Lithium Americas

NI 43 – 101 TECHNICAL REPORT

Updated Feasibility Study

Reserve Estimation and Lithium Carbonate Production at the Cauchari-Olaroz Salars, Jujuy Province, Argentina

ACSI

MONTGOMERY & ASSOCIATES Water Resource Consultants

GROUNDWATER INSIGHT Expertise in Hydrogeology

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1.0 SUMMARY

1.1 INTRODUCTION

This report titled "Updated Feasibility Study, Reserve Estimation and Lithium Carbonate Production at 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 Sociedad Quimica y Minera de Chile S.A. ("SQM") own the Cauchari-Olaroz Project through a 50/50 joint venture company ("JV"), Minera Exar S.A. ("Minera Exar"). Lithium Americas is a public company listed on the TSX under the symbol "LAC" and on the OTCQX under the symbol "LACDF". ACSI understands that the Company may use this Report for internal decision making purposes and it will be filed as required under applicable Canadian securities laws.

The current updated Reserve 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 as well as Ontario Securities Commission ("OSC") Staff Notice 43-704 regarding brine projects and in force as of the effective date of this Report, which is March 29, 2017.

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 S23º18' to S24º05' and in an east-west direction from W66º34' to W66º51'. 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 where the LAC field offices are located. 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 70,796 ha of exploration and mining permits have been requested in the Department of Susques; 46,520 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$66,415 (AR$1,056,000).

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.

As of September 30, 2016, the Company's 50% portion of Minera Exar's commitments and contingencies include an annual royalty of US$100,000 due in May of every year and expiring in 2041, as well as annual payments to six communities located in the Cauchari-Olaroz project area that have terms from five to thirty years. The annual fees due are US$270,000 between 2017 and 2021 and US$2,323,000 between 2021 and 2055, assuming that these payments will be extended for the life of the project. These payments will be incurred only if the Project starts production.

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.

If Minera Exar exercises the purchase option, a US$300,000 payment must be made within 10 days of the commercial plant construction start date; and a payment of 3% net profit interest (the Company's portion is 1.5%) for 40 years, payable in pesos, annually within the 10 business days after calendar year end.

Minera Exar can acquire the first 20 years of net profit interest in exchange for a one-time payment of US$7,000,000, extendable for an additional 20 years for another one-time payment of US$7,000,000.

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 2011 to evaluate the lithium development potential of the Project area:

- Surface Brine Program – 55 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 rock.
- Time Domain Electromagnetic (TEM) Survey – TEM surveying was conducted to attempt to define fresh water and brine interfaces within the salar.
- Air Lift Testing Program – Testing was conducted within individual boreholes as a preliminary step in estimating aquifer properties related to brine recovery.
- Vertical Electrical Sounding (VES) Survey – A VES survey was conducted to attempt to identify fresh water and brine interfaces, and surrounding fresh water occurrences.
- Surface Water Sampling Program – A program was 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 conducted at five locations to estimate aquifer properties related to brine recovery and fresh water supply.
- Boundary Investigation – This test pitting and borehole program was conducted to assess the configuration of the fresh water/brine interface at the salar surface and at depth, at selected locations on the salar perimeter.
- 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 – This program was conducted to collect continuous cores for geotechnical testing (RBRC, grain size and density) and geological characterization. The program included 29 boreholes and collection of 127 field brine samples (and additional Quality Control samples).

1.6 MINERAL RESOURCES AND RESERVES

The lithium resources and 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.

A hydrostratigraphic model was developed for the brine Resource Estimate (King 2010b) and was updated in 2012 (King, Kelley, Abbey, 2012). The 2012 Resource Estimate is used in this Report. At the 2012 Resource Estimate stage, the model supported an estimate of bulk in situ brine volume, with preliminary characterization of brine recoverability based on a porous media parameter known as specific yield.

The Reserve Estimate has been updated in 2017 by Montgomery and Associates, and the characterization of brine recoverability was considerably enhanced relative to previous estimates. The hydrostratigraphic model was incorporated into a numerical groundwater model, and the following groundwater flow and solute transport parameters were assigned to the model layers:

- Boundary conditions for lithium and TDS;
- Recharge and evaporation at the ground surface;
- Lateral surface and subsurface recharge to the salar;
- Hydraulic conductivity, storage characteristics, and specific yield of aquifers and aquitards; and
- Dispersivity and diffusion of dissolved constituents.

A numerical groundwater model was developed for the central area of the basin, to support this Reserve Estimate. The model simulates long-term brine recovery, and is based on a rigorous assembly of groundwater flow and solute transport parameters. The numerical model was calibrated to pre-pumping steady-state conditions and short-term dynamic pumping tests conducted by LAC. It was then used to simulate long-term brine recovery, which provided the basis for the Reserve Estimate.

It is the opinion of the independent QPs that the dataset used to develop the numerical model is acceptable for use in the Reserve Estimate.

A Resource Estimate for the Project is summarized in Table 1.1. A Reserve Estimate for the Project is summarized in Table 1.2.

A cut-off value was not employed in the Reserve Estimate because the average calculated lithium concentration after 40 years of pumping was significantly above the processing constraint. The 2012 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 at that time.

TABLE 1.1 LITHIUM RESOURCE SUMMARY				
Description	**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 Resource	630	576,000	3,039,000	9.1×10^8
2012 Indicated Resource	570	1,650,000	8,713,000	2.9×10^9
Total	**585**	**2,226,000**	**11,752,000**	**3.8×10^8**

(1) The 2012 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.

TABLE 1.2 LITHIUM RESERVE SUMMARY				
Description	**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) Ratios of lithium to other metals include: K:Li of 8.2, Mg:Li of 2.4, B:Li of 1.6, SO_4:Li of 28.5.
(2) LCE is calculated based the following conversion factor: Mass of LCE = 5.323 x Mass of lithium metal
(3) The conversion is direct and does not account for estimated processing losses.
(4) The values in the columns on Lithium Metal and Lithium Carbonate Equivalent above are expressed as total contained metals.

Reserve Estimate values of Table 1.2 are based on numerical model predictions of pumped brine (pre-processing).

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.

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 taking the brine concentrate through a hydrometallurgical facility to produce high-grade lithium carbonate. The 2012 process model employed proprietary, state-of-the-art physiochemical estimation methods and process simulation techniques for electrolyte phase equilibrium. Since SQM acquired a 50% interest in Minera Exar in 2016, SQM has advanced the process engineering work, employing their proprietary technology and operational experience, the results of which are reflected in this current Feasibility Study. The basis of the anticipated process methods have been tested and supported by laboratory evaporation test work, as well as pilot testing facilities.

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 17.7. Primary process inputs include water, lime, soda ash, HCl, NaOH, steam, and natural gas. 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 1.3.

TABLE 1.3
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	7,700
Availability	%	90.4
Utilization (22 h/d)	%	97.2
Plant Overall Efficiency	%	71

1.8 SITE INFRASTRUCTURE AND BUILDINGS

1.8.1 Wells

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 at the site where the ponds will be located. The pond orientation and placement were based on predominant wind patterns observed in the area.

Assuming the above-mentioned evaporation rate, the total evaporation area required for the production of 25,000 tpa of lithium carbonate is 1,100 ha. The ponds will be lined with a polymer-based material laid over a protective geosynthetic material and engineered granular bedding. The ponds configuration includes provision for uninterrupted production during salt harvesting and maintenance work.

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

1.8.3 Salt Harvest Equipment

The ponds have been designed for the efficient annual removal of salt deposits formed at the bottom of the ponds. Salt removal will be conducted using typical earthmoving machinery, such as bulldozers, front end loaders, and dump trucks.

1.8.4 Site Infrastructure and Support Systems

1.8.4.1 Natural Gas Pipeline

Natural gas will be obtained from the Rosario gas compression station, which is on the Gas Atacama pipeline, 52 km north of the project site.

Capital costs for this pipeline are estimated at US$ 11.8 million, as quoted from a contractor bid. This pipeline will be capable of supplying natural gas at capacities that are sufficient for a 25,000 tpa LCE facility, and beyond.

1.8.4.2 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 interconnection will consist of a sub-station with a voltage transformer (345/138 kV) and associated switchgear. Another substation at the Project site will consist of a voltage transformer (132/23 kV) and electrical room with associated switchgear and auxiliary equipment for a 23 kV local distribution system.

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 distribution is aerial unless there are major restrictions, in which case underground distribution is adopted.

The estimated load for the Project is approximately 53,700 MWh/y or 8 MW/h, which includes a design safety factor of 1.2.

A stand-by diesel generating station, located closed to main substation, will power selected equipment during grid outages.

1.8.4.3 Camp

The construction and permanent camps will be located approximately 300 m north of National Highway 52. 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.

1.8.4.4 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.

1.8.4.5 Security

A metallic perimeter fence will be built surrounding the lithium carbonate plant, warehouses, administrative offices, and camp. Given the location of the facilities, it is not necessary to enclose the pond area. Nevertheless, the pond area is to be illuminated to allow night work and improve security.

A metallic peripheral fence will be installed at each brine well facility, providing protection to main equipment, instruments and valves.

1.8.4.6 Access and Site Roads

Access to the plant site is via paved National Highways 9 and 52, which connect the site to San Salvador de Jujuy and Salta in Argentina. In addition, National Highway 52 connects to Paso Jama to the west, a national border crossing between Chile and Argentina, and provides connection to Chilean Route 27 and convenient access to Antofagasta, the likely embarkation port for the product.

Access within the site is possible through a gravel road, Route 70, which skirts the west side of the salars. This road is approximately 1 km from the plant site. Site roads to ponds, wells, and other infrastructure will be part of the overall construction.

1.8.4.7 Fuel Storage

The plant includes a diesel storage and dispensing station for mobile equipment and transport vehicles. Diesel fuel will also be used in stand-by generators, for boilers and dryers in the plant. The main fuel for equipment operation will be natural gas.

1.8.4.8 Water Supply

The estimated average consumption of industrial water is 80 liters per second (“L/s”) ± 20%.

Water demands for industrial use will be supplied by groundwater wells adjacent to the salar.

1.8.4.9 Pond Solid Wastes

The evaporation process in the ponds leaves considerable amounts of salts on the bottom of the ponds. These salts must be harvested and transported to nearby piles. These salt piles may reach 10 m in height and can be built on the salar surface. It is estimated that approximately 390 ha of salt piles will be built over a 40 year period and these piles will be built near the pond areas.

These discarded salts are classified as inert waste. The salts are generated from brines already present in the salar and do not introduce foreign compounds. It is estimated that sodium chloride and sulphate make up over 87% of this waste.

1.8.4.10 Tailings Liquid Disposal

Several possible sites for the evaporation ponds for the plant's industrial liquid wastes were analyzed. A 20 ha parcel located close to the plant has been selected for the industrial waste evaporation ponds and presents no risks to distant populated areas.

1.9 MARKET STUDIES AND CONTRACTS

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 divided equally between the partners of Minera Exar (SQM and LAC). 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.

1.9.1 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 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 is subject to approval by Chinese authorities.

1.9.2 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 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, subsequent to the closing of the Ganfeng transaction.

1.10 PERMITTING, ENVIRONMENTAL STUDIES AND SOCIAL OR COMMUNITY IMPACT

1.10.1.1 Permits and Authorities

Argentina has a provincial system to manage natural resources. Therefore, the province of Jujuy has the responsibility of providing social and environmental permits, through the Provincial Department of Mines and Energy under the Secretariat of Mining and Hydrocarbons. Other entities involved in the permitting process are Jujuy's Provincial Department of Water Resources, the Department of Environmental Management, which has supervisory authority for environmental and natural resources, and the Secretariat of Tourism and Culture, which regulates operating permits in areas of potential archaeological and paleontological interest. The Cauchari-Olaroz Salar is a Protected Area for Multiple Use (Law No. 3820/81), which allows mining activities, but has a specifically designed control system that aims to protect the local vicuña population.

These authorities have granted, or are evaluating, the authorizations and permits required for the exploration and test work and the construction to be carried out by LAC on its mining properties in Cauchari-Olaroz. An Environmental Impacts Report for the exploitation phase was presented in December 2011 to the Provincial Government of Jujuy (Direccion Provincial de Mineria y Recursos Energeticos) and approved by Resolution 29/2012 on 08 November 2012 based on an initial annual production rate of 20,000 tonnes of lithium carbonate with a second expansion phase to 40,000 tonnes/year. A report for the renewal of the permit was submitted in March 2015 based on the same Project description as the initial 2011 filing, which has yet to be approved by the Authority. A further renewal application was submitted in February 2017 based on updated Project parameters. It was agreed with the Authority that this would replace and supercede the March 2015 submission.

The update to the Environmental Impacts Report for Exploitation for the Cauchari-Olaroz Project is therefore under evaluation by the Authority. Although the updates have not yet been approved by the Authority, the permit for exploitation issued in 2012 for the Project is still valid as ratified by a letter issued by the Gobierno de Jujuy (NOTA SMeH No 043/20179, issued 16 March 2017), which also states 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."

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.

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

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 which 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

Environmental and social impacts of the project, both positive and negative, were assessed for each of the various stages of the lithium brine exploitation project, including construction, operations, and closure.

During the Construction and Operation stages of the project, moderate impacts on the environment will occur, which can be reversed or mitigated in the short, medium, and long term. These potential impacts have been reassessed and updated in the subsequent updates to the IIA (Environmental Impact Indicator, or Indicador de Impacto Ambiental) for exploitation as the understanding of the project and the environment has developed.

The area of influence of the Project includes the communities of Susques, Huancar, Pastos Chicos, Puesto Sey, Catua, and Olaroz Chico. The Project implementation will have a potential economic impact on its area of influence that will result in both positive and negative changes in these communities.

1.10.5 Community Relations Plan

Minera Exar has developed a plan that promotes social and economic development within a sustainable framework. Minera Exar 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 minimizing negative impacts.

The Community Relations Plan has been divided into several programs: one dealing with external and internal communications to provide information and transparency; a second is a consultation program that allows Minera Exar to acknowledge community perceptions of their mining activities; a third program deals with service and supply contracts to be signed with the communities. The intended outcome of the plan is to deliver social, cultural, and environmental initiatives.

Minera Exar has signed formal contracts with neighbouring communities that own the surface rights where the Project will be developed. According to these contracts, the communities agree to grant Minera Exar traffic and other rights in exchange for cash payments to be used as the members of the communities decide.

1.11 CAPITAL AND OPERATING COST ESTIMATE

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 are expressed in current US dollars on a 100% project equity basis. LAC will need to contribute or secure 50% of these costs, matching its current shareholding in Minera Exar. 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 1.4.

Table 1.4 Capital Costs Summary		
Direct Cost		**US$ M**
Brine Ext. Wells and piping		14.8
Evaporation Ponds		129.1
Lithium Carbonate Plant and Aux.		121.5
On-Site Infra structure		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 Estimate Confidence Range

Expected confidence range of this estimate is ±15%, and contingencies are estimated as 15% of direct and indirect costs.

1.11.3 Exclusions

The following items are not included in this estimate:

- Legal costs;
- Special incentives and allowances;
- Permissions and construction insurance;
- Escalation;
- Interest and financing costs; and
- Start-up costs beyond those specifically included.

1.11.4 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$15.90/US$; no provision for currency escalation has been included.

1.11.5 Operating Cost Estimate

The operating cost estimate (±15% expected accuracy) for the Project is estimated at $2,495 per tonne of lithium carbonate (Table 1.5). 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. Labour requirements are based on SQM's expertise in operating a similar type of facility. Labour costs have been estimated using the results of a specific salary survey, carried out on behalf of Minera Exar in Argentina, on mining companies with similar conditions, and supported by SQM. Consumables costs were estimated on the basis of SQM's related experience.

Table 1.5 **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**
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 1.6.

Table 1.6 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 1.7.

Table 1.7 Production and Revenue Schedule			
Year	**Total Revenues 000 US$**	**Accumulated 000 US$**	**Li_2CO_3 (t)**
1 (2017)	0	0	-
2 (2018)	0	0	-
3 (2019)	72,000	72,000	6,000
4 (2020)	168,000	240,000	14,000
5 (2021)	300,000	540,000	25,000
6 (2022)	300,000	840,000	25,000
7 (2023)	300,000	1,140,000	25,000
8 (2024)	300,000	1,440,000	25,000
12 (2028)	300,000	2,640,000	25,000
18 (2034)	300,000	4,440,000	25,000
24 (2040)	300,000	6,240,000	25,000
32 (2048)	300,000	8,640,000	25,000
40 (2056)	300,000	11,040,000	25,000
Total		**11,040,000**	**920,000**

1) 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 1.8 Project Evaluation Results Summary[1]			
Price Case US$/t Li_2CO_3	**High**	**Medium**	**Low**
	$14,000	**$12,000**	**$10,000**
CAPEX	425	425	425
Max Negative Cash Flow	265	265	265
Average Yearly Values (US$ 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[2]	2Y, 11M	3Y, 4M	3Y, 11M
IRR	39.50%	34%	28.10%
After-Taxes (US$ M)			
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 50% of the project.

2 Measured form the end of the capital investment period

1.13 CONCLUSIONS AND RECOMMENDATIONS

1.13.1 Conclusions

- Brine Reserve/Resource: The lithium Resources and 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 structurally confined basin.
- Groundwater Model: A numerical groundwater model was updated in 2017 for the central area of the basin to calculate the Reserve Estimate. The model simulates long-term brine recovery, and is based on a rigorous assembly of groundwater flow and solute transport parameters.
- It is the opinion of the independent QPs responsible for the Reserve Estimate that the dataset used to develop the numerical model is acceptable for use in the Reserve Estimate.
- Reserves: The total reserve estimate for proven and probable reserves is 1,499,000 tonnes of LCE.
- Brine Composition: Extensive sampling indicates that the brine has a relatively low magnesium/lithium ratio (<3, on average), suggesting that 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.

- Lithium Industry: Market studies indicate that the lithium industry has a promising future. The use of lithium ion batteries for electric vehicles and renewable energy storage applications are driving lithium demand rapidly to unprecedented levels.
- Project Capital Cost: The capital investment for the 25,000 tpa lithium carbonate Cauchari Project, including equipment, materials, indirect costs and contingencies during the construction period is estimated to be US$425 million. Costs have been estimated using consulting engineering services for facilities definition and supplier quotations for all major items.
- The main CAPEX driver is pond construction, which represents 44% of total project capital expenditures.
- Operating Costs: The operating cost estimate (+/-15% accuracy) for the 25,000 tpa lithium carbonate facility is US$2,495 per tonne. This figure includes pond and plant chemicals, energy/fuel, labour, salt waste removal, maintenance, camp services, and transportation.
- Sensitivity Analysis: The Project is forecast to generate positive cash flow even under unfavourable market conditions for key variables. The sensitivity analysis indicated that lithium carbonate price and annual production have the highest impact on economic performance results (NPV and IRR). Economic performance is less sensitive to capital expenditures and total operating costs.
- 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

- Probable and Proven Reserves: The ongoing operation of all production wells should be managed as long term pumping tests, to assist in the conversion of Probable Mineral Reserves to Proven Reserves over time.
- Pumping Test Manual: A formal manual should be compiled and followed for execution of construction phase pumping tests.
- Monitoring Activities Manual: A formal manual should be compiled and followed for all long-term monitoring activities.
- Project Database: All existing and new site data should be compiled in a formal database.
- Updates to Groundwater Model: The composition of the numerical groundwater model should be re-evaluated at least every quarter, as site production well construction and operation proceeds. The model should be updated as appropriate. Types of model re-evaluation 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.
- New Well Testing: In addition to the long-term evaluation components recommended above, each new production well should be initially pump tested for at least four days, for initial assessment of long-term performance.

- Resource Expansion: Given the persistence of high grades at the north, south and below the current Resource Zone, it is recommended that additional investigation be conducted to determine the extent to which the resource can be expanded into these areas.
- Project capacity expansion: Given the high level of mineral resources estimated in this report, we recommend that a capacity expansion project be carried out at Feasibility Study (FS) level.
- Lithium hydroxide production study: Process data and market study work suggest it should be feasible to produce lithium hydroxide at Cauchari. It is recommended that this possibility be the subject of a technical study.
- Lime supply: We recommend that efforts to locate an alternate lime supply source be pursued, and also perform tests to analyze the effect of different lime sources on process yields and product quality. A local supply of lime may result in operational cost savings.
- Process tests: Process tests that can improve the economics of the project should be completed during detailed engineering.

2.0 INTRODUCTION AND TERMS OF REFERENCE

2.1 TERMS OF REFERENCE

Lithium Americas Corp. retained Andeburg Consulting Services Inc. ("ACSI"), Montgomery and Associates ("M&A"), and Ausenco to complete an updated, independent NI 43-101 compliant Feasibility Study and Reserve Estimate on the Cauchari-Olaroz Salars, located in the Province of Jujuy in Argentina. The supervising Independent Qualified Person ("QP") for the Report is Ernie Burga, P.Eng. of ACSI. Groundwater Insight and Matrix Solutions Inc. have signed off on Section 12 (Data Verification) and Section 14 (Resource Estimate) being carried forward from the 2012 Feasibility report titled NI 43-101 Technical Report Reserve Estimation and Lithium Carbonate and Potash Production at the Cauchari-Olaroz Salars, Jujuy Province, Argentina dated July 11th, 2012.

The Reserve Estimate considers lithium brine at the Cauchari-Olaroz Project that is potentially amenable to pumping. The current Reserve 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 the Ontario Securities Commission (OSC) Staff Notice 43-704 (dated July 22, 2011), in which it is stated that the OSC considers brine projects to be mineral projects, as defined in NI 43-101. Additional discussion of the NI 43-101 standards as they relate to brine deposits is provided in Section 2.4.

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 with its corporate office at:

1100-355 Burrard Street,
Vancouver, British Columbia, Canada
V6C 2G8

This report is considered current as of March 29th, 2017.

2.2 SITE VISITS

Mr. Ernie Burga, P.Eng., Mr. David Burga, P.Geo. (ACSI), and Mr. Mike Rosko, P.Geo. (M&A) all qualified persons under the terms of NI 43-101, conducted a site visit of the Property on January 24, 2017. Mr. Daron Abbey, P.Geo, (Matrix Solutions Inc.) a qualified person under the terms of NI 43-101, conducted a site visit of the Property on June 1-4, 2010. Dr. Mark King, P.Geo., (Groundwater Insight) a qualified person under the terms of NI 43-101, conducted several site visits to the Property, with the most recent occurring on September 12-15, 2011.

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.

David Burga, P.Geo. will be taking responsibility for Sections 2 - 12. Sections 2.4.1 and Sections 4-12 were taken from the 2012 King, Kelley, Abbey report. Sections 4,5,6 and 12 were updated for the 2017 report. Mr. Burga's role in Sections 7-11 is in a review capacity.

The 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 SPECIAL CONSIDERATIONS FOR BRINE RESOURCES

2.4.1 Evaluation Framework

NI 43-101 applies to all disclosures of scientific or technical information made by an issuer, including disclosure of a mineral resource or a mineral reserve, concerning a "mineral project" on a property material to the issuer. NI 43-101 defines the term "mineral project" to include "any exploration, development or production activity in respect of a natural solid inorganic material including industrial minerals."

In the Ontario Securities Commission (OSC) Staff Notice 43-704 (dated July 22, 2011), it is stated that the OSC considers brine projects to be mineral projects, as defined in NI 43-101. It is further stated that OSC considers the definitions of mineral resources and mineral reserves to be applicable to brine projects. LAC and the QP co-authors of this report concur with these views. We consider that NI 43-101 provides a proper and rigorous reporting framework for mineral projects hosted in a brine while also providing the necessary flexibility to accommodate these projects' specific characteristics and analytical parameters. Furthermore, reporting on mineral projects hosted in a brine pursuant to NI 43-101 provides the necessary level of protection expected by investors.

The approach used herein to estimate Mineral Resources and Reserves is based on the framework in the CIM Definition Standards for Mineral Resources and Reserves (2005), with some enhancements to accommodate the special considerations of a brine resource. CIM defines a Mineral Resource as:

"A concentration or occurrence of diamonds, natural solid inorganic material, or natural solid fossilized organic material including base and precious metals, coal, and industrial minerals in or on the Earth's crust in such form and quantity and of such a grade or quality that it has reasonable prospects for economic extraction",

and a Mineral Reserve as:

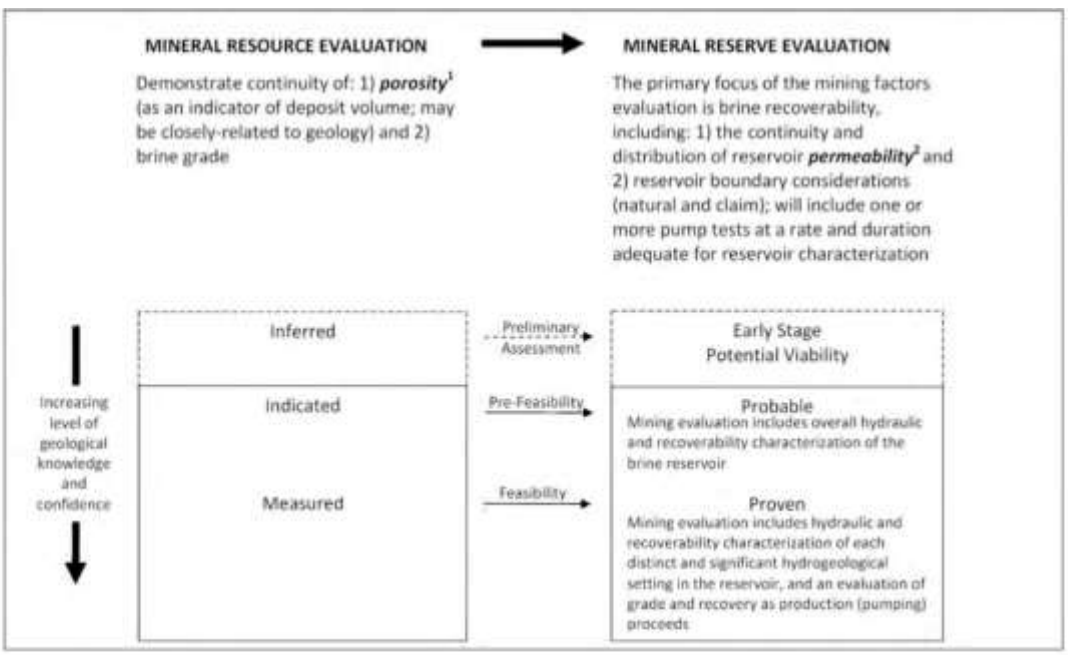
"The economically mineable part of a Measured or Indicated Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction can be justified".

For the reasons discussed above, in the professional opinion of the QP co-authors and LAC, the CIM definition of Mineral Resource extends to natural solid inorganic material such as lithium and potassium, which are both industrial minerals that happen to be hosted in a liquid brine.

Furthermore, it is the professional opinion of the supervising independent QP and LAC that, subject to taking into consideration certain additional parameters of a brine, including porosity, permeability, and boundary conditions, the CIM framework for evaluating a Mineral Resource and Mineral Reserve is applicable to minerals hosted in a brine.

The evaluation framework developed and used for this project is shown in Figure 2.1. As indicated in the figure, the primary enhancements are related to the porosity of the host formation (for Resources) and the permeability and boundary conditions of the host formation (for Reserves).

Figure 2.1 Evaluation Framework Developed and Used for this Project



Notes:

1. *Porosity – a measure of the void (pore) space in a geologic material; several porosity-related parameters are available and may be appropriate, depending on the application, including: total porosity, effective porosity, drainable porosity, relative brine release capacity, etc.*
2. *Permeability – A measure of the ease with which liquid can be transmitted through a geological material.*

These components for Resource and Reserve Evaluation of a lithium deposit in brine are enhancements of, or otherwise in addition to, those already contained in the CIM Standards as provided by CIM (2005) and OSC, APGO and TSX (2008).

2.4.2 Brine Resources – Porosity

Evaluation of the resource potential of a brine deposit includes estimation of two key components:

- The continuity and distribution of brine grade; and
- The portion of host material porosity that contains the resource.

The first of these is analogous to solid deposits. Brine grade continuity and distribution are evaluated through detailed sampling and an understanding of site geology, similar to a solid deposit exploration program. The second component (host material porosity) does not have a direct analogy to solid deposits. The term "porosity" denotes the ratio of the volume of void spaces in a rock or sediment to the total volume of the rock or sediment (e.g., Fetter, 1994). It is relevant to brine deposits because brine occurs in the pore spaces of a rock or sediment. However, not all of the brine present in the pore space constitutes a resource. A portion of the brine will not be recoverable, due to:

- Partial retention of brine by capillary tension within the pore spaces; and
- Dead-end pores that are not hydraulically connected to the broad pore network.

For the Resource Estimates conducted for the property to date, a porosity-related parameter known as Relative Brine Release Capacity (RBRC) is used to estimate the portion of host material porosity that contains the resource. The RBRC methodology was developed for this Project by D.B. Stephens and Associates Laboratory in response to some of the unique technical challenges in determining porosity-related parameters for brine-saturated samples. The method is described in Section 11.2.4.2.2 and sample collection is described in Section 11.1.3. The values provided by the RBRC test can be considered approximately equivalent to the more common term "Specific Yield" (Sy), defined as the ratio of the volume of water a rock or soil will yield by gravity drainage to the volume of the rock or soil (e.g., Fetter, 1994). It is noted, however, that Sy is a concept, while RBRC is a measurement determined with a specific test method. The brine Resource Estimate stage was supported by the development of a hydrostratigraphic model, initially described by King (2010b) and updated as described in Section 7. Consistent with the description above, the model was primarily intended to define the distribution of RBRC (and therefore Sy) throughout the Resource zone. This was a preliminary step in assessing the recoverability of the brine, since the derived estimates were lower than the total estimated brine in the system (i.e., Sy is lower than total porosity). Additional, more sophisticated assessment of brine recoverability is conducted at the Reserve Estimate stage.

2.4.3 Brine Reserves - Permeability and Boundary Conditions

At the Reserve Estimate stage (as described in Section 15 of this report) the volume of brine that can be recovered from the reservoir is evaluated in more detail. Many components of Reserve estimation are site and deposit-specific, regardless of whether a mineral deposit is solid or brine. However, the two following considerations are unique to brine deposits, and are incorporated into the Reserve Estimate:

- The continuity and distribution of permeability (the ease with which brine can be pumped from the brine reservoir); and
- Brine reservoir boundary conditions.

Permeability is evaluated through testing to define values for two primary hydraulic properties of the host material:

- Hydraulic Conductivity (K) – a coefficient of proportionality describing the rate at which water of a given density/viscosity can move through a porous earth material (e.g., Freeze and Cherry, 1979); and
- Specific Storage (SS) – the volume of water that a unit volume of porous earth material releases from storage in response to a unit decline in hydraulic head (e.g., Freeze and Cherry, 1979).

For this Project, these properties were evaluated with results from pumping tests and numerical modeling (Section 9.10 and Section 15 respectively). Defining the reservoir boundary conditions involves specifying hydraulic properties and brine grades at a boundary that is relevant to the reserve estimation zone. These specified conditions affect the predicted response of the brine deposit to production pumping. They are critical to the Reserve Estimate because they determine the predicted duration and/or rate at which the brine deposit can be pumped before non-economic grades are recovered. For this Project, boundary conditions were evaluated with pumping tests, numerical modeling results, assessment of brine grade distributions, hydrogeological interpretations, and a targeted boundary investigation program.

2.4.4 Cut-off Values for Brine Resources and Reserves

For a brine deposit, the application of a cut-off value differs substantially between the Resource and Reserve stages of evaluation. As applied to a brine Resource, the cut-off defines a three dimensional static brine body within which all concentrations are estimated to be at or above the specified grade. Conversely, the cut-off value for a brine Reserve will likely be expressed relative to the aggregate grade of brine recovered from all projected wells in a future production well field. The Reserve itself is based on a dynamic assessment of the point at which aggregate produced grade decreases to below the cut-off. In evaluating the Reserve, it may not be critical that the grade of all recovered brine exceeds the cut-off value. Unlike the Resource, it may be reasonable to recover some brine from low grade regions (less than the cut-off value), as long as the aggregate produced grade of the Reserve is predicted to remain above the cut-off.

2.5 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. The US$ is used throughout this report unless otherwise specified. The exchange rate as at the effective date of the Report is 1 U.S.$ = 15.9 AR$

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
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
AR$	Argentine Pesos
ARAWP	ARA WorleyParsons
ASA	Alex Stewart Argentina
ASL	Alex Stewart Laboratories S.A.
AT	After Tax
B	Boron
BIT	Before Interest and Tax
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
COMIBOL	Corporacion Minera de Bolivia (Bolivian Mining Corporation)
CU	Uniformity coefficient
δ	delta, the exponent for the relative permeability curve
DC + IC	Direct Costs plus Indirect Costs
DD	Diamond Drilling
Deg	Degrees
DEM	Digital Elevation Model
Dep, Amort & RA	Depreciation, Amortization and Remediation Allowance
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
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
hectopascal (100 pascals)	hPa
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	inches
INTA	Instituto Nacional de Tecnología Agropecuaria (National Institute of Agricultural Technology)
IRR	Internal Rate of Return
IT	Information Technology
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
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
ktonne/yr	1,000 tonnes per year
KUS$	Thousands of US dollars
KV	Vertical Hydraulic Conductivity
kWh	kilo watt hour
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
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
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/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
mbgs	metres below ground surface
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
MP	Mining Permit
MT	Million tonnes
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
φe	Transport properties include effective porosity
Pe	effective porosity
RBRC	relative brine release capacity
Ss	specific storage
Sr	residual saturation
Sy	specific yield

3.0 RELIANCE ON OTHER EXPERTS

ACSI has assumed, and relied on the fact, that all the information and existing technical documents listed in the References section of this Report are accurate and complete in all material aspects. While we carefully reviewed all the available information presented to us, we cannot guarantee its accuracy and completeness. We reserve the right, but will not be obligated to revise our Report and conclusions if additional information becomes known to us subsequent to the date of this Report.

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 to have conducted the proper legal due diligence.

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. ACSI has also relied on LAC's independent consultants and partner, SQM, as cited in the text of the Report and in the references, for information on costs, prices, legislation and tax in Argentina, as well as for general project information.

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 23º 18' to S 24º 05', and in an east-west direction from W 66º 34' to W 66º 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.

4.2 PROPERTY AREA

LAC has negotiated, through its 50% owned Argentine subsidiary Minera Exar S.A. ("Minera Exar"), mining and exploration permits, and has requested from mining authorities exploration and mining permits covering a total of 70,796 ha in the Department of Susques, of which 41,520 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 15,254 ha, are presented in Table 4.2. These claims are where the lithium brine will be pumped from during production. The 59 claims that are not subject to exploitation, totalling an approximate area of 53,729 ha, are presented in Table 4.3 and will be subject to further exploration. The annual aggregate property payment required by Minera Exar to maintain the claims referenced in Figure 4.2 is approximately US$ 66,415 (AR$ 1,056,000).

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 April of each year.

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.

4.3.1 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 (the Company's portion was US$50,000) upon signing and has a right to exercise the purchase option at any time within 30 months for the total consideration of US$12M (the Company's portion is US$6M) to be paid in sixty quarterly installments of US$200,000 (the Company's portion is US$100,000). 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.

If Minera Exar exercises the purchase option, the following royalties will have to be paid to Los Boros:

- US$300,000 (the Company's portion is US$150,000) within 10 days of the commercial plant construction start date; and
- 3% net profit interest (the Company's portion is 1.5%) 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$3.5M) and the next 20 years for additional US$7M (the Company's portion is US$3.5M).

4.3.2 Borax Argentina S.A. Agreement

Under Minera Exar's usufruct agreement with Borax Argentina S.A. ("Borax Argentina"), on May 15th 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.

4.3.3 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 SQM.

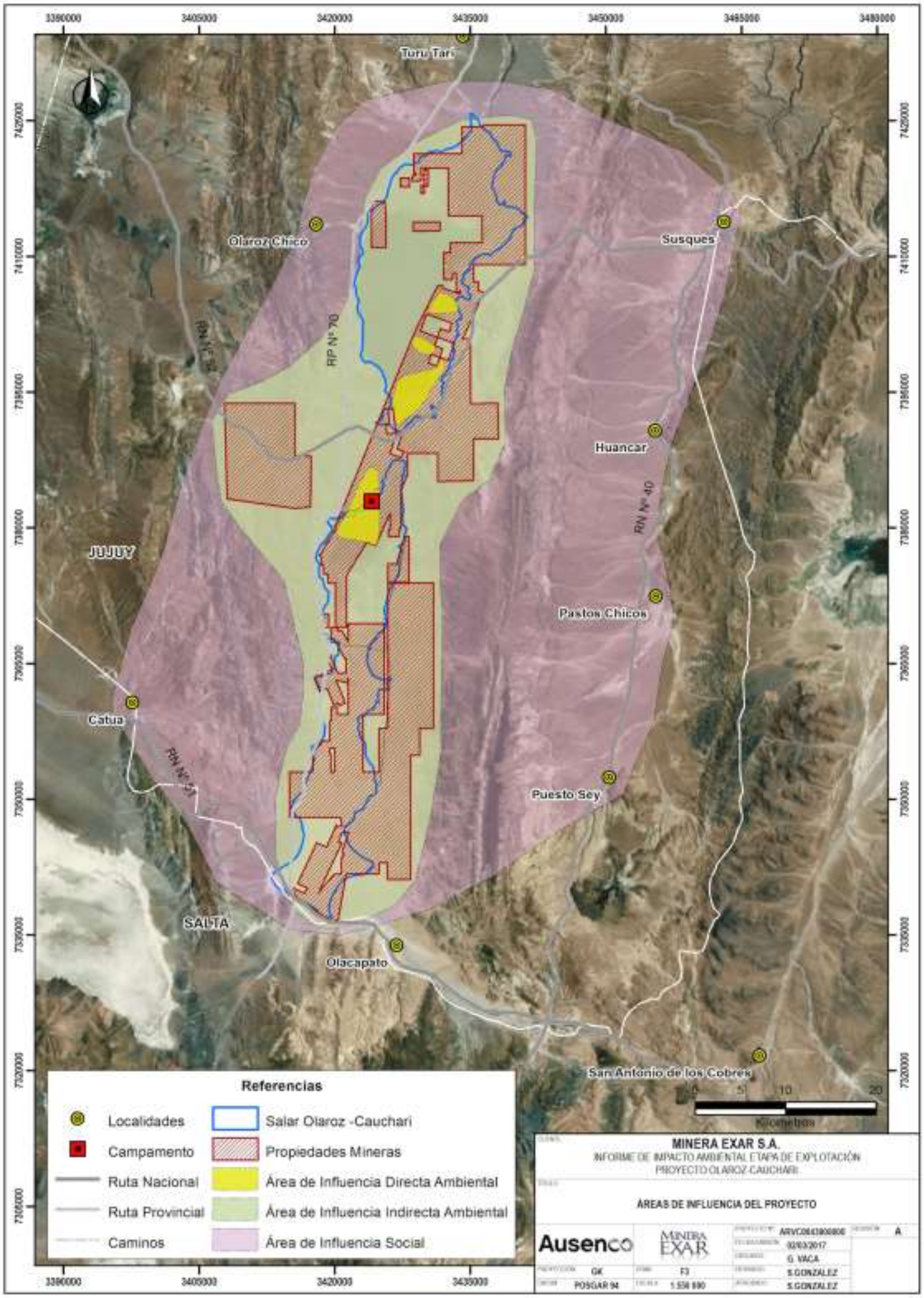
The above-mentioned agreements with private mineral rights owners are independent of, and do not impinge upon the right of the Provincial Government to charge a royalty of up to 3% of the value of the mineral at well head. A summary of royalties and payments is presented in Table 4.1.

TABLE 4.1 **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	150,000
2020 – Onwards Annual Payments	178,000

Figure 4.1 Location of the Cauchari-Olaroz Project

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

Figure 4.2 LAC Property Claims at the Cauchari-Olaroz Project



Source: *Minera Exar*

TABLE 4.2
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	Silvia Rojo	EP	998	996	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	4,705	Huancar / O Chico / P. Chicos	Usufruct Agreement	Opted
Arturo	60-L-98	Grupo Minero Los Boros S.A	MP	5,100	5,049	Huancar / Olaroz Chico	Usufruct Agreement	Opted
Angelina	59-L-98	Grupo Minero Los Boros S.A	MP	2,346	2,346	O Chico / Portico / Huancar	Usufruct Agreement	Opted
La Yaveña	27-R-00	Minera Exar S.A.	MP	1,117		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
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

TABLE 4.2
MINERA EXAR S.A. MINERAL CLAIMS SUBJECT TO EXPLOITATION AND PRODUCTION

Claim	File	Owner	Claim	Requested	Received	Aboriginal	Contract	Status
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				**17,067**	**15,254**			

TABLE 4.3
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	Puesto Sey	Option to Purchase	Opted
San Antonio	72-M-99	Minera Exar S.A.	MP	2,165	2,400/1000	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

TABLE 4.3
MINERA EXAR S.A. MINERAL CLAIMS NOT SUBJECT TO EXPLOITATION

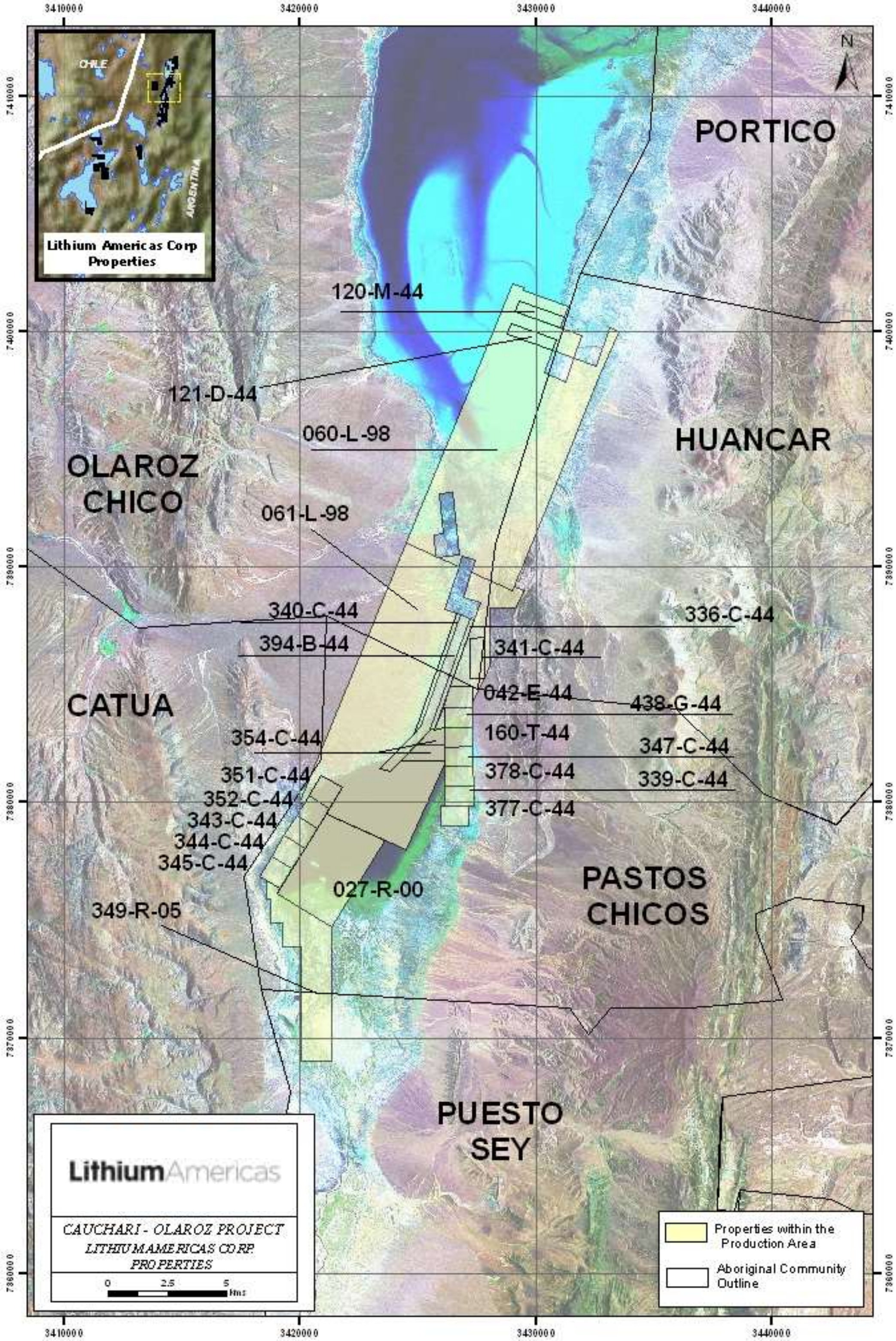
Claim	File	Owner	Claim	Requested	Received	Aboriginal	Contract	Status
Chico 4 (1)	1252-M-09	Minera Exar S.A.	MP	1,100	1,100	Pastos Chicos	Option to Purchase	Opted
Sulfa 6	70-R-98	Minera Exar S.A.	MP	1,395	1,683	Puesto Sey	Option to Purchase	Opted
Sulfa 7	71-R-98	Minera Exar S.A.	MP	1,667	1,824	Puesto Sey	Option to Purchase	Opted
Sulfa 8	72-R-98	Minera Exar S.A.	MP	1,417	1,841	Puesto Sey	Option to Purchase	Opted
Sulfa 9	67-R-98	Minera Exar S.A.	MP	1,336	1,570	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
Irene	140-N-92	Triboro S.A.	MP	200	200	Portico / Olaroz Chico	Option to Purchase	Opted
Jorge	62-L-98	Luis Losi S.A	MP	2,461	2,351	Catua / P. Sey	Option to Purchase	Opted
Chin Chin Chuli II	201-C-04	Vicente Costa	MP	1,000	910	Portico / Olaroz Chico	Option to Purchase	Opted
Grupo La Inundada	101-C-90	Minera Exar S.A.	MP	550	537	Puesto Sey	Option to Purchase	Opted
Alegria I	1337-M-09	Minera Exar S.A.	MP	3,000	Under review	Portico	Staked	To be Opted
Alegria 2	1338-M-09	Minera Exar S.A.	MP	3,000	Under review	El Toro / Portico / O. Chico	Staked	To be Opted
Alegria 3	1339-M-09	Minera Exar S.A.	MP	3,000	Under review	Portico	Staked	To be Opted
Alegria 4	1340-M-09	Minera Exar S.A.	MP	999	Under review	Olaroz Chico / El Toro	Staked	To be Opted
Alegria 5	1341-M-09	Minera Exar S.A.	MP	793	Under review	Olaroz Chico	Staked	To be Opted

TABLE 4.3
MINERA EXAR S.A. MINERAL CLAIMS NOT SUBJECT TO EXPLOITATION

Claim	File	Owner	Claim	Requested	Received	Aboriginal	Contract	Status
Alegria 7	1343-M-09	Minera Exar S.A.	MP	1,277	Under review	Portico	Staked	To be Opted
Cauchari Este	1149-L-09	Minera Exar S.A.	MP	5,900	Pending	Huancar	Staked	To be Opted
Cauchari Sur (1)	1072-L-08	Minera Exar S.A.	EP	1,599	1,499	Puesto Sey	Staked	Opted
Cauchari Oeste	1440-M-10	Minera Exar S.A.	MP	9751		Catua / O. Chico	Staked	To be Opted
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		Usufruct Agreement	Opted
Porvenir	116-D-44	Borax Argentina S.A.	MP	100	100		Usufruct Agreement	Opted
Alicia	389-B-44	Borax Argentina S.A.	MP	100	100		Usufruct Agreement	Opted
Clarisa Y Demasia Clarisa	402-B-44	Borax Argentina S.A.	MP	119	119		Usufruct Agreement	Opted
Ines	220-S-44	Borax Argentina S.A.	MP	100	100		Usufruct Agreement	Opted
Maria Central	43-E-44	Borax Argentina S.A.	MP	100	100		Usufruct Agreement	Opted

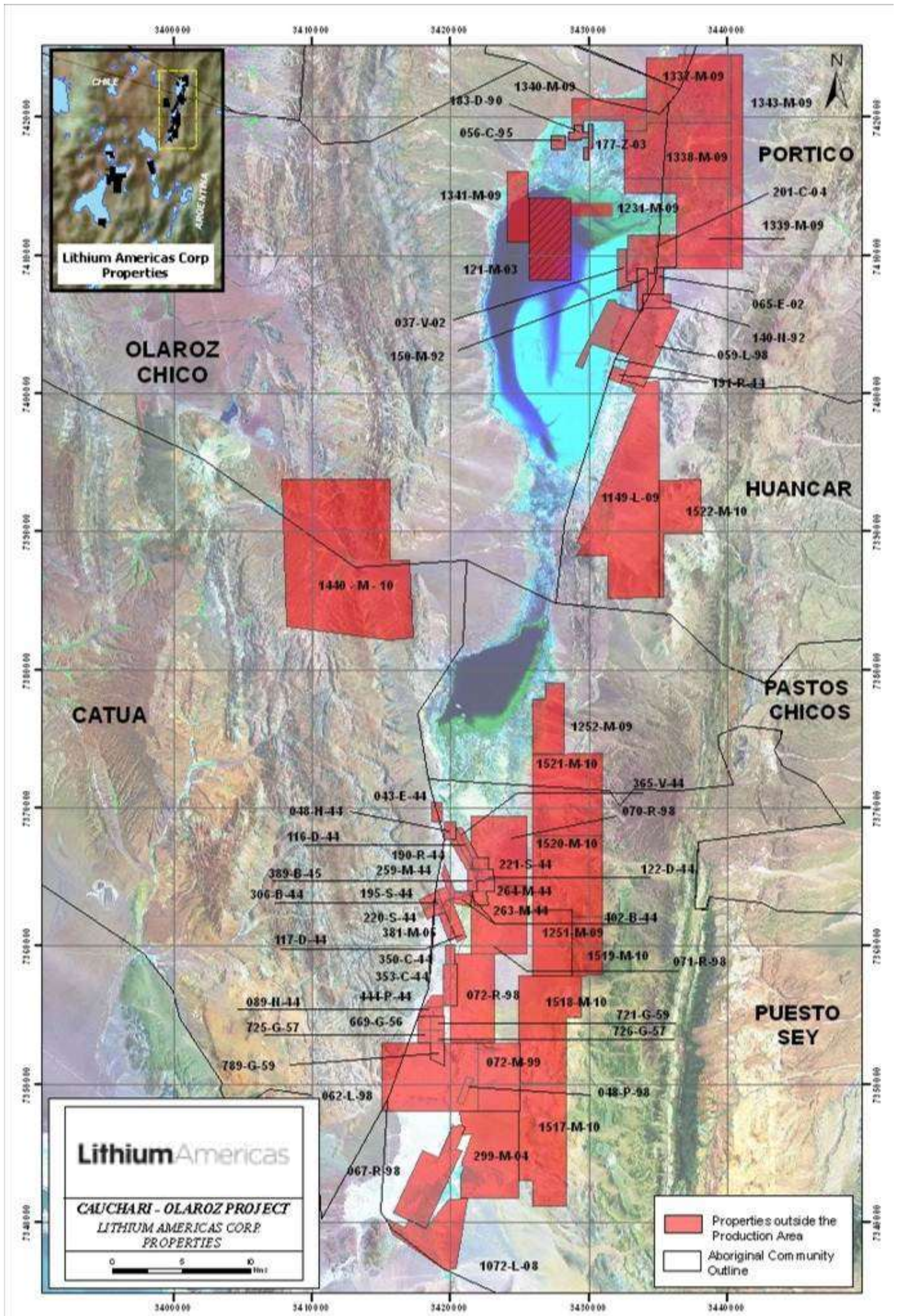
Table 4.3 **Minera Exar S.A. Mineral Claims Not Subject to Exploitation**								
Claim	**File**	**Owner**	**Claim**	**Requested**	**Received**	**Aboriginal**	**Contract**	**Status**
Maria Esther	259-M-44	Borax Argentina S.A.	MP	100	100		Usufruct Agreement	Opted
Sahara	117-D-44	Borax Argentina S.A.	MP	300	300		Usufruct Agreement	Opted
Paulina	195-S-44	Borax Argentina S.A.	MP	100	100		Usufruct Agreement	Opted
SIBERIA	206-B-44	Borax Argentina S.A.	MP	100	100		Usufruct Agreement	Opted
Alegria 6	1342-M-09	Minera Exar S.A.	MP	31	Under review			
Payo III	1517-M-10	Minera Exar S.A.	MP	2,905	2,890	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		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	Electroquimica El Carmen S.A.	MP	100	100	Olaroz Chico	Usufruct Agreement	Opted
Victoria I	65-E-02	Electroquimica El Carmen S.A.	MP	200	200	Portico / Olaroz Chico	Usufruct Agreement	Opted
				53,729	**26,266**			

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*

4.4 TYPE OF MINERAL TENURE

There are two types of mineral tenure in Argentina: Mining Permits and Exploration Permits. 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. 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.

4.5 PROPERTIES ASSIGNED TO PRODUCTION AND EXPLOITATION

Table 4.2 and Figure 4.2 show the mineral properties where the resource and 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 15,701 ha. Figure 4.3 shows the claims assigned to production and exploitation.

4.6 ADDITIONAL PROPERTIES TO THE PROJECT

Table 4.3 and Figure 4.4 show an additional 58 mineral properties that are outside the area of production. These properties cover a total of 53,729 ha requested of which a total of 26,266 ha have been granted to date. Only one of these properties is an exploration permit (file # 1072-L-08 covering a total of 1,501 ha); the rest are mining permits.

4.7 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.

4.8 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, 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. 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 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. Additional information is provided in Section 20.1.

4.9 PERMITS

The Provincial Government of Jujuy (Direccion Provincial de Mineria y Recursos Energeticos) approved the LAC Environmental Impacts Report (the “EIA”) for the Cauchari-Olaroz Project exploration work, by Resolution No. 25/09 on August 26, 2009. There have been subsequent updates to accurately reflect the ongoing exploration program, including a 2009 update IIA (Environmental Impact Indicator, or Indicador de Impacto Ambiental) including topographic and geophysical studies, opening loan wells and new exploration wells. In addition, there was an IIA for the installation of a brine enrichment pilot plant, and in 2011 the renewal of the IIA was presented for the exploration stage, specifying all activities undertaken and planned exploration activities for the 2012-2013 period. An addendum to the IIA for Exploration was submitted in May 2014 for the installation, implementation and subsequent operation of the POSCO lithium phosphate plant which was approved in July 2014 (Resolution 011/2014). Further, in June 2015 and June 2016 two separate IIA 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 IIA for exploration submitted in February 2017. The IIA 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 29/2012, November 08, 2012	The various activities carried out from 2009 to 2011were 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 011/2014, July 15, 2014	Installation, implementation and subsequent operation of the POSCO lithium phosphate plant
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.
Renovation of 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.

An Environmental Impacts Report for the exploitation phase was presented in December 2011 and approved by Resolution 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 renewal 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 renewal 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 for Exploitation for the Cauchari-Olaroz Project is therefore in evaluation by the Authority. Although the updates have not been approved by the Authority, the permit for exploitation issued in 2012 for the Project is still valid as ratified by a letter issued by the Gobierno de Jujuy (NOTA SMeH Nº 043/20179, issued 16 March 2017), which also states 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."

TABLE 4.5
EXPLOITATION PERMITS FOR CAUCHARI-OLAROZ PROJECT

Report Submitted	Date Presented	Approvals	Observations
Environmental Impacts Report for Exploitation	December 2011	Resolution 29/2012, November 08, 2012	Production of 20,000 tonnes/year of lithium carbonate with a second expansion phase to 40,000 tonnes/year
Renovation 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
Renovation 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

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.

4.10 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$50,000 per year between 2017-2019;

- Aggregate payments of approximately US$178,000 per year 2020 and beyond;
- Joint environmental monitoring programs;
- Priority right on 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 and is used by borate producers.

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: *King, (2010)*

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

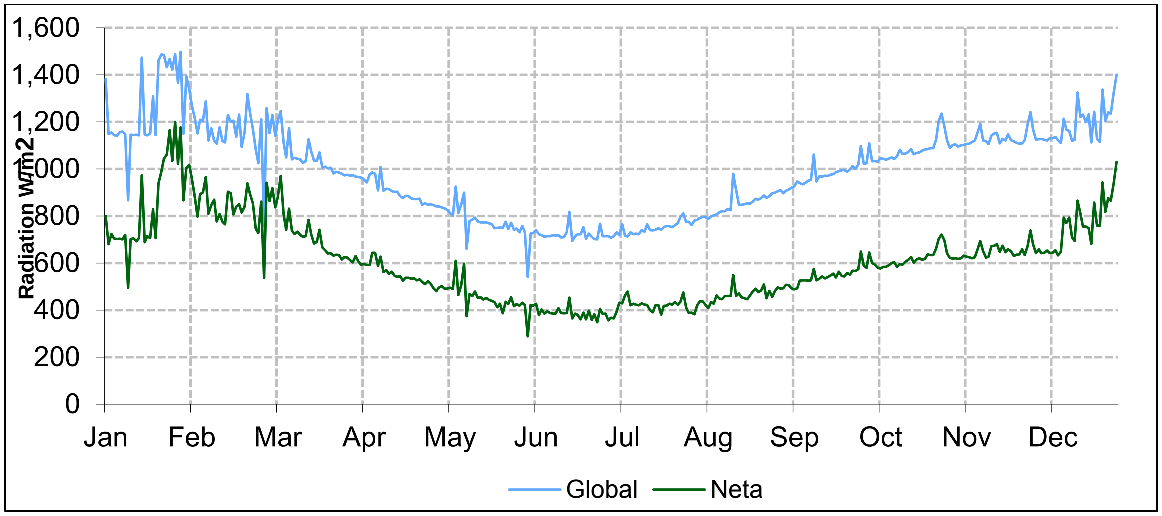
In May 2010, Minera Exar installed a Vaisala-brand automated meteorological station (model MAWS301) adjacent to the site offices on the Cauchari Salar. Parameters include solar radiation, temperature, precipitation, humidity, and wind speed and direction. Data was quality controlled to support the engineering 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 5.1 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



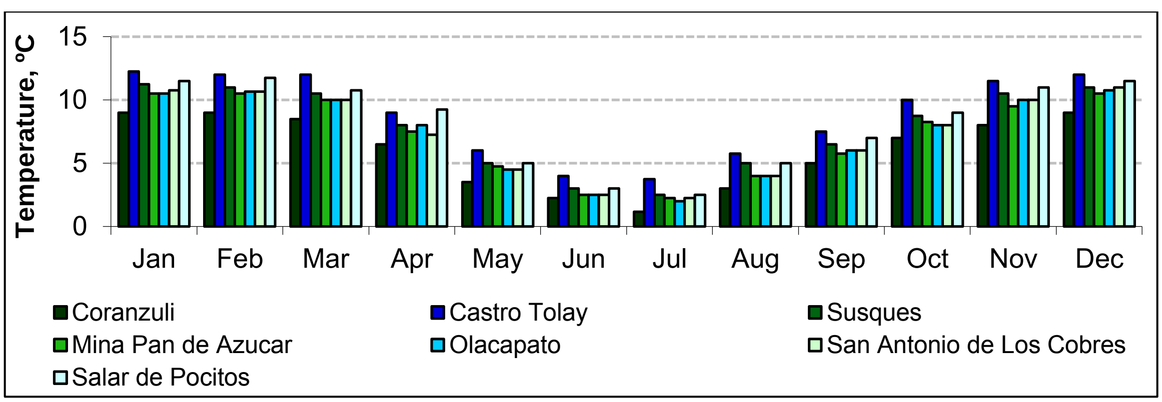
Source: *King, Kelley, Abbey, (2012)*

5.5 TEMPERATURE

Diurnal temperature variations can be as much as 20ºC, 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.

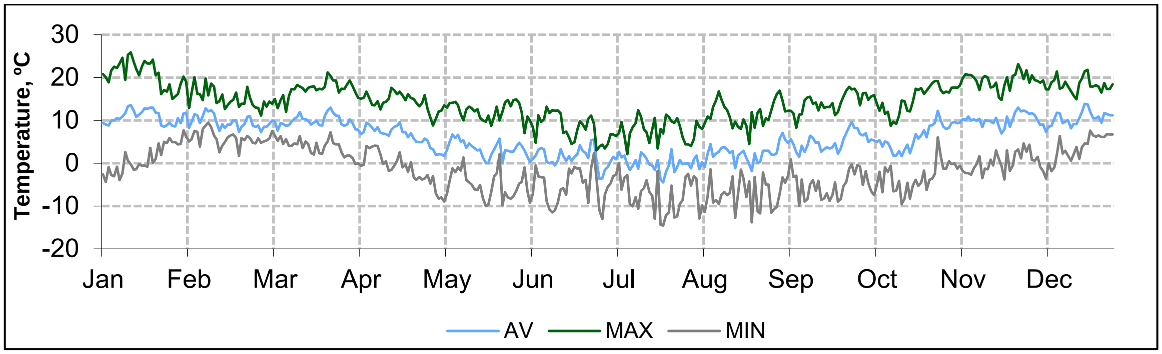
The mean monthly temperatures recorded by the regional meteorological stations is presented in in Figure 5.3. Temperature data collected at site by the Vaisala station in 2011 is presented in Figure 5.4.

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

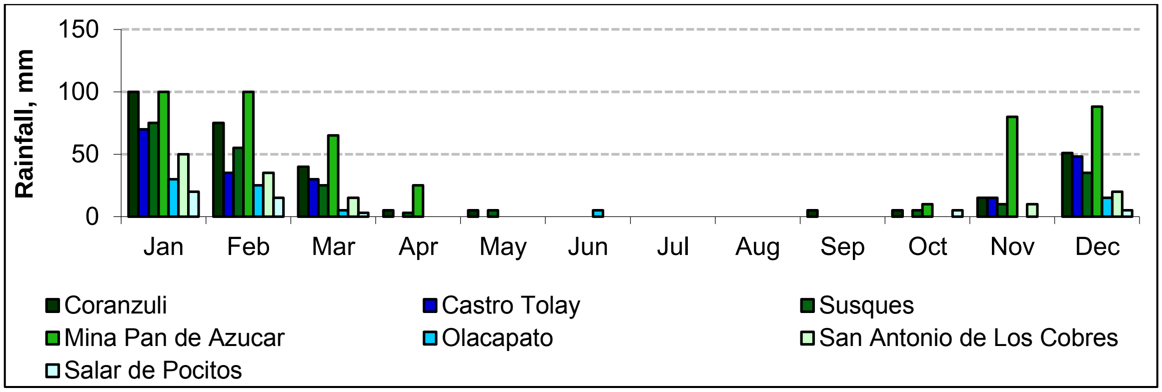
Temperature (°C)	2012 Feasibility Study	Vaisala Station (2011-2016)
Average	6.3	6.4
Absolute Minimum	-14.6	-18
Absolute Maximum	25.9	25.9

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.

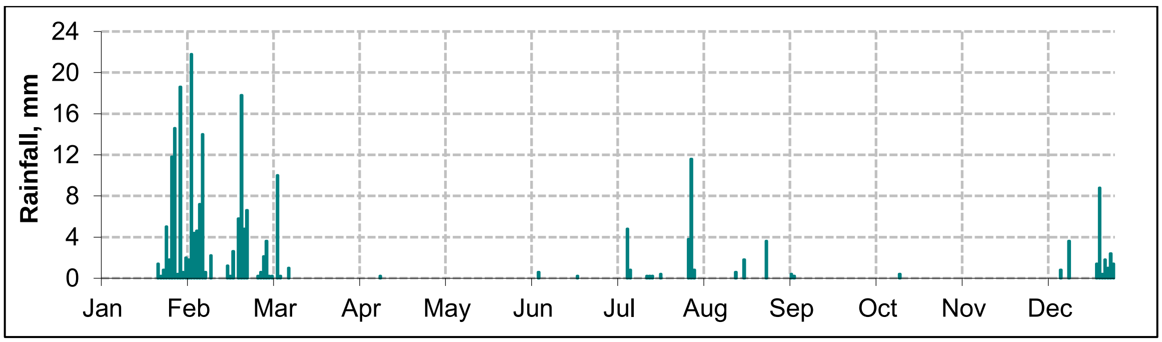
Figure 5.5 Average Monthly Rainfall Recorded by Regional Meteorological Stations Near the Cauchari- Olaroz Salars



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)

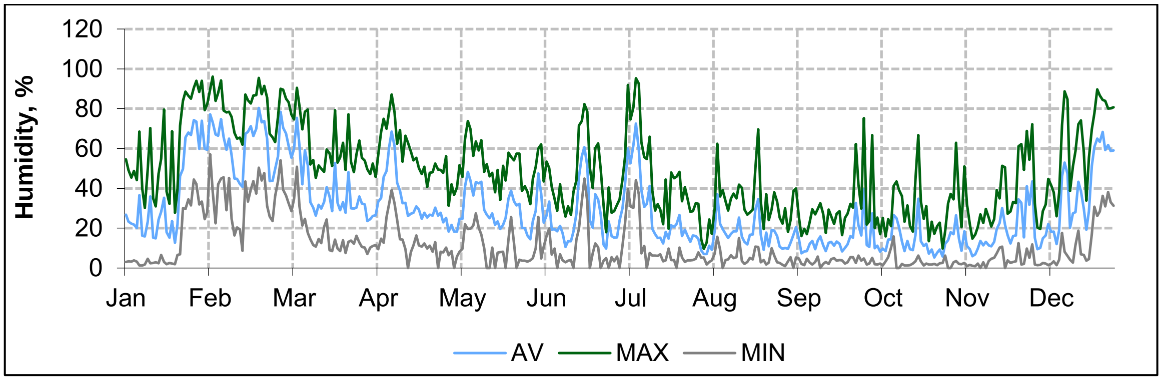


Source: *King, Kelley, Abbey, (2012).*

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

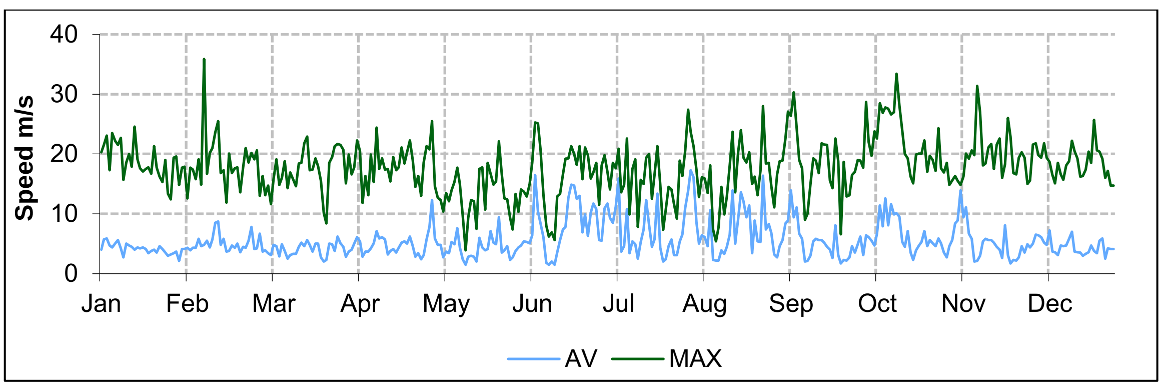


Source: *King, Kelley, Abbey, (2012).*

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.

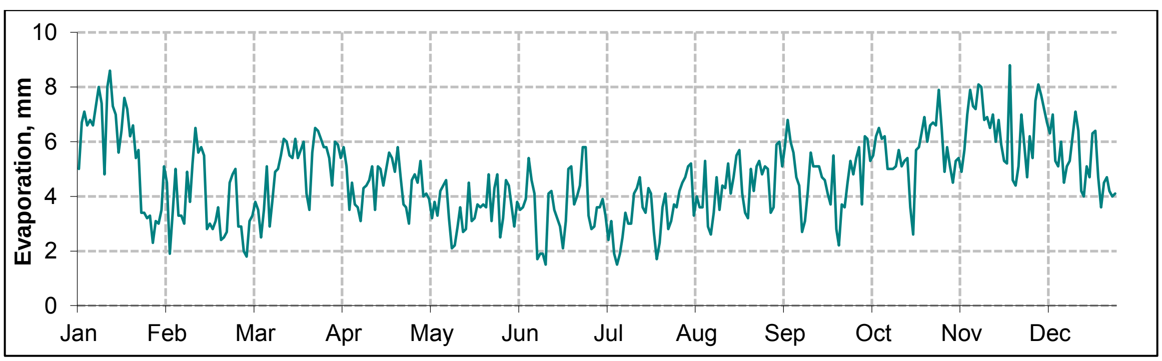
To account for the relatively short period of record of one year, factors were applied to water and brine evaporation data, resulting in an average evaporation rate for water of 7 mm/day, (2,554 mm/yr) and 3.5 mm/day for brine (1,273 mm/yr).

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)			
	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 meteorologicial 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 (ºC)**			**Humidity (%)**			**Pressure (hPa)**	**Wind, (m/s)**		**Solar Radiation (W/m²)**		**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

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 located approximately 60 km south of the Project

A core shed exists on site that adequately stores all the project drill core and can be used for future logging activities. Several small modular buildings are on site, housing the pilot plant, offices, a cafeteria, bathrooms, and rooms for 70 people. The site also has a water supply and sanitation facilities to support existing infrastructure.

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 NI43-101 complaint feasibility study that presented a resource and reserve estimate, proposed processing technology, environmental and permitting assessment, costing and economic analysis. The 2012 report is superseded by this current Technical Report, which provides updated reserve estimate, processing technology, permitting assessment, costing and economic analysis.

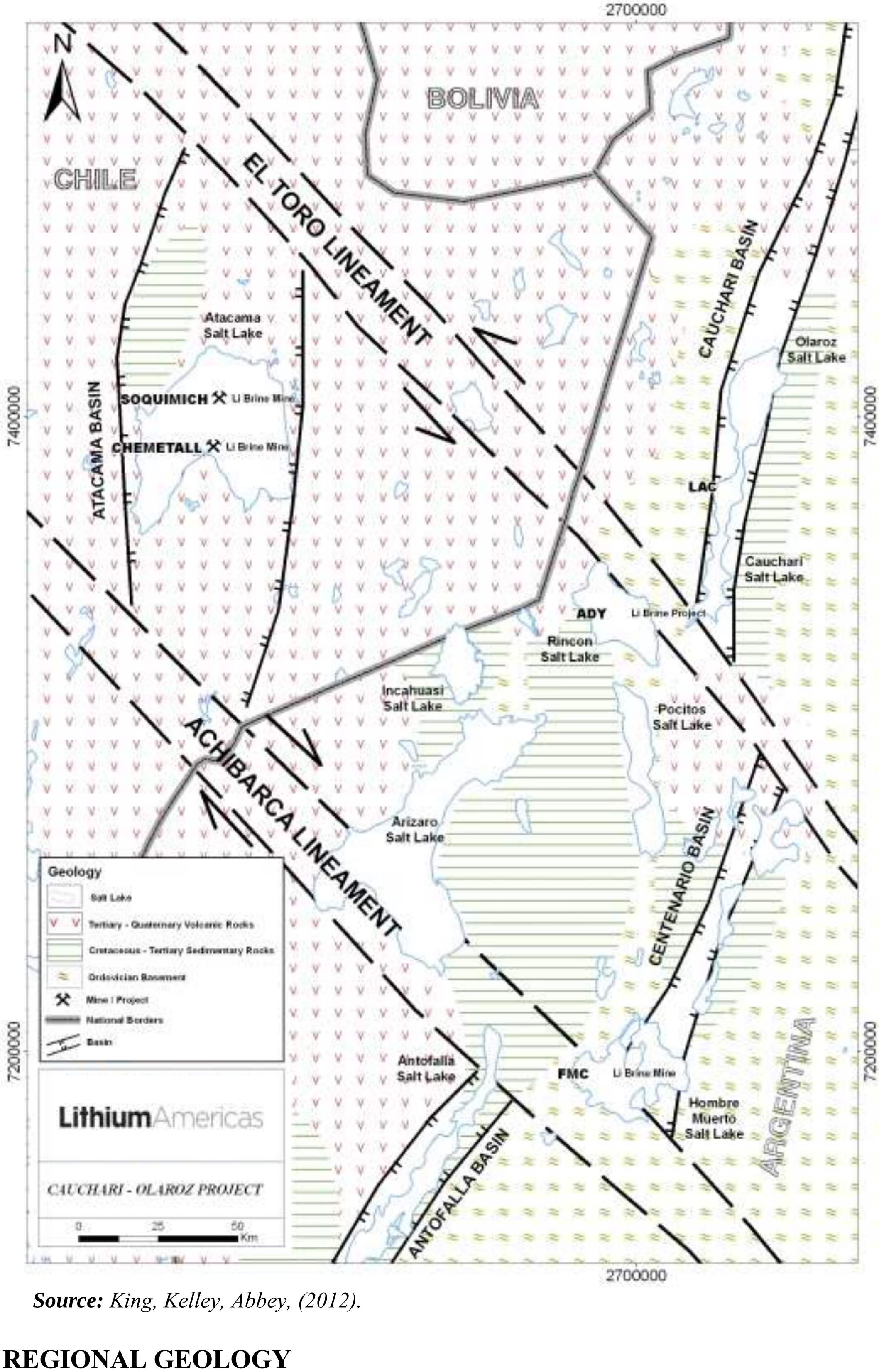
7.0 GEOLOGICAL SETTING AND MINERALIZATION

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

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.

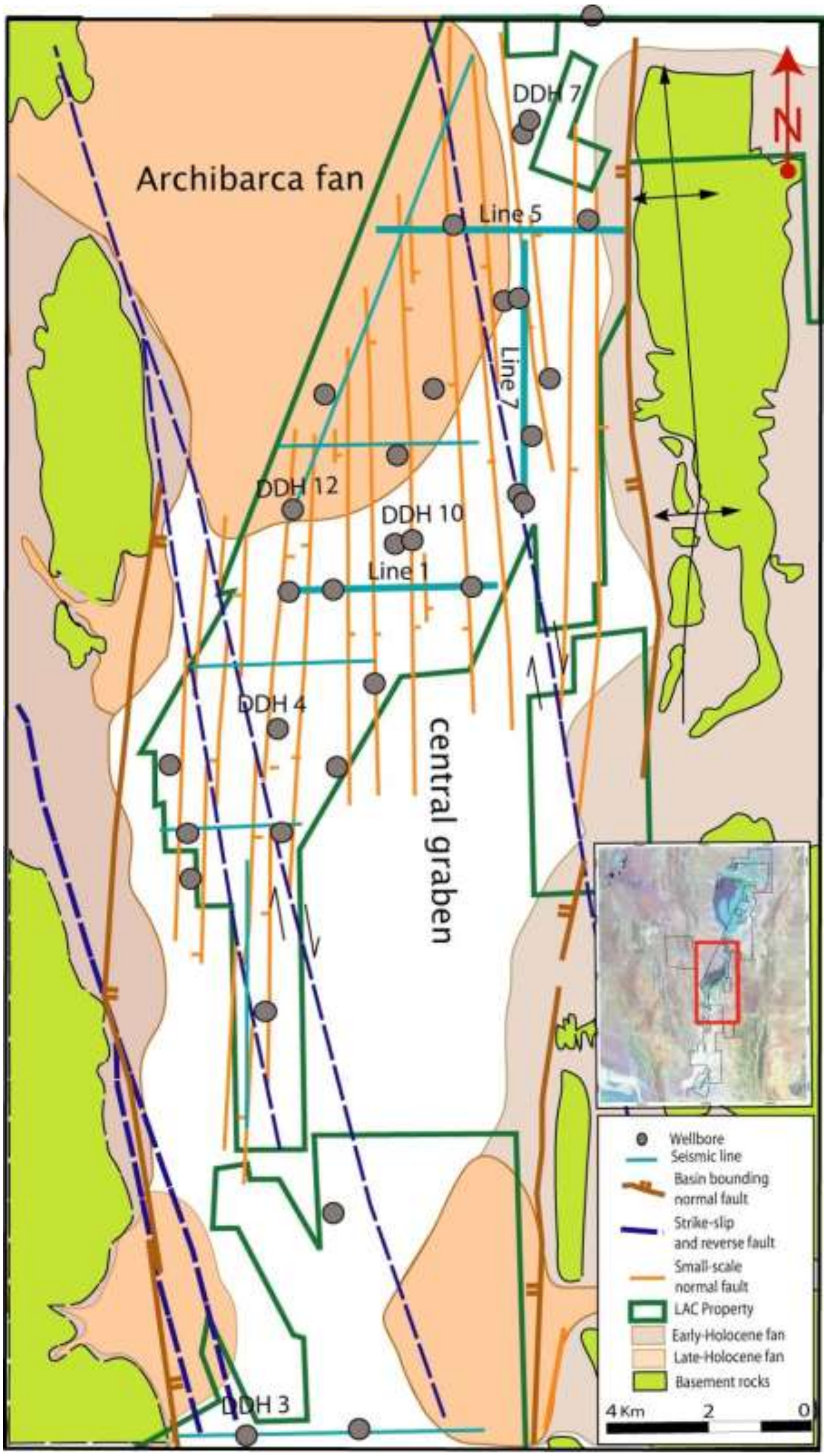
7.3 GEOLOGY OF THE OLAROZ AND CAUCHARI SALARS

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 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).*

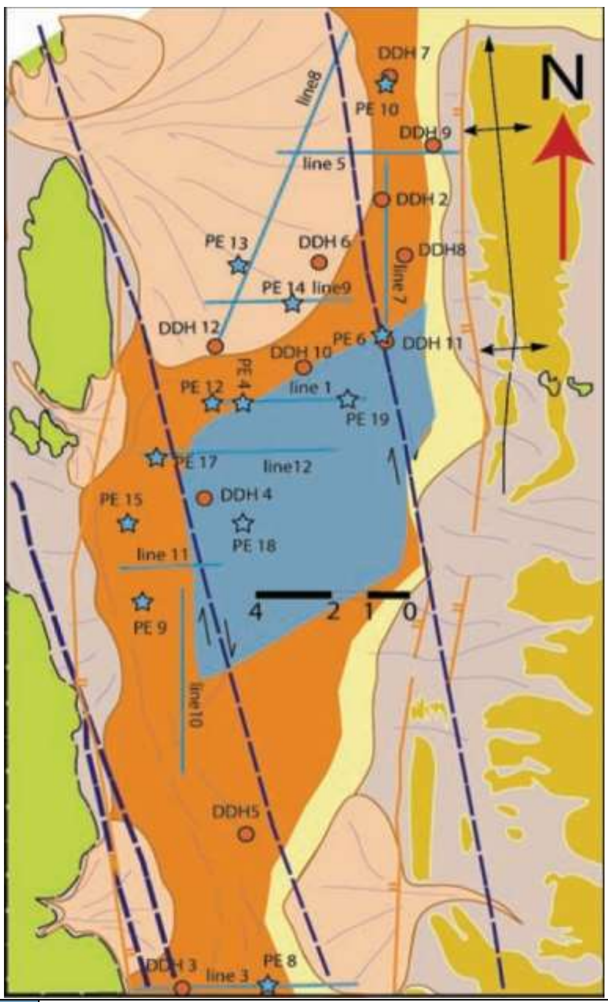
7.4 SALAR SURFACE SEDIMENTS AND MINERALIZATION

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 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.

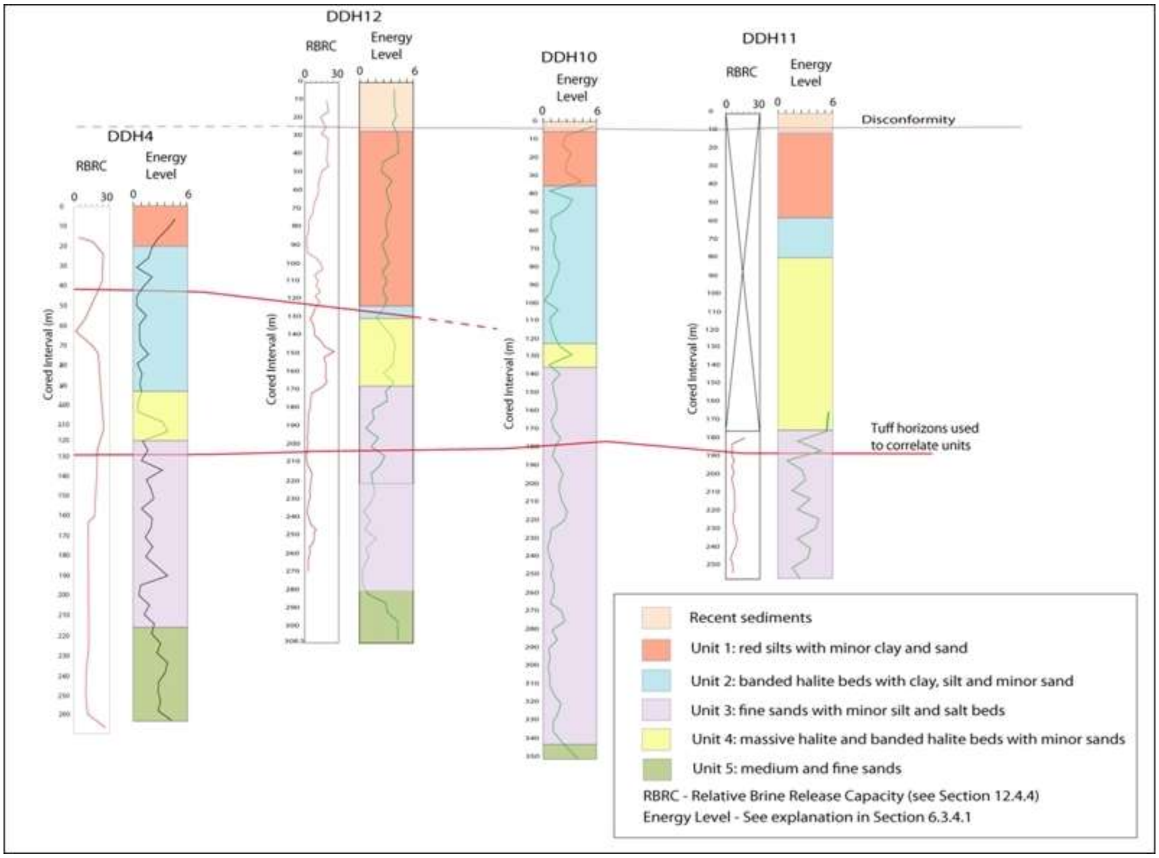
7.5 SALAR LITHOSTRATIGRAPHIC UNITS

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, in four boreholes located in the previous Resource Estimate zone. 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.

Figure 7.7 Correlation of Lithostratigraphic Units in the Cauchari Basin



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

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).

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 in Figure 7.7 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, analysis, and results of the RBRC samples are described in Sections 11.1.3, 11.2.4.2.2, and 15.5 respectively. 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 55 (Appendix 1). 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 Figures A55 and 56 (Appendix 1), 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 55 (Appendix 1). This salt body is continuous, but irregular in the fraction that it comprises of the LSGC. As shown in Figure A55 (Appendix 1), 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.

Clastic contributions to the LSGC originated from various locations around the salar (Figure 56, Appendix 1). 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 56, Appendix 1). 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 57 (Appendix 1). 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 A57, Appendix 1), probably due to the smoothing effect of the final subsidence stage. The two southern loci of salt deposits in the LSGC (Figure A55, Appendix 1) unify into one in the USGC (Figure A57, Appendix 1) 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.

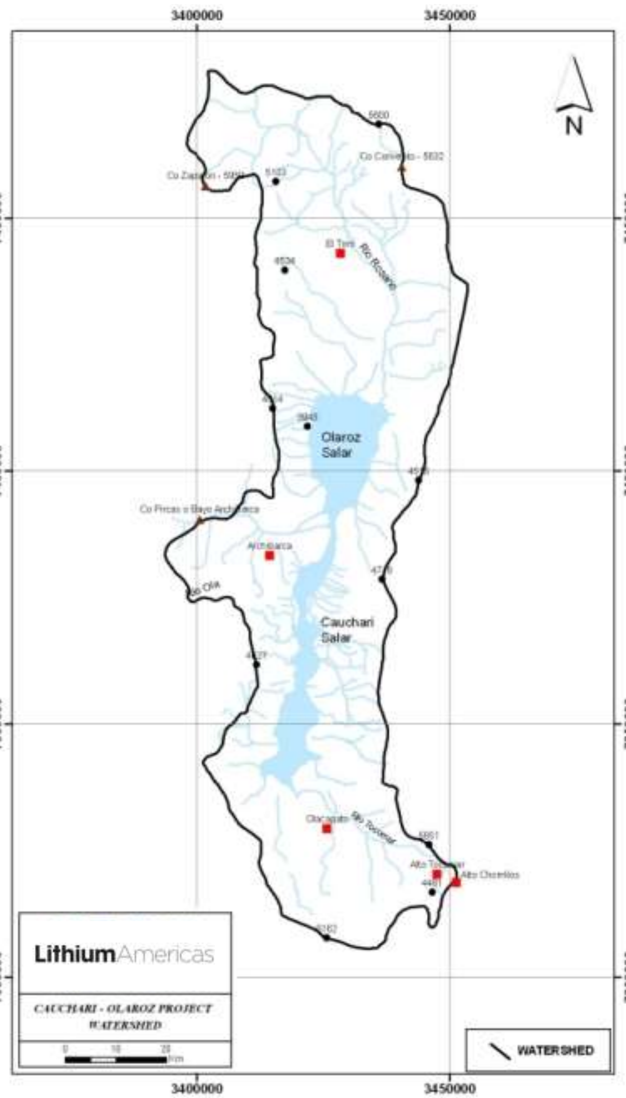
Figure 58 (Appendix 1) shows locations where sand entered the salar basins during the USGC deposition period. Similar to the LSGC, the primary location is at the Archibarca Fan (below the present-day fan), as indicated by the high sand fraction extending into the salar. Secondary locations occur at another 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.

7.6 SURFACE WATER

The Cauchari-Olaroz watershed is shown in Figure 7.8. 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 7.9). 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 7.8 Caucharri-Olaroz Watershed



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

Figure 7.9 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 7.10).

Figure 7.10 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 7.11). Rio Tocomar was dry in the villages of Olacapato and Cauchari on that same date.

Figure 7.11 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 GROUNDWATER

7.7.1 Overview

The technical considerations for the transition from a brine Resource Estimate to a brine Reserve Estimate are discussed in Section 2.4. A key component of this transition is the prediction of brine extraction over a production period. Previous 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 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 7.6.

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 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 Resource Estimate (King, 2010b). It is also included herein, due to its role in the Reserve Estimate, in Section 15 (RBRC results summary), 11.1.3 (collection methods) and 11.2.4.2.2 (analytical methods).

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 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 7.6.

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 Hydrostratigraphic Model (update for current Reserve Estimate)	5-Unit Hydrostratigraphic Model (used for previous Resource Estimate) (King, 2010b)	Literature Values for Sy[1] (comparable to RBRC)		Sampling Results for Sy (as estimated by RBRC testing)			
		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) From Beauheim (1991), Johnson (1967), Bear (1972), Freeze and Cherry (1979), Van der Leeden et. al. (1990).

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 15.10).

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:

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

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

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	AQTESolve 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)

7.7.5 Salar Hydrostratigraphic Model

A hydrostratigraphic model is an assemblage of hydrostratigraphic units, which, in turn, are groupings of lithostratigraphic units with similar hydraulic properties (i.e., K, SS, Sy, and Pe). The hydrostratigraphic model developed herein represents the interpreted three-dimensional structure, spatial distribution, and interconnectedness of these units. It provides the basic structure and hydraulic parameters for the numerical groundwater model (Section 15). Consequently, the completed numerical model is capable of simulating groundwater/brine flow through the defined hydrostratigraphic model.

A hydrostratigraphic model defining the distribution of Sy (as estimated by RBRC) was previously developed for the Resource Estimate zone (King, 2010b). As discussed in Section 2.4, the purpose of the model at the Resource Estimate stage was to support an estimate of bulk brine volume, with preliminary consideration of recoverability. In addition to Sy, the hydrostratigraphic model for a Reserve Estimate also defines the distribution of other hydraulic properties, including K, S, Pe.

A generalized framework of the hydrostratigraphic model developed herein is presented in Figure 7.12 and an example cross-section is displayed in Figure 7.13. The model is based on the interpretation of boreholes, geophysical surveys, and hydraulic testing at the site, and also considers the interpreted salar in-filling history described in Section 7.3.

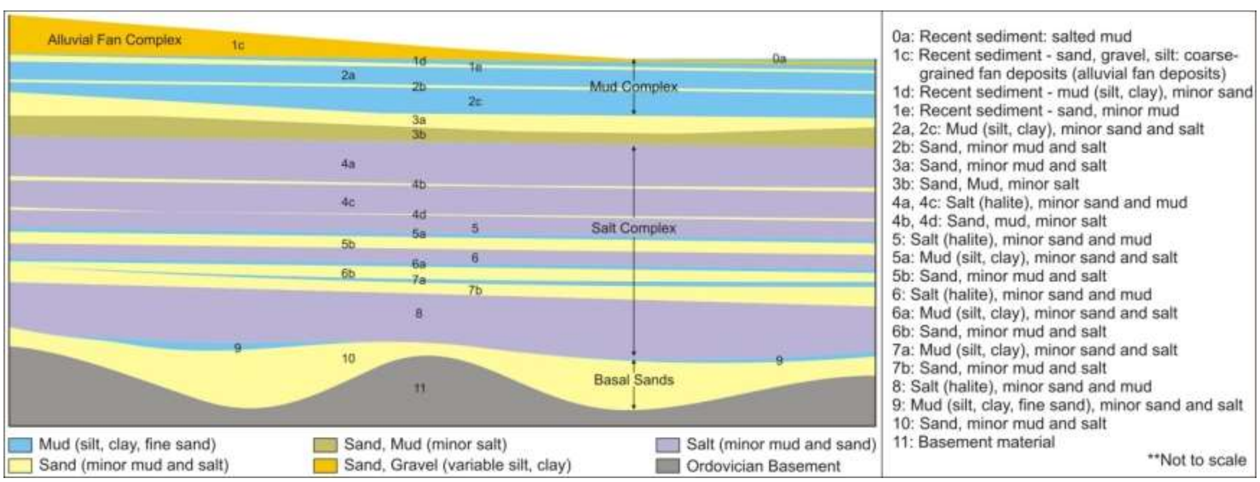
A seismic survey conducted at the site (Section 9.3) was used for interpolating between boreholes. Comparison of the seismic results with borehole logs indicated the following general relationships between seismic velocity and primary hydrostratigraphic units:

- Sands (higher than 3,000 m/sec);
- Clays and Silts (between 2,000 and 3,000 m/sec); and
- Halite (between 3,000 and higher than 4,000 m/sec, depending on composition and degree of consolidation).

The model includes 24 layers interpreted across the Cauchari Salar. The consistency between borehole logs and geophysical survey results provides confidence that the model interpretations are reasonable. Some descriptive comments regarding the hydrostratigraphic model are as follows:

- 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 to facilitate numerical modelling 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 centre and the east.

Figure 7.12 General Framework for Cauchari Salar Hydrostatic Model



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

In developing the hydrostratigraphic model, it was noted that stratigraphic variability is apparent between boreholes, which causes some uncertainty in correlating logs. The variability is considered to be related to:

- The narrow shape of the basin in relation to the size of the sediment entry and dispersal systems; and

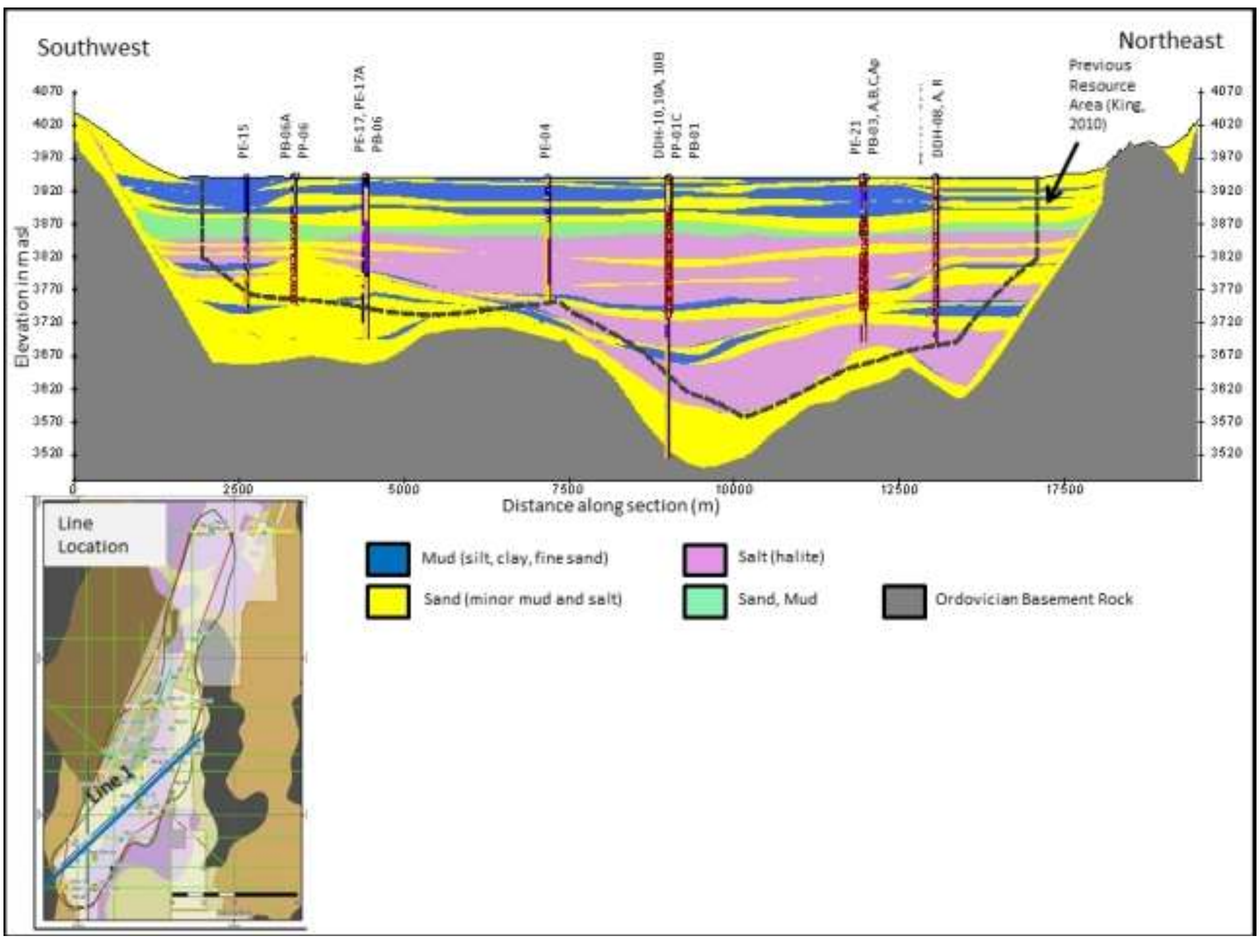
- Differential settlement of the salar sediments.

Consequently, in some locations, the model may represent some hydrostratigraphic surfaces as smoother than they actually occur in the salar. However, it is considered that the potential effect of this approximation on the Reserve Estimate is negligible. Details of the FEFLOW model development and application for the Reserve Estimate are provided in Section 15. The final representation of hydrostratigraphic units within the previous Resource Zone is presented in Table 7.4

TABLE 7.4
SUMMARY OF UNITS IN THE UPDATED HYDROSTRATIGRAPHIC MODEL

Hydrostratigraphic Unit	Percent Contribution
Sand	37%
Mud (Silt, Clay)	21%
Halite	32%
Sand Mix	10%

Figure 7.13 Section through the Cauchari Salar Hydrostartigraphic Model



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

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 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 7.5. 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 7.5 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

Table 7.6 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 7.6 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

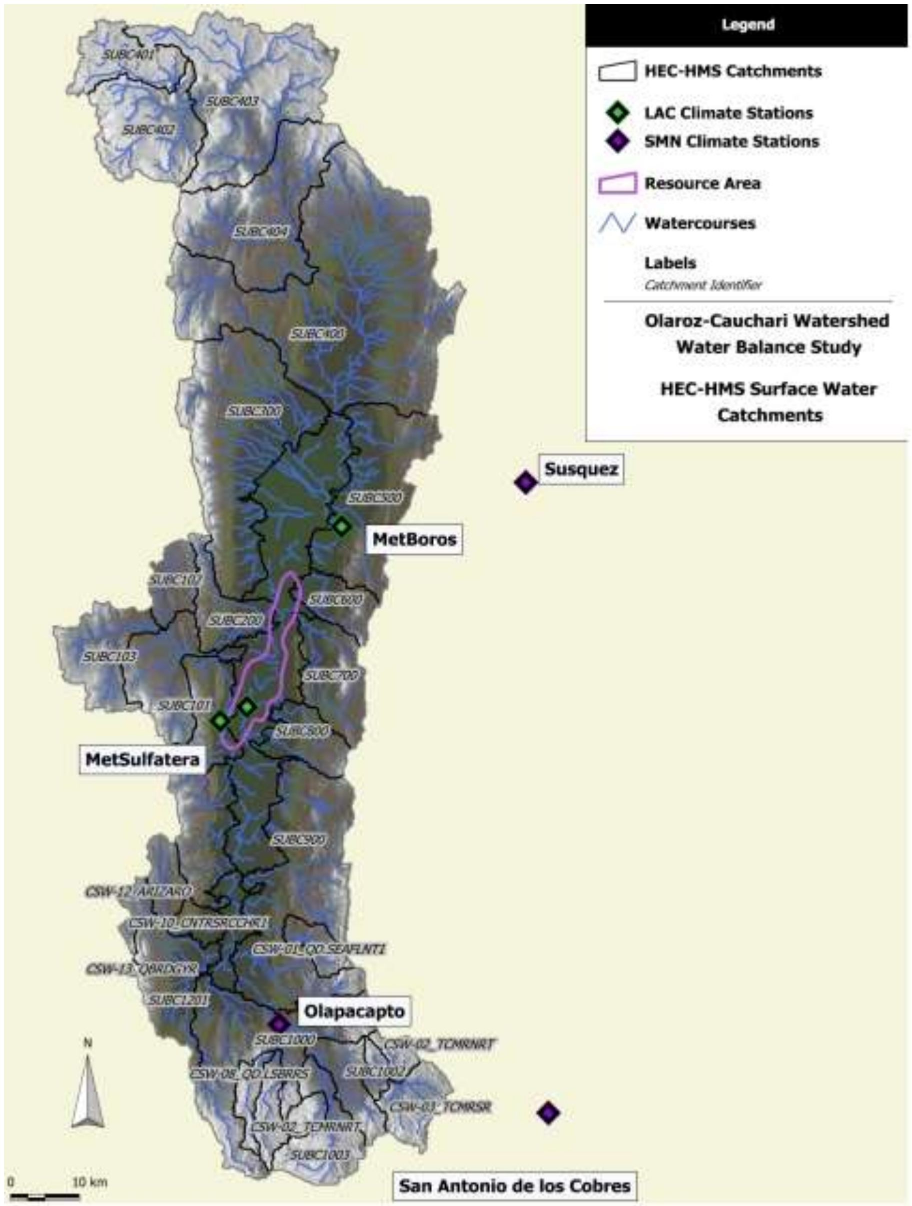
7.10.1 Temporal Considerations

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 7.14), 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 km2 to 860 km^2, with an average area of 170 km^2.

Figure 7.14 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

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

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 Reserve Estimate is based on the 2012 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

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

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 7.15 and Figure 7.16 for streams south of Cauchari,
- Figure 7.17 to Figure 17.20 for streams in the vicinity of Olacapato,
- Figure 17.21 and Figure 17.22 for streams west of Cauchari; and
- Figure 17.23 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.

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 7.7 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 7.7
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

TABLE 7.7 CAUCHARI-OLAROZ CATCHMENT WATER BALANCE (1950-1990)					
Catchment	**Area (km^2)**	**Precipitation (mm)**	**Catchment Outflow (mm)**	**ET (mm)**	**Error (%)**
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

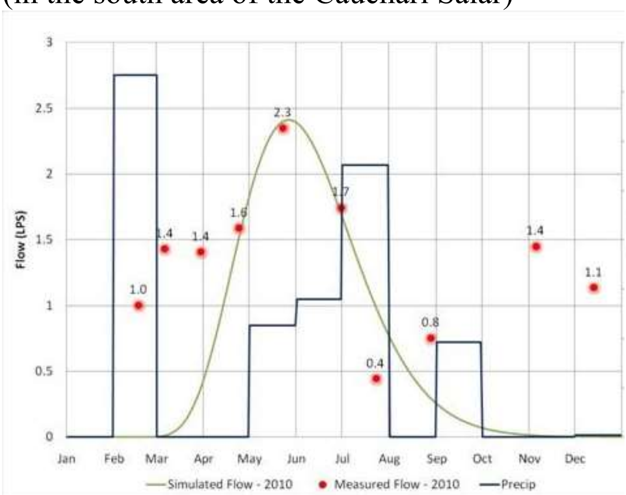
The long-term water balance was used to determine typical lateral recharge rates to the salar, for input to the groundwater model used to calculate of the Reserve Estimate (Section 15). The outflows from 31 catchments were lumped into nine catchments that contribute flow directly to the salar. These lumped values are shown in Figure 17.25, 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 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.

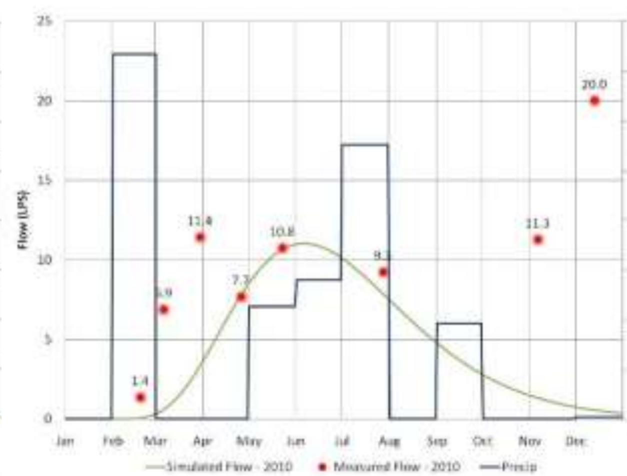
Figure 17.24 shows the estimated freshwater outflow from the catchments contributing to the Archibarca Fan, to provide an indication of annual variability. The Archibarca Fan is located on the boundary between the Olaroz and Cauchari Salars, and is within the groundwater model domain. Annual outflows 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 7.15 CSW-01_QD.SEAFLNT1
(in the south area of the Cauchari Salar)



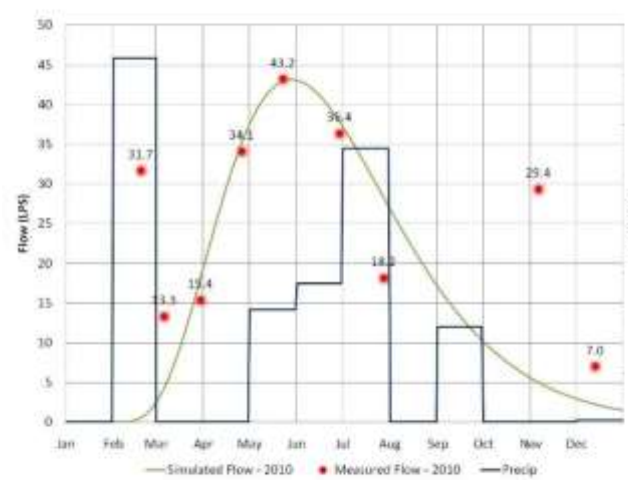
Source: *King, Kelley, Abbey, (2012).*

Figure 7.16 CSW-02_TCMRNRT
(in the south area of the Cauchari Salar)



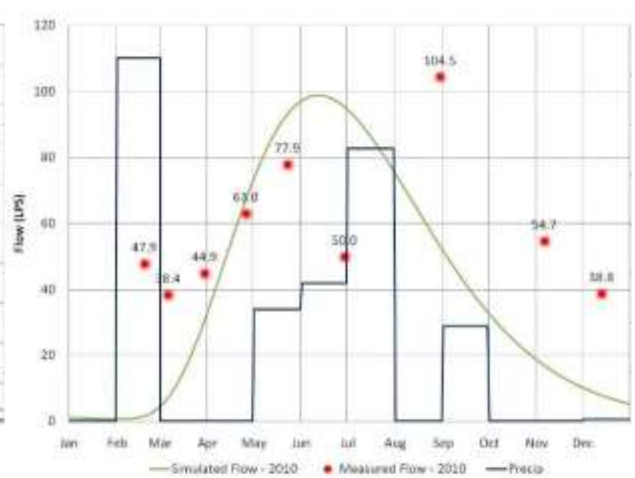
Source: *King, Kelley, Abbey, (2012).*

Figure 7.17 CSW-03_TCMRSR
(near Olacapato)



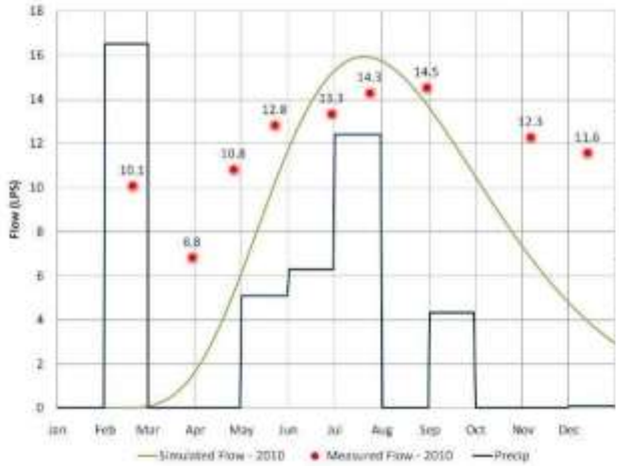
Source: *King, Kelley, Abbey, (2012).*

Figure 7.18 CSW-04_R.TCMRR2PNT
(near Olacapato)



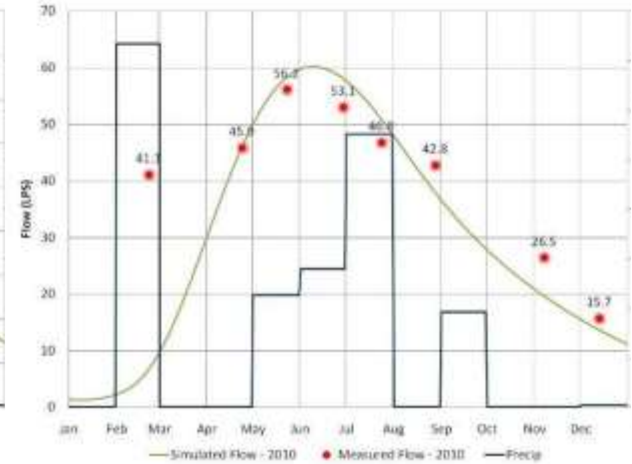
Source: *King, Kelley, Abbey, (2012).*

Figure 7.19 CSW-05_RANTC
(near Olacapato)



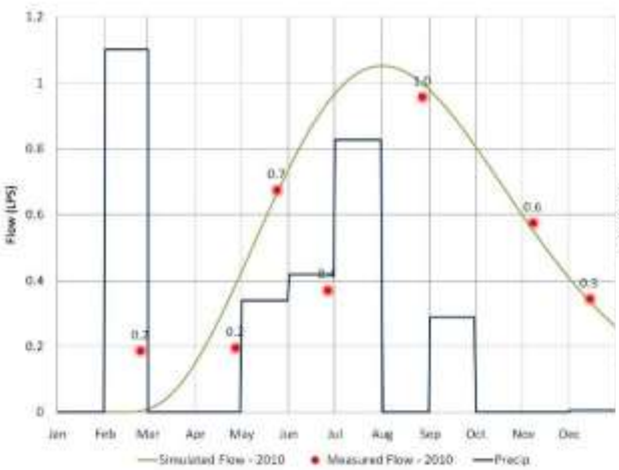
Source: *King, Kelley, Abbey, (2012).*

Figure 7.20 CSW-07_RQVR
(near Olacapato)



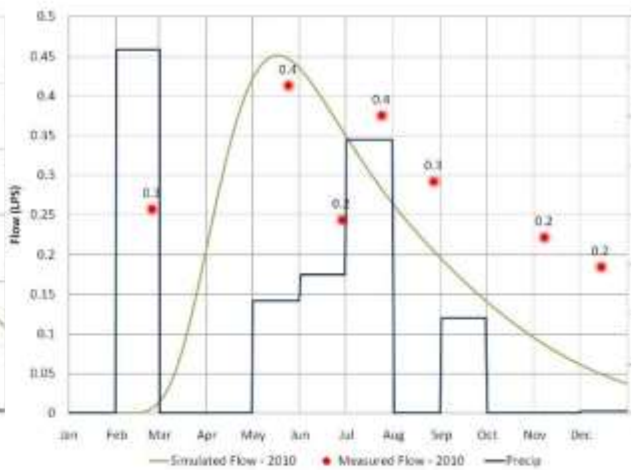
Source: *King, Kelley, Abbey, (2012).*

Figure 7.21 CSW-12_ARIZARO
(west of the Cauchari Salar)



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

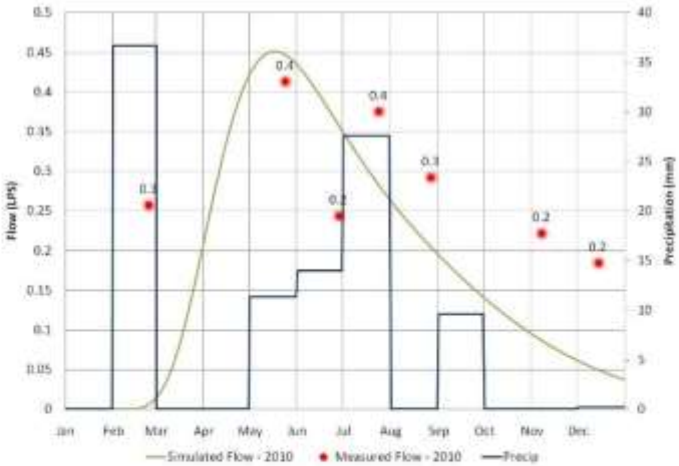
Figure 7.22 CSW-13_QBRDGYR
(west of the Cauchari Salar)



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

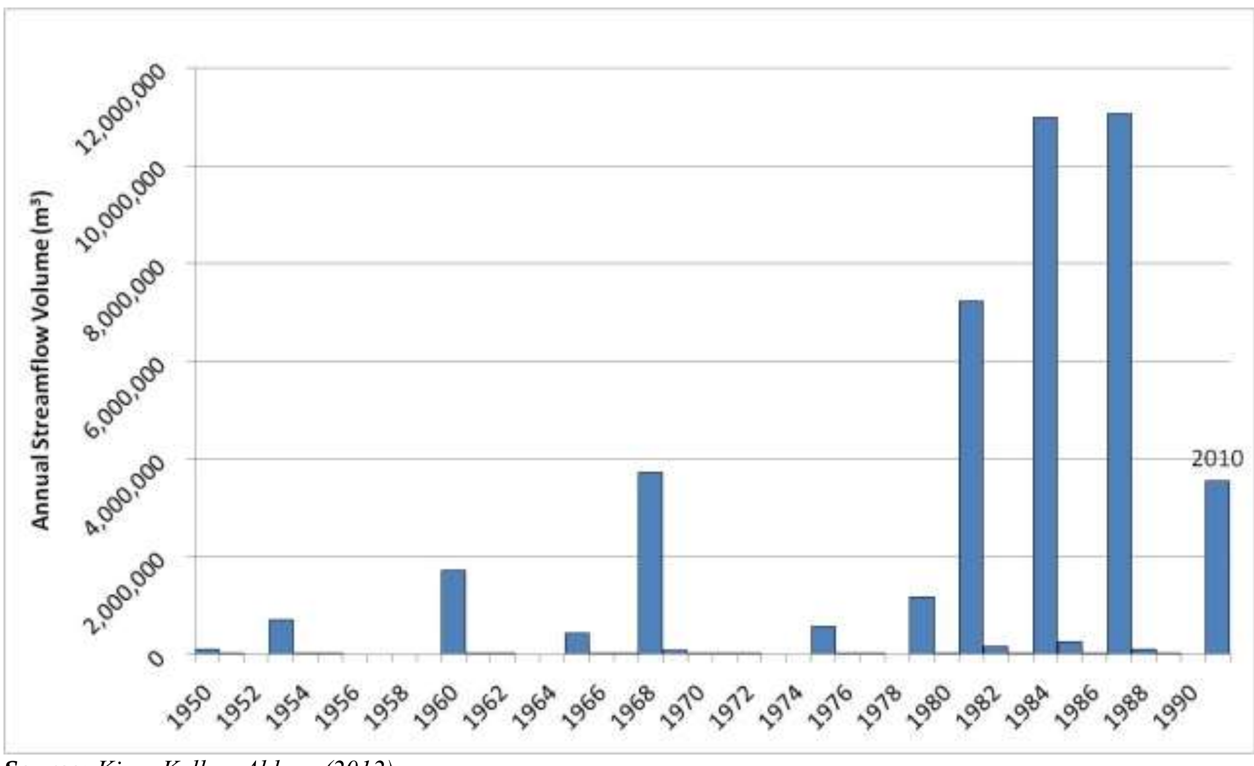
Figure 7.23 OSW-01_RRSRPNTR

(north of the Olaroz Salar)



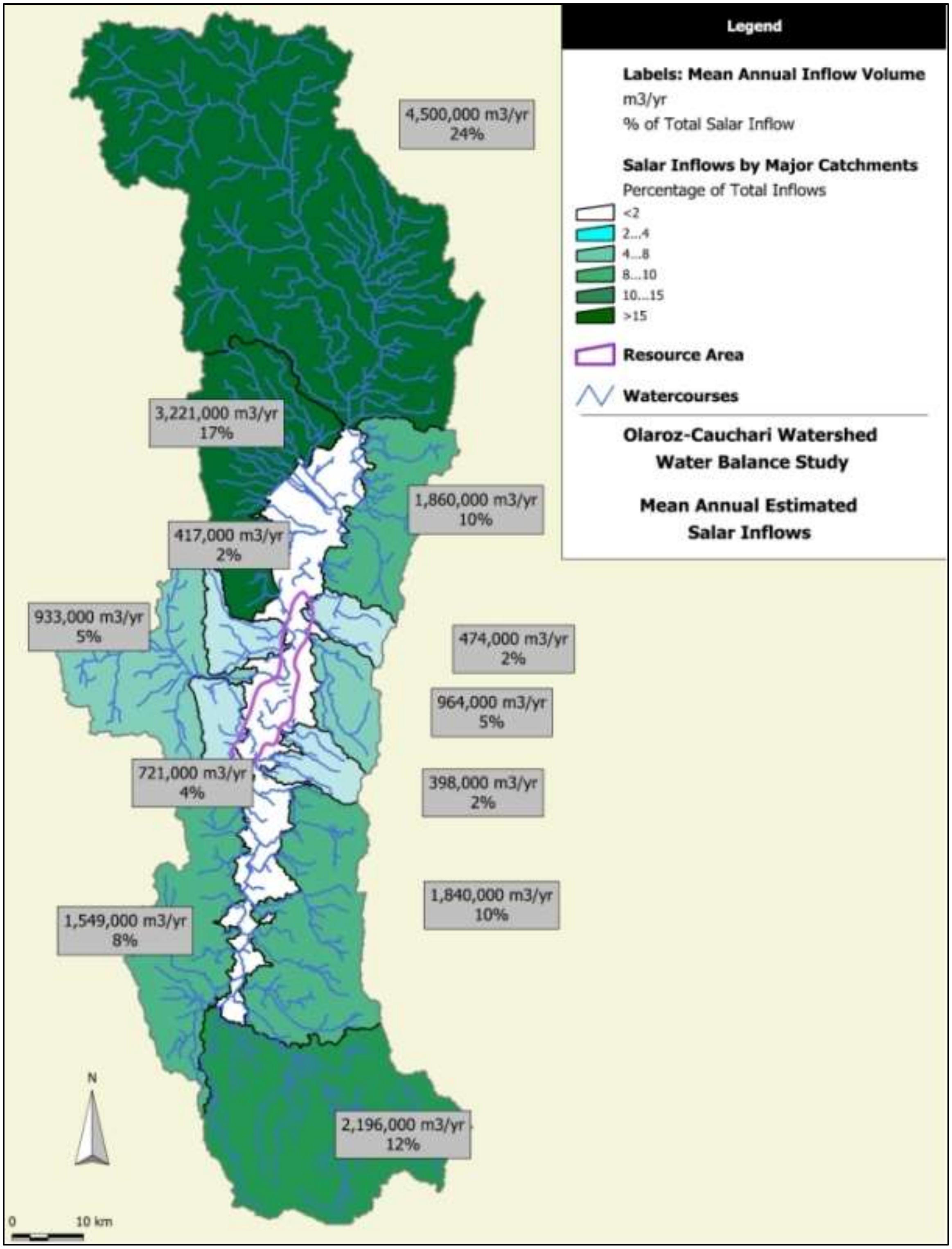
Source: *King, Kelley, Abbey, (2012).*

Figure 7.24 Annual Freshwater Outflow Totals for Areas Contributing to the Archibarca Fan



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

Figure 7.25 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. Table 8.1 compares the average Cauchari brine composition measured in weight percent with other natural brine deposits. Figure 7.26 shows concentration histograms for lithium and potassium in brine samples collected from the Resource Estimate zone.

A Janecke Projection comparing the chemistry of several brine deposits is shown in Figure 7.27. 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 8.2, 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 ($MgCl_2 \cdot 6H_2O$).

TABLE 7.8
COMPARATIVE CHEMICAL COMPOSITION OF NATURAL BRINES

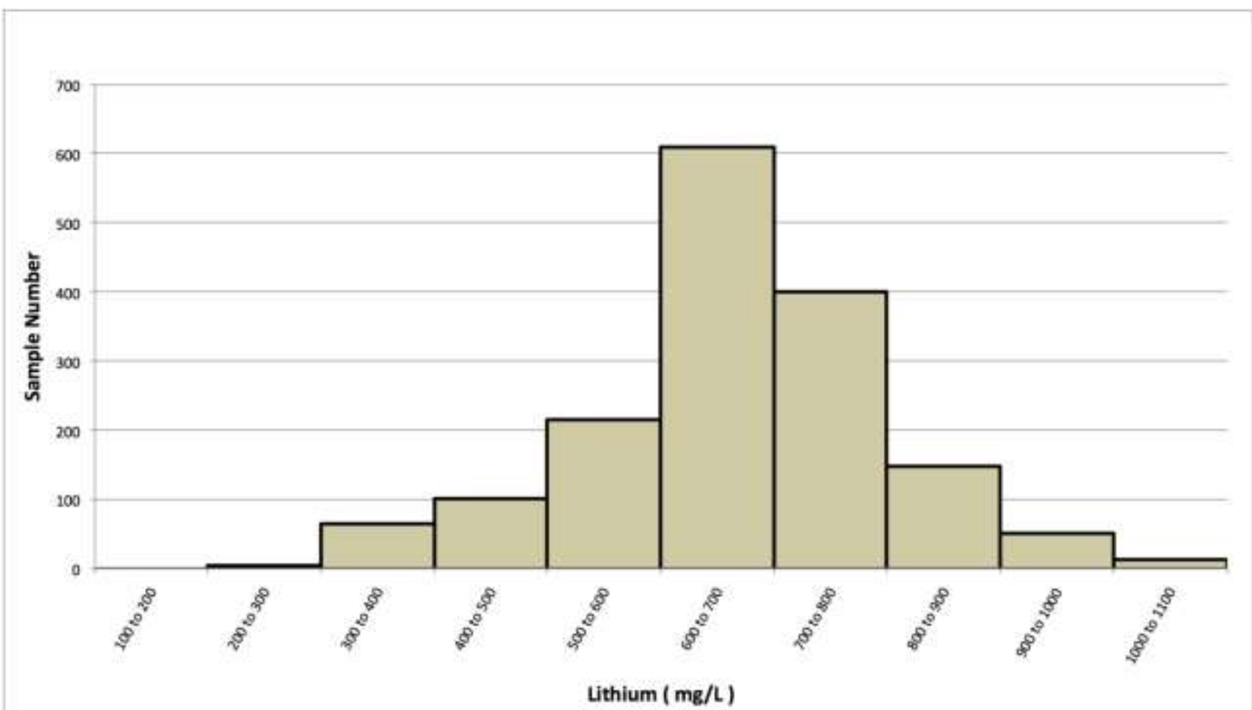
Company	Location	Category	wt %					Density (g/cm³)	Ratios				
			Li	K	Mg	SO4	B		Mg/Li	K/Li	SO_4/Li	SO_4/Mg	SO_4/K
Comibol (state)	Uyuni, Bolivia (A)	Inferred	0.035	0.720	0.650	0.850	0.020	1.211	18.57	20.57	24.29	1.31	1.18
SQM	Atacama, Chile (B)	Probable Proven	0.150	1.850	0.960	1.650	0.064	1.223	6.40	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

TABLE 7.8 COMPARATIVE CHEMICAL COMPOSITION OF NATURAL BRINES														
Company	Location	Category	wt %					Density (g/cm³)	Ratios				
			Li	K	Mg	SO4	B		Mg/Li	K/Li	SO_4/Li	SO_4/Mg	SO_4/K
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
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*

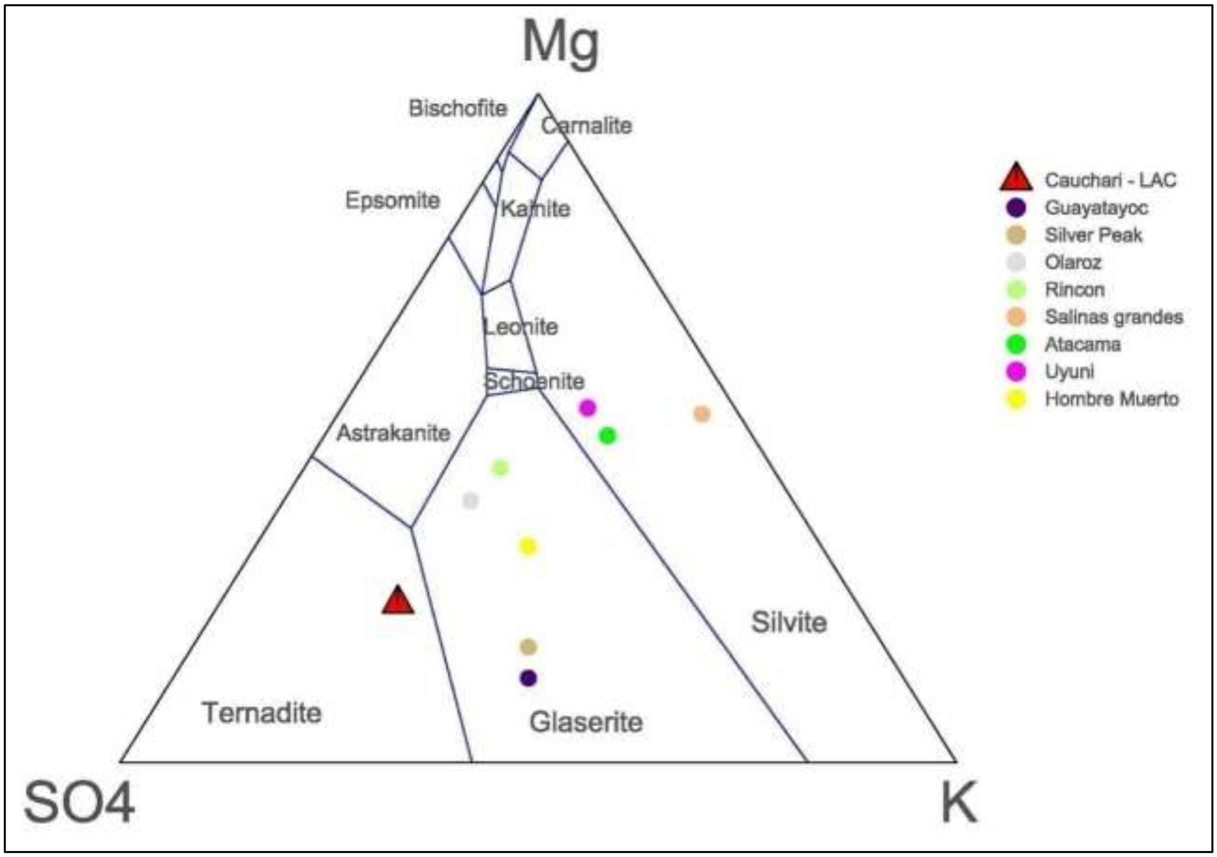
It should be noted that the Qualified Person has been unable to verify the information for other properties listed in Table 7.8 and that the information is not necessarily indicative of the mineralization on LAC's Cauchari-Olaroz Property that is the subject of the Technical Report.

Figure 7.26 Lithium Histogram for Brine Samples from the Resource Estimate Zone



Source: *King, (2010b).*

Figure 7.27 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.

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.

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.

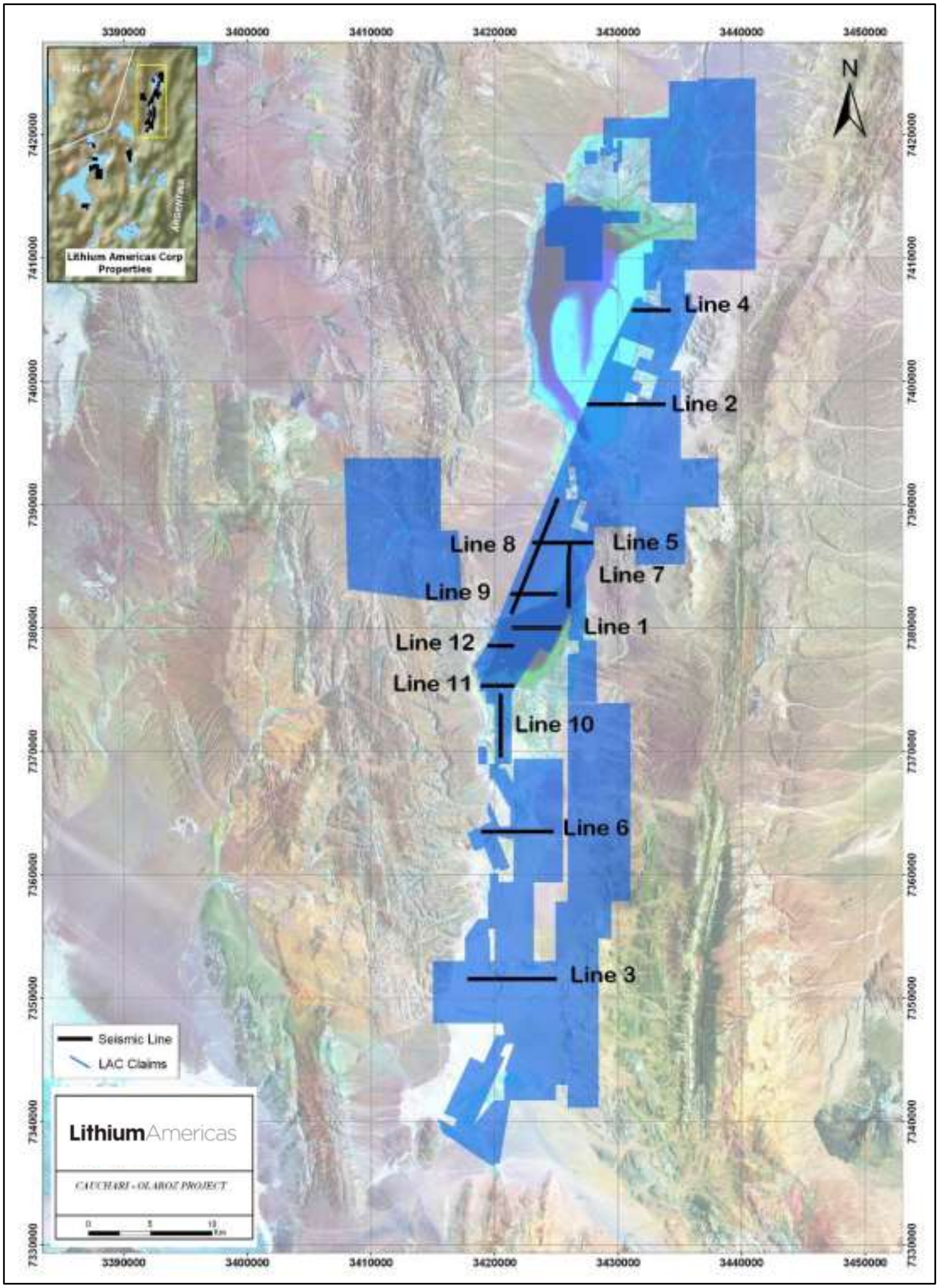
9.2 SURFACE BRINE PROGRAM

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.

Figure 9.1 Seismic Tomography Lines – 2009 and 2010



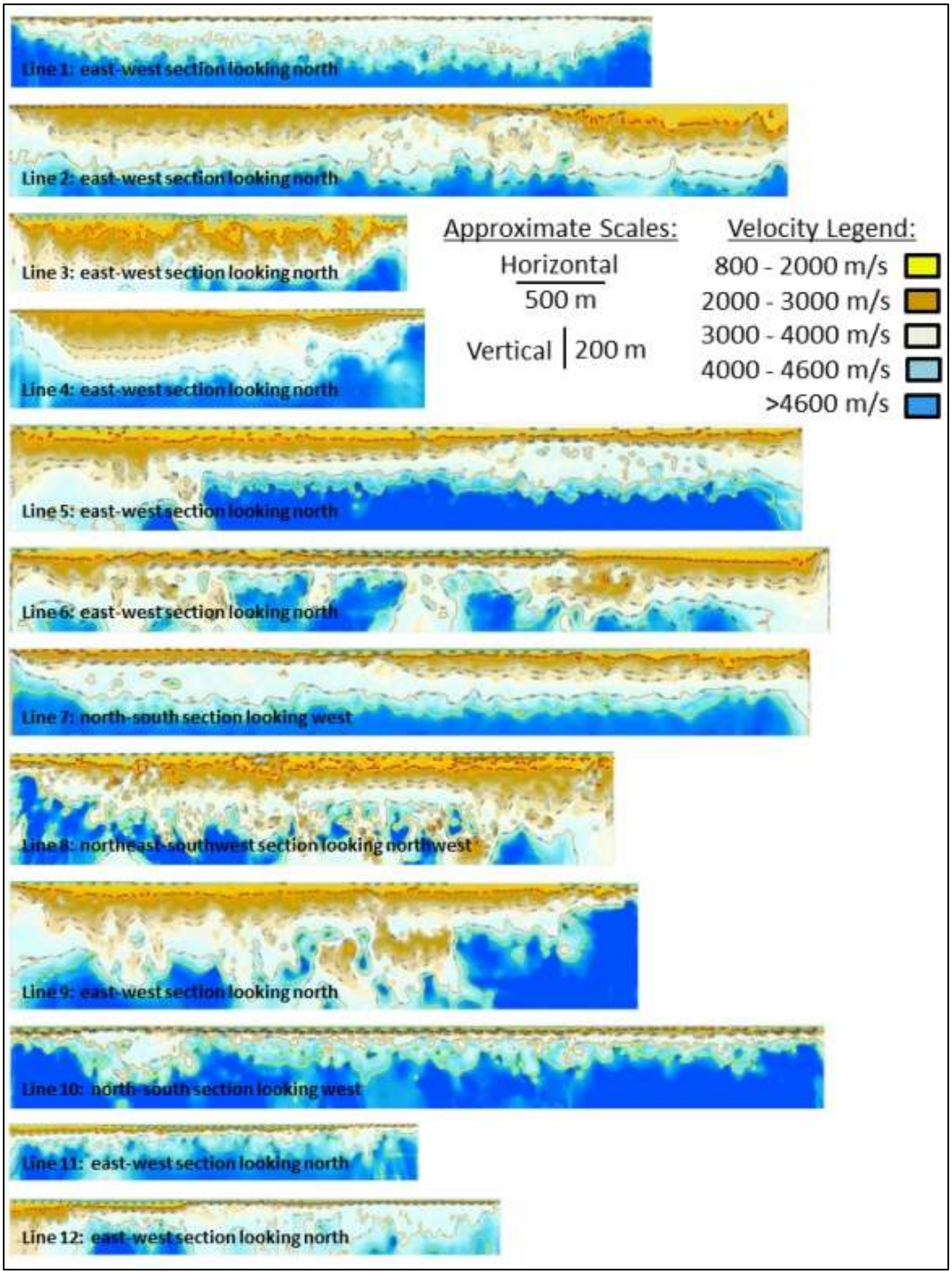
Source: *King, Kelley, Abbey, (2012).*

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.

To date, none of the boreholes drilled at the site have reached the underlying basement to confirm depth of basin estimates. Consequently, it remains unknown whether the very high velocities of > 4,000 m/s indicated at depth are related to highly-compacted halite, the compression of other lithologies (and possibly the removal of liquids and subsequent changes in porosity) due to the weight of overlying salar sediments, or to basement rocks. Any of these could have similar velocity characteristics, and all would likely have low RBRC values relative to shallower materials.

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

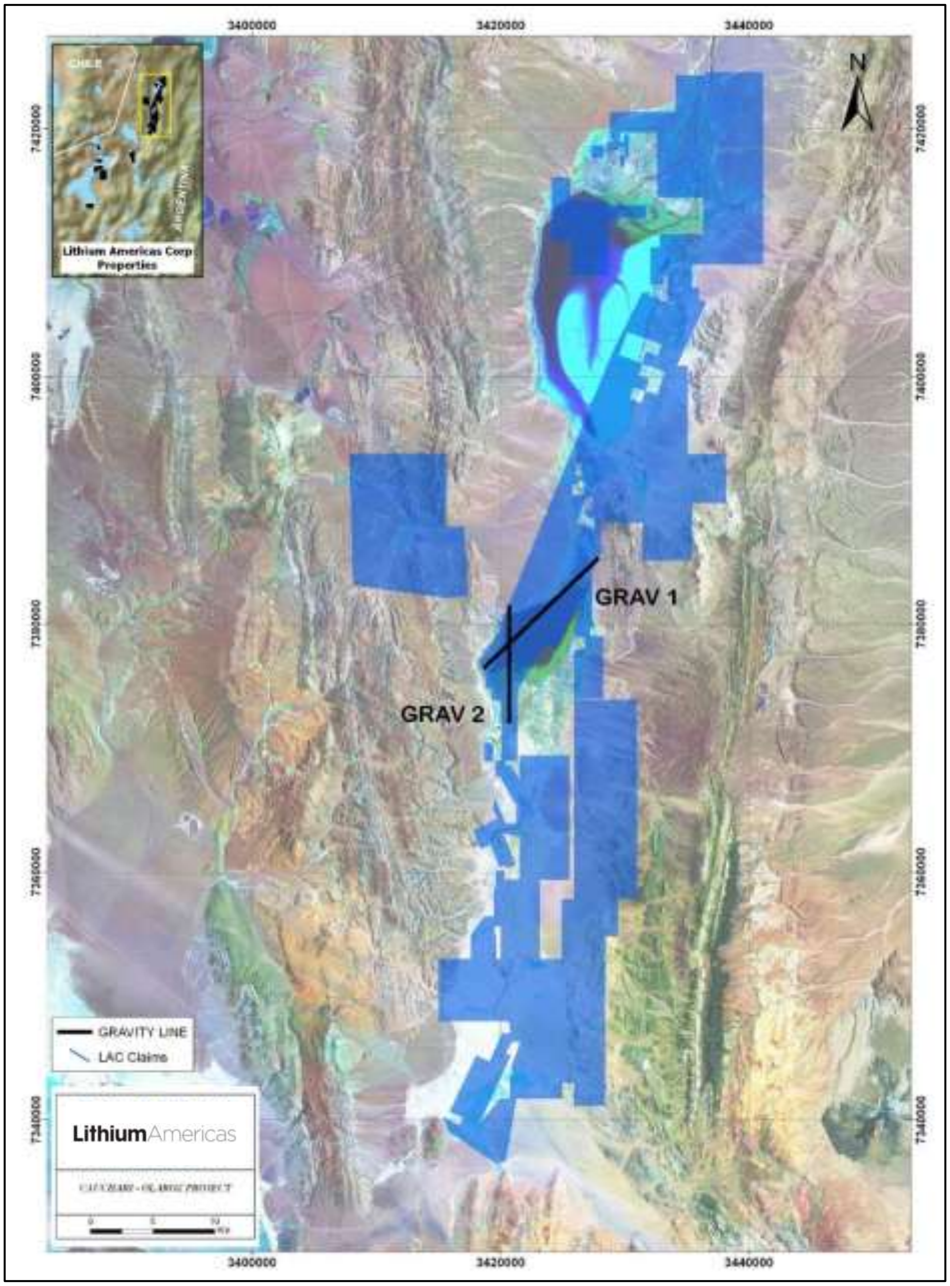


Source: *King, Kelley, Abbey, (2012).*

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.

Figure 9.3 Location of Gravity Survey Lines at the Cauchari Salar



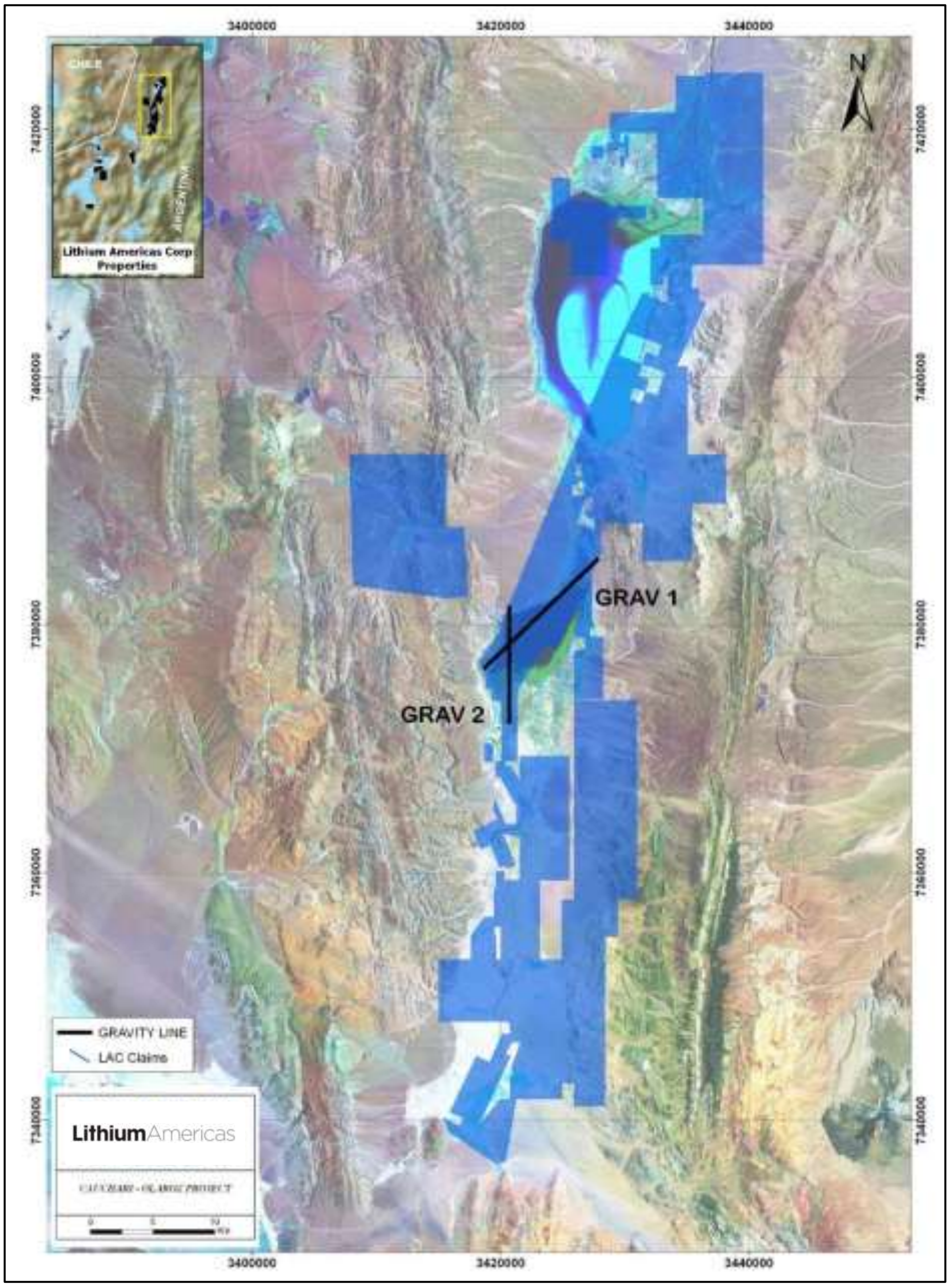
Source: *King, Kelley, Abbey, (2012).*

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.

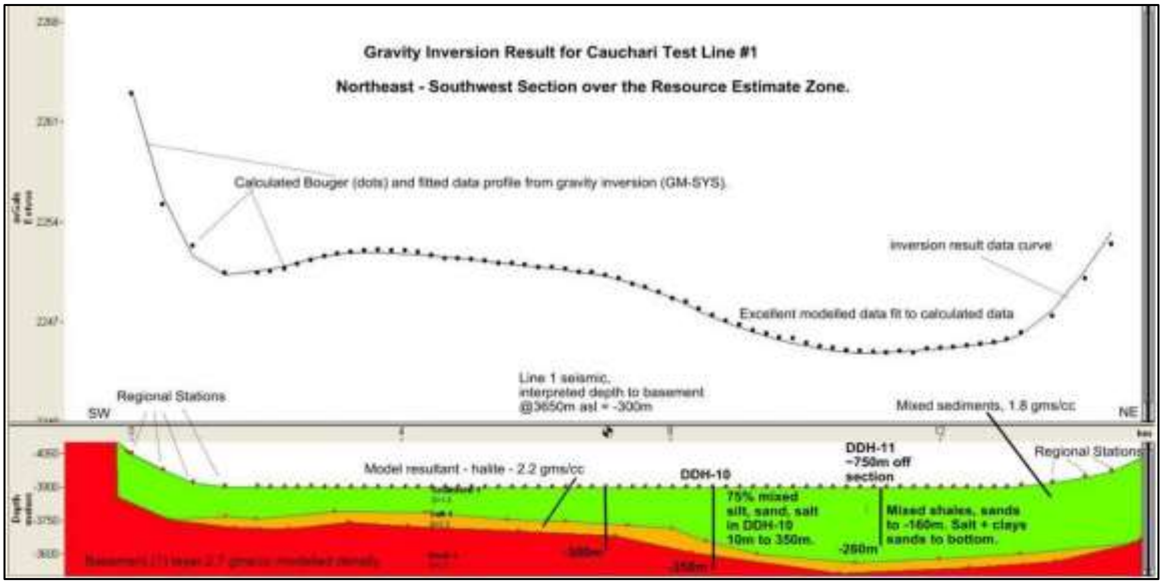
Modelling results for the northeast oriented gravity survey line (GRAV 1) are shown in Figure 9.4. The image shows the location of boreholes, the input densities used for model generation, and the calculated Bouger results from the field data. The upper profiles indicate an excellent fit of observed 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.

Figure 9.4 Location of Gravity Survey Lines at the Cauchari Salar



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

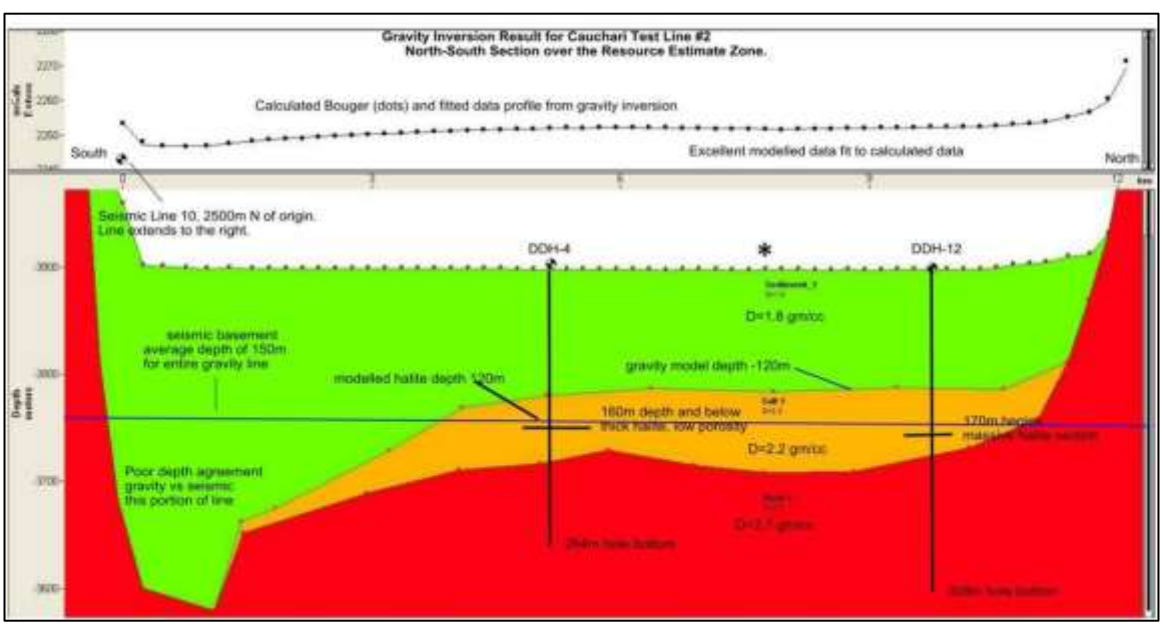
Figure 9.5 Modeling Results for the Northeast Oriented Gravity Line (Grav 1) Over the Resource Estimate



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

Modelling results for the north-south gravity profile (GRAV 2) across the southwest portion of the Resource Estimate zone are shown in Figure 9.6. 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 9.6 Modeling Results for the North-South Gravity Line (Grav 2) Across the Southwest Portion of the Resource Estimate



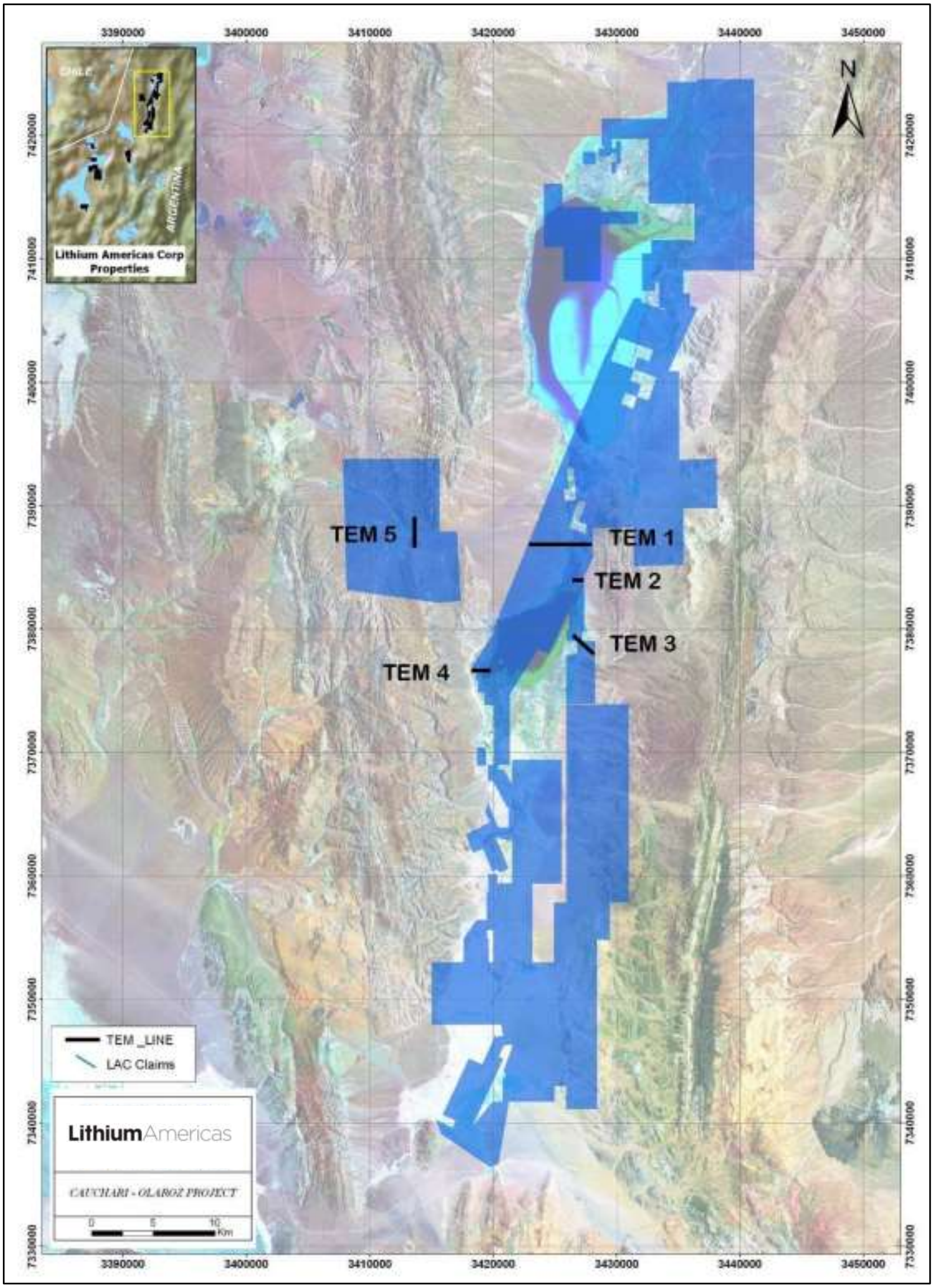
Source: *King, Kelley, Abbey, (2012).*

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 9.7. 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.

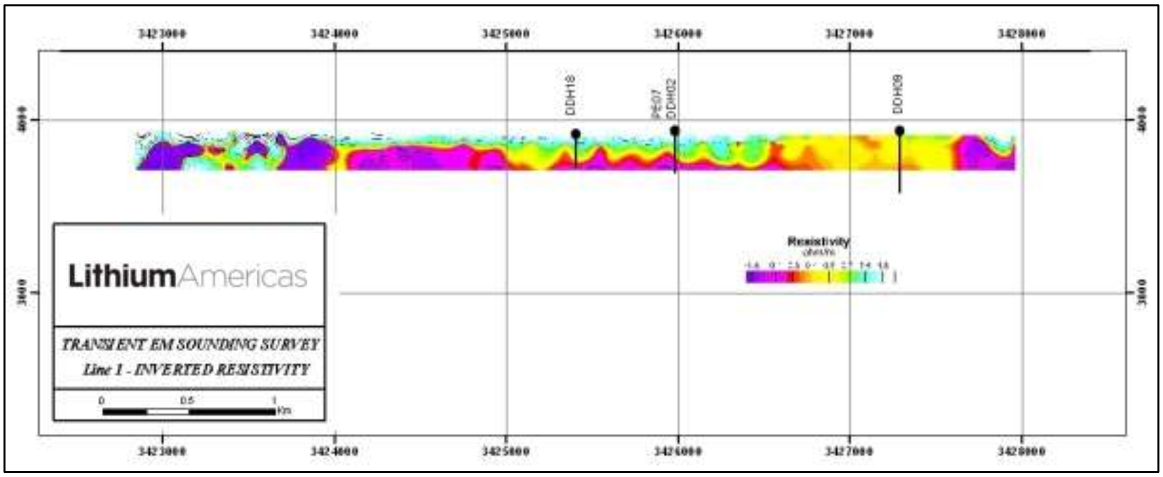
Figure 9.7 Location of TEM Sounding Profiles Conducted at the Cauchari Salar



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

Line TEM 1 (Figure 9.8) – 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.

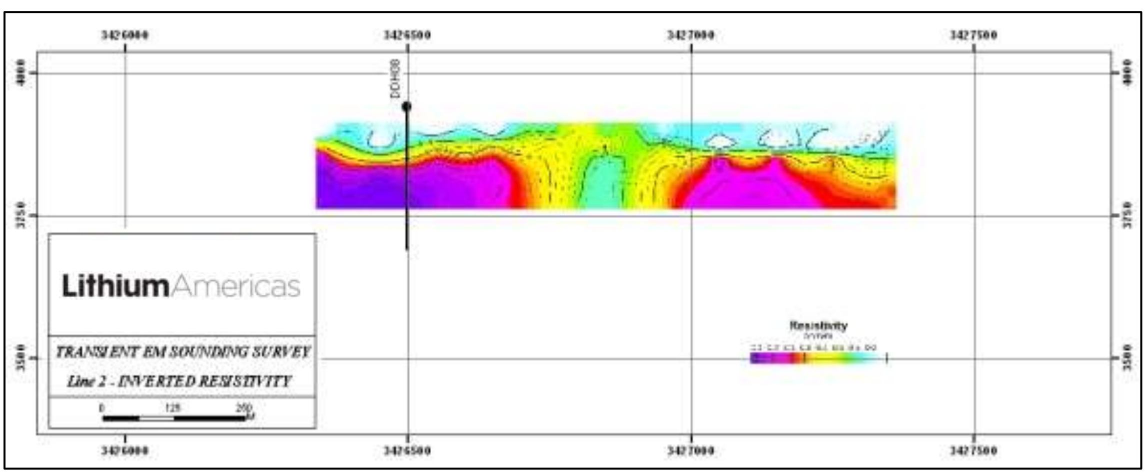
Figure 9.8 Survey Results for Line TEM 1



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

Line TEM 2 (Figure 9.9) – 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.

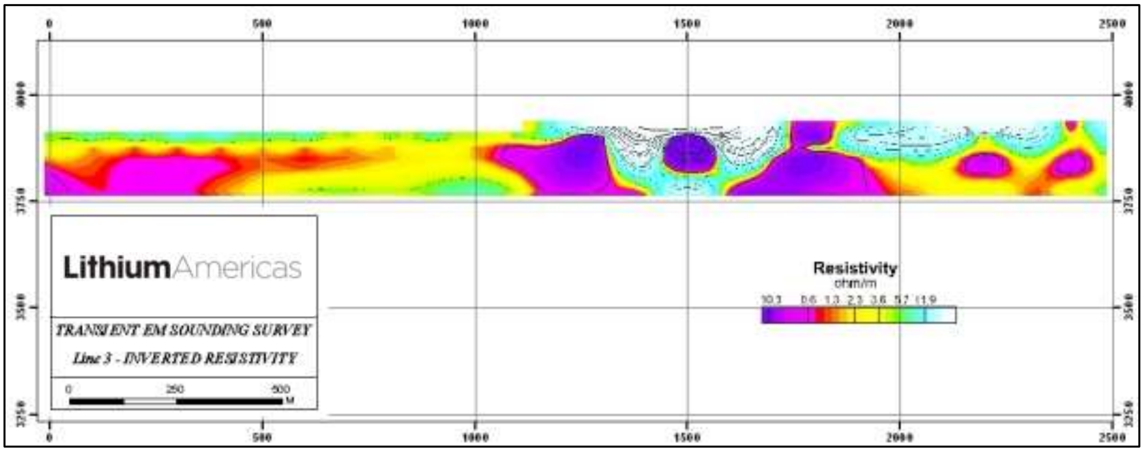
Figure 9.9 Survey Results for Line TEM 2



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

Line TEM 3 (Figure 9.10) – 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.

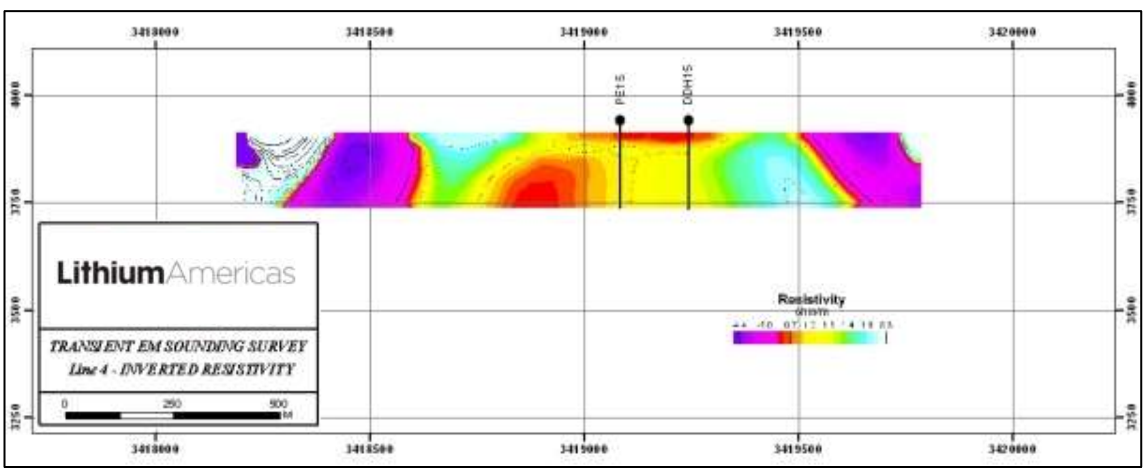
Figure 9.10 Survey Results for Line TEM 3



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

Line TEM 4 (Figure 9.11) – 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 9.11 Survey Results for Line TEM 4

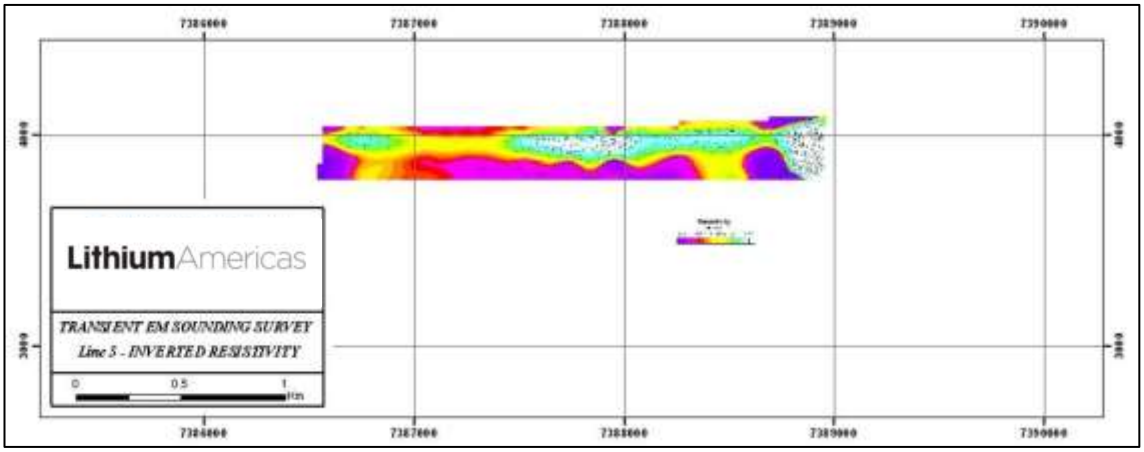


Source: *King, Kelley, Abbey, (2012).*

Line TEM 5 (Figure 9.12) – 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 9.12 Survey Results for Line TEM 5



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

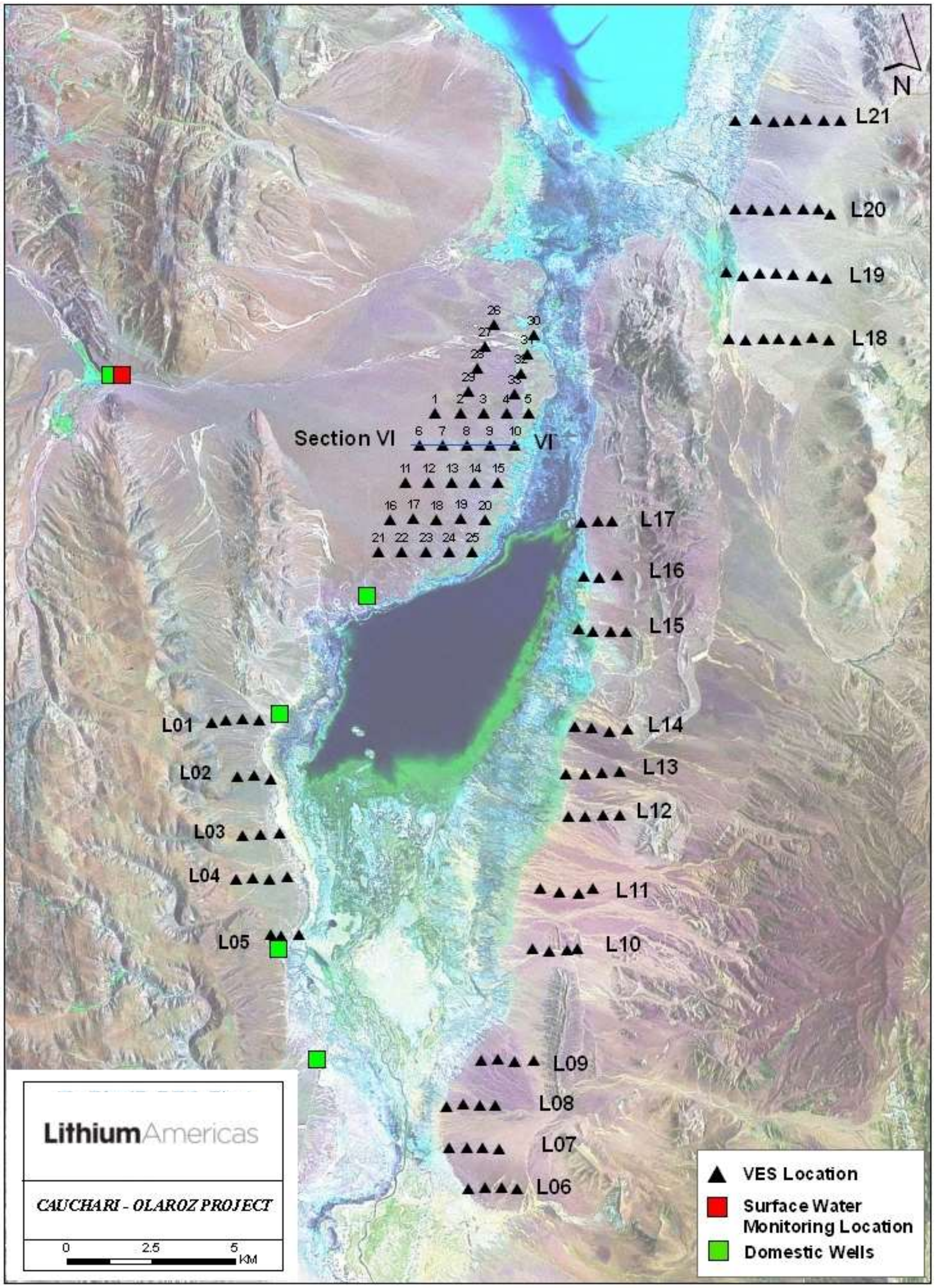
In conclusion, the TEM survey results indicate that the method can be used to determine resistivity contrasts within the salar. However, resolution may be limited to depths on the order of 75 m – 100 m, due to the broad presence of low resistivity materials, as indicated by ambient resistivity values 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 9.13.

Figure 9.13 Map of VES Survey Area



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

The VES results enable the differentiation of the following five zones on the Archibarca Fan and the salar perimeter locations, as shown in Figure 9.14 through Figure 9.17:

- 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.

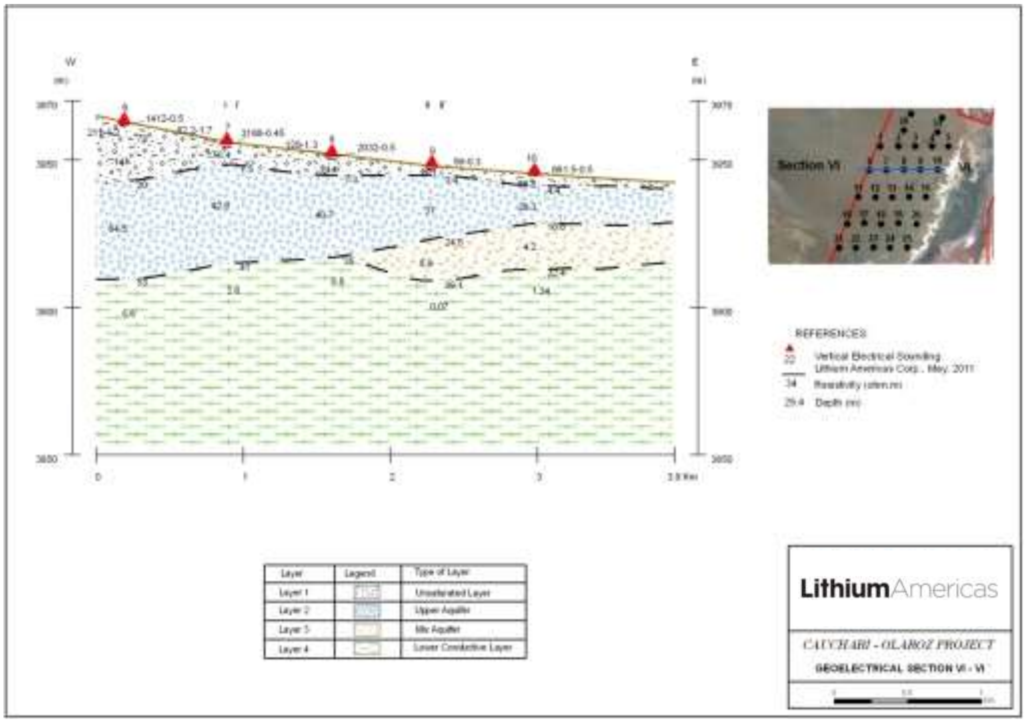
The first three of these were encountered on most lines and are interpreted to be relatively continuous on the Archibarca Fan and the salar perimeter. The latter two were discontinuous. On the Archibarca Fan, the VES results indicate the occurrence of fresh water to an average depth of 50 m below surface. 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 9.14 through 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.

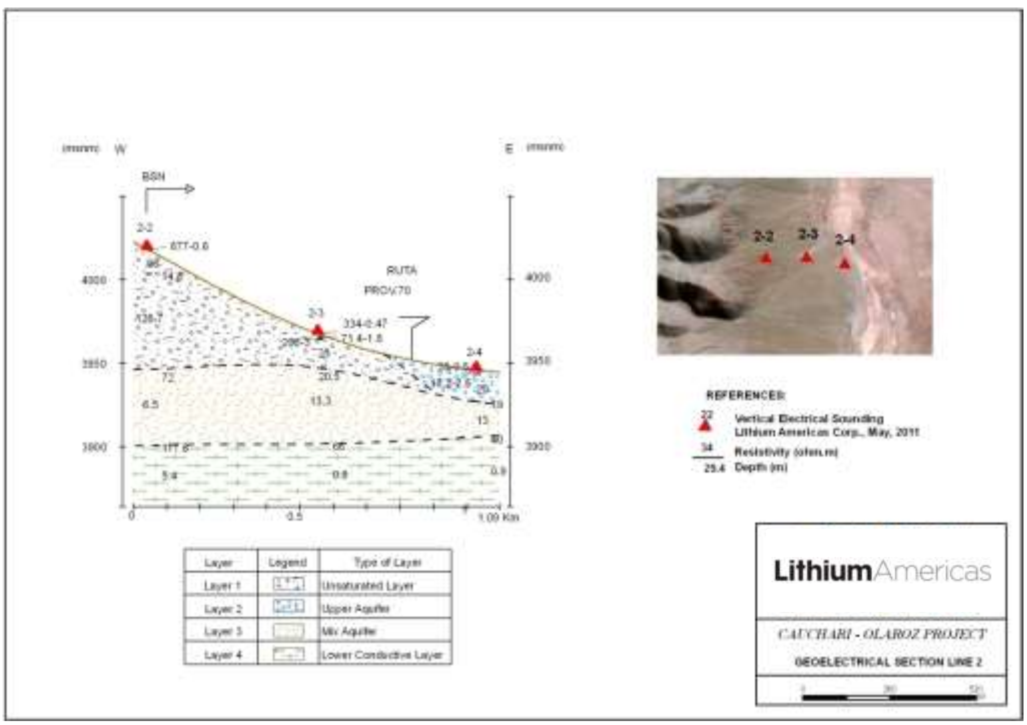
The VES results are also useful for general delineation of the fresh water/brine interface on the salar boundary. They were used to identify follow-up sampling locations at perimeter drilling and test pitting locations (see Section 9.7). Subsequently, the VES results and the follow-up sampling were used to define grade boundary conditions along the salar perimeter, as described in Section 15.8.

Figure 9.14 VES Survey Interpretation on the Archibarca Fan, along Line VI



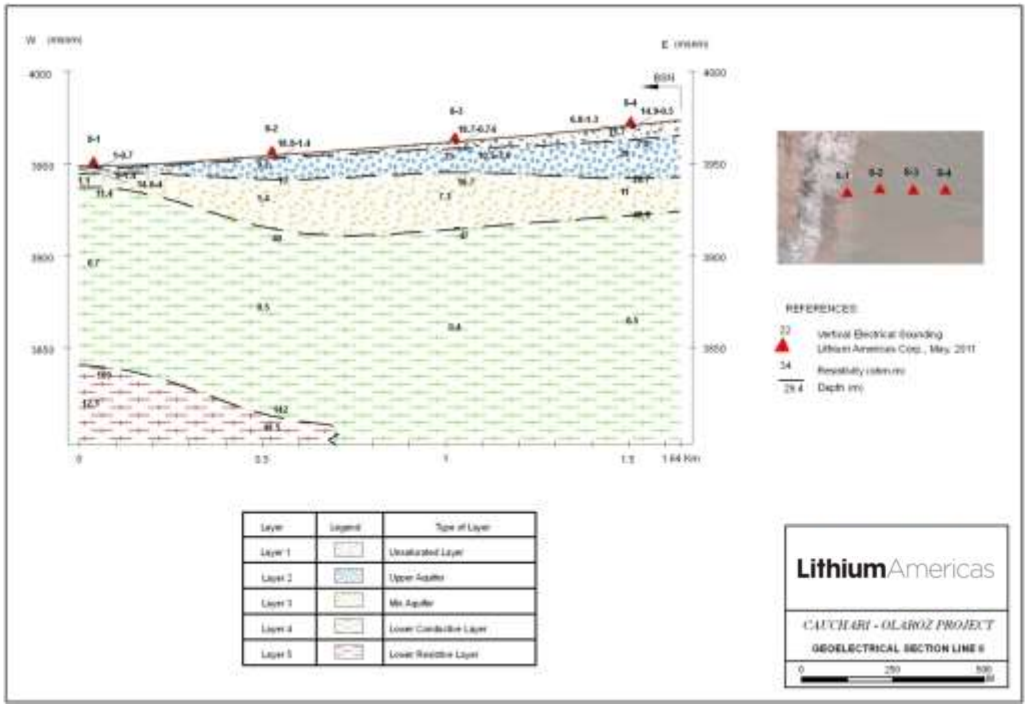
Source: *King, Kelley, Abbey, (2012).*

Figure 9.15 VES Survey Interpretation along Line 2



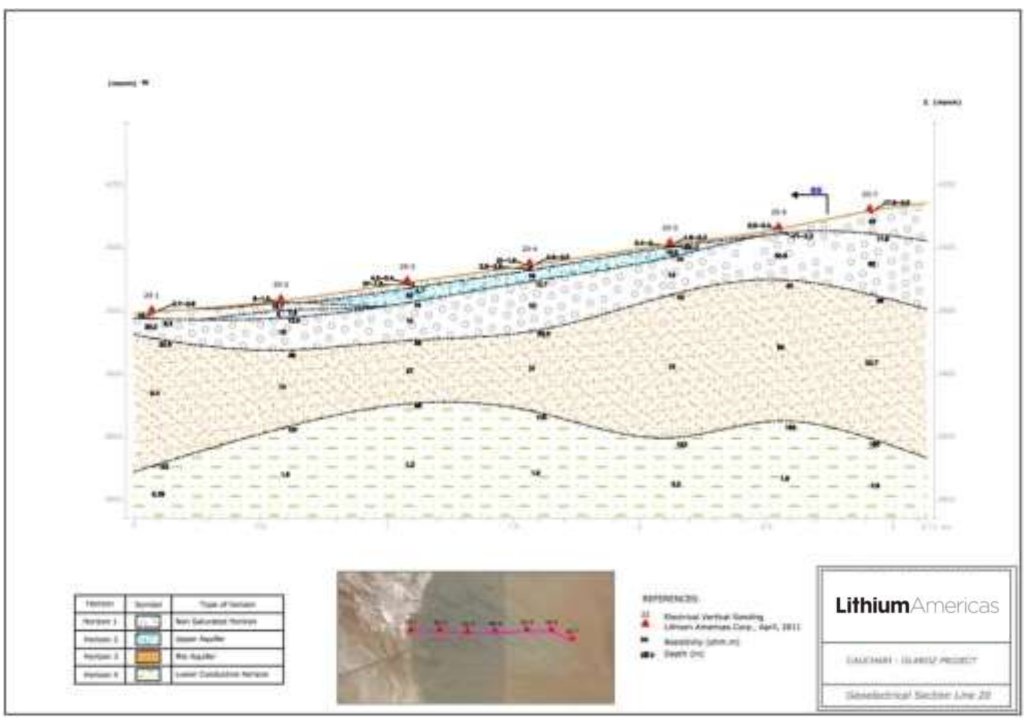
Source: *King, Kelley, Abbey, (2012).*

Figure 9.16 VES Survey Interpretation along Line 8



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

Figure 9.17 VES Survey Interpretation along Line 20



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

9.7 BOUNDARY INVESTIGATION

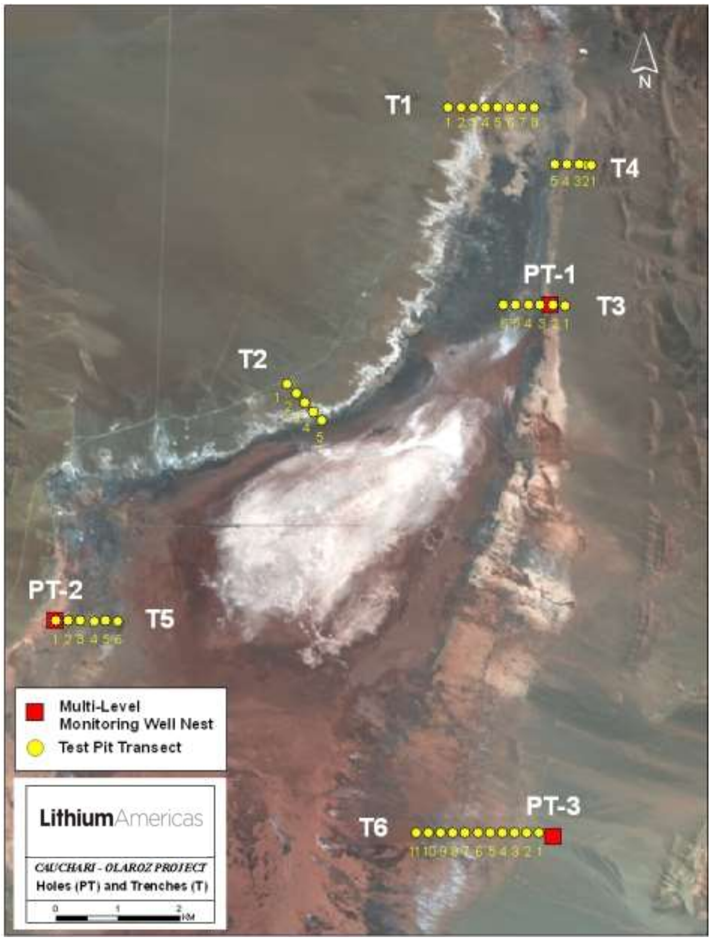
The Boundary Investigation was conducted to further assess the configuration of the fresh water/brine interface, at the salar surface and at depth, at selected locations on the salar perimeter. Data from this program were interpreted in conjunction with the VES survey (described in the previous section). 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 9.18, 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 9.18 Boundary Investigation Map Showing Test Pit Transects and Multi-level Monitoring Well Nests



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

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

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)**
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	**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
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.

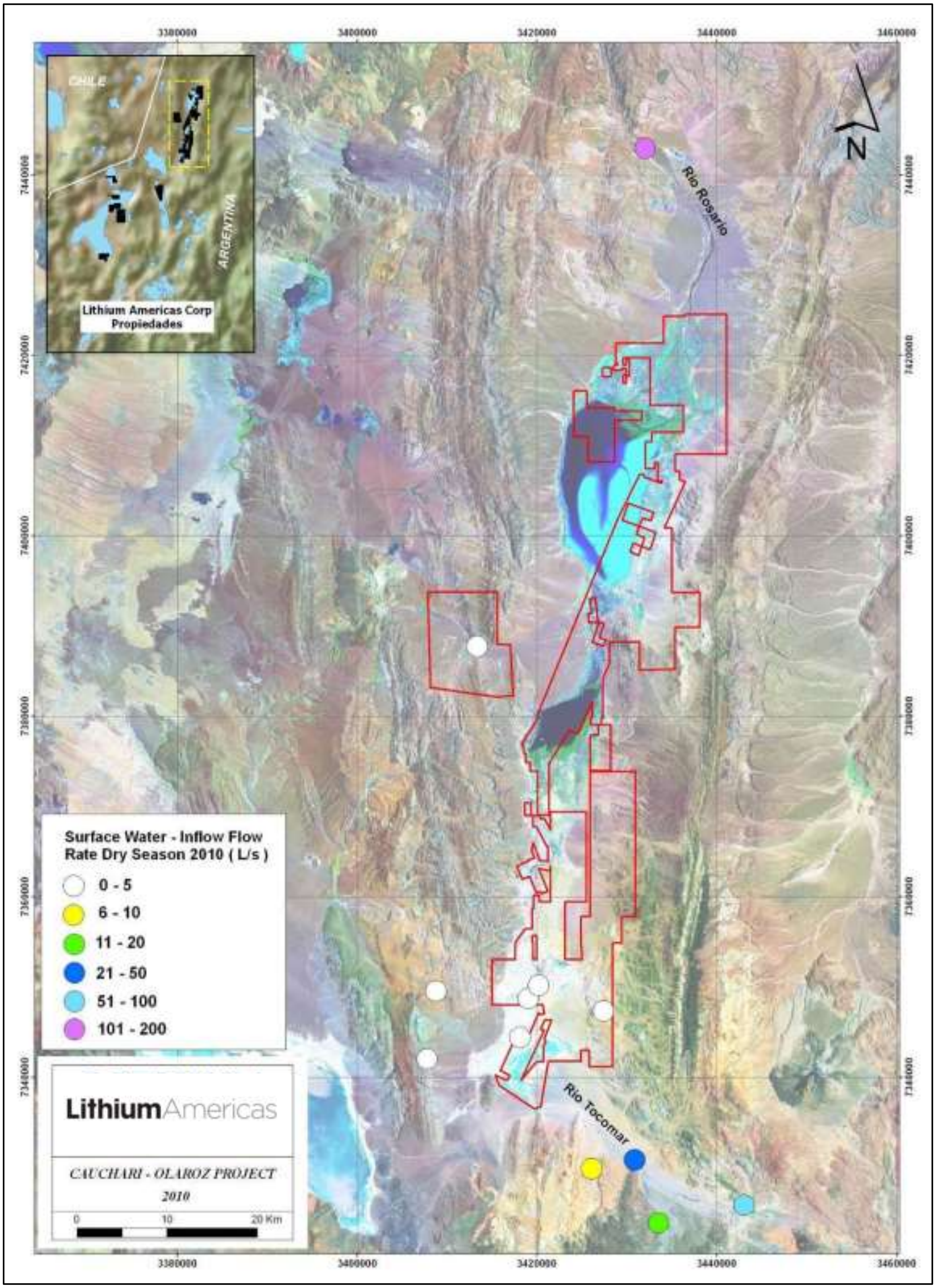
9.8 SURFACE WATER MONITORING PROGRAM

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, and samples were collected for laboratory analysis.

Flow rates were monitored every three months during the dry season, and monthly during the wet season. 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. Typical dry and wet season flow monitoring results are shown in Figure 9.19 and Figure 9.20, respectively. Wet season sampling results for lithium are shown in Figure 9.21. The results show that these parameters are somewhat elevated in surface water inflows to the north and south ends of the salars, relative to other surface water inflows.

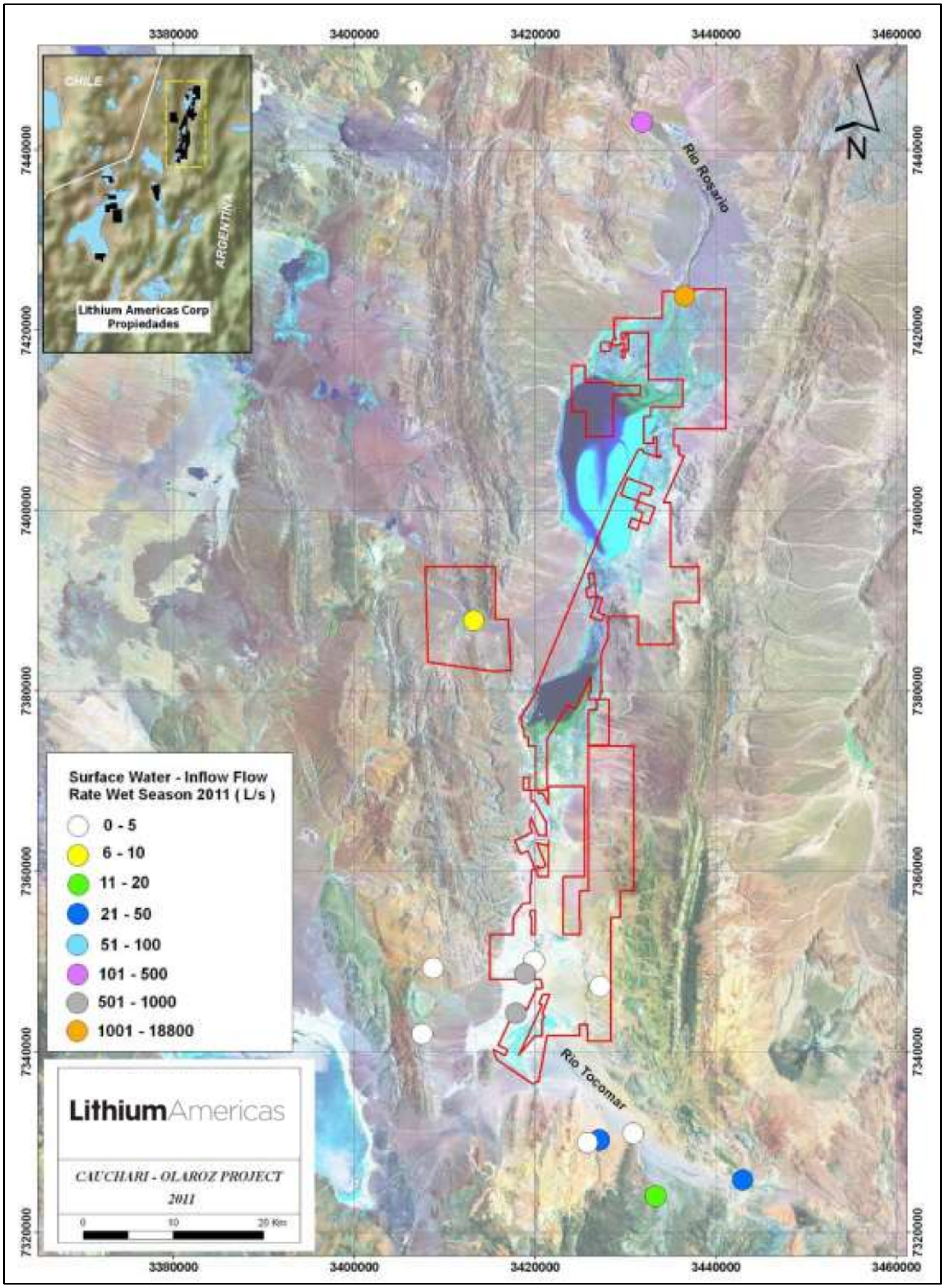
The data acquired from this program supported the water balance calibration and numerical groundwater modeling.

Figure 9.19 Surface Water Flow Monitoring Sites, With Dry Season Flow Results for 2010



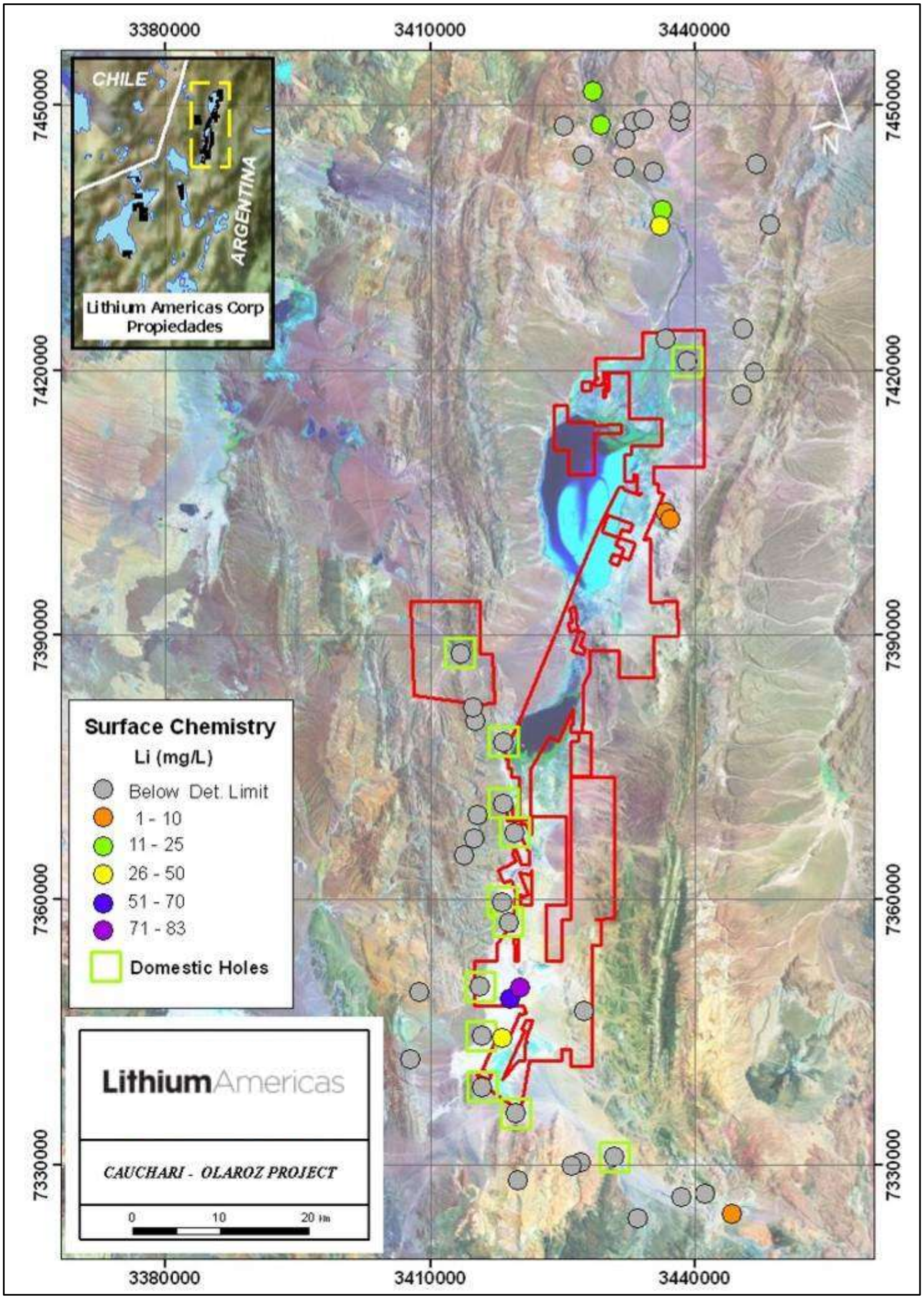
Source: *King, Kelley, Abbey, (2012).*

Figure 9.20 Surface Water Flow Monitoring Sites, With Wet Season Flow Results for 2011



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

Figure 9.21 Lithium Results (mg/L) for Surface Water Sites During the Wet Season (April – June 2010)



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

9.9 BRINE LEVEL MONITORING PROGRAM

The static level of subsurface brine was monitored every 15 days from an array of accessible wells within the salars. Monitoring was also conducted at domestic water wells just outside the Cauchari

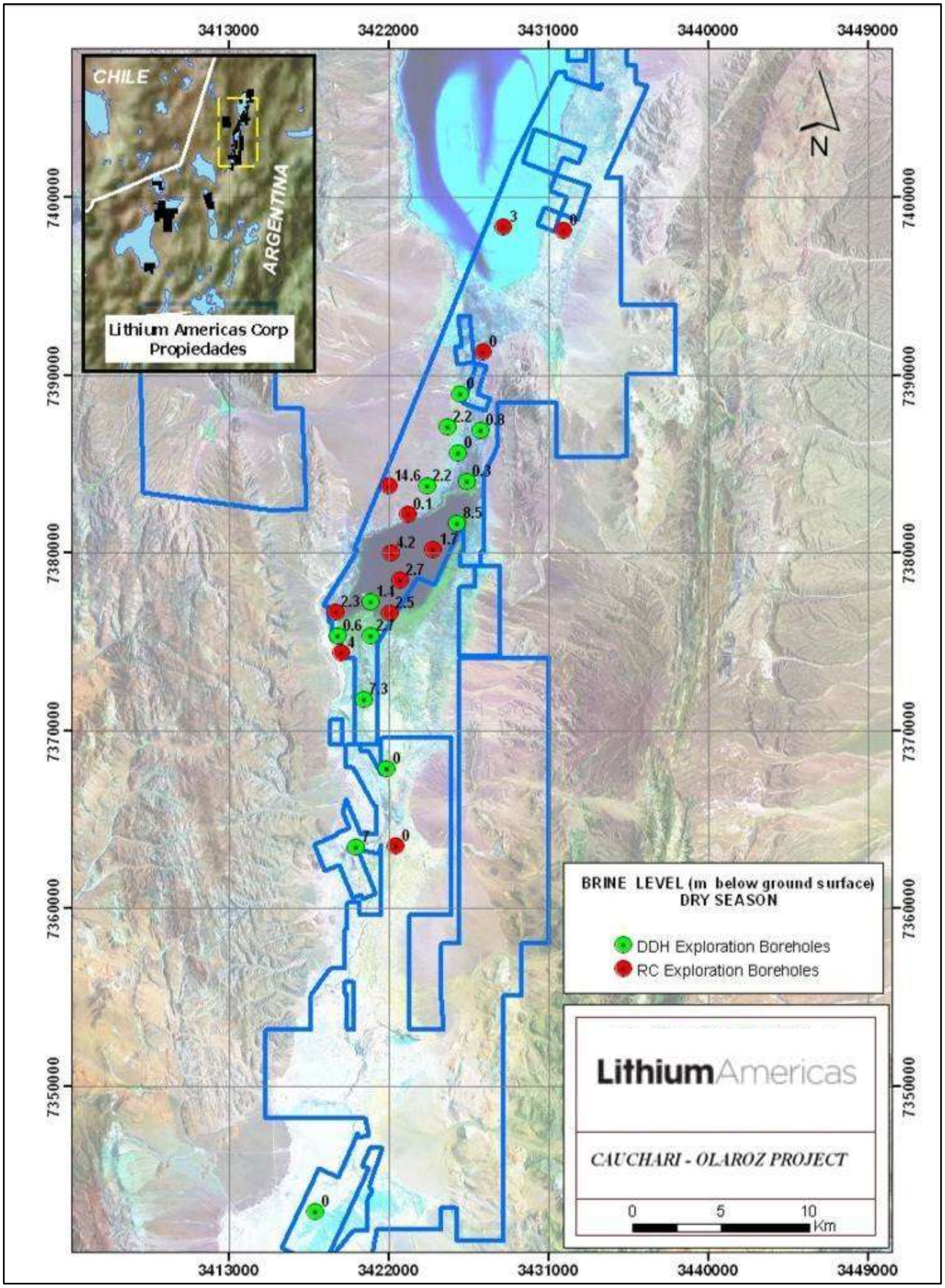
Salar. Measurements were taken with a Solinst Model 101 Water Level Meter. Table 9.3 shows the range of static levels observed in the monitoring wells. Measurements collected during the dry and wet seasons are shown in Figure 9-.2 and Figure 9.23, respectively. The brine level data were not corrected for density effects. However, 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 for calibration of 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 the next section.

TABLE 9.3
STATIC WATER LEVEL MEASUREMENTS FOR THE PERIOD FROM JANUARY 2010 TO JANUARY 2012

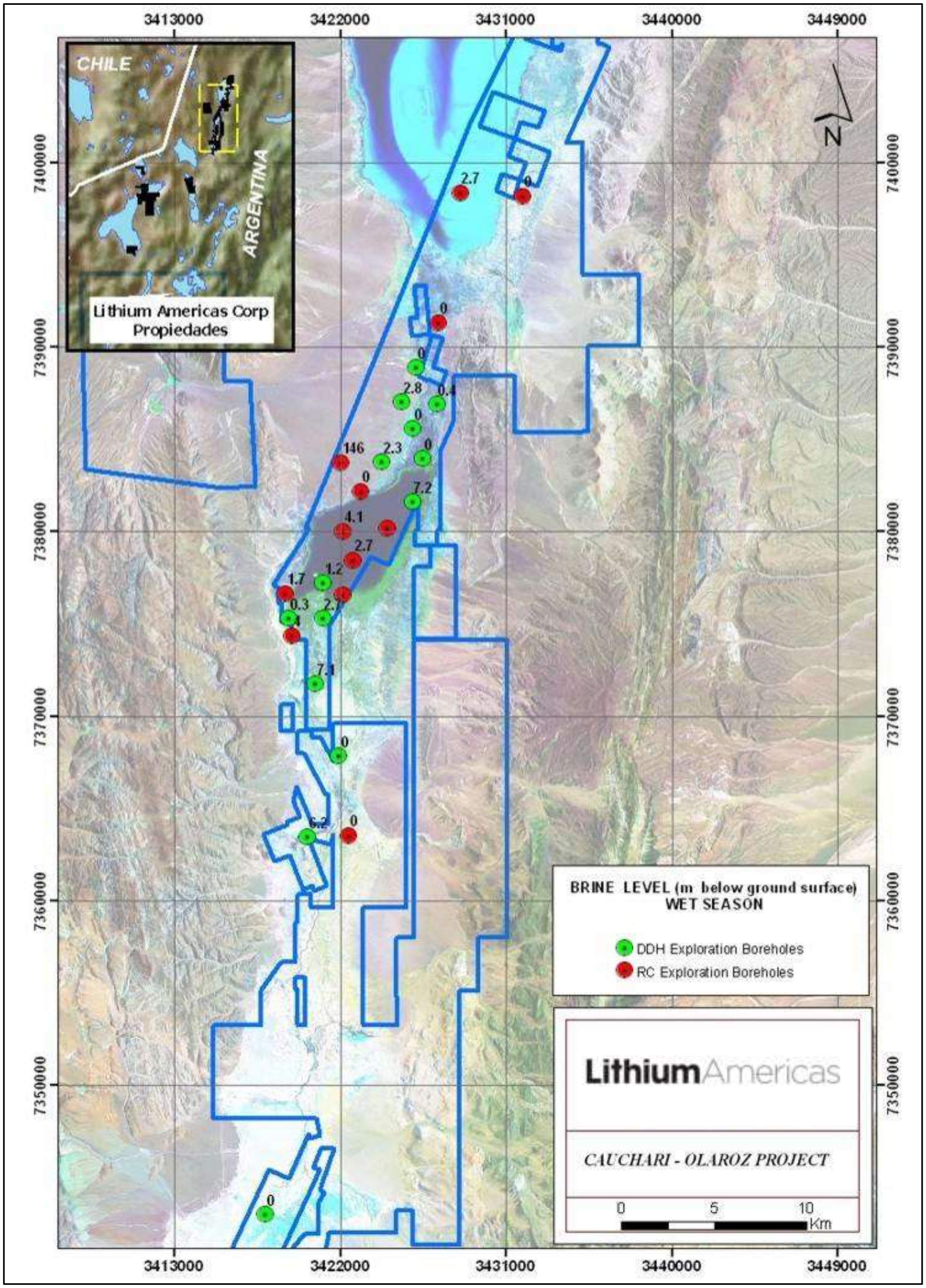
Borehole	Monitoring Period mm/yy	Water level range (m below ground surface)	Borehole	Monitoring Period mm/yy	Water level range (m below ground surface)
DDH -1	02/10 – 12/11	3.1 – 8.0	PE -1	01/10 – 11/11	0.7 – 0.9
DDH -2	01/10 – 01/12	0.1 – 1.0	PE -2	01/10 – 11/11	Artesian – 0.9
DDH -3	01/10 – 01/12	6.3 – 7.4	PE -3	01/10 – 11/11	Artesian
DDH -4	01/10 – 03/11	1.7 – 1.9	PE -4	01/10 – 01/12	4.2 – 5.2
DDH -5	01/10 – 12/11	0.2 – 0.4	PE -5	01/10 – 11/10	3.0 – 4.0
DDH -6	02/10 – 01/12	2.5 – 3.0	PE -7	01/10 – 01/12	8.2 – 9.2
DDH -7_ PE -10	03/10 – 01/12	Artesian	PE -8	01/10 – 12/11	Artesian – 0.2
DDH -8	03/10 – 01/12	0.0 – 0.8	PE -9	01/10 – 12/11	4.5 – 4.7
DDH -9	04/10 – 01/12	0.3 – 1.2	PE -11	03/10 – 01/12	Artesian – 1.0
DDH -13	06/10 – 12/11	3.0 – 3.5	PE -13	03/10 – 01/12	11.4 – 14.7
DDH -14	07/10 – 12/11	7.2 – 7.5	PE -14	03/10 – 01/12	0.0 – 0.5
DDH -15	08/10 – 12/11	0.2 – 1.3	PE -19	06/10 – 12/10	1.6 – 1.7
DDH -16	07/10 – 12/11	6.0 – 11.5	PE -22	08/10 – 01/12	3.3 – 3.5
DDH -17	08/10 – 10/11	Artesian			
DDH -18	08/10 – 01/12	2.7 – 3.0			

Figure 9.22 Static Dry Season Monitoring Results from the Brine Level Monitoring Program



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

Figure 9.23 Static Wet Season Monitoring Results from the Brine Level Monitoring Program



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

9.10 PUMPING TEST PROGRAM

9.10.1 Overview

A total of five pumping well batteries (each including a pumping well and associated observation wells) were installed at the site in 2011, at the locations shown on Figure 9.23. 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 7.5. 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 was conducted by Andina Perforaciones of Salta, Argentina, under field supervision by Conhidro of Salta, Argentina. The drilling method was direct rotary. Using these pumping well batteries, seven aquifer step tests and six aquifer constant rate tests were conducted in 2011. Field supervision of the pumping tests was provided by LAC staff. The constant rate pump tests were preceded by step tests, to determine appropriate pumping rates.

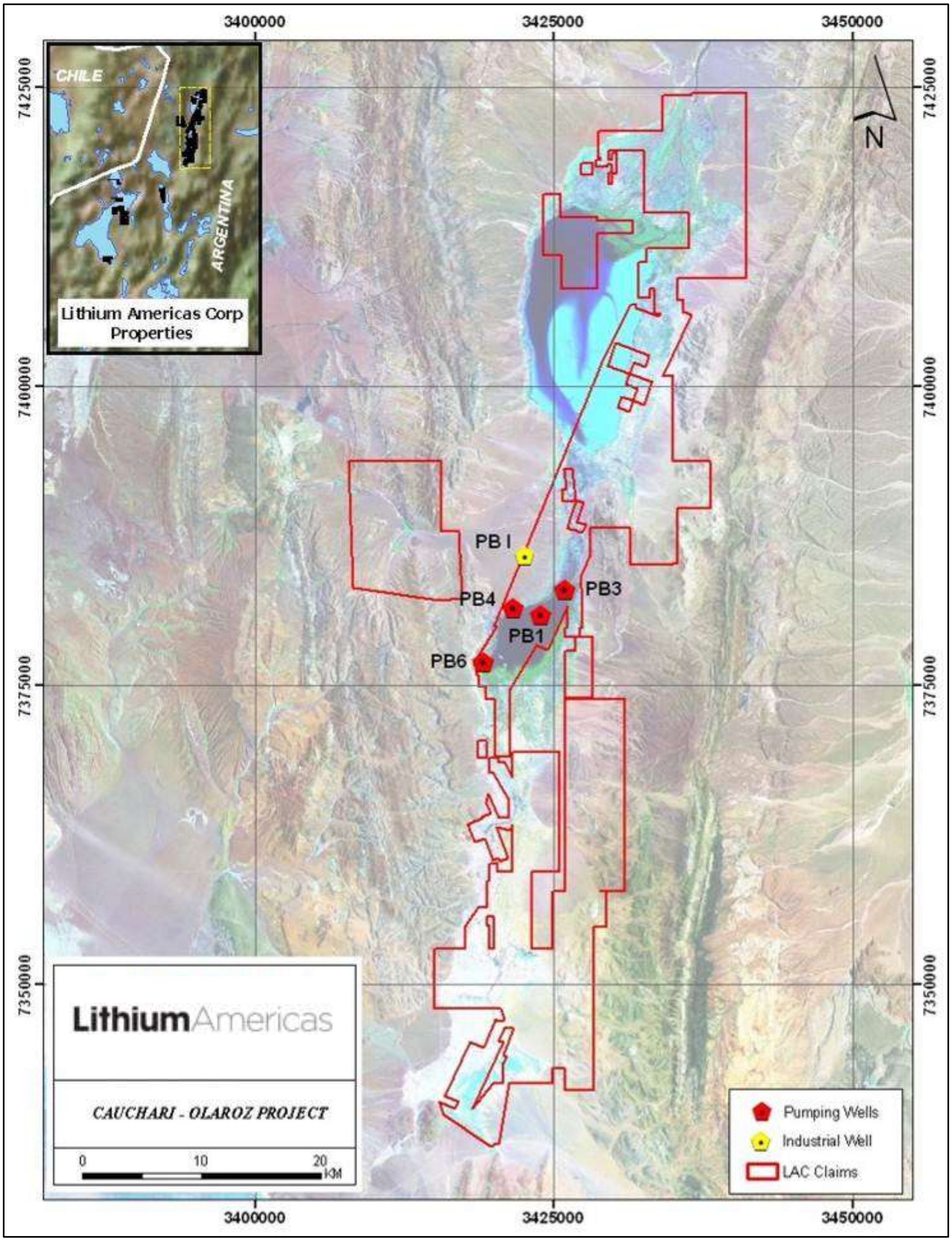
Pumping test analysis was conducted independently by both Conhidro and by Matrix Solutions Inc. Matrix Solutions Inc., also developed the numerical groundwater model, used to support the Reserve Estimate in 2012. For pumping test analysis, Conhidro used Infinite Extent V4.1.0.1; Matrix Solutions Inc., used AQTESOLVE V4.5.2 Professional and FEFLOW.

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:

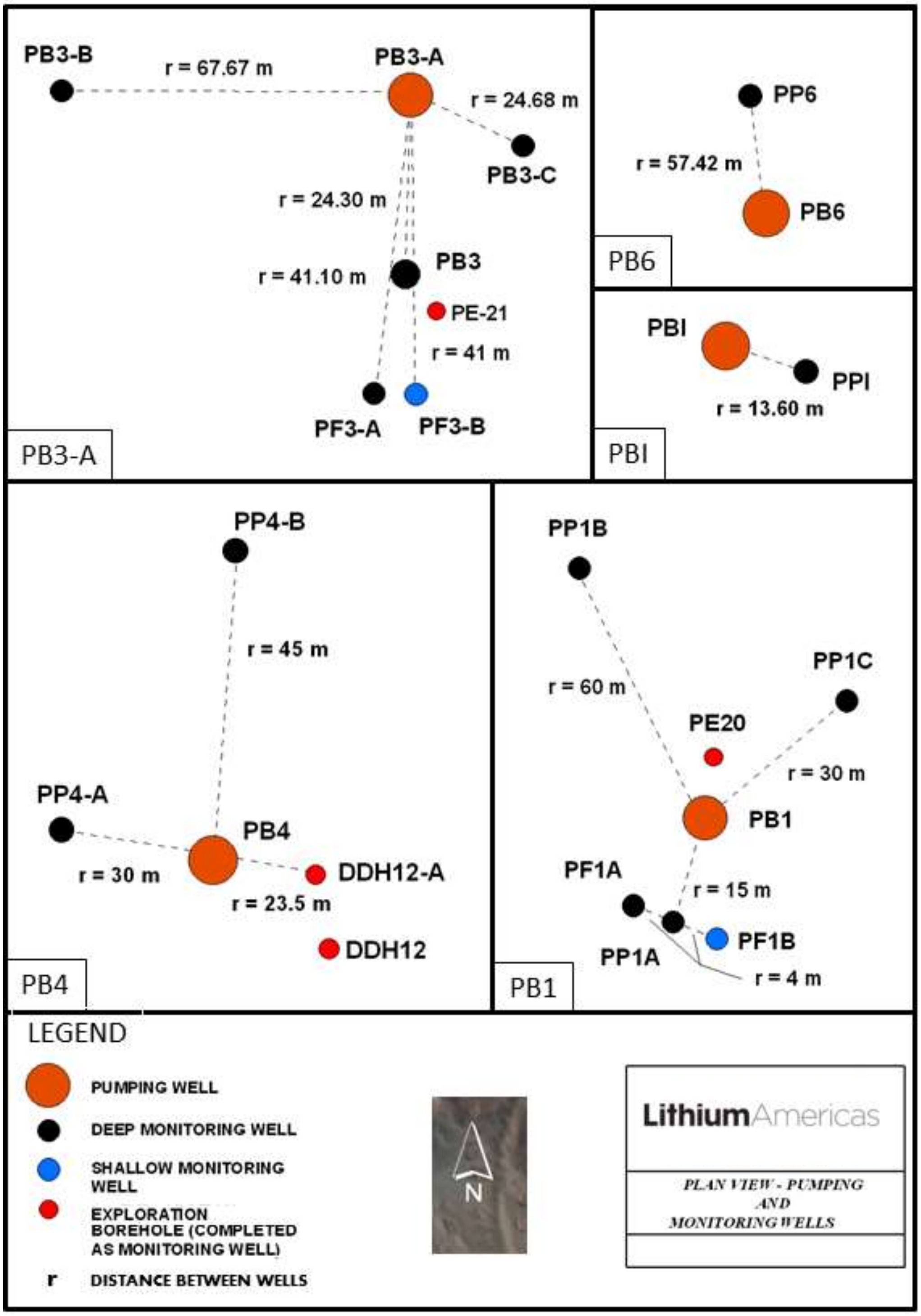
- Pumping test battery locations are shown in Figure 9.24.
- The configurations of the five pumping test well batteries are shown in Figure 9.25.
- The conceptual hydraulic interpretation for each battery is summarized in Table 9.4 through Table 9.8 for each test of the test batteries: PB-01, PB-03A, PB-04, PB-06, and PBI, respectively.
- A summary of step tests and constant rate tests is provided in Table 9.9 and 9.10, respectively.
- Photos of the pumping tests and well materials are shown in Figure 9.26, Figure 9.27 and Figure 9.28.
- Constant rate test plots are provided in Appendix 3.
- Hydraulic testing results are summarized in Section 9.10.3.

Figure 9.24 Pumping Test Battery Locations



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

Figure 9.25 Conceptual Layout of the Pumping Test Batteries* (not to scale)



**Monitoring wells located further afield were also included in the pumping test analyses, and are listed in Table 9.11.*

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

Table 9.4 **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 9.5 **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
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 9.6 **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 9.7 **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 9.8 **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 9.9 **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 9.10 **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

TABLE 9.10 RECORD OF CONSTANT RATE PUMPING TESTS			
Test Name	**Test Phases**	**Date Start**	**Date Finish**
	Recovery	21/10/2011 6:10	
PB-I 3-day Constant Rate Test	22.6 L/s	12/09/2011 19:00	16/09/2011 3:00
	Recovery	16/09/2011 3:00	
PB-I 7-day Constant Rate Test	26.9 L/s	18/09/2011 18:00	25/09/2011 18:00
	Recovery	25/09/2011 18:00	

Figure 9.26 Constant Rate Pump Test at PB-04

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

Figure 9.27 Constant Rate Pump Test at PB-04

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

Figure 9.28 Step Test at PB-04

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

9.11 PUMPING TEST ANALYSIS AND RESULTS

9.11.1 Overall Summary

A summary of the data, interpretations and analytical methods for all the pumping tests is provided in Table 9.11. Overall observations of the analysis are as follows:

- Analyses within AQTESOLVE 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 behavior 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 AQTESOLVE.
- 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 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 9.11
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.

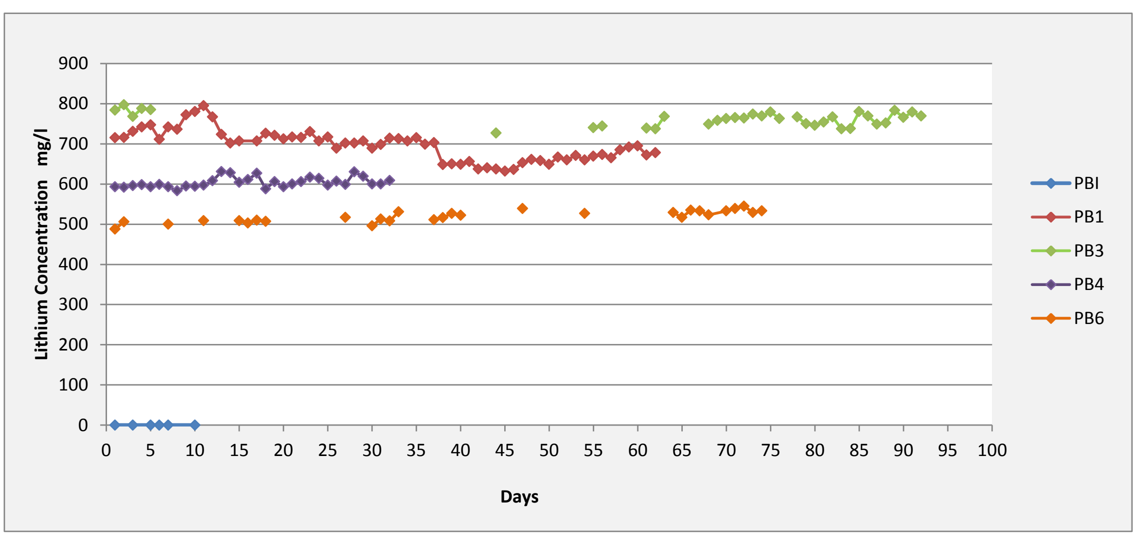
9.12.4 Observations for PB-I

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 PUMP TESTING CHEMISTRY

A plot of lithium results for samples collected during the pumping tests is provided in Figure 9.29. The record of concentration is relatively stable for each well, with the exception of PB-01. Lithium concentrations at PB-01 start and end at approximately 700 mg/L, but show approximately ± 100 mg/L fluctuation over the pumping period.

Figure 9.29 Lithium Concentrations in Samples Collected During Pump Tests



**Data points are shown as connected where there was continuous pumping between samples, and disconnected where there was a stoppage in pumping. The time scale (Days) shows elapsed time from the beginning of pumping at each individual well.*

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

10.0 DRILLING

10.1 REVERSE CIRCULATION (RC) BOREHOLE PROGRAM

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							

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

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

Borehole	Depth (m)	Length (m)	B	K	Li	Mg	SO_4	Mg/ Li	K/Li	SO_4/Li
	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
	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

Table 10.3: Brine concentrations (mg/L) and ratios averaged across selected depth intervals for RC Program boreholes

10.2 DIAMOND DRILLING (DD) BOREHOLE PROGRAM

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							

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. Sample collection, preparation and testing methods are described in Sections 11.1.3, 11.2.2 and 11.2.4, respectively.

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. Sample collection, preparation and analytical methods are described in Sections 11.1.4, 11.2.2.1 and 11.2.3.1, respectively. 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, as further described in Section 11.1.4. 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

11.0 SAMPLE PREPARATION, ANALYSES AND SECURITY

11.1 SAMPLING METHOD AND APPROACH

The various field programs were executed under the direct field supervision of Dr. Waldo Perez, P. Geo., from the Project startup (July 2008) to September 2009. From that time until the end of 2010, all site work was conducted under the supervision of the Company QP, John Kieley (P. Geo. from Canada). The pump testing phase of the Project, starting at the end of 2010, was supervised by Santiago Campellone, a LAC Argentinian employee.

11.1.1 Background

During RC drilling, rock chips and brine were directed from the drill cyclone into a plastic bag, over a one-metre drilling interval (Figure 11.1). If the output from the cyclone was dry (rock chips only), a geologist placed a representative sample from the plastic bag into a rock chip tray (Figure 11.2). If the output was wet (rock chips and brine), it was sieved. The separated solids were then placed in a rock chip tray and the brine was poured from the bottom of the sieve into a plastic bottle. The brine was then field-analyzed for the following:

- Potassium – using a Thermo Fisher Scientific Niton portable XRF analyzer (on an irregular basis);
- pH and temperature - using a Hatch HD-30 pH meter; and
- Conductivity – using a Hatch HD-30 conductivity meter.

After the field measurements were taken, the brine sample was split into three, one-litre, clean, plastic sample bottles. The three bottles were tagged with pre-printed tag numbers. Two samples were mixed to form one sample, which was shipped to the Alex Stewart Laboratories S.A. ("ASL") in Mendoza. One sample was maintained in the LAC Susques office as a backup. Results from the RC Borehole Program are provided in Section 10.1 and are shown on the RC borehole logs provided by King (2010b). Brine sample analysis is described in Section 11.2.3.1.

Figure 11.1 Cyclone with Plastic Bag (dry sample)

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

Figure 11.2 Rock Chip Tray with Dry and Wet Samples

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

11.2 DIAMOND DRILLING BOREHOLE SOLIDS SAMPLING METHODS

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 core boxes for geologic logging, sample collection, and storage. 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 11.3 and Figure 11.4). 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.

Figure 11.3 Collecting an Undisturbed Sample from Sand Core

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

Figure 11.4 Collecting an Undisturbed Sample from Clay Core

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

11.3 DIAMOND DRILLING BOREHOLE BRINE SAMPLING METHODS

Brine sampling was conducted in selected DD Program borehole locations. Locations were selected to augment the results from the RC boreholes, which represent the primary source of brine data, as shown in Table 10.2. Some of the selected DD locations became unusable due to various physical borehole conditions, including: failure of the borehole walls, subsurface voids, sediment in-filling, decoupling of the PVC casing. Also, in some cases, DD sampling results were excluded from the Project database due to concerns associated with contamination by fresh water injected during drilling and well development. Reliable results were obtained from six DD borehole locations, as shown in Table 10.5.

A two-valve low-flow pump was used to extract brine samples from the subsurface using a pressurized nitrogen/oxygen gas mix. At some locations, samples were also retrieved with a bailer. Samples were taken at 5 to 10 m intervals along the screened section of the boreholes, where possible. They were tested in the field for pH, conductivity, temperature, and dissolved oxygen. 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, one-litre, clean, plastic sample bottles. The three bottles were tagged with pre-printed tag numbers. Two samples were mixed to form one sample, which was shipped to ASL in Mendoza. One sample was maintained in the LAC Susques office, as a backup.

11.4 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 Susques field office of LAC. All brine samples were stored inside a locked office, and all drill cores were stored inside a locked warehouse adjacent to the office. Brine samples were picked up from the Susques field office by the analytical laboratory every Friday and transported to Mendoza in a laboratory 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), an ISO 9001-2008 certified laboratory with facilities in Mendoza, Argentina and headquarters in England. Analytical methods for all brine samples are described in Section 11.2.3. Quality Assurance/Quality Control (QA/QC) for brine samples collected up to PE-09 is described by King (2010a) and for samples collected to the end of exploration drilling and in advance of the pumping test phase of the Project, by King (2010b). QA/QC for brine samples collected since that time is described in Section 11.2.3, which is summarized from correspondence provided in Appendix 5.

D.B. Stephens and Associates Laboratory in Albuquerque, New Mexico, USA is used for the geotechnical property analyses of the undisturbed core samples from the DD Borehole Program. 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.

11.4.1 Brine Samples from RC Borehole Program and DD Low Flow Sampling

These samples often contained high levels of turbidity. If turbidity was significant (more than one centimetre of sediment in the bottom of the sample bottle) then the sample was filtered in the LAC Susques field office. The filtration was carried out using a standard lab filter, Kitasato flask, and a vacuum pump. Subsequent to borehole RC-12, all samples were also filtered by ASA as part of their standard analytical process. The samples were sent to the ASA laboratory in sealed one-litre plastic bottles with sample numbers clearly identified.

11.4.2 Brine Samples from the Pumping Test Program

These samples were collected directly from the flow measurement weirs, at regular intervals. The samples were sent to the ASA laboratory in sealed one-litre plastic bottles with sample numbers clearly identified. They were not filtered after collection because the pumping wells produced brine with negligible suspended solids.

11.5 BRINE ANALYSIS

11.5.1 Analytical Methods

ASA was the primary laboratory 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 collected from RC borehole PE-08 onward were diluted by 100:1 before analysis. Additional method refinements have occasionally been implemented over the course of the analytical program.

For the first six RC boreholes (PE-1 through PE-6), sulphate was assayed using the turbidimetric method, with checking of 20% of samples using the gravimetric method. Subsequent samples were analyzed using only the gravimetric method. The argentometric method was used for assaying chloride and volumetric analysis (acid/base titration) was used for carbonates (alkalinity as $CaCO_3$). Laboratory measurements were conducted for Total Dissolved Solids (TDS), density, and pH. ASA was audited for Best Practice compliance by Smee and Associates Consulting Ltd. in April 2010, on behalf of LAC. ASA was found to be following industry standard practices; minor recommendations for improvement were made during the RC sampling phase of the Project.

11.6 ANALYTICAL QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

The QA/QC measures followed for the RC and DD Borehole Programs are documented in King (2010a and 2010b). The QA/QC documented herein deals strictly with brine samples collected during the pumping tests described in Section 9.10. It is summarized from the QA/QC report prepared by Dr. Barry Smee, and provided in Appendix 5. The pumping test brine samples were used for a qualitative indication of brine grade persistence over the prolonged pumping periods. They were also used quantitatively in developing the grade interpolations input to the numerical groundwater model. However, the large majority of the grade dataset is from the previous three-dimensional sampling programs documented by King (2010a and 2010b).

Brine samples were bottled directly from the pumping test weirs and assayed at Alex Stewart Argentina ("ASA") in Mendoza, with some confirmatory assays done at Acme Santiago and the University of Antofagasta.

LAC has been running a Quality Control program to monitor the quality of assays from ASA, which includes the insertion of a field blank, a field duplicate, and one of two remaining standards that appear to be relatively stable. These data were compiled by LAC staff and then sent to Smee and Associates Consulting Ltd. for confirmation of the accuracy and precision of the analysis. This is the second time that Dr. Barry Smee has reviewed quality control data for the Project. The results of the first review were reported by King (2010b).

11.6.1 Quality Control Data Review

This review includes data compiled for six pumping test holes, including four to test the brine aquifer and two for testing the fresh water source. As part of this review, Dr. Smee has noted that the drill hole nomenclature is somewhat confusing, and that it would be preferable to use a year prefix and consecutive hole number, such as Hole 11-3, 11-4, 11-5 etc.

11.6.2 Field Blanks

Field blanks were submitted to all three laboratories. The data for lithium, potassium, and sulphate were compiled into Shewhart chart format. It is obvious that the three laboratories use different methods of analysis, as the detection limits are different.

The lithium data do not show any contamination or sample mix-ups from the laboratories.

The method used by the University of Antofagasta has a very low detection limit of near 1 mg/L, while Acme has a detection limit of 50 mg/L and ASA a detection limit of 10 mg/L. A similar pattern occurs for the potassium, but no indication of contamination is shown by the field blanks.

The performance of the sulphate analysis by Acme shows a distinct contamination signature compared to the other laboratories. ASA has one sample result that may be indicative of contamination, assuming that the blank sample received by all the laboratories is identical. Acme should be informed that they may have a contamination issue with sulphate in their laboratory.

These data suggest that the important economic elements lithium and potassium have not been contaminated in the sample collection, sample ordering, or in the analytical laboratory.

Two standards were used to monitor analytical accuracy. The data were compiled in Excel and plotted in Shewhart chart format, with the accepted mean and limits shown on the charts. Only ASA received the RC-19 standard, and showed the same low bias as seen in the previous standard.

The data did not contain any outright failures for lithium (> 3 SD from mean), but the lithium data is biased low from ASA and high from Acme, as compared to the mean. The data is consistent within the two laboratories, suggesting that the difference between the labs is related to laboratory methods rather than a deterioration of the standard. Lithium concentrations obtained from ASA may be slightly conservative, while those from Acme may be slightly more than calculated.

A similar pattern is seen with the potassium data, with ASA slightly below the mean, and Acme above the mean. The two Antofagasta standards are close to the mean. The potassium results can be considered to be accurate, on average.

Usually geological samples are solids that will exhibit a sampling error at the point of sampling. This is not the case with liquid brines, as the liquid should be homogeneous because of normal mixing in the aquifer. The duplicate data was placed on an x-y chart to confirm this hypothesis.

The field duplicate data for lithium and potassium at both ASA and Acme confirms that the brine samples are homogeneous, and that the data from the pumping tests can be considered to be representative as required by NI 43-101.

11.6.3 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 Susques field office of Minera Exar. All brine samples were stored inside a locked office, and all drill cores were stored inside a locked warehouse adjacent to the office. Brine samples were picked up from the Susques field office by the analytical laboratory every Friday and transported to Mendoza in a laboratory 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 for immediate shipment to the appropriate analytical laboratory.

11.7 QA/QC CONCLUSIONS AND RECOMMENDATIONS

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.

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) as summarized in Table 11-1. 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 Reserve Estimate, is provided in Section 7.5.

TABLE 11.1
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.

12.0 DATA VERIFICATION

12.1 OVERVIEW

Dr. Mark King (independent QP) conducted the following forms of data verification:

- Visits to the Project site and the LAC corporate office;
- Review of LAC sampling procedures, although it is noted that actual brine sampling was not viewed due to the nature of the geologic units encountered by the RC drill at the time of the site visits;
- Inspection of original laboratory results forms for the LAC brine dataset;
- Inspection of electronic copies of the LAC brine dataset and comparison with corresponding stratigraphic logs;
- Review of LAC field and laboratory QA/QC results;
- Review of publicly available information from an adjacent exploration property (Orocobre) in Olaroz Salar.

Daron Abbey (independent QP) conducted the following forms of data verification:

- A visit to the Project site;
- Inspection of borehole logs;
- Inspection of the Project database.

Dr. Barry Smee conducted the following forms of data verification:

- Visits to the Project site and the LAC corporate office;
- Review of LAC sampling procedures and all data handling methods and procedures;
- Inspection of original laboratory results forms for the LAC brine dataset, and the Project database; and
- Inspection of LAC field and laboratory QA/QC methods and results.

Independent sampling and chemical analysis were not conducted by the independent QPs, although Dr. Smee inserted QA/QC samples in the sampling stream during his visit to the Project Site.

12.2 SITE VISITS

Dr. Mark King visited the Project site and field office on December 10-11, 2009, in preparing for the Inferred Resource Estimate Report (King, 2010a). A second site visit was conducted from June 1-5, 2010, as part of the preparation for the Measured, Indicated and Inferred Resource Estimate Report (King, 2010b). During the recent pumping test phase conducted to support this Reserve Estimate, Dr. King visited the site on January 22-24, 2011, and September 12-15, 2011. The following observations were made during these visits, which are relevant to data verification:

- All of the pumping test sites were visited and an active pump test was observed at one site.
- Most of the past drilling sites were observed, including cuttings, borehole completions, brine ponds, and new gravel roads constructed to the sites.
- Sampling procedures for brine, rock chips, and core were reviewed and are considered appropriate for maintaining data integrity.

- An active drilling site was observed, although it is noted that brine sampling was not conducted during the visit due to the nature of the salar units through which the RC drill was advancing at that time.
- The sample storage facility and security systems were observed and are considered appropriate.
- Example cores were inspected, compared with compiled logs, and a detailed review of core results in progress by Dr. Gerardo Bossi was observed.
- Field data entry and log production procedures were observed and determined to be appropriate.
- Interaction procedures with the central data storage technician at the Mendoza corporate office were reviewed and determined to be appropriate.
- Staff operations, responsibilities, and mentoring were observed; it was determined that staff were conducting tasks appropriate to their training, and that the working environment encouraged scientific integrity, diligence, and mentoring through progressive levels of responsibility.

Dr. Mark King visited, and worked from, the corporate office in Mendoza from January 22-30, 2010, as part of the preparation for Inferred Resource Estimate Report (King, 2010a). A second visit to the Mendoza office was conducted from August 29 to September 3, 2010, during preparation of the Measured, Indicated, and Inferred Resource Estimate Report (2010b). Project features inspected and reviewed during these visits, which are relevant to data verification, included the following:

- Hard copies of all analytical data available to that time were reviewed;
- Spot comparisons were made with plotted borehole logs, maps, and working spreadsheets; and
- Accurate transcription was confirmed.

The derivation of the hydrostratigraphic model (used as input for the block model) was reviewed in detail and was determined to be a reasonable representation of site conditions.

12.3 PROJECT QA/QC

Dr. Barry Smee visited the LAC corporate office in Mendoza on April 23, 2010, the ASA laboratory on April 22, 2010, and the Project site from April 18-22, 2010. He also engaged in ongoing communication with LAC personnel regarding Project QA/QC. In his review of QA/QC, he performed the following data verification tasks:

- Review of the initial QA/QC data, including organizing and certifying the analytical of standards (see Appendix 5);
- Review of field sampling and field QA/QC procedures;
- Review of data capture procedures and data base design;
- Audit of the ASA laboratory;
- Made recommendations for further QA/QC actions; and
- Review of final QA/QC data.

Details of QA/QC Program results are provided in Section 11.2.3.2. On the basis of this data verification work, Dr. Smee concluded that the analytical data used in the calculation of resources and reserves for the LAC Project are acceptably accurate, precise, and free from contamination.

12.4 2017 DATA VERIFICATION

David Burga (independent QP) conducted the following forms of data verification:

- A visit to the Project site;
- Inspection of select drill core;
- Review of LAC sampling procedures;
- Inspection of the Project database;
- Inspection of digital laboratory results forms for the LAC brine dataset, and the Project database; and
- Acquired an independent brine sample from the sole pumping well, PB-4.

Mr. D. Burga collected a brine sample during his site visit from PB-4 while the well was pumping. The sample was brought back to Canada and submitted to AGAT Laboratories (AGAT) in Mississauga for chemical analysis. The sample was analyzed for lithium using and ICP with an OES finish. AGAT reported a lithium concentration of 567 mg/L for Sample PB-4, consistent with historical analyses.

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

- Several drill hole locations were visited and an active pump test at PB-4 was observed;
- A brine sample was obtained from PB-4;
- The sample storage facility and security systems were observed and are considered appropriate; and
- Select drill core were reviewed.

Mr. D. Burga conducted an interview with Marcela Casini, the former Chief Geologist of Minera Exar during the exploration programs and she confirmed the sampling and QA/QC protocols observed on site by Dr. King and reviewed by Dr. Smee.

Digital copies of the database used for the Resource calculation were obtained from directly from Alex Stewart and compared to the Minera Exar database. No errors were noted.

12.5 TECHNICAL COMPETENCE

Dr. Mark King 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 deep experience within their respective disciplines. The actions of these experts show that they are committed to developing technically-defensible Resource and Reserve Estimates. Their interpretations demonstrate a conservative approach in assigning constraints on the estimate, which increases the technical strength of the results.

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 industry standards:

- Pumping brine from the aquifers;
- Concentrating the brine through evaporation ponds; and
- Taking the brine concentrate through a hydrometallurgical facility to produce high-grade lithium carbonate.

The 2012 process model employed proprietary, state-of-the-art physiochemical estimation methods and process simulation techniques for electrolyte phase equilibrium. 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 this current Feasibility Study. The basis of the anticipated process methods have been tested and supported by laboratory evaporation and metallurgical test work.

Several tests were conducted in different qualified laboratories and in pilot facilities located at the Project site to develop a brine processing methodology. Testing objectives included:

- Determine the evaporation path as the brine gets more concentrated, and determine the type of salts which are formed during the process.
- Determine the amount of CaO required to accomplish Mg depression and its effect on SO_4.
- Verify the maximum lithium concentration.

The main process changes in this Technical Report are: 1) elimination of potash production, and 2) the addition of a precipitation step to remove KCl.

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 $CaCl_2$-treated brines. $CaCl_2$ was used in addition to CaO in order to cost-effectively precipitate sulfate ions. A temperature and air flow-regulated evaporation chamber was used (Figure 13.1).

A series of dry air, negative pressure evaporation tests were carried out in parallel, as shown in Figure 13.2.

Figure 13.1 Evaporation Pans and Lamps

Figure 13.2 Dry Air Evaporation Tests

Test results demonstrated that it is possible to obtain a concentrated brine through an evaporation process by treating the brine with CaO alone to control Mg levels.

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

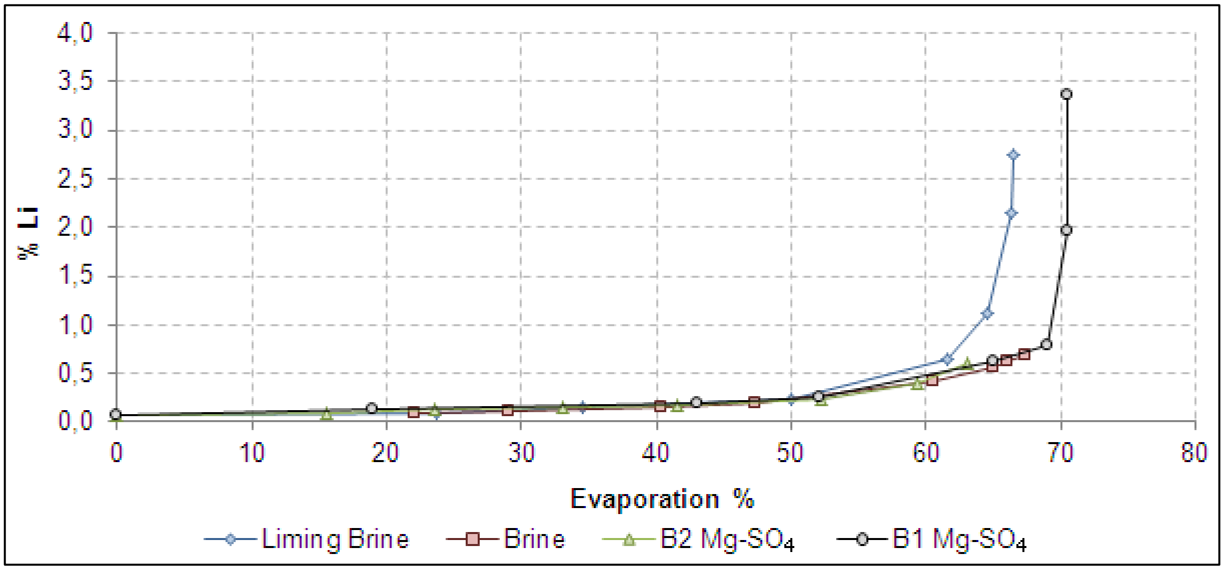


Figure 13.3 shows the change of Li ion concentration in the brine at different evaporation stages. In brines treated with CaO and $CaCl_2$ concentrations above 1% Li and brines with concentrations close to 4% Li with a mass decrease of 99% brine were achieved.

Results suggested treatment with CaO alone (i.e. liming) is ideal for magnesium precipitation. Limed brine produced 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).

Evaporation testing of $CaCl_2$-treated brine indicated it was not necessary to control SO_4 as the CaO liming process alone resulted in 60% reduction in sulfate ions.

13.2 TESTS – MINERA EXAR, CAUCHARI SALAR

13.2.1 Salar de Cauchari Evaporation Pan and Pilot Pond Testing

Seven months of evaporation pan testing at the Salar de Cauchari pilot facility helped:

- Determine the evaporation path of Cauchari brine exposed to the Project site environmental conditions;
- Obtain concentrated brines for additional purification testing; and
- Obtain sylvinite salts (KCl, NaCl) for the flotation tests.

A total of 6 pilot ponds totalling 11,180 m2 were then constructed. Pre-concentration, liming decant and settling, and concentration ponds were represented. Over 20,000 liters of 1% Li brine was generated over a 7 month period. The pilot ponds can be seen in Figure 13.4 Pond pilot testing helped:

- Validate the continuous operation of evaporation ponds considering all environmental effects (wind, temperature, rain, etc.) in a similar industrial system;
- Concentrate brine for the purification pilot plant;
- Develop the operating philosophy of the ponds and lime plant system; and
- Train the staff (engineers and operators) who will work in the commercial plant.

Salar testing results were consistent with prior laboratory and mathematical model results. 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 in the middle and with excess of lime over 10%. 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.

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.

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

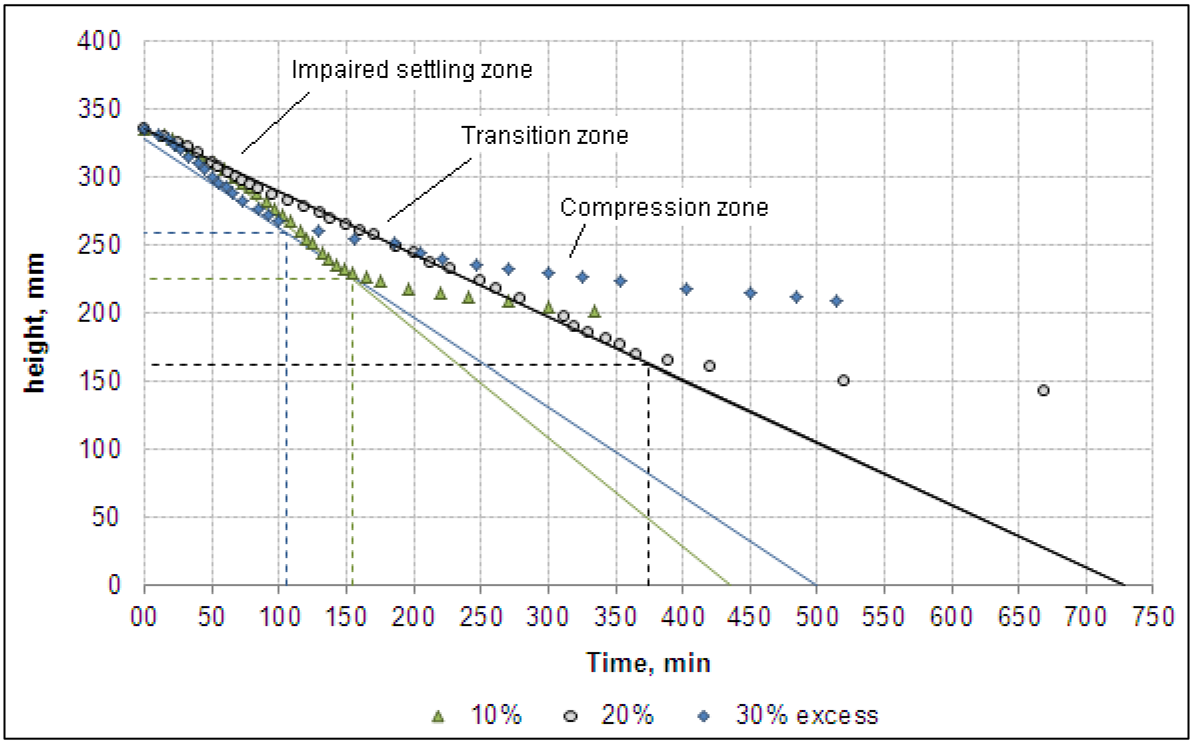


Figure 13.5 shows the sedimentation rate data that is used for settler design.

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

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

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

This testing helped determine:

- The most effective organic reagents for the boron extraction from the brine
- The ph effect on the extraction of boron;
- Extraction isotherms for the design of the stages of extraction and re- extraction required in the project;
- The extraction and re-extraction kinetics in the system at two temperatures previously defined;
- The phase separation rate at two temperatures previously defined; and
- The required extraction and re-extraction number of stages using the construction of a mccabe – Thiele diagram for designing a pilot plant.

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 = 4 using HCl, and re-extraction at basic pH using a solution of NaOH.

Figure 13.6 and Figure 13.7 show the isotherms in a McCabe-Thiele diagram where the number of steps required for the process has been determined.

Figure 13.6 Extraction isotherm at 20 ºC Using Mixed Extractants.

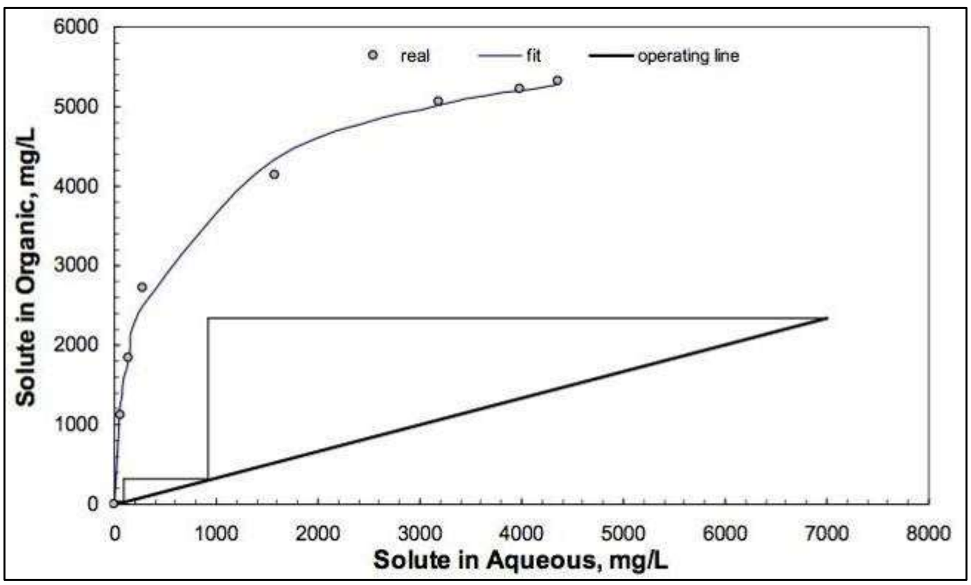
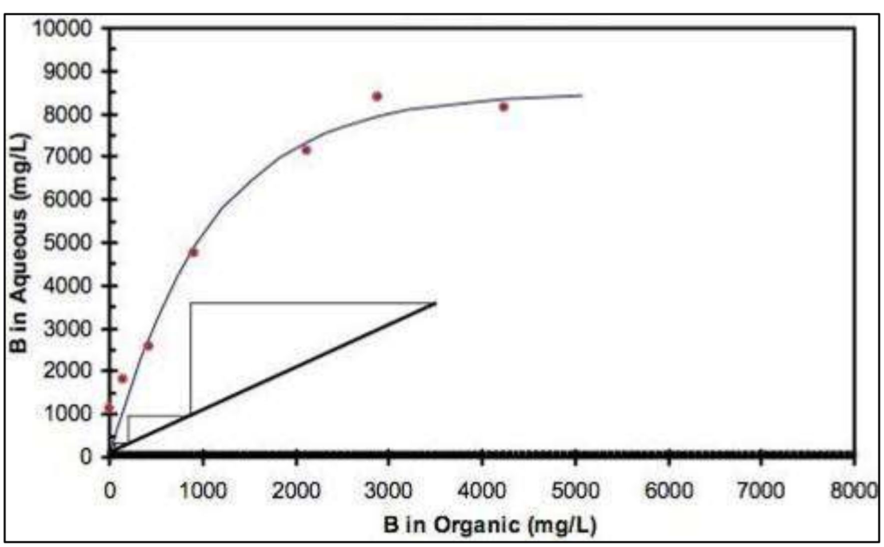


Figure 13.7 Re-extraction Isotherm at 20 ºC Using Mixed Extractants



13.4 CARBONATION TESTS – SGS MINERALS (CANADA)

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

The following phases were conducted:

- Removal of remnant Mg using NaOH solution;
- Purification of the solution by removing the remaining Ca using a solution of Na_2CO_3; and
- Carbonation reaction of Li using Na_2CO_3 solution.

Differing reagent dosage, residence time, and temperatures were investigated.

13.5 PILOT PURIFICATION TESTING – SGS MINERALS

SGS Minerals piloted removal of B, Mg, and Ca, and lithium carbonate production using 10,000 liters of concentrated brine from the Salar de Cauchari pilot pond system. Results were used for plant design.

The main objectives were:

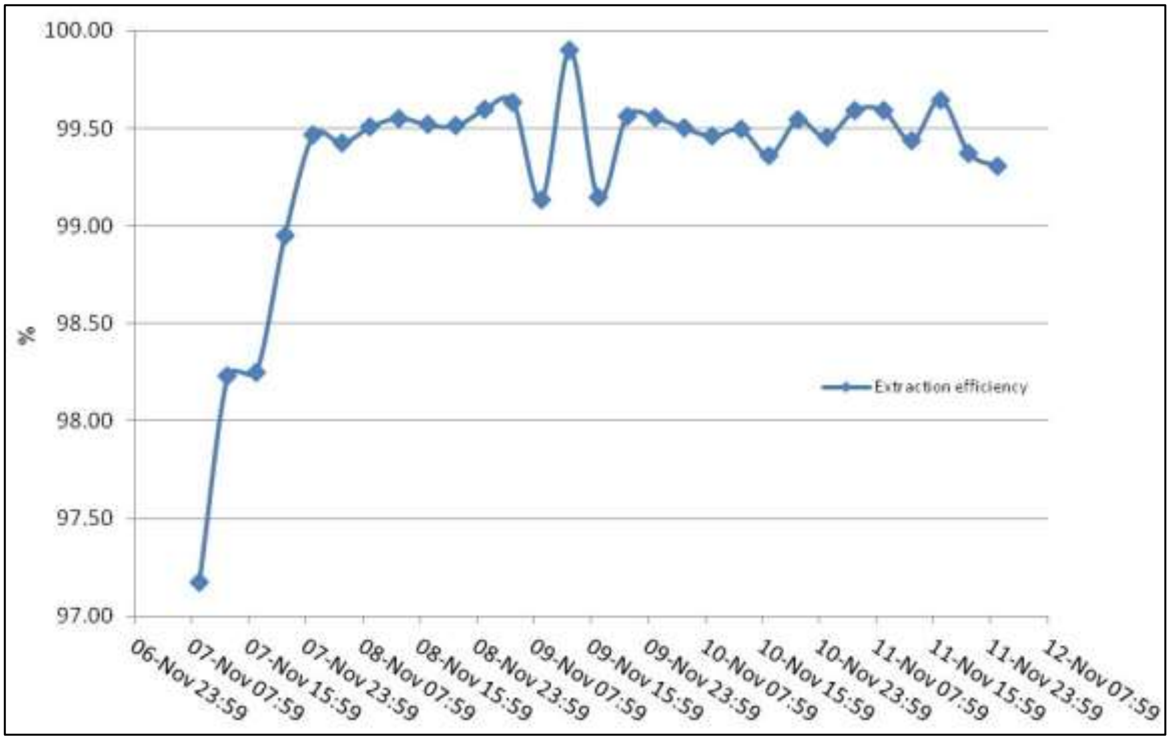
- Test the continuous process developed from bench testing; and
- Validate and obtain parameters and design criteria for the correct development of the industrial plant engineering.

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

Figure 13.8 shows the equipment that constitutes the pilot plant where the first tests were performed. This plant was subsequently installed in the Salar de Cauchari for further testing and training of the operators. The pilot plant will provide future data for brines of varying compositions.

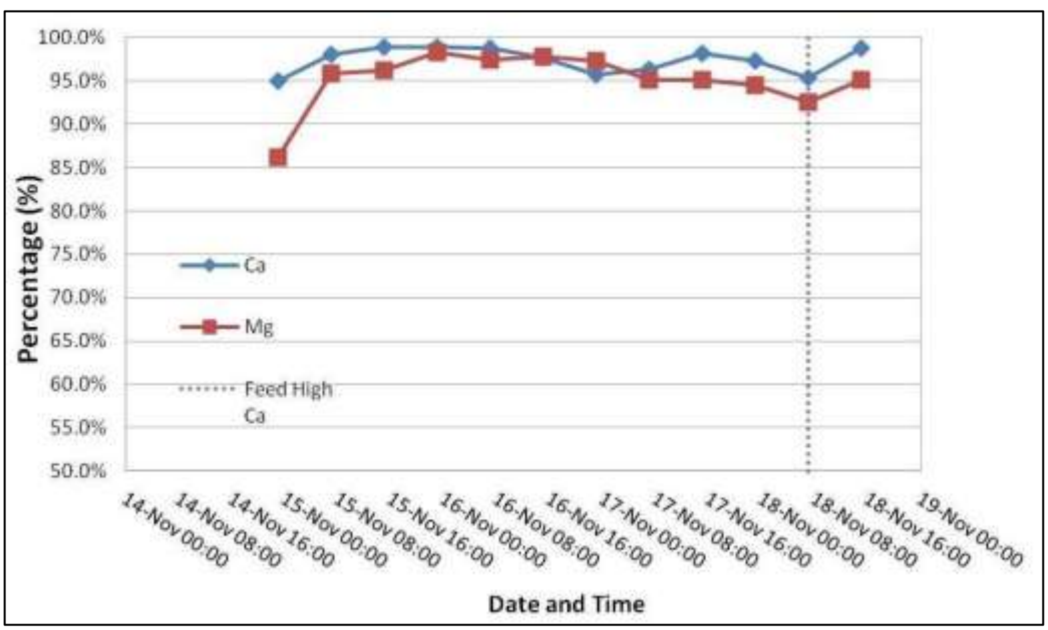
The SX pilot plant achieved an extraction efficiency of over 99.5% as shown in Figure 13.9.

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.

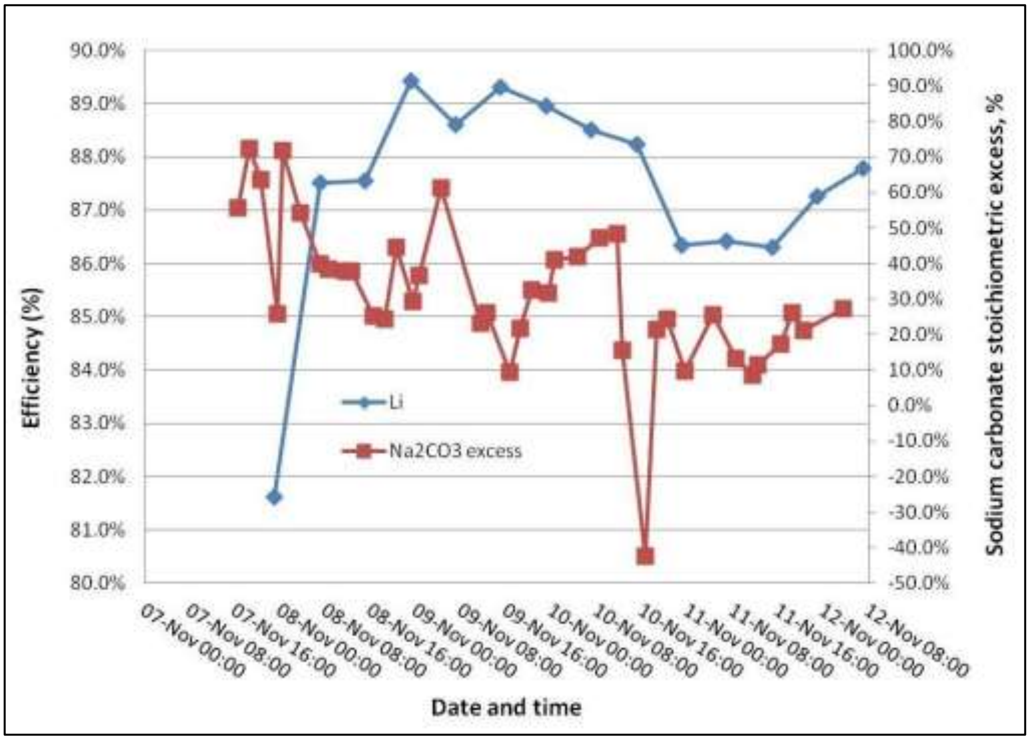
Figure 13.10 Ca and Mg Precipitation Efficiency



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.

Figure 13.11 Li Precipitation Efficiency



Washing of lithium carbonate filter cake with soft water resulted in sufficient product purity.

Control of lithium carbonate crystal habit and particle size via precipitation reaction parameters was effective in minimizing impurities.

Dried lithium carbonate was micronized in the United States.

13.6 POTASH PROCESS TESTS

The original 2012 Feasibility Study (King, Kelley, Abbey, 2012) included a section with details of potash processing test work implemented to define a potash production facility.

The present study does not include the production of potash and no further information is presented in this work.

13.7 SX OPTIMIZATION TESTS

The use of mother liquor from the lithium carbonate plant in stripping boron from the organic phase indicated an OPEX reduction of 60% over the test bench SX results was possible.

14.0 MINERAL RESOURCE ESTIMATES

14.1 OVERVIEW

The mineral resource estimate for lithium remains unchanged from the previous 2012 Feasibility Study for Cauchari-Olaroz.

In developing the Resource Estimate in 2012 that is documented in this report, key computational aspects of the previous 2010 Resource Estimate (King, 2010b) were independently re-evaluated by Matrix Solutions Inc., in 2012. The objectives of this work were to evaluate the following:

- Differences between the previous and updated resource estimates that are due to differences in computational software;
- Differences between the previous and updated resource estimates that are due to differences in the hydrostratigraphic models and brine concentration fields; and
- Updated values for the resource estimate, for comparison with the reserve estimate developed herein.

The specific re-evaluation components conducted in 2012 by Matrix Solutions Inc., are described below. This re-evaluation was based on interpolation of lithium concentrations only. A summary of the previous and updated resource estimates is provided in Table 15.2.

14.2 INTERPOLATION WITH THE ORIGINAL DATA SET (WITHIN THE ORIGINAL RESOURCE ZONE)

This component used the identical hydrostratigraphic model and lithium grade dataset as the previous Resource Estimate. However, the grade dataset was interpolated with different software. The 2010 Estimate was conducted with the Vulcan© software package (Maptek, 2009), while the check was conducted with Leapfrog© software (Leapfrog Hydro, 2012). This comparison was conducted because Leapfrog was to be used to support subsequent numerical modelling and Reserve Estimation. The two software packages calculated the same combined Resource, to within 0.2%, with variations no greater than 4.5% at any of the six regions into which the Resource Zone was subdivided. Based on this, it was concluded that the differences caused by the 2010 and current grade interpolation software were negligible.

14.3 INTERPOLATION WITH A 2012 DATASET (WITHIN THE ORIGINAL RESOURCE ZONE)

In this component, data that have become available since the 2010 Resource Estimate (King, 2010b) were incorporated into the analysis. After incorporating these data in 2012, Matrix Solutions Inc., calculated a combined Resource (Measured + Indicated + Inferred) value 12% lower than the 2010 estimate. This difference was primarily due to:

- Revisions in the hydrostratigraphic model;
- Incorporation of new shallow brine sampling results;
- Geophysical surveys in salar boundary areas;
- Drilling and brine sampling results from the salar boundary areas;
- Pumping test results; and
- Third party sampling results from the area north of the resource zone (Houston and Gunn, 2011).

On balance, it was concluded that the net effect of the 2012 hydrostratigraphic model and new grade results on the Resource Estimate was minor, especially when the Resource Zone was updated, as described below.

14.4 INTERPOLATION WITH A 2012 DATASET (WITHIN 2012 RESOURCE ZONE)

This component incorporated the 2012 dataset, as described in the section above. In addition, the new data were also used to update the Resource Zone boundaries. The limited modifications to the Resource Zone included:

- Exclusion of some upper Zone volumes (based on low grade indications from recent geophysics and shallow test pit sampling);
- Inclusion of some deeper Zone volumes (based on high grade indications at depth from the recent pumping well sampling);
- Inclusion of some lateral areas based on geophysics and brine sampling results from some of the recent salar boundary investigations.

A compilation of data types used in this re-evaluation component is shown in Figure 14.1, and comparison of the updated and previous Resource Zones is shown in Figure 14.2. Volume and mass calculations for the updated Zone were developed with GIS software (Manifold Version 8.0.27, 2012). A detailed comparison of the estimates is provided in Section 15.11. The net effect on the Resource Zone was an increase of 35% in lithium tonnage over the 2010 estimate (King, 2010b).

In the Resource Zone, the entire volume was defined as either Measured or Indicated (no Inferred) based on the continuity demonstrated by the additional available data. The Measured and Indicated Zones are shown in Figure 14.3. The methodology for defining the Measured and Indicated components was as follows:

14.4.1 Indicated

The lateral extent of the Indicated zone 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 cutoff 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.

14.4.2 Measured

A zone is identified as Measured 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 Resource values are used for comparison with the Reserve Estimate, to assess the portion of the Resource that is recoverable through pumping (Section 15).

The 2012 Resource Estimate was calculated relative to a 354 mg/L cut-off (Table 14.1). The former grade was used to enable comparison with the previous Resource Estimate. The lower cut-off value (354 mg/L) was used to enable comparison with the Reserve. This value was identified as a processing constraint for the Reserve. Considerations for brine Resource and Reserve cut-off values are discussed in Section 2.4.4.

TABLE 14.1 LITHIUM RESOURCE SUMMARY				
Description	**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 Resource	630	576,000	3,039,000	9.1×10^8
2012 Indicated Resource	570	1,650,000	8,713,000	2.9×10^9
Total	**585**	**2,226,000**	**11,752,000**	**3.8×10^8**

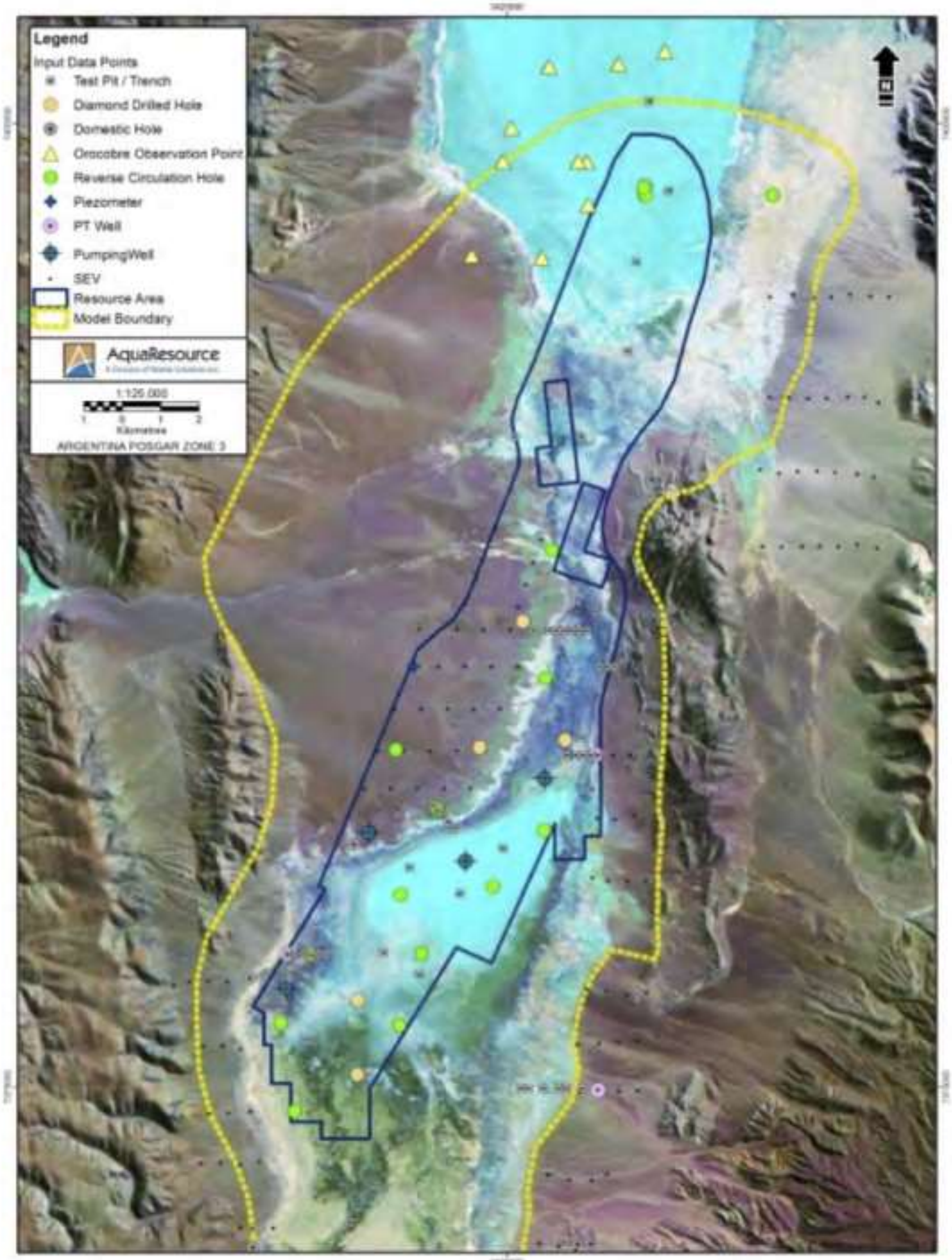
(1) The 2012 Resources are expressed relative to a lithium grade cut-off of ≥ 354 mg/L, which was identified as a brine processing constraint by LAC engineers.

(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

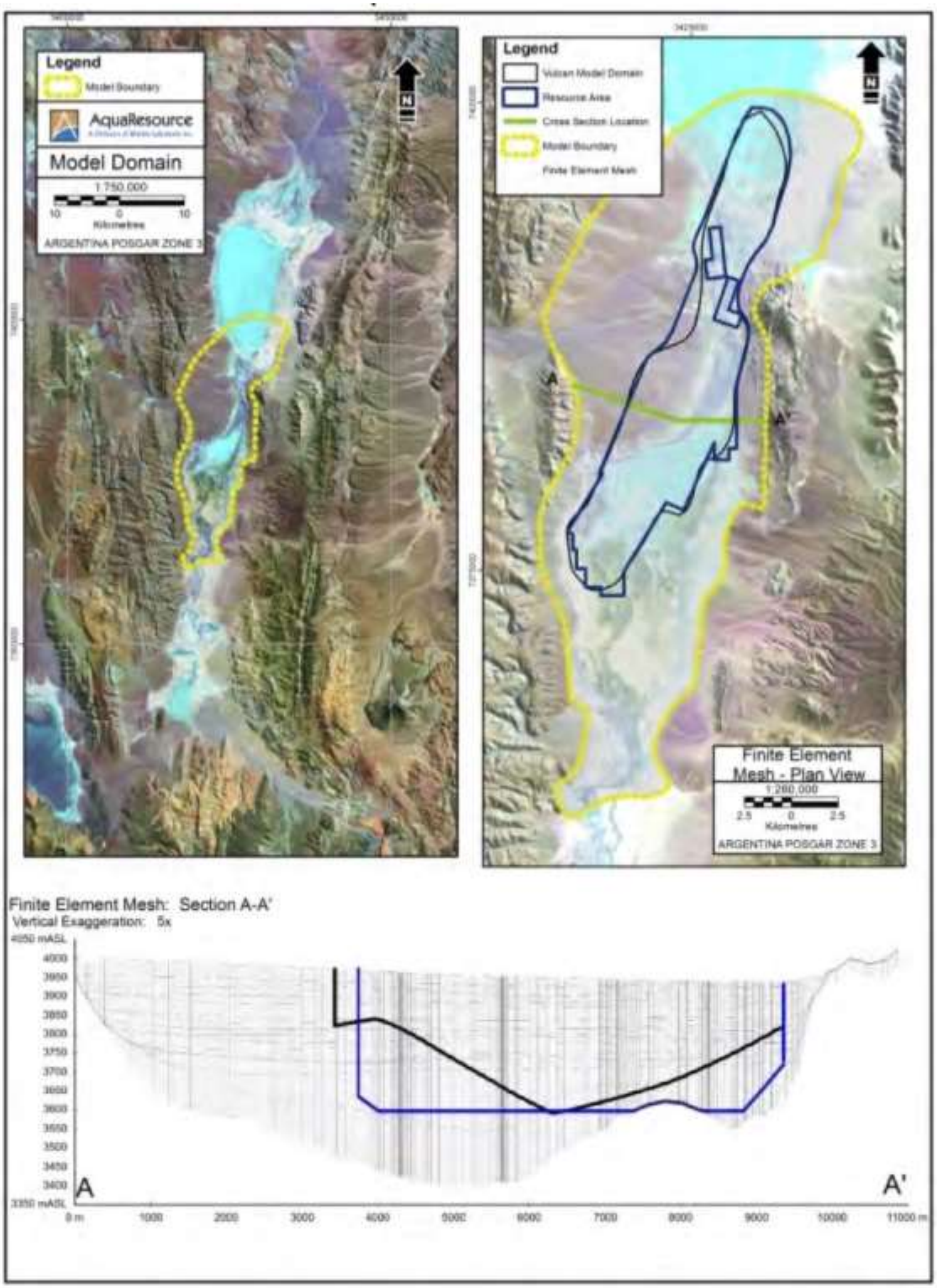
(4) The values in the columns on Lithium Metal and Lithium Carbonate Equivalent above are expressed as total contained metals within the relevant cut-off grade.

Figure 14.1 Compilation of Data Types for Re-evaluating the Resource Zone



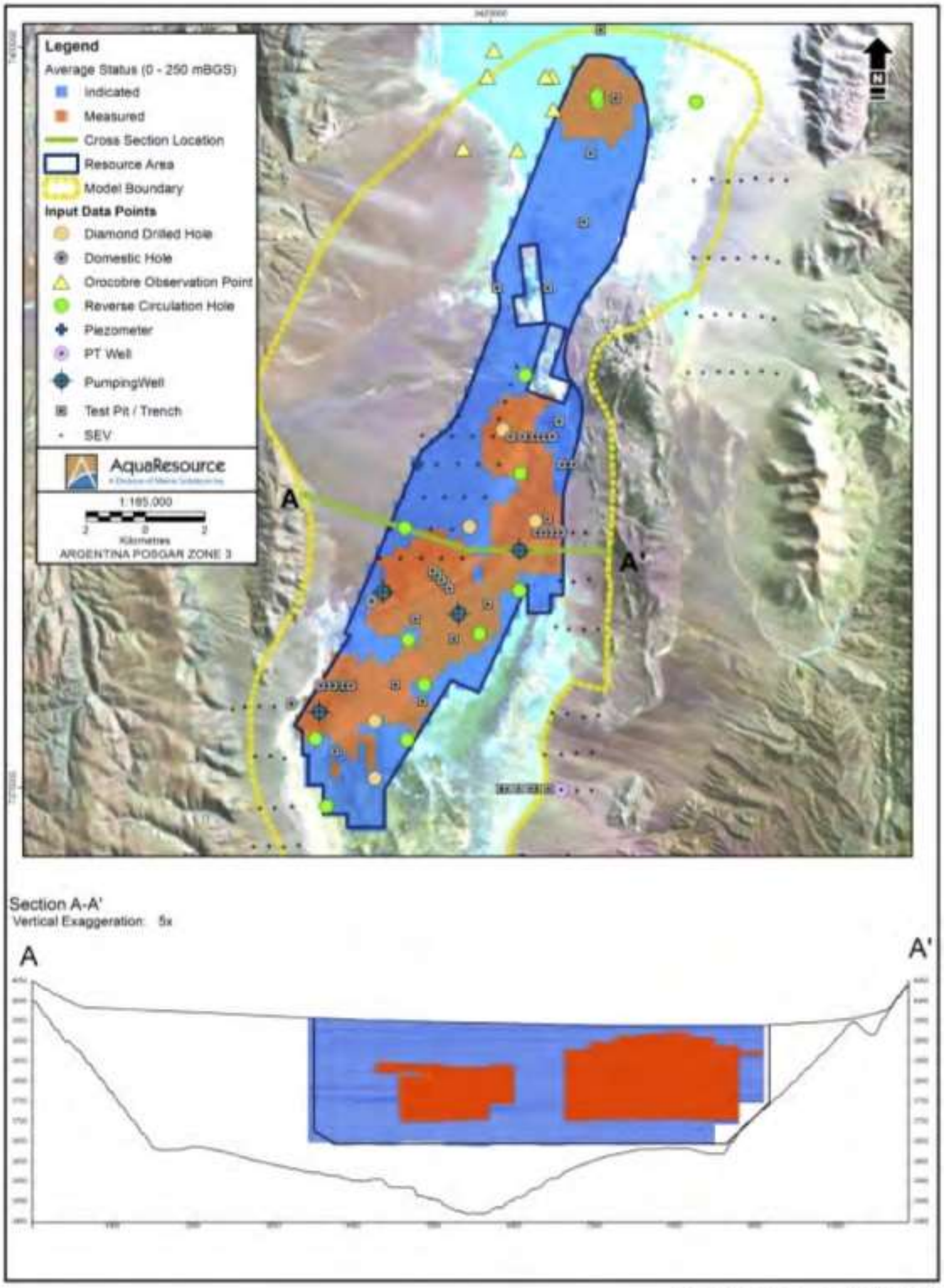
Source: *King, Kelley, Abbey, (2012).*

Figure 14.2 Plan and Section Views of the Numerical Model Domain and Mesh, and the 2010 and 2012 Resource Zone



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

Figure 14.3 Plan and Section Views of Indicated and Measured Resources in the Updated Zone



Plan view shows a horizontal slice at depth of 150 m

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

15.0 MINERAL RESERVE ESTIMATE

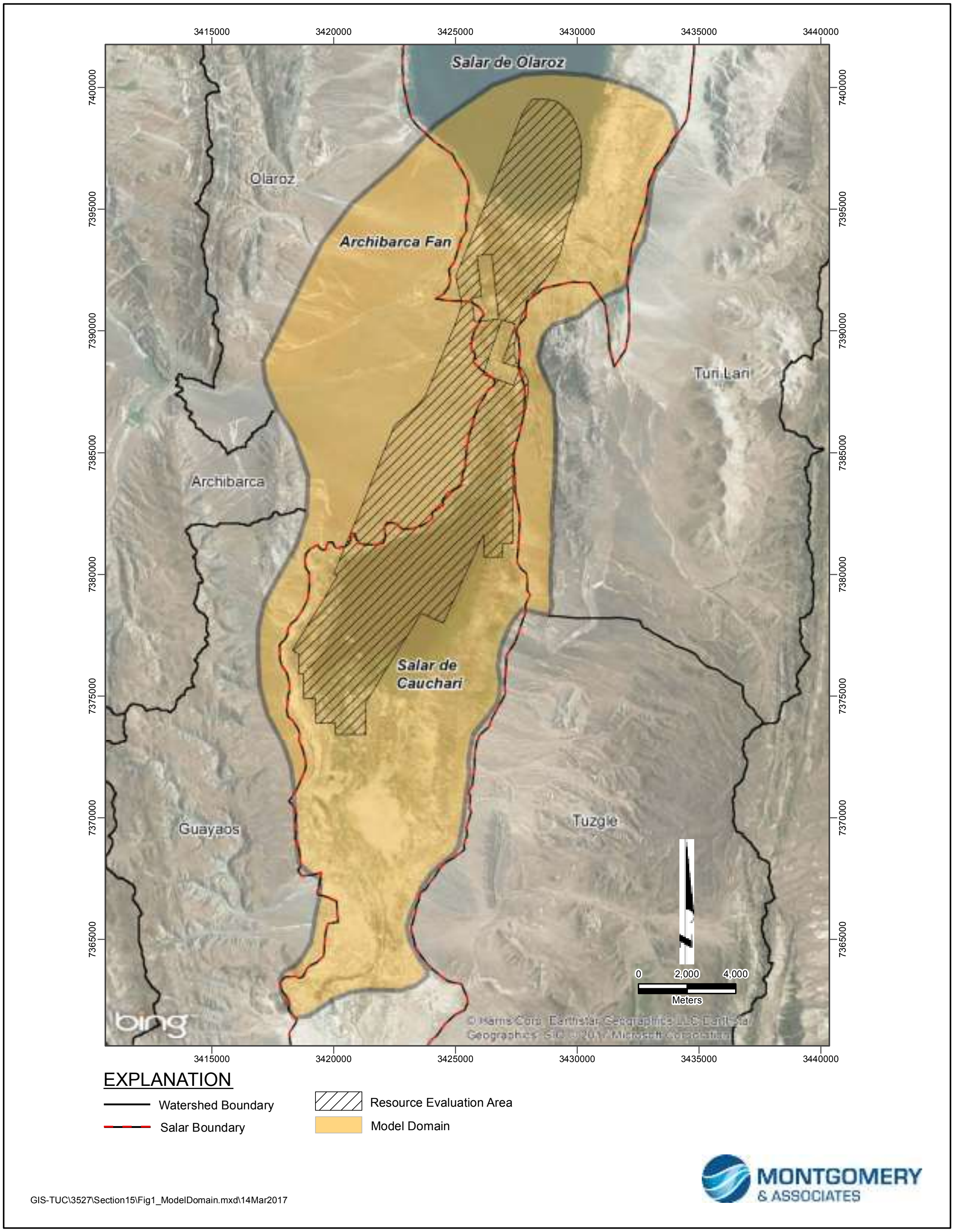
15.1 NUMERICAL MODEL

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 existing 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 Qualified Person believes it is appropriate and valid to update and recalibrate and expand the model as outlined in this Section.

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. As summarized by Groundwater Insight (2012), the domain includes the Resource Evaluation Area and was designed to be large enough to minimize influence of applied boundary conditions on production well simulations. The base of the model domain was set at the top of bedrock valley in which the sediments were deposited. The model simulates equilibrium conditions for groundwater movement and lithium concentration distribution in the sedimentary basin aquifer, with fresh groundwater inflow from five drainage basins that surround the Cauchari salar. Groundwater outflow from the basin occurs via evaporation from the moist salar surface. Groundwater movement is generally from the margins of the salar, where mountain front recharge enters the model domain as groundwater underflow, toward the center of the salar. Precipitation recharge to the salar surface, limited due to the large evaporative potential, is included in the model and was generally applied to the model surface outside evaporative zones. Groundwater-surface water interactions are believed to be negligible within the salar but potential recharge from surface water that flows into the southern edge of the domain was included in the model.

Figure 15.1 Model Domain and Watersheds



15.1.2 Numerical Model Mesh

The model domain was divided into prismatic elements that are triangular in plan-view. Elements with small lateral dimensions were assigned in areas of interest within the salar, particularly in the vicinity of production well locations, while larger elements were assigned near the margins of the model domain. Vertically, the domain was divided into 24 model layers, each of which consists of 92,382 elements. Using FEFLOW terminology, layers are bounded by slices, each of which consists of 45,992 nodes at the vertices of the triangular elements. The entire mesh consists of 24 layers with a total of 2,193,168 elements and 25 slices with a total of 1,149,800 nodes.

Layers in the model were defined based on the hydrostratigraphic model. As required by FEFLOW Version 6, the layers are continuous and extend across the entire model domain. To account for hydrostratigraphic units that are discontinuous (pinch out) according to the geologic model, a layer thickness of 0.1 m was assigned where the unit is interpreted to pinch out. In regions where hydrostratigraphic units are thicker, the same hydraulic property zones were extended across multiple layers as necessary to represent a single unit of the geologic model.

15.1.3 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. The numerical boundary conditions that were applied to simulate these groundwater flow conditions are summarized as follows:

- **Top boundary –** Based on hydrologic modeling reported by Groundwater Insight (2012), recharge due to infiltration of precipitation was applied at a temporally constant rate of 10 millimeters per year (mm/yr) (Groundwater Insight, 2012) over the 139 km2 of the model domain that lies outside the salar boundary (Figure 15.1). Within the 215 km^2 salar boundary of the domain, an expression that allowed temporal variation of net recharge depending on the depth to the water table below the surface was applied. In regions where depth to the simulated water table was greater than the evaporative extinction depth, recharge (inward flux) was applied at the 10 mm/yr rate. In regions where depth to the water table was lower than the extinction depth, evaporation (outward flux) was applied. Potential evaporation (ETp), the rate of evaporation when the water table is coincident with the ground surface, of 4.3 millimeters per day (mm/d) was assigned to the entire salar region and two evaporative extinction depths were applied, 2 m in the salar nucleus and 4 m in the region between the nucleus and the edge of the salar (Groundwater Insight, 2012). Actual evaporation was simulated as a function of depth to the water table, ranging from zero where the water table was below the extinction depth to ETp where the water table was at ground surface, and has virtually no effect on potential lithium recovery. During simulation, therefore, net recharge within the salar region of the model domain varies spatially and temporally in response to changes in depth to the water table.
- **Lateral Boundaries –** Except as noted below for select nodes on model slices 1 and 2, all nodes along the lateral boundaries of the domain are assigned no flow boundary conditions. Therefore, neither fresh groundwater nor brine can enter or exit the model domain at any of these nodes. Specific locations where boundary conditions were applied along the lateral boundaries of the model are described below:
    - **Mountain front recharge –** Mountain front recharge was increased in the model as compared to previous analyses (Groundwater Insight, 2012) for consistency with a recent study conducted by SQM (2016). Recharge which

occurs in watersheds that are outside the model domain and then enters as groundwater underflow was applied at a temporally constant rate to nodes on model Slice 2 along the edge of the domain using FEFLOW well type boundary conditions, as shown on Figure 15.2. Total groundwater inflow from each watershed was determined with the basin wide water balance and prorated to the 400 injection well boundary conditions used to simulate mountain front recharge into the model domain. Based on this water balance analysis, the quantity of mountain front recharge, in m^3/day, increased for this model in comparison to the model described by Groundwater Insight (2012) as summarized below in Table 15.1.

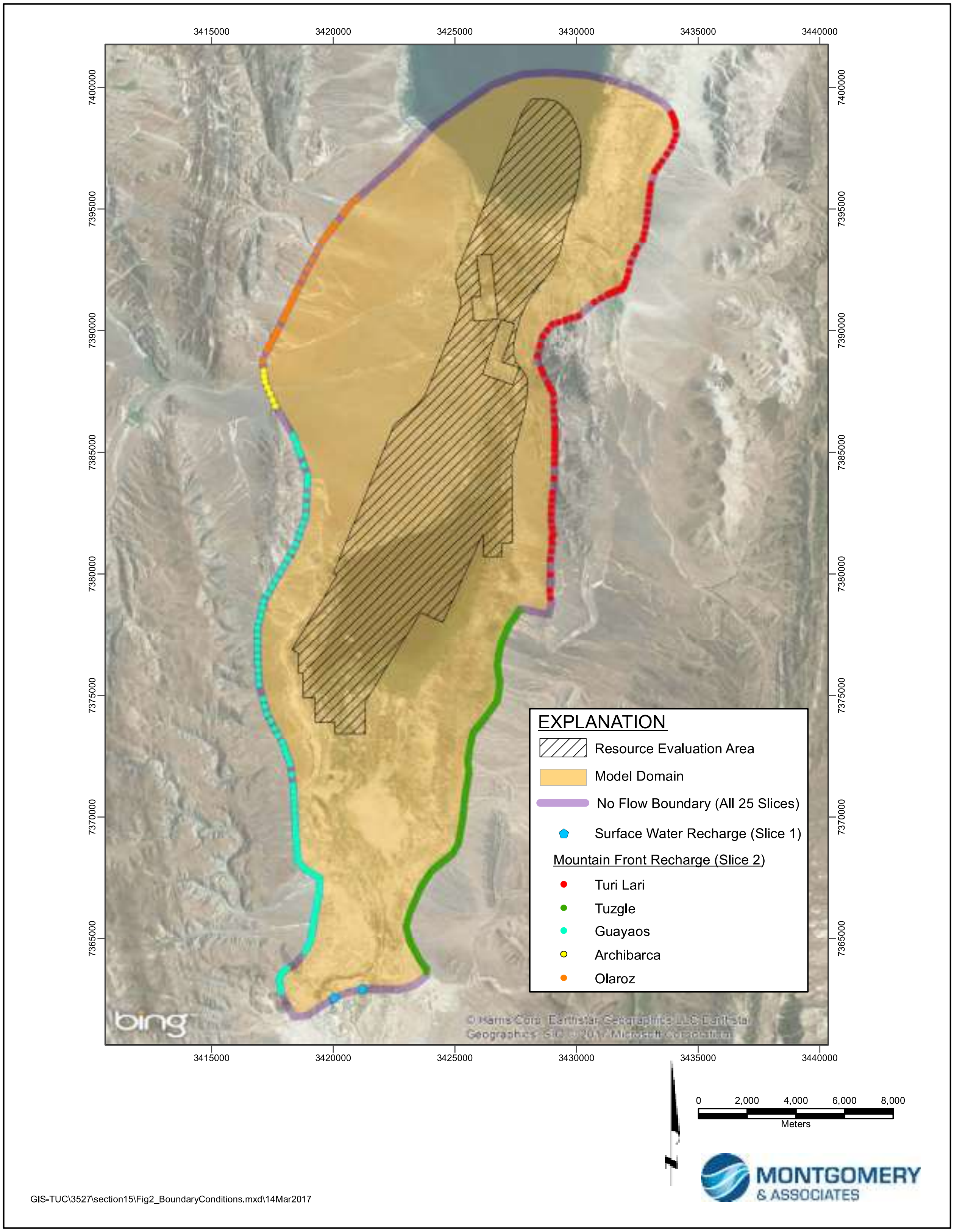
TABLE 15.1
SUMMARY OF MOUNTAIN FRONT RECHARGE

Watershed	Groundwater Insight (2012)	SQM (2016)
Turi Lari	4,705.1	6,478.7
Tuzgle	2,295.7	3,493.8
Guayaos	2,371.0	3,359.8
Archibarca	3,717.0	10,930.4
Olaroz	775.4	1,162.9
Total	**13,864.3**	**25,425.5**

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



Brine will be pumped from the aquifer beneath the salar to produce lithium. The wells that will be constructed for extraction of brine were simulated as FEFLOW multi-layer wells. In FEFLOW Version 6, the well is considered as all nodes along the screen or open area of the well connected by a highly conductive 1D element to simulate the near-infinite permeability within the well casing. As a result, the same head is applied at all of the nodes which represent the well screen to compute the contribution from each layer in the model. The net result is that each layer provides its contribution to total well discharge based on hydraulic properties and heads in that layer; that is, contributions from each layer are proportional to the transmissivity of the layer. Three wells will also be constructed to extract groundwater for industrial use from the upper portion of the aquifer outside the salar. These three wells were also simulated as FEFLOW multi-layer wells.

Mountain front recharge was assumed to consist of fresh water free of lithium, so solute transport boundary conditions were not applied to any of the injection wells used to simulate this source of groundwater. Similarly, surface recharge applied within the model domain was assumed to be free of lithium so solute transport boundary conditions were not applied to these hydrologic boundaries. Due to the approach used to simulate evaporation, FEFLOW does not allow solutes to exit from the model domain through the upper model surface. The surface water inflow through the southern boundary of the model was assumed to have a lithium concentration similar to that determined from laboratory analyses of samples of the water (Groundwater Insight, 2012). (Therefore, the two nodes at the south end of the model domain which were assigned constant head boundary conditions were also assigned constant concentration boundary conditions with regard to solute transport.

15.1.4 Hydraulic and Transport Properties

Hydraulic and transport properties used in the current model are those determined through calibration of the original model by Groundwater Insight (2012). Hydraulic properties include hydraulic conductivity in the three cardinal directions (Kx, Ky, and Kz), specific storage (Ss), unsaturated flow porosity, and unsaturated hydraulic properties. Range of assigned hydraulic properties is shown in Table 15.2 and brief summaries of the parameters are provided below:

- **Hydraulic Conductivity –** The hydraulic conductivity distribution used in the model was determined by Groundwater Insight (2012) during calibration of the model with values constrained by results of pumping tests conducted in the salar. Horizontal anisotropy was not considered so Kx is equal to Ky. Horizontal hydraulic conductivity ranges from 8.64x105 m/d for the lower permeability units (halites, clays, silts) of to 86.4 m/d for the permeable units (sands, gravels). Anisotropy was applied in the vertical direction with ratios of Kx over Kz ranging from 1 to 1000 (generally lower conductivity units and in sand units that contained laminations of mud and halite). Cross-sections showing representative distributions of Kx as applied in the model are provided on Figure 15.3.
- **Specific Storage –** The range of specific storage assigned in the model, 1x10-7 m-1 to 9x10-4 m-1, is generally reasonable for sediments. The lower end of the range, 1x10-7 m-1, is near the compressibility of water, which indicates a rigid, low porosity material (little compressibility of the rock mass). The upper end of the range, 9x10-4 m-1, is indicative of higher porosity and substantial compressibility of the rock mass (e.g. silts and clays).
- **Unsaturated Flow Porosity –** Since the model is based on the Richards equation, specific yield is not specified directly. Rather, unsaturated flow porosity, the difference in water content between saturated and unsaturated conditions, is used to compute the quantity of pore water stored in the aquifer under various hydraulic head distributions. The parameter is not directly equal to specific yield since pore space will be completely unsaturated, that is at residual saturation, and therefore only under conditions that are unlikely to occur within the model domain. Nonetheless, unsaturated flow porosity does provide an indication of the quantity

of water produced under gravity drainage since a residual saturation of zero is assigned throughout the model domain. In the model, unsaturated flow porosity ranges from about 0.036 to 0.27.

- Unsaturated Hydraulic Properties – The modified van Genuchten parametric equations are used to relate saturation and unsaturated hydraulic conductivity to pressure head in the model. As noted previously, specific yield is not specified directly when simulating flow using the Richards equation since the release of water from pore space is computed based on capillary pressure or saturation. Unsaturated hydraulic properties are spatially and temporally constant in the model domain:
  - The fitting coefficient of the capillary head curve, alpha (α), is assigned a value of 0.1 m-1. This parameter is approximately equal to the inverse of the air-entry pressure head. Air entry pressure of 10 m is reasonable for fine grained sediments but is considerably larger than would be expected for sands and gravels.
  - The fitting exponent for the capillary head curve, n, is related to the pore-size distribution and is assigned a value of 1.964, indicative of a relatively uniform pore-size distribution.
  - The second fitting exponent for the capillary head curve, m, is assigned a value of 0.509, or 1/n rather than the typical value of 1 – (1/n) that is typically used with the modified van Genuchten parametric equations.
  - The exponent for the relative permeability curve, delta (δ), is assigned as 0.1. In general, this parameter would be expected to be in the range of 2 or greater. In essence the low value used in the model results in high relative permeability throughout the saturation range. In reality, the relative permeability probably declines much more rapidly as the sediments in the basin dry out. However, the lower value for δ does tend to make the model numerically stable. This simplification likely has no effect with respect to quantity of groundwater and lithium extracted because sediments become unsaturated in only small regions adjacent to the upper screened interval of some of the production wells. In these regions, groundwater will move toward the well more rapidly in the model than in the physical system but will not enter the well because FEFLOW does not permit inflow to unsaturated nodes along the axis of multi-layer wells.
  - Maximum saturation, Ss, is assigned as 1, a reasonable value in the absence of actual test data. A value of 1 simply means that the entire unsaturated porosity is considered rather than accounting for entrapped air or hysteresis as the water table position fluctuates.
  - Residual saturation, Sr, is assigned as 0, so that the entire saturated porosity is considered. For rigorous modeling of unsaturated flow, which is not necessary for this modeling endeavor, a higher value of Sr is often used to account for water which remains in pores following gravity drainage.
  - Transport properties include effective porosity (φe), longitudinal dispersivity coefficient (DL), transverse dispersivity coefficient (DT), and molecular diffusion coefficient:
  - Effective porosity – This parameter was assumed to be equivalent to the unsaturated flow porosity and it varies spatially. Generally, effective porosity would be expected to be slightly larger than the unsaturated flow porosity so using a smaller value has the effect of overestimating the rate of expansion of capture zones.

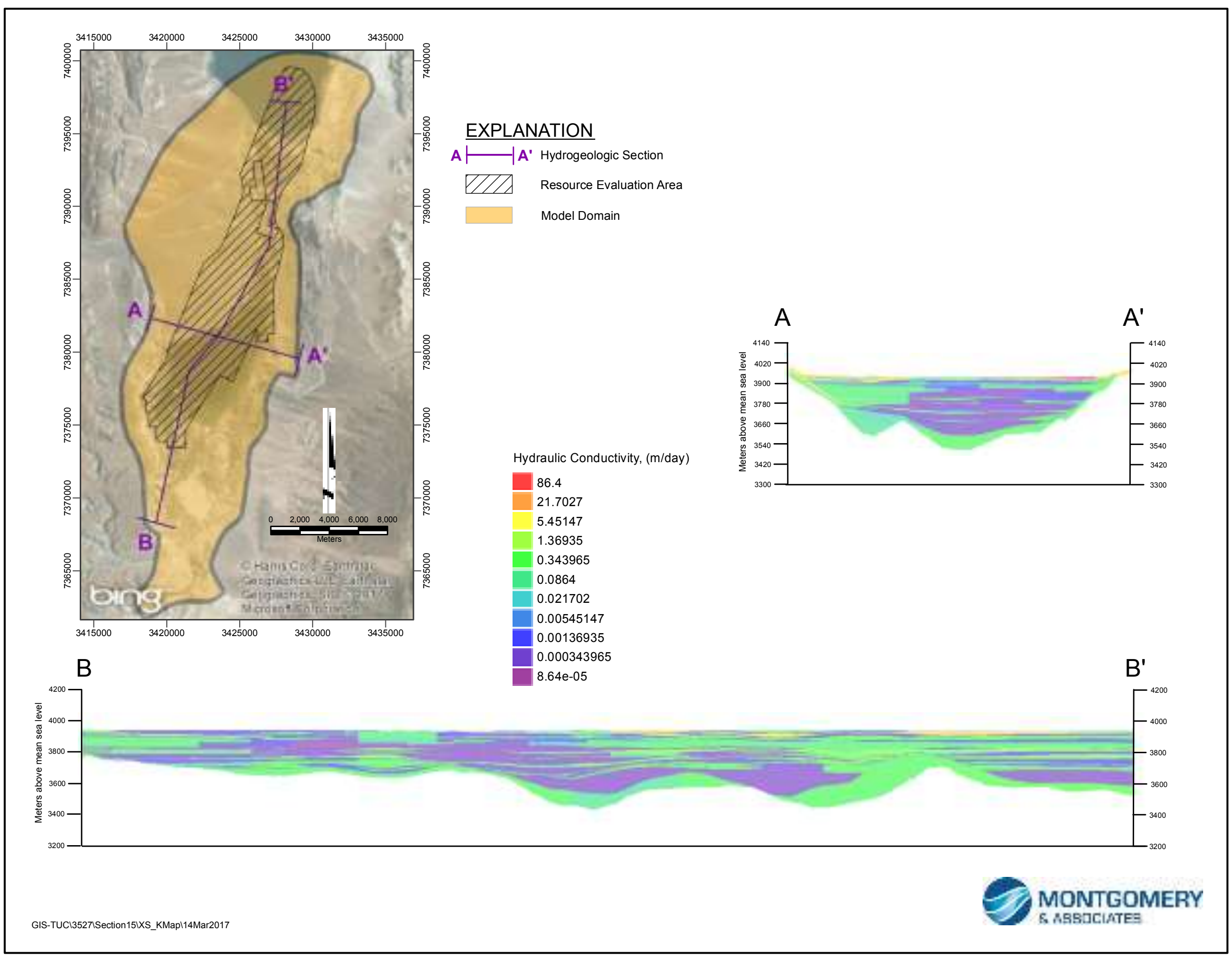
- Dispersivity Coefficients – Values for longitudinal dispersivity (DL) and transverse dispersivity (DT) were set to 5 m and 0.5 m, respectively.
- Molecular Diffusion Coefficient – Given the scale of the model, molecular diffusion is not an important process and the coefficient was assigned the default FEFLOW value of 1x10-9 m2/s.

TABLE 15.2
RANGE OF ASSIGNED HYDRAULIC PROPERTIES

Lateral Hydraulic Conductivity	Vertical Hydraulic Conductivity	Anisotropy Ratio	Specific Storage (Ss)		Unsaturated Flow Porosity	
Kx = Ky (m/d)a	Kz (m/d)	Kx/Kz	Minimum (1/m)b	Maximum (1/m)	Minimum	Maximum
7.02E-04	4.35E-06	161	1.00E-07	1.00E-07	0.0490	0.0555
3.16E-04	5.64E-06	56	1.00E-07	1.00E-07	0.0595	0.0595
1.59E-04	9.85E-06	16	1.00E-07	1.00E-07	0.0425	0.0425
8.64E-05	1.17E-05	7	1.00E-07	1.00E-07	0.0360	0.0360
1.01E-03	2.64E-05	38	1.00E-07	1.00E-07	0.0392	0.0392
7.56E-04	5.99E-05	13	9.00E-04	9.00E-04	0.0520	0.0520
2.61E-04	7.81E-05	3	1.00E-07	8.97E-06	0.0490	0.2490
8.64E-04	8.64E-05	10	9.00E-04	9.00E-04	0.0520	0.2510
8.64E-02	1.27E-04	682	2.20E-06	2.20E-06	0.0555	0.2700
1.73E-01	2.53E-04	682	2.20E-06	2.20E-06	0.0555	0.1210
2.59E-01	3.80E-04	682	2.20E-06	2.20E-06	0.0420	0.2645
4.25E-03	4.25E-04	10	9.00E-04	9.00E-04	0.0826	0.1210
3.60E-01	5.28E-04	682	2.20E-06	8.97E-06	0.0420	0.2700
7.34E-03	7.34E-04	10	2.20E-06	2.20E-06	0.1160	0.1160
8.64E-02	7.45E-04	116	1.00E-07	8.97E-06	0.0611	0.2490
3.80E-02	8.63E-04	44	1.00E-07	8.97E-06	0.0805	0.1210
8.64E-04	8.64E-04	1	9.00E-04	9.00E-04	0.0555	0.0555
8.64E-03	8.64E-04	10	9.00E-04	9.00E-04	0.0520	0.2700
7.27E-02	1.01E-03	72	1.00E-07	1.00E-07	0.0420	0.0420
8.64E-02	1.62E-03	53	2.20E-06	2.20E-06	0.2510	0.2510
1.04E-01	2.48E-03	42	2.20E-06	2.20E-06	0.1012	0.1012
1.73E-01	4.13E-03	42	2.20E-06	4.46E-06	0.0586	0.1677
4.32E-01	8.08E-03	53	2.20E-06	2.20E-06	0.2131	0.2510
8.64E-03	8.64E-03	1	9.00E-04	9.00E-04	0.1305	0.2510
8.64E-02	8.64E-03	10	9.00E-04	9.00E-04	0.0555	0.1997
8.64E+00	8.64E-03	1000	2.20E-06	2.20E-06	0.0420	0.2700
1.73E-01	1.36E-02	13	2.20E-06	2.20E-06	0.1139	0.1139
8.07E-01	1.51E-02	53	2.20E-06	2.20E-06	0.0555	0.2510
1.73E-01	1.73E-02	10	2.20E-06	2.20E-06	0.0490	0.2490
8.64E-02	2.81E-02	3	2.20E-06	2.20E-06	0.0555	0.1289
4.32E-01	3.41E-02	13	2.20E-06	2.20E-06	0.1139	0.1139
4.32E-02	4.32E-02	1	1.00E-07	1.00E-07	0.2490	0.2490
1.73E-01	5.63E-02	3	2.20E-06	2.20E-06	0.1339	0.1339
7.34E-01	5.80E-02	13	2.20E-06	8.97E-06	0.0555	0.2700

TABLE 15.2 RANGE OF ASSIGNED HYDRAULIC PROPERTIES						
Lateral Hydraulic Conductivity	**Vertical Hydraulic Conductivity**	**Anisotropy Ratio**	**Specific Storage (Ss)**		**Unsaturated Flow Porosity**	
Kx = Ky (m/d)[a]	**Kz (m/d)**	**Kx/Kz**	**Minimum (1/m)[b]**	**Maximum (1/m)**	**Minimum**	**Maximum**
8.64E+00	7.20E-02	120	2.20E-06	2.20E-06	0.0555	0.2700
7.52E+01	7.52E-02	1000	2.20E-06	2.20E-06	0.1889	0.2490
1.73E-01	1.13E-01	2	2.20E-06	2.20E-06	0.0555	0.2490
7.52E+01	2.38E-01	316	2.20E-06	2.20E-06	0.2236	0.2490
7.34E-01	2.39E-01	3	2.20E-06	8.97E-06	0.0555	0.2490
6.91E+01	5.76E-01	120	2.20E-06	2.20E-06	0.0567	0.1889
7.34E-01	7.34E-01	1	2.20E-06	2.20E-06	0.2490	0.2490
8.64E-01	8.64E-01	1	9.00E-04	9.00E-04	0.2490	0.2490
6.48E+01	6.48E+01	1	9.00E-04	9.00E-04	0.2490	0.2490
8.64E+01	8.64E+01	1	1.00E-07	1.00E-07	0.2490	0.2490
[a]m/d = meters per day						
[b]1/m = 1 per meter						

Figure 15.3 Hydraulic Conductivity Distribution in Brine Production Wellfield Region



15.1.5 Simulated Pre-Development Conditions

The original model (Groundwater Insight, 2012) assumed that pre-development groundwater movement in the salar region occurred under equilibrium conditions in which all recharge is consumed by evaporation. As a result, initial conditions were taken as the steady-state distribution of hydraulic head. However, mountain front recharge is about 83% larger in the updated model so it was necessary to update the initial conditions to be consistent with the increased recharge. The approach adopted by Groundwater Insight (2012) to handle the temporal variation in evaporative discharge is not amenable to a steady-state solution of the Richards equation. Therefore, new initial conditions were obtained with a series of transient simulations that considered only natural recharge (areal and mountain front) and discharge (evaporation). These natural transient simulations were executed for 50,000 days and results were evaluated with respect to changes in heads and boundary fluxes to determine if the solution had reached quasi-steady-state conditions. The first simulation used the heads from the original model as initial conditions. For the next 50,000-day simulation, the heads from the first simulation were used as initial conditions. By the end of the second simulation, both hydraulic heads and boundary fluxes had stabilized sufficiently and the resulting distribution of hydraulic head was taken as initial conditions for the predictive pumping simulations.

Results of the new quasi-steady-state simulation were compared to target heads used by Groundwater Insight (2012) in an effort to evaluate the reliability of the updated recharge model. A mean error of 2.7 m was reported for the steady-state flow solution by Groundwater Insight (2012) as compared to a mean error of -2.5 m for the revised model used in this analysis. Since the magnitude of the apparent error is about the same for the revised model as for the original model, it was concluded that the quasi-steady state distribution of heads could be reasonably used as initial conditions in the updated recharge model.

The water balance for the revised quasi-steady-state simulation is good with an error of about 15 m3/d, or about 0.1%. Predicted evaporation from the salar increased by about 10,891 m3/d, which removed the additional 11,742 m3/d of mountain front recharge applied in the revised model. A relatively large error in the original model water balance (Groundwater Insight, 2012) is responsible for the smaller increase in evaporation compared to the increase in mountain front recharge. In addition, the increased evaporation from the salar surface resulted in slightly less areal recharge as the extent of the evaporative area is larger than applied in the original model. Boundary fluxes for the updated model with larger recharge are compared to those for the original model in Table 15.3.

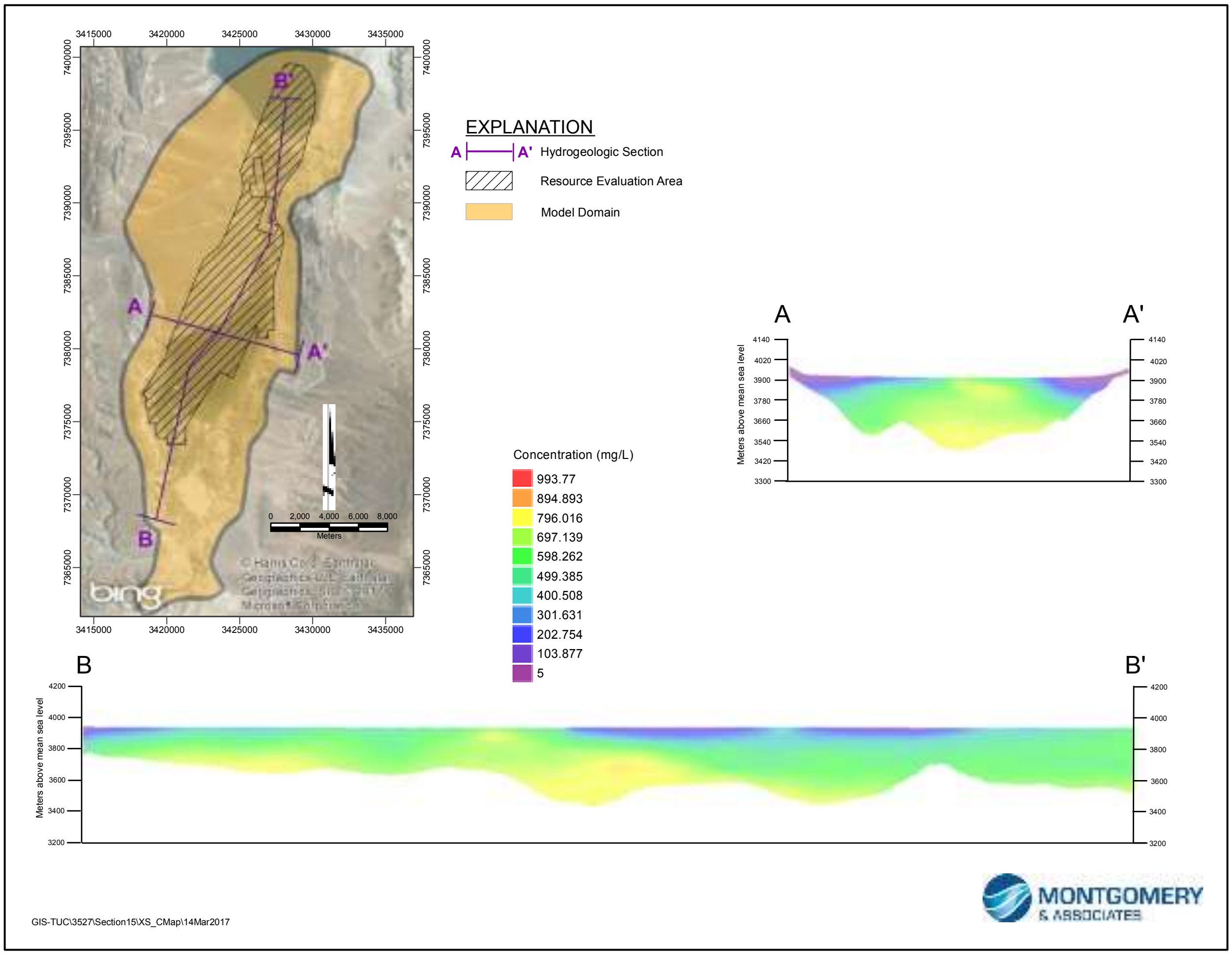
TABLE 15.3
COMPARISON OF MODEL BOUNDARY FLUXES

Water Balance Component	Original Model (m^3/day)	Updated Model (m^3/day)
Surface Water Recharge (constant head boundaries)	+3	+3
Mountain Front Recharge (injection well boundaries)	+13,684	+25,426
Areal Recharge	+4,058	+4038
Evaporation	-18,561	-29,452
Error	-636	+15
% Error	-3.4	+0.1

The initial lithium concentration distribution used in the original model was used without modification in the updated recharge model.

Representative initial lithium concentrations are shown for two cross-sections in the well field on Figure 15.4. The total mass of lithium in solution within the model domain before initiation of brine production is computed to be about 6.25 million tonnes.

Figure 15.4 Initial Concentration in Brine Production Wellfield Region



15.1.6 Projected Results

The updated recharge model was used to predict production of LCE for a 40-year period. Brine production was subject to the following new constraints:

- Pumping rate of at least 259 m^3/d (3 L/s) from all wells
- Drawdown of 100 m or less at all production wells
- Total well field production rate adjusted to account for seasonal variations in potential evaporation

The capture zone for each production well was delineated using Backward Pathline Analysis to identify wells that which may extract lithium from outside the Resource Evaluation Area (offsite lithium). Offsite lithium is defined as lithium that originated outside the Resource Evaluation Area and moves with groundwater to a production well where it is extracted along with lithium and groundwater from within the Resource Evaluation Area. The model was also used to predict the total mass of offsite lithium as well as the quantity of offsite lithium produced at each production well.

15.1.6.1 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 15.5. Evaluation of potential evaporation on a seasonal basis indicates that 20% more water can be evaporated in the peak summer months (December and January) than under average conditions that occur in the spring (March and April) and fall (September and October) and 20% less water can be evaporated during the winter months (June and July). Model predicted brine production, shown on Figure15.6, ranges from 21,600 m^3/d (250 L/s) during winter months to 34,200 m^3/d (396 L/s) during summer months. In general, higher brine production rates were required in the later years of the simulation due to decreases in concentration and the need to pump more brine from the northern half of the salar, where concentrations are lower, to meet the drawdown constraint. 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 15.4.

Figure 15.5 Well Location Map

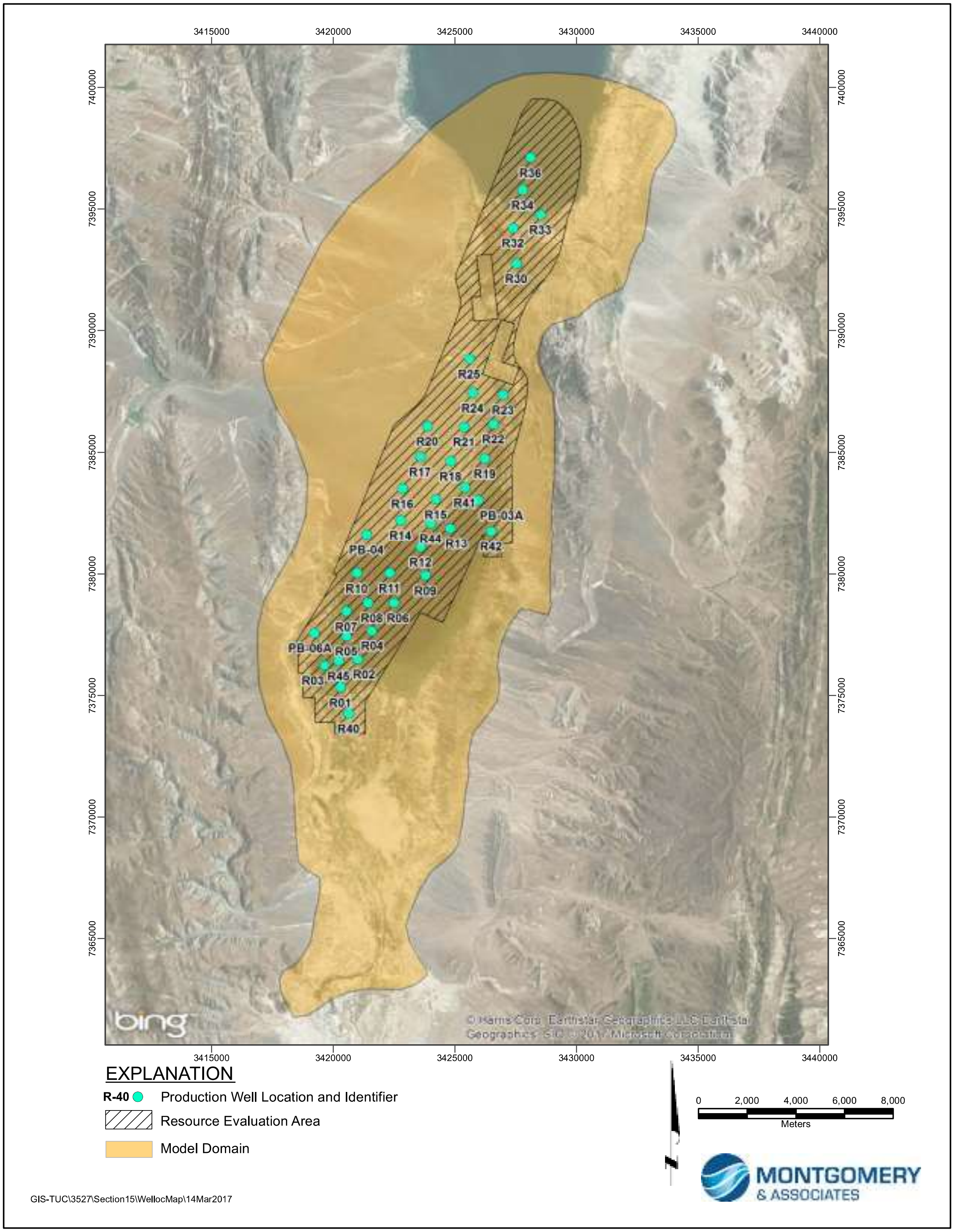


Figure 15.6 Simulated Brine Production Rate

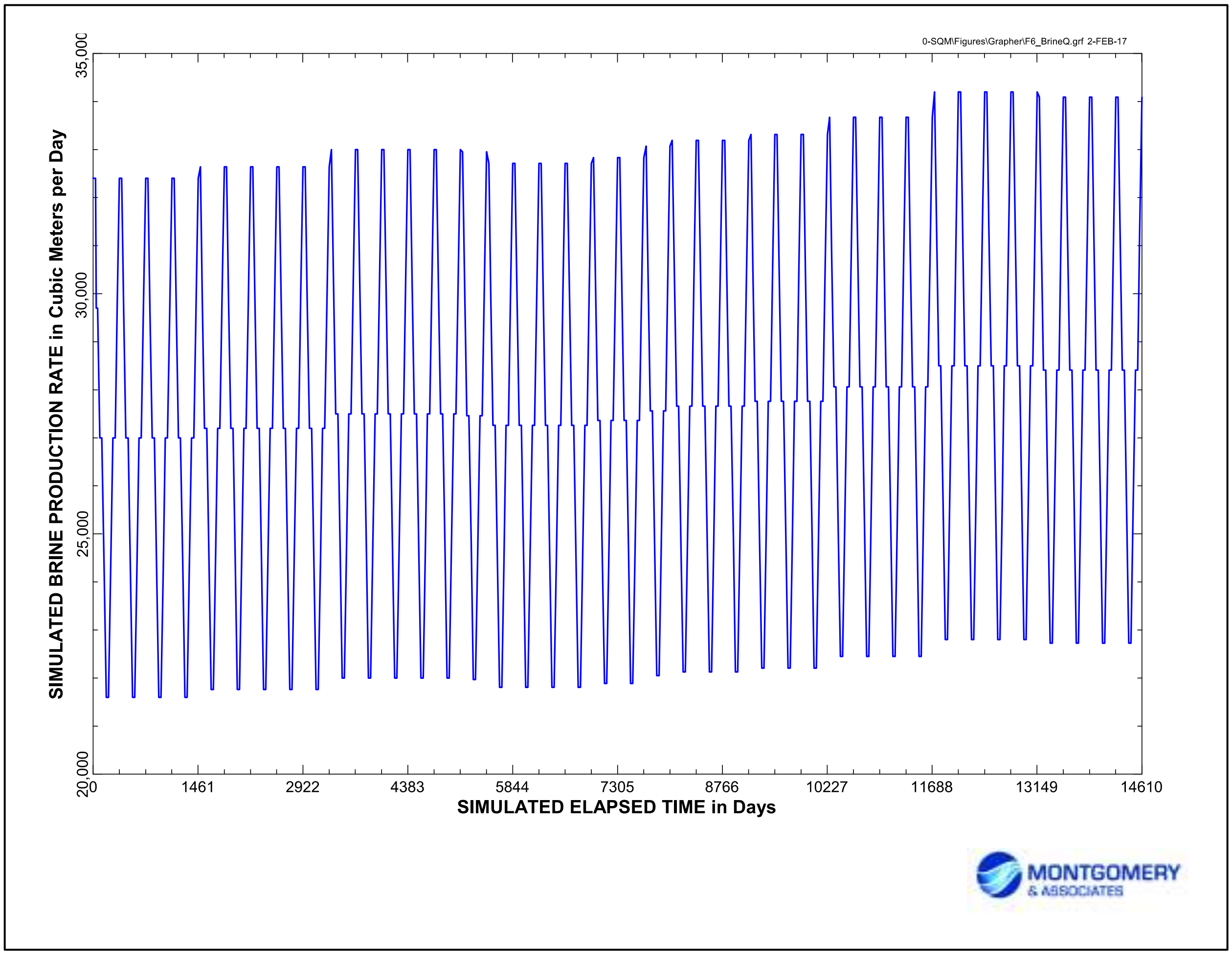


TABLE 15.4
SUMMARY OF PREDICTED BRINE AND LITHIUM PRODUCTION

Well	Brine Volume Produced (m³)a	Pumping Duration (days)	Average Pumping Rate (m³/d)b	Maximum Predicted Drawdown (meters)	Production Concentrations Minimum (mg/L)c	Production Concentrations Maximum (mg/L)	Production Concentrations 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

TABLE 15.4 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)**
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
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
am^3 = cubic meters								
bm^3/d = cubic meters per day								
cmg/L = milligrams per liter								

15.1.6.2 Lithium Production Results

Lithium production predicted by the model, shown on Figure 15.7, exhibits similar monthly variations as brine production with higher rates in the summer months and lower rates in the winter months. Predicted cumulative mass of Lithium produced was extracted directly from the model results at the end of each time step. The results were then multiplied by a conversion factor of 5.323 (grams LCE per gram Lithium) to compute the LCE produced during each time step. The model predicts that LCE production will total 1,499,130 tonnes. Overall efficiency of brine processing to produce LCE is reported to be 71% (SQM personal communication). The net amount of LCE produced was computed by multiplying the LCE extracted from the well field by 71%. The resulting values were then summed for each production year to determine the predicted annual LCE production, which is summarized on Figure 15.8. Predicted average annual production rate over the 40-year period is 26,609 tpa.

Figure 15.7 Simulated Lithium Carbonate Production Rate

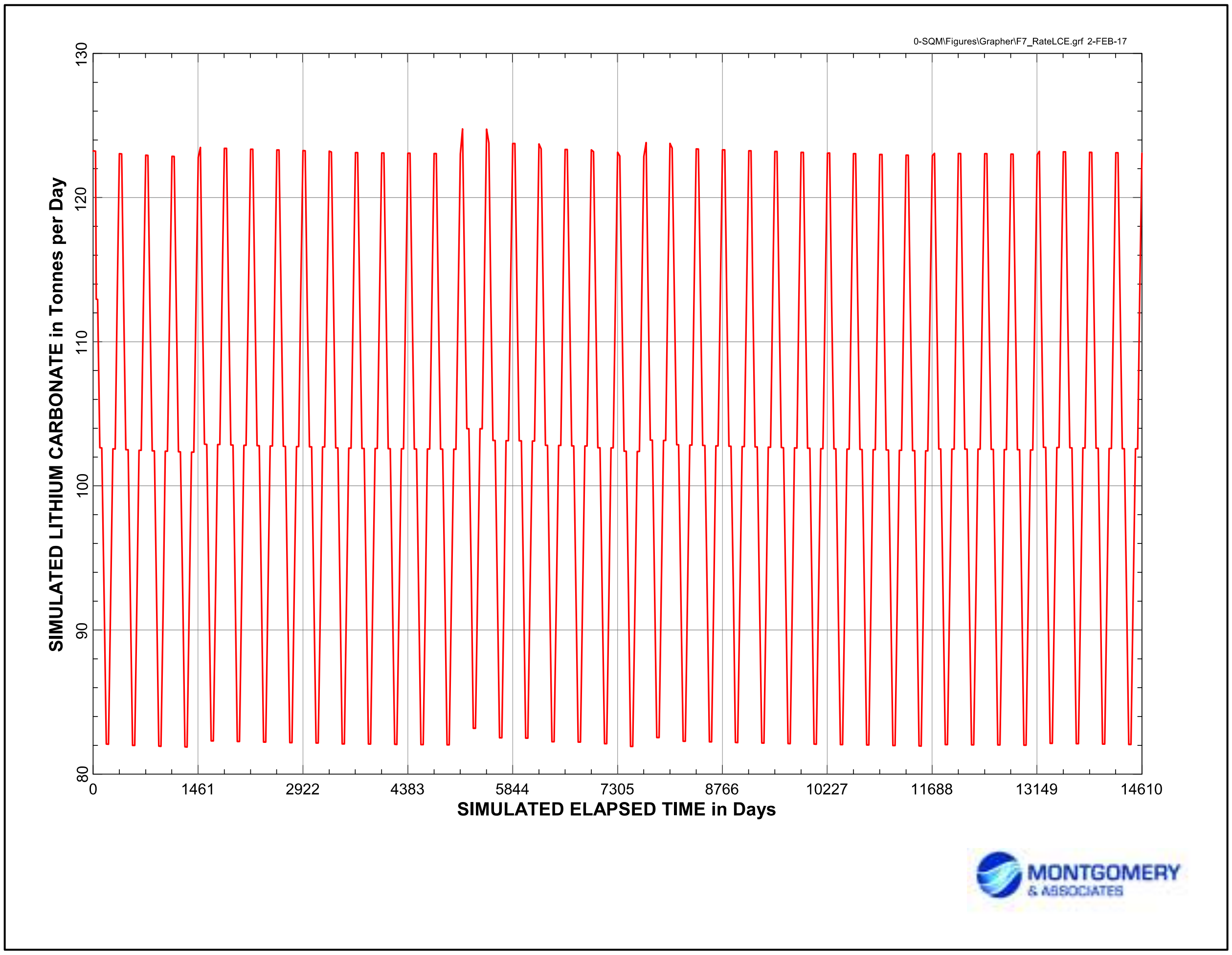
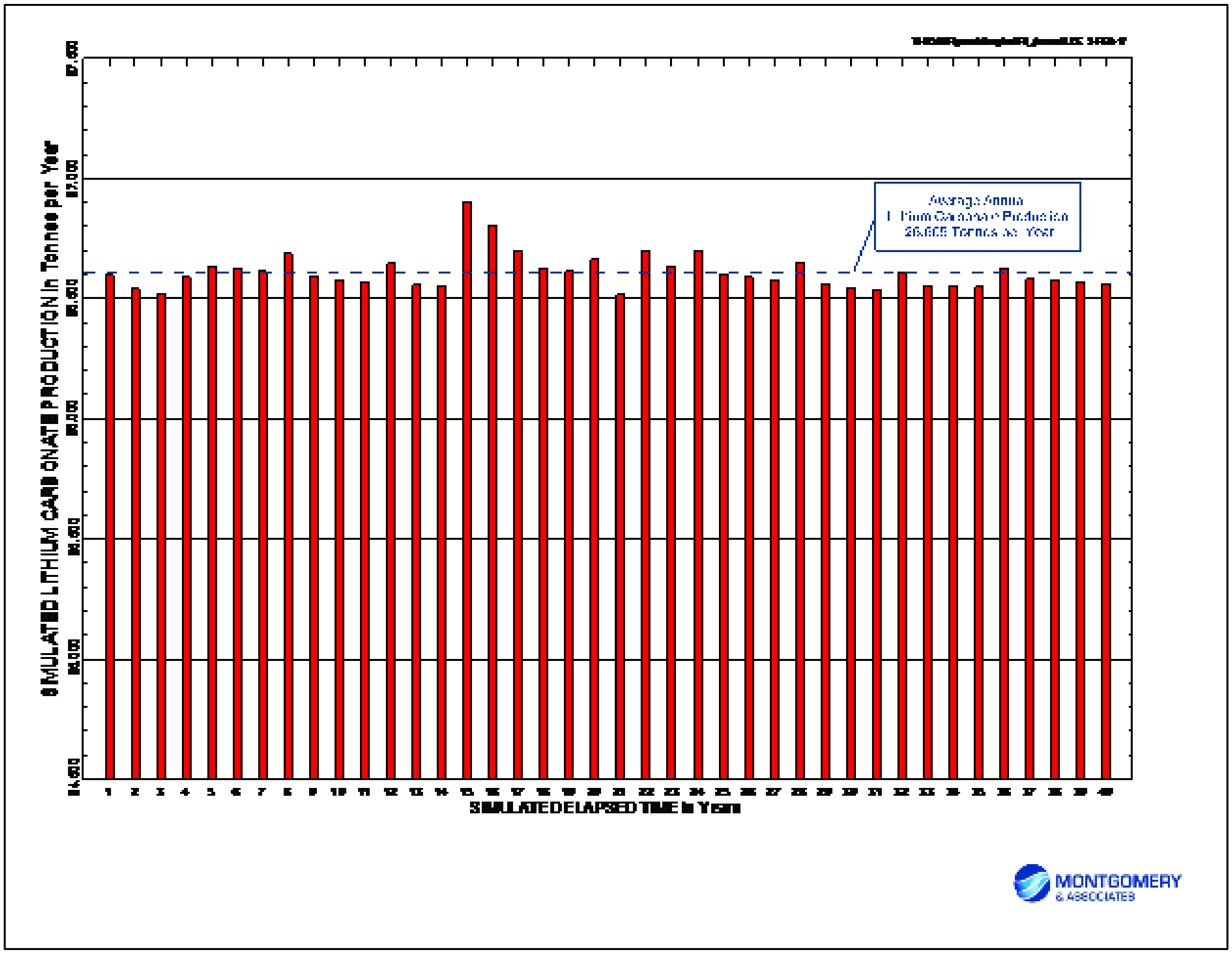
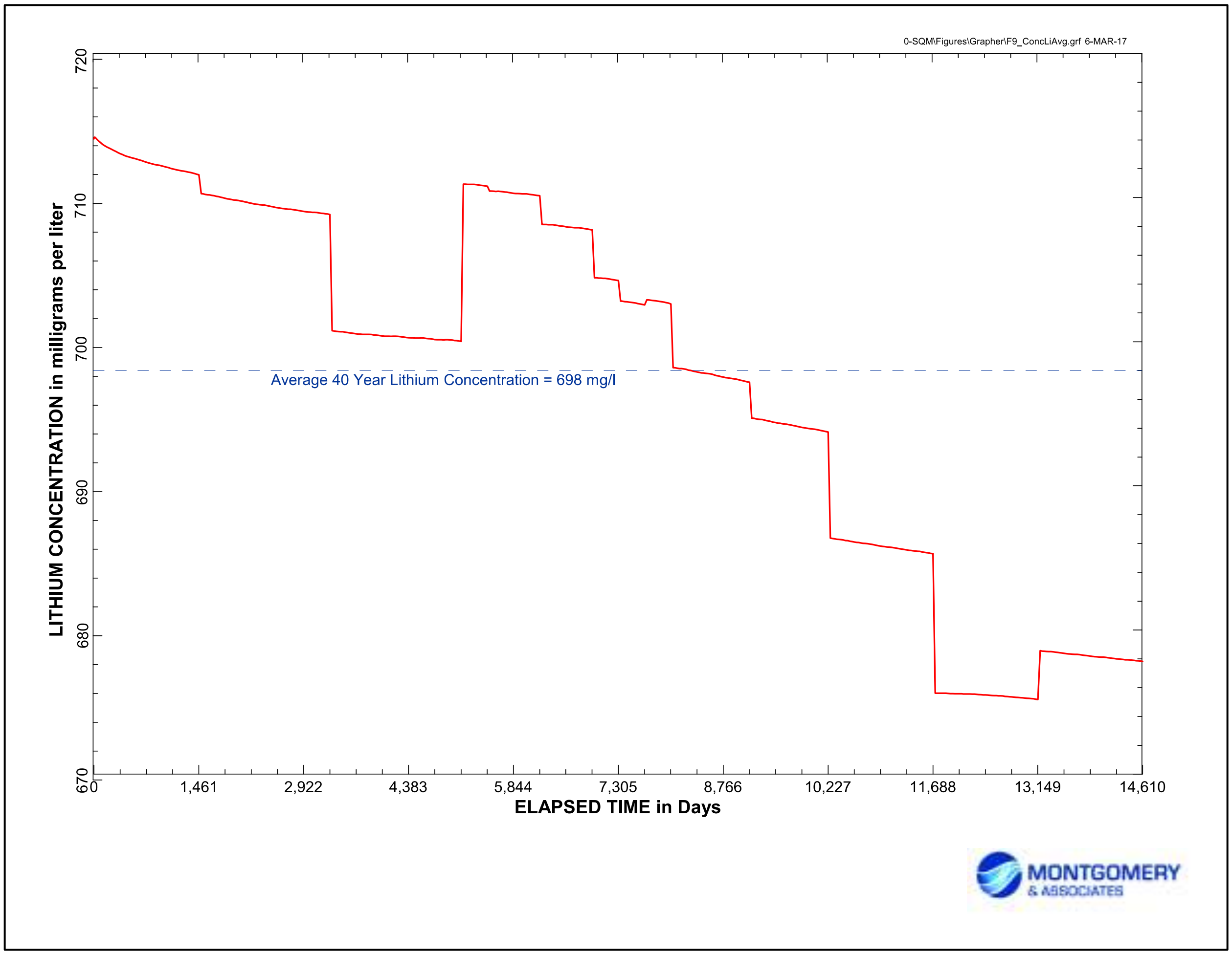


Figure 15.8 Predicted Annual Lithium Carbonate Production Assuming 71% Process Efficiency



Lithium concentrations at each production well were also extracted from the model at the end of each time step to evaluate grade variation at the well during its productive life. The lithium concentration data were combined with individual well production rates to compute the mass of lithium extracted at each well. Results of these computations are summarized in Table 15.4. As shown, the lowest lithium concentration in produced brine is predicted to be 548 mg/L at well PB-04 and the highest is predicted to be 827 mg/L at well PB-03A. Average lithium concentration during the productive life of each well is also presented in Table 15.4. Average annual predicted lithium concentration of extracted brine is plotted as a function of elapsed production time on Figure 15.9; predicted average lithium concentration over 40-year production period is 698 mg/L.

Figure 15.9 Average Annual Simulated Lithium Concentration of Extracted Brine



Mass balance for the simulation as reported by FEFLOW is generally poor with a cumulative error of about -29.7% with a range of -69.6% to +20.4% for individual time steps. However, these results are slightly better than errors computed for the original model. According to a technical memorandum prepared by Matrix Solutions (2016) and Groundwater Insight, the relatively large error is attributed to complexities being represented in the numerical model, including:

- Vertically-stretched elements along the perimeter of the alluvial valley;
- Dynamic simulation of the water table position, saturation state, shallow storage changes, and effective hydraulic conductivity of each element (i.e., variably saturated flow conditions);
- Instantaneous pumping changes;
- Variability in sub-surface storage conditions; and
- Long-term simulations approached using aggressive time-stepping.

These conditions also apply to the updated recharge model described in this report. To further evaluate the reliability of the predicted mass extracted from the model, simple external computations were used to estimate the mass of lithium produced at each well. Pumping rates applied in the numerical model were multiplied by the initial concentration at each well to estimate total LCE production of 1,512,289 tonnes, which is less than 1% more than estimated with the numerical model. It is apparent, therefore, that the mass balance error introduced into the numerical model has little, if any, effect on the estimate of the amount of LCE produced by the well field.

15.1.6.3 Production Well Capture Analyses

Two methods were utilized to evaluate capture of brine (and lithium) from outside the Resource Evaluation Area. Well capture zones were computing using the Backward Pathline Analysis tool available in FEFLOW. Capture zones are predicted by assigning 'seeds' to each production well node and FEFLOW uses stored model results to compute a pathline for each seed from the well back to its point of origin starting at the time of interest and proceeding back in simulated elapsed time. For these analyses, 32 seeds were applied to each well node. Capture zones were delineated as of the end of each year of the simulation to determine if any of the pathways originated outside the boundary of the Resource Evaluation Area. Results of the analysis revealed that two of the simulated wells – PB04 and PB06A – capture brine from outside the Resource Evaluation Area. Capture zones computed at the time simulated pumping at PB06A was stopped at the end of Production Year 14 are shown on Figure 15.10. At that time, the model predicts that capture zones for all wells are located within the Resource Evaluation Area, although some of the pathlines for PB06A are essentially at the boundary. Figure 15.11 depicts the capture zones at the end of Production Year 32 when pumping was halted at PB04. By then, pathlines from both PB04 and PB06A extend beyond the Resource Evaluation Area boundary. At PB04, pathlines first extend beyond the boundary by the end of Production Year 21. As shown on Figure 15.12, both PB04 and PB06A continue to exhibit offsite movement of groundwater into the Resource Evaluation Area at the end of the simulation in Production Year 40.

A separate transport simulation was conducted to quantify offsite contribution to predicted LCE production. For this simulation, initial lithium concentrations of 0 mg/L were assigned to all nodes on all slices within the footprint of the Resource Evaluation Area while leaving the original lithium concentrations everywhere else (including the two L-shaped regions within the outer boundary of the Resource Evaluation Area). Brine production schedule was identical to that used in the original transport simulation. Results of this analysis indicate that almost 942 tonnes of LCE (less than 0.1% of the 1,499,130 tonnes produced in the initial simulation) will originate from outside the Resource Evaluation Area.

Figure 15.10 Well Capture Zones After 14 Years of Brine Production (After Pumping Stops at Well PB-06A)

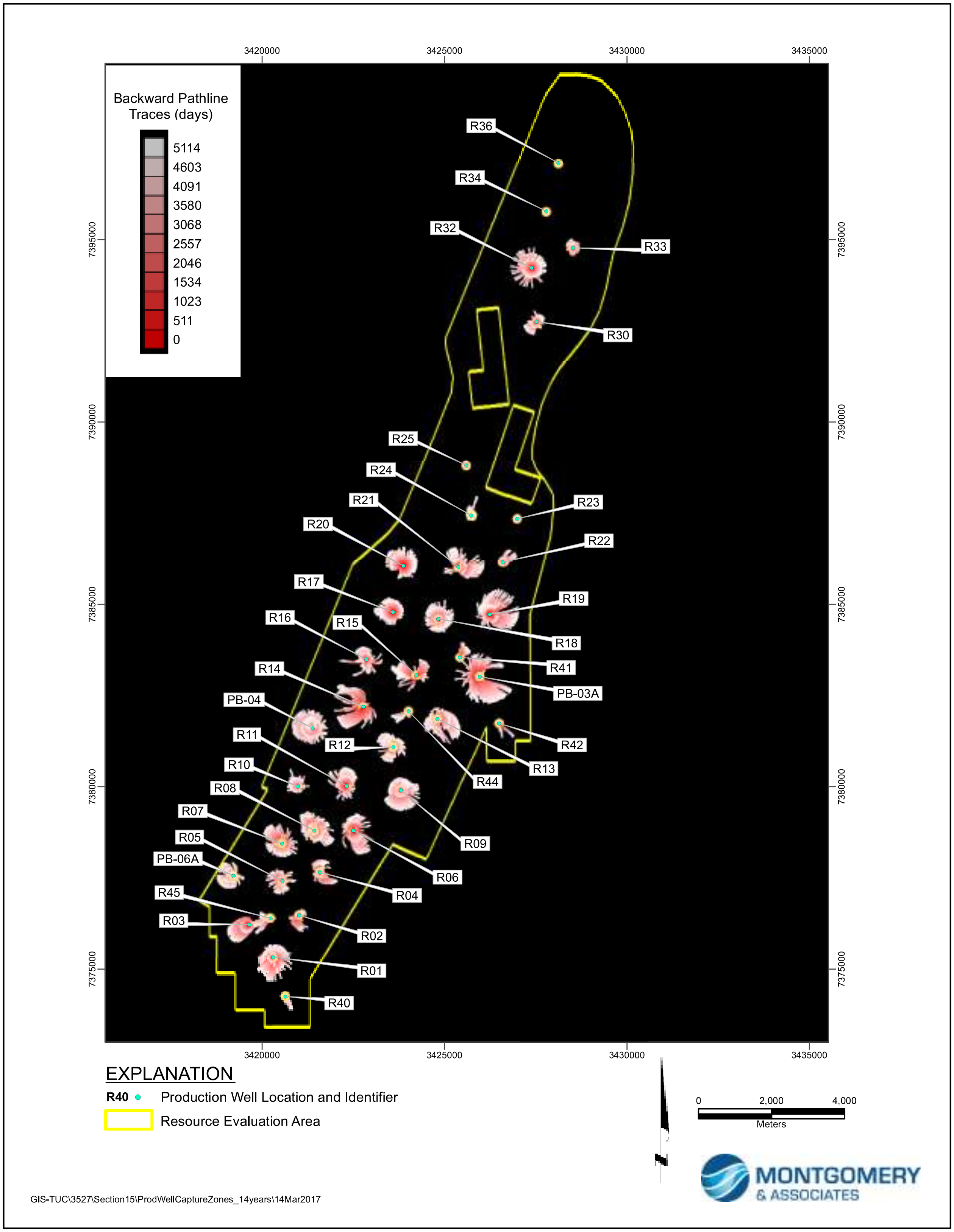


Figure 15.11 Well Capture Zones After 32 Years of Brine Production (After Pumping Stops at Well PB-04)

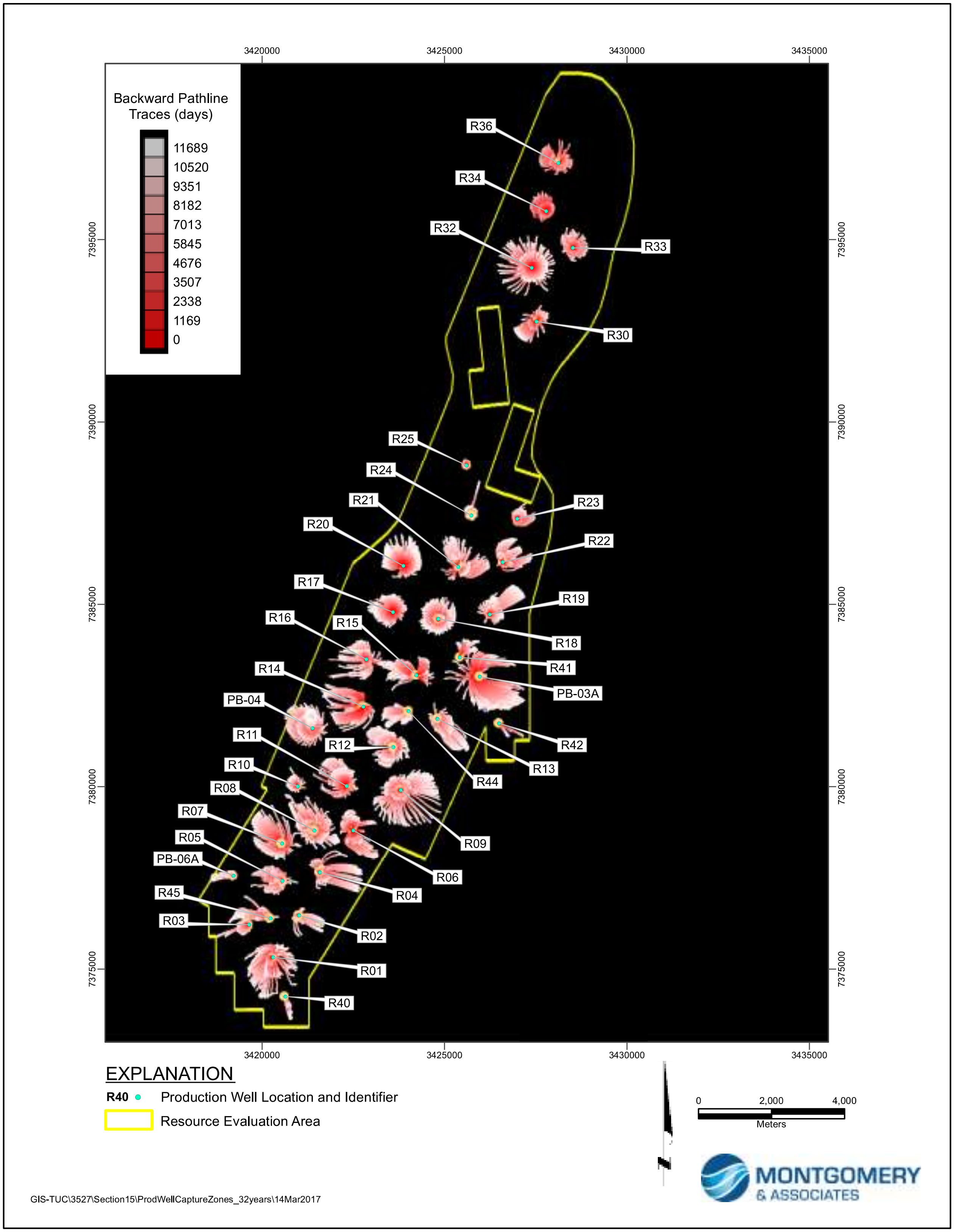
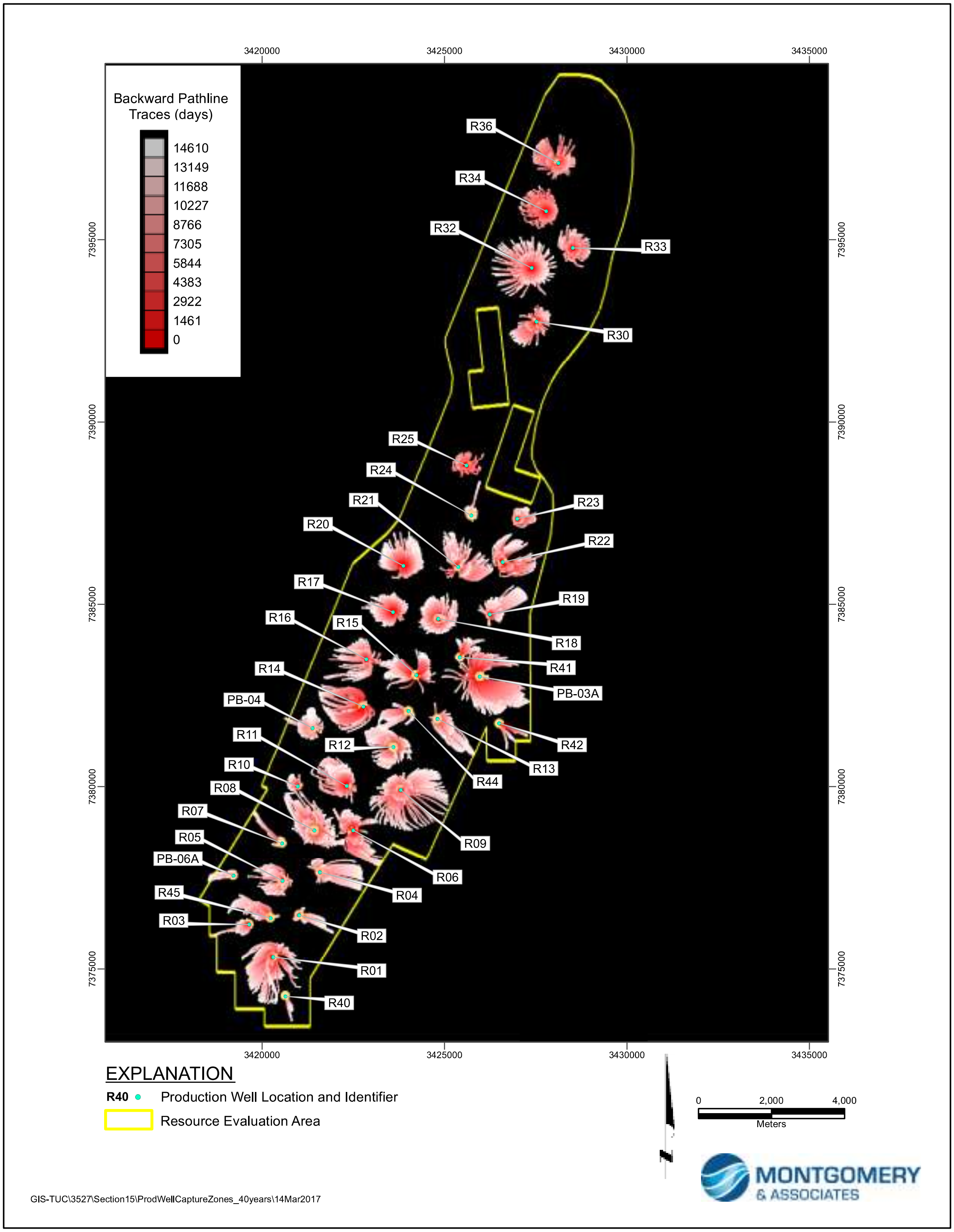


Figure 15.12 Well Capture Zones After 40 Years of Brine Production (End of Simulation)



15.1.7 Numerical Model Summary

The numerical groundwater model was used to evaluate the potential to produce LCE for 40 years from a well field constructed in the Salar de Cauchari. Predicted results for the 40-year pumping period are as follows:

- Average lithium concentration of 698 mg/L for the 40-year pumping period (Figure 15.9);
- Minimum lithium concentration of 676 mg/L, which occurs near the end of pumping (Figure 15.9);
- Average LCE production of 26,609 tpa after accounting for production efficiencies (Figure 15.8); and
- Maximum drawdown of 100 m or less at all 38 production wells (Table 15.4) (note: the numerical model does not account for well efficiency losses).

15.2 LITHIUM 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 Reserve to the end of a 40-year production period. Proven Reserves were produced up to the end of Year 5 of the simulation and Probable 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 Reserve Estimate was calculated for 40 years.

Table 15.5 was generated from the FEFLOW model and represents the total annual well field pumping amounts and rates, and the total lithium, LCE simulated for 40 years. These values were used to compute the Proven and Probable reserves.

TABLE 15.5
SUMMARY PUMPED BRINE

Year	Cumulative Brine Volume Pumped To Ponds, M3	Average Well Field Pumping Rate, M3/D	Average Li Concentration In Mg/L	Annual Amounts Pumped To Ponds	
				Tonnes Li	Tonnes Lce
1	9,856,865	26,931.3	714.0	7,037	37,460
2	19,703,765	26,977.8	713.1	7,022	37,379
3	29,550,665	26,977.8	712.6	7,017	37,353
4	39,428,615	26,988.9	712.2	7,035	37,448
5	49,344,735	27,167.5	710.6	7,047	37,509
6	59,264,575	27,177.6	710.2	7,045	37,500
7	69,184,415	27,177.6	709.9	7,042	37,483
8	79,135,535	27,188.9	709.6	7,061	37,586
9	89,055,375	27,177.6	709.3	7,037	37,456
10	99,079,045	27,462.1	701.5	7,031	37,428
11	109,108,295	27,477.4	700.9	7,029	37,417
12	119,169,170	27,488.7	700.8	7,050	37,528
13	129,198,420	27,477.4	700.6	7,027	37,404

TABLE 15.5 **SUMMARY PUMPED BRINE**					
Year	**Cumulative Brine Volume Pumped To Ponds, M3**	**Average Well Field Pumping Rate, M3/D**	**Average Li Concentration In Mg/L**	**Annual Amounts Pumped To Ponds**	
				Tonnes Li	**Tonnes Lce**
14	139,227,670	27,477.4	700.5	7,026	37,397
15	149,243,076	27,439.5	710.7	7,118	37,891
16	159,220,097	27,259.6	710.8	7,092	37,750
17	169,161,819	27,237.6	710.6	7,065	37,607
18	179,103,541	27,237.6	708.6	7,045	37,498
19	189,045,263	27,237.6	708.3	7,042	37,482
20	199,052,944	27,343.4	704.9	7,055	37,553
21	209,031,136	27,337.5	703.2	7,017	37,349
22	219,078,548	27,527.2	703.2	7,065	37,608
23	229,164,290	27,632.2	698.7	7,047	37,511
24	239,283,701	27,648.7	698.1	7,065	37,606
25	249,371,303	27,637.3	697.8	7,039	37,468
26	259,493,515	27,732.1	695.1	7,036	37,452
27	269,617,587	27,737.2	694.6	7,033	37,434
28	279,773,583	27,748.6	694.3	7,051	37,535
29	290,001,485	28,021.6	687.0	7,027	37,404
30	300,234,967	28,036.9	686.4	7,024	37,389
31	310,468,449	28,036.9	686.1	7,021	37,374
32	320,734,200	28,048.5	685.8	7,041	37,477
33	331,119,966	28,454.2	676.5	7,026	37,398
34	341,513,916	28,476.6	675.9	7,026	37,398
35	351,907,866	28,476.6	675.8	7,025	37,392
36	362,334,591	28,488.3	675.7	7,045	37,501
37	372,697,392	28,391.2	678.7	7,033	37,439
38	383,058,519	28,386.6	678.7	7,032	37,431
39	393,419,646	28,386.6	678.5	7,030	37,421
40	403,780,773	28,386.6	678.3	7,028	37,411
Total				**281,633**	**1,499,130**

Based on our understanding of the conceptual hydrogeologic system and results of the numerical model, we believe it is appropriate to categorise the Proven 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.

Reserves for lithium are summarised in Table 15.6, with key points as follows:

- Proven Reserves (without processing losses)
  - The Proven Reserves for lithium are 35,000 tonnes
  - The Proven Reserves for Lithium Carbonate Equivalent (LCE) are 187,000 tonnes
- Probable Reserves (without processing losses)
  - The Probable Reserves for lithium are 246,000 tonnes
  - The Probable Reserves for LCE are 1,312,000 tonnes
- Total Reserves (without processing losses)
  - The Total Reserve for lithium is 282,000 tonnes
  - The Total Reserve for LCE is 1,499,000 tonnes

The updated 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 (Figure 15.9) a cutoff grade was not used to reduce the Reserve estimate.

TABLE 15.6
SUMMARY OF ESTIMATED PROBABLE AND PROVEN RESERVES WITHOUT PROCESSING LOSSES

Reserve Category	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**

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 (Figure 15.6) has been simulated to maintain similar production of LCE.

15.2.1 Summary of Reserve Estimates and Anticipated Process Losses

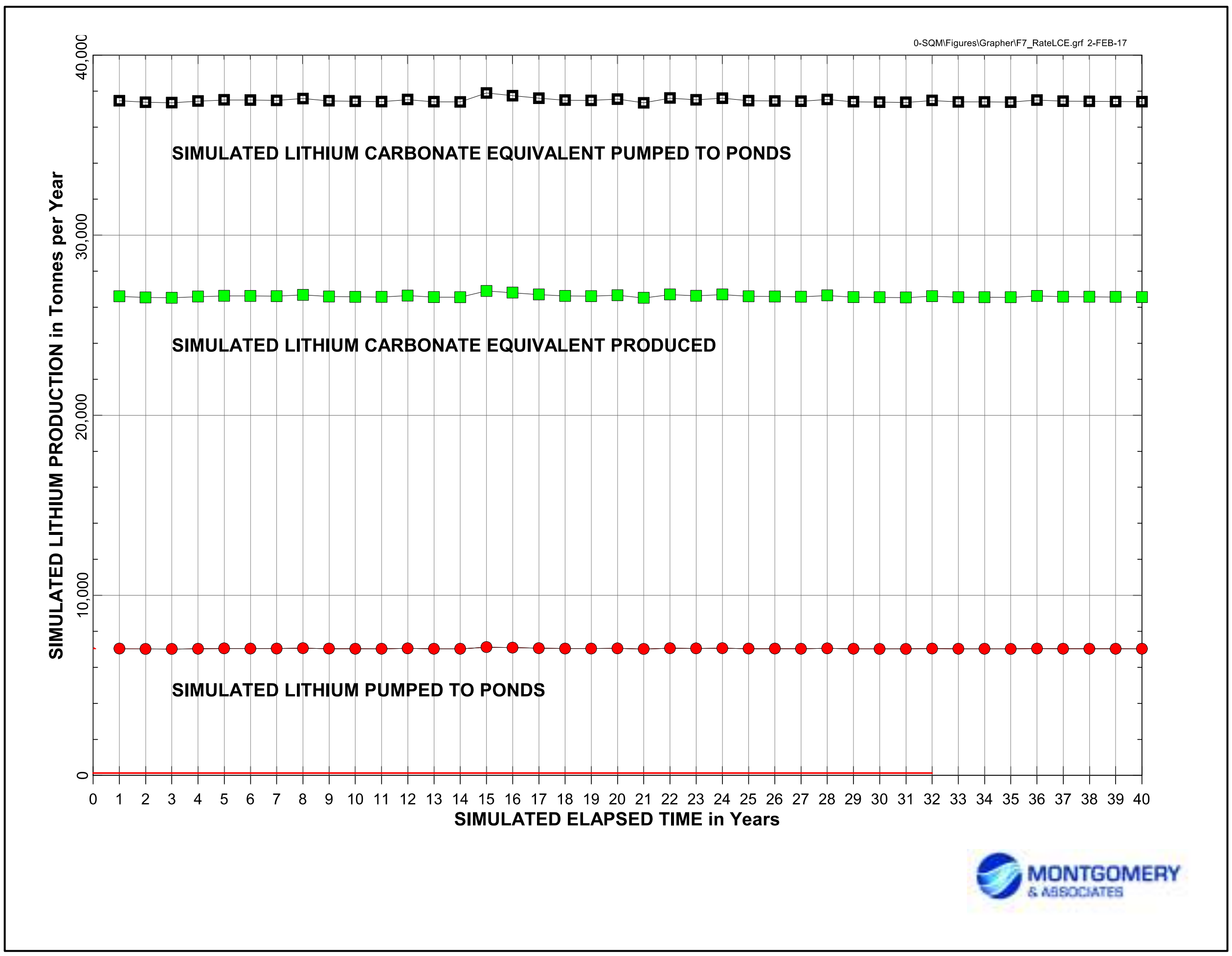
During the evaporation and concentration process of the brines, there will be anticipated losses of lithium. Therefore, the total amounts provided in Table 15.6 do not include anticipated loss of lithium due to process losses and leakages, and therefore cannot be used for determination of the economic 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 15.7 gives results of the Proven and Probable reserves from the well field when these percent estimated processing losses are factored, assuming continuous average brine extraction rates given in Table 15.5.

Table 15.7 Summary of Estimated Probable and Proven Reserves, Assuming 71% Process Efficiency					
Reserve Category	**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**

The simulated lithium production values for the first 40 years of pumping are shown in Figure 15.8. These values were calculated by the FEFLOW model, based on the total wellfield pumping.

Figure 15.3 below shows the annual simulated total Li and LCE pumped to the ponds, and the amount of processed LCE assuming 71% processing efficiency. Simulated pumping in the numerical model was adjusted annually based on anticipated changes in Li concentration in the pumped brine (Figure 15.9) and was controlled to keep production rates relatively constant during the life of the project.

Figure 15.13 Simulated Lithium Pumped and Lithium Carbonate Equivalent Produced



15.2.2 Relative Accuracy and Confidence in Reserve Calculation

The relative accuracy and confidence in the 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 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.

Concentrations in the pumped brine for these deleterious elements were computed based on linear relationships between their measured values and measured values of lithium; concentrations and totals for these elements were not directly simulated by the numerical groundwater flow model. Rather, concentrations and amounts of the elements were computed using equations based on correlations between these components and lithium using data from samples groundwater (Figures 15.4 from 2012 LAC report– check section 15.8 showing the graphs and equations). The following represents the quantities calculated for each, and corresponding ratios to lithium. We have assumed that these relationships would be constant during the 40-year period of brine production. Table 15.8 is a summary of the projected concentrations, tonnages, and ratios to Li for potassium, magnesium, boron, and sulfate.

TABLE 15.8
SUMMARY OF DELETERIOUS ELEMENTS

	Proven	Probable	Combined
	From startup to end of year 5	From year 6 to end of year 40	From startup to end of year 40
Brine Volume (m3)	49,344,735	354,436,038	403,780,773
	Average Concentration mg/L		
Potassium	5,706	5,593	5,609
Magnesium	1,673	1,639	1,644
Boron	1,119	1,109	1,111
Sulfate	19,838	19,517	19,561
	Tonnage		
Potassium	281,564	1,982,458	2,264,022
Magnesium	82,529	580,900	663,429
Boron	55,224	393,088	448,311
Sulfate	978,920	6,917,379	7,896,299
		Ratios	
K/Li	8.01	8.04	8.16
Mg/Li	2.35	2.36	2.39
B/Li	1.57	1.59	1.62
SO4/Li	27.84	28.07	28.45

16.0 MINING METHODS

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.

For the initial four years, brine production was simulated from 28 wells. As concentrations declined, additional wells were incorporated into the well field to maintain LCE production above 25,000 tpa (i.e. began pumping at R22 and R40 at the beginning of Year 5). To ensure compliance with production constraints on capture of lithium from outside the Resource Evaluation Area and maximum drawdown of 100 m, pumping was stopped at some wells (i.e. R10, R24, R42, R22, and R40 at the start of Year 10) and started at other wells (i.e. R02, R03, R04, and R33 at the start of Year 10). Details of simulated annual production are provided in Table 16.1. As shown, the number of active wells ranges from 27 to 31 while average annual pumping rate slowly increases with time to offset declines in pumped concentration. As noted previously, off-site capture accounts for less than 0.1% of total brine pumped during the simulation.

Due to uncertainties in the spatial distribution of aquifer hydraulic properties, it may prove difficult to achieve the pumping rates applied in the simulation and to comply with the 100-m drawdown constraint. Therefore, estimates of capital and operating costs should include a contingency allowance of additional wells to ensure that production targets can be achieved. In addition, it is likely that wells will need to be rehabilitated or replaced during the 40-year production period and cost estimates should include provisions to cover such expenditures.

Figure 16.1 Simulated Brine Production Well Schedule

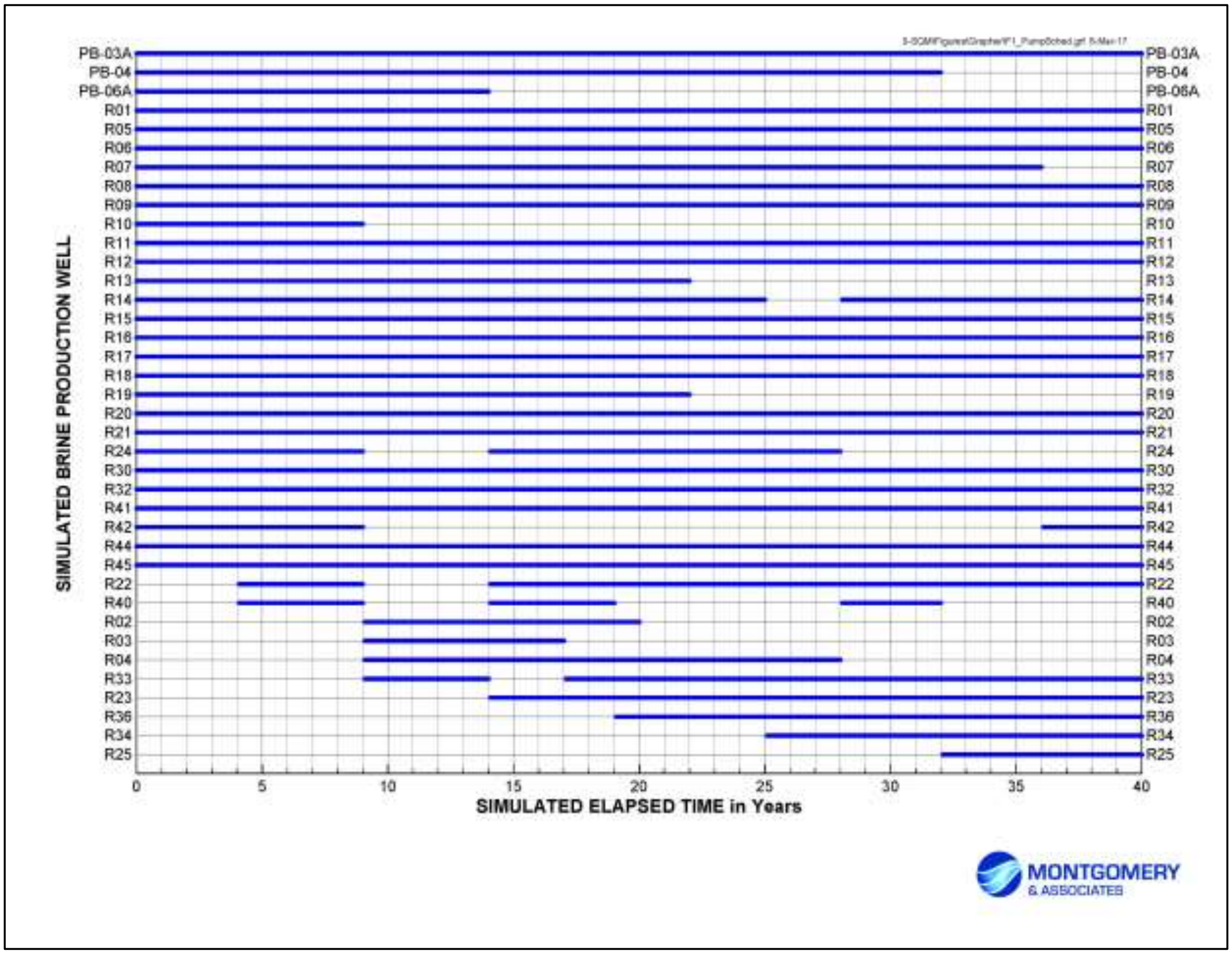
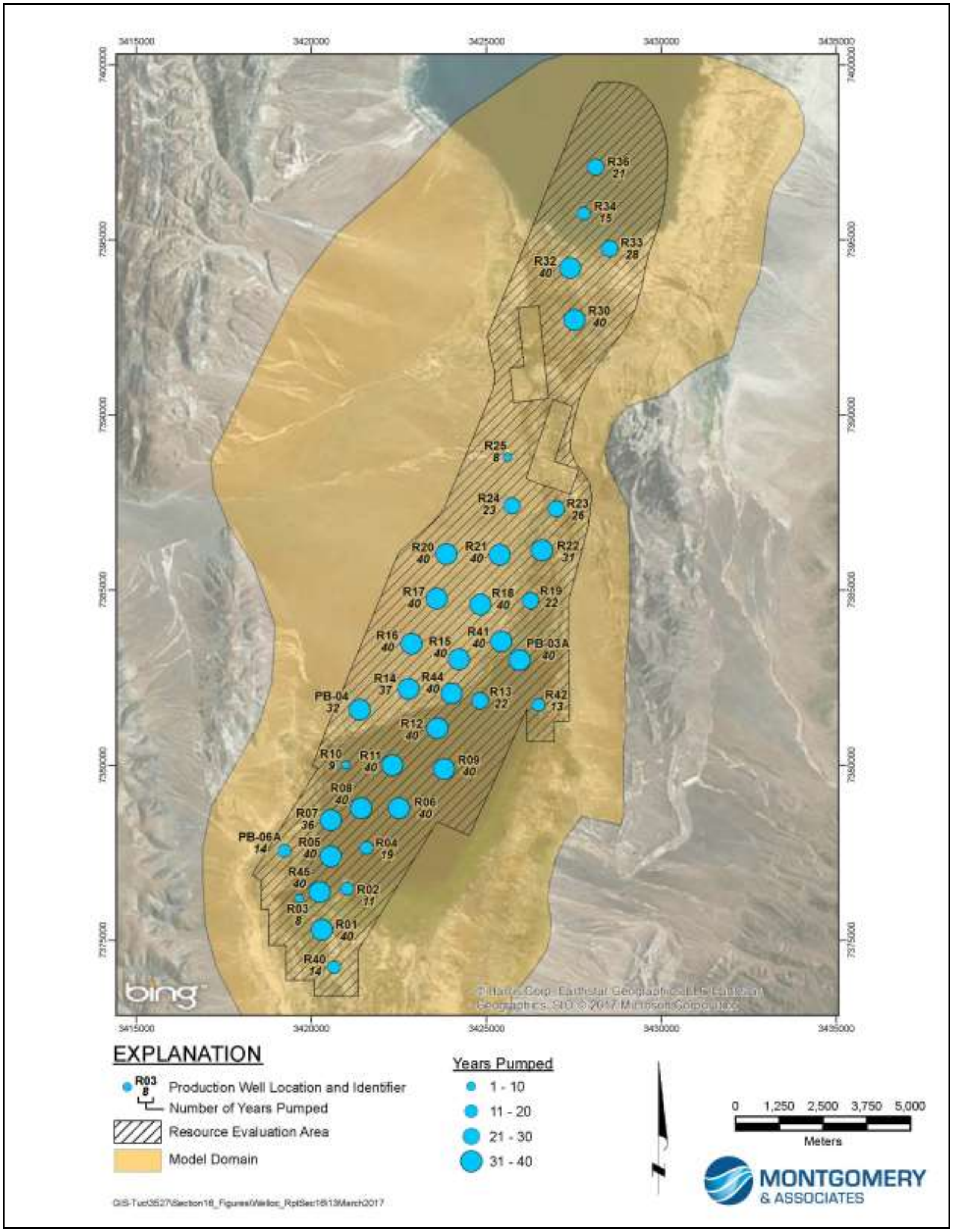


Figure 16.2 Simulated Brine Production Well Locations and Number of Years Pumping



16.2 DETAILS OF SIMULATED ANNUAL BRINE PRODUCTION

16.2.1 Uncertainty Assessment

An assessment of key potential sources of uncertainty in the numerical model predictions and the Reserve Estimate is provided below. These descriptions are based on an extensive series of model runs conducted by Groundwater Insight (2012) for calibration and sensitivity analysis.

Initial brine concentrations – These are based on relatively extensive sampling programs. The order of uncertainty in the average modeled brine concentration is expected to be ± 6%, based on differences between the previous resource area models of brine concentration developed initially by Maptek and then updated as described by Groundwater Insight (2012).

Effective Porosity (φe) and Specific Yield (Sy) – Effective porosity is difficult to measure in the field. Therefore, effective porosity was assumed to be equal to specific yield for modeling purposes. A high degree of variability is noted in the Sy estimates (as based on RBRC results). Since most of extracted brine is derived from elastic rather than pore storage, uncertainties in effective porosity only effect the distance that lithium travels to reach a production well. As a result, uncertainties in estimates of specific yield will effect only the amount of off-site lithium produced by the well field.

Stratigraphic assumptions – Stratigraphic variability is inherent in any depositional environment. The hydrostratigraphic model used herein is based on the available data and interpretation of depositional processes. Additional refinements were made based on well responses to the pumping tests, to refine the continuity of aquifer and aquitard units between wells. Stratigraphic uncertainty tends to affect either the number of wells required to recover the Reserve, or the rate at which the Reserve can be recovered, rather than the total Reserve. Consequently, it can be addressed by the addition of contingency wells. Similarly, it could be addressed by acceptance of lower production rates spread over a longer period of time. As the production wellfield is constructed there will be further opportunity to update the stratigraphy and hydraulic properties to better predict drawdown and refine the number of wells required to meet pumping targets.

Hydraulic conductivity (K) – The K distribution field also carries a relatively high degree of uncertainty, due to the broad range over which K can vary, and the close relationship with the hydrostratigraphic model. Again, this source of uncertainty primarily affects the number of required pumping wells, rather than the total Reserve. If K is significantly less than its representation in some areas of the model, then a closer well spacing may be required. This is addressed by the addition of contingency wells.

Recharge – This parameter relates to the entry of water into the salar, either laterally or vertically. The amount of recharge into the model domain has the potential to affect the required number of pumping wells. If actual recharge is significantly less than represented in the model, then the amount of drawdown associated with a given pumping rate will tend to be greater. Consequently, more production wells would be required, to spread out the recovery points and promote less drawdown at individual pumping wells. This is addressed by the addition of contingency wells.

No simulated extraction of shallow brine resource – Direct extraction of the shallow brine resource was not simulated. Some capture of brine from the shallow zone is implicitly included in the Reserve, but only to the extent that it leaks into the deeper aquifers. There exists an opportunity to target the brine resource in shallow sand aquifers in the top 60 to 80 m of the Resource Zone, using shallow pumping wells and/or horizontal collectors.

Brine production from adjacent properties – This Reserve Estimate assumes that production on LAC claims will not be affected by production from adjacent third party properties. This is a reasonable assumption, if appropriate setbacks are maintained for production wells on adjacent properties. Off-claim brine pumping from immediately adjacent to the LAC claims may have some effect on the Estimate, depending on the well location. Details of proposed off-claim production are not known.

16.2.2 Well Utilization Philosophy

For this analysis, it was assumed that the 28 wells needed to meet production goals had been constructed and tested prior to initiation of operations. Storage ponds and the recovery plant were also assumed to be fully operational at the start of the simulation. As a result, ramp up of pumping was not necessary and pumping at rates needed to achieve production goals was initiated at the start of the simulation.

As discussed previously, variations in brine demand due to differences in potential evaporation were incorporated directly into the simulation. Applied pumping rates were varied monthly in accordance with average monthly potential evaporation. Annual maximum and minimum pumping rates applied in the well field are presented in Table 16.2. In the simulation, monthly changes to well field pumping rates were prorated among all active. In practice, however, pumping at selected wells could be stopped and started as necessary to meet total well field requirements.

TABLE 16.1
ANNUAL SIMULATED WELL FIELD SUMMARY

Production Year	Number of Operating Wells	Minimum Pumping Rate (m^3/d)	Maximum Pumping Rate (m^3/d)	Average Pumping Rate (m^3/d)	LCE Pumped (Tonnes)	Average Pumped Concentration (mg/L)
1*	28	21,600	32,400	27,000	37,460	714
2*	28	21,600	32,400	27,000	37,379	713
3*	28	21,600	32,400	27,000	37,470	713
4*	28	21,600	32,400	27,000	37,330	712
5	30	21,760	32,640	27,200	37,509	711
6	30	21,760	32,640	27,200	37,500	710
7	30	21,760	32,640	27,200	37,601	710
8	30	21,760	32,640	27,200	37,468	710
9	30	21,760	32,640	27,200	37,456	709
10	29	22,000	33,000	27,500	37,428	701
11	29	22,000	33,000	27,500	37,535	701
12	29	22,000	33,000	27,500	37,410	701
13	29	22,000	33,000	27,500	37,404	701
14	29	22,000	33,000	27,500	37,397	701
15	31	21,968	32,952	27,460	38,010	711
16	31	21,808	32,712	27,260	37,631	711
17	31	21,808	32,712	27,260	37,607	711
18	31	21,808	32,712	27,260	37,498	709
19	31	21,808	32,712	27,260	37,601	708
20	30	21,888	32,832	27,360	37,435	705
21	30	21,888	32,832	27,360	37,349	703

Table 16.1 **Annual Simulated Well Field Summary**						
Production Year	**Number of Operating Wells**	**Minimum Pumping Rate (m^3/d)**	**Maximum Pumping Rate (m^3/d)**	**Average Pumping Rate (m^3/d)**	**LCE Pumped (Tonnes)**	**Average Pumped Concentration (mg/L)**
22	28	22,048	33,072	27,560	37,608	703
23	28	22,128	33,192	27,660	37,630	699
24	28	22,128	33,192	27,660	37,488	698
25	28	22,128	33,192	27,660	37,468	698
26	28	22,208	33,312	27,760	37,452	695
27	28	22,208	33,312	27,760	37,552	695
28	28	22,208	33,312	27,760	37,417	694
29	28	22,448	33,672	28,060	37,404	687
30	28	22,448	33,672	28,060	37,389	686
31	28	22,448	33,672	28,060	37,492	686
32	28	22,448	33,672	28,060	37,359	686
33	27	22,800	34,200	28,500	37,398	676
34	27	22,800	34,200	28,500	37,398	676
35	27	22,800	34,200	28,500	37,510	676
36	27	22,800	34,200	28,500	37,383	676
37	27	22,728	34,092	28,410	37,439	679
38	27	22,728	34,092	28,410	37,431	679
39	27	22,728	34,092	28,410	37,539	679
40	27	22,728	34,092	28,410	37,293	678

Note *The well field production will follow the proposed ramp up schedule and will not reach full production until Year 5*

Table 16.2 **Simulated Well Production Summary**					
Well Number	**Well Name**	**Pumping Start Year**	**Minimum Pumping Rate (m^3/d)**	**Minimum Pumping Rate (m^3/d)**	**Average Pumping Rate (m^3/d)**
1	PB-03A	1	800	1,548	1,040
2	PB-04	1	800	1,200	1,000
3	PB-06A	1	800	1,200	1,000
4	R01	1	496	1,038	834
5	R05	1	800	1,260	1,005
6	R06	1	260	390	325
7	R07	1	480	720	600
8	R08	1	480	720	600
9	R09	1	320	480	400
10	R10	1	688	1,038	862
11	R11	1	384	696	518
12	R12	1	260	390	325
13	R13	1	560	840	700
14	R14	1	260	390	325
15	R15	1	704	1,056	880

TABLE 16.2 SIMULATED WELL PRODUCTION SUMMARY					
Well Number	**Well Name**	**Pumping Start Year**	**Minimum Pumping Rate (m^3/d)**	**Minimum Pumping Rate (m^3/d)**	**Average Pumping Rate (m^3/d)**
16	R16	1	880	1,320	1,099
17	R17	1	1,200	1,968	1,562
18	R18	1	1,056	2,436	1,458
19	R19	1	1,096	1,644	1,369
20	R20	1	1,540	2,640	2,115
21	R21	1	760	1,200	995
22	R24	1	424	1,320	862
23	R30	1	260	2,340	1,190
24	R32	1	1,016	2,124	1,447
25	R41	1	960	1,440	1,199
26	R42	1	300	726	515
27	R44	1	800	1,200	1,000
28	R45	1	1,040	1,560	1,299
29	R22	5	260	1,458	554
30	R40	5	344	1,140	624
31	R02	10	1,036	1,554	1,294
32	R03	10	632	948	790
33	R04	10	1,036	1,554	1,294
34	R33	10	632	1,920	1,274
35	R23	15	260	390	325
36	R36	20	344	1,560	1,132
37	R34	26	340	2,160	1,524
38	R25	33	1,312	1,968	1,639

17.0 RECOVERY METHODS (BRINE PROCESSING)

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:

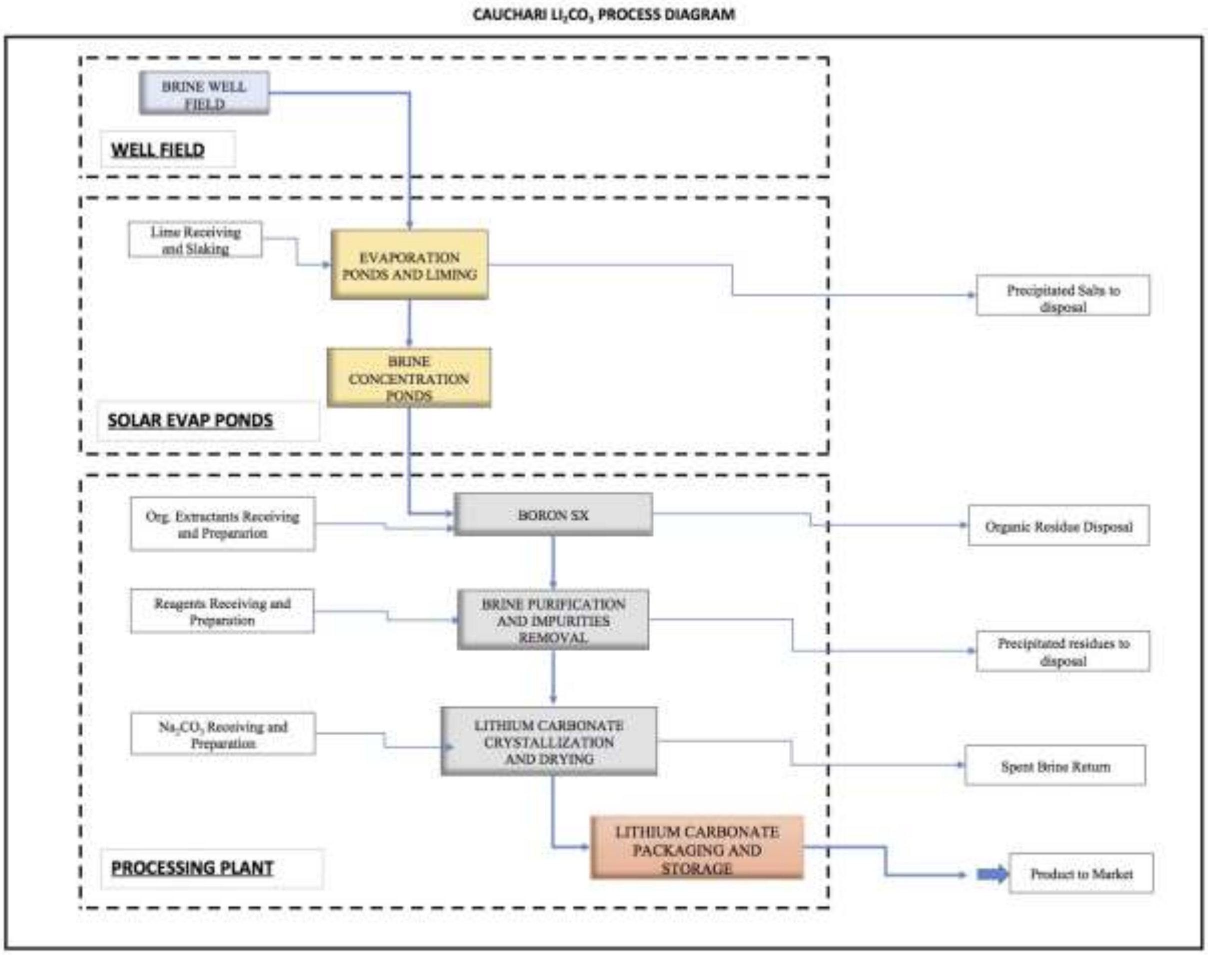
- Pond-Based Sulfate And Boron Reduction;
- Plant-Based Potassium Chloride Reduction; and
- Mother Liquor re-Concentration.

Mass and energy balance simulations were developed for estimation of operating and equipment costs. Due to the significant offtaker financing of the project, a conservative approach was used to design the ponds and plant infrastructure to ensure product purity and delivery commitments.

17.2 PROCESS DESCRIPTION

17.2.1 Process Block Diagram

Figure 17.1 Process Block Diagram



17.2.2 Pond Surface Area

SQM has provided expertise in the design, configuration and planned operation of the pond system.

A brine evaporation rate of 2.52 mm/day was used as the design criteria for the pond system (Table 5.5), which is lower than the evaporation rate measured at site using Class A evaporation pans (3.5 mm/day). In addition, extra pond area was assumed to enable continuous production during salt harvesting.

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 (Table 17.2). 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.

TABLE 17.1 EVAPORATION AND CONCENTRATION PONDS SURFACE ESTIMATE	
Description	**Area (ha)**
Required Ponds Surface Area in Production	1,140
Required Harvest & Maintenance Ponds Surface Area	60
Required Total Pond Surface	**1,200**

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 Design

The pond design consists of engineered bedding material, protective geomembrane and a thick impermeable pond liner (geotextile). The use of engineered bedding material and a geomembrane de-risks the potential of rocks penetrating the geotextile and compromising pond impermeability. The engineered bedding material consists of screened sands and fines which are placed on the native material in the pond excavation. The geomembrane is installed over the engineered bedding and provides additional protection of the pond liner. The pond liner overlies the geomembrane and forms the impermeable barrier that prevents brine leakage.

Simulated operations testing of this design using pond liners from a number of suppliers is underway. A total of 10 pond cells (approx. 40m x 40m) were constructed on site and installed with the proposed design. Production and salt harvesting were then simulated, and the liners were then tested for damage/leakage using geophysical testing equipment.

Figure 17.2 illustrates the engineered bedding that will be overlaid with a geomembrane and geotextile and exposed to simulated operations.

Figure 17.2 Pond Design Testing Cells at Cauchari Salar

The pond berms will be constructed using compacted, impermeable clay-rich soils and overlaid with the engineered materials described above. Testing of the berm construction material, which is sourced locally in Olaroz salar, has confirmed design specifications can be obtained (Figure.17.3).

Figure 17.3 Testing of Berm Material

17.2.4 Pond Layout

Figure 17.4 presents the outline of the ponds and the salt disposal area.

Figure 17.4 Evaporation Ponds and Salt Disposal Area

17.2.5 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.

Prevailing wind direction was also taken into consideration in pond orientation.

A 1% slope is also applied.

17.2.6 Salt Harvesting

As brine concentrates, the salt load reaches a point beyond which further evaporation leads to salt precipitation. Salt that precipitates in the bottom of ponds is porous and therefore entraps brine at a significant rate. In order to recover pond volume taken up by precipitated salt and lithium values entrapped with the brine, salt will be harvested on a year-round basis.

In order to maintain evaporation capacity with year-round harvesting, brine will be diverted from ponds in salt harvest to spare ponds provided for this purpose. This approach allows for production to continue uninterrupted during harvesting.

17.2.7 Pond-Based Impurity Reduction

Sodium and potassium concentrations decline in the ponds due to evaporation as the brine saturates. Magnesium, sulfate, and boron also decline with evaporation but tend to have a more significant impact on product purity either due to higher solubility in concentrated brine (magnesium and sulfate) or the high molecular weight of the compounds they form when dried (boron).

Slaked lime is introduced at two points in the pond system in order to reduce magnesium, sulfate, and boron impurity levels. The fine precipitates are settled readily in the large pond area downstream of lime addition. Special provisions are provided for harvesting the salt and precipitation muds from these ponds as the salt surface tends to be softer than precipitated salt alone.

17.2.8 Plant-Based Impurity Polishing

17.2.8.1 Boron

Boron removal is necessary to achieve high quality product. A solvent extraction stage will allow an effective removal of this element.

In the 2012 Feasibility Study, a boron solvent extraction stage was considered to treat the brine and produce an essentially boron-free brine for further processing.

The design of the extraction unit is based on past and ongoing pilot testing at the pilot plant located at the project site.

17.2.8.2 Magnesium

Magnesium must be removed before the carbonation step. This is accomplished by adding a combination of lime and soda ash in a reactor. The lime reacts with the magnesium in the brine to form insoluble magnesium hydroxide. The soda ash reacts with any calcium in solution to produce insoluble calcium carbonate.

A thickener and overflow and underflow filters are provided for separation of the precipitated magnesium hydroxide.

17.2.8.3 Calcium

Residual calcium in the brine will be precipitated with soda ash. A thickener and overflow and underflow filters are provided for separation of the precipitated calcium carbonate.

17.2.8.4 Sulfate

Residual sulfate ion will be precipitated by addition of barium chloride in a stirred reactor.

A thickener and overflow and underflow filters are provided for separation of the precipitated gypsum (calcium sulfate dihydrate).

17.2.8.5 Potassium

Potassium concentrations will be reduced by evaporative crystallization and filtration. To eliminate sylvinite crystals

17.2.9 Lithium Carbonate Precipitation and Recovery

Lithium carbonate is precipitated by temperature control and soda ash addition. Precipitated lithium carbonate is separated from mother liquor by a combination of hydro-cyclones, a thickener, and a vacuum belt filter. The filter cake will be dried in a direct fired, rotary dryer.

17.2.10 Mother Liquor Recycle

Cyclone overflow and filtrate mother liquors will be neutralized with HCl and sent to a dedicated pond for concentration to plant head feed Li-concentration levels.

17.2.11 Lithium Carbonate Compaction and Micronization

A compaction and micronization system will be employed to produce fine Lithium Carbonate for customers who require a small, narrowly distributed particle size.

17.3 REAGENTS

Burnt lime (CaO) will be trucked to site and stored in silos. Hydrated lime ($Ca(OH)_2$) will be made up in batches on site and distributed to the various users. Two (2) different lime qualities will be sourced. A lower grade lime will be used to supply the evaporation pond consumers while a higher quality grade product will be used within the lithium carbonate plant for magnesium removal.

Soda ash (Na_2CO_3) will be transported by ship and trucked to the project site in Argentina. Sodium carbonate solution will be prepared in batches with purified water and recovered wash water. It will be used for calcium removal and to produce lithium carbonate in the processing facility.

Barium chloride will be trucked and stored at site. A solution of barium chloride will be prepared in batches with purified water and used to remove any residual sulfate in solution in the process liquor.

Hydrochloric acid will be trucked and stored at site as 32 wt.% solution. Hydrochloric acid will be used as a pH modifier in the boron solvent extraction process, a water treatment reagent and in the lithium concentration pond to help avoid unwanted precipitation of lithium carbonate.

Sodium hydroxide will be trucked and stored at site as a 50 wt.% solution. Sodium hydroxide will be used as a stripping agent in the Boron solvent extraction circuit and as a water treatment reagent.

Sulfuric acid will be trucked and stored at site as a 98 wt.% solution. The acid will be diluted and distributed to the within the lithium carbonate plant for de-scaling and cleaning.

17.4 PLANT DESIGN BASIS

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.

17.5 LITHIUM CARBONATE PLANT ENGINEERING DELIVERABLES

17.5.1 Basic Engineering Deliverables

The scope for this Basic Engineering included in this Report involved the following areas:

- Wells;
- Ponds;
- Lithium carbonate plant for 25,000 tpa LCE: Basic design for the Plant and all utilities; and
- Off-site infrastructure for HV power line and natural gas pipeline.

Engineering designs were carried out by SQM's consultant in accordance with applicable standards for consulting engineering services.

The main activities, plans and documents developed by each engineering discipline were used to obtain a CAPEX with a ± 15% accuracy and 15% contingency.

17.5.2 Process Discipline

This discipline provided plant design criteria, mass balances review, flow diagrams, and major equipment data sheet support, among other activities. Typical documents and drawings produced in this phase are as follows:

- Flow Diagrams
- Mass Balances
- Design Criteria
- Process Trade off
- P&IDs

17.5.3 Mechanical Discipline

This discipline produced major equipment technical specifications and evaluations, prepared general arrangement plans for the facilities, developed equipment listings and design criteria. Documents and activities carried out were as follows:

- General 3D models for the ponds and processing plant.
- Equipment General Arrangement and Plant General Layout based on the model.

- General Plants and Elevations
- Equipment Listing
- Mechanical Design Criteria
- Mechanical equipment pre-purchasing packages
- Mechanical equipment technical bid evaluations
- Support in CAPEX and OPEX estimates

17.5.4 Structural and Civil Work Discipline

This discipline prepared the general arrangement drawings for foundations and structures used as a basis for the cost estimates. The following documents and drawings were produced during this stage:

- General Structural Diagrams
- Civil-Structural Design Criteria
- Take-Offs
- Support in CAPEX and OPEX estimates

17.5.5 Piping Discipline

This discipline provided design criteria, pump reference data sheets for quoting, preliminary pump calculations, plant P&IDs and piping general arrangement for the cost estimates. Typical drawings and documents for this phase were:

- Piping Design Criteria
- Pump Data Sheets
- Natural Gas Pipeline technical specification
- P&IDs
- Piping General Diagrams for Take-Offs
- Support in CAPEX and OPEX estimates

17.5.6 Electrical Discipline

The Electrical Discipline prepared the documents and drawings required for the project electrical system. This phase involved the following activities:

- Design Criteria;
- Technical specifications and trade-off for power generation;
- Electrical System Architecture;
- Single Line Diagrams;
- Lines General Arrangement;
- Equipment General Arrangement – Room;
- Main equipment technical specifications and evaluations (Room, Unit Substation and MCC); and
- Support in CAPEX and OPEX estimates.

17.5.7 Instrumentation Discipline

This discipline specified the control system design, instrumentation, wiring and control cabinet designs used as a basis for the cost estimates. The following typical drawings and documents were developed:

- Design Criteria;
- Control Philosophy;
- Plant control system technical specification and evaluation;
- Control System Block Diagram; and
- Support in CAPEX and OPEX estimates.

17.5.8 Pre-Procurement

Quotations from suppliers and service providers for main equipment, materials, freight, and construction contracts were used to assemble the cost estimates. Quotations were assessed for technical and commercial soundness and only those deemed credible were included in the analysis. Argentine import rules and regulations were considered in the budgeting exercise.

Critical equipment with long delivery times or necessary to commence construction were identified.

17.5.9 Engineering Design Deliverables

The following table summarizes the quantity of deliverables provided by the engineering team:

TABLE 17.2
ENGINEERING DESIGN DELIVERABLES

	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

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 startup, 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.

The wells will be slotted screened across the most productive lithium and sealed against fresh water aquifers.

Up to 12 additional wells may be installed during operations in order to maintain the required brine production.

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.

The receiving piping discharges into collecting brine pools (termed 'PDA1' and 'PDA4') which will encourage brine homogenization before discharging into the pre-concentration ponds. Transfer pumps from PD4 have a design flow rate of 1,442 m^3/h and allow for the controlled and rapid transfer of brine to the evaporation ponds.

18.2.3 Additional Equipment in the Well field

In addition, the well field equipment required include:

- 10,000 L to 20,000 L capacity water trucks;
- Temporary portable diesel generators for well pump operation in early stages;
- Cable reel truck for electrical network;
- Electrical lines for proper power distribution; and
- Portable brine transfer pumps.

18.2.4 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

SQM has provided expertise in the design, configuration and planned operation of this area.

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 18.2 shows the location of the evaporation ponds.

Figure 18.1 Site Main Facilities

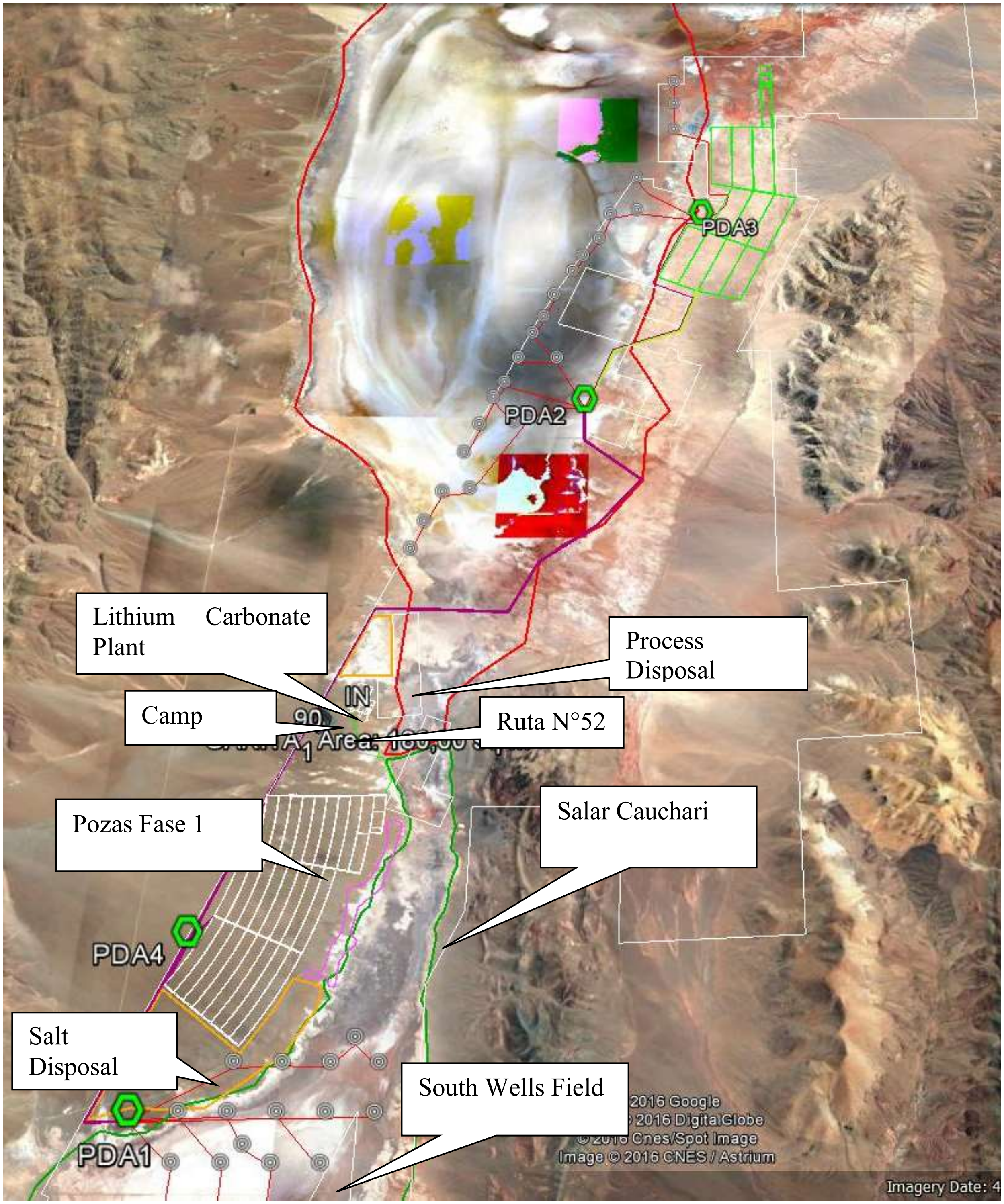
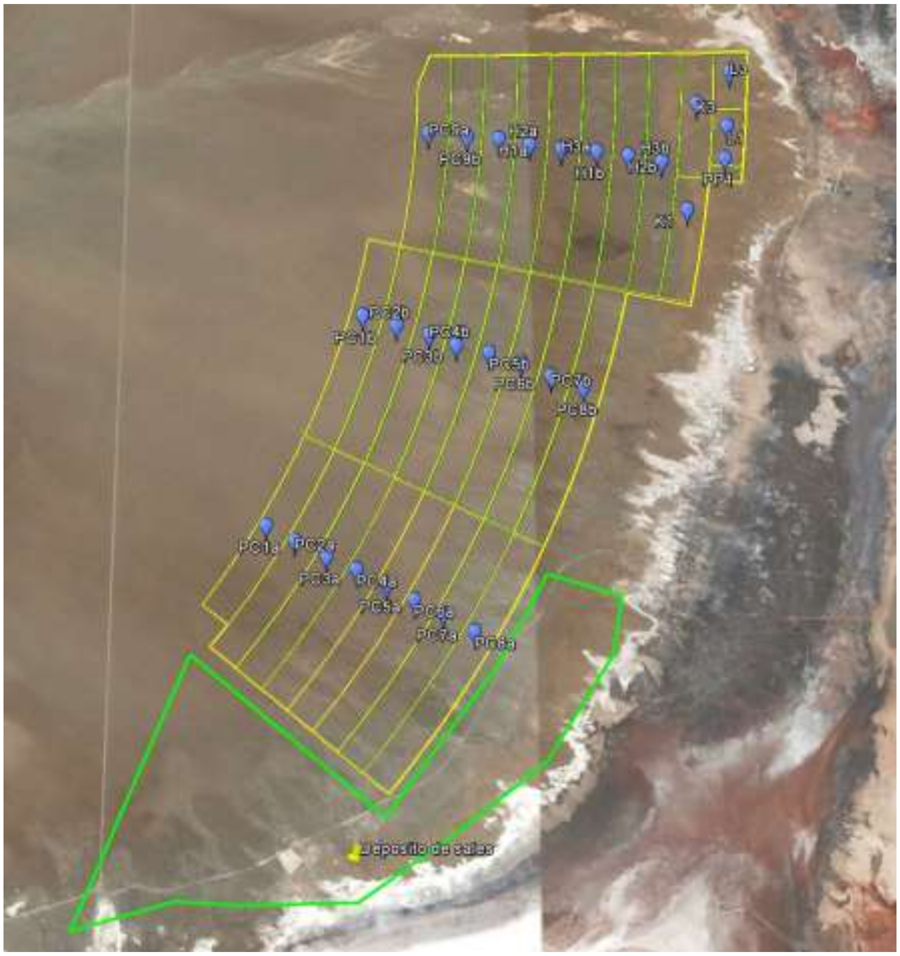


Figure 18.2 Evaporation Pond Layout



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. Harvested salts, some of which will be rich in potassium, will be stockpiled locally and available for future exploitation pending market forces.

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).

18.5.1 Plant Wide Instrumentation

Well, pond, and plant control signals will be provided to a centralized control system. The control system will utilize redundant controllers. Communication with remote devices such as those associated with wells and ponds will either utilize fiber optic or wireless communications. Distributed control system information, operation, and alarms will be accessible from a centralized control room.

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 m3/each, and a storage tank at the plant. A pumping system will fill a water storage tank located in the plant. This in turn will feed the fire water system and the raw water system. Raw water will feed the reverse osmosis (RO) water treatment plant to produce ultra-pure water for the process. A separate pump station, located at the storage pond, transfers water to the potable water plant located by the side of the Camp and raw water to the process 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 Archibarca sub basin is a sedimentary accumulation unit, consisting of coarse gravels and sands which transitionally become finer sediments in the distal regions. At the apex of this sedimentary cone there is a plain surface of water, which enters the permeable sediments through vertical direct infiltration and lateral inflow from slope zones. This aquifer is between 17 and 50 m deep. A layer of clay acts as a seal isolating the lower brine aquifer from the upper fresh water aquifer. A test well was installed in the Archibarca Fan (known as well 'IP') and pumping tests were conducted.

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.

18.6.2 Sanitary Services

A sanitary effluent treatment plant will receive and treat effluent from the camp and the plant.

18.6.3 Diesel Fuel

The plant includes a diesel storage and dispensing station for mobile equipment and transport vehicles. Diesel fuel will be used in fork lifts, stand-by generators and for boilers and dryers in the plant. The main fuel for equipment operation will be natural gas.

18.7 PERMANENT CAMP

The permanent camp and construction camp will be located approximately 300m north of National Highway 52. The permanent camp is a full habitational and administrative complex to support all activities in the operation with a capacity of approximately 300 people. 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

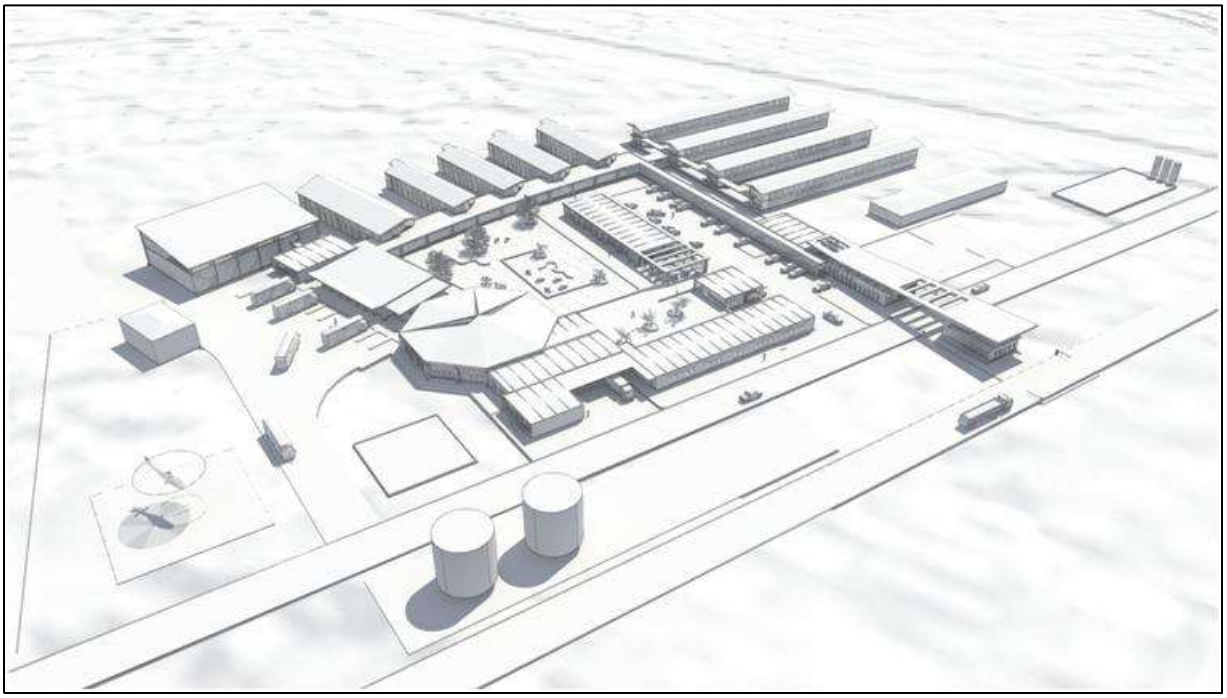


Figure 18.4 Camp Entrance

18.7.1 Other Buildings

Additional buildings include:

- Spare parts and consumables warehouse building;
- Soda ash storage building;
- Final product – lithium carbonate – storage building; and
- Solvent extraction chemicals storage building.

All buildings will be equipped with appropriate lighting, heating, ventilation, and security provisions.

18.7.2 Security

A metallic perimeter fence will be built surrounding the lithium carbonate plant, warehouses, administrative offices and camp. Given the remote location of the facilities, it is not necessary to enclose the pond area. The pond area is to be illuminated to allow night work and improve security.

A metallic peripheral fence will be installed at each brine well facility, giving access protection to equipment, instruments and valves.

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. This pipeline was built to export gas to Chile, but currently it mostly provides small volumes to local customers, with exports to Chile being almost nil. Local natural gas supplies are ample, especially considering the proximity to Bolivian fields from which Argentina is committed to import increasing gas volumes. The above notwithstanding, Argentina suffers considerable gas shortages during the winter time, but these affect mostly Buenos Aires and the central industrial cities, rather than Jujuy and Salta.

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 interconnection will consist of a sub-station with a voltage transformer (345/138 kV) and associated switchgear. Another substation at the Project will consist of a voltage transformer (132/23 kV) and electrical room with switchgear and auxiliary equipment for a 23 kV local distribution system.

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

Lithium Americas commissioned Global Lithium LLC ("Global Lithium") to prepare an updated Lithium Market Report for its NI 43-101 Technical Report - Feasibility Study on the Cauchari-Olaroz Project dated as of April 2017. The text of this section consists of excerpts from this report.

19.1 LITHIUM DEMAND

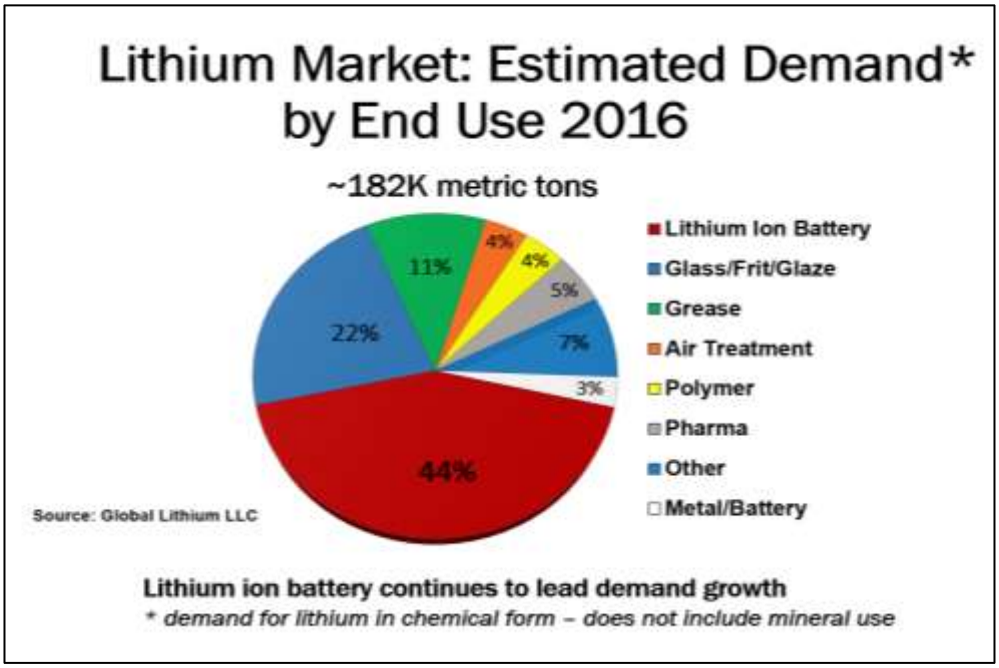
Lithium is the lightest metal in the periodic table with the symbol Li and atomic number 3. It is a soft, silver-white metal belonging to the alkali metal group. Under standard conditions, it is the least dense solid element. Like all alkali metals, lithium is highly reactive and flammable. The combination of lightness and high reactivity make it uniquely suited for use in batteries and many industrial processes. Pure lithium never occurs freely in nature, only in compounds. Lithium occurs in pegmatitic minerals the most important of which is spodumene, but due to its solubility as an ion, is present in sea water and is commonly obtained from brines and clays.

As this decade began the market for lithium chemicals could only be described as tiny compared to other metals such as copper or nickel. As recently as 2012, the entire global market for lithium chemicals was approximately US$ 1 billion. 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.

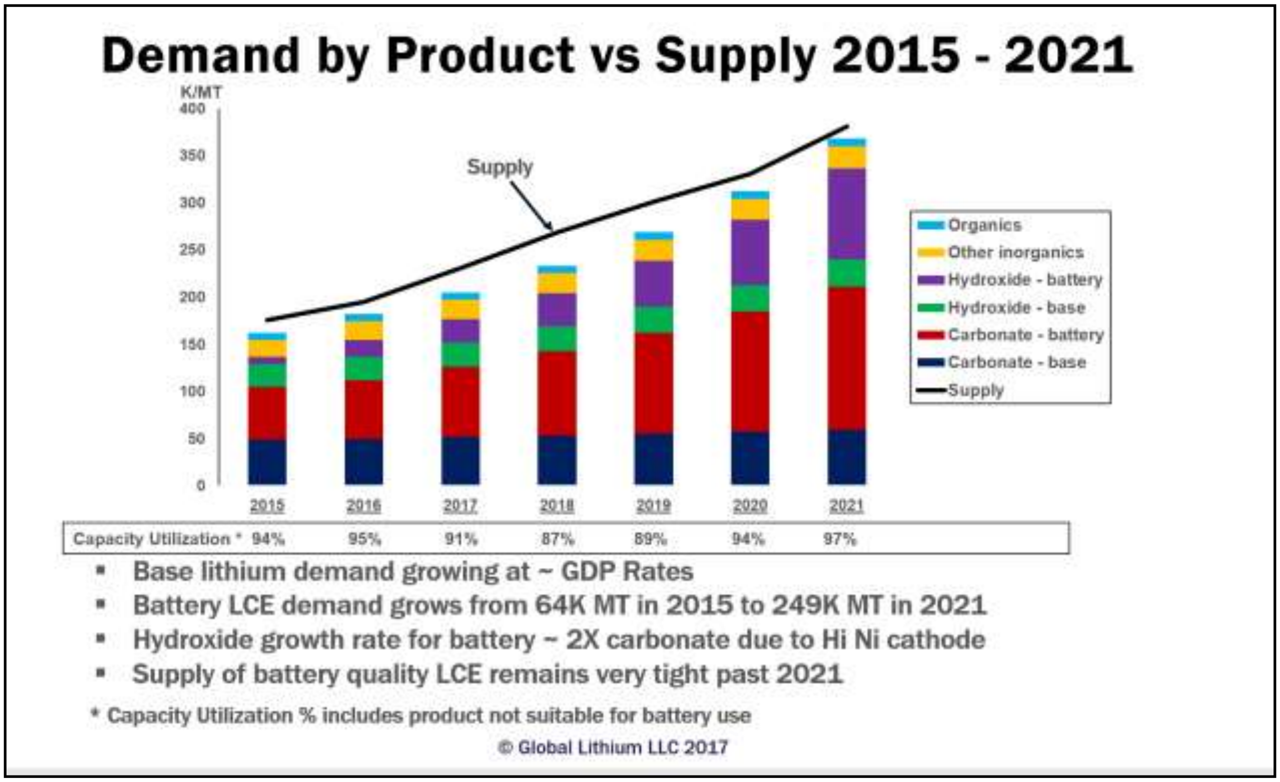
In 2016, global demand for lithium chemicals was approximately 182,000 MT of LCE (Figure 19.1). Global Lithium estimates the lithium ion battery share of demand was 44% or approximately 80K MT LCE. Glass related applications are the second largest demand at 22% followed by grease at 11%. The top three 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.

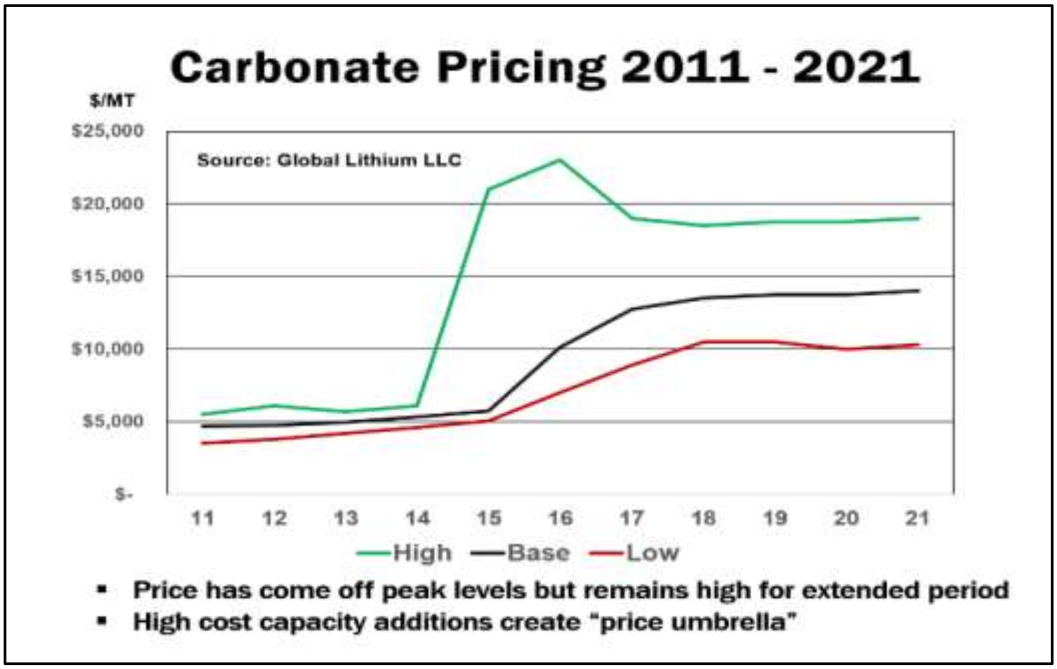
China brine in Qinghai and Tibet is expected to have a slow incremental rise in production, as has been the case the past several years. Orocobre's Olaroz Project in Argentina is assumed to continue to ramp up Phase 1 and begin start-up of a Phase 2 in 2021. The failed Canada Lithium/RB Energy project 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 divided equally between the partners of Minera Exar (SQM and LAC). 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.

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 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 is subject to approval 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 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 subsequent to the closing of the Ganfeng Lithium transaction.

20.0 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

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 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 16 March 2017.

An update to the Environmental Impacts Report was submitted to the authorities on 14 February 2017.

20.1.1 Permits and Authorities

Argentina has a provincial system to manage natural resources. Therefore, the province of Jujuy has the responsibility of providing social and environmental permits, through the Provincial Department of Mines and Energy under the Secretariat of Mining and Hydrocarbons. That body approved LAC's Environmental Impact Report for the exploration work of the Cauchari-Olaroz Project (Resolution No. 25/09 on August 26, 2009). There have been subsequent updates to accurately reflect the ongoing exploration program, including a 2009 update IIA (Environmental Impact Indicator, or Indicador de Impacto Ambiental) including topographic and geophysical studies, opening loan wells and new exploration wells. In addition, there was an IIA for the installation of a brine enrichment pilot plant, and in 2011 the renewal of the IIA was presented for the exploration stage, specifying all activities undertaken and planned exploration activities for the 2012-2013 period. An addendum to the IIA for Exploration was submitted in May 2014 for the installation, implementation and subsequent operation of the POSCO lithium phosphate plant which was approved in July 2014 (Resolution 011/2014). And in June 2015 and June 2016 two separate IIA exploration permit addenda were submitted for on-going exploration work. These remained in the approval process and, in agreement with the authority, were replaced in the approval process by the update of the IIA for exploration submitted in February 2017.

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

At the end of 2011 an IIA was presented for the operations stage to the enforcement authority of the Province of Jujuy. The preparation of this study was based on the Law No. 24,585: Environmental Protection for Mining Activities ("De la Protección Ambiental para la Actividad Minera") and the procedures stipulated in Decree No. 5772-P-2010, from the Province of Jujuy Environment Law ("Ley General de Medio Ambiente de la Provincia de Jujuy") and approved by Resolution 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 renewal of the permit was submitted in March 2015 based on the same Project description as the initial 2011 filing, which has yet to be approved by the Authority. A further renewal was submitted in February 2017 based on the new Project parameters, and it was agreed with the Authority that this would replace the March 2015 submission.

The update to the Environmental Impacts Report for Exploitation for the Cauchari-Olaroz Project is therefore in evaluation by the Authority. Although the updates have not been approved by the Authority, the permit for exploitation issued in 2012 for the Project is still valid as ratified by a letter issued by the Gobierno de Jujuy (NOTA SMeH No 043/20179, issued 16 March 2017), which also states 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."

Another important agency is the Department of Environmental Management, supervisor authority for environmental and natural resources. The Cauchari-Olaroz Salar (Law No. 3820/81) is a Protected Area for Multiple Use, which allows mining activities, but has a specifically designed control system, which aims to encourage the populations of vicuñas. The Secretariat of Tourism and Culture regulates operating permits in areas of potential archaeological and paleontological interest (Provincial Law No. 4133/84, and National Law No. 25,743/03).

20.1.2 Environmental Liabilities

LAC adhered firmly to the Equator Principles[2] ("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 following measures:

- 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.
- 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).

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

[3] ILO: International organization responsible for drawing up and overseeing international labour standards.

LAC commits to maintain a contract registration, records of all the meetings with communities and reports relating to negotiations with property owners.

The team responsible of keeping the proper community relationships will manage this process through specific programs and the CEO of LAC will be informed regularly and directly about them.

20.1.3 Environmental Baseline Studies

To describe the environmental components, the team of specialists and technicians of Ausenco Vector completed, according to the needs of each discipline, a field survey carried out between September 2010 and July 2011.

After the initial 2011 baseline two biannual renewals to the EIA for Exploitation were presented to the authorities, for which the data base was updated by further field work on some components of the baseline:

2015 (March): Air quality, water quality (surface, underground, and camp effluents), flora and fauna.

2016 (October): Air quality, water quality (surface and underground), limnology, flora, fauna and social aspects.

This survey contains all the aspects that would be likely affected by the implementation of a future mining project. It includes natural environment studies and both inert (air, soil, water, geology) and biotic (flora, fauna and Limnology) components, including a section of ecosystem characterization and a socio-economic & cultural study of the analyzed surroundings.

A brief summary of the studies are presented as follows:

20.1.4 Climate

Weather data were obtained from three weather stations considered as the most representative of the Project area. Additionally, an automatic recording station was analyzed, installed by LAC in late May 2010 to obtain evaporation data for the site as well as temperature, precipitation and humidity.

The Project site is affected by strong and persistent westerly winds, particularly in the warmer months (October to May). Maximum wind velocities can reach in excess of 43 m/s (155 km/h), with median wind velocities in the range of 5 to 10 m/s (18 to 36 km/h). 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% in January-February to a minimum average monthly relative humidity ranging from 11% to 19% in the period September to November, based on the Project site data during the period 2011 to 2016.

The climate data base was updated in February 2017 with data from the onsite weather station through to September 2016.

20.1.5 Water Quality

Surface and groundwater water samples were analyzed for 3 surface locations (Vega de Archibarca, Vega de Olaroz Chico, and Casa de Guardasparque) and one groundwater source (the industrial water well in the Archibarca Fan). Results were compared with Water Quality Standards set by the Water Quality Reference Levels (Niveles Guía de Calidad de Agua) under the National Law N° 24585 Annex IV and by the Argentine Food Code (2010).

It was observed that for surface waters, the 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, which is inferred to be as a result of the lithologies present in the area.

Follow up field campaigns were carried out in March 2015 and October 2016. The results of these campaigns confirmed the results from previous sampling rounds.

20.1.6 Air Quality

A baseline air quality campaign was completed in 2012 and the different elements measured (PM_{10}, SO_2, NO_2, H_2S, O_3) were below the values established in Law 24585/95, Mining Legal Framework (Marco Jurídico Minero).

Noise measurements were also carried out during these campaigns, the results of which were below the guideline value (70 dBA) set by the World Health Organization (WHO) for industrial and traffic areas.

Further air quality and noise campaigns were carried out in March 2015 and October 2016, the 2016 campaign being done in conjunction with members of the communities in the Project's Area of Direct Influence. The monitoring points for these two campaigns were at the Exar camp and at the Centro de Interpretación Olaroz (CIO).

The results of the latest campaigns indicate that PM10, lead and gases were also all below the values established in Law 24585/95 at both sites. Noise values were below the 70 dBA established by the World Health Organization at both sites.

20.1.7 Soils

Soils in the area of the Cauchari-Olaroz Salar generally have qualities that make them unsuitable for cultivation, including weather conditions, salinity, high risk of erosion and shallow depth, and restrict use to natural pastures and wildlife and recreation.

Using satellite images and on-site surveys (test pits and sampling horizon), 8 soil units were defined. Based on the taxonomic classification of soils, they belong to the Entisols order, and to the TypicTorrifluvents and TypicTorripsamments subgroups.

Soil units were also classified according to their land capability classes (Soil Survey Staff, 1999)[4], all being in Class VII and Class VIII, which are marginal soils used for extensive livestock breeding, and for tourism and mining.

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[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.

20.1.8 Flora

The Project area lies within the eco-regions of the Puna and High Andes. Fieldwork identified the following units of vegetation in the area of influence of the Project: dry woodlands, yaretas subshrub steppe, herbaceous steppe and stipa sporobolus, peladales and wetlands.

The shrub steppes vegetation unit has the highest species richness. The same trend was observed with the Shannon Index for the same vegetation units.

Further rounds of vegetation monitoring was carried out in the area of the pilot plant at the end of summer 2015 and in October 2016, this being the area where the majority of the present technical field program is being carried out. The values obtained for the Shannon and Weaver indices of species richness and diversity during the 2011 baseline studies reported in the 2012 EIA are similar to those obtained in the 2015 and 2016 monitoring rounds, which infers that there have not been significant changes to the plant communities.

20.1.9 Fauna

The fauna surveys identified 26 species of which 2 belong to the reptile class, 17 to birds and 7 to mammals.

All mammalian species are residents. One of the most abundant species in the cone of Archibarca is the Highland tuco tuco, a rodent that is found especially in peladales. Vicuñas were observed in all surveys. Reptiles were observed only during times of higher temperature, which coincides with their period of greatest metabolic activity. Within the bird class, the "caminera puneña" and the "agachona chica" live in the area all year round. The golden-wing dove and the oquencho were observed near small pools of water or on the edge of the salt flat. Species such as the "lechucita de las vizcacheras", and the local harrier showed low population densities within the Project area, but they are probable residents.

The Project area is within the Cauchari - Olaroz Flora and Fauna Reserve, created in October 1981, and one of whose principle aims is the recovery of vicuñas. Because of this protection, and local, national and international conservation programs, information from the 2008 National Census indicated that the population size has been restored, with the result that, based on International Union for Conservation of Nature ("IUCN") criteria, vicuñas have been considered as a Least Concern ("LC") species since 2008.

Figure 20.1 Caminera Puneña (Geositta Punensis)

Source: *Ausenco (2017)*

Figure 20.2 Agachona Chica (Thinocorus Rumicivorus)

Source: *Ausenco (2017)*

Figure 20.3 Vicuñas (Vicugna Vicugna) on Shrub Steppe of Archibarca Cone

Source: *Ausenco (2017)*

20.1.10 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, the Archibarca cone being the zone with the greatest biodiversity within the Project area.

Follow up fauna and flora monitoring campaigns were carried out in the area of the pilot plant in March 2015 and in October 2016. Diversity results indicate that there is no significant change in the diversity parameters.

20.1.11 Limnology

The composition of the phytoplankton, zooplankton, phytobenthos and microinvertebrate communities in water bodies close to the Project has been determined. The analysed environments present high salinity and hydrological stress situations. The few species that were documented are adapted to these environments.

The communities of phytoplankton and phytobenthos showed some diatom species, whose presence indicates that the analyzed environments contain high concentrations of nutrients from organic plant matter, and from local cattle. Zooplankton species found are species adapted to shallow water bodies with high salinity. The extreme conditions have been proposed as the main reason that the diversity of macroinvertebrate species in the Project area was low.

20.1.12 Landscape

Five landscape units were identified, listed as follows: Cauchari-Olaroz Salt Flats, Alluvial Plain; Isolated Mountains, Mountains West of Cauchari; El Tanque Mountains.

In general the fragility and visual quality of the landscape, in the area of the Project have values ranging from medium-high to medium-low, with the Cauchari-Olaroz Salt Flats landscape unit having the highest visual quality and fragility value. This indicates that protection, correction, or mitigation of environmental impacts on the landscape, which will decrease the impact of future extractive activities, will be required in order to preserve the current morphology of the landscape, chromatic variation, landscape perspectives as well as the preservation of the natural ecosystem. This has been covered within the context of the Environmental Impacts Report for Exploitation and is especially pertinent with respect to the height of the salt heaps and visibility of the ponds from the national and provincial roads.

20.1.13 Paleontological Study

Eight points were studied on both sides of the Cauchari-Olaroz salt flats during the paleontological survey with the aim of identifying the existence of fossils in the study area. From the geological background information and the results of the field studies it has been concluded that the area has no paleontological significance. However, any new Project activities within sedimentary lithologies will require a specific paleontological survey of the site for the purposes of assessing the impacts of the new activities.

20.1.14 Archaeological Study

Intensive and extensive surveys carried out in the area resulted in the identification of the presence of 56 archaeological sites, which were organized into five sectors: Northeast Sector, East Sector, Southeast Sector, West Sector and Center West Sector. Archaeological sensitivity, based on the type of project and the actions to be performed in the construction phase, is low for the Northeast, East and Southwest sectors. Based on the Project description, the West and Centre West sectors have a medium-high archaeological sensitivity. The archaeological sites that possess a high archaeological sensitivity within these two sectors are as follows: CV02, CV08, CV09, CV10 and CV26. (IIA, 2012).

20.1.15 Geology and Geomorphology

This subject is covered in Sections 7.3 to 7.5 of this report.

20.1.16 Hydrogeology

This subject is covered in Section 7.6 of this report.

20.1.17 Hydrology

This subject is covered in Sections 7.5.4 of this report.

20.1.18 Social Characteristics

The area of direct influence for the Project includes the communities of Susques (1656 residents), Huáncar (379 residents), Pastos Chicos (173 residents), Puesto Sey (153 residents), Catua (466 residents) and Olaroz Chico (194 residents) based on 2016 data. All these communities are in the department of Susques, Province of Jujuy, with the town of Susques being the head of the Department, located approximately 60 km by road from the Project.

The population directly impacted by the Project is mostly rural and self-identifies with the Atacama ethnic group. In general, their settlement patterns and spatial dispersion is based on the camelid's pasturage activity.

Structurally all communities share similar rural characteristics, however, Susques is unique in having urban characteristics such as denser population, national and provincial public institutions, and commercial activity. Commercial activity in Susques is the highest of the Department.

The main economic activities in Susques are employment in public administration, trade, small-scale livestock production, craft industries, and small industries related to tourism and mining. Mining-related employment includes direct employment and indirect employment such as transportation, lodging, dining, grocery shopping, vacation homes and offices. The main activities in the rest of the department are mainly related to mining and small scale livestock (mainly camelid) production.

Project Perceptions: In the surveyed communities there is generally a positive perception of the mining industry as it has recently become an economic pillar of the region. For this reason, Minera Exar S.A. is very well considered and the Cauchari-Olaroz project is viewed as a possible source of job opportunities for the population in general.

There has been an active communication, consultation, and engagement process in place since 2009. LAC has designed and implemented a Community Relations Plan for the long-term cooperation with the population within the Area of Direct Influence of the Project. The communities have signed a Convention approving all stages of the Project.

Among the direct benefits expected from the Project, respondents indicated the following: direct employment on the Project; collaboration of the company in resolving water related issues; and provision of training. There is a general expectation that the Project will facilitate improvement in infrastructure, health and education.

Respondents also explained that approval of the Project by the members of the communities is conditional on measures taken to protect the environment and mitigate the possible social impacts, as well as its ability to generate a positive contribution to the community.

Vehicular Traffic: A traffic study of the area focused on three routes: RN No. 51, RN No. 52 and RP No. 70. Three key intersections of interest for the Project were analyzed.

Based on the Average Daily Traffic ("ADT") results, it was observed that for both national routes the busiest hour of the day is noon; while on Provincial Highway No. 70 there was more traffic in the mornings and evenings. These differences may be related to the purpose for which the roads are used: National Routes are for international transit, while the use of the Provincial Highway is largely related to local inter-urban transit and transit to mining projects in the area.

20.1.19 Framework Legal Study

A compilation of international, national, and provincial norms and standards applicable to the Environmental Impacts Report 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.

20.1.20 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.

Initially, actions that could cause impacts were identified, and a classification of the environment was made, providing Environmental Units to each of the factors that will be affected by the Project.

Subsequently, qualitative and quantitative impacts using the methodology proposed by Conesa Fernández-Vítora (Conesa Fernández-Vítor , 1997)[5] were performed. The evaluation was done for each stage of the Project, including construction, operation and closure.

During the construction and operation stages of the Project, there is the potential for moderate impacts to the environment that can be reversed or mitigated in the short, medium and long term. The following are the key potential impacts that were identified:

- Change in air quality due to the emission of particles and combustion gases;
- Increased noise levels due to the use of equipment, machinery and vehicles, and plant process operations;
- Changes in the geomorphology and soils due to evaporation ponds and production facilities;
- Change in land use and diversification of land use;
- Impact on the brine reservoir and aquifer system in general;
- Intensive use of industrial water, estimated to be almost all of the natural recharge of the basins near the proposed site;
- Removal of the vegetation for the siting of Project facilities;
- Alteration of wildlife habitat due to reductions of vegetation in some sectors, emission of noise and vibration, and human settlements; and
- Impact on landscape due to salt waste dumps.

In addition, potential impacts were identified, such as:

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[5] Conesa Ferná dez-Vít ra, V. (1997). Auditorí s medioambientales, guía etodológica (2a. ed. re). Madrid: Mundi-Prensa. Retrieved from http://www.sunass.gob.pe/doc/cendoc/pmb/opac_css/index.php?lvl=author_see&id=174

- Archaeological resources due to the possibility of subsurface findings; and
- Biological corridor due to the installation of infrastructure in the salt flat.

The Project's area of influence includes the communities of Susques, Huancar, Pastos Chicos, Puesto Sey, Catua and Olaroz Chico. The development of the Project will have economic impacts in the area of influence that will result in positive and negative changes.

In relation to subsistence activities, primarily camelid pasturage, it would be affected in a moderate intensity by the significant increase in the number of people, and the movement in the area of vehicles and machinery, typical of the activities related to each of the stages of the Project. This does not imply the disappearance of the traditional economic practice but a probable decrease during the life of the Project.

The hiring of local labor by the company will generate a positive impact because a portion of the population will have increased quality of life. This in turn has a positive impact on the local economy. Access to formal employment will have direct (monthly salaries) and indirect (skilled training) benefits that will have immediate and longer term positive impacts, particularly in terms of increasing employability post completion of contracts/mine closure. Also, local employment contributes towards stopping the phenomenon of youth migration to urban centers in search of better jobs. These effects are also pertinent to the Area of Indirect Influence (personnel coming from other provinces).

The procurement of goods and services during Project implementation would involve a stimulus in each of the industries supplying these resources. These effects would occur in the total area of influence of the mining Project.

20.1.21 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.

Susques is the most important commercial center in the area. However, the Plan also focused on the Catua, Olaroz Chico, Huancar, Pastos Chicos and Puesto Sey communities.

The Community Relations Plan has been divided into three key programs. One deals with external and internal communications to provide information and show transparency. The second is a consultation program that allows LAC to acknowledge perceptions of mining activities. A third program deals with execution of contracts with the communities for economic benefits. The most important part of the plan is supporting social, cultural and environmental initiatives. The criteria for choosing initiatives are: it should benefit the whole community; contribute to sustainable development and be participatory, yet it must be originated inside the community. It should also be noted that 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.

20.1.22 Waste and Tailing Disposals

20.1.22.1 Pond Solid Wastes

The evaporation process in the ponds leaves considerable amounts of salts on the bottom of the ponds. These salts must be removed ("harvested") and transported to proximal stock-piles. The quantity of salt to be harvested is approximately 8,400 tonnes/day, necessitating the use of mining-type front end loaders and trucks for this purpose. Transportation of waste salts will be undertaken taking into account load & haul optimization needs, as well as environmental considerations. The salt piles normally are up to 10 m high and can be built on the salt flat surface. It is estimated that approximately 390 ha of piles will be built over a 40 year period and these piles will be built 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.

20.1.23 Tailings Liquid Disposal

20.1.23.1 Site Selection Study Summary

Several possible sites for the evaporation ponds for the plant's industrial liquid wastes were analyzed. A location close to the plant, on the salt flat was chosen and which presents no risks to populated areas. A total of 20 ha are required for this purpose.

20.1.23.2 Tailings Dam Construction

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, but the Project does not require a tailings dam.

21.0 CAPITAL AND OPERATING COSTS

Capital and operating cost estimates are based on quotations from third-party vendors for major items, such as civil earthworks, ponds, plant buildings and equipment, transmission line, gas pipeline and wells. SQM's operations experience in building and operating brine operations was relied on to validate quotations from the venders. In-house costing data from Hatch was used for minor items (i.e. doors, staircases, conduits etc.).

21.1 CAPITAL COST (CAPEX) ESTIMATE

The main objectives for determining the capital costs for the Project are:

- Providing an estimate of the total project CAPEX for budget purposes;
- Identifying and evaluating the processes and facilities that provide the best balance between initial costs and operating costs;
- Providing the necessary data for the economic evaluation of the project; and
- Providing guidance for the following engineering phase.

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.

Capital costs include direct and indirect costs for:

- Brine production wells;
- Evaporation and concentration ponds;
- Lithium carbonate plant;
- General 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 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 Cauchari-Olaroz Project including equipment, materials, indirect costs and contingencies during the construction period is estimated at US$425 million. This excludes debt interest expense that may be capitalized during the same period. Disbursements of these expenditures start in year 1 (2017) and are summarized in Table 21.1.

TABLE 21.1 LITHIUM CARBONATE PLANT CAPITAL COSTS SUMMARY	
Direct Cost	**US$ M**
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 ESTIMATE (RE: 15.1.6.1)		
Description	**Unit**	**Value**
Total brine required (Table 15.5)	m^3/day	27,300
Total brine required (Average)	L/s	315
Brine requirement for number of well estimate	L/s	378
Estimated Average Well Brine Output □30%	L/s	15
Number of wells required	no.	21
Reserve wells	no.	5
Total Production Wells required	**no.**	**26**

TABLE 21.3 **PRODUCTION WELLS CAPITAL COST ESTIMATE**	
Description	**Total Projected Budget**
	US$ M
Wells, pumps and auxiliaries	7.9
Power Distribution	6.9
Total	**14.8**

21.1.3 Evaporation Ponds

TABLE 21.4 **EVAPORATION AND CONCENTRATION PONDS CAPITAL COST ESTIMATE**	
Description	**Total Projected Budget**
	US$ M
Ponds	125.63
Power Distribution	3.43
Total	**129.1**

The capital cost estimate for the evaporation and concentration pond facilities is US$129M.

21.1.4 Lithium Carbonate Plant

The direct cost estimate for the construction of the Lithium Carbonate plant is US$121.4M Capital equipment costs were estimate using more than 100 quotes for various equipment items and construction contracts estimates, and using in-house data for minor items. Material take-off (e.g. material quantity estimates) from 3D models were employed as required to complete the capital cost definition.

TABLE 21.5 **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	**121.5**

21.1.5 Offsite Infrastructure Cost Estimate

Offsite infrastructure refers to gas and electrical interconnection and transmission. Costs are shown in Table 21.6.

TABLE 21.6
OFFSITE INFRASTRUCTURE COST

	US$ M
Natural Gas Supply	11.8
Power Supply	29.5
Total Offsite Infrastructure	**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.

Installed cost for this work is US$11.8MM. This pipeline is designed to supply natural gas sufficient for production up to 50,000 tpa LCE.

21.1.5.2 Power Supply to Plant

The transmission system has been designed to provide sufficient electricity for a production capacity of at least 50,000 tpa LCE. Installed cost for this work is US$29.5M.

21.1.5.3 Onsite Infrastructure and General Cost Summary

TABLE 21.7
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	**26.3**

21.2 INDIRECT COSTS

The factors and results used in estimating indirect costs for this study are given in Table 21.8.

TABLE 21.8 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.

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 21.9). 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.

Reagent consumption rates were determined by pilot plant, laboratory and computer model simulation. Reagent cost estimates, which represent 40% of OPEX, are reflective of SQM's experience with reliable suppliers servicing their existing operation requirements and are considered very accurate.

Energy consumption has been determined on an equipment-by-equipment basis and design utilization rate.

Labour levels are based on SQM expertise in operating similar types of facilities. Salary and wage estimates are the result of a salary survey, carried out on behalf of LAC in Argentina, on mining companies with similar site conditions. A labour rate cost of US$45/hr was obtained from a survey that included the main mining companies operating in Argentina in similar conditions as the Project.

Maintenance estimates were developed by SQM based on their experience with similar existing operations.

Environmental and closure cost estimates are consistent with local regulations. Results are as follows:

TABLE 21.9
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**
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 their existing suppliers for similar facilities. Consumption volumes have been obtained from laboratory work and computer model simulations, performed by SQM and its consultant.

Pond and plant reagents include the following:

- Calcium oxide;
- Lime;
- Sodium Carbonate;

- Barium Chloride;
- Hydrochloric Acid;
- Sodium Hydroxide;
- Sulphuric Acid;
- Extractants diluent; and
- Organic solvents.

As indicated in Section 17, sulphate brines such as the one present in Cauchari typically require treatment with lime to remove unwanted salts before proceeding to the lithium carbonate plant. It has been assumed that lime is bought from existing SQM suppliers in Antofagasta. A local producer (150 km from the Project) requires expansion of their facilities to be considered a preferable supplier; however the proximity of this lime facility could provide cost savings over other supply alternatives.

Na_2CO_3 is the dominant reagent cost in the lithium carbonate plant. Boron removal costs are dominated by solvent extraction organic make-up and HCl, for pH adjustment.

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.

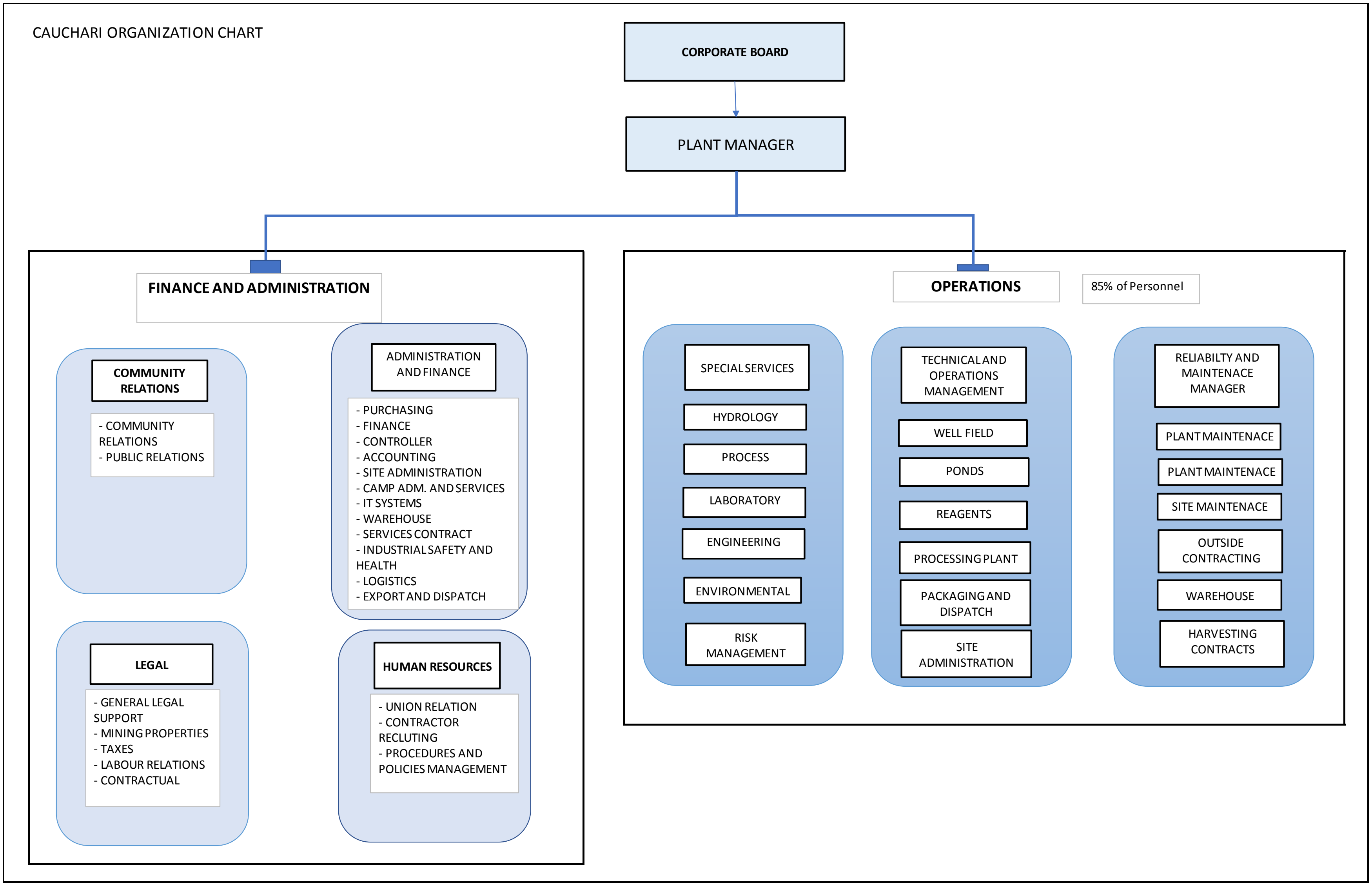
21.3.8 Bus In/Bus-Out Transportation

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.

Figure 21.1 Project Organization



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.

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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 (2017)	0	0	-
2 (2018)	0	0	-
3 (2019)	72,000	72,000	6,000
4 (2020)	168,000	240,000	14,000
5 (2021)	300,000	540,000	25,000
6 (2022)	300,000	840,000	25,000
7 (2023)	300,000	1,140,000	25,000
8 (2024)	300,000	1,440,000	25,000
12 (2028)	300,000	2,640,000	25,000
18 (2034)	300,000	4,440,000	25,000
24 (2040)	300,000	6,240,000	25,000
32 (2048)	300,000	8,640,000	25,000
40 (2056)	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

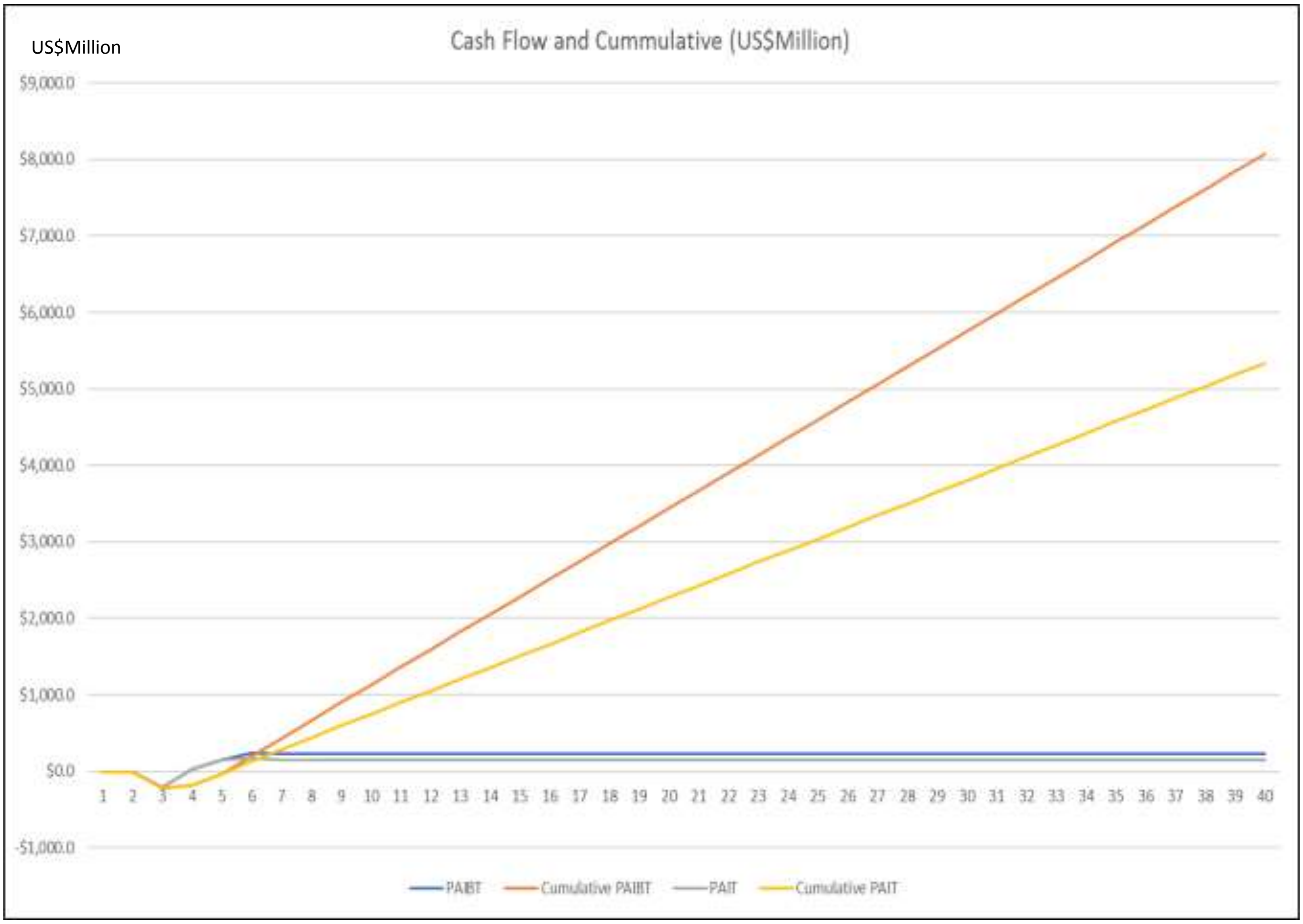
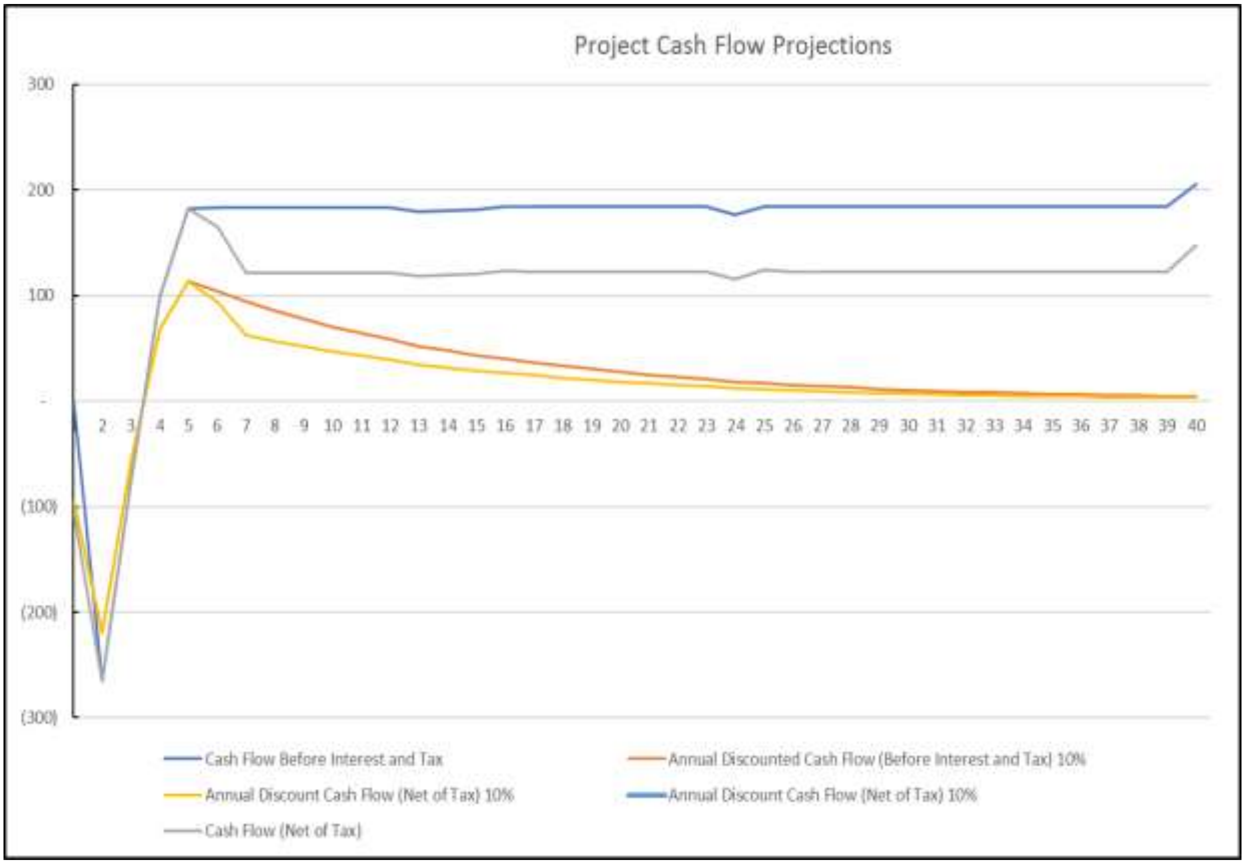


Figure 22.2 Yearly Simple Cash Flow and Discounted Cash Flow (Before and After Tax) at 10% Discount rate (in US$ M)



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			
Price Case	**High**	**Medium**	**Low**
	$14,000	**$12,000**	**$10,000**
CAPEX	425	425	425
Max Negative Cash Flow	265	265	265
Average Yearly Values (US$ 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[1]	3Y	3Y, 5M	4Y
IRR	33%	28.4%	23.5%

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

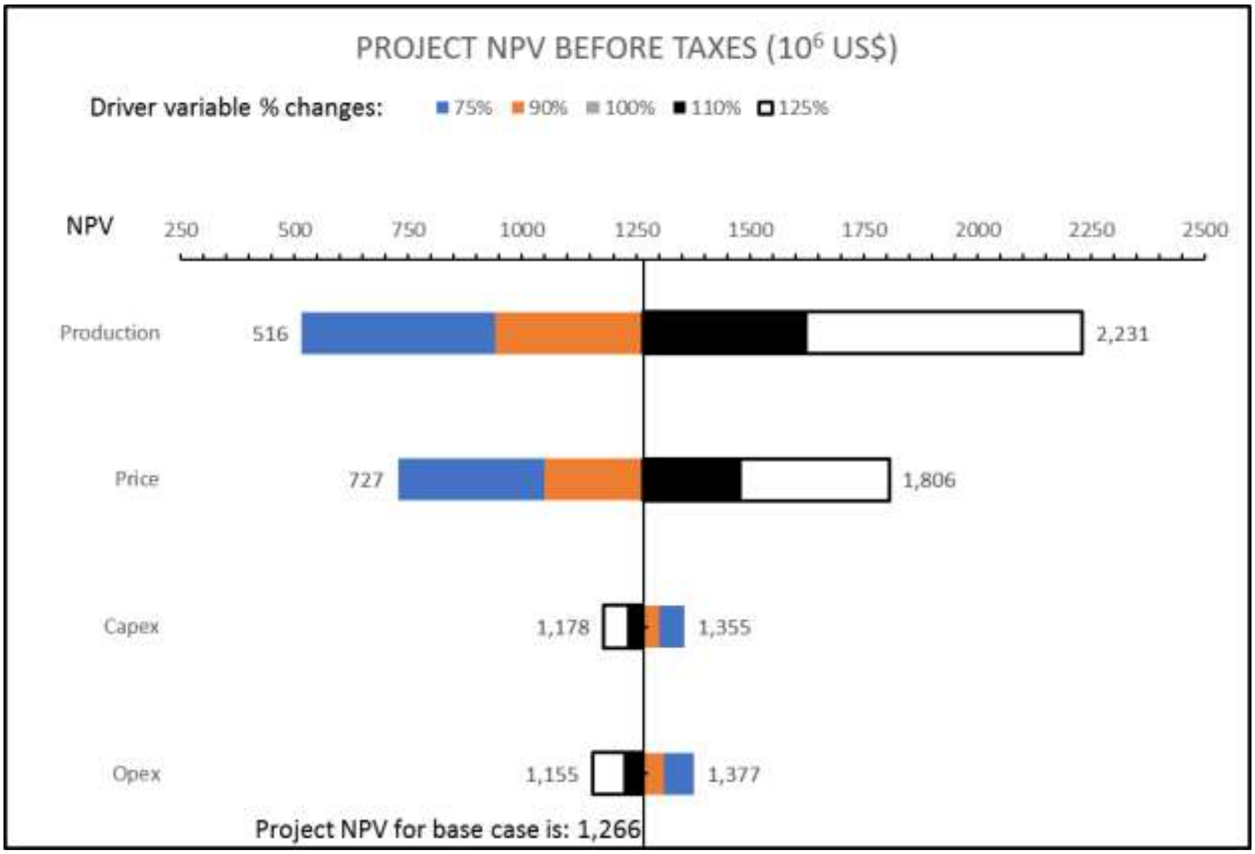


TABLE 22.8 PROJECT IRR BEFORE TAXES -10% DISCOUNT RATE-SENSITIVITY MEDIUM SCENARIO							
Driver Variable	**Base Data**		**Project IRR**				
			75%	**90%**	**100%**	**110%**	**125%**
Production	Tonne/Year	$25,000	21.10%	28.70%	34.00%	39.40%	47.70%
Price	US$/Tonne	$12,000	24.90%	30.50%	34.00%	37.40%	42.10%
Capex	US$ 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

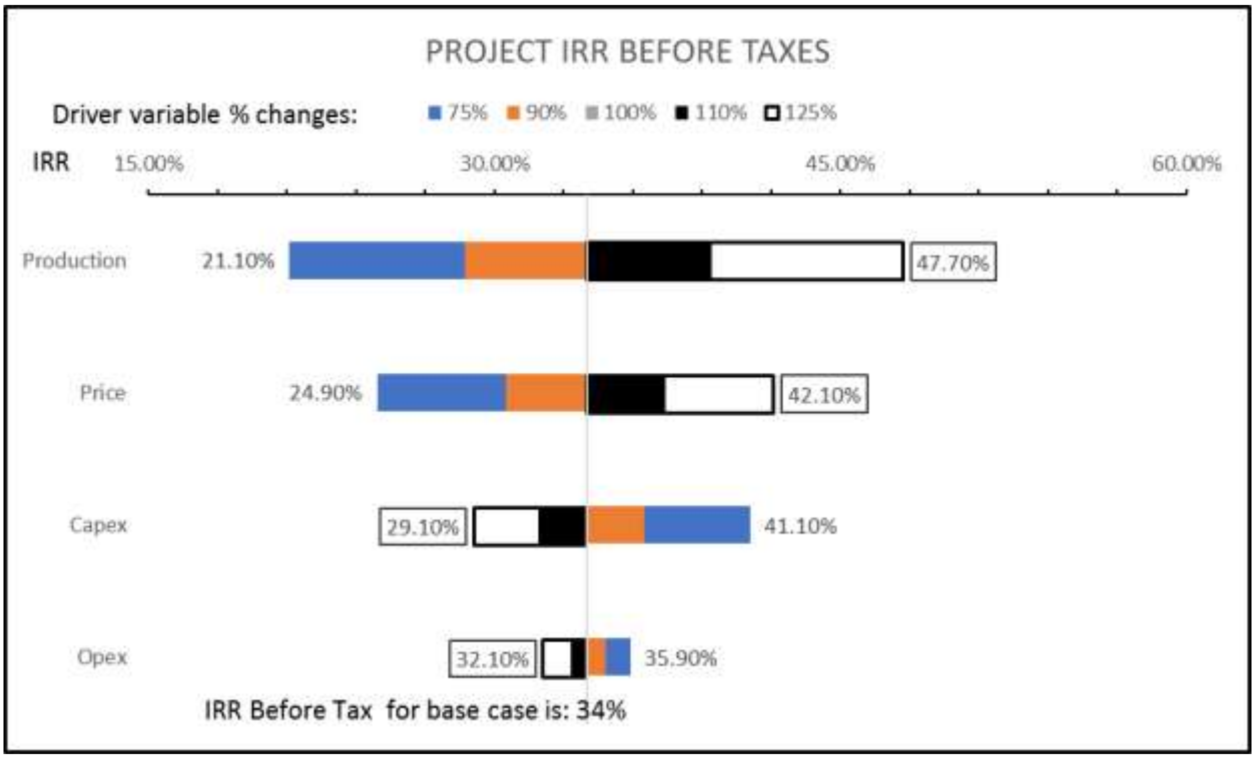


TABLE 22.9 PROJECT NPV AFTER TAXES - 10% DISCOUNT RATE-SENSITIVITY MEDIUM SCENARIO							
Driver Variable	Base Data		Project NPV (US$ M)				
			75%	90%	100%	110%	125%
Production	Tonne/Year	$25,000	301	940	803	1,043	1,215
Price	US$/Tonne	$12,000	443	660	803	947	1,161
Capex	US$ M	$425	870	831	803	776	736
Opex	US$/Tonne	$2,495	877	833	803	744	729

Figure 22.5 Diagram for Project NPV After Taxes - 10% Discount Rate-Sensitivity Medium Scenario

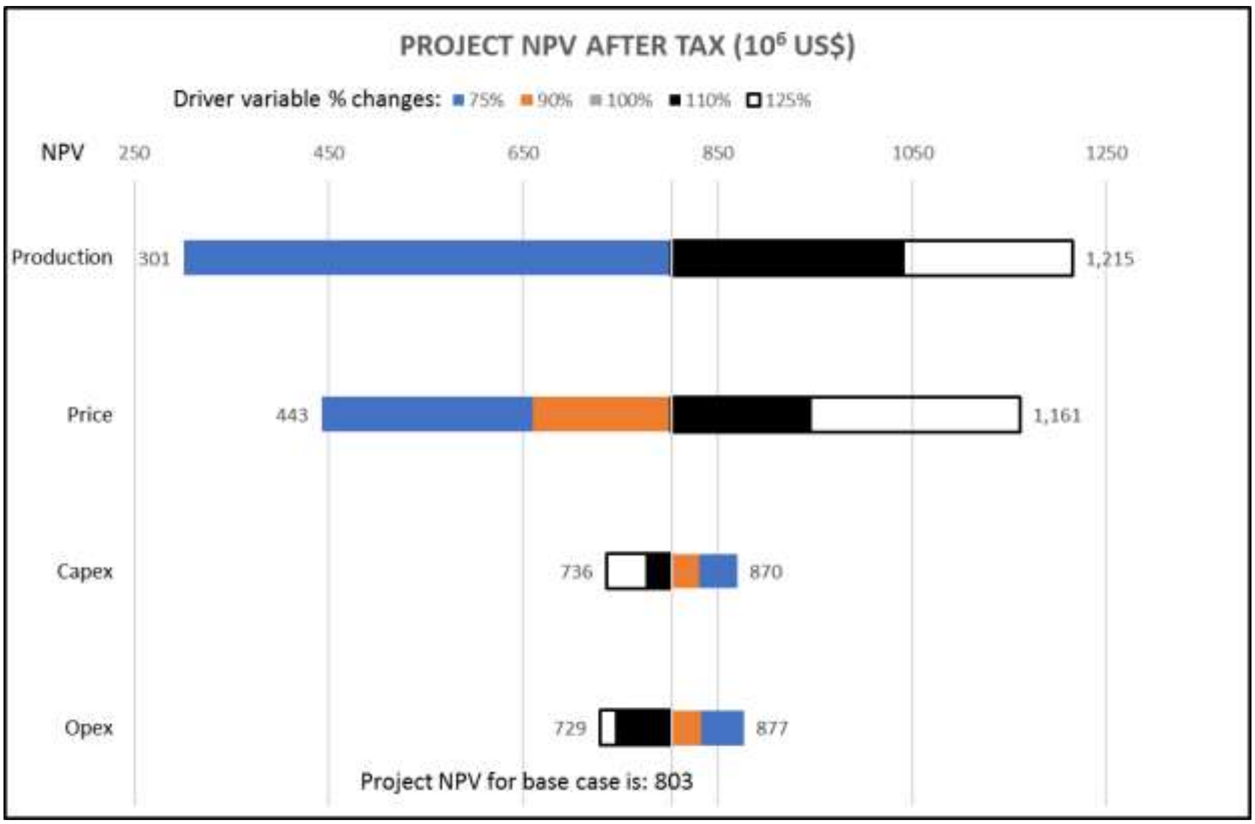
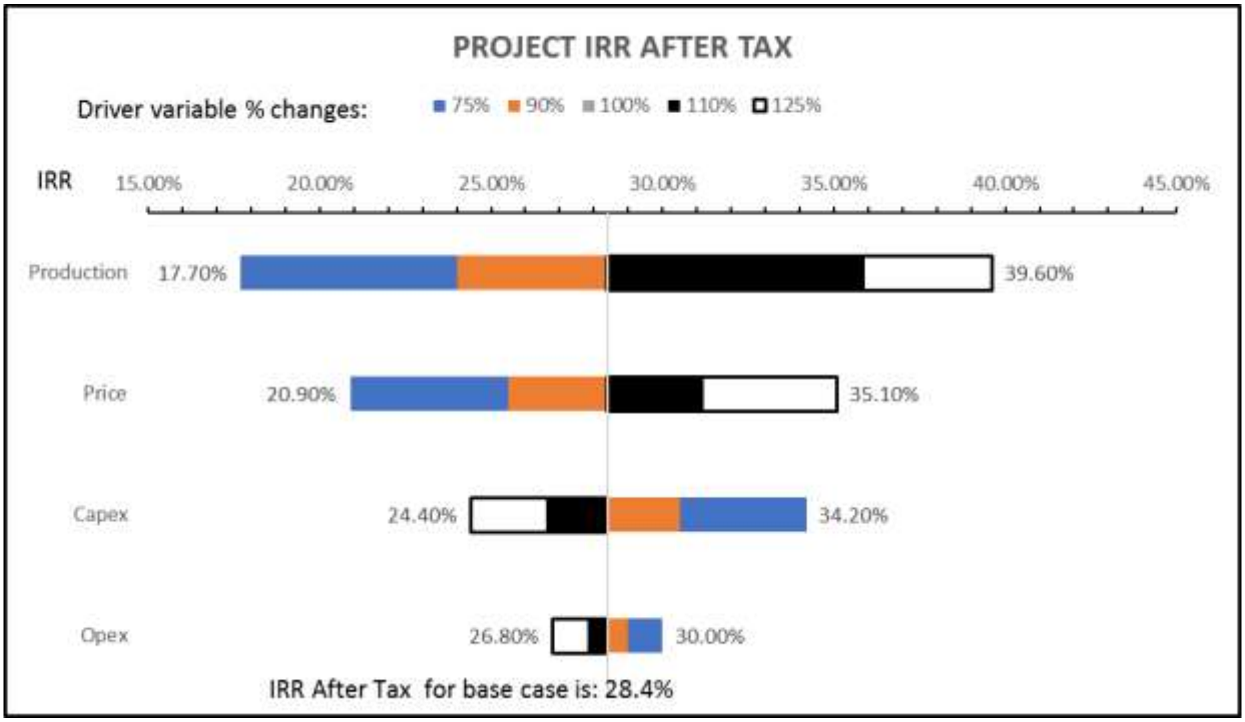


TABLE 22.10 PROJECT IRR AFTER TAXES -10% DISCOUNT RATE-SENSITIVITY MEDIUM SCENARIO							
Driver Variable	Base Data		Project IRR				
			75%	90%	100%	110%	125%
Production	Tonne/Year	$25,000	17.70%	24.00%	28.40%	35.90%	39.60%
Price	US$/Tonne	$12,000	20.90%	25.50%	28.40%	31.20%	35.10%

TABLE 22.10 PROJECT IRR AFTER TAXES -10% DISCOUNT RATE-SENSITIVITY MEDIUM SCENARIO							
Driver Variable	Base Data		Project IRR				
			75%	90%	100%	110%	125%
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 Please use tornado diagram



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.
- Resources Size: Identified lithium 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:

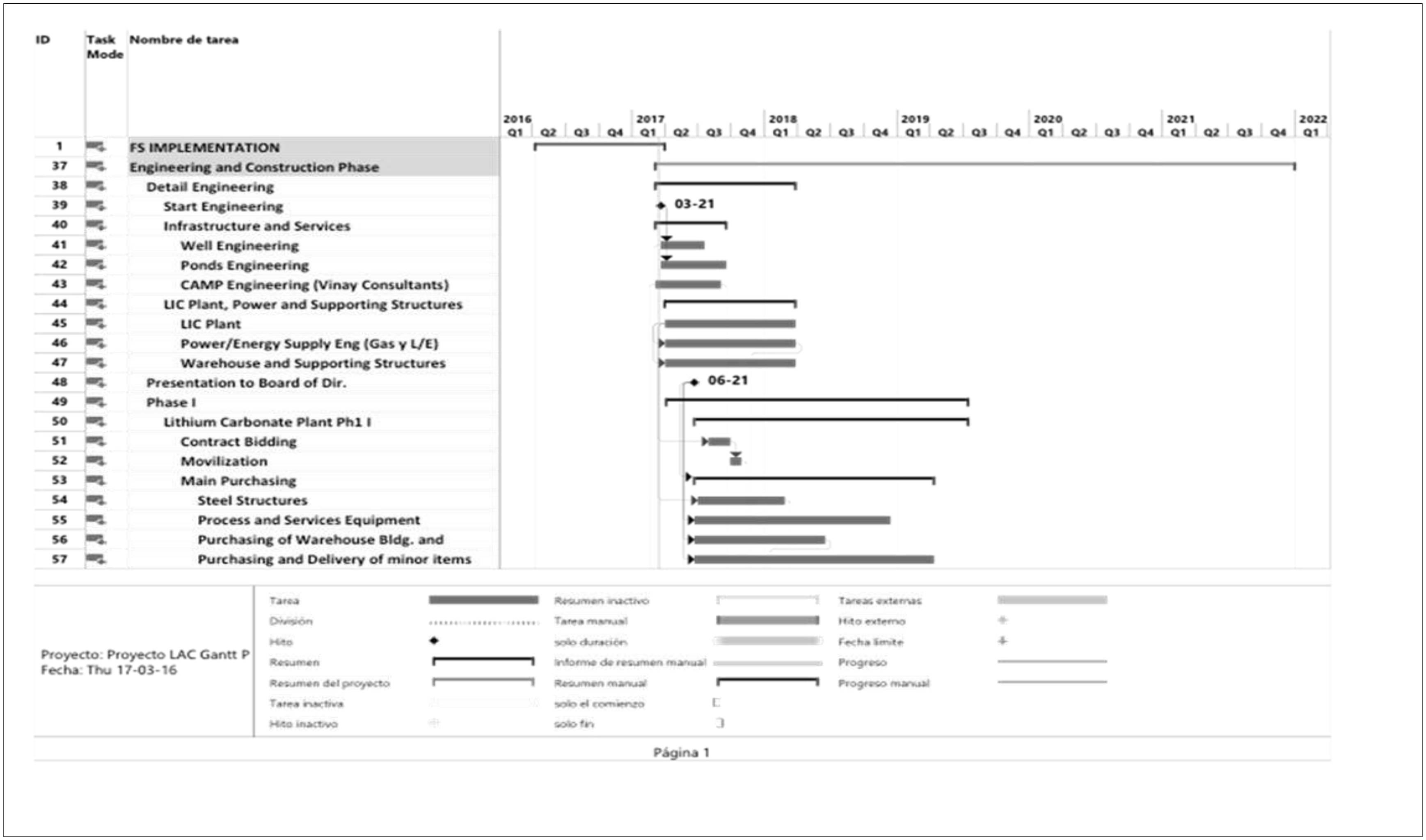
- Continuation of the production ramp up of the Lithium Carbonate plant.

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).

A Technical Report on the Olaroz properties prepared by Houston and Gunn (2011) highlighted Measured and Indicated Resources for lithium of 0.27 and 0.94 million tonnes, respectively. The Measured and Indicated 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 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 six boreholes, Orocobre estimated the lithium brine body extends 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.

On February 28, 2017, Orocobre announced a production of 6,542 t of lithium carbonate in their Half Year, 2017 update.

Figure 23.1 Orocobre Property Showing Boundary with LAC Property

24.0 OTHER RELEVANT DATA AND INFORMATION

The northern border of the Property, on the Olaroz salar, is shared with Orocobre. Care was taken during the calculation of the Reserve to ensure that none of the flow lines in LAC's calculations crossed over the property boundary.

Orocobre has placed one well on LAC's property along the northern boundary. This well is not actively pumping brine and negotiations are currently underway to have this well decommissioned.

25.0 INTERPRETATION AND CONCLUSIONS

25.1 GEOLOGY AND RESOURCES

Key interpretations and conclusions from the Reserve Estimation work are as follows:

- Brine: The Resource and 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.
- Groundwater Model: A numerical groundwater model was developed for the central area of the basin to support the Reserve Estimate. The model simulates long term brine recovery, and is based on a rigorous assembly of groundwater flow and solute transport parameters. As a preliminary step in preparing the numerical model, a previous Resource Estimate developed in 2012 was re-evaluated and updated in this Report.
- The Resource Estimate for the Project is summarized in Table 25.1 Resource values are expressed relative to a lithium grade cut-off of ≥ 354 mg/L, which was identified as a brine processing constraint by LAC engineers.
- The Reserve Estimate for the Project is summarized in Table 25.2
- Full details of the Reserve Estimate are provided in Section 15.
- It is the opinion of the independent QPs responsible for the Reserve Estimate that the dataset used to develop the numerical model is acceptable for use in the Reserve Estimate and Resource Estimate.

TABLE 25.1
LITHIUM RESOURCE SUMMARY

Description	Average Lithium Concentration (mg/L)	Mass Cumulated (cut-off 354 mg/L)		Brine Volume (m³)
		Li (tonne)	Li_2CO_3 (tonne)	
Updated Measured Resource	630	576,000	3,039,000	9.1×10^8
Updated Indicated Resource	570	1,650,000	8,713,000	2.9×10^9
Total	**585**	**2,226,000**	**11,752,000**	$\mathbf{3.8 \times 10^9}$

TABLE 25.2
LITHIUM RESERVE SUMMARY

Description	Average Lithium Concentration (mg/L)	Mass Cumulated		Brine Volume (m³)
		Li (tonne)	Li_2CO_3 (tonne)	
Proven Reserves (Year 1-5)	712	35,159	187,149	4.9×10^7
Probable Reserves (Year 6-40)	695	246,474	1,312,000	3.5×10^8
Total (40 Year Total)	**698**	**281,633**	**1,499,000**	$\mathbf{4.0 \times 10^8}$

The values in Table 25.2 are expressed as total contained metals. Reserve Estimate values are based on numerical model predictions of pumped brine (pre-processing).

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 BRINE PRODUCTION

The location, design and assumed productivity of the brine extraction wells was determined using a hydrogeologic model supported by data collected from geologic logs, drill cores, chemistry analysis and long-term pumping test data. The analysis concluded that over 99% of the brine pumped over 40 years of production will be sourced from within the property boundary controlled by Minera Exar.

25.3 PROCESS INFORMATION AND DESIGN

The proposed process is based on conventional brine extraction and processing methods including: pumping brine from the salar, concentrating the brine through evaporation ponds, and taking the brine concentrate through a hydrometallurgical facility to produce high-grade lithium carbonate. LAC and its consultants have successfully tested the brine chemistry of the Cauchari deposit through process simulation using estimation methods and process simulation techniques. This work has been validated by the results of evaporation and process testing at the on-site pilot plant and evaporation ponds, in addition to other testing developed with universities and suppliers.

25.4 ECONOMIC ANALYSIS

- Lithium Industry: Market studies indicate that the lithium industry has a promising future. The use of lithium ion batteries for electric vehicles and renewable energy storage applications are driving lithium demand rapidly to unprecedented levels.
- Project Capital Cost: The capital investment for the 25,000 tpa lithium carbonate Cauchari Project, including equipment, materials, indirect costs and contingencies during the construction period is estimated to be US$425 million. Costs have been estimated using consulting engineering services for facilities definition and supplier quotations for all major items. The main cost driver is pond construction, which represents 44% of total project capital expenditures.
- Operating Costs: The operating cost estimate (+/-15% accuracy) for the 25,000 tpa lithium carbonate facility is US$2,495 per tonne. This figure includes pond and plant chemicals, energy/fuel, 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.
- Sensitivity Analysis: The Project is forecast to generate cash flow even under unfavourable conditions for key variables. Project economic sensitivity analysis shows that lithium carbonate price and production have the highest impact on project results (NPV and IRR). Project results are somewhat less sensitive to capital expenditures and total operating costs.
- Viability of the Project: Project cash flow analysis for the base case and alternative cases indicates that, if assumptions that sustain the different cases materialize, the project remains economically viable.
- Project Strength: Project fundamentals, such as ease of construction, capital and operating costs, product demand and price, and economics are all strong.

25.5 PROJECT RISKS

- Reserves: As in all mining projects, there is a risk that some of the parameters used in reserves estimation do not behave in the long term as expected, thereby negatively impacting reserve estimation.
- Process risk: SQM's processing experience will help to mitigate potential problems. Problems may arise during detailed design, or later in scaling up to full production capacity. Reagents consumption may be higher than predicted and/or product yields may be lower than current estimates. As an experienced operator, SQM is well positioned to manage these potential risks.
- Construction delays and costs: Experience in building this type of facility is relatively limited in Argentina. This risk is mitigated by the construction expertise that the SQM partnership brings to the Project. SQM has built similar sized and type of projects in high-altitude environments in Chile. Selection of an experienced contractor will also reduce the risk of delay, especially for critical path items such as the pond construction. In addition, importation of foreign equipment requires careful management to ensure the necessary approvals/ documentation is in place to reduce the risk of delay. Occurrence of these delays or other factors may negatively impact project construction schedule and/or costs.
- Fluctuation in reagent costs: Soda ash supply is assumed to be imported. There is an existing soda ash manufacturer in Argentina, which currently operates at full capacity. Market pricing for other reagents may also fluctuate. However, the sensitivity analysis demonstrated that the economic performance of the project is relatively insensitive to operating cost.
- Electricity and Gas: Electricity for the Project will be supplied via the provincial electrical network and is approximately 7.5% of the total operating costs. Cost escalation risk for grid power is relatively low, and can be mitigated quickly and cost-effectively by exploiting the significant solar energy potential at site, if required. Natural gas will be used mainly for camp operations and specific process applications and represents only 3.4% of the total operating costs. The current natural gas price is US$5.52/MMBTU. This price reflects a supply mix of domestic production from: i) older conventional wells bought at US$2.70/MMBtu to US$3.00/MMBtu, ii) domestic gas from new developments (mostly shale/tight gas production from the Vaca Muerta formation) at US$7.50/MMBtu, and iii) imported gas at market prices (Platts, 2016). Domestic natural gas production has been diminishing for the last decade, however, the Vaca Muerta shale gas deposit, located in east-central Argentina, was discovered in 2010 and has since attracted numerous global producers. This massive deposit contains an estimated 308 trillion cubic feet of technically recoverable shale gas resources and has the potential to balance domestic gas production with demand. Production costs in the Vaca Muerta formation are higher than conventional production in Argentina, but will likely come down as producers continue to employ horizontal drilling and hydraulic fracturing techniques. Given that potential domestic natural gas resources appear ample, it is unlikely that the price will increase to above $7/MMBtu. A rise in natural gas prices could also affect electric power costs.
- Taxes: The Company operates under Federal Argentinian Mining Law N° 24.196. This law grants Minera Exar a tax freeze, or protection against tax increases for a period of 30 years from the date when Minera Exar files the Feasibility Study with the Federal Mining Authority.
- Inflation, exchange rate, and devaluation: The Argentine economy underwent significant positive changes in late 2015 and early 2016 as a result of measures that

the new government, led by President Mauricio Macri, has taken to reduce or remove controls and restrictions on capital flows. The current government has lifted foreign exchange controls that had been in place since 2011, and abolished export taxes on many agricultural and industrial goods, including lithium. A change in government could affect mining policies and the Project.

26.0 RECOMMENDATIONS

The Qualified Persons involved in the Report make the following recommendations:

- Probable and Proven Reserves: The ongoing operation of all production wells should be managed as long-term pumping tests, to assist in the conversion of Probable Mineral Reserves to Proven Reserves.
- Pumping Test Manual: A formal manual should be compiled and followed for execution of construction phase pumping tests.
- Monitoring Activities Manual: A formal manual should be compiled and followed for all long-term monitoring activities.
- Project Database: All existing and new ecological, hydrological and geological site data should be compiled in a formal database.
- QA/QC: 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.
- Updates to Groundwater Model: New conceptual and numerical groundwater models should be prepared following installation and testing of the proposed production wells 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 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.

- New Well Testing: In addition to the long-term evaluation components recommended above, each new production well should be initially pump tested for at least twenty-one days, for initial assessment of long-term performance.
- Project capacity expansion: Given the level of mineral resources estimated in this report, we recommend that a capacity expansion project, for Lithium Carbonate, be carried out at a Feasibility Study (FS) level.
- Lithium hydroxide production study: Process data and market study requirements suggest it should be feasible to produce lithium hydroxide at Cauchari. We recommend that this possibility be also the subject of a FS.
- Lime supply: We recommend that efforts to locate an alternate lime supply source be pursued, and also perform tests to analyze the effect of different lime sources on process yields and quality.

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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 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.
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, 5-11,23, 24 and 27 and co-authoring Sections 4, 12, 25 and 26 of the Technical Report along with those sections of the Summary pertaining thereto. Sections 2.4.1 and Sections 4-12 were taken from the 2012 King, Kelley, Abbey report. Sections 4,5,6 and 12 were updated for the 2017 report. My role in Sections 7-11 is in a review capacity.
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 29, 2017
Signing Date: May 11, 2017

{SIGNED AND SEALED}
[David Burga]

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 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.
3. I am a graduate of the National University of Engineering located in Lima, Peru at which I earned my Bachelor Degree in Mechanical Engineering (B.Eng. 1965). I have practiced my profession continuously since graduation and in Canada since 1975. 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, 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 – HG. Engineering..1988-2003
   - Lead Mechanical Engineer – AMEC Americas...2003-2005
   - Sr. Mechanical Engineer – SNC Lavalin Ltd...2005-2009
   - President – Andeburg Consulting Services Inc..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 13, 17, 18, 19, 21, and 22 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 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 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 29, 2017
Signing Date: May 11, 2017

{SIGNED AND SEALED}
[Ernest Burga]

Ernest Burga, P. Eng.

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31 March, 2017

Certificate of Qualified Person

Tony Sanford

I, Tony Sanford, BSc. (Hons.), MBA (Mineral Resources Management), Pr.Sci.Nat, residing at Calle Esquilache 371, Piso 6, San Isidro, Lima Perú 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 Feasibility Study and Reserve Estimation and Lithium Carbonate Production at the Cauchari-Olaroz Salars, Jujuy Province, Argentina", (the "Technical Report") with an effective date of March 29, 2017.
3. I graduated with a MBA (Mineral Resources Management) from the University of Dundee, Scotland, Centre for Energy, Petroleum and Mineral Law and Policy, in 1998; with a B.Sc (Hons), Geology from the University of Natal, Durban, South Africa in 1985 and B.Sc. (Geology & Applied Geology) in 1984. I have worked in my profession for a total of nearly 31 years since completing my honours degree in 1984 in the fields of geology, and environmental and social science related to the exploration, construction, operation, and closure phases of mine development. My experience includes working in environmental and social issues related to both open pit and underground mining including heap leach and mine waste/tailings disposal, and on the development of regulatory permits including ESIAs and mine closure plans, the last 18 years of which have been in South America. 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:

- Senior Regional Consultant, South America, Ausenco 2016-present
- Environmental Services and Water Resources Manager. Perú, Ausenco 2015 - 2016
- Environmental Services Manager, Perú, Ausenco 2008 - 2015
- Senior Geologist, Perú, Ausenco 2004 - 2008
- Geologist, Senior Geologist, Anglovaal, South Africa, Zambia 1985 - 1996

4. I have visited the Property that is the subject of this Technical Report during the period 14-15 February, 2017.
5. I am responsible for authoring Section 20 and Sections 4.7 through 4.10 and co-authoring Sections 25 and 26 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 29, 2017
Signing Date: May 11, 2017

{SIGNED AND SEALED}
[Tony Sanford]
Tony Sanford, Pr.Sci.Nat.

DATE AND SIGNATURE PAGE
CERTIFICATE of AUTHOR – MICHAEL ROSKO

As the co-author of the report titled "Updated Feasibility Study, Reserve Estimation and Lithium Carbonate Production at the Cauchari-Olaroz Salars, Jujuy Province, Argentina", with an effective date of March 29th, 2017 (the Technical Report) I, Michael Rosko, MSc., CPG, do hereby certify that:

1 I am a principal hydrogeologist with:
   Montgomery & Associates Consultores, Ltda.
   Isidora Goyenechea 3365, Of 901-902
   Las Condes, Santiago de Chile

2. I graduated with a Bachelor of Science degree in Geology from University of Illinois in 1983
3. I graduated with a Master of Science in Geology (Sedimentary Petrology focus) from University of Arizona in 1986
4. I am a registered professional geologist in the states of Arizona (25065), California (5236), and Texas (6359)
5. I am a registered member of the Society for Mining, Metallurgy & Exploration (SME) #4064687
6. I am a member of the National Ground Water Association, Arizona Hydrological Society, and International Association of Hydrogeologists.
7. I have practiced hydrogeology for 31 years, with much of this time working in salar basins similar to Salar de Cauchari.
8. 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 and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101. This Technical Report is based on my personal review of information provided by Lithium Americas Corporation (LAC) and Soquimich (SQM) and on discussions with LAC and SQM representatives.
9. I have visited the property two times, January 24, 2011 and January 24, 2017.
10. I have not had prior involvement with the properties that are the subject of the Technical Report.
11. 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.
12. I am independent of the issuer applying all of the tests in section 1.5 of National Instrument 43-101.
13. 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.
14. As qualified person for this project, I have been responsible for review of the conceptual model and drilling and testing results, updating and re-calibrating the previous numerical groundwater flow model, and for calculating estimated reserve values for lithium and potassium provided in this Technical Report. I am responsible for authoring Section 15 and 16 of the Technical Report along with those sections of the Summary pertaining thereto.

Effective Date: March 29th, 2017
Signing Date: May 11th, 2017

{SIGNED AND SEALED}
[Michael Rosko]

____
Signature of Michael Rosko, MSc, C.P.G.

DATE, SIGNATURE AND CERTIFICATE OF QUALIFICATIONS

Mark W.G. King
Groundwater Insight Inc.
3 Melvin Road, Halifax, Nova Scotia. B3P 2H5
Phone: 902 223 6743
king@gwinsight.com

As supervising author of Sections 12 and 14 in the "Updated Feasibility Study Reserve Estimation of Lithium Carbonate at the Cauchari-Olaroz Salars, Jujuy Province, Argentina" with and effective date of March 29, 2017, prepared for Lithium Americas Corp. (the "Report"), I, Mark W.G. King, do hereby certify that:

1. I am employed as President and Senior Hydrogeologist with Groundwater Insight Inc., 3 Melvin Road, Halifax, Nova Scotia, B3P 2H5, telephone 902 223 6743, email king@gwinsight.com.
2. I have the following academic and professional qualifications and experience:
   a. Academic
      i. B.Sc. (Geology), Dalhousie University, Halifax, Nova Scotia, 1982
      ii. M.A.Sc. (Civil Eng.), Technical University of Nova Scotia, 1987
      iii. Ph.D. (Earth Science), University of Waterloo, Waterloo, Ontario, 1997
   b. Professional
      i. Registered Professional Geoscientist of Nova Scotia (membership #84); member of Council of the Association
      ii. Member of Association of Groundwater Scientists and Engineers (membership #3002241)
   c. Areas of Specialization Relevant to this Report
      i. Field delineation and monitoring of solutes in groundwater
      ii. Organic and inorganic groundwater geochemistry
      iii. Involvement in lithium brine studies on more than 10 salars in Chile, Argentina and Nevada
      iv. 29 years of experience in groundwater quality and quantity projects.
3. I am a "qualified person" for the purposes of National Instrument 43-101 — Standards of Disclosure for Mineral Projects (the "Instrument").
4. I visited the Cauchari and Olaroz Salars several times during the course of the field work conducted there, with the most recent visit being on or around the end of 2012.
5. I am responsible for technical review and supervising the preparation of materials under Section 12 Data Verification and Section 14 Mineral Resource Estimate. These sections were originally provided in the July 2012 Report entitled: "Feasibility Study Reserve Estimation and Lithium Carbonate and Potash Production at the Cauchari-Olaroz Salars, Jujuy Province, Argentina". It is my understanding that they have been re-produced in the current report in a manner that is consistent with their original issuance, with some minor re-organization for presentation purposes. Lithium Americas Corp. has indicated to me that no substantive and relevant information has been collected since the original issuance in 2012, which should be considered in Sections 12 and 14. My role in the current report is limited to these two previous Sections (Sections 12 and 14). I have not been involved in, nor do I have technical knowledge of, the numerical modeling updates and applications used to update the Reserve Estimate documented in Section 15 of the current report.

6. I am independent of Lithium Americas Corp. as described in section 1.5 the Instrument.

7. In addition to the current report, I also supervised the preparation of three previous reports on the Cauchari and Olaroz Salars on behalf of Lithium Americas Corp. entitled “Feasibility Study Reserve Estimation and Lithium Carbonate and Potash Production at the Cauchari-Olaroz Salars, Jujuy Province, Argentina” dated July 11, 2012; "Amended Inferred Resource Estimation of Lithium and Potassium at the Cauchari and Olaroz Salars, Jujuy Province, Argentina” dated May 6, 2010 and “Measured, Indicated, and Inferred Resource Estimation of Lithium and Potassium at the Cauchari and Olaroz Salars, Jujuy Province, Argentina” dated December 6, 2010.

8. I had no involvement with the Cauchari and Olaroz Salars, prior to preparation of the above-noted reports.

9. I have read the Instrument, and Sections 12 and 14 of this Report have been prepared in compliance with the Instrument.

10. As of the date of this Report, and to the best of my knowledge, information, and belief, the sections of the Report under my responsibility (Sections 12 and 14) as stated above contain all scientific and technical information that is required to be disclosed to make this Report not misleading.

Effective Date: March 29, 2017

Date of Signing: May 11, 2017

{SIGNED AND SEALED}

[Mark King]

Signature of Qualified Person | Print name of Qualified Person

DATE, SIGNATURE AND CERTIFICATE OF QUALIFICATIONS

Daron Abbey
Matrix Solutions Inc. (formerly AquaResource)
31 Beacon Point Court, Breslau, Ontario N0B 1M0
Phone: 519 772 3777
dabbey@matrix-solutions.com

As a coauthor of Sections 12 and 14 in the "Updated Feasibility Study Reserve Estimation of Lithium Carbonate at the Cauchari-Olaroz Salars, Jujuy Province, Argentina" with an effective date of March 29th, 2017, prepared for Lithium Americas Corp. (the "Report"), I, Daron Abbey, do hereby certify that:

1. I am employed as Principal Hydrogeologist with Matrix Solutions Inc., 31 Beacon Point Court, Breslau, Ontario N0B 1M0, telephone 519 772 3777, email dabbey@matrix-solutions.com.
2. I have the following academic and professional qualifications and experience:
   a. Academic
      iv. B.Sc. (Environmental Science), Carleton University, Ottawa, Ontario, 1996
      v. M.Sc. (Earth Sciences), Simon Fraser University, Burnaby, B.C., 2000
   b. Professional
      iii. Registered Professional Geoscientist in Ontario (membership #0697)
   c. Areas of Specialization Relevant to this Report
      v. Conceptualization of Groundwater flow and transport systems;
      vi. 3D Hydrostratigraphic model development
      vii. Dissolved solute distribution mapping;
      viii. 19 years of experience in geophysical, hydrogeologic and solute transport studies.
3. I am a "qualified person" for the purposes of National Instrument 43-101 — Standards of Disclosure for Mineral Projects (the "Instrument").
4. I visited the Cauchari and Olaroz Salars on June 1-4, 2010.
5. I am responsible for co-authoring materials under Section 12 Data Verification and Section 14 Mineral Resource Estimate. These sections were originally provided in the July 2012 Report entitled: "Feasibility Study Reserve Estimation and Lithium Carbonate and Potash Production at the Cauchari-Olaroz Salars, Jujuy Province, Argentina". The material in this Report reflects my best judgment in light of the information available to me at the time of preparation. It is my understanding that the Sections 12 and 14 have been re-produced in the current report in a manner that is consistent with their original issuance, with some minor re-organization for presentation purposes. Further, Lithium Americas Corp. has represented to me that no substantive and relevant information has been collected since the original issuance in 2012, which should be considered in Sections 12 and 14. My role in the current report is limited to these two previous Sections (Sections 12 and 14). I have not been involved in, nor do I have technical knowledge of, the numerical modeling updates and applications used to update the Reserve Estimate documented in Section 15 of the current report.
6. I am independent of Lithium Americas Corp. as described in section 1.5 the Instrument.
7. In addition to the current report, I am also responsible for the preparation of the preliminary hydrogeologic modeling completed to support a previous report "Measured, Indicated and

Inferred Resource Estimation of Lithium and Potassium at the Cauchari and Olaroz Salars, Jujuy Province, Argentina" dated December 6, 2010.

8. I had no involvement with the Cauchari and Olaroz Salars, prior to preparation of the above-noted Reports.
9. I have read the Instrument, and Sections 12 and 14 of this Report have been prepared in compliance with the Instrument.
10. As of the date of this Report, and to the best of my knowledge, information, and belief, the sections of the Report under my responsibility (co-author of Sections 12 and 14) as stated above contain all scientific and technical information that is required to be disclosed to make this Report non- misleading.

Effective Date: March 29, 2017

Date of Signing: May 11, 2017

{SIGNED AND SEALED}
[Daron Abbey]

Signature of Qualified Person — Print name of Qualified Person

APPENDIX 1

APPENDIX 1: EXCERPT FROM DI BOSSI SITE SEDIMENTOLOGY REPORT, PREPARED FOR LAC - 2011

Basin analysis

Facies maps

The facies analysis maps presented here are built using the composition triangle (see lower left corner of figures 55 and 58) of three end members:

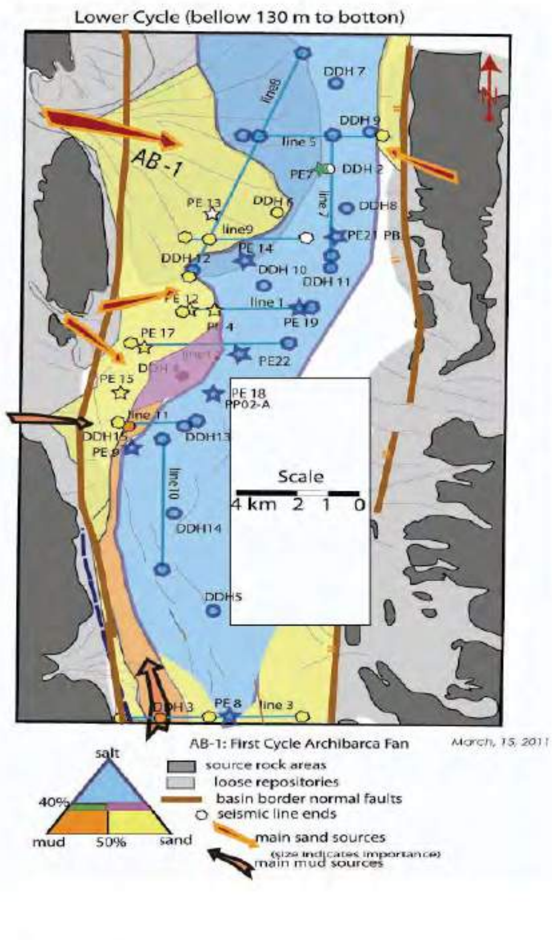


Figure 55: Facies map of the Lower Salt Cycle showing the Line 1 crossing a thick salt succession.

a. *mud (silt and clay, normally red salted materials with minor bioturbation)*
b. *sand (fine sand with minor medium to coarse size sands and conglomerates)*
c. *halite (massive and banded salt with mud or sand partitions)*

Additionally, two isopleth maps (figure 56 and 57 and figures 59 and 60) were prepared with the sand % and salt % end members, to trace the entering point of the sand, salt depocenters and the shapes of the alluvial major contributions of the source areas using the contouring design.

Limits of the fields are arbitrary and were selected from the plotted boreholes distribution in order to split them in natural groups that are shown in the composition triangle with different colours.

Every borehole was inspected by the end member thickness proportions in two levels: (1) upper 130 m and (2) lower sediments bellow 130 meters. The depth division was placed considering the two cycles found in the well DDH10 and DDH4 (see Ciclicity).

The Lower Cycle environment

The Lower Cycle environment (figure 55) show facies controlled by tectonic subsidence defining a central elongate salt deposition area. The blue field is continuous in the figure 55 but irregular in thickness as can be seen in figure A55, is the main halite depositional area. There are two elongated depocenters in the central and southern parts of the Salar located in the middle of the Basin structure. The volume of clastic contribution in these areas is more or less of uniform coming from the eastern and western borders. The third depocenter, located north of line 1, is displaced to the eastern border due to the strong influence of the Archibarca Fan clastic sedimentation.

The main sand source (figure 56) is located in the mountains of the western slopes and is responsible for the building of the old fan system known as Archibarca Fan. Minor sand was coming from the eastern slopes during this evolution stage.

The main mud source is located at the south and is coming from a place out of the southern limit of figure 55 facies map. An additional source is located in the western basin border.

The irregular basin floor structure is related to the equilibrium between subsidence and clastic supply. Halite is formed in places where subsidence is higher than clastic supply (graben structures). In other words, where water fills the accommodation space, more frequently, making a very shallow lake that evaporates to dryness with precipitation of a salt crust. In other places where subsidence is lower (horst structures), mud or sand cover the surface and the water presence at surface is of very low residence, then the evaporation and formation of a salt crust is inhibited. No significant salt precipitation took place (only isolated small borate concretions, salt hoppers and gypsum crystals).

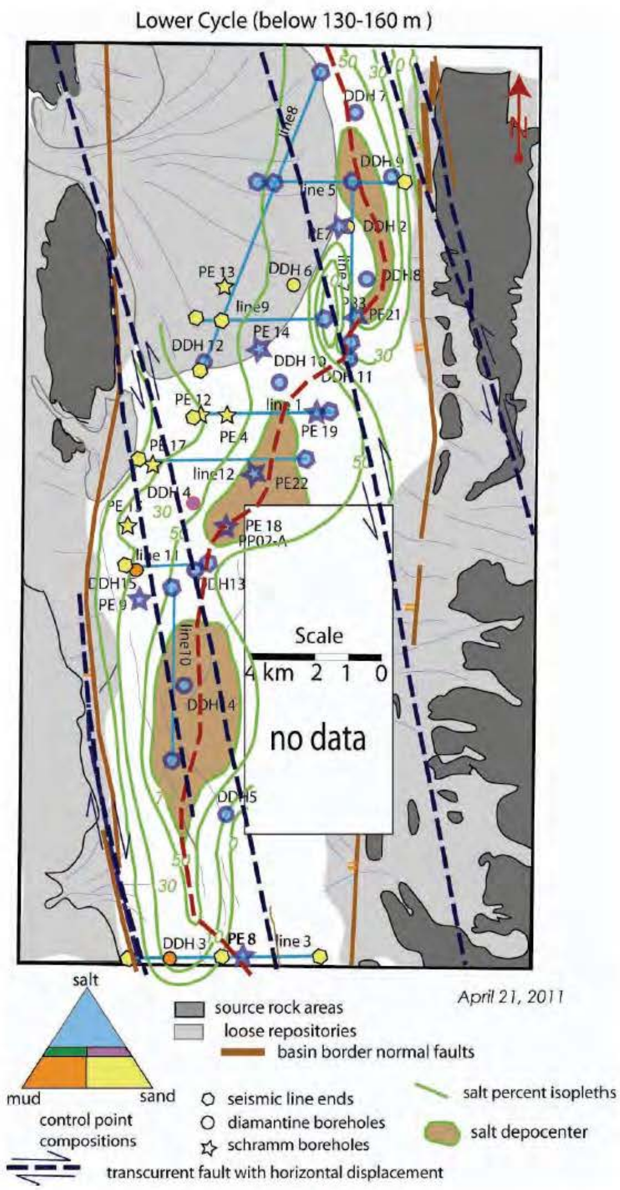


Figure A55: Isopleth curves of salt per cent in the facies triangle. Three elongated depocenters are defined, deflecting to the East by the strong influence of the Archibarca Fan, in the northern section of the Basin.

The irregular basin floor structure is related to the equilibrium between subsidence and clastic supply. Halite is formed in places where subsidence is higher than clastic supply (graben structures). In other words, where water fills the accommodation space, more frequently, making a very shallow lake that evaporates to dryness with precipitation of a salt crust. In other places where subsidence is lower (horst structures), mud or sand cover the surface and the water presence at surface is of very low residence, then the evaporation and formation of a salt crust is inhibited. Less salt crust precipitation took place (with small borate concretions, salt hoppers and gypsum crystals in interbedded muds).

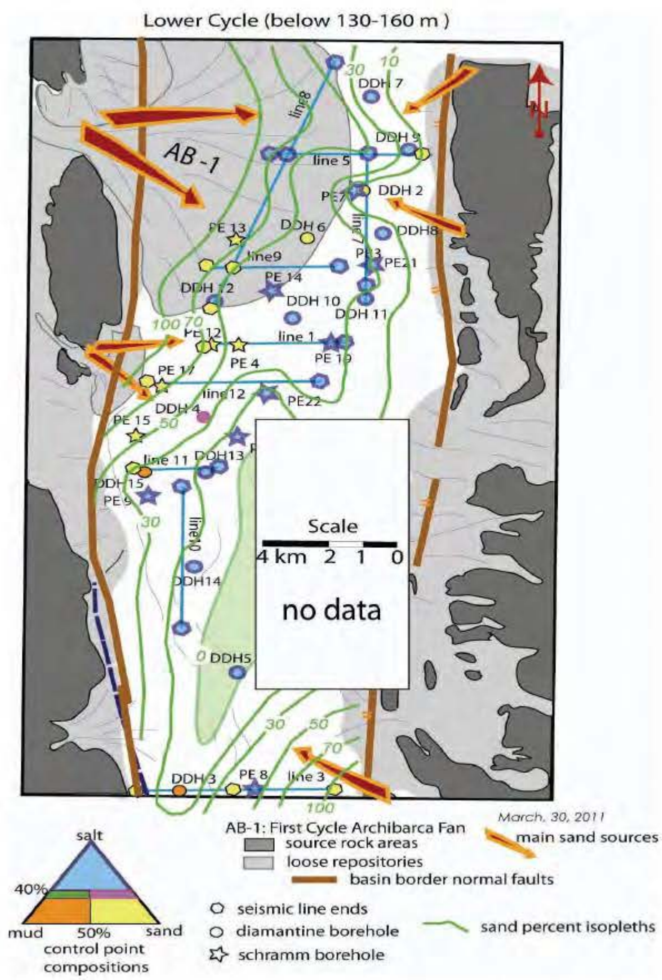


Figure 56: Main sand sources of the Lower Cycle derived from the shape and sand proportions shown by the isopleth curves.

G.E.Bossi. The Cauchari Sedimentology Final Report. Minera Exar S.A.

The Lower Cycle presents the higher amount by volume of saltpans and the denser halite masses (in many cases the hydrologic basement).

The Archibarca Fan system is well defined as sand and coarse clastic material at this early stage being responsible for the deflection of the salt depocenter east of the fan border (figure 56).

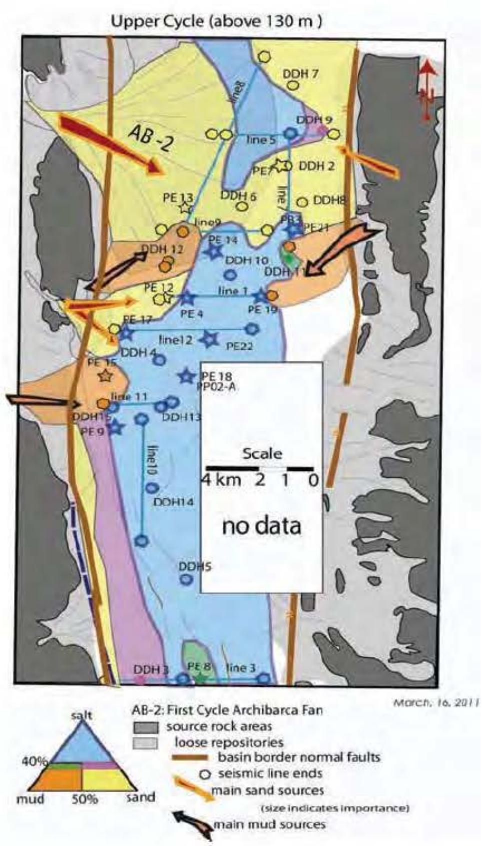


Figure 57: Facies map of the Upper Cycle. Salt generation is concentrated at the western and southern sections of the Cauchari Basin.

It is possible that during the Lower Cycle sedimentation the water evaporated at very high rates (over 3000 mm /year) creating optimum conditions for a huge hard pan generation. This situation could not be assigned totally to a dramatic global climate change in the South American continent. It is also possible that the Puna block was located at a lower altitude during the Lower Pleistocene time, and the Salar surface being at around 2,000 m elevation, creating climatic conditions similar to the present Atacama Salar in Chile.

The Upper Cycle environment

The Upper Cycle situation is shown in figure 57. The clastic supply is higher and the saltpan is located mainly is the southern section of the Salar with a minor isolated section at the northern part, probably connected with the Olaroz Basin system.

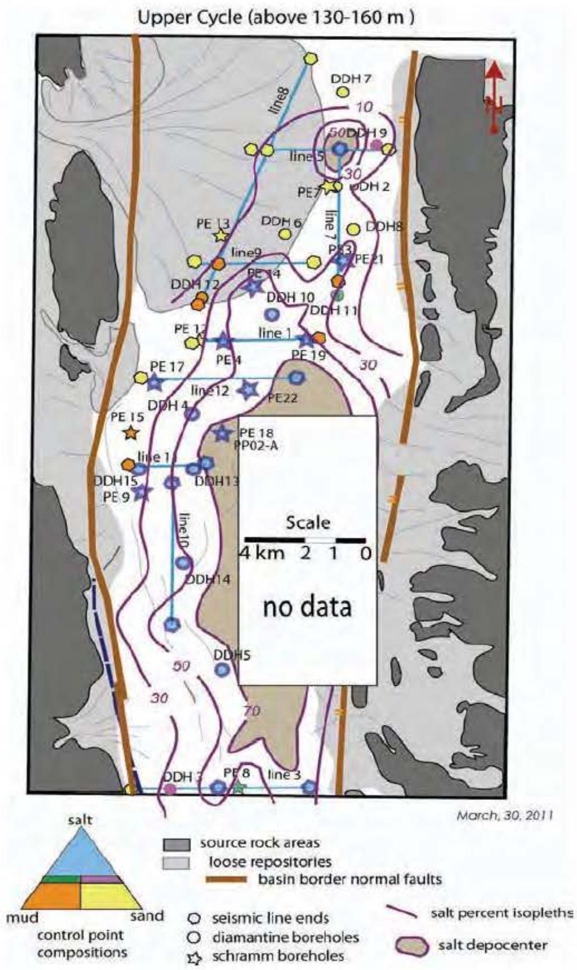


Figure A57: Salt percent isopleths of the Upper Cycle, showing the persistency of the southern depocenter, occupying a wider area and a small remnant of the northern depocenter.

The irregularities (figure A57) of the Basin depositional geometry are almost lost probably due to the smoothing effects of the final thermal subsidence stage. The area painted in blue in figure 57 is still large but the salt volume and thickness is lower than in the Lower Cycle.

The two southern depocenters of the Lower Cycle unify into one in the Upper Cycle that occupy a wider surface in the central area of the Basin. A remnant small depocenter still persists in the northeastern part of the Basin close to the eastern border and in front of the protruding border of the Archibarca Fan.

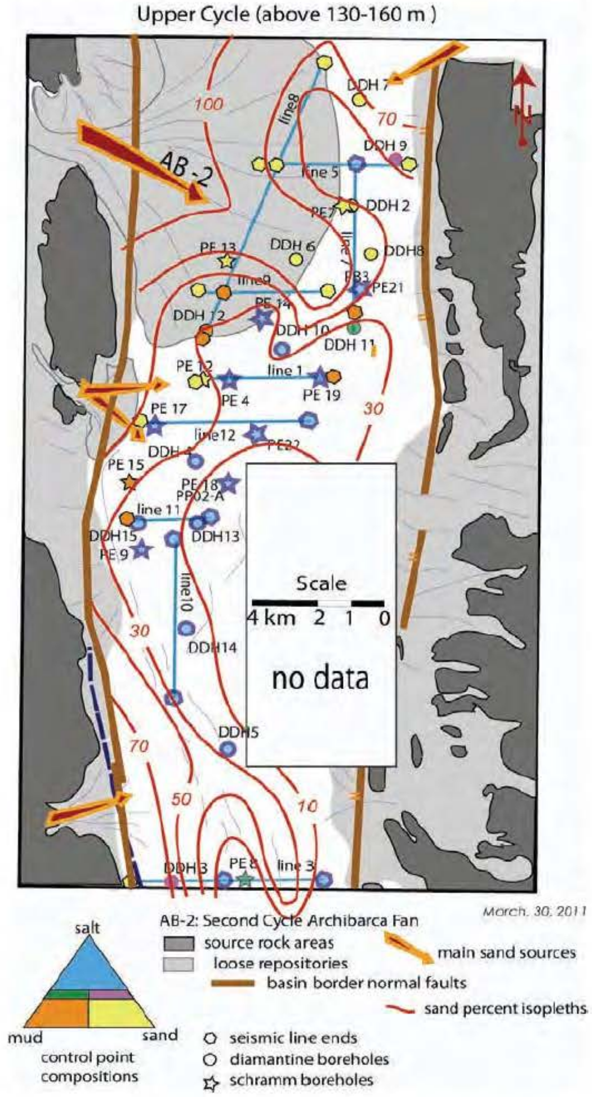


Figure 58: Isopleth map of sand per cents of the Upper Cycle sedimentation stage.

The most promising area for brine location in the Upper Cycle is in between the main salt depocenter and the smaller northern salt depocenter remnant. Salt sources and clastic horizons are intermixed in equal proportions creating good aquifer conditions.

Two main sand sources (figure 58) are indicated in the map: (1) the Archibarca Fan (bellow the present day fan) and (2) another fan system coming from the eastern mountains. Two minor sand sources are (figure 58) also located in the western border of the Basin south of the Archibarca Fan. Penetration of the Archibarca Fan into the Basin reaches a maximum in this stage.

Most mud is still coming from the south with minor contributions from the mountains located in the western border.

Facies design indicates a closure of the Salar salt pan surface at the North section of the map due to the very high sand and gravel supply (figure 57 and 58) coming mainly from the Archibarca Fan.

The Cauchari Salar with an altitude around 4,200 m of elevation has at present time a surface transformed in a salted red mud playa lake or "barreal". The evaporation rate is high (around 1,000 mm/year with pluvial precipitations around 60 mm/year) but not enough to create condition to build relevant saltpans in any place

APPENDIX 2

Quality Control Data Review Salares Lithium Project, Argentina

Prepared for:

Minera Exar S.A.
Ricardo Videla 8046, Timbre 7
(5505) Lujan de Cuyo-La Puntilla
Mendoza, Argentina

Prepared by:

Smee and Associates Consulting Ltd.
December, 2011

SMEE & ASSOCIATES CONSULTING LTD.
CONSULTING GEOCHEMISTRY / GEOLOGY

Table of Contents

1. Introduction

Minera Exar S.A (Exar) is a wholly owned Argentina-based subsidiary of Lithium Americas Corp. (LAC). Exar is operating lithium in brine exploration programs in the Jujuy Province of northern Argentina, known collectively as the Salares Project. The Salares Project is progressing toward commercial production, and has completed a number of pump tests to confirm the aquifer, mineral content of the brines and is confirming the lithium resource of the project.

It is the intention of LAC to produce data that is compatible with industry Best Practices and that is acceptable to the OSC, TSX and possibly the SEC rules.

Samples that are analyzed for the important elements in brine have been bottled at the drill sites and assayed at Alex Stewart Argentina (ASA) in Mendoza, and some confirmatory assays have been done at Acme Santiago and The University of Antofagasta. Earlier in 2011 Exar produced certified reference material consisting of several different brine samples that had been analyzed by numerous laboratories to produce an accepted mean and standard deviation. Unlike solid reference material, brine samples are not stable over a long period of time, and have to be used within a relatively short period.

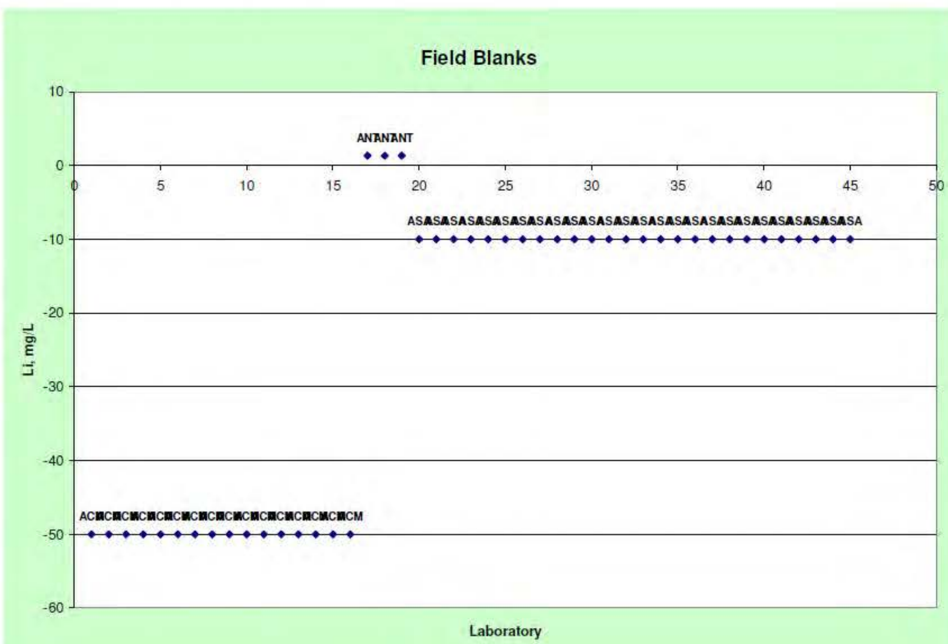
Exar has been running a Quality Control program to monitor the quality of assays from ASA which includes the insertion of a field blank, a field duplicate and one of two remaining standards that appear to be relatively stable. These data have been compiled by Exar staff and have been sent to Smee and Associates Consulting Ltd. for confirmation of the accuracy and precision of the analysis. This is the second report reviewing quality control data. The first report (Smee, 2010) modified procedures, and audited the ASA laboratory in Mendoza Argentina.

2. Quality Control Data Review

This review includes data compiled for six pump test holes including four to test the brine aquifer, and two for testing the fresh water source. The drill hole nomenclature is a bit confusing and would be better to consist of a year prefix and consecutive hole number, such as Hole 11-3, 11-4, 11-5 etc.

2.1 Field Blanks

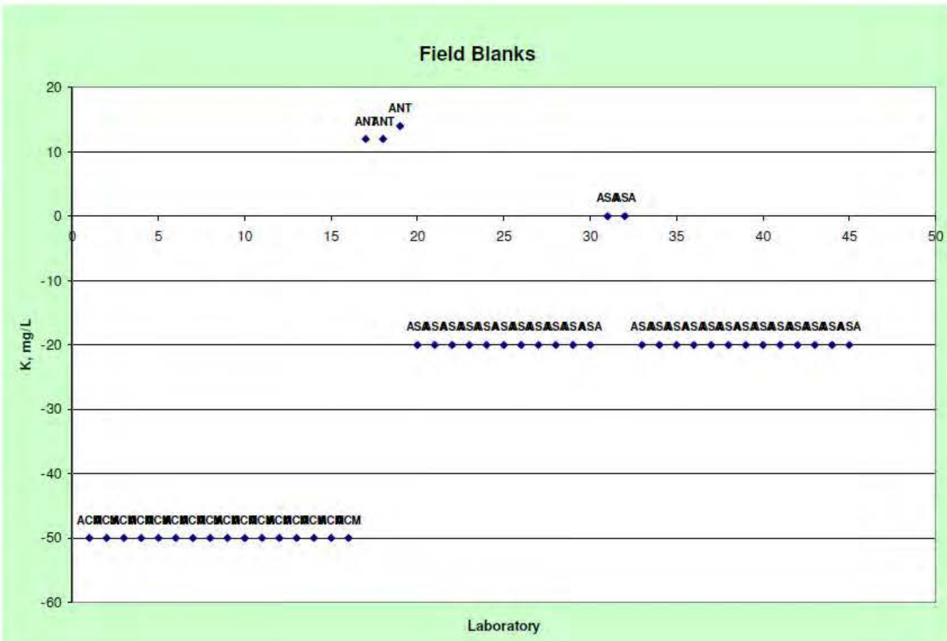
Field blanks were submitted to all three laboratories. The data for Li, K and SO4 were compiled into Shewhart chart format. It is obvious that the three laboratories use different methods of analysis, as the detection limits are different. Each of these methods should be compiled and described in the final NI 43-101 report.

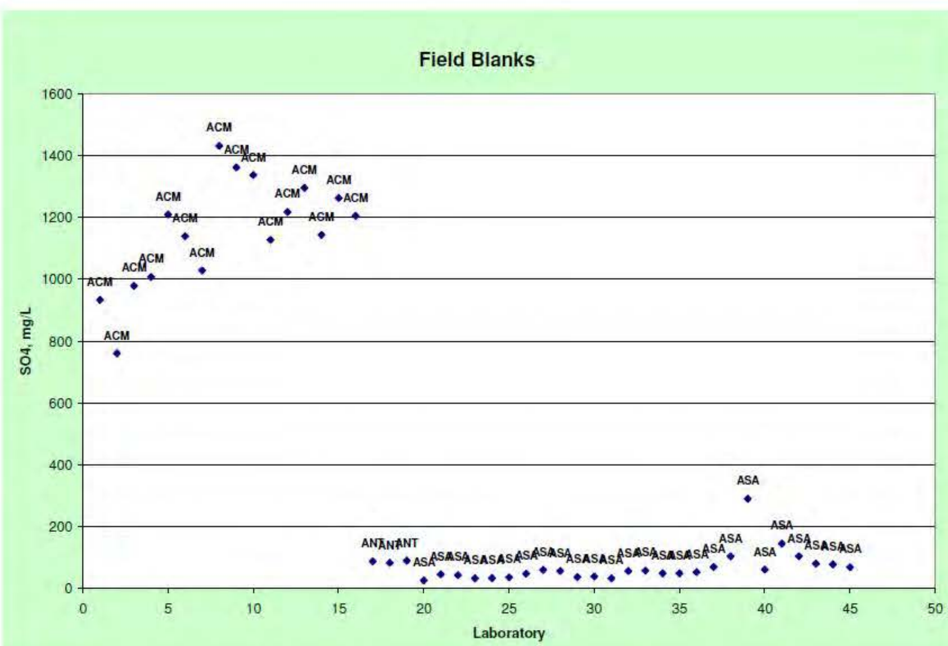


The Li data does not show any contamination or sample mix-ups from the laboratories. The method used by the University of Antofagasta has a very low detection limit of near

1 mg/l, while Acme has a lower detection limit of 50 mg/t and ASA a detection limit of 10 mg/l.

A similar pattern occurs for the K, but no indication of contamination is shown by the field blanks.



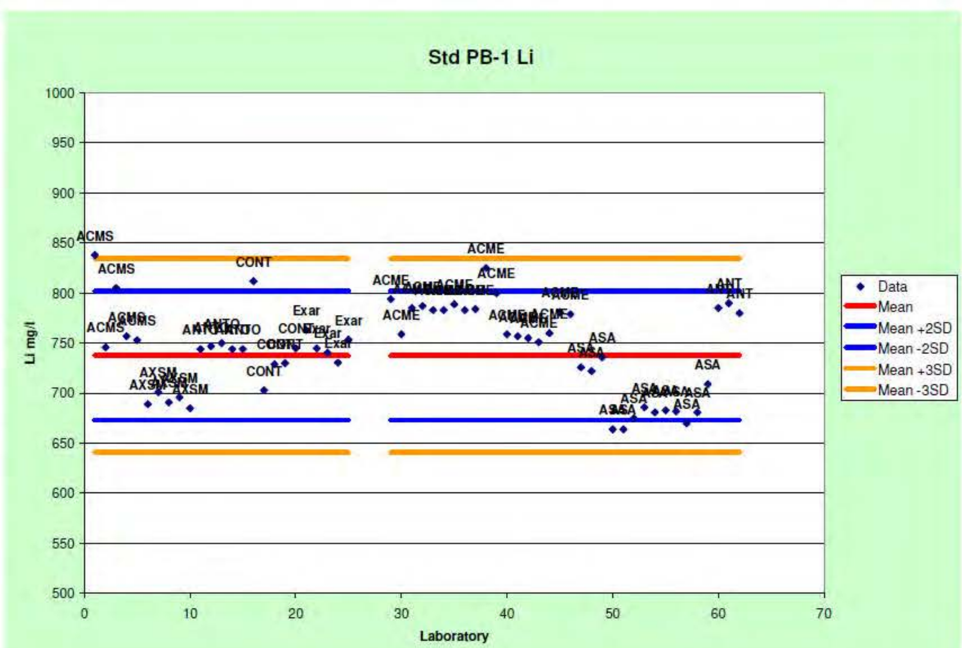


The SO4 is a different story, with the samples analyzed by Acme showing a distinct contamination signature compared to the other laboratories. ASA has one sample that could be contaminated, assuming that the blank sample received by all the laboratories is identical. **Acme should be informed that they may have a contamination issue with SO4 in their laboratory.**

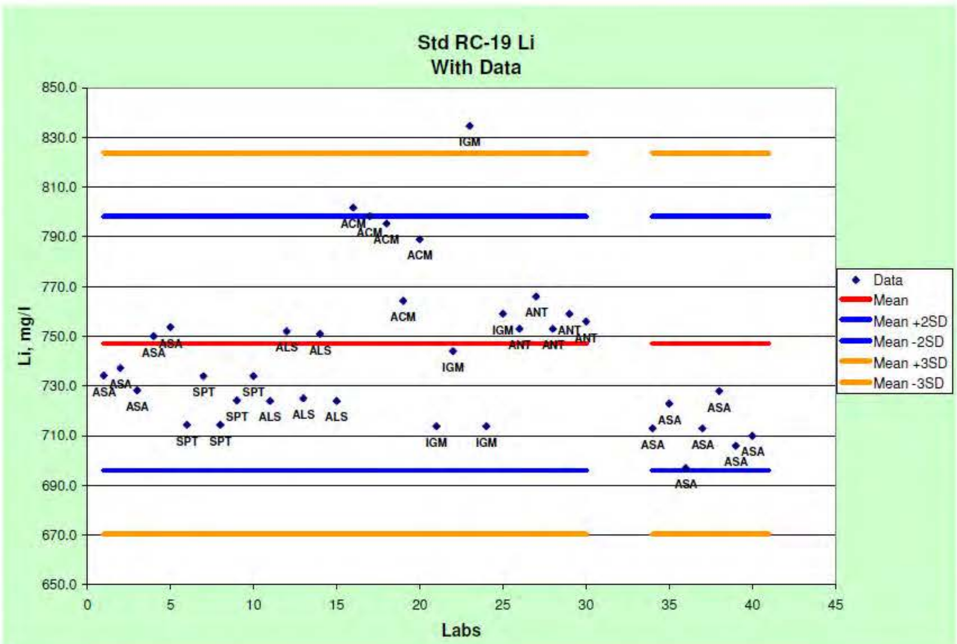
This data suggests that the important economic elements Li and K have not been contaminated in the sample collection, sample ordering, or in the analytical laboratory.

2.2 Standard Results

Two standards were used to monitor analytical accuracy. The data was separated from the laboratory reports, and placed into a data base table. These were compiled in Excel and plotted in Shewhart chart format, with the accepted mean and limits shown on the charts.

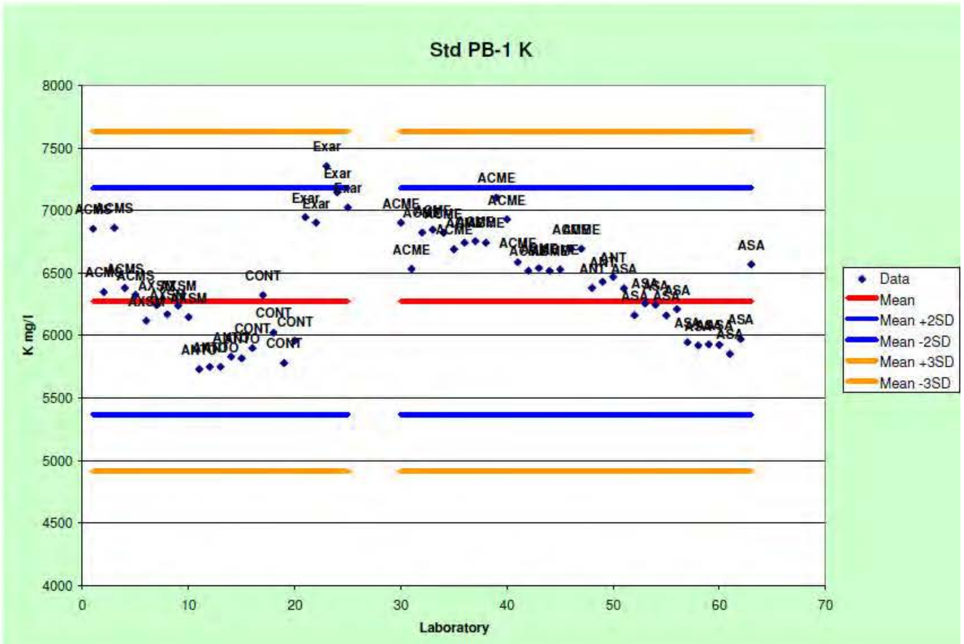


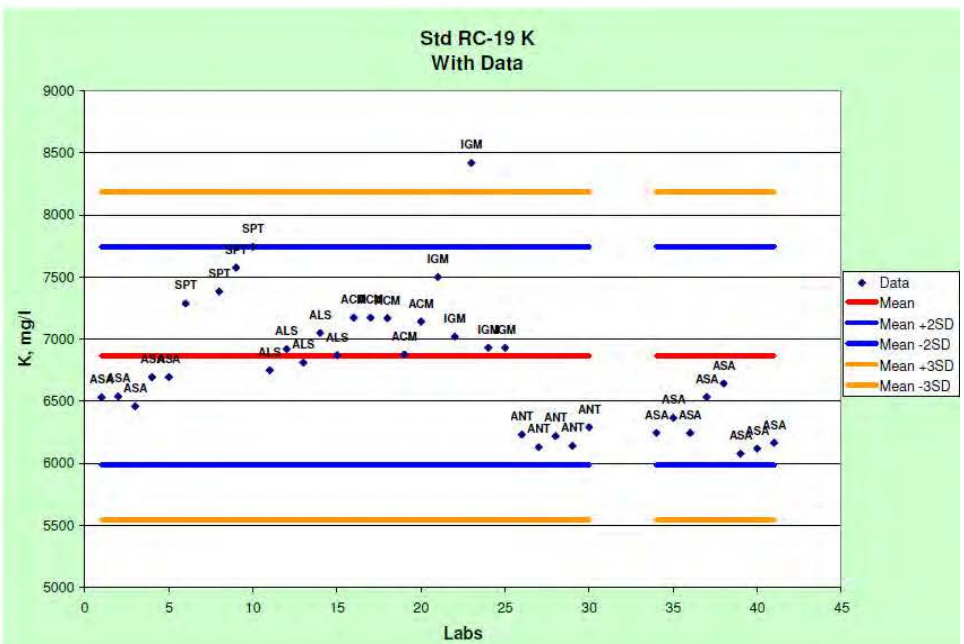
Only ASA received the RC-19 standard, and showed the same low bias as seen in the previous standard.



The data did not contain any outright failures for Li (> 3SD from mean) but the Li data from ASA is biased low and from Acme is biased high compared to the mean. The data is consistent within the two laboratories, suggesting the difference between the labs is related to laboratory methods rather than a deterioration of the standard. **If the majority of Li concentrations used for the resource calculation is obtained from ASA, the resource may be slightly conservative. If from Acme, the Li resource may be slightly less than calculated.**

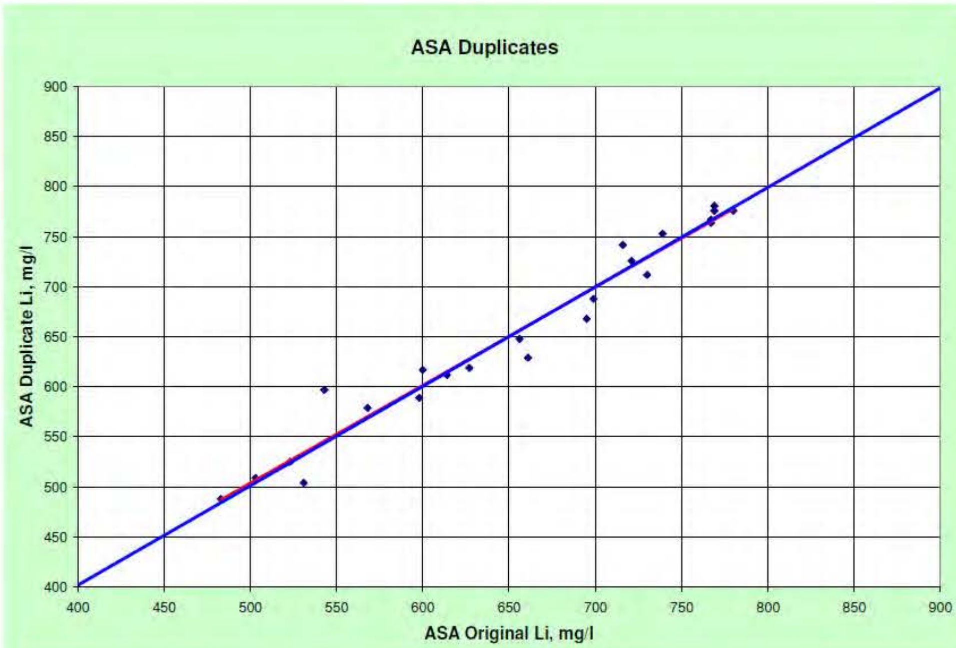
A similar pattern is seen with the K data, with ASA slightly below the mean, and Acme above the mean. The two Antofagasta standards are close to the mean. **The K resource can be considered to be accurate, on average.**

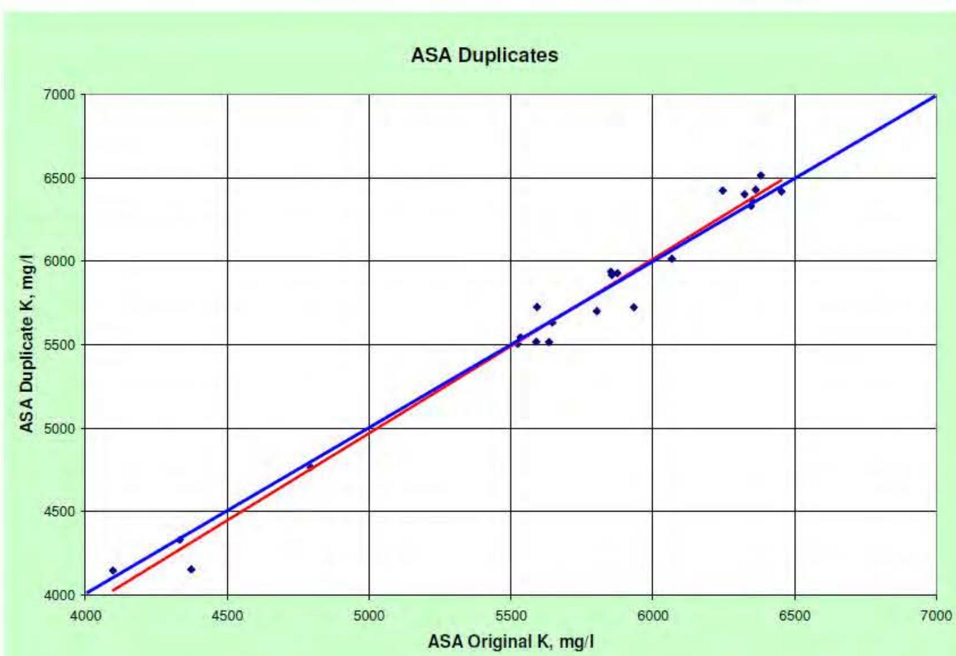

Std PB-1 K
K mg/l
Laboratory
Data
Mean
Mean +2SD
Mean -2SD
Mean +3SD
Mean -3SD


Std RC-19 K
With Data
K, mg/l
Labs
Data
Mean
Mean +2SD
Mean -2SD
Mean +3SD
Mean -3SD

2.3 Field Duplicate Data

Usually geological samples are solids that will exhibit a sampling error at the point of sampling. This is not the case with liquid brines, as the liquid should be homogeneous because of normal mixing in the aquifer. The duplicate data was placed on an x-y chart to confirm this hypothesis.






Acme Duplicates
Duplicate Sample Li, mg/l
Original Sample Li mg/l
450
550
650
750
850
950
Data Li
Linear (Data Li)


Acme Duplicates
Duplicate Sample K, mg/l
Original Sample K mg/l
4000
4500
5000
5500
6000
6500
7000
7500
8000
Data K
Linear (Data K)

The field duplicate data for Li and K at both ASA and Acme confirms that the brine samples are homogeneous, and that the data used for the resource calculation can be considered to be representative as required by NI 43-101.

3. Conclusions and Recommendations

The field sampling of brines for the pump 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 laboratory methods should be detailed so that comparisons between laboratories can be made with some certainty as to the cause of the observed differences.

Respectfully Submitted by:

BW Smee

Barry W. Smee, Ph.D., P.Geo.

References

Smee, B.W., 2010: Results of an Audit on the Alex Stewart Argentina Laboratory Mendoza, and Field Sampling Methods and Quality Control Review Salares Lithium Project, Argentina. Exar internal report, 70 p.

Certificate of Qualifications

1. I, Barry W. Smee a geologist and geochemist, reside at 4658 Capilano Rd. North Vancouver B.C., V7R 4K3.

2. I am a member in good standing of the Association of Professional Engineers and Geoscientists of British Colombia and a full member of the Association of Exploration Geochemists. I have been practicing my profession for 40 years in Canada and abroad. I am a Qualified Person as defined under NI 43-101.

3. I most recently visited the Salares Project and the Mendoza ASA Laboratory between April 17 and 22, 2010. This report concerned data only, and did not include a field visit.

4. I am responsible for this complete report.

5. I am not aware of any material fact or material item that could change or affect the conclusions contained in this report.

6. I am an independent consultant. I do not have any interest in Lithium Americas or its subsidiaries or any of their projects.

7. I have read NI 43-101 and its companion policies. This report concerns only two technical aspects of the requirements of NI 43-101, namely the laboratory and quality control aspects, and does not follow the guidelines for a NI 43-101 property report.

8. I give Lithium Americas Corp permission to use this report to upgrade their Quality Control or laboratory methods or to include in a NI 43-101 report.

Submitted on December 30, 2011 in electronic format only,

Barry W. Smee, Ph.D., P.Geo.