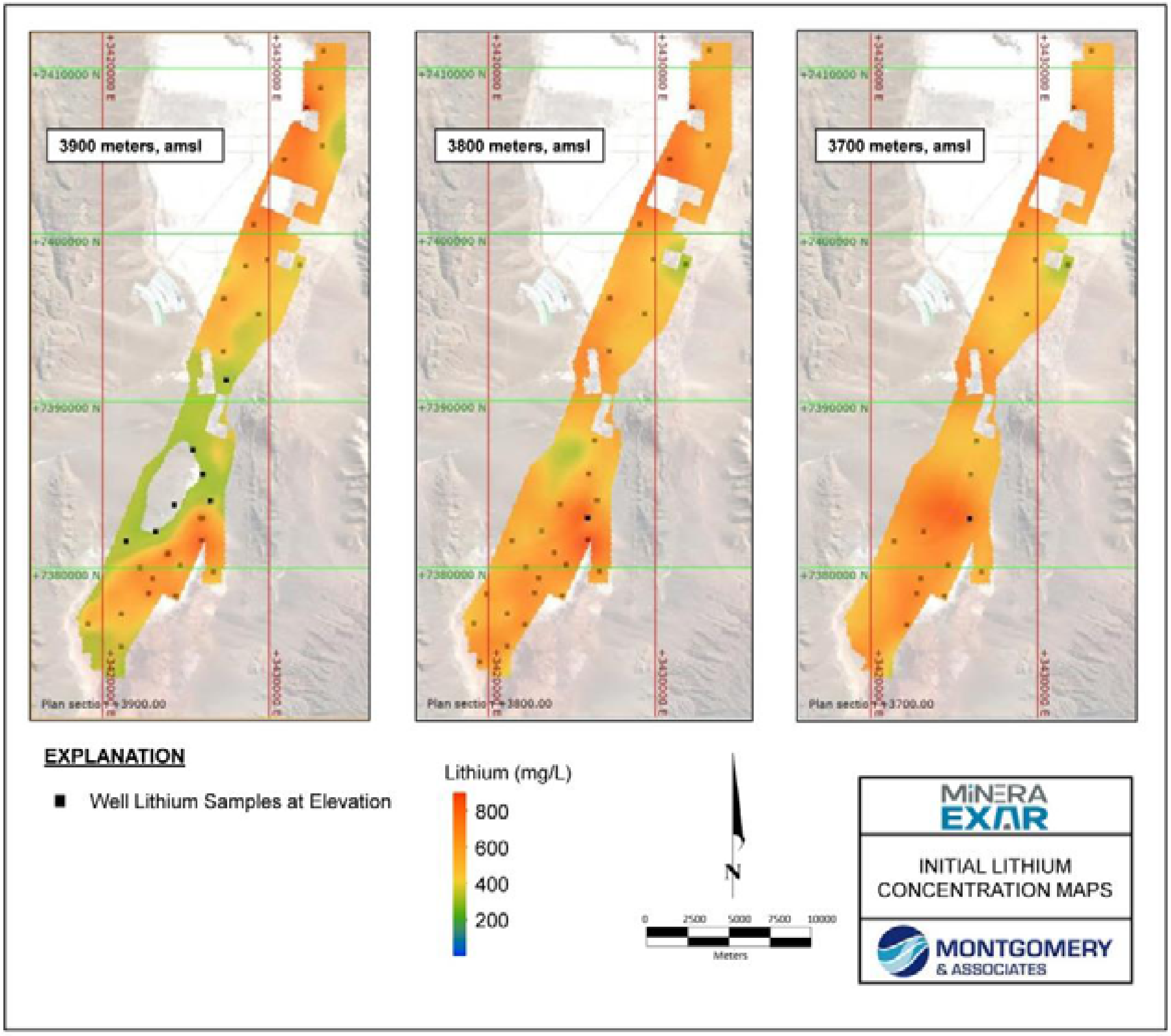
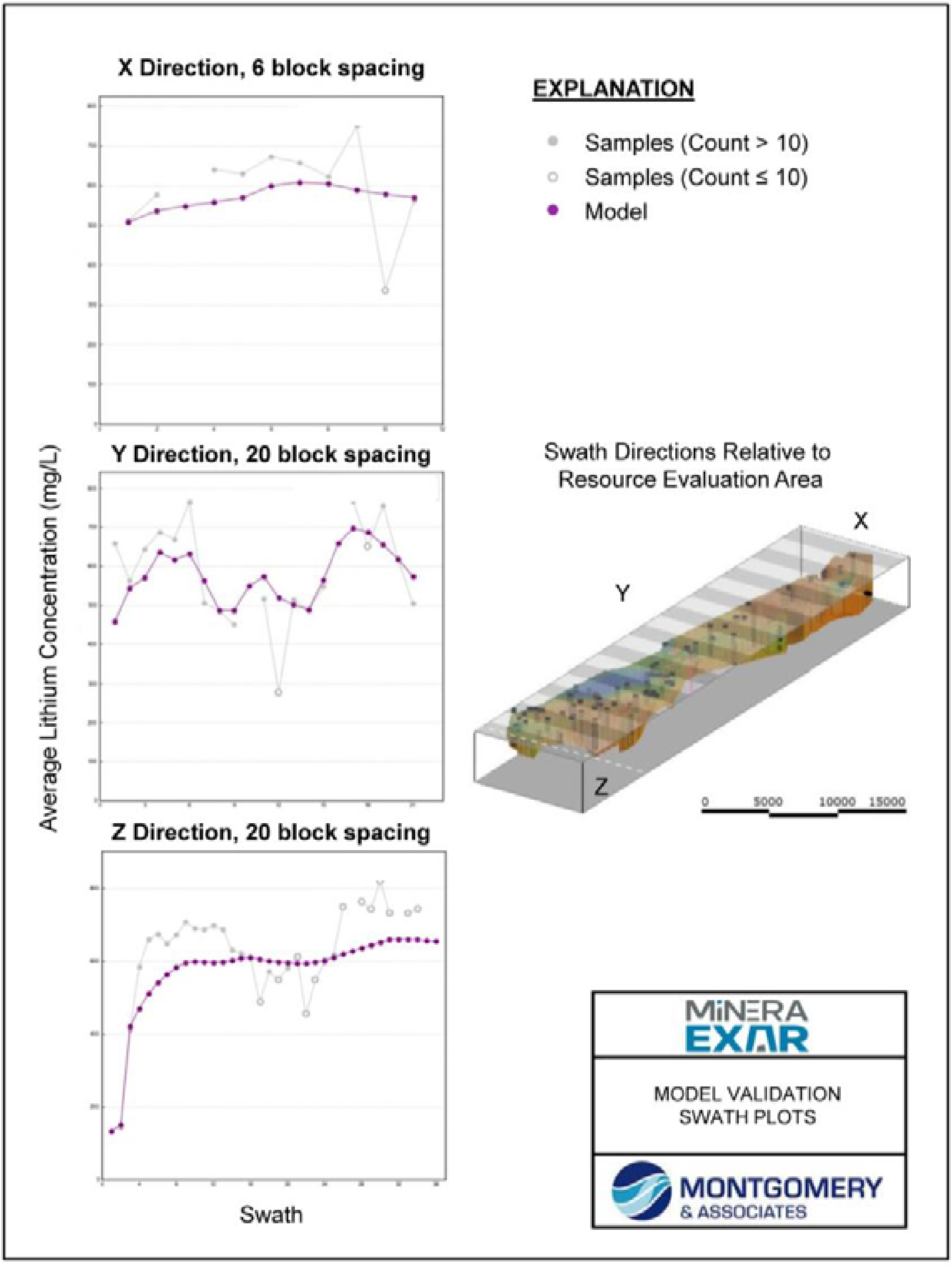


Figure 14.18 Model Validation Swath Plots in the X, Y, and Z Directions



14.4 MINERAL RESOURCE STATEMENT

A map showing the Resource Evaluation Area of resource categories is shown on Figure 14.19 for the prior Mineral Resource Estimate and for the updated Mineral Resource Estimate. For the updated Mineral Resource Estimate, the Resource Evaluation Area extends north to include: 1) Minera Exar property areas with 2017 and 2018 exploration results, and 2) areas meeting the criteria of resource categories for Mineral Resource estimation. Figure 14.20 shows a section view of the updated Mineral Resource Estimate and a map view at a slice elevation of 3,800 masl (approximate depth of 150 m within SdC). Comparing a similar representation for the 2012 Mineral Resource Estimate (Figure 14.4), the updated Mineral Resource Estimate extends deeper in the brine mineral deposit as well as to the north property claim area. Figure 14.21 shows the 3D view of the Resource Evaluation Area for the Mineral Resource categories: Measured, Indicated, and Inferred.

Except for cut-off grade, the methodology and resource classification scheme for evaluating the updated Mineral Resource Estimate followed the prior 2012 Mineral Resource Estimate criteria for Measured and Indicated (Section 14.3). The prior 2012 processing constraint of cut-off grade of 354 mg/L was not imposed as a strict control by Minera Exar for the current update. For comparison purposes the cut-off grade was set at 300 mg/L concentration of lithium, largely to include results from drilling platform 06.

The Mineral Resource Estimate at the Measured, Indicated, and Inferred Mineral Resource category (CIM, 2014) for lithium is based on the total amount of lithium in brine that is theoretically drainable from the bulk aquifer volume. The volumes where lithium concentration is determined to be less than the cut-off grade of 300 mg/L are not included in the resource calculations. In some areas, there are volumes of brine included in the Mineral Resource Estimate even where they extend beyond data points from wells. These zones (usually at depth below known data points or extending laterally from known data points) are included in the Mineral Resource Estimate based on the substantial amount of geophysical information obtained that justifies extrapolating the resource to its logical boundary conditions (such as lateral property or geological boundaries, lithological characteristics, or hydrogeologic bedrock constraints). The Mineral Resource Estimate does not include brine aquifer volumes at depths greater than the projected bedrock contacts.

With further exploration and characterization, deep aquifer volumes at the Inferred category may convert to a higher confidence category; other aquifer volumes within property boundaries to the north and south remain open. Prior to conducting an exploratory drilling program, geophysical surveys (seismic and CSAMT / MT) should further delineate exploration targets in these areas. This information will aid in better defining limits of the resource extending to property boundaries.

Figure 14.19 Location Map Showing Resource Evaluation Areas – 2012 Mineral Resource Estimate and Updated Mineral Resource Estimate

Figure 14.20 Representative Plan and Section Views of the Updated Measured, Indicated, and Inferred Mineral Resource Estimate

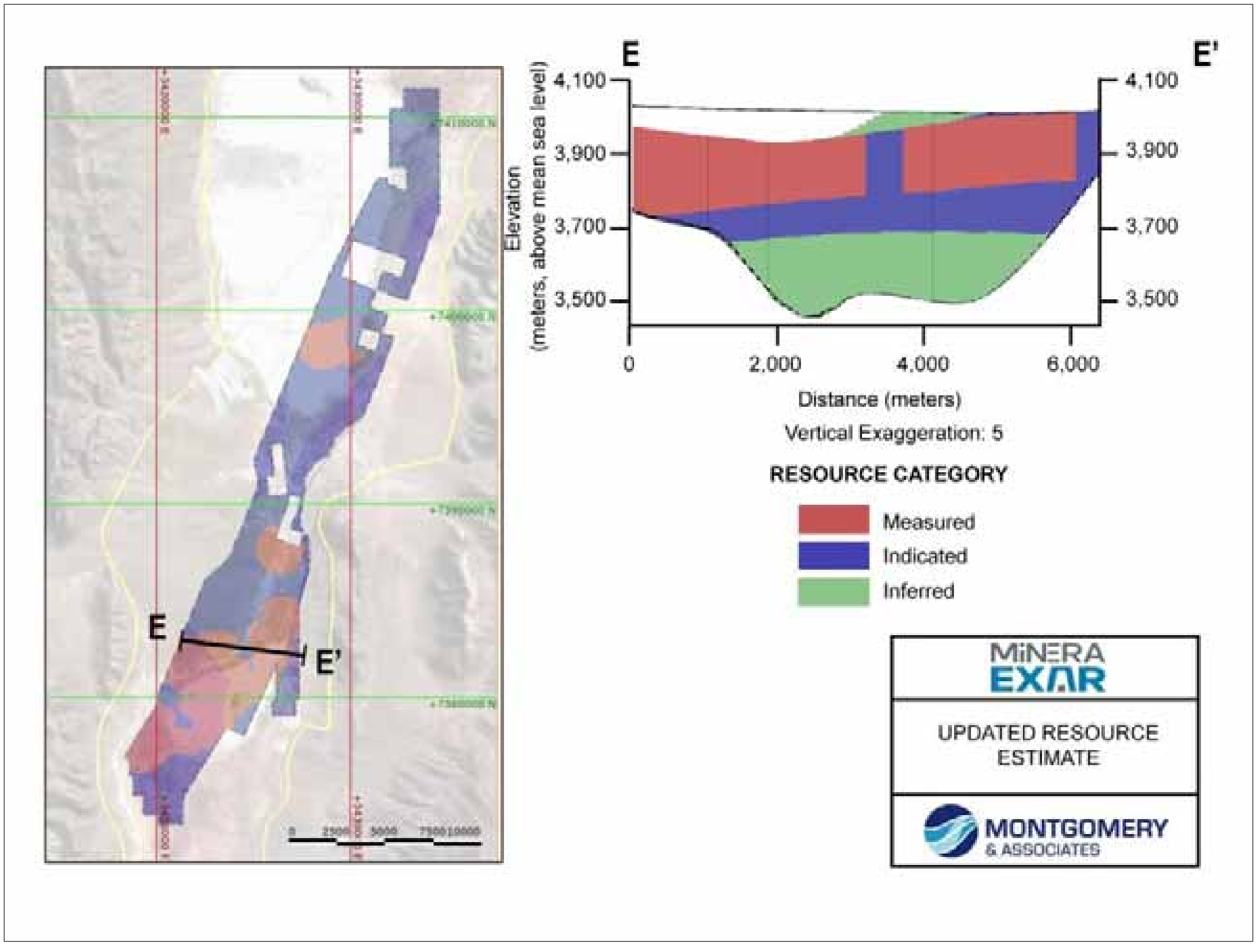
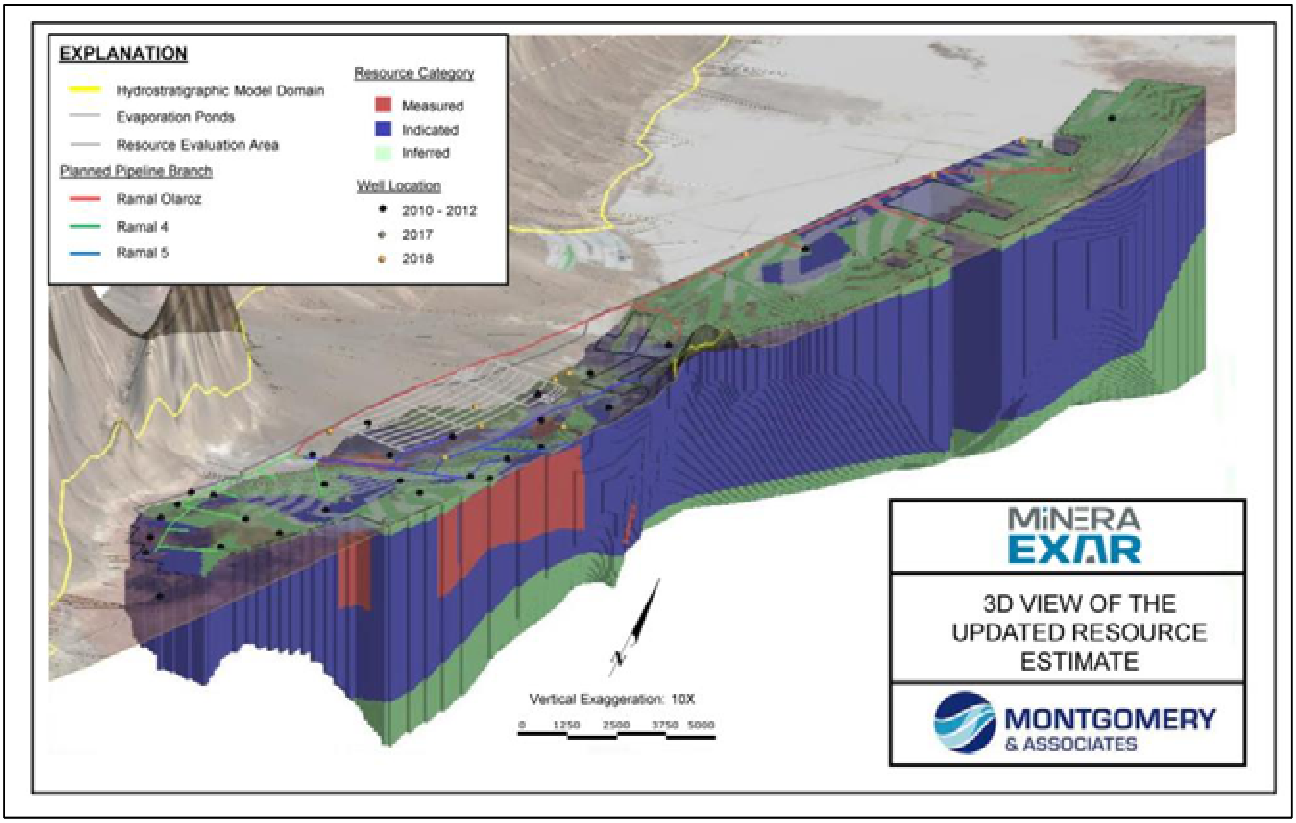


Figure 14.21 3D View of the Updated Mineral Resource Estimate – Measured, Indicated, and Inferred



The updated Measured, Indicated, and Inferred Mineral Resource Estimate for lithium is summarized in Table 14.5. The updated Mineral Resource Estimate for lithium has an effective date of February 13, 2019, and is based on most recent sampling information included for interpreting and updating the Mineral Resource Estimate. As is common and accepted standard practice with a brine Mineral Resource Estimate for lithium, Table 14.6 provides lithium as Li_2CO_3 or LCE, at the Inferred, Indicated, and Measured confidence level categories.

TABLE 14.5 **SUMMARY OF UPDATED MINERAL RESOURCE ESTIMATE FOR LITHIUM**				
Description	**Aquifer Volume (m^3)**	**Drainable Brine Volume (m^3)**	**Average Lithium Concentration (mg/L)**	**Lithium (tonnes)**
Measured Resource	1.03E+10	1.11E+09	587	651,100
Indicated Resource	4.27E+10	4.70E+09	580	2,726,300
Measured + Indicated	**5.31E+10**	**5.81E+09**	**581**	**3,377,400**
Inferred	1.37E+10	1.59E+09	602	957,400

Notes:

1. *The Mineral Resource Estimate has an effective date of February 13, 2019 and is expressed relative to the Resource Evaluation Area and a lithium grade cut-off of greater than or equal to 300 mg/L.*
2. *The Mineral Resource Estimate is not a Mineral Reserve Estimate and does not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resources will be converted to Mineral Reserves.*
3. *Volumes only include Measured, Indicated, and Inferred Resource volumes above cut-off grade.*
4. *The Mineral Resource Estimate has been classified in accordance with CIM Mineral Resource definitions and best practice guidelines (2012 and 2014).*
5. *Comparisons of values may not add due to rounding of numbers and the differences caused by use of averaging methods.*

TABLE 14.6 **UPDATED MINERAL RESOURCE ESTIMATE FOR LITHIUM** **REPRESENTED AS LCE**	
Description	**LCE (tonnes)**
Measured Resource	3,465,700
Indicated Resource	14,511,500
Measured + Indicated	**17,977,200**
Inferred	5,096,000

Notes:

1. *Lithium carbonate equivalent ("LCE") is calculated using mass of LCE = 5.322785 multiplied by the mass of Lithium reported in Table 14.5.*
2. *The Mineral Resource Estimate represented as LCE has an effective date of February 13, 2019 and is expressed relative to the Resource Evaluation Area and a lithium grade cut-off of greater than or equal to 300 mg/L.*
3. *The Mineral Resource Estimate is not a Mineral Reserve Estimate and does not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resources will be converted to Mineral Reserves.*
4. *The Mineral Resource Estimate has been classified in accordance with CIM Mineral Resource definitions and best practice guidelines (2012 and 2014).*
5. *Comparisons of values may not add due to rounding of numbers and the differences caused by use of averaging methods.*

Comparing the 2012 Mineral Resource Estimate to the updated Mineral Resource Estimate (Tables Table 14.1, Table 14.5 and Table 14.6), the percent change is a decrease of less than 1% for total average lithium concentration of Measured + Indicated (585 mg/L vs. 581 mg/L); the percent change is an increase of 53% for total LCE Measured + Indicated (11,752,000 tonnes LCE vs. 17,977,200 tonnes LCE). The large increase in overall mass can be attributed to the expansion and deepening of the Resource Evaluation Area based on exploration results obtained in 2017 and 2018. The small decline in total average concentration can be attributed to the updated Mineral Resource Estimate affected by the 2017 and 2018 range of samples collected in SdO and Archibarca areas of the Project. When spatially averaged with the lithium concentration of SdC samples, which essentially dominated the prior 2012 Mineral Resource Estimate, the updated Mineral Resource Estimate has a relatively small percentage decrease in the overall concentration of lithium.

14.5 RELATIVE ACCURACY OF THE MINERAL RESOURCE ESTIMATE

The relative accuracy of the Mineral Resource Estimate for lithium is largely a function of the confidence demonstrated in sampling methods, laboratory results, analytical methods, and the overall development and understanding of the conceptual hydrogeologic system. Montgomery has confidence in the Mineral Resource Estimate based on previous data collected and interpreted by LAC (2012), as well as analysis of 2017 and 2018 exploration data and methods provided by Minera Exar, in particular with brine concentration and lithologies of the hydrostratigraphic model domain.

With respect to conceptualization and parameterization of the hydrogeologic system for the updated Mineral Resource Estimate, the factors that could affect resource estimation include:

- Hydrostratigraphic modeling method and approach for processing and expansion of the resource model. The complex layering strategy of a 24-layer hydrostratigraphic model obtained from the 2012 FEFLOW model is difficult to maintain and logically assimilate lithologic and aquifer parameter data from exploration campaigns expanding laterally and at depth.

- Estimates of drainable porosity or Sy values. The estimates of Sy are extrapolated from the 2012 resource grid to similar lithologies in the expanded and updated resource grid. Estimates of Sy in the expanded resource grid have some uncertainty due to the lack of representative testing results of samples.

To address the uncertainties and improve the Mineral Resource Estimate, recommendations include the following:

- The updated hydrostratigraphic model used a complex 24-layer scheme based on the 2012 FEFLOW model layers in areas where 2017 and 2018 exploration data were not available; lack of correlation of layers across the entire basin is evident, especially with expanded exploration sites of the SdO region. As a result, future efforts to update the hydrostratigraphic model will be difficult to reconcile as exploration and production campaigns continue. To overcome this issue, the hydrostratigraphic model should be modified using geologic modeling methods, such as Leapfrog Geo, that simplifies hydrostratigraphy and incorporates conceptual depositional environments or stratigraphic sequence units.

- Drainable porosity or S_y estimates relied upon the prior 2012 model estimates because the 2017 and 2018 exploration results lacked S_y estimates. In order to address the uncertainty of S_y estimates for the different stratigraphic groups, ongoing exploration work should include analysis of S_y by use of laboratory methods such as RBRC or similar techniques for core samples, and field methods using calibrated nuclear magnetic resonance ("NMR") borehole logging in open boreholes or in wells with PVC casing installed.

15.0 MINERAL RESERVE ESTIMATE

Information in this Section has been excerpted and summarized from the Feasibility Study reported in 2017 (Burga et al., 2017). The reader is referred to Burga et al. (2017) for detailed information. Note that the feasibility study and derived information was based on the 2017 Mineral Reserve Estimate.

15.1 NUMERICAL MODEL

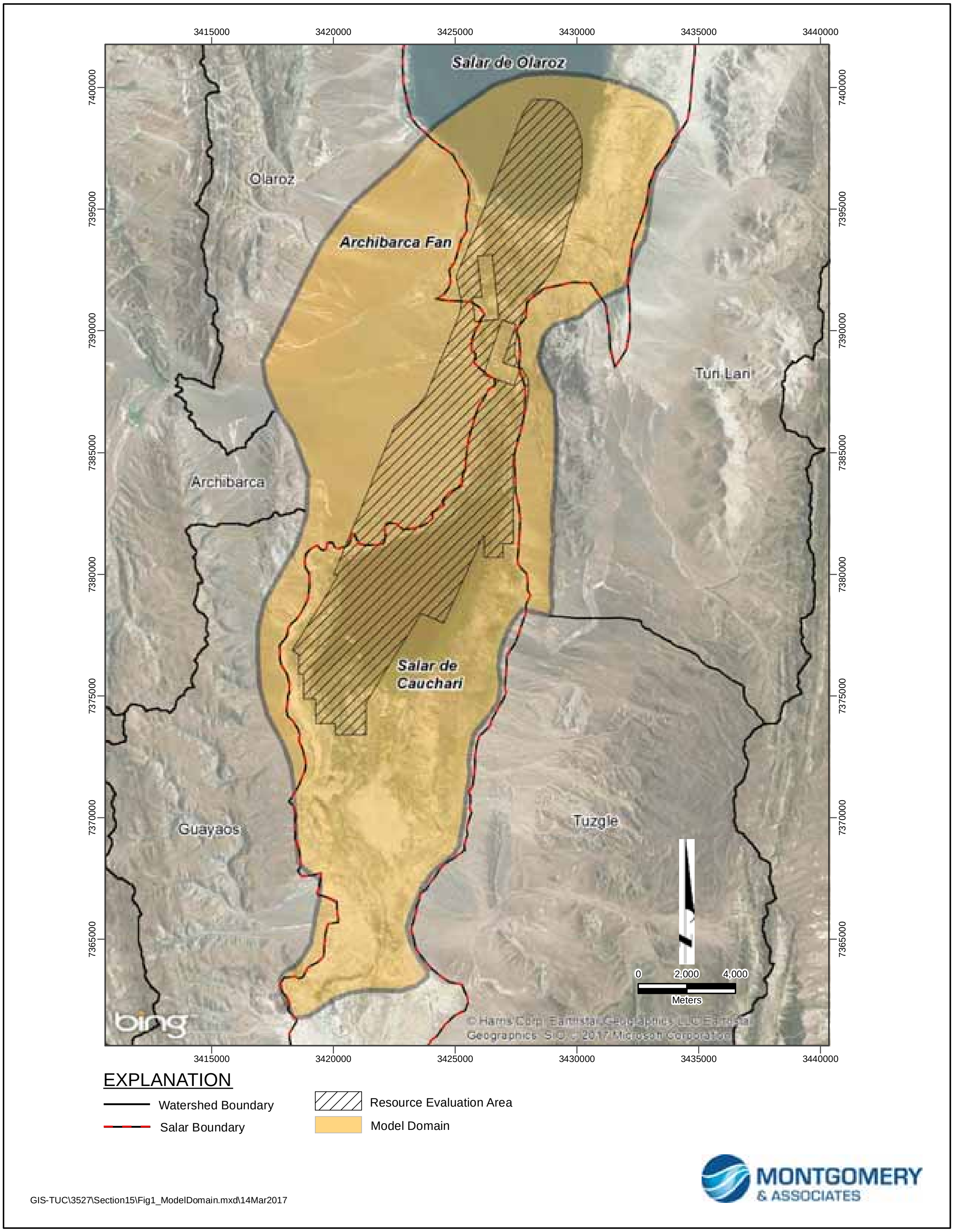
A groundwater flow and transport model, developed by others in support of a previous study (Groundwater Insight, 2012), was used in 2017 to evaluate feasibility of extracting sufficient brine to produce 25,000 tpa or more of lithium carbonate equivalent (LCE) from the Salar de Cauchari. The model was constructed using the finite-element code FEFLOW Version 6 (DHI, 2010). The 2017 numerical model was used to predict LCE production from brine extracted from 38 wells located in and near the salar. Groundwater Insight (2012) concluded that rigorous consideration of variable density within the aquifer did not materially improve model results so density effects were not simulated in these current analyses. Mountain front recharge was increased in the model for consistency with a recent study conducted by SQM (2016). The model was then used to select production well locations and brine extraction rates to achieve an LCE production rate of at least 25,000 tpa. Model results include predicted brine production rates, drawdown in production wells, and lithium concentration during simulated well field pumping.

The Mineral Reserve Estimate for lithium remains unchanged from the prior Updated Feasibility Study for Cauchari-Olaroz (Burga et al. 2017). The QPs responsible for the preparation of the Mineral Reserve Estimate have conducted a review of the estimates and consider the Mineral Reserves reported in this Section are current as of the effective date of the Report.

15.1.1 Numerical Model Construction

The model domain encompasses the sedimentary deposits comprising Salar de Cauchari basin. Extent of the model domain, which covers an area of about 354 square kilometers (km^2), is shown on Figure 15.1.

Figure 15.1 Model Domain and Watersheds



15.1.2 Numerical Model Boundary Conditions

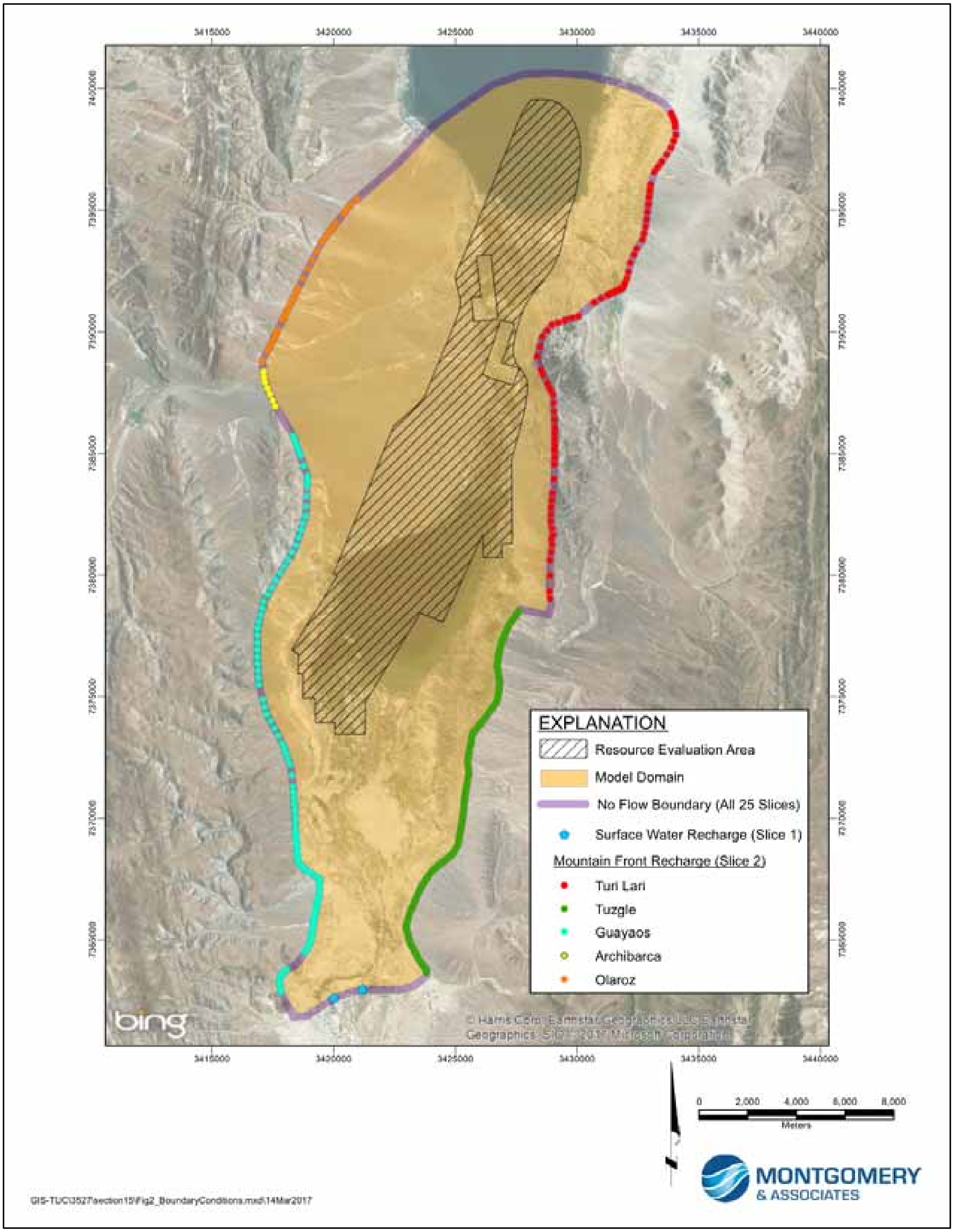
Boundary conditions that are consistent with the conceptual model were applied in the numerical model. In general, the aquifer is recharged by a combination of groundwater underflow from upland, mountain front recharge and surface infiltration of precipitation. Under natural conditions, all of the influent groundwater is consumed by evaporation that occurs in the center and along the margins of the salar.

Overall, the changes in the water balance do not have a large positive, or negative effect on the ability of the proposed wellfield to extract lithium from the aquifer system.

- Surface water inflow – Surface water features have been observed near the northern and southern ends of the model domain where it crosses through the salar. Two constant head nodes were assigned at the south end of the domain, as shown on Figure 15.2 as ‘Surface Water Recharge (Slice 1)’, to account for inflow of surface water in this area.

- Bottom Boundary – The entire bottom slice of the model was assigned no flow boundary conditions.

Figure 15.2 Lateral Model Boundary Conditions



15.1.2.1 Brine Production Results

A series of trial simulations were conducted to select locations for pumping wells within the domain, pumping rates applied at each well during the simulation, and the duration of pumping at each location to meet the above constraints while achieving a LCE production rate of 25,000 tpa. Locations of the 38 wells which were used in the simulation are shown on Figure 15.3. Average annual brine production rate ranges from approximately 27,000 m^3/day (312 L/s) during the first 4 years of the simulation to 28,500 m^3/d (330 L/s) during the latter stages of the simulation.

A total of 503 time steps were required to execute the 40-year production simulation. According to water balance results, cumulative numerical error for the simulation is 0.13%. For individual time steps, numerical error ranges from -4.97% to +3.61%, although the error is closer to the cumulative numerical error for a majority of time steps. Therefore, it is concluded that numerical error does not adversely affect the model results with respect to the water balance. Brine production rate and maximum predicted drawdown for each well during the 40-year simulation are summarized in Table 15.1.

Figure 15.3 Well Location Map

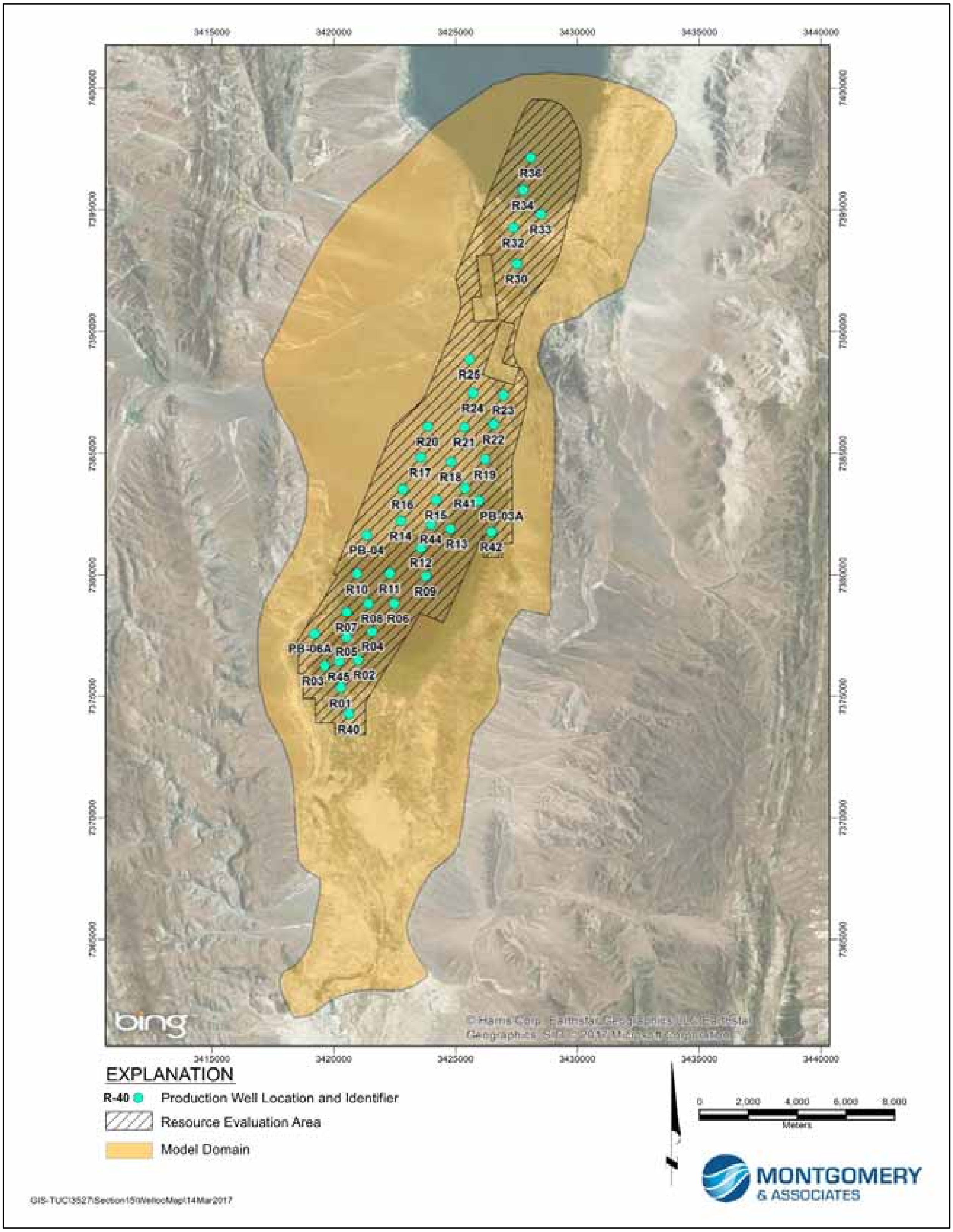


TABLE 15.1
SUMMARY OF PREDICTED BRINE AND LITHIUM PRODUCTION

Well	Brine Volume Produced (m^3)a	Pumping Duration (days)	Average Pumping Rate (m^3/d)b	Maximum Predicted Drawdown (meters)	Production Concentrations Minimum (mg/L)c	Maximum (mg/L)	Average (mg/L)	Lithium Mass Produced (grams)
PB-03A	15,191,094	14610	1,040	95	758	827	786	11,935,289,773
PB-04	11,683,600	11688	1,000	61	548	579	573	6,695,956,701
PB-06A	5,111,700	5113	1,000	63	566	573	572	2,926,163,334
R14	4,389,938	13514	325	100	726	740	734	3,220,831,923
R15	12,850,640	14610	880	95	785	789	788	10,122,076,613
R10	2,833,784	3287	862	57	617	626	621	1,760,789,950
R18	21,299,150	14610	1,458	95	761	764	763	16,242,601,286
R21	14,530,045	14610	995	99	677	703	683	9,923,766,853
R24	7,240,831	8401	862	80	745	749	746	5,404,260,672
R12	4,745,975	14610	325	93	783	785	784	3,721,368,366
R13	5,622,610	8035	700	81	785	785	785	4,412,354,158
R11	7,564,393	14610	518	85	683	719	705	5,332,233,763
R09	5,841,200	14610	400	82	755	763	756	4,418,127,478
R19	11,004,251	8035	1,370	89	620	627	623	6,850,567,823
R22	6,276,096	11323	554	82	562	571	567	3,557,700,253
R23	3,084,673	9497	325	35	733	737	736	2,269,448,013
R25	4,787,816	2922	1,639	62	552	556	554	2,654,167,213
R30	17,387,143	14610	1,190	53	653	658	655	11,393,296,255
R32	21,137,740	14610	1,447	73	655	658	656	13,856,396,021
R33	13,022,621	10227	1,273	52	570	570	570	7,423,149,140
R34	8,349,048	5479	1,524	77	563	565	564	4,711,411,194
R36	8,683,992	7670	1,132	58	579	582	580	5,039,311,302
R06	4,745,975	14610	325	93	773	791	778	3,691,719,941
R08	8,761,800	14610	600	84	675	706	688	6,025,163,770
R07	7,886,340	13149	600	92	589	600	594	4,685,725,536

TABLE 15.1
SUMMARY OF PREDICTED BRINE AND LITHIUM PRODUCTION

	Brine Volume	Pumping	Average Pumping	Maximum Predicted	Production Concentrations			Lithium Mass
Well	**Produced (m^3)a**	**Duration (days)**	**Rate (m^3/d)b**	**Drawdown (meters)**	**Minimum (mg/L)c**	**Maximum (mg/L)**	**Average (mg/L)**	**Produced (grams)**
R04	8,983,027	6940	1,294	94	706	717	710	6,380,585,726
R05	14,676,075	14610	1,005	74	651	673	659	9,665,550,881
R02	5,200,850	4018	1,294	88	677	683	680	3,535,416,242
R03	2,307,274	2922	790	68	638	645	640	1,476,917,291
R01	12,184,446	14610	834	86	735	745	741	9,027,538,430
R16	16,063,300	14610	1,099	89	599	712	663	10,650,594,200
R17	22,824,566	14610	1,562	83	762	773	768	17,532,171,552
R20	30,907,398	14610	2,115	93	755	757	756	23,360,563,271
R40	3,190,849	5114	624	38	785	792	787	2,512,770,913
R41	17,523,600	14610	1,199	76	778	785	783	13,715,087,775
R42	2,444,080	4748	515	61	734	753	744	1,819,335,629
R44	14,603,000	14610	1,000	70	785	785	785	11,463,351,056
R45	18,983,900	14610	1,299	69	636	672	648	12,301,128,096

Note: *am^3 = cubic meters*
bm^3/d = cubic meters per day
cmg/L = milligrams per liter

15.2 LITHIUM MINERAL RESERVE ESTIMATE

Using the groundwater model, we computed the average lithium content of brine for the proposed wellfield. The output was tabulated and analysed to calculate the Mineral Reserve to the end of a 40-year production period. Proven Mineral Reserves were produced up to the end of Year 5 of the simulation and Probable Mineral Reserves were produced from the beginning of year 6 to the end of year 40.

Because the model does not project excessive drawdown in either well field at the end of 40 years, and pumped brine is still projected to be above the cut-off grade, the current numerical model projections suggest that additional brine could be pumped from the basin from the proposed well fields past a period of 40 years. However, the model projects that it would become increasingly difficult to remain in compliance with the property and drawdown constraints without curtailing the production rate or without adding additional production wells in other areas. Consequently, the Mineral Reserve Estimate was calculated for 40 years.

Based on our understanding of the conceptual hydrogeologic system and results of the numerical model, we believe it is appropriate to categorise the Proven Mineral Reserve as what we believe is feasible to be pumped to the ponds and recovered at the end of the process during the first 5 years. After 5 years of operation, the numerical model should be recalibrated based on demonstrated results and new projections should be done.

Mineral Reserves for lithium are summarised in Table 15.2, with key points as follows:

- Proven Mineral Reserves (without processing losses)
  - The Proven Mineral Reserves for lithium are 35,000 tonnes
  - The Proven Mineral Reserves for Lithium Carbonate Equivalent (LCE) are 187,000 tonnes.

- Probable Mineral Reserves (without processing losses)
  - The Probable Mineral Reserves for lithium are 246,000 tonnes
  - The Probable Mineral Reserves for LCE are 1,312,000 tonnes.

- Total Mineral Reserves (without processing losses)
  - The Total Mineral Reserve for lithium is 282,000 tonnes
  - The Total Mineral Reserve for LCE is 1,499,000 tonnes.

The updated Mineral Reserve Estimate was calculated for a 40-year pumping period. Because the average pumped brine for each year during the 40-year period is projected to have a minimum grade larger than 675 mg/L of lithium a cut-off grade was not used to reduce the Mineral Reserve Estimate.

TABLE 15.2 SUMMARY OF ESTIMATED PROBABLE AND PROVEN MINERAL RESERVES WITHOUT PROCESSING LOSSES					
Classification	**Time Period (Years)**	**Projected Total Brine Pumped (cubic metres)**	**Projected Average Grade Li (mg/L)**	**Total Li mass in Tonnes**	**Total LCE mass in Tonnes**
PROVEN	1 - 5	49,344,735	712	35,159	187,000
PROBABLE	6 - 40	354,436,038	695	246,474	1,312,000
Total	**40 years total**	**403,780,773**	**698**	**281,633**	**1,499,000**

The Measured and Indicated Mineral Resources are inclusive of the Mineral Reserves and are not "in addition" to the Mineral Reserves. It should be noted that the Mineral Reserve Estimate presented in Tabe 15.2 is based on the Mineral Resource Estimate prepared by King, Kelley, Abbey, (2012), which is presented on Table 6.1.

LCE is calculated based the following conversion factor:

Mass of LCE = 5.323 x Mass of lithium

The conversion is direct and does not account for estimated processing losses.

Therefore, based on the model simulations, the total amount of lithium in the brine supplied to the ponds in 40 years of pumping is estimated to be about 1.5 million tonnes of LCE, before processing losses. Modeling results indicate that during the 40-year pumping period, brine will be slightly diluted by fresh and brackish water, resulting in reduced concentrations of lithium in the pumped brine; to compensate for the average decline in concentration, a slightly increased total annual pumping has been simulated to maintain similar production of LCE.

15.2.1 Summary of Mineral Reserve Estimates and Anticipated Process Losses

During the evaporation and concentration process of the brines, there will be anticipated losses of lithium. Therefore, the total amounts provided in Table 15.2 do not include anticipated loss of lithium due to process losses and leakages, and therefore cannot be used for determination of the economic reserve. According to the SQM chemical engineers, the amount of recoverable lithium in the brine feed is calculated to be about 71% of the total brine supplied to the ponds. Table 15.3 gives results of the Proven and Probable Mineral Reserves from the well field when these percent estimated processing losses are factored, assuming continuous average brine extraction rates.

TABLE 15.3 SUMMARY OF ESTIMATED PROBABLE AND PROVEN MINERAL RESERVES, ASSUMING 71% PROCESS EFFICIENCY					
Classification	**Time Period (Years)**	**Projected Total Brine Pumped (cubic metres)**	**Projected Average Grade Li (mg/L)**	**Total Li Mass in Tonnes**	**Total LCE Mass in Tonnes**
PROVEN	1 - 5	49,344,735	712	24,963	132,876
PROBABLE	6 - 40	354,436,038	695	174,997	931,507
Total	**40 years total**	**403,780,773**	**698**	**199,959**	**1,064,383**

15.2.2 Relative Accuracy and Confidence in Mineral Reserve Calculation

The relative accuracy and confidence in the Mineral Reserve estimation is dominantly a function of the accuracy and confidence demonstrated in sampling and analytical methods, development and understanding of the conceptual hydrogeologic system, and construction and calibration of the numerical groundwater flow model. As has been demonstrated in the previous report sections, input data and analytical results via sample duplication, the use of multiple methods to determine brine grade, and to obtain aquifer parameters from pumping tests have been validated.

Using standard methods, a conceptual geological and hydrogeologic model consistent with the geologic, hydrogeologic, and chemistry data obtained during the field exploration phases of the project was prepared. The conceptual model was then used to prepare the numerical groundwater flow model. In addition, the calibration of the numerical model iteratively provided support for the conceptual hydrogeologic model. As a result, we have a reasonably high level of confidence in the ability of the aquifer system to yield the quantities and grade of brine calculated as Proven and Probable Mineral Reserves.

15.2.2.1 Deleterious Elements

Along with lithium, the pumped brine is projected to contain significant quantities of potassium magnesium, sulfate, and boron. These constituents must be removed from the brine to enable effective retrieval of the lithium.

16.0 MINING METHODS

Information in this Section has been excerpted and summarized from the Feasibility Study reported in 2017 (Burga et al., 2017). The reader is referred to Burga et al. (2017) for detailed information. Note that the feasibility study and derived information was based on the 2017 Mineral Reserve Estimate.

16.1 PRODUCTION WELLFIELD

A total of 38 wells were used to simulate brine production at the Cauchari-Olaroz salars. The pumping schedule for the simulation is shown on Figure 16.1. Production was maintained at 19 of the wells for the entire 40-year simulation period. As shown on Figure 16.2, these wells are predominantly located in the central portions of the salars, which minimizes capture of lithium from outside the Resource Evaluation Area.

Figure 16.1 Simulated Brine Production Well Schedule

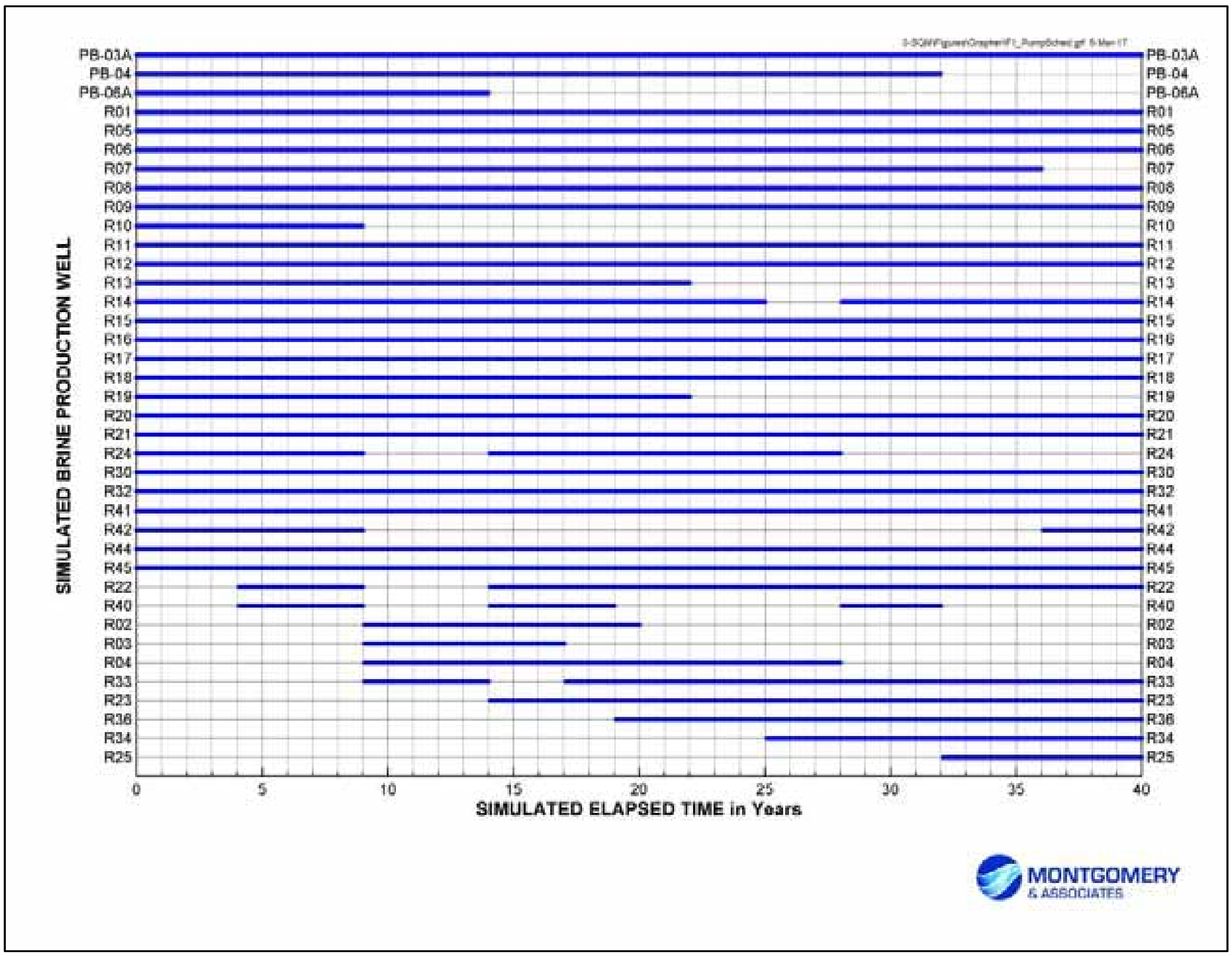
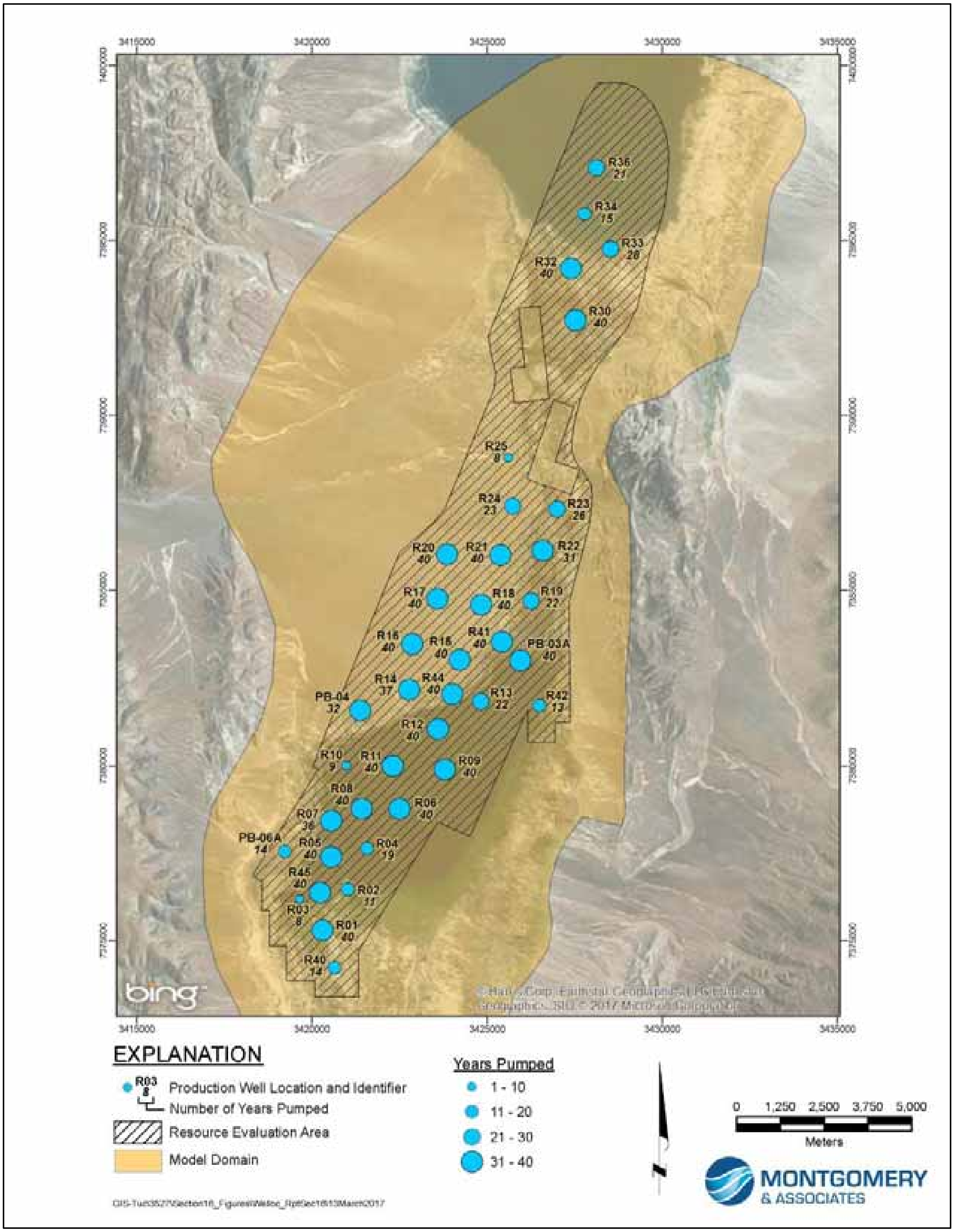


Figure 16.2 Simulated Brine Production Well Locations and Number of Years Pumping



17.0 RECOVERY METHODS (BRINE PROCESSING)

Information in this Section has been excerpted and summarized from the Feasibility Study reported in 2017 (Burga et al., 2017). The reader is referred to Burga et al. (2017) for detailed information. Note that the feasibility study and derived information was based on the 2017 Mineral Reserve Estimate.

17.1 GENERAL

As described in the 2012 Feasibility Study, the Lithium recovery process consists of:

- Brine production from wells;
- Sequential solar evaporation;
- Pond-based impurity reduction;
- Plant-based impurity polishing;
- Lithium carbonate precipitation;
- Mother liquor treatment and recycle;
- Lithium carbonate crystal compaction and micronization; and
- Lithium carbonate packaging.

The current process design, based on testing and simulation, has been enhanced with:

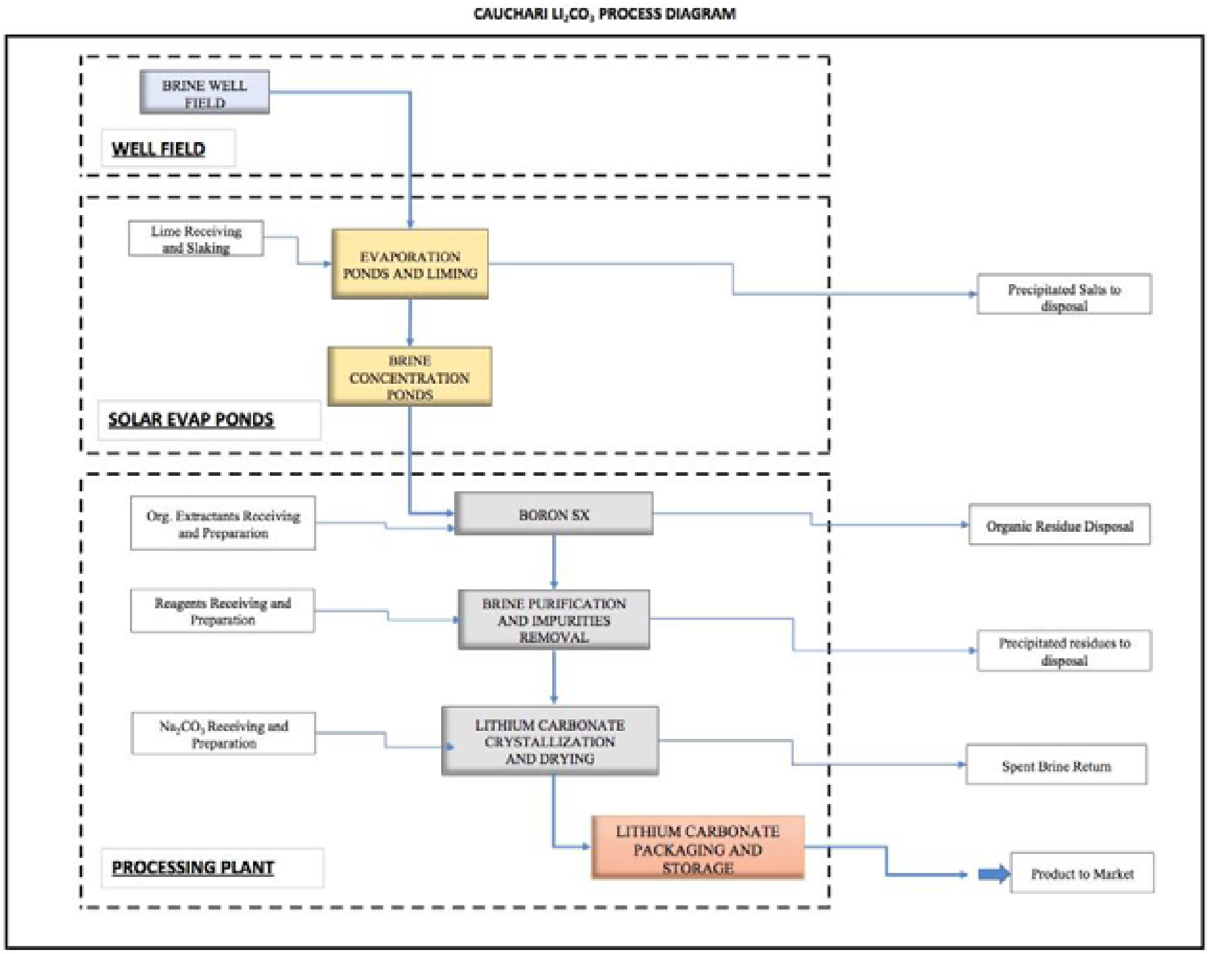
- Pond-Based Sulfate And Boron Reduction;
- Plant-Based Potassium Chloride Reduction; and
- Mother Liquor re-Concentration.

17.2 PROCESS DESCRIPTION

17.2.1 Process Block Diagram

Figure 17.1 shows the process diagram.

Figure 17.1 Process Block Diagram



17.2.2 Pond Surface Area

Using the above-mentioned rate, a total pond surface area of 11.4 km^2 is required to produce 25,000 tpa of lithium carbonate. An additional 0.6 km^2 pond area is required to enable salt harvesting and maintenance. Daily monitoring of pan evaporation and weekly pond mass balancing will be utilized to adjust surface area requirements as necessary during operations.

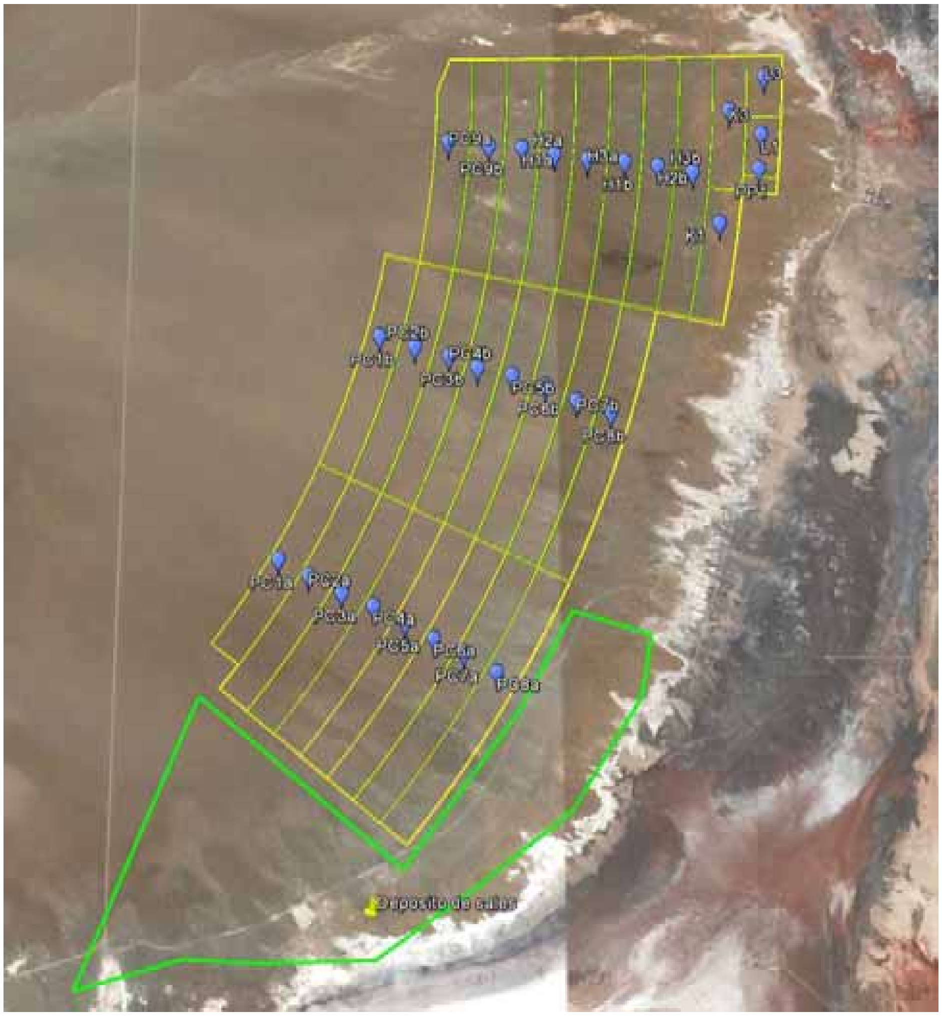
The pond system consists of 29 evaporation ponds segregated into the following types:

- 18 pre-concentration ponds;
- 6 ponds as Halite ponds;
- 2 ponds as Sylvinite ponds;
- 1 pond as a precipitates pond; and
- 2 ponds as lithium control.

17.2.3 Pond Layout

Figure 17.2 presents the outline of the ponds and the salt disposal area.

Figure 17.2 Evaporation Ponds and Salt Disposal Area



17.2.4 Pond Transfer System

Each pond is equipped with a pump and pipeline system for feeding brine to the next pond in sequence. The pumps, pipelines, and ponds are arranged geometrically in order that brine flows along the long axis of a given pond to avoid bypassing of lower concentration brine.

The following describes the criteria for the operation of the Lithium Carbonate Plant:

- Plant operating capacity is 25,000 tpa;
- The plant operates 330 days per year (90.4% availability) and 22 hrs/day (97.2% utilization);
- Design factor of 1.2;

- Lithium carbonate plant yield is 84%;
- Lithium carbonate has a purity of at least 99.5%;
- Lithium carbonate product has a particle size of approximately 10 microns (battery grade);
- Existing water in the area is rich in chlorine, sulphate, boron and calcium, thus an osmosis plant and water softener are required to obtain the water quality needed by the process; and
- Product is packed into 0.5 – 0.6 to 1.2 tonne maxi bags and 20 – 25 kg bags for shipping and dispatching to customers through ports of embarkation.

17.3 LITHIUM CARBONATE PLANT ENGINEERING DELIVERABLES

17.3.1 Engineering Design Deliverables

Table 17.1 summarizes the quantity of deliverables provided by the engineering team.

TABLE 17.1
ENGINEERING DESIGN DELIVERABLES

Items	Drawings	Documents	Total
General	-	29	29
Process	186	15	201
Mechanics	11	94	105
Civil/Structural	33	20	43
Piping	6	18	24
Electricity	30	29	59
Total	**266**	**176**	**432**

18.0 PROJECT INFRASTRUCTURE

Information in this Section has been excerpted and summarized from the Feasibility Study reported in 2017 (Burga et al., 2017). The reader is referred to Burga et al. (2017) for detailed information. Note that the feasibility study and derived information was based on the 2017 Mineral Reserve Estimate.

18.1 MAIN FACILITIES LOCATION

Figure 18.1 presents the location of the main facilities that are part of the Phase 1 for the Cauchari project, including:

- Well Field;
- Evaporation ponds;
- Lithium Carbonate Plant;
- Salt and Process residues disposal; and
- Camp.

18.2 BRINE EXTRACTION

18.2.1 Well Field

At start-up, twenty-six (26), Cauchari Salar production and reserve wells, with average nominal 15 L/s capacity, will provide 334 L/s of brine to the ponds.

18.2.2 Well Pumps

Submersible well pumps will be equipped with variable speed drives. Flow from each well will be monitored before discharging into a common pipeline. Brine from four or five wells are combined into a single pipe to induce homogenization of the brines.

18.2.3 Well Field Electric Power Distribution

A 6.5 km 23 kV transmission line from the main plant substation feeds the two substations in the well field located at brine collection ponds PDA-4 and PDA1. The substations downgrade the voltage for distribution to the pond pumps. Low voltage aerial distribution lines feed power to well pumps, where local transformers provide 400 V power to well pumps.

18.3 EVAPORATION PONDS

There are 29 evaporation ponds located in the south-east area of the property, and consist of:

- 18 pre-concentration ponds;
- 6 halite ponds;
- 2 sylvinite ponds;
- 1 impurities polishing tailings pond; and

- 2 mother liquor re-concentration ponds.

Figure 18.1 Site Main Facilities

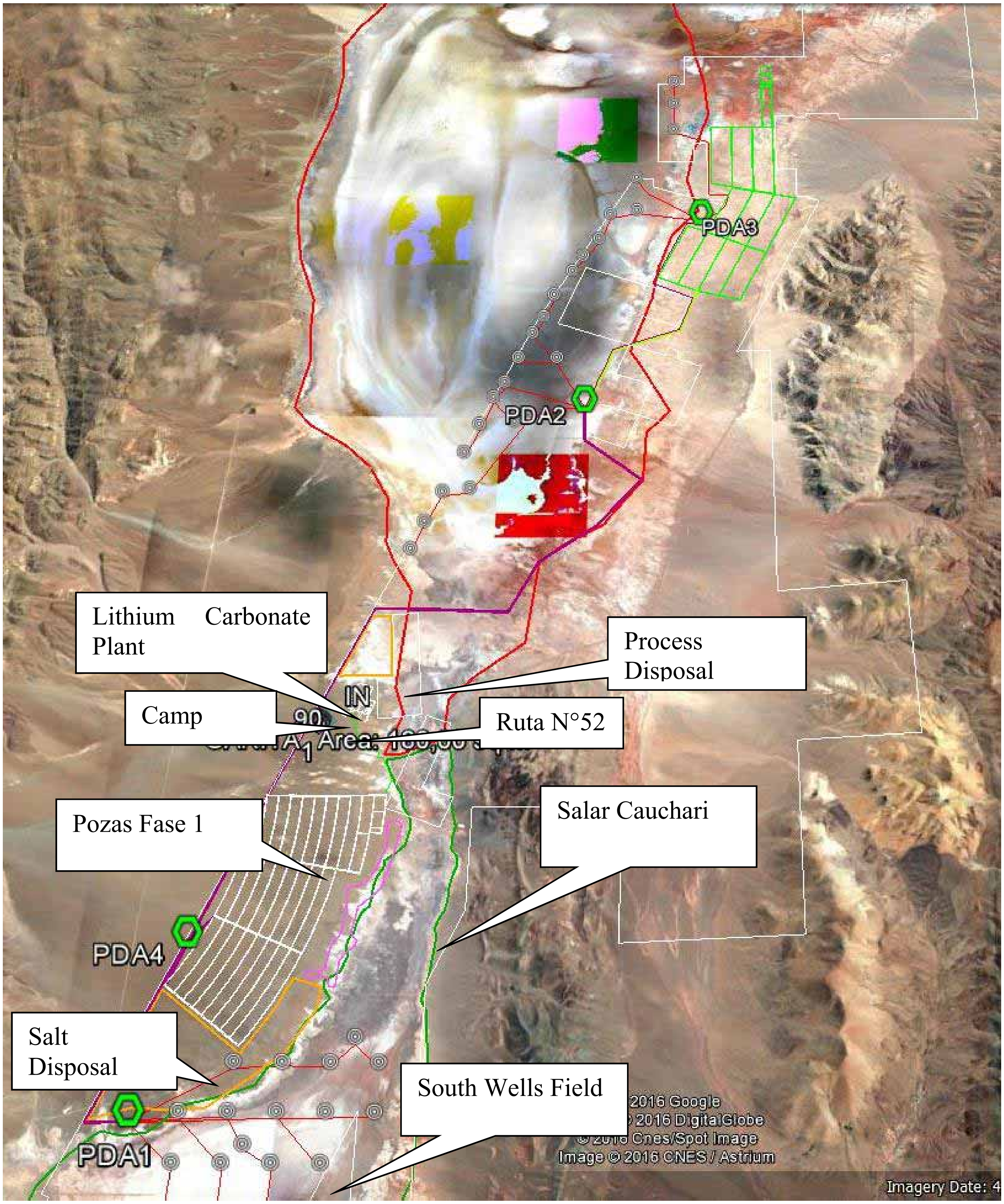
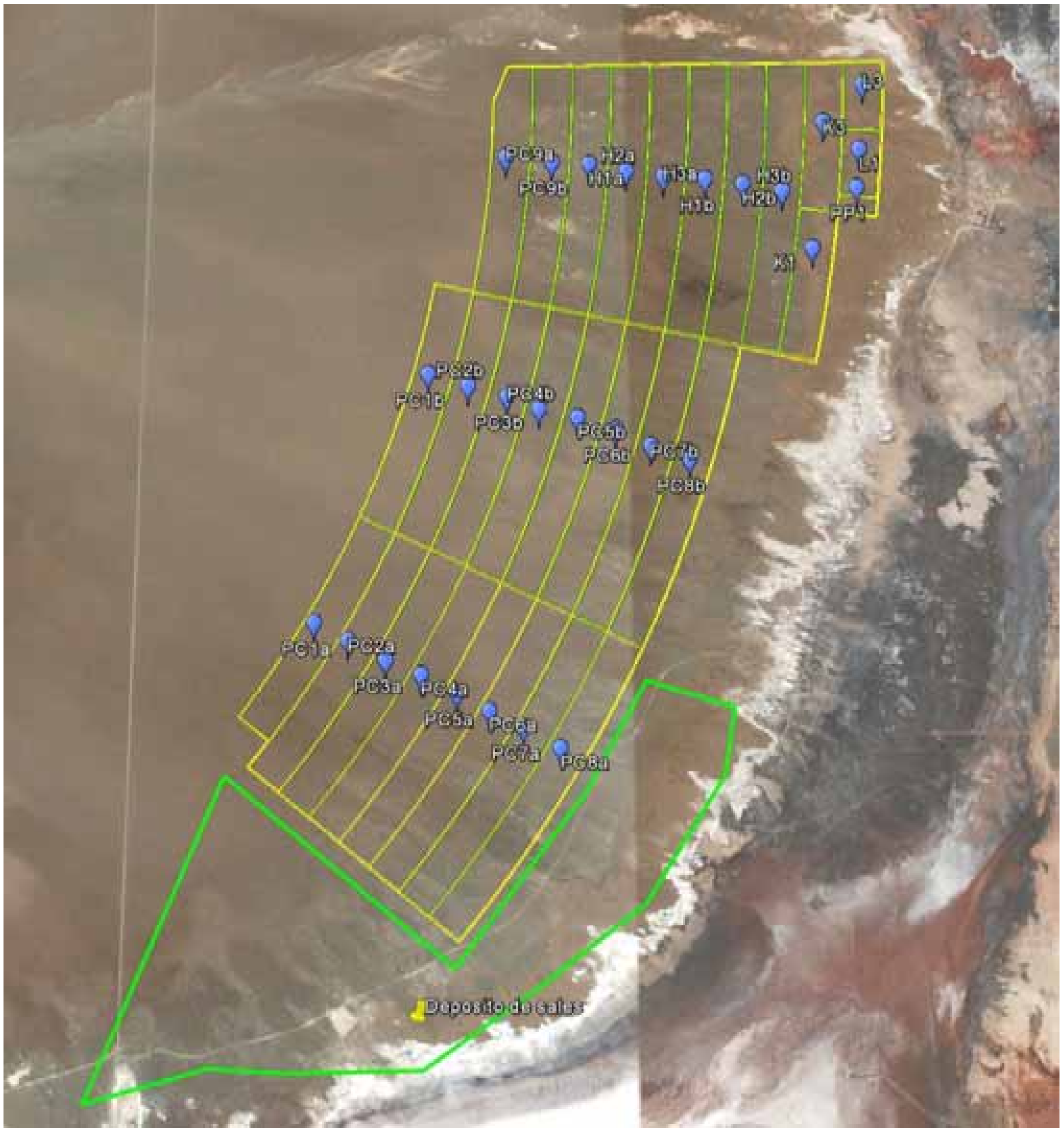


Figure 18.2 shows the location of the evaporation ponds.

Figure 18.2 Evaporation Pond Layout



18.4 SALT HARVEST EQUIPMENT

Pond design and operation call for removal of the salt deposits formed at the bottom of the ponds. For this purpose, typical earthmoving machinery will be used, such as bulldozers, front end loaders and dump trucks.

18.5 LITHIUM CARBONATE PLANT

The plant is located approximately 800 m north of National Highway 52. Plant equipment is designed for a 0.80 On Stream Factor (7,006 hours per year).

18.6 SUPPORTING SERVICES

18.6.1 Fresh Water

The 80 L/s of fresh water requirements be provided by local wells with the watershed. The infrastructure for water handling include wells, low-voltage transmission lines to power the wells, piping, two storage ponds of 15,000 m^3/each, and a storage tank at the plant. A pumping system will fill a water storage tank located in the plant.

At present, water requirements for the existing pilot plant and camp facilities (70-person camp) are satisfied from a well drilled in the Archibarca Fan, located immediately to the west of the pilot plant. This well (PBI) has a flow capacity of 26.9 l/s and is currently pump limited (not specific capacity limited).

The official permit to exploit fresh water from the Archibarca Fan is sufficient for the Project requirements (Phase 1 - 25,000 tpa LCE).

Exploration for alternative sources of fresh water will be conducted in the watershed that could satisfy a potential doubling of production to 50,000 tpa LCE, and may be of higher quality.

18.7 PERMANENT CAMP

The permanent camp and construction camp will be located approximately 300 m north of National Highway 52. The permanent camp includes 15,000 m^2 of buildings and 35,700 m^2 of external facilities.

The permanent camp includes: administration building, habitational area, dining facilities, medical room, maintenance workshops, spare parts warehouse, laboratory, lockers, gym, soccer field, helipad and parking lots. The habitational area including single bedrooms with private bathrooms, dormitories with private bathrooms and large dorm rooms with shared bathrooms.

Temporary modules will be utilized during construction to accommodate a maximum construction crew capacity of approximately 800 people. These modules will be consider gradual installation of habitational modules and as necessary to support construction crews. Special modules for construction crew will be added and removed as construction cycle is finished.

Figure 18.3 and Figure 18.4 show the camp layout and its components.

Figure 18.3 Camp General Layout

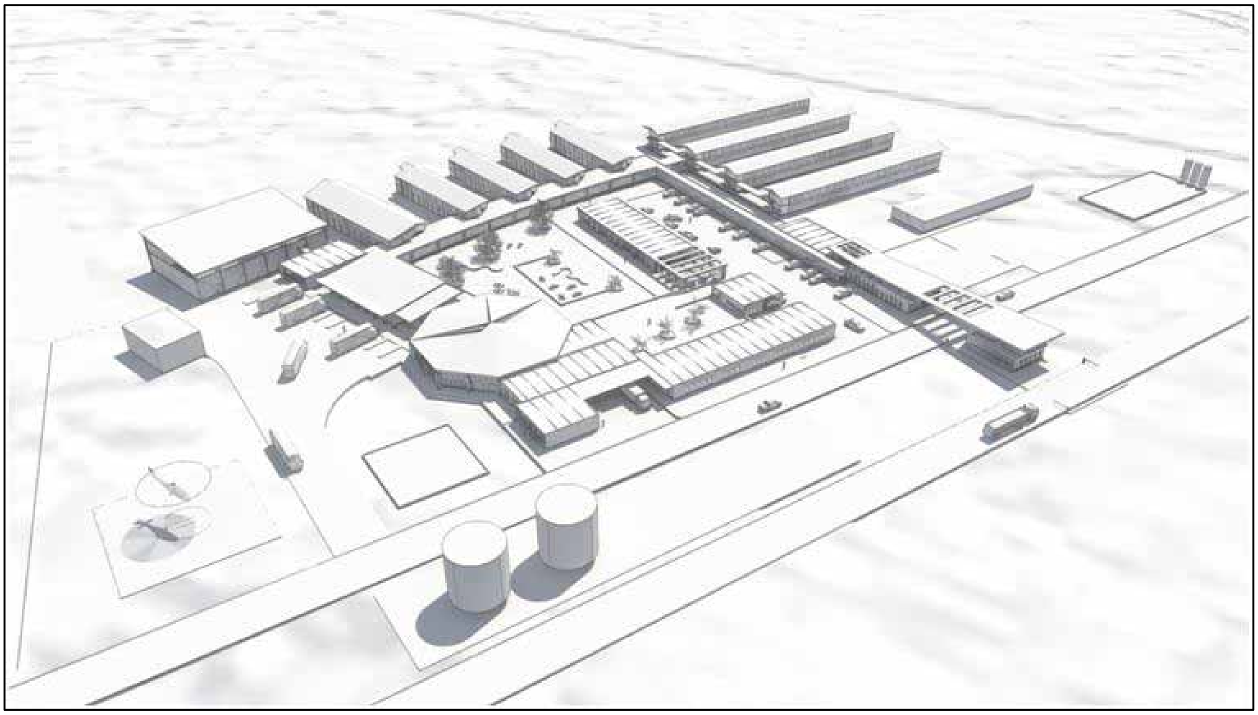


Figure 18.4 Camp Entrance

18.8 OFF SITE INFRASTRUCTURE AND SUPPORT SYSTEMS

18.8.1 Natural Gas Pipeline

The natural gas pipeline will transport fuel to the Project from the Rosario gas compression station located 52 km south of the plant. The main pipeline belongs to Gas Atacama.

18.8.2 Electrical Power Supply

Electricity will be provided by a new 138 kV transmission line that will interconnect with an existing 345 kV transmission line located approximately 60 km south of the Project.

The 23 kV local electrical distribution system will provide power to the plant, camp, PDA brine homogenizing pools/lime pumps, wells and ponds. In general, all the distribution is aerial unless there are major restrictions then the underground distribution is adopted.

The estimated load for the Project is in the order of 46,590 MWh/y or 7-8 MW assuming a design factor of 1.2.

A stand-by diesel generating station, located closed to main substation, will power selected equipment during outages.

19.0 MARKET STUDIES AND CONTRACTS

Information in this section has been excerpted and summarized from the Feasibility Study reported in 2017 (Burga et al., 2017). The reader is referred to Burga et al. (2017) for detailed information.

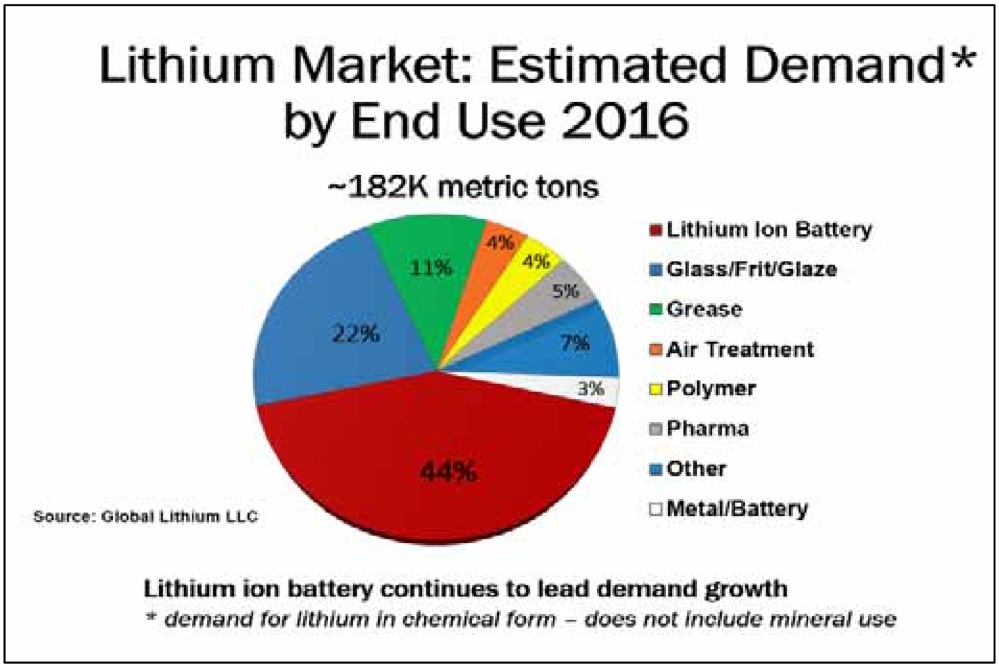
19.1 LITHIUM DEMAND

As this decade began the market for lithium chemicals could only be described as tiny compared to other metals such as copper or nickel. In 2017, based on both volume growth and higher prices, the world market will exceed US$ 2 billion. If prices remain at 2017 levels, the market size is forecast to exceed US$ 4 billion in 2020. The recent rise in prices has not slowed demand growth. In major lithium applications such as rechargeable batteries, most uses in glass, multipurpose grease, and pharmaceuticals, lithium raw materials tend to be a low percentage of the final product cost across applications. Generally speaking, demand for lithium chemicals is relatively price inelastic.

The combination of a sustained period of high demand growth in the electric transportation and ESS markets coupled with a tight supply situation exacerbated by the long lead times and difficulties bringing new lithium projects to market will create many attractive investment opportunities in the lithium space over the next decade.

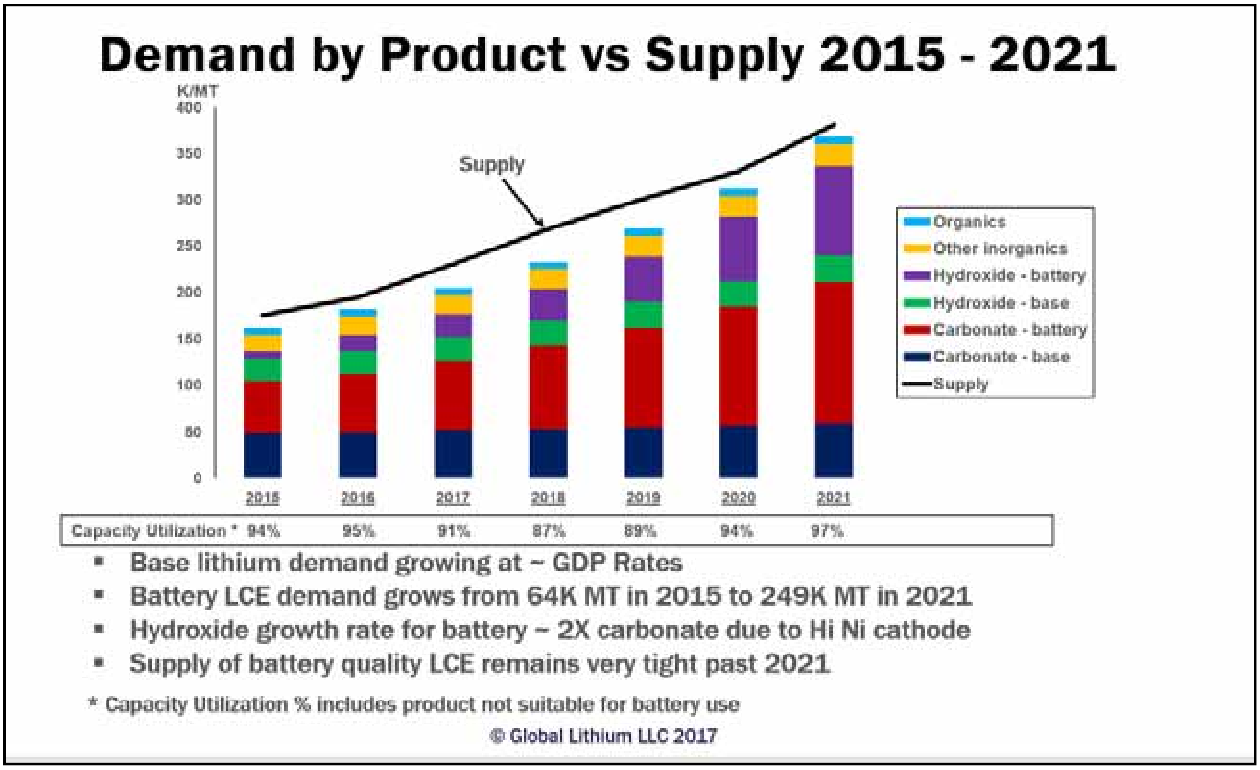
In 2016, global demand for lithium chemicals was approximately 182,000 MT of LCE (Figure 19.1). Global Lithium estimates the lithium ion battery share of demand was 44% or approximately 80K MT LCE. Glass related applications are the second largest demand at 22% followed by grease at 11%. The top three applications account for more than 75% of demand.

Figure 19.1 Global Lithium End Use in 2016



In the past, battery demand was driven by growth in the use of cell phones (and later smart phones), laptops, tablets, power tools, etc. The rapid growth anticipated in the next ten years will be led by the growth in electric transportation: automobiles, buses, delivery vehicles, bikes, scooters, etc., and Energy Storage Systems (ESS) for management of electrical grids and storage of energy generated from renewable sources – primarily wind and solar. Projections for the speed of development of both e-transportation and ESS vary widely. Global Lithium projects that in 2021 battery related demand will represent 68% of market demand or approximately 250K MT with total lithium demand increasing to ~ 370K MT (Figure 19.2).

Figure 19.2 Projected Global Lithium Demand to 2021



Battery demand drives the demand for lithium ion battery cathode which is the key driver of lithium demand. The major lithium raw materials used to make ion battery cathode are lithium carbonate and lithium hydroxide. Depending on the power needs and charge/discharge (cycle) requirements there are various types of cathodes used. Lithium raw material requirements vary by cathode type.

19.2 LITHIUM SUPPLY

Lithium supply comes in two basic forms: 1) mineral based also called "hard rock", normally in the form of spodumene and 2) lithium containing brines. Starting in the 1980s, brine based lithium chemicals provided most of the supply; however, in recent years' mineral-based forms have moved to near parity with brine as the feedstock for lithium chemical production.

In the coming five years, significant investment is expected from both established players (SQM, Albermarle, Ganfeng, and Tianqi) and juniors such as Galaxy and Lithium Americas. Albemarle's LaNegra 2 expansion is in start-up. Additional production from Talison being converted in China by Tianqi and Albermarle is underway. Both Galaxy's Mt Cattlin and Mt Marion (partially owned by Ganfeng) are currently ramping up and have made shipments to customers. The numbers in Table 19-1 below are believed to be more conservative than public guidance.

TABLE 19.1
LCE PROJECTED SUPPLY GROWTH FROM 2017 TO 2021

LCE Supply Growth from 2017 to 2021 - Metric Tons

	Type	2017	2018	2019	2020	2021
Albemarle - LaNegra 2	Brine	5,000	13,000	20,000	20,000	20,000
Albemarle - Talison	Mineral	2,940	9,800	12,740	12,740	12,740
Tianqi - Talison	Mineral	3,060	10,200	13,260	13,260	13,260
Orocobre	Brine	1,000	2,500	4,000	5,000	10,000
SQM	Brine	2,000	4,000	4,000	9,000	16,500
Ganfeng - Mt Marion	Mineral	15,000	25,000	30,000	30,000	3,000
Lithium Americas/Ganfeng	Brine	-	-	-	5,000	12,500
Galaxy - Mt Cattlin via China	Mineral	10,000	17,000	20,000	20,000	20,000
Galaxy - SDV	Brine	-	-	-	-	5,000
Quebec - NAL/Nemaska	Mineral	2,000	5,000	10,000	15,000	20,000
China	Brine	2,000	5,000	8,000	13,000	17,000
Pilbara/Altura	Mineral	-	-	5,000	12,000	18,000
Total		43,000	91,500	127,000	155,000	168,000

Source: *Global Lithium LLC.*

China brine in Qinghai and Tibet is expected to have a slow incremental rise in production, as has been the case the past several years. Orocobre's Olaroz Project in Argentina is assumed to continue to ramp up Phase 1 and begin start-up of a Phase 2 in 2021. The failed Canada Lithium/RB Energy project is expected to begin operations as North American Lithium (NAL) – producing spodumene in 2017 and starting the refurbished carbonate plant in late 2018 with a slow ramp-up. Nemaska is trying to start-up an electrolytic hydroxide pilot plant in 2017. Global Lithium also believes a fourth spodumene operation will start up in Western Australia by the end of the decade. Product will be shipped to China for conversion. Expansions of conversion capacity in China by Ganfeng, Sichuan Tianqi, Albermarle, Yahua, Ruifu and several others should have sufficient capacity to process the additional spodumene production from Western Australia.

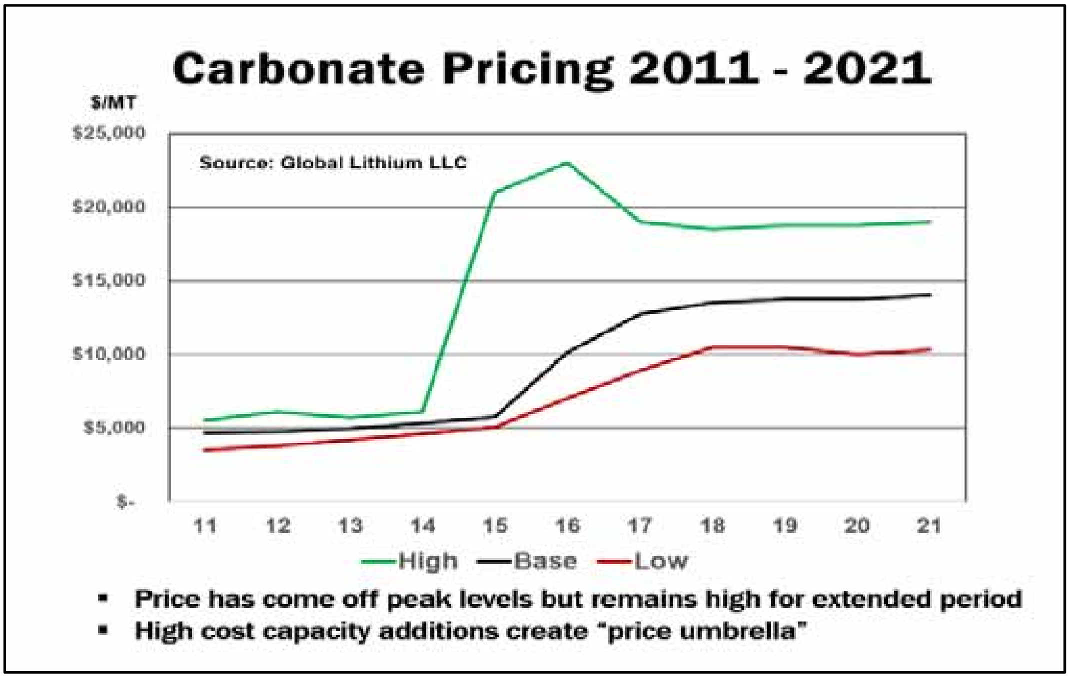
Finally, there are numerous announced projects that predominantly lack financing and teams capable of executing construction and production in the near term. Lithium is a small industry and the number of capable, technically trained engineers with lithium experience is very limited. This, coupled with the phenomena of lithium projects being late and/or failing to produce at all (Canada Lithium, Galaxy's Jiangsu carbonate plant, Orocobre's Olaroz project, FMC's failed expansion in Argentina, and ALB's LaNegra 2 delay) are the basis for Global Lithium's conservative view of capacity additions.

19.3 LITHIUM PRICES

Total lithium chemical supply has narrowly exceeded demand in recent years. The lack of timely capacity additions by brine producers in South America coupled with an increasing rate of demand growth will put pressure on the supply/demand balance over the next several years.

Despite capacity being slightly higher than demand, due to long, complex supply chains, some of the capacity producing at a quality level that is unacceptable for use in the high growth battery market and the monopolistic behavior of certain producers, prices have increased dramatically since the third quarter of 2015 from a global average price of lithium carbonate in the $6,000 per ton range to over $12,000 per metric ton in early 2017. A range of projected prices to 2021 is presented in Figure 19.3.

Figure 19.3 Projected Pricing for Lithium Carbonate to 2021



A more conservative projected pricing schedule than what is presented in Figure 19.3 has been adopted for the economic analysis presented in Section 22, as displayed in Table 19.2.

TABLE 19.2 **PRICING SCENARIOS ADOPTED FOR THE ECONOMIC ANALYSIS OF THE PROJECT**		
Pricing Scenarios **Per Tonne - Lithium Carbonate**		
Low	Medium	High
$10,000	$12,000	$14,000

19.4 OFFTAKE CONTRACTS

Production from the Project will be allocated between the partners of Minera Exar in accordance with their ownership. LAC has agreed to lithium carbonate Offtake Entitlements with two counterparties, Ganfeng and Bangchak. These offtake entitlements are related to strategic investment agreements by the counterparties, which include both debt facilities for Project construction and equity participation in the Company.

19.4.1 Ganfeng Offtake Entitlement

As outlined in the LAC press release dated January 17, 2017, Ganfeng and LAC have agreed to terms for an Offtake Entitlement such that Ganfeng may purchase of up to 70% of a portion of LAC's share of the Project's lithium carbonate production at market prices, rising to 80% only if/when Bangchak's 15% offtake becomes effective. The entitlement does not apply to potential future expansion(s). The transaction will close following receipt of formal acceptance by Chinese authorities.

19.4.2 Bangchak Offtake Entitlement

As outlined in the LAC press release dated January 19, 2017, Bangchak and LAC have agreed to terms for an Offtake Entitlement such that Bangchak may purchase up to 15% of a portion of LAC's share of the Project's lithium carbonate production at market prices. The entitlement does not apply to potential future expansion(s). Pursuant to the Company's announcement on January 19, 2017, LAC anticipates closing the financing with BCP Innovation Pte Ltd., a wholly-owned subsidiary of Bangchak Corporation Public Company Ltd., ("Bangchak") subsequent to the closing of the Ganfeng Lithium transaction.

20.0 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

Information in this section has been excerpted and summarised from the Feasibility Study reported in 2017 (Burga et al., 2017). The reader is referred to Burga et al. (2017) for detailed information.

20.1 ENVIRONMENTAL AND SOCIAL STUDIES

LAC hired Ausenco Vector to carry out environmental and social studies required for the Project. The Environmental Impacts Report ("EIR") for the operational phase of the Project was presented to the corresponding authorities in December 2011 and approved on 08 November 2012, thus complying with existing environmental permits in the province of Jujuy, Argentina, and also with the international standards. The continued validity of this permit was ratified by a letter issued by the Gobierno de Jujuy (NOTA SMeH No 043/20179), issued on March 16, 2017.

An update to the EIR was submitted to the authorities on 14 February 2017.

20.1.1 Permits and Authorities

The Provincial Department of Mines and Energy, under the Secretariat of Mining and Hydrocarbons, approved LAC's EIR for the exploration work of the Cauchari-Olaroz Project (Resolution No. 25/09 on August 26, 2009). Subsequent updates have been made to accurately reflect the ongoing exploration program (some are awaiting approval).

LAC also obtained a water supply license for the exploration program. This license was granted by Jujuy's Provincial Department of Water Resources.

20.1.2 Environmental Liabilities

LAC adheres firmly to the Equator Principles[2] ("EP"), maintaining the following measures as a minimum:

- Make the effort to understand and respect local customs, traditions, lifestyles and needs.
- Commit to meet the country standards.
- Establish safety procedures for its own staff, consultants and contractors.
- A FPIC (Free and Prior Informed Consent) shall be granted, thereby respecting the rights of nearby communities to access information. The two-way open communication will be kept permanently, and before each stage of the Project is initialized, nearby communities will receive the required information to participate.

[2] EP: Credit risk management framework for determining, assessing and managing environmental and social risk in Project Finance transactions.

- As long as relationships with communities through agreements that define roles and responsibilities are formalized, they may be used to reduce the risk of misunderstandings relative to the presence, activities and intentions of LAC in the area.

Indigenous and Tribal Peoples' Rights: As defined in the ILO (International Labour Organization[3]), will be ratified and will respect the Indigenous and Tribal Peoples' Convention, 1989 (No. 169).

20.1.3 Environmental Baseline Studies

Ausenco Vector completed a baseline field survey between September 2010 and July 2011 with further fieldwork carried out in March 2015 and October 2016. A brief summary of the studies are presented as follows:

- **Climate –** Climate studies conclude that the Project site is affected by strong and persistent westerly winds, particularly from October to May. The average annual temperature is 5.1°C and the maximum and minimum annual averages are 15.6°C and -6.6°C respectively. The annual average rainfall is approximately 50 mm and the average monthly relative humidity varies between 32% and 62% from January to February, to a minimum average ranging from 11% to 19% from September to November.

- **Water Quality –** Surface and groundwater water samples from 3 surface locations (over three separate campaigns) determined that surface water concentrations of aluminum, boron and iron exceed the permissible limits for drinking water. The groundwater samples showed acceptable values in most of the physico-chemical parameters analyzed, boron being the only element that exceeds the Water Quality Reference Levels values throughout the area; inferred to be as a result of the lithologies present in the area.

- **Air Quality –** Baseline and/or subsequent air quality campaigns measuring PM_{10}, SO_2, NO_2, H_2S, O_3, lead and gases were below allowable levels. Noise measurements were also below the World Health Organization guideline value of 70 dBA.

- **Soils –** Soils in the Project area are generally unsuitable for cultivation and use is restricted to natural pastures and wildlife and recreation. Soil units were classified based on taxonomic classification and according to land capability classes (Soil Survey Staff, 1999)[4]. All soils are in Class VII and Class VIII, which are marginal soils used for extensive livestock breeding, and for tourism and mining.

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[3] ILO: International organization responsible for drawing up and overseeing international labour standards.

[4] Soil Survey Staff. (1999). Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys (2nd ed.). Washington D.C.: US Department of Agriculture Soil Conservation Service.

- **Flora –** Fieldwork identified dry woodlands, yaretas subshrub steppe, herbaceous steppe and stipa sporobolus, peladales and wetlands, within the Project area of influence. Additional vegetation monitoring in 2015 and 2016, reported similar results and infers that there have not been significant changes to the plant communities.

- **Fauna –** Fauna surveys identified 26 species of which 2 belong to the reptile class, 17 to birds and 7 to mammals.

- **Ecosystem Characterization –** The Project area has a low diversity, although there are some zones within it that are more diverse than others, such as shrub steppes and meadows, with the Archibarca cone showing the greatest biodiversity. were carried out in the area of the pilot plant in March 2015 and in October 2016. Diversity results from follow up fauna and flora monitoring campaigns in 2015 and 2016, indicate no significant change in the diversity parameters.

- **Limnology –** The composition of the phytoplankton, zooplankton, phytobenthos and microinvertebrate communities in water bodies close to the Project, present high salinity and hydrological stress situations, to which the few species that were documented are adapted to. The extreme conditions have been proposed as the main reason that the diversity of macroinvertebrate species in the Project area is low.

- **Landscape –** Five landscape units were identified: Cauchari-Olaroz Salt Flats; Alluvial Plain; Isolated Mountains; Mountains West of Cauchari; El Tanque Mountains. The visual quality of the Cauchari-Olaroz Salt Flats landscape unit, in the Project area, has the highest visual quality and fragility value. The EIR for Exploitation addresses the need for preserving the current morphology of the landscape, chromatic variation, landscape perspectives, as well as the preservation of the natural ecosystem, particularly with respect to the height of the salt heaps and visibility of the ponds from the national and provincial roads.

- **Paleontological Study –** Geological background information and the results of field studies within the Cauchari-Olaroz salt flats to date, have concluded that the area has no paleontological significance.

- **Archaeological Study –** Intensive and extensive surveys carried out in the area resulted in the identification of the presence of 56 archaeological sites: Northeast; East; Southeast; West; and Center West sectors. The Northeast, East and Southwest sectors have low archaeological sensitivity, and the West and Centre West sectors have a medium-high sensitivity, with sites CV02, CV08, CV09, CV10 and CV26 possessing high sensitivity.

- **Social Characteristics –** The area of direct influence for the Project includes the communities of Susques, Huáncar, Pastos Chicos, Puesto Sey, Catua and Olaroz Chico. LAC has designed and implemented a Community Relations Plan for the long-term cooperation with the population and the communities have signed a Convention approving all stages of the Project.

- **Framework Legal Study –** A compilation of international, national, and provincial norms and standards applicable to the EIR was made. Special emphasis was given to Argentine environmental standards (National level) and especially in the Province of Jujuy (Provincial level), applicable to mining projects. All relevant state institutions involved in the implementation of the legislation and the permits that need to be managed to construct and operate the Project were taken into account. As a base guideline for the Project, the Environmental Protection Act for Mining Activity No. 24585 and its supplementary regulations was used.

- **Evaluations of Impacts –** The identification, description and assessment of potential environmental and social impacts, both positive and negative, were performed for the construction, operation and closure stages of the Project.

- **Community Relations Plans –** LAC has developed a plan that promotes social and economic development within a sustainability framework. LAC began work on the Community Relations Plan with the Susques Department in 2009. This plan was created to integrate local communities into the Project, by implementing programs aimed at generating positive impacts on these communities and minimising negative impacts. LAC has signed formal contracts with neighboring communities that own the surface ground where the Project will be developed. According to these contracts, the communities grant LAC traffic and other rights, while LAC ensures them a regular cash flow, to be used as the members of the communities decide.

20.1.4 Waste and Tailing Disposals

20.1.4.1 Pond Solid Wastes

The evaporation process in the ponds leaves considerable amounts of salts on the bottom of the ponds that must be harvested and transported to proximal stockpiles at a rate of approximately 8,400 tonnes/day. The salt piles are normally up to 10 m high and it is estimated that approximately 390 ha of piles will be built over a 40-year period, at an estimated distance of 2.3 km from the pond sector.

These discarded salts can be considered as inert waste. The salts are generated from brines already present in the salt flat and do not introduce foreign compounds to it. Basically, they are composed of sodium chloride (common salt), sodium and calcium sulphates and boron. It is estimated that sodium chloride and sulphate make up over 87 % of this waste.

20.1.4.2 Tailings Liquid Disposal

The Project generates discarded salts and liquid wastes during the process, mainly brines, which do not represent a contamination risk. These liquid wastes are sent to the above-mentioned evaporation ponds and the Project does not require a tailings dam. Several possible sites for the evaporation ponds, for the plant's industrial liquid wastes, were analyzed. A 20 ha area close to the plant, on the salt flat, was chosen that presents no risks to populated areas.

21.0 CAPITAL AND OPERATING COSTS

Information in this section has been excerpted and summarized from the Feasibility Study reported in 2017 (Burga et al., 2017). The information in this Section was prepared based on Mineral Resource and Mineral Reserve Estimates presented in Burga et al. (2017). The reader is referred to Burga et al. (2017) for detailed information.

The Capital and Operating cost presented in this section correspond to the planned production capacity of 25,000 TPA of Lithium Carbonate. The cost estimates were based on quotation of third-party vendors for major equipment and construction contractors that will participate on the supply of equipment and construction of the facilities. The experience of SQM in building and operating brine operation were integrated in the work completed by Hatch for this phase of the project.

21.1 CAPITAL COSTS (CAPEX) ESTIMATE

21.1.1 Capital Expenditures - CAPEX

Capital expenditures are based on a design capacity of 25,000 tpa of lithium carbonate at 0.80 on stream factor. The estimates are expressed in current US dollars. No provision was included to offset future cost escalation as expenses and revenue are expressed in constant dollars.

The capital investment for the 25,000 tpa Lithium Carbonate Cauchari-Olaroz Project including equipment, materials, indirect costs and contingencies during the construction period is estimated at US$425 million. The full CAPEX is summarized in Table 21.1.

TABLE 21.1 **LITHIUM CARBONATE PLANT CAPITAL COSTS SUMMARY**	
Item	**US$ M**
Direct Cost	
Brine Wells and Piping	14.8
Evaporation Ponds	129.1
Lithium Carbonate Plant and Aux.	121.5
On-Site Infrastructure	26.3
Off-site Services	41.3
Total Direct Cost	**333.0**
Indirect Cost	
Total Indirect Cost	**37**
Total Direct And Indirect Cost	
Total Direct And Indirect	370
Contingencies (15%)	55
Total Capital	**425**

21.1.2 Brine Extraction Wells

Maximum brine production rate will be achieved by 26 brine wells, including 5 in reserve (Table 21.2). It is estimated that an additional 12 wells will be drilled throughout the 40-year operation to maintain brine productivity. Costs for these well installations are included as part of sustaining capital in the operational expenditure estimate (Section 22).

TABLE 21.2 **PRODUCTION WELLS CAPITAL COST ESTIMATE**	
Description	**Total Projected Budget** **US$ M**
Wells, pumps and auxiliaries	7.9
Power distribution	6.9
Total Costs	**14.8**

21.1.3 Evaporation Ponds

The capital cost estimate for the evaporation and concentration pond facilities is US$129M (Table 21.3).

TABLE 21.3 EVAPORATION AND CONCENTRATION PONDS CAPITAL COST ESTIMATE	
Description	**Total Projected Budget**
	US$ M
Ponds	125.63
Power distribution	3.43
Total Costs	**129.1**

21.1.4 Lithium Carbonate Plant

The direct cost estimate for the construction of the Lithium Carbonate plant is US$121.5M (Table 21.4).

TABLE 21.4 LITHIUM CARBONATE PLANT CAPITAL COST SUMMARY	
Description	**Total Projected Budget**
	US$ M
LIC Plant	
Boron SX	27.7
LIC wet plan	28.9
Dry area	21.8
In-plant evap. circuit	6.6
Plant wide auxiliaries	3.1
Power distribution	3.5
Utilities	13.4
Reagents Area	
Reagents preparation	14.2
Plant wide	0.6
Power distribution	1.7
Total Costs	**121.5**

21.1.5 Offsite Infrastructure Cost Estimate

Offsite infrastructure cost for 41.3M covers for gas and electrical interconnection and transmission. Costs breakdown is shown in Table 21.5.

TABLE 21.5 OFFSITE INFRASTRUCTURE COST	
Item	**US$ M**
Natural gas supply	11.8
Power supply	29.5
Total Offsite Infrastructure Costs	**41.3**

21.1.5.1 Natural Gas Supply to Plant

Natural gas will be obtained from the Rosario gas compression station of the Gas Atacama pipeline located 52 km north of the project site. Cost for this pipeline was obtained from a specific contractor bid.

21.1.5.2 Power Supply to Plant

The transmission system has been designed to provide enough electricity for a production capacity of at least 50,000 tpa LCE.

21.1.5.3 Onsite Infrastructure and General Cost Summary

Onsite infrastructure costs are summarized in Table 21.6.

TABLE 21.6 ONSITE INFRASTRUCTURE AND GENERAL CAPITAL COST SUMMARY	
Description	**Total Projected Budget**
	US$ M
On-Site Infrastructure	
Plant wide	8.9
Camp	15.7
Non-Process Buildings	
Building, Maintenance, Tools	1.7
Total Costs	**26.3**

21.2 INDIRECT COSTS

The factors and results used in estimating indirect costs for this study are given in Table 21.7.

TABLE 21.7 PROJECT INDIRECT COSTS		
Description	**%**	**US$ M**
EP – Engineering and Procurement	1.5	4.88
CM – Construction Management	2.6	8.68
Commissioning	0.3	0.94
Vendor Representative	0.5	1.8
Third Party Services	0.2	0.63
Construction Camp	2.1	6.83
Freight (for client)	3.1	10.41
Spares	0.5	1.8
First Fills (calculated)	0.3	1.05
Total Indirect Costs		**37.02**

21.2.1 Estimate Confidence Range

Expected confidence range of this estimate is ± 15% for direct and indirect costs. Capital equipment costs were estimate in accordance to guidelines to complete a level 2 AACE International Cost estimate suitable for feasibility studies based on bids and contractor price input.

21.2.2 Exclusions

The following items were not included in this estimate:

- Legal costs;
- Special incentives and allowances;
- Permissions and construction insurance, considered in the economic evaluation for tax purposes;
- Escalation; and
- Interest and financing costs.

21.2.3 Currency

All values are expressed in current US dollars, the Argentine peso to US dollar exchange rate used is AR$15.9. No provision for escalation has been included.

21.3 OPERATING COSTS ESTIMATE

21.3.1 Operating Cost Summary

A ± 15% operating cost (OPEX) estimate for a 25,000 tpa lithium carbonate facility has been prepared (Table 21.8). The estimate is based on vendor quotes for main costs such as reagents, labour, fuel (diesel and natural gas), electricity, transportation, plus catering and camp services.

TABLE 21.8 OPERATING COSTS SUMMARY		
Description	**Total 000 US$/Year**	**US$/Tonne Li_2CO_3**
Direct Costs		
Reagents	24,775	991
Maintenance	5,250	210
Electric Power	4,675	187
Pond Harvesting & Tailing Management	8,625	345
Water Treatment System	950	38
Natural Gas	2,125	85
Manpower	4,150	166
Catering, Security & Third Party Services	2,425	97
Consumables	1,275	51
Diesel	1,725	69
Bus-in/Bus-out Transportation	875	35
Product Transportation	3,375	135
Direct Costs Subtotal		**2,409**
Indirect Costs		
G&A	1,895	76
E&C	250	10
Indirect Costs Subtotal		**86**
Operating Costs		
Total Operating Costs		**2,495**

21.3.2 Pond and Plant Reagents Costs Definition

Regents comprise 40% of total OPEX costs and were estimated by SQM using quotes obtained from their existing suppliers for similar facilities. Consumption volumes have been obtained from laboratory work and computer model simulations, performed by SQM and its consultant.

21.3.3 Salt Removal and Transportation

Annual cost for harvesting and disposal of the projected precipitated salts were estimated at US$8,625,000, based on qualified service provider quote.

21.3.4 Energy Cost

Overall electricity consumption is estimated to be 46,590 MWh/year. Electric power is available in the area. The project cost includes the installation of a grid-tied high voltage transmission line to supply all electric power requirements. Electricity costs have been estimated using existing grid pricing of US$0.1/kW.

Current prices of natural gas for new projects in Argentina are in the range of US$5.52/MMBTU at the plant gate including pipeline and other charges. The natural gas consumption rate is estimated to be 1,373 Nm^3/h. Natural gas yearly expenditure is US$2,130,000.

Diesel fuel is also required by the stand-by diesel generators and mobile equipment. Annual diesel cost is estimated to be US$1,723,000.

During construction, when the wells start pumping brine to fill the evaporation ponds, the gas pipeline and/or the electrical power facilities may not be operational. Temporary diesel power generators will be used to meet the energy requirements and are included in the capital cost estimate.

21.3.5 Maintenance Cost

Maintenance cost factors were estimated based on SQM experience in Chilean operations. Yearly expenditures for this item, considering Lithium Carbonate plant and supporting facilities, are estimated at US$5,250,000.

21.3.6 Labour Cost

SQM estimated the workforce requirements based on their experience in similar plant operations. The total number of employees is estimated to be 266 people (Figure 21.1). Salaries were obtained from a survey that included the main mining companies operating in Argentina with similar conditions as the Project.

Monthly total costs, including base salary, contributions, bonuses, benefits and other remuneration inherent to the area and type of work performed, are approximately US$345,800, or US$4,150,000 per year.

21.3.7 Catering and Camp Services Cost

Catering and camp services include breakfast, lunch, dinner and housekeeping. This item amounts to US$ 2,425,000/year and is based on a credible supplier quotation.

21.3.8 Bus In/Bus-Out Transportation

Personnel transportation including bus and pickup truck round-trips between San Salvador de Jujuy and the project site as well as intra-site pickup trucks is estimated to be US$875,000.

21.3.9 General and Administrative Costs

Management salaries, Jujuy office cost, and other related costs total US$1,895,000. Environmental and Closure provisions are estimated to be US$250,000 per year and are consistent with government regulations.

22.0 ECONOMIC ANALYSIS

22.1 INTRODUCTION

The objective of this section is to present an economic analysis of the Project to determine its financial viability. The analysis was prepared by using an economic model and assesses both before- and after-tax cash flow scenarios. Capital and Operational Expenditures presented in previous sections have been used in this analysis. Prices for Lithium Carbonate are from a market study carried out by a third party and summarized in Section 19.1. The model includes all taxes, rebates, government and commercial royalties/payments and community payments.

The results include Net Present Values ("NPV") for different discount rates, Internal Rate of Return ("IRR"), Pay Back periods and sensitivity analysis of key inputs.

22.2 EVALUATION CRITERIA

The following criteria have been used to develop the economic model:

- Project life: Engineering and construction and life of mine is estimated to be 2 and 40 years, respectively.
- Pricing was obtained from a market study (Section 19).
- Production for lithium carbonate is 25,000 tpa in the third year of operations, assuming a ramp up rate of 24% for the first year of operations and 56% for the second year of operations.
- Equity basis: For project evaluation purposes, it has been assumed that 100% of capital expenditures, including pre-production expenses and working capital are financed with owners' equity.
- Brine composition may be suitable for extraction and commercial production of other salts or other chemical compounds such as Boric Acid (H_3BO_3), potassium, etc. these options were not included in this report.
- The economic evaluation was carried out on a constant money basis so there is no provision for escalation or inflation on costs or revenue.
- The exchange rate assumed is AR $15.9/US$.

22.3 TAXES AND ROYALTIES

The following taxes and royalties have been applied to the economic analysis of the Project:

22.3.1 Provincial Royalty

A rate of 1% of sales is applied; which is consistent with Orocobre Ltd.'s Argentine subsidiary (Sales de Jujuy) current royalty payments (the other company operating in the same watershed and producing the same mineral). Provinces can charge up to 3% of the value of the mineral "mine of mouth" according to the Federal Mining Legislation in place (Act. N° 24196), however, the existing provincial royalty precedent was assumed in the model.

22.3.2 Export Refund

PricewaterhouseCoopers (PwC, an independent Tax consultant) has confirmed lithium carbonate is entitled to receive a 2.5% of sales incentive refund for operating in the Puna region.

22.3.3 Mining Licenses

The total annual cost of maintaining mining licences is US$67,000 per year based on the current amount paid by LAC on the mining canon. The amount paid is a function of hectares.

22.3.4 Tax on Debits and Credits Accounts

In Argentina, the tax on debits and credits on bank accounts considers 0.6% on debits plus another 0.6% on credits. Minera Exar is permitted to book 34% of the tax paid on credits accounts as a credit for income tax. Thus, the net effective rate on both debit and credit accounts used in the economic model is 0.996%.

22.3.5 Los Boros Agreement

The Los Boros agreement is described in Section 4.3.1. The economic analysis assumed the following payments will have to be made to Los Boros under the agreement:

- US$300,000 within 10 days of the commercial plant construction start date;
- A US$12MM payment for the exercise of the option, distributed quarterly, as per the agreement, for a total of 60 quarterly installments of US$200,000 each (US$800,000 annually for 15 years); and
- Two lump sum payments of US$7,000,000 each in year 4 and year 24 (royalty buyout payments).

22.3.6 Borax Argentina Royalty Payment

Pursuant to the usufruct agreement dated May 19, 2011, a fixed to amount of US$200,000 per year is to be paid by Minera Exar to Borax Argentina over a total of thirty (30) years. (Paid to date: 5 installments. Remaining installments: 25). The model has assumed the same fixed amount of US$200,000 per year for the remaining 15 years of the Project, and assumes that Minera Exar will extend the agreement with Borax Argentina with the same terms and conditions. The agreement relates to claims that constitute less than approximately 5% of the Project property, and thus is not considered material to the Project's economics.

22.3.7 Aboriginal Programs

The economic model has accounted for all payments pursuant to existing agreements with local aboriginal groups.

22.3.8 Corporate Taxes

The corporate tax rate is 35%.

22.3.9 VAT

VAT payments involve two tax rates affecting goods and services. A reduced rate of 10.5% is applied to local supplied equipment, all bulk materials, construction labour and construction subcontracts that are directly part of the project implementation. A normal rate of 21% has been allocated to project indirect costs. The present regulation considers a return on the VAT payments after two-years. This is included in the model.

22.4 CAPITAL EXPENDITURES SPEND SCHEDULE

The spend schedule for capital expenditures is presented in Table 22.1.

TABLE 22.1
CAPEX EXPENDITURE SPEND SCHEDULE

Description	2017 000 US$	2018 000 US$	2019 000 US$	Total 000 US$
Brine Extraction Wells	3,780	10,400	4,730	18,910
Evaporation Ponds	32,950	90,630	41,190	164,770
Lithium Carbonate Plant	37,720	103,740	41,150	188,610
Infrastructure & General	10,540	28,990	13,180	52,710
Total	**84,990**	**233,760**	**106,250**	**425,000**

22.4.1 Lithium Carbonate Production Schedule

The Lithium Carbonate production schedule is presented in Table 22.2.

TABLE 22.2 PRODUCTION AND REVENUE SCHEDULE			
Year	**Total Revenues 000 US$**	**Accumulated 000 US$**	**Li_2CO_3 (t)**
1	0	0	-
2	0	0	-
3	72,000	72,000	6,000
4	168,000	240,000	14,000
5	300,000	540,000	25,000
6	300,000	840,000	25,000
7	300,000	1,140,000	25,000
8	300,000	1,440,000	25,000
12	300,000	2,640,000	25,000
18	300,000	4,440,000	25,000
24	300,000	6,240,000	25,000
32	300,000	8,640,000	25,000
40	300,000	11,040,000	25,000
Total		**11,040,000**	**920,000**

22.5 OPERATING COSTS SCHEDULE

The operating cost schedule is shown on Table 22.3.

TABLE 22.3
PRODUCTION COSTS

OPEX 000 US$ -- Li2CO3	1	2	3	4	5	6	7	8	9	14	18	22	32	40	Total
DIRECT COSTS															
Reagents	0	0	5,946	13,874	24,775	24,775	24,775	24,775	24,775	24,775	24,775	24,775	24,775	24,775	911,720
Maintenance	0	0	1,260	2,940	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	193,200
Electric Power	0	0	1,122	2,618	4,675	4,675	4,675	4,675	4,675	4,675	4,675	4,675	4,675	4,675	172,040
Pond Harvesting & Tailing Management	0	0	2,070	4,830	8,625	8,625	8,625	8,625	8,625	8,625	8,625	8,625	8,625	8,625	317,400
Water Treatment System	0	0	228	532	950	950	950	950	950	950	950	950	950	950	34,960
Natural Gas	0	0	510	1,190	2,125	2,125	2,125	2,125	2,125	2,125	2,125	2,125	2,125	2,125	78,200
Manpower	249	498	996	2,324	4,150	4,150	4,150	4,150	4,150	4,150	4,150	4,150	4,150	4,150	153,467
Catering, Security & Third Party Service	146	291	582	1,358	2,425	2,425	2,425	2,425	2,425	2,425	2,425	2,425	2,425	2,425	89,677
Consummables	0	0	414	966	1,725	1,275	1,275	1,275	1,275	1,275	1,275	1,275	1,275	1,275	47,730
Diesel	104	207	414	966	1,725	1,725	1,725	1,725	1,725	1,725	1,725	1,725	1,725	1,725	63,791
Bus-In / Bus-Out Transportation	53	105	210	490	875	875	875	875	875	875	875	875	875	875	32,358
Product Transportation	0	0	810	1,890	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	124,200
Direct Cost Subtotal	**551**	**1,101**	**14,562**	**33,978**	**60,675**	**60,225**	**60,225**	**60,225**	**60,225**	**60,225**	**60,225**	**60,225**	**60,225**	**60,225**	**2,218,742**
INDIRECT COSTS															
G & A	1,302	2,603	2,603	1,895	1,895	1,895	1,895	1,895	1,895	1,895	1,895	1,895	1,895	1,895	76,623
E & C			250	250	250	250	250	250	250	250	250	250	250	250	9,500
Indirect Cost Subtotal	**1,302**	**2,603**	**2,853**	**2,145**	**2,145**	**2,145**	**2,145**	**2,145**	**2,145**	**2,145**	**2,145**	**2,145**	**2,145**	**2,145**	**86,123**
Total Li_2CO_3 OPEX	**1,852**	**3,704**	**17,415**	**36,123**	**62,820**	**62,370**	**62,370**	**62,370**	**62,370**	**62,370**	**62,370**	**62,370**	**62,370**	**62,370**	**2,304,864**

22.6 PRODUCTION REVENUES

Production revenues have been estimated based on the three price scenarios for Lithium Carbonate as identified in Table 19.6 and Table 19.9 ($10,000, $12,000 and $14,000 per tonne), and the production schedule shown on Table 22.2. The resulting revenue projection is shown in Table 22.4.

TABLE 22.4
REVENUE, HIGH, MEDIUM AND LOW PRICE SCENARIOS (000 US$)

Revenue 000 US$	*Year*											Total
	1	*2*	*3*	*4*	*5*	*6*	*18*	*19*	*31*	*32*	*40*	
Li_2CO_3												
High Price Scenario: US$ 14,000/Ton	-	-	84,000	196,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000	**12,880,000**
Medium Price Scenario: US$ 12,000/Ton			72,000	168,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	**11,040,000**
Low Price Scenario: US$ 10,000/Ton			60,000	140,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	**9,200,000**

22.7 CASH FLOW PROJECTION

Table 22.5 and Figures 22.1 and 22.2 summarize cash flows for the medium price scenario.

TABLE 22.5
PROJECT EVALUATION MEDIUM PRICE SCENARIO (KUS$)

CAUCHARI OLAROZ PROJECT

PROFIT & LOSS ACCOUNT **Price Scenario** ***12,000*** **US$/ Tonne**

Tax Rate **35%**

Description 000 US$		*17*	*18*	*19*	*20*	*21*	*28*	*38*	*48*		***TOTAL***
		1	*2*	*3*	*4*	*5*	*12*	*22*	*32*	*40*	***000 US$***
Gross Revenues		-	-	72,000	168,000	300,000	300,000	300,000	300,000	300,000	**11,040,000**
EXPENSES		(3,325)	(4,877)	(19,380)	(44,248)	(62,865)	(59,115)	(58,315)	(58,315)	(58,315)	**(2,190,707)**
Operating Costs		(1,852)	(3,704)	(17,415)	(36,123)	(62,820)	(62,370)	(62,370)	(62,370)	(62,370)	**(2,304,864)**
TAXES AND ROYALTIES											
Provincial Royalties (1%)	1%	-	-	(720)	(1,680)	(3,000)	(3,000)	(3,000)	(3,000)	(3,000)	**(110,400)**
Export Refund value (2.5% of Li2CO3 revenue)	2.5%	-	-	-	1,800	4,200	7,500	7,500	7,500	7,500	**268,500**
Mining Licenses		(67)	(67)	(67)	(67)	(67)	(67)	(67)	(67)	(67)	**(2,680)**
Payment of Purchasing Option Los Boros		(800)	(800)	(800)	(800)	(800)	(800)				**(12,000)**
Aboriginal Programs		(106)	(106)	(178)	(178)	(178)	(178)	(178)	(178)	(178)	**(6,963)**
Los Boros		(300)	-		(7,000)				-	-	**(14,300)**
Borax		(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	**(8,000)**
DEPRETIATION		-	-	(256,765)	(86,764)	(87,291)	(6,506)	(6,506)	(6,506)	(15,991)	**(667,501)**
PBIT		(3,325)	(4,877)	(204,145)	36,988	149,844	234,379	235,179	235,179	225,695	8,181,792
Tax Debt and Credits		(1,020)	(2,805)	(1,275)	(1,673)	(2,988)	(2,988)	(2,988)	(2,988)	(2,988)	**(114,341)**
Less Interest											**-**
Accumulated Losses	1,947	(389)	(389)	(389)	(389)	(389)					**(1,947)**
PAIBT		(4,734)	(8,071)	(205,809)	34,925	146,467	231,391	232,191	232,191	222,707	**8,065,503**
Cumulative PAIBT		(4,734)	(12,805)	(218,614)	(183,689)	(37,222)	1,590,154	3,902,551	6,217,460	8,065,503	
Tax After Funding		-	-	-	-	-	(78,362)	(78,642)	(78,642)	(75,322)	**(2,731,051)**
PAIT		**(4,734)**	**(8,071)**	**(205,809)**	**34,925**	**146,467**	**153,029**	**153,549**	**153,549**	**147,384**	**5,334,452**

Figure 22.1 Yearly Cash Flow and Cumulative Cash Flow (Before and After Taxes) at 10% Discount Rate

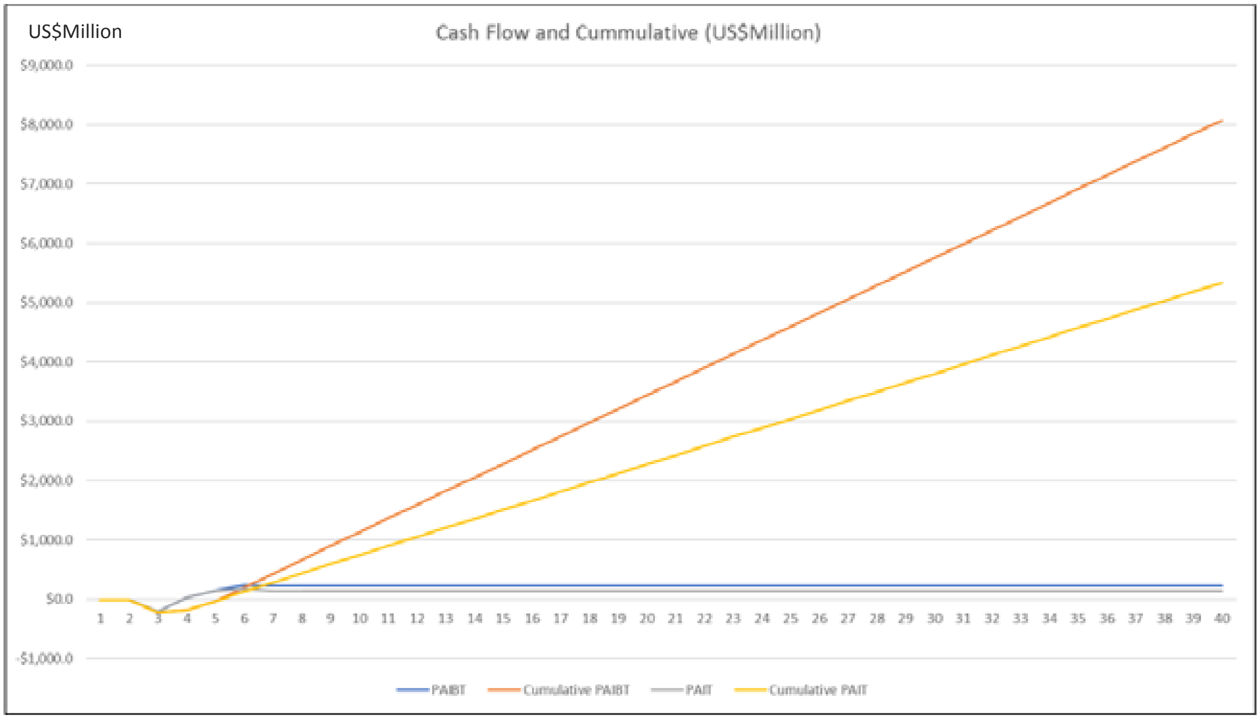
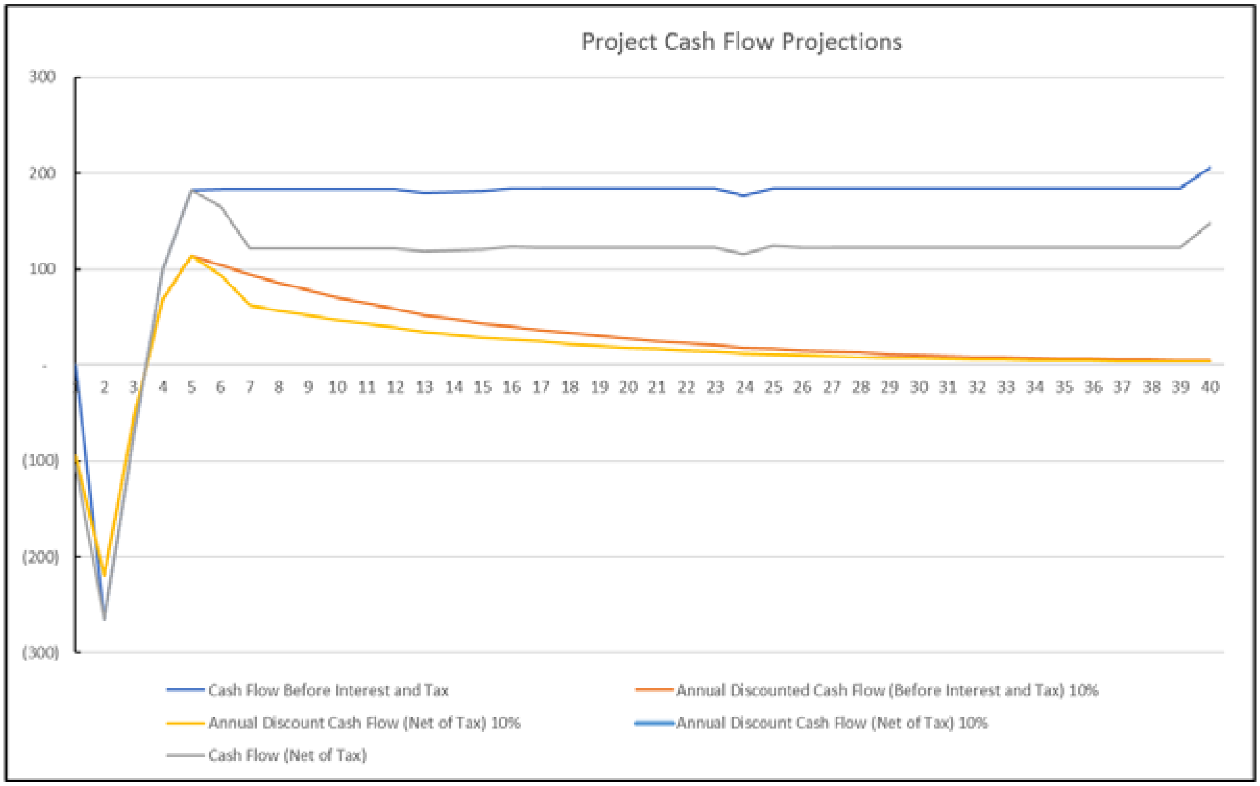


Figure 22.2 Yearly Simple Cash Flow and Discounted Cash Flow (Before and After Tax) at 10% Discount Rate (in US$ M)



22.8 ECONOMIC EVALUATION RESULTS

Project economics resulting from three price scenarios used in the economic model are presented in Table 22.6.

TABLE 22.6 PROJECT EVALUATION RESULTS SUMMARY[1]			
Price Case US$/t Li_2CO_3	**High $14,000**	**Medium $12,000**	**Low $10,000**
CAPEX	425	425	425
Max Negative Cash Flow	265	265	265
Average Yearly Values (US$ M)			
Revenue	350	300	250
OPEX	62.3	62.3	62.3
Other Expenses	8.2	7.2	6.2
EBITDA	282	233	184
Before Taxes (US$ M)			
NPV (6%)	3,064	2,450	1,837
NPV (8%)	2,190	1,728	1,266
NPV (10%)	1,626	1,266	907
DCF (8%) Payback[1]	2Y, 11M	3Y, 4M	3Y, 11M
IRR	39.50%	34%	28.10%
After-Taxes			
NPV (6%)	2,015	1,609	1,204
NPV (8%)	1,420	1,113	807
NPV (10%)	1,042	803	564
DCF (10%) Payback[2]	3Y	3Y, 5M	4Y
IRR	33%	28.4%	23.5%

1. *Presented on a 100% project equity basis. LAC currently owns 62.5% of the project.*
2. *Measured form the end of the capital investment period.*

22.9 PAYBACK ANALYSIS

The base case scenario ($12,000/tonne lithium carbonate) forecasts that Payback occurs in 3 years and 4 months on a before-tax basis and 3 years and 5 months on an after-tax basis.

22.10 SENSITIVITY ANALYSIS

A sensitivity analysis was conducted to illustrate the impact of changes in key variables on the project's NPV and IRR (Table 22.8 to Table 22.11 and Figures 22.3 to 22.6).

TABLE 22.7 PROJECT NPV BEFORE TAXES - 10% DISCOUNT RATE SENSITIVITY MEDIUM SCENARIO							
Driver Variable	**Base Data**		**Project NPV (US$ M)**				
			75%	**90%**	**100%**	**110%**	**125%**
Production	Tonne/Year	$25,000	516	940	1,266	1,626	2,231
Price	US$/Tonne	$12,000	727	1,050	1,266	1,482	1,806
Capex	US$ M	$425	1,355	1,302	1,266	1,231	1,178
Opex	US$/Tonne	$2,495	1,377	1,311	1,266	1,222	1,155

Figure 22.3 Diagram for Project NPV Before Taxes - 10% Discount Rate-Sensitivity Medium Scenario

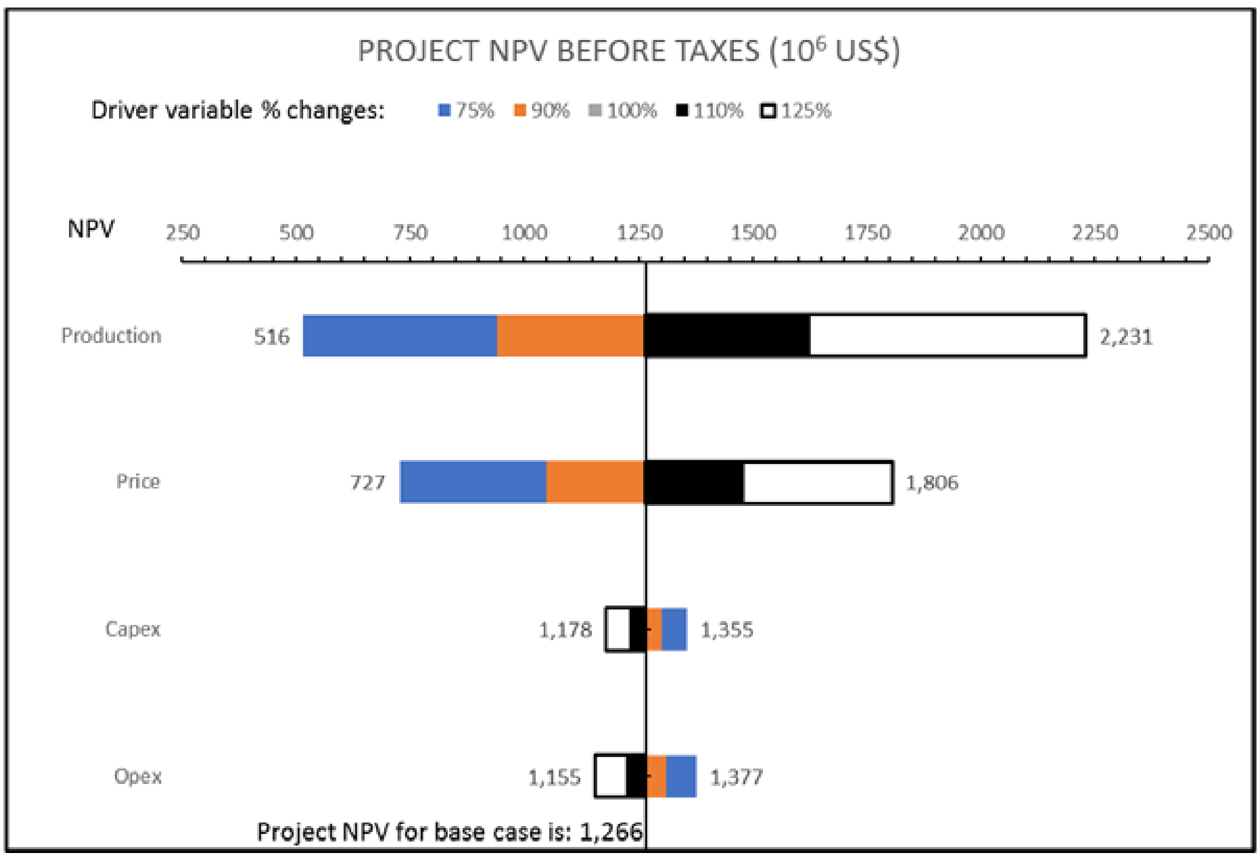


TABLE 22.8 PROJECT IRR BEFORE TAXES -10% DISCOUNT RATE - SENSITIVITY MEDIUM SCENARIO							
Driver Variable	**Base Data**		**Project IRR**				
			75%	**90%**	**100%**	**110%**	**125%**
Production	Tonne/Year	$25,000	21.10%	28.70%	34.00%	39.40%	47.70%
Price	US$/Tonne	$12,000	24.90%	30.50%	34.00%	37.40%	42.10%
Capex	US$ M	$425	41.10%	36.50%	34.00%	31.90%	29.10%
Opex	US$/Tonne	$2,495	35.90%	34.80%	34.00%	33.30%	32.10%

Figure 22.4 Diagram for Project IRR Before Taxes – 10% Discount Rate-Sensitivity Medium Scenario

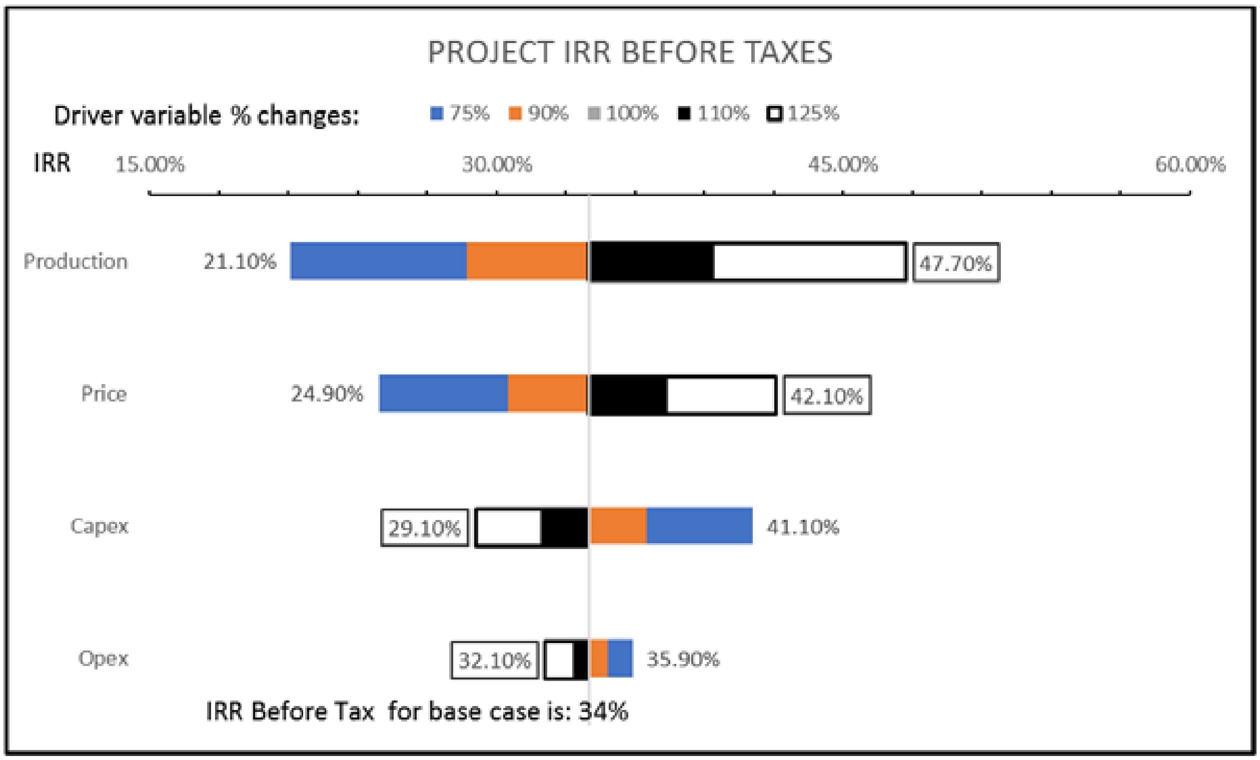


TABLE 22.9 PROJECT NPV AFTER TAXES - 10% DISCOUNT RATE-SENSITIVITY MEDIUM SCENARIO							
Driver Variable	**Base Data**		**Project NPV (US$ M)**				
			75%	**90%**	**100%**	**110%**	**125%**
Production	Tonne/Year	$25,000	301	940	803	1,043	1,215
Price	US$/Tonne	$12,000	443	660	803	947	1,161
Capex	US$ M	$425	870	831	803	776	736
Opex	US$/Tonne	$2,495	877	833	803	744	729

Figure 22.5 Diagram for Project NPV After Taxes - 10% Discount Rate-Sensitivity Medium Scenario

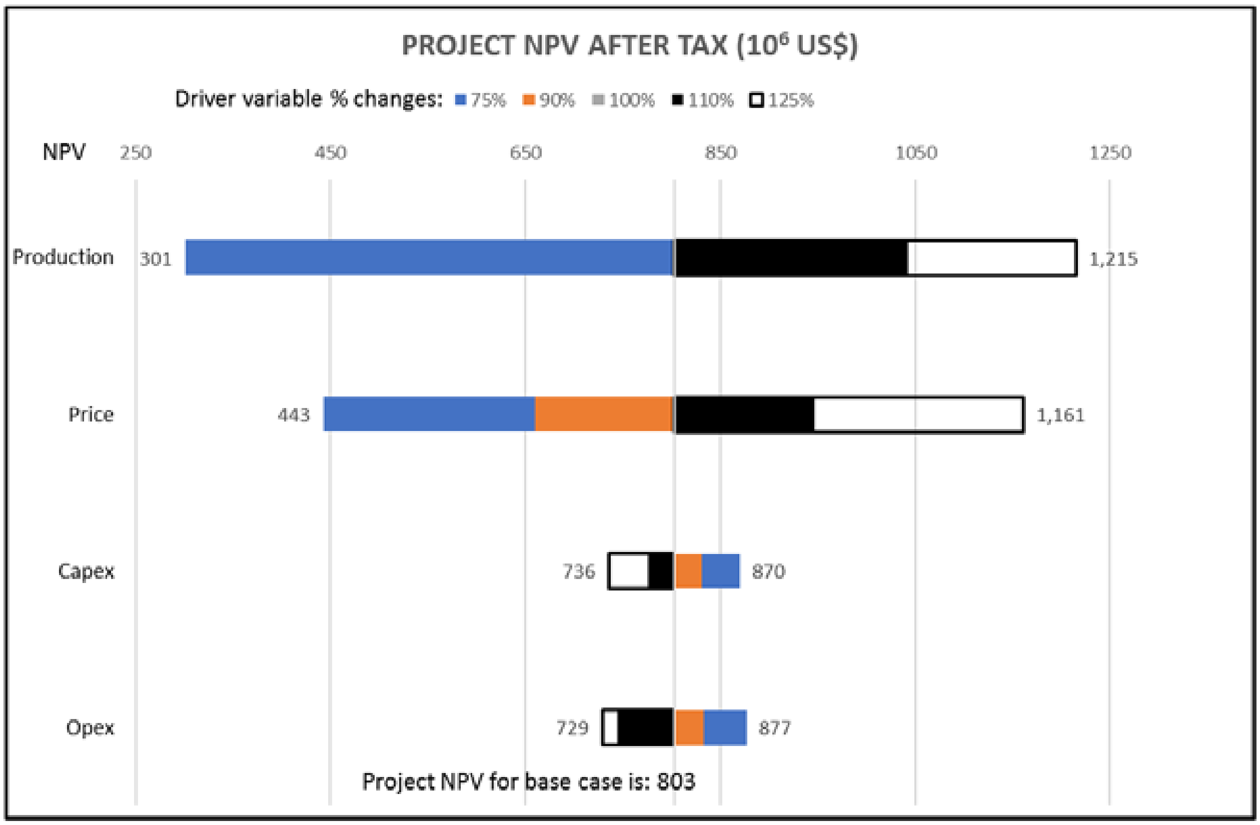
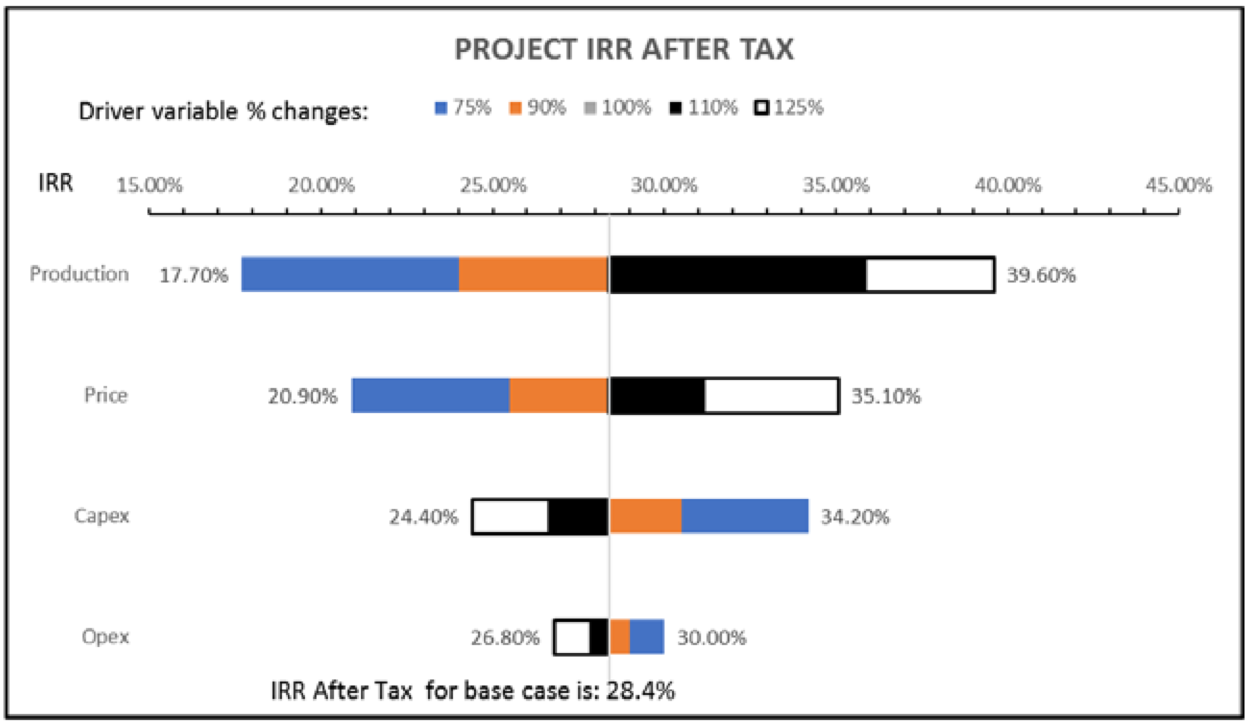


TABLE 22.10 PROJECT IRR AFTER TAXES -10% DISCOUNT RATE-SENSITIVITY MEDIUM SCENARIO							
Driver Variable	**Base Data**		**Project IRR**				
			75%	**90%**	**100%**	**110%**	**125%**
Production	Tonne/Year	$25,000	17.70%	24.00%	28.40%	35.90%	39.60%
Price	US$/Tonne	$12,000	20.90%	25.50%	28.40%	31.20%	35.10%
Capex	US$ M	$425	34.20%	30.50%	28.40%	26.60%	24.40%
Opex	US$/Tonne	$2,495	30.00%	29.00%	28.40%	27.80%	26.80%

Figure 22.6 Project After Tax IRR Sensitivity Medium Scenario



Project economics are most sensitive to variability in product pricing and production. Project results are less sensitive to capital expenditures and total operating costs, but some differences appear when results are measured in terms of NPV. The project is shown to be more sensitive to capital expenditures than to total operating cost when measuring IRR.

22.11 CONCLUSIONS

22.11.1 Economic Analysis

- CAPEX: Capital investment for the 25,000 tpa lithium carbonate project, including equipment, materials, indirect costs and contingencies during the construction period is estimated to be US$425 M. This total excludes interest expense that might be capitalized during the same period.

- Working capital requirements are estimated to be US$12.5 M.

- Sustaining capital expenditures total US$175.4 M over the 40-year evaluation period of the project. Disbursements of these expenditures start in year 3.

- Main CAPEX component is pond construction, which represents 39% of total direct cost of project capital expenditures. Pond investment is driven by two variables, namely, evaporation rate, and pond construction unit cost. The latter has been taken from a detailed quotation analysis, and which accurately represent current costs for this work in Argentina. The evaporation rate was estimated through on-site measurement, meteorological simulation and regional analysis. SQM and its consultant conservatively determined the brine evaporation design criterion for pond design at 2.52 mm/d.

- OPEX: The operating cost for the Project is estimated at US$2,495 per tonne of lithium carbonate. This figure includes pond and plant chemicals, energy, labour, salt waste removal, maintenance, camp services, and transportation. The cost estimate was based on SQM's operating experience and quotations from suppliers and service providers.

- Cash Flow: Cash flow will be according to production ramp up that will reach 100% in year 5 after a decision to proceed is formalized.

- Sensitivity Analysis: Sensitivity analysis indicates that the project is economically viable even under very unfavourable market conditions.

- Other: The Project's economic evaluation presented in this report does not consider any payment on financing taken by the owner of Minera Exar.

22.11.2 Project Strengths

- Brine: The Project is based on the exploitation of subsurface brines, which as a lithium source are commercially proven to be more economic than hard rock sources of lithium.

- Mineral Resources Size: Identified lithium Mineral Reserves (Proven + Probable) are very substantial, over 317,000 tonnes of lithium (nearly 1.5 million tonnes

LCE), enough to meet the 25,000 tpa production rate over 40 years. In addition, potential exists for resource expansion at depth and geographically to the north in Olaroz salar, and laterally outside the existing well capture zones.

- Location – Transportation: The project site is on a major international highway connecting Argentina and Chile. This route provides access to ports in Northern Chile, to bring imported capital goods and raw materials for the project, as well as for exports of product to Asia. In addition, the same route provides connection to Jujuy, Salta and Buenos Aires and allows convenient transportation of local capital goods, raw materials and personnel.

- Location – Energy Access: The project site is only 50 km away from a Natural Gas (NG) trunk pipeline; moreover, the ground over which the feeder pipeline is to be built is the edge of the salar (almost flat and featureless), reducing pipeline construction cost and complexity.

- Location – Favourable Site Conditions: Existence of an alluvial fan separating the Cauchari and Olaroz salars, and LAC's surface rights over this area reduces geotechnical risk as the plant and camp facilities will be on solid ground. Ponds will be constructed on flat ground in the salar. In general, site conditions across the entire property are favourable for this type of facility.

- Energy Costs: Access to NG supplies through the above-mentioned pipeline provides supplies of this fuel at estimated long term costs of approximately US$7 per MMBTU, providing a substantial cost advantage over existing projects in the same general area that do not have access to natural gas.

- Chemical Costs: SQM's existing operations require significant quantities of the same reagents required for the Project and this buying power should result in considerable cost savings for reagents.

- Pricing Estimate: Sensitivity analysis indicates that the project is economically viable even under unfavourable pricing conditions.

22.11.3 Project Weaknesses

- Location – Elevation: The project site is at a high elevation, approximately 4,000m above sea level, which can result in difficult work conditions for individuals used to lower elevations. Medical oxygen tanks will need to be readily available for staff travelling to, and working at, the mine site.

- Brine composition: Relatively high contents of sulphate and magnesium in the brine make it necessary for a chemical treatment with lime to remove these components.

22.11.4 Project Schedule

The schedule is based on mid-2017 construction start, and 2017 activities include:

- Detailed engineering of on-site infrastructure including plant, wells, ponds and camp;
- Definition and acquisition of construction and installation contracts for the Pond Area;
- Equipment and materials procurement for the construction of wells, ponds and the Lithium Carbonate plant;
- Temporary camp construction;
- Commence earthworks for pre-concentration and concentration ponds, Lithium Carbonate plant and facilities;
- Commence production well installation; and
- Start operation of brine wells filling of the pre-concentration ponds.

In 2018, the following activities will occur:

- Completion of well construction;
- Continuance of the pre-concentration ponds construction;
- Construction of permanent camp;
- Continuance of the Lithium Carbonate plant and facilities construction;
- Construction of the concentration ponds; and
- Commence operation phase by filling the first and second pre-concentration ponds strings and the concentration ponds.

In 2019, the following activities will occur:

- Completion of pre-concentration ponds and Lithium Carbonate plant construction;
- The first and second pre-concentration ponds strings and the concentration ponds enter into gradual operation; and
- Beginning of production ramp up of the Lithium Carbonate plant.

In 2020, the following activities will occur:

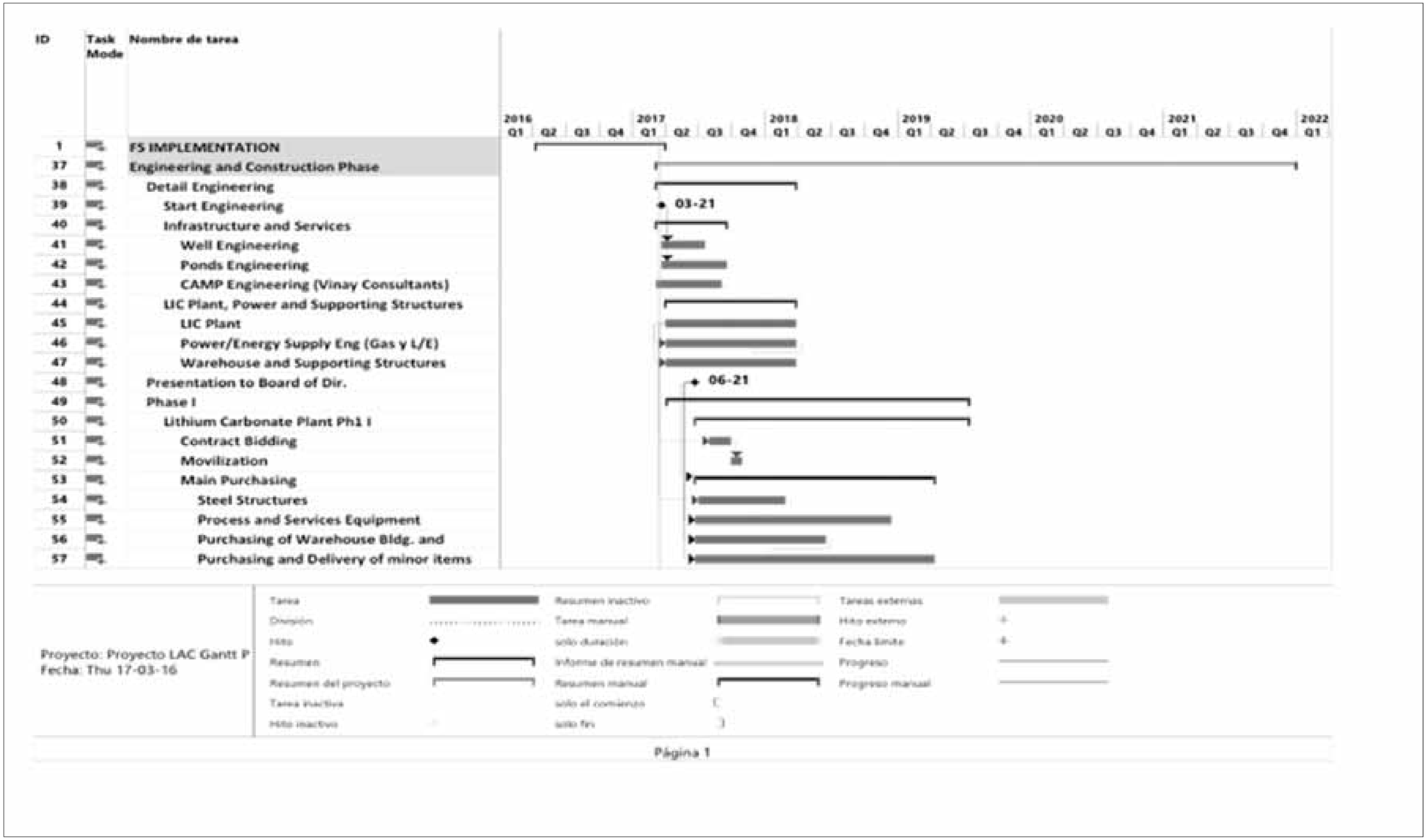
- Continuation of the production ramp up of the Lithium Carbonate plant.

In 2021, the following activities will occur:

- Completion of the production ramp up of the Lithium Carbonate plant.

Figure 22.7 presents these activities in a Gantt chart format.

Figure 22.7 Project Schedule



23.0 ADJACENT PROPERTIES

23.1 OROCOBRE LIMITED

Orocobre Limited ("Orocobre") is an Australian-listed company that owns and operates brine production facilities in the Olaroz and Cauchari Salars, adjacent to the Minera Exar properties. Orocobre's Salar de Olaroz project consists of 63,000 ha of claims (Figure 23.1) and its Cauchari project consists of 28,000 ha of claims.

A Technical Report on the Olaroz properties prepared by Houston and Gunn (2011) highlighted Measured and Indicated Mineral Resources for lithium of 0.27 and 0.94 million tonnes, respectively. The Measured and Indicated Mineral Resources for potassium were 2.08 and 8.02 million tonnes, respectively. Houston and Gunn note mean lithium and potassium concentrations within the nucleus of the salar of 690 mg/L and 5,730 mg/L, respectively.

In a press release dated January 31, 2012, Orocobre reported results of a pump test in the area of the proposed Olaroz extraction field. They reported the test produced average lithium grades of ± 875 mg/L, and that the test ran for more than three months at a flow rate of 14 L/s. Preliminary model results showed brine level drawdown due to pumping will be limited and the decline in grade is predicted to be slow, relative to the assumed project life.

The January 31, 2012 press release also reports results on Orocobre properties in Cauchari, adjacent to those of LAC, including a drill program of six boreholes to depths between 46 to 249 m. The elevated lithium values detected on the adjacent LAC property have been confirmed to extend onto the Orocobre property. Brine geochemistry is interpreted to be similar to the Orocobre Olaroz property. Based on the spacing of the boreholes, Orocobre estimated the lithium brine body to extend over an area of approximately 26 km^2.

In March of 2013, Orocobre began construction of a 17,500 tpa lithium carbonate production facility that was completed in November of 2014 with production subsequently commencing on November 21, 2014.

In an October 23, 2014 press release, Orocobre announced an exploration target, approximately 100 m thick, below its present resource area at a depth between 197 m and 323 m.

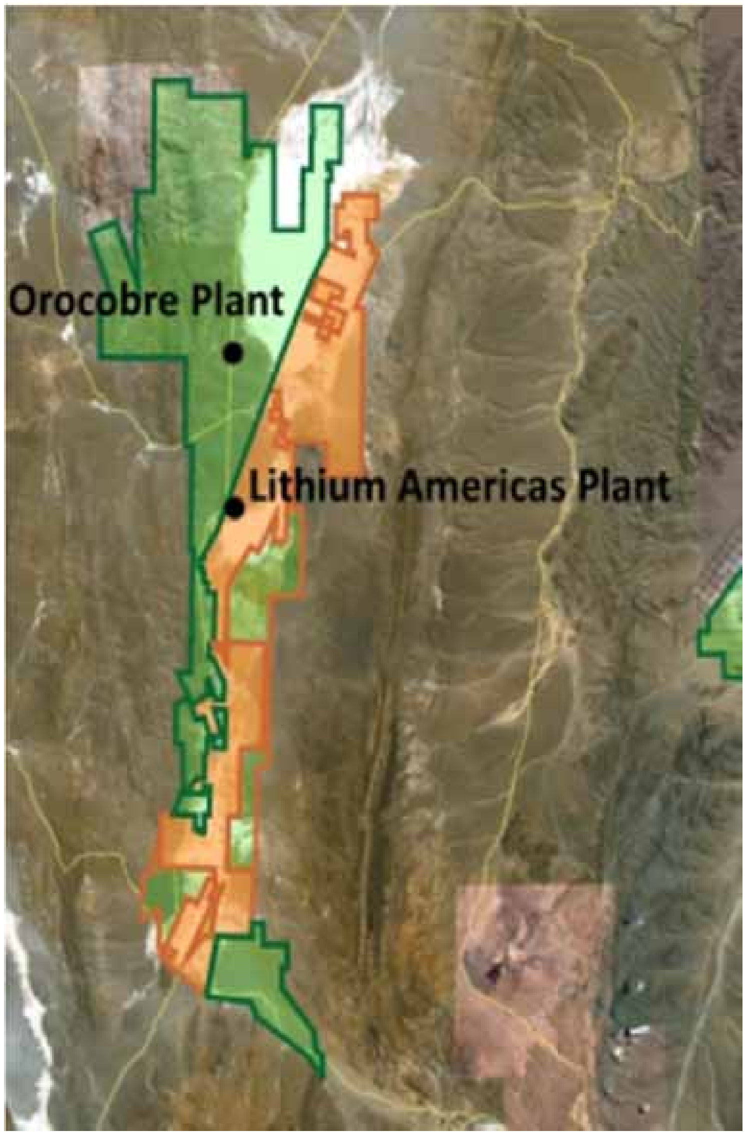
In November 2016, Orocobre entered into a joint venture ("JV") agreement with Advantage Lithium on its Cauchari Project, as well as a number of exploration projects. The Cauchari JV project is a 25/75 JV between Orocobre and Advantage Lithium and lies between Orocobre's producing Olaroz Lithium facility and LAC's Cauchari-Olaroz Project.

A Technical Report on the Cauchari project prepared by Reidel and Ehren, (2018) reported Inferred Mineral Resources for lithium of 0.57 million tonnes at a mean concentration of 450 mg/L and Inferred Mineral Resources for potassium of 4.98 million tonnes at a mean concentration of 4,028 mg/L.

On February 22, 2019, Orocobre announced a production of 6,075 tonnes of lithium carbonate in their Half Year, 2018 update.

The information in this section has not been verified by the QP and it should be noted that the information is not necessarily indicative of the mineralization on the property that is the subject of this technical report.

Figure 23.1 Orocobre Property Showing Boundary with LAC Property



24.0 OTHER RELEVANT DATA AND INFORMATION

ACSI prepared a Feasibility Study for the Project in 2017 (Burga et al., 2017). Sections of this report have been excerpted and summarized from that document. The reader is referred to that document for further elaboration.

The northern border of the Property, on the Olaroz salar, is shared with Orocobre. Care was taken during the calculation of the Mineral Reserve to ensure that none of the flow lines in LAC's calculations crossed over the property boundary.

25.0 INTERPRETATION AND CONCLUSIONS

25.1 GEOLOGY AND MINERAL RESOURCES

Key interpretations and conclusions from the Mineral Reserve estimation work are as follows:

- **Brine:** The Mineral Resource and Mineral Reserves described in this report occur in subsurface brine. The brine is contained within the pore space of salar deposits that have accumulated in a structural basin.

- **Hydrostratigraphic Model and Resource Block Model:** A hydrostratigraphic model and resource block model was developed to support the Updated Mineral Resource Estimate. Modeling is based on a rigorous assembly of lithologic and aquifer parameters. New observation and pumping wells drilled in 2017-2018 contributed information used in the Updated Mineral Resource Estimate.

- **Mineral Resource Estimate:** The Mineral Resource Estimate for the Project is summarized in Table 25.1 Resource values are expressed relative to a lithium grade cut-off of ≥ 300 mg/L, which was identified as a brine processing constraint by LAC engineers. Comparing the prior 2012 Mineral Resource Estimate to the Updated Mineral Resource Estimate, the percent change is a decrease of less than 1% for total average lithium concentration of Measured + Indicated; the percent change is an increase of 53% for total LCE Measured + Indicated (11,752,000 tonnes LCE vs. 17,977,200 tonnes LCE). The large increase in overall estimated mass of LCE can be attributed to the expansion and deepening of the Resource Evaluation Area based on exploration results obtained in 2017 and 2018. The small decline in total average concentration can be attributed to the updated Mineral Resource Estimate affected by the 2017 and 2018 spatial range of samples collected in the Salar de Orocobre and Archibarca alluvial fan areas of the Project.

TABLE 25.1
SUMMARY OF UPDATED MINERAL RESOURCE ESTIMATE FOR LITHIUM

Description	Aquifer Volume (m^3)	Drainable Brine Volume (m^3)	Average Lithium Concentration (mg/L)	Lithium (tonnes)
Measured Resource	1.03E+10	1.11E+09	587	651,100
Indicated Resource	4.27E+10	4.70E+09	580	2,726,300
Measured + Indicated	**5.31E+10**	**5.81E+09**	**581**	**3,377,400**
Inferred	1.37E+10	1.59E+09	602	957,400

Notes:

1. *The Mineral Resource Estimate has an effective date of February 13, 2019 and is expressed relative to the Resource Evaluation Area and a lithium grade cut-off of greater than or equal to 300 mg/L.*
2. *The Mineral Resource Estimate is not a Mineral Reserve Estimate and does not have demonstrated economic*

viability. There is no certainty that all or any part of the Mineral Resources will be converted to Mineral Reserves.

3. *Volumes only include Measured, Indicated, and Inferred Mineral Resource volumes above cut-off grade.*
4. *The Mineral Resource Estimate has been classified in accordance with CIM Mineral Resource definitions and best practice guidelines (2012 and 2014).*
5. *Comparisons of values may not add due to rounding of numbers and the differences caused by use of averaging methods.*

- **Data:** It is the opinion of the independent QPs responsible for the Updated Mineral Resource Estimate that the dataset used to develop the hydrostratigraphic and resource block models are acceptable for use in the Updated Mineral Resource Estimate.

- **Brine Composition:** The brine chemistry is advantageous for conventional lithium recovery methods, having has a relatively low magnesium/lithium ratio (<3, on average) and high sulphate content, which limits the quantity of reagents required for processing.

25.2 PROJECT RISKS

- **Mineral Reserves:** As in all mining projects, there is a risk that some of the parameters used in Mineral Reserve estimation do not behave in the long term as expected, thereby negatively impacting Mineral Resource and Mineral Reserve Estimation.

26.0 RECOMMENDATIONS

The Qualified Persons involved in the Report make the following recommendations:

- Sample Preparation and Analysis: Sample tag booklets should be used at the site for field sampling.

- A dedicated building should be made to store duplicate samples.

- A selection of low, medium and high grade Li brine duplicates should be selected and submitted to Alex Stewart for analysis.

- QA/QC Standard Operating Procedure Manual: A formal manual should be compiled and followed for the insertion of QA/QC Samples and actions to be taken in the case of a failure.

- The QA/QC program, using regular insertions of blanks, duplicates and standards should be continued. All exploration samples should be analyzed at a certified, independent laboratory.

- Proper certified lithium standards, with values comparable to the grades found on site, be sourced.

- Distilled water should be used for blanks as freshwater in the area can contain trace amounts of lithium.

- If the Patrons made at the Exar lab continue to be used, they should go through round robin testing at external laboratories to obtain a more accurate value.

- The Exar laboratory should implement ISO procedures and be subjected to external audits to maintain quality control.

- Updates to models representing Mineral Resources and Reserves: New conceptual and Mineral Resource and Reserve models should be prepared following installation and testing of the new production well and any additional monitoring wells. The domain of the model should be enlarged so that additional areas can be included as potential new sources for Mineral Reserve estimates. Future modeling activities should include:
    - Comparison of the model hydrostratigraphy against any new borehole data;
    - Comparison of produced brine concentrations against predicted concentrations;
    - Comparison of measured production and monitor well drawdown levels against predicted levels;
    - Comparison of measured production well flow rates against predicted rates; derivation of updated K (hydraulic conductivity) and Ss (specific

storage) estimates from analysis of pumping and drawdown information, and comparison with the values used in the model; and incorporation of third party brine pumping from adjacent properties, if any occurs in the future.

- Update of Mineral Reserve Estimate: The positive results of the Updated Mineral Resource Estimate justify an update to the Mineral Reserve Estimate prepared in 2017.

- New Well Testing: In addition to the long-term evaluation components recommended above, each new production well should undergo an initial pumping test, on the order of one month of constant-rate pumping, for assessment of long-term performance.

- Project capacity expansion: Given the level of Mineral Resources estimated in this report, we recommend that the Feasibility Study (FS) update be carried out to explore a production of 40, 000 tpy of lithium carbonate.

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28.0 CERTIFICATES
CERTIFICATE OF QUALIFIED PERSON
DAVID BURGA, P.GEO.

I, David Burga, P. Geo., residing at 3884 Freeman Terrace, Mississauga, Ontario, do hereby certify that:

1. I am an independent geological consultant contracted by Lithium Americas Corporation.

2. This certificate applies to the technical report titled "Updated Mineral Resource Estimate for the Cauchari-Olaroz Project, Jujuy Province, Argentina" (the "Technical Report") with an effective of March 1st, 2019.

3. I am a graduate of the University of Toronto with a Bachelor of Science degree in Geological Sciences (1997). I have worked as a geologist for a total of 20 years since obtaining my B.Sc. degree. I am a geological consultant currently licensed by the Association of Professional Geoscientists of Ontario (License No 1836). I have read the definition of "qualified person" set out in National Instrument 43-101 ("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. My relevant experience for the purpose of the Technical Report is:

   - Exploration Geologist, Cameco Gold 1997-1998
   - Field Geophysicist, Quantec Geoscience 1998-1999
   - Geological Consultant, Andeburg Consulting Ltd. 1999-2003
   - Geologist, Aeon Egmond Ltd. 2003-2005
   - Project Manager, Jacques Whitford 2005-2008
   - Exploration Manager – Chile, Red Metal Resources 2008-2009
   - Consulting Geologist 2009-Present

4. I have visited the Property that is the subject of this Technical Report on January 24, 2017.

5. I am responsible for Sections 2, 3-12, 15, 16, 17, 20, 23, and 24 to 27 of the Technical Report along with those sections of the Summary pertaining thereto.

6. I am independent of the Issuer applying the test in Section 1.5 of NI 43-101.

7. I have had prior involvement with the Property that is the subject of this Technical Report. That involvement was as an author on the technical report titled "Updated Feasibility Study and Reserve Estimation and Lithium Carbonate Production at the Cauchari-Olaroz Salars, Jujuy Province, Argentina", (the "Technical Report") with an effective of March 29th, 2017. I have read NI 43-101 and Form 43-101F1 and this Technical Report has been prepared in compliance therewith.

8. I have read NI 43-101 and Form 43-101F1 and the Technical Report has been prepared in compliance therewith.

9. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: March 1st, 2019
Signing Date: March 29th, 2019

{SIGNED AND SEALED}
[David Burga]

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David Burga, P.Geo.

CERTIFICATE OF QUALIFIED PERSON
ERNEST BURGA, P. ENG.

I, Ernest Burga, P. Eng., residing at 3385 Aubrey Rd., Mississauga, Ontario, L5L 5E3, do hereby certify that:

1. I am an Associate Mechanical Engineer and President of Andeburg Consulting Services Inc.
2. This certificate applies to the technical report titled "Updated Mineral Resource Estimate at for the Cauchari-Olaroz Salars, Jujuy Province, Argentina" (the "Report" or "Technical Report") with an effective of March 1st, 2019.
3. I am a graduate of the National University of Engineering located in Lima, Peru where I earned my Bachelor Degree in Mechanical Engineering (B.Eng. 1965). I have practiced my profession continuously since graduation and in Canada since 1975. My work has exposed me to the hydrometallurgical work with specialized depth to understand chemistry as required for metal extraction and salt processing. In the last 25 years, I have completed hydrometallurgical projects interfacing directly with metallurgists for application of conventional and novel hydrometallurgical processes including hydrometallurgical processing of copper refinery slimes for a precious metal refinery, the selective removal of Bismuth and antimony from copper refinery electrolyte using IBC Advanced Technologies' Molecular Recognition Technology based on a Nobel prize recognized development. During the last seven years, I have participated in the Lithium industry implementing brine processing under the direction of specialized metallurgists and process modeller interpreting test works results, brine processing mass balances and undertaken full responsibility for process implementation and engineering work for PEAs and Definite feasibility studies for brine processing projects for Lithium 1, Galaxy Resources, Simbol Minerals and Lithium Americas. Also, I provided technical assistance to develop Process Ortech's HCl technology for metal extraction. I am licensed by the Professional Engineers of Ontario (License No. 6067011).

   I have read the definition of "qualified person" set out in National Instrument 43-101 ("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 in the Lithium Carbonate extraction processing, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101. My summarized career experience is as follows:

   - Maintenance Engineer – Backus and Johnston Brewery of Peru 1966-1975
   - Design Mechanical Engineer – Cambrian Engineering Group.. 1975-1978
   - Design Mechanical Engineer – Reid Crowther Bendy.. 1979-1981
   - Lead Mechanical Engineer – Cambrian Engineering Group.. 1981-1987
   - Project Engineer –Hydro Metalurgical Division- HG. Engineering.. 1988-2003
   - Lead Mechanical Engineer – AMEC Americas 2003-2005
   - Sr. Mechanical Engineer – SNC Lavalin Ltd. 2005-2009
   - President – Andeburg Consulting Services Inc.- Specialized in Lithium Extraction .... 2004 to present
   - Contracted Mechanical Engineer – P&E Mining Consultants Inc. .... 2009 to present

4. I have visited Property that is the subject of this Technical Report on January 24, 2017.
5. I am responsible for authoring Sections 18, 19, 21, 22 and 25.2-25.5 of this Technical Report along with those sections of the Summary pertaining thereto.
6. I am independent of the issuer applying the test in Section 1.5 of NI 43-101. I am independent of the Vendor and the Property.
7. I have had prior involvement with the Property that is the subject of this Technical Report. That involvement was as an author on the technical report titled "Updated Feasibility Study and Reserve Estimation and Lithium Carbonate Production at the Cauchari-Olaroz Salars, Jujuy Province, Argentina", (the "Technical Report") with an effective of March 29th, 2017.
8. I have read NI 43-101 and Form 43-101F1 and the Technical Report has been prepared in compliance therewith.

9. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: March 1st, 2019
Signing Date: March 29th, 2019

{SIGNED AND SEALED}
[Ernest Burga]

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Ernest Burga, P. Eng.

CERTIFICATE OF QUALIFIED PERSON
DANIEL WEBER, P.G., RM-SME

As the co-author of the report titled "Updated Mineral Resource Estimate at for the Cauchari-Olaroz Salars, Jujuy Province, Argentina" (the "Report" or "Technical Report") with an effective date of March 1st, 2019 (the Technical Report) I, Daniel Weber, P.G., RM-SME, do hereby certify that:

1. I am a senior hydrogeologist and operations manager with Errol L. Montgomery & Associates, Inc. (Montgomery), 400 South Colorado Blvd., Suite 340, Denver, CO 80246 USA.

2. This certificate applies to the technical report titled "Updated Mineral Resource Estimate for the Cauchari-Olaroz Project, Jujuy Province, Argentina" (the "Technical Report") with an effective of March 1st, 2019.

3. I graduated with a Bachelor of Science degrees in Geological Sciences and Environmental Sciences from Bradley University, Peoria, Illinois in 1980. I graduated with a Master of Science in Hydrology from the University of Arizona, Tucson, Arizona in 1986.

   I have professional registrations in good standing with the following organizations: Registered Professional Geologist in the State of Arizona (26044); Registered Professional Geologist in the State of California (5830); Society for Mining, Metallurgy, and Exploration (SME) registered member (4064243).

   I have practiced hydrogeology for 33 years, during which I have worked extensively in salar basins in Arizona, Nevada, California, Chile and Argentina. My experience as a hydrogeologist includes groundwater resource development and management, drilling and testing of production, injection, and monitoring wells, technical oversight for feasibility investigations, design and application of groundwater models, and interpretation of aquifer test data.

   I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that and by reason of my education, experience and affiliation with professional associations I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101.

4. I participated in field visits to the Project site on September 8th and 9th, 2018.

5. As qualified person for this project, I am responsible for review of the conceptual hydrogeological model, drilling and lithological results, and updating the prior hydrostratigraphic model for calculating estimated resource values for lithium provided in this Technical Report. I am responsible for authoring Section 14 of the Technical Report along with those sections of the Summary pertaining thereto.

6. I am independent of the issuer applying all of the tests in section 1.5 of National Instrument 43-101.

7. I have not had prior involvement with the properties that are the subject of the Technical Report.

8. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

9. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

10. I consent to the filing of the Technical Report with any stock exchanges or other regulatory authority and any publication by them, including electronic publication in the public company files on the websites accessible by the public, of the Technical Report.

Effective Date: March 1st, 2019
Signing Date: March 29th, 2019

{SIGNED AND SEALED}
[Daniel S. Weber]

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Signature of Daniel S. Weber, P.G., RM-SME

CERTIFICATE OF QUALIFIED PERSON
Wayne Genck

I, Wayne Genck, a Ph.D. Chemical Engineer, business address at 3 Somonauk Court, Park Forest, Illinois, 60466, USA do hereby certify that:

1) I am an independent consultant contracted by Lithium Americas Corporation.
2) This certificate applies to the technical report titled "Updated Resource Estimate for the Cauchari-Olaroz Project, Jujuy Province, Argentina", (the "Technical Report") with an effective of March 1st, 2019.
3) I am a member in good standing of the American Institute of Chemical Engineers and the American Chemical Society. I have been practicing my profession for 40 years in the United States and abroad. I am a Qualified Person as defined under NI 43-10 l.
4) I have not visited the Property that is the subject of the Technical Report.
5) I am responsible for Sections 13 and 17 of the Technical Report along with those sections of the Summary pertaining thereto.
6) I am independent of the Issuer applying the test in Section 1.5 of NI 43-101.
7) I have had no prior involvement with the Property that is the subject of this Technical Report.
8) I have read NI 43-101 and Form 43-101F1 and this Technical Report has been prepared in compliance therewith.
9) As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: March 1st, 2019
Signing Date: March 29th, 2019

{SIGNED AND SEALED}
[Wayne Genck]

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Wayne Genck, Ph.D.