NI 43-101 Technical Report

Preliminary Economic Assessment (Rev. 1)

of the

Clayton Valley Lithium Project Esmeralda County, Nevada

prepared for

PURE ENERGY MINERALS

Prepared by:

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Effective Date: June 15, 2017

Report Date: August 8, 2017

Revised Report Date: March 23, 2018

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Important Notice Regarding Forward-looking Information

This Preliminary Economic Assessment (PEA) contains "forward-looking information" within the meaning of applicable Canadian securities legislation. Forward-looking information includes, but is not limited to, statements related to activities, events, or developments that the authors or the Company expect or anticipate will or may occur in the future, including, without limitation, statements related to the authors' or the Company's economic analysis of the Project, the mineral resource estimate; the estimated annual production of LiOH-H$_2$O and LCE; the estimated NPV of the Project; the estimated IRR of the Project; estimated average operating costs; estimated capital costs; estimated EBITDA; the estimated payback period for the Project; the estimated timeline for construction of the Project; the estimated production schedule at the Project; anticipated chemistry of brines at the Project; expected growth in the market for lithium hydroxide; anticipated changes in battery formulation technologies; estimated market prices for lithium hydroxide; anticipated lithium recovery levels at the Project; expected pilot plant testing at the Project; design work at the Project; the permitting process; environmental assessments; business strategy; objectives and goals; exploration and the development of a timeline for completion of a feasibility study for the Project. Forward-looking information is often identified by the use of words such as "plans," "planning," "planned," "expects" or "looking forward," "does not expect," "continues," "scheduled," "estimates," "forecasts," "intends," "potential," "anticipates," "does not anticipate," or "belief," or describes a "goal," or variation of such words and phrases or state that certain actions, events or results "may," "could," "would," "might" or "will" be taken, occur or be achieved. Forward-looking information is based on a number of factors and assumptions made by the authors or the Company and considered reasonable at the time such information is provided. Forward-looking information involves known and unknown risks, uncertainties and other factors that may cause the actual results, performance, or achievements to be materially different from those expressed or implied by the forward-looking information. The PEA is, by definition, preliminary in nature and should be considered speculative. It is based on a process flow sheet that may change, which would impact all costs and estimates. Operating Costs for the Project were based on assumptions including future energy costs, water costs, labour, and other variables that are likely to change. Capital Costs were based on a list of equipment thought to be necessary for production. Lithium price forecasts were based on third-party estimates and management assumptions that may change due to market dynamics. The mineral resource estimates were based on assumptions outlined in the "Resource Estimate" section. Some figures were calculated using a factor to convert short tons to metric tonnes. Changes in estimated costs to acquire, construct, install, or operate the equipment, or changes in projected pricing, may adversely impact project

economics. Among other factors, the Company's inability to complete further mineral resource and mineral reserve estimates, the inability to complete the Feasibility Study, the inability to obtain sufficient recharge, the inability to anticipate changes in brine volume or grade, changes to the economic analysis, the failure to obtain necessary permits to explore and develop the Clayton Valley Lithium Project, environmental issues or delays, inability to successfully complete additional drilling at the Clayton Valley Lithium Project, factors disclosed in the Company's current Management's Discussion and Analysis, as well as information contained in other public disclosure documents available on SEDAR at http://www.sedar.com might adversely impact the Project. Although the authors have attempted to identify important factors that could cause actual actions, events, or results to differ materially from those described in the forward-looking information, there may be other factors that cause actions, events, or results not to be as anticipated, estimated, or intended. There can be no assurance that forward-looking information will prove to be accurate. The forward-looking information contained herein is presented for the purposes of assisting investors in understanding the Company's plans, objectives, and goals and may not be appropriate for other purposes. Accordingly, readers should not place undue reliance on forward-looking information. The authors or the Company do not undertake to update any forward-looking information, except in accordance with applicable securities laws.

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Certificates of Qualified Persons (QPs)

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CERTIFICATE of AUTHOR

I, Ron Molnar, do hereby certify that:
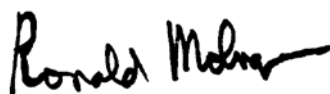
1.   I am currently engaged as the President and Owner of MetNetH$_2$O Inc.

2.   This certificate applies to the technical report titled "NI 43-101 Technical Report Preliminary Economic Assessment for the Clayton Valley Project, Esmeralda County, Nevada," with effective date, 15th June 2017 (the "Technical Report").

3.   I am a graduate of the Royal School of Mines, Imperial College, University of London where I earned my Doctor of Science degree in metallurgy (Ph.D., 1980). I earned my Bachelor of Engineering degree in metallurgical engineering at McGill University (B.Eng., 1972). I have practiced my profession continuously since graduation and in Canada from 1972 to 1974 and then since 1980. I am licensed by the Professional Engineers of Ontario (License No. 100111288).

4.   My summarized career experience is as follows:
- Research Engineer, Steel Castings Institute of Canada   1972-1974
- Doctoral Student, Hydrometallurgy, Royal School of Mines   1974-1980
- Research & Development Engineer, Ivaco Steel Group   1980-1982
- Research Scientist → Section Head, Solution Purification → Program Principal, Effluents Program, CANMET (Canada Centre of Minerals and Energy Technology), Government of Canada, Department of Natural Resources   1982-1995
- Senior Metallurgist, Lakefield Research Limited → SGS Minerals   1995-2006
- President/Principal, MetNetH2O Inc.   2006 to present

5.   I have read the definition of "qualified person" set out in NI 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.

6.   I am responsible for authoring Sections 1.7, 1.14, 13, 17, 24.2, 24.3, and 26 (items 4 and 6).

7.   I have not visited the Clayton Valley project site. I visited the Tenova Advanced Technologies (TAT)

research facilities in Katzrin, Israel on June 1-15, 2016 to observe the test program being executed there on the Pure Energy Minerals flowsheet and was more directly relevant to my participation in this Technical Report than a visit to the Clayton Valley site.

8 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.

9. I do not hold, nor do I expect to receive, any securities or any other interest in any corporate entity, private or public, with interests in the properties that are the subject of this report or in the properties themselves, nor do I have any business relationship with any such entity apart from a professional consulting relationship with the issuer, nor to the best of my knowledge do I have any interest in any securities of any corporate entity with property within a two (2) kilometer distance of any of the subject properties.

10. I am independent of Pure Energy Minerals according to the criteria stated in Section 1.5 of NI 43101.

11. I have read NI 43-101 and Form NI 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

12. I consent to the filing of the Technical Report with any stock exchanges or other regulatory authority and any publication by them, including electronic publication in the public company files on the websites accessible by the public, of the Technical Report.

Dated this 23rd day of March, 2018.

Signature of Qualified Person

Ronald Molnar

Print name of Qualified Person

DANIEL S. WEBER, P.G., RM-SME
Senior Hydrogeologist/Operations Manager
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CERTIFICATE of AUTHOR

I, Daniel S. Weber do hereby certify that:

1.   I am a senior hydrogeologist and operations manager with Errol L. Montgomery & Associates, Inc. (Montgomery & Associates), 400 South Colorado Blvd., Suite 340, Denver, CO 80246 USA, telephone number +01 303.927.6820.

2.   I graduated with a Bachelor of Science degrees in Geological Sciences and Environmental Sciences from Bradley University, Peoria, Illinois in 1980. I graduated with a Master of Science in Hydrology from the University of Arizona, Tucson, Arizona in 1986.

3.   I have professional registrations in good standing with the following organizations: Registered Professional Geologist in the State of Arizona (26044); Registered Professional Geologist in the State of California (5830); Society for Mining, Metallurgy, and Exploration (SME) registered member (4064243).

4.   I have practiced hydrogeology for 31 years, during which I have worked extensively in Salar basins in Arizona, Nevada, Chile and Argentina. My experience as a hydrogeologist includes groundwater resource development and management, drilling and testing of production, injection, and monitoring wells, technical oversight for feasibility investigations, design and application of groundwater models, and interpretation of aquifer test data.

5.   I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that and by reason of my education, experience and affiliation with professional associations I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101.

6.   I am responsible for the preparation of the report titled "NI 43-101 Technical Report Preliminary Economic Assessment for the Clayton Valley South Project, Esmeralda County, Nevada," effective date, 15th June, 2017 (the "Technical Report"), with specific responsibility for Sections 1.1, 1.3, 1.4, 1.5, 1.6, 1.13, 2, 3, 7.2, 8, 9, 10.1, 10.3, 10.5, 11.1, 11.2, 11.3, 11.4, 11.5, 14, 15, 16.1, 16.2, 16.3, 25, 26 (items 1-3 and 5), 27, and 28.

7.   I participated in field visits to the Clayton Valley Project site on January 13 and 14, 2016 and December 5 and 6, 2016.

8   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.

9.   I do not hold, nor do I expect to receive, any securities or any other interest in any corporate entity, private or public, with interests in the properties that are the subject of this report or in the properties themselves, nor do I have any business relationship with any such entity apart from a professional consulting relationship with the issuer, nor to the best of my knowledge do I have any interest in any securities of any corporate entity with property within a two (2) kilometer distance of any of the subject properties.

10.   I am independent of Pure Energy Minerals Limited according to the criteria stated in Section 1.5 of NI 43101.

12.   I have read NI 43-101 and Form NI 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

13.   I consent to the filing of the Technical Report with any stock exchanges or other regulatory authority and any publication by them, including electronic publication in the public company files on the websites accessible by the public, of the Technical Report.

Dated this 23rd day of March, 2018.

SME
Society for
Mining, Metallurgy
& Exploration

Daniel S. Weber
SME Registered Member No. 4064243

Signature_____
Date Signed_____
Expiration date_____

_____

Signature of Qualified Person

"Daniel S. Weber"

Print name of Qualified Person

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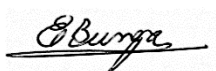
I, Ernest Burga, do hereby certify that:

1.   I am currently engaged as Project Manager and President of Andeburg Consulting Services Inc.

2.   This certificate applies to the technical report titled "NI 43-101 Technical Report Preliminary Economic Assessment for the Clayton Valley Project, Esmeralda County, Nevada," with effective date, 15th June 2017 (the "Technical Report").

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).

4.   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

5.   I have read the definition of "qualified person" set out in NI 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.

6.   I am responsible for authoring Sections 1.9, 1.10, 1.11, 1.12, 16.4, 16.5, 16.6, 16.7, 17.8, 18, 19, 21, 22, 24.1 and Table 26.1.

7.   I participated in a visit to the Clayton Valley Project site on November 3rd, 2016.

8   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.

9.   I do not hold, nor do I expect to receive, any securities or any other interest in any corporate entity, private or public, with interests in the properties that are the subject of this report or in the properties themselves, nor do I have any business relationship with any such entity apart from a professional consulting relationship with the issuer, nor to the best of my knowledge do I have any interest in any securities of any corporate entity with property within a two (2) kilometer distance of any of the subject properties.

10.   I am independent of Pure Energy Minerals according to the criteria stated in Section 1.5 of NI 43101.

11.   I have read NI 43-101 and Form NI 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

12.   I consent to the filing of the Technical Report with any stock exchanges or other regulatory authority and any publication by them, including electronic publication in the public company files on the websites accessible by the public, of the Technical Report.

Dated this 23rd day of March 2018.

E Burga

Signature of Qualified Person

Ernest Burga

Print name of Qualified Person

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CERTIFICATE of AUTHOR

I, Jeffrey A. Jaacks, do hereby certify that:

1. I am currently a self-employed Consulting Geochemist /Geologist with an office at:

    8493 E. Foxhill Pl.
    Centennial, CO 80112

2. I graduated with a degree in Chemistry with a Specialization in Earth Sciences (B.A.) from the University of California at San Diego in 1979. I was granted a Doctor of Philosophy (Ph.D.) in Geochemistry from Colorado School of Mines in Golden, Colorado in 1984.

3. I am a Certified Professional Geologist with the American Institute of Professional Geologists (CPG# 11249).

4. I am a:
    o   Fellow and Past President in the Association of Applied Geochemists (AAG),
    o   Past Geochemistry Committee Chairman in the Society of Mining, Metallurgy and Exploration (SME),
    o   Member of the American Institute of Professional Geologists (AIPG),
    o   Member of the Society of Economic Geologists (SEG),
    o   Member of the Denver Regional Exploration Geologists Society (DREGS),

5. I have worked as a geochemist/geologist for a total of 33 years since my graduation from university, as a geologist at 3 major mining companies, then a Chief Geochemist for mid-size and major mining companies, and for over 18 years as an independent consultant in the fields of exploration geochemistry and geology, mineral resource and mineral reserve estimation, quality assurance and quality control programs for exploration and mining.

6. 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.

7. I visited the Clayton Valley Project from September 19-22, 2016 and again from December 5-8, 2016.

8. I am responsible for the preparation of the quality assurance and quality control parts of the technical report titled "NI 43-101 Technical Report Preliminary Economic Assessment for the Clayton Valley Project, Esmeralda County, Nevada," effective date, 15th June, 2017 (the "Technical Report"), with

specific responsibility for Sections 11-6 through 11-8 and Section 12.

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.

9.   I do not hold, nor do I expect to receive, any securities or any other interest in any corporate entity, private or public, with interests in the properties that are the subject of this report or in the properties themselves, nor do I have any business relationship with any such entity apart from a professional consulting relationship with the issuer, nor to the best of my knowledge do I have any interest in any securities of any corporate entity with property within a two (2) kilometer distance of any of the subject properties.

10. I am independent of Pure Energy Minerals according to the criteria stated in Section 1.5 of NI 43101.

12. I have read NI 43-101 and Form NI 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

13. I consent to the filing of the Technical Report with any stock exchanges or other regulatory authority and any publication by them, including electronic publication in the public company files on the websites accessible by the public, of the Technical Report.

Dated this 23rd day of March, 2018

Signature of Jeffrey A. Jaacks, Ph.D., C.P.G.

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CERTIFICATE of AUTHOR

I, Raymond P. Spanjers do hereby certify that:

1.   I am currently engaged as a Geological Consultant.

2.   I am a graduate of the University of Wisconsin – Parkside with a Bachelor of Science in Earth Science (1977), and a Master of Science degree in Geology from North Carolina State University (1983).

3.   I am a Registered Member through the Society for Mining, Metallurgy & Exploration (SME), Number 3041730RM.

4.   I have practiced by profession in geology since 1980 and have 37 years of experience in mineral exploration, mining and mineral processing of industrial minerals.

5.   I have read the definition of "qualified person" set out in NI 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.

6.   I am responsible for the preparation of the report titled "NI 43-101 Technical Report Preliminary Economic Assessment for the Clayton Valley Project, Esmeralda County, Nevada," effective date, 15th June, 2017 (the "Technical Report"), with specific responsibility for Sections 1.2, 4.1, 4.2, 4.3, 5, 6, 7.1, 7.3, 7.4, 10.2, 10.4 and 23.

7.   I visited the Clayton Valley Project site on April 2, 2015.

8   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 for disclosure, and is not misleading.

9. I do not hold, nor do I expect to receive, any securities or any other interest in any corporate entity, private or public, with interests in the properties that are the subject of this report or in the properties themselves, nor do I have any business relationship with any such entity apart from a professional consulting relationship with the issuer, nor to the best of my knowledge do I have any interest in any securities of any corporate entity with property within a two (2) kilometer distance of any of the subject properties.

10. I am independent of Pure Energy Minerals according to the criteria stated in Section 1.5 of NI 43101.

11. I previously contributed to the preparation of the technical report on the Clayton Valley South project titled "Inferred Resource Estimate for Lithium. Clayton Valley South Project, Clayton Valley, Esmeralda County, Nevada, USA" dated July 17th, 2015.

12. I have read NI 43-101 and Form NI 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

13. I consent to the filing of the Technical Report with any stock exchanges or other regulatory authority and any publication by them, including electronic publication in the public company files on the websites accessible by the public, of the Technical Report.

Dated this 23rd day of March, 2018.

 /s/ Raymond P. Spanjers   (Signature)

 Signature of Qualified Person

            "Raymond P. Spanjers"

 Print name of Qualified Person

VALERIE J. SAWYER, RM-SME
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CERTIFICATE of AUTHOR

I, Valerie J. Sawyer do hereby certify that:

1. I am currently engaged as a Principal consultant by. SRK Consulting (U.S.), Inc., 1250 Lamoille Highway, Suite 520, Elko, Nevada 89801.

2. I am a graduate of the Michigan Technological University with a Bachelor of Science in Metallurgical Engineering (1981), and have practiced my profession continuously since 1981.

3. I am a Registered Member in good standing of the Society for Mining, Metallurgy, and Exploration, Member No. RM 4192564.

4. I have worked as a metallurgical engineer and environmental professional for a total of 36 years since my graduation from university; as an employee of a major mining companies, and several engineering companies.

5. I have read the definition of "qualified person" set out in NI 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.

6. I am responsible for the preparation of the report titled "NI 43-101 Technical Report Preliminary Economic Assessment for the Clayton Valley Project, Esmeralda County, Nevada," effective date, 15th June, 2017 (the "Technical Report"), with specific responsibility for Sections 1.8, 4.4, and 20.

7. I participated in a visit to the Clayton Valley Project site on November 3, 2016.

8 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.

9. I do not hold, nor do I expect to receive, any securities or any other interest in any corporate entity, private or public, with interests in the properties that are the subject of this report or in the properties themselves, nor do I have any business relationship with any such entity apart from a professional consulting relationship with the issuer, nor to the best of my knowledge do I have any interest in any securities of any corporate entity with property within a two (2) kilometer distance of any of the subject properties.

10.   I am independent of Pure Energy Minerals according to the criteria stated in Section 1.5 of NI 43101.

11.   I have read NI 43-101 and Form NI 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

12.   I consent to the filing of the Technical Report with any stock exchanges or other regulatory authority and any publication by them, including electronic publication in the public company files on the websites accessible by the public, of the Technical Report.

Dated this 23rd day of March, 2018.

This signature was scanned with the author's approval for exclusive use in this document; any other use is not authorized.

Signature of Qualified Person

"Valerie J. Sawyer"

Print name of Qualified Person

1 Summary

1.1 Introduction

Pure Energy Minerals Ltd. (PEM) commissioned Montgomery & Associates and Geochemical Applications International Inc. (GAII) of Denver, Colorado; MetNetH$_2$O of Peterborough, Ontario, Canada; Andeburg Consulting Services (ACSI) of Toronto, Canada; SRK of Elko, Nevada; and Ray Spanjers, an independent consulting geologist to prepare a Preliminary Economic Assessment (PEA) for its Clayton Valley Lithium Project (Project). This revised NI 43-101 Preliminary Economic Assessment Technical Report (Technical Report) summarizes the results of the PEA in accordance with National Instrument (NI) 43-101 Standards for Disclosure for Mineral Projects (NI 43-101).

PEM is a Canadian-registered mining company domiciled in Vancouver, British Columbia and publicly listed on the TSX Venture Exchange under the ticker symbol "PE", the OTCQB Marketplace under the ticker symbol "PEMIF" and the Frankfurt Börse under the ticker symbol "AHG1". PEM is a development-stage, pre-revenue lithium company primarily focused on a lithium project at Clayton Valley in Esmeralda County, Nevada.

This report provides technical information for the Project. PEM, through its indirect wholly-owned subsidiary Esmeralda Minerals LLC, controls, directly or through agreement, mineral leases on more than 10,600 hectares (ha) (26,300 acres [ac]) in the Clayton Valley in Esmeralda County, Nevada.

PEM intends to deploy a novel lithium recovery process, developed by Tenova Advanced Technologies (TAT or Tenova, formerly known as Tenova Bateman Technologies) and its partners (the Tenova Process), to recover lithium and produce lithium hydroxide monohydrate (LiOH·H$_2$O) without the need for conventional evaporation ponds. This approach has not yet been used at a commercial scale for the recovery of lithium from brine. As a result of this novel process, the consumptive use of water would be small compared to conventional processing. Most of the brine pumped from the aquifer would be returned and infiltrated into the basin. The proposed Tenova Process involves the conversion of the lithium in the Clayton Valley brines into a LiOH·H$_2$O product.

The selection of LiOH·H$_2$O as the product is driven by the requirements of potential customers, such as Tesla Motors, Inc. (Tesla), for use in the production of lithium-ion batteries. The hydroxide form of lithium is becoming more important in the Electric Vehicle (EV) market due to evolving cathode chemistries in lithium-ion batteries used to power EVs.

The Tenova process design is such that the lithium in the input brines can be converted to the LiOH·H$_2$O product without having to produce lithium carbonate as an intermediate step. Combined with the avoidance of the long evaporation cycle, this results in a much faster time to final product than conventional lithium brine mines (hours vs. months).

The annual capacity of the plant has been selected on the basis of 10,000 tonnes (approximately 11,000 tons) of lithium carbonate equivalent (LCE), which correlates to about 11,500 tonnes (approximately 12,500 tons) of LiOH·H$_2$O.

The overall lithium recovery of the plant is expected to be about 90 percent. This compares favorably to recoveries of 30 – 60 percent for conventional evaporation pond-based flowsheets.

1.2 Property Description and Location

The Project is located in central Esmeralda County, Nevada (Figure 1-1. Project Location) approximately halfway between Las Vegas and Reno.

The property consists of 1,085 lithium placer claims located in Clayton Valley. The placer claims are comprised of blocks to the south and north of Albemarle Corporation's existing lithium-brine operation. In their entirety, the claims controlled by PEM occupy approximately 106 km^2 (10,600 ha or 26,300 ac). All 1,085 claims are located on unencumbered public land managed by the federal Bureau of Land Management (BLM), and shown in Figure 1-2. Map of Claims Controlled by Pure Energy Minerals.

Figure 1-1. Project Location

Silver Peak and
Clayton Valley

Figure 1-2. Map of Claims Controlled by Pure Energy Minerals

Access to and across the site from Silver Peak is via a series of gravel/dirt roads. The main gravel roads that run south and southeast from Silver Peak into the project area are well maintained and easily accessible with a normal two-wheel drive (WD) vehicle. The minor gravel/dirt roads that criss-cross the property are typically not maintained and can require four-WD vehicles to negotiate safely, particularly after high winds have caused drifting sand to form on the roads.

Clayton Valley lies in a complex zone of disrupted structure between the northwest trending Sierra Nevada Mountain Range to the west, and the north-south trending Basin and Range province to the north and east. The valley has a total watershed area of 1,437 km^2 (555 mi^2) and the floor of the valley lies at an altitude of approximately 1,320 metres (4,320 feet) above sea level (ASL).

There is no permanent surface water in the Clayton Valley watershed, with the exception of the man-made evaporation ponds operated by Albemarle Corp. All watercourses are ephemeral and only active during periods of intense precipitation.

Clayton Valley has a generally arid to semi-arid climate, characterised by hot dry summers and cold winters. Precipitation is scattered throughout the year, with slightly more precipitation in late winter/early spring. The average potential evaporation rate for Esmeralda County exceeds the average annual precipitation, and on an annual basis as much as 95 percent of the total annual precipitation is lost through evaporation and transpiration.

1.3   Geology and Mineralization

Clayton Valley is in the Basin and Range Province in southern Nevada and is an internally drained, fault-bounded and closed basin. Basin-filling strata, asymmetrically thicker to the east, compose the aquifer system which hosts and produces the lithium-rich brine. Multiple wetting and drying periods during the Pleistocene resulted in the formation of lacustrine deposits, salt beds, and lithium-rich brines in the basin.

Except for the freshwater aquifers occurring in alluvial fans composed of coarse-grained sediments on the higher elevation flanks of mountain fronts, the primary aquifer system within the Clayton Valley basin, and in particular the area of the Resource Estimate, is composed of layered sequences of unconsolidated to semi-consolidated Quaternary playa (ephemeral lake) sediments and volcanic ash units. The playa deposits are predominantly fine grained, clastic sediments with some salt deposits and localized sand and gravel facies. Below these deposits is a basal conglomerate sequence, predominantly matrix supported pebble conglomerate, overlying bedrock composed of brecciated meta-siltstones and sandstones with partially silicified carbonates. Steeply dipping, normal faults largely control the basin geometry. Fault scarps on the

east side of the valley expose tuffaceous and lacustrine sediments (claystones and siltstones). Exposed bedding of older sedimentary units in this area dips gently toward the basin center.

The lithium resource is hosted as a solute in a predominantly sodium chloride brine. Dissolved constituents in the brine, such as lithium, originate from multiple processes of mineral dissolution and precipitation, remobilization, geothermal circulation, and evaporation occurring in the basin aquifer.

1.4   Exploration

Previous exploration at the Property was completed by Rodinia in 2009 and 2010 and by Pure Energy in late 2014 and early 2015. The current phase of exploration by PEM includes work conducted from late 2015 through June 15, 2017. The total work program completed at the Property to date has included:

- surface geophysics (gravity, seismic, and CSAMT/MT) for bedrock control, stratigraphic information, basin boundary conditions, and fluid salinity;

- drilling and sampling exploration boreholes (SPD-8 and SPD-9) for lithology and hydrochemistry;

- drilling, constructing, and sampling wells (CV-1 through CV-8) for lithology, hydrochemistry, and aquifer parameters;

- borehole geophysical logging (natural gamma, temperature, fluid conductivity, induction resistivity, sonic, caliper, deviation, NMR, well video) for lithologic features, hydrostratigraphy, and aquifer characteristics;

- multi-day pumping tests (CV-3, CV-7, and CV-8) for well production and aquifer parameters;

- bulk sampling and depth specific sampling for determining spatial variability of lithium; concentrations and other dissolved chemical constituents in the aquifer system;

- laboratory (RBRC) and borehole geophysics (NMR) measurements for estimating drainable porosity; and

- water level monitoring for determining direction of groundwater movement, hydraulic gradient, and aquifer characteristics.

Exploration results indicate the aquifer penetrated by the Clayton Valley exploration wells is a single, multi-layer, unconfined aquifer system. Hydrostratigraphy shows no clear correlations between well locations, such as pervasive thick clay sequences acting as a hydraulically confining unit or conversely, thick sand units with high permeability.

Typically at brine well locations, a shallow, fresher groundwater zone is first encountered, which is underlain by a transitional interface with increasing salt concentrations leading to consistent brine concentrations at depth. Brine concentrations at boreholes SPD-8 and SPD-9 were highest at SPD-9 and lowest at SPD-8. This relationship is consistent with results of logging and sampling conducted in the vicinity of these boreholes at exploration wells CV-1, CV-3, and CV-7. At those exploration wells, below the depth of the brine interface, lithium concentrations of discrete samples tend to increase with depth and bulk sampling showed no dilution during multi-day pumping tests.

Concentrations of lithium are highest at CV-1 and CV-3 and lowest at CV-7. Some variation in brine concentration was evident in borehole SPD-8 and well CV-2, where lithium concentrations appeared to show dilution in some of the deeper intervals sampled. This is interpreted to be the result of bounding structural faulting on the eastern edge of the basin allowing less saline groundwater to penetrate and dilute the brine aquifer along the basin margin. Similarly, deeper structural anomalies to the south of SPD-8 are believed to allow for brine dilution at CV-4, CV-5, and CV-6.

Water level data combined with barometric pressure response analysis indicate the aquifer conditions are hydraulically unconfined, displaying essentially water table conditions where the system is open to the atmosphere through permeable aquifer material. It is likely that deeper, fine-grained units may act locally to cause hydraulically "semi-confined" aquifer conditions; however, due to large intervals of well screen installed in the wells, these conditions have not been evident during testing and monitoring. Measurements to determine water level elevations show the direction of groundwater movement is from the southeast to the northwest, toward the lowest elevations of the playa basin floor and active lithium brine mining operations operated by Albemarle.

1.5   Mineral Resource Estimates

The Resource Estimate is based on the aquifer geometry, specific yield (Sy) of the aquifer, and the concentration of lithium in brine samples. Classification standards for a Mineral Resource are applied as indicators of confidence level categories as follows: Measured, Indicated, and Inferred. According to these classification standards, Measured is the most confident category and Inferred is the least confident category.

At the current stage of Project exploration, the Resource Estimate is at an Inferred mineral resource category for lithium. The Resource Estimate incorporates current data collected during three phases of

exploration performed in 2015 through 2017 and previous data from exploration performed by Rodinia Minerals, Inc. in 2009 and 2010.

The Resource Estimate is based on lithium brine grade in the host brine aquifer volume within PEM claim boundaries and its specific yield. The boundaries of the Resource Estimate are presently defined laterally north, east, and west by property claim boundaries controlled by PEM and in the subsurface by bedrock contacts. To the south, an east-west boundary is identified between SPD-8 and CV-4 based on brine sampling results and results of surface geophysical surveys. Vertically, the inferred resource brine volume extends from saturated basin-fill deposits at the brine interface to as deep as the bedrock contact at CV-8 (942 meters or 3,090 feet) or the bedrock surface (determined by seismic and gravity surveys), whichever is shallower. Representative lithium concentrations in brine samples for the boreholes used in the Resource Estimate model are categorized as follows: 22, 65, 132, and 221 mg/L. Lithium concentrations of less than 22 mg/L (cut-off grade) were excluded in the model of the Resource Estimate. Relatively higher concentration brine occurs on the northeastern side of the resource area and in the deeper extents of the basin. Lower grade brine, typically occurring in the shallower parts of the system and lateral boundaries, may represent brine diluted by brackish or fresh water.

The lithium concentration volumes are used to calculate the yield of drainable fluid obtained under gravity flow conditions from the interconnected pore volume of the aquifer for the Resource Estimate using an estimated Specific Yield of 6 percent. Table 1-1. summarizes the Resource Estimate for Lithium as lithium metal (Li), lithium hydroxide monohydrate (LiOH·H_2O) and lithium carbonate equivalent (LCE) at the Inferred category.

Table 1-1. Inferred Resource Estimate for Lithium

	Average Lithium Concentration in Brine Volume (mg/L)	Brine Volume (m^3) x 10^3	Average Specific Yield	Drainable Brine Volume (m^3) x 10^3	Lithium (kTonnes)	LiOH·H_2O (kTonnes)	LCE (kTonnes)
Resource Volumes by Average Lithium Concentration	22	550,600	0.06	33,040	0.7	4.39	3.87
	65	2,424,000	0.06	145,400	9.5	57.16	50.32
	132	579,200	0.06	34,750	4.6	27.73	24.41
	221	1,971,000	0.06	118,200	26.1	158.00	139.09
Total	**123**	**5,524,000**	**0.06**	**331,500**	**40.9**	**247.3**	**217.7**

Notes:

1) The concentration and mass estimates represent the Inferred Resource of elemental lithium prior to pumping. To obtain the resource tonnage expressed as LiOH·H_2O and LCE, the estimated mass of lithium was multiplied by a factor that is based on the atomic weights of each element in lithium hydroxide monohydrate and lithium carbonate to obtain the final compound weight. The conversion factor from lithium to LCE is 5.322785. The conversion factor from lithium to LiOH·H_2O is 6.046398.

2) The average lithium concentration is based on the final calculated lithium mass and drainable volume. Brine with inferred lithium concentrations below the cutoff grade of 22 mg/L was not included in the resource calculation.

3) The Resource Estimate is for claims controlled by PEM, based on an effective date of June 15, 2017

4) Comparisons of values in the table may differ due to rounding and averaging methods.

5) Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability.

6) The preliminary economic assessment is preliminary in nature and includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the preliminary economic assessment will be realized.

The Resource Estimate totals 40,900 tonnes (45,085 tons) of elemental lithium. This can also be represented as 217,700 tonnes (240,000 tons) on an LCE basis or 247,300 tonnes (272,600 tons) as LiOH·H_2O. The average lithium concentration is 123 mg/L based on the calculated lithium mass and the theoretical drainable volume of the host brine aquifer. A substantial part of the brine volume falls between concentrations of 65 mg/L and 221 mg/L lithium.

The updated Resource Estimate represents a substantial decline from the reported maiden Resource Estimate. The main components of the reduction are a smaller surface area projection of the resource and a lower estimated specific yield. These factors are partially offset by a significant increase in the depth and thickness of the brine resource and the addition of higher lithium grades at depth. Although a significant area in the south part of the Project was excluded based on negative brine concentration results in the

updated Resource Estimate, there remains significant exploration potential at depth to the south based on analyses of brine from CV-8 and seismic results, and in newly acquired properties to the north.

1.6 Mining

Economic extraction of lithium brine requires favorable hydrogeological conditions within the deposit, including: (1) sufficient saturated thickness of the brine aquifer; (2) sufficient hydraulic conductivity and drainable porosity within the brine aquifer; and (3) sufficient levels of brine concentrations of lithium during the mine life to offset eventual dilution of the deposit. Site characterization efforts as part of the forthcoming Feasibility Study will focus on gathering data to better assess these hydrogeological conditions.

Mine planning includes construction and operation of an extraction wellfield to extract brine from the aquifer. The extraction wells would be drilled and constructed in order to optimize brine production rates and lithium concentrations. The forthcoming Feasibility Study will include assessment of the mining method for extracting lithium brine from the aquifer using numerical modeling methods and optimizing lithium concentrations and extraction pumping from a potential wellfield in order to further support Mineral Resources and Mineral Reserve Estimates.

1.7 Processing

The proposed Tenova Process would use unit operations related to technologies already in use in industrial practice. The Tenova circuit design is such that lithium in the input brines can be converted to $LiOH \cdot H_2O$ without having to produce lithium carbonate as an intermediate step.

The combination of these unit operations represents a novel flowsheet that has not yet been used to extract and process lithium from brines at a commercial scale. After preliminary laboratory-scale testwork, the Tenova process was evaluated for the Clayton Valley project in a mini-pilot test using a synthetic brine prepared to match the composition and properties of Clayton Valley brine.

The application of these unit operations in this sequence and for the recovery of lithium are what would make the Clayton Valley Project the first of its kind. This is especially important for Clayton Valley because it would enable lithium recovery from relatively low grade feed brines, as compared with the typical South American high grade feed brines as well as significantly reducing the environmental footprint of the recovery operation as compared to conventional evaporation technology. The relatively low levels of calcium and magnesium (and other potentially deleterious elements) in the Clayton Valley brine are also favorable indicators for lower membrane operating costs, compared to other brines tested with the pre-treatment (LiP™) part of the Tenova Process.

The overall process would consist of the following steps:

1. Brine Reception;

2. Pre-Treatment - LiP™ process;

3. pH elevation and Polishing;

4. Solvent Extraction - LiSX™ process;

5. Electrolysis - LiEL™ process;

6. Evaporation and Crystallization;

7. Product Drying, Handling and Shipping.

The basin brines would be collected and pumped to the brine reception area. The pre-treatment stage (LiP™) would, as efficiently as possible, isolate the alkaline earth metal ions in a concentrate stream while maximizing the recovery of lithium ions to an advancing process stream. Elevating the pH of the permeate would precipitate any remaining calcium and magnesium ions. These calcium and magnesium precipitates would be removed using a clarification and / or filtration stage.

The LiSX™ solvent extraction step would incorporate the Tenova Pulsed Columns in each of extraction, scrubbing and stripping sections. The LiSX™ step is anticipated to increase the lithium concentration by a factor of approximately 38 with negligible loss of lithium as well as to selectively separate lithium from other monovalent cations which are present in much greater concentration in the feed. The design allows for the installation of an ion exchange circuit after the LiSX™ stage to remove any contaminant ions that may also have been co-extracted with lithium, even in trace amounts, and concentrated by the solvent extraction step.

Through a process of electrolysis designated LiEL™, the lithium sulphate recovered in the preceding solvent extraction step would be transformed into a pure lithium hydroxide solution. The lithium hydroxide solution would be converted to solid LiOH·H_2O by driving off the free water through evaporative crystallization. The crystallized lithium hydroxide monohydrate would be dried and bagged for shipment. Based on the results of the mini-pilot plant, the overall lithium recovery of the plant from feed brine to crystal product is expected to be about 90 percent. This is an exceptionally high recovery compared with conventional solar evaporation-based plants which typically struggle to achieve 60 percent recovery, even when starting with brines that contain significantly higher lithium grades.

Potential process risks relate primarily to the uncertainties inherent in the application of a novel technology and in the level of testwork performed at the PEA level of this report. Examples of such risks and uncertainties include:

- Performance over an extended period of time of the individual unit processes;

- Potential buildup of deleterious elements at different points in the flowsheet;

- The effects of integration of internal process recycle streams and the effect over longer term of such recycles;

- Reagent consumption that may differ from that observed during the mini-pilot test;

- Metallurgical recovery that may differ from that measured during the mini-pilot test;

- Scalability of the flowsheet to a commercial plant.

Some risks also offer opportunities for improving efficiency and economics, such as reduced reagent consumption or improved metallurgical recovery.

1.8   Environmental and Permitting

There are currently no known environmental conditions associated with the Clayton Valley Project. Cultural resources are generally minimal on the playas, and the probability of the presence of threatened and endangered faunal or floral species is considered low. Limited liabilities remain from the reclamation obligations associated with the current exploration program(s).

From a permitting perspective, the hydrographic basin was designated as in need of additional administration in early 2016 by the Nevada State Engineer. Whether this designation would have material implications on PEM's ability to obtain the necessary water rights to develop the resource into a reserve, and ultimately, produce lithium, is unknown at this time. Because lithium, a locatable mineral under the U.S. General Mining Act of 1872, is dissolved in non-potable water beneath the ground surface, different and competing legal opinions exist regarding whether state water law should limit PEM's ability to explore for lithium, obtain water rights, or develop its federal mining claims. Proceedings with the Nevada Division of Water Resources and in Nevada District Court regarding these interpretations are currently underway.

The Project is located primarily on unpatented federal mineral claims within Esmeralda County, Nevada. The federal claims encompass public lands administered by the BLM and the facilities would be located on private land. The project, therefore, falls under the jurisdiction and permitting requirements of Esmeralda

County, the State of Nevada (primarily the Nevada Division of Environmental Protection (NDEP) and the Nevada Division of Water Resources (NDWR), also known as the State Engineer's office), and the BLM.

The Nevada State Engineer's administration of water rights and waivers for exploration has been delayed by the protests and lobbying activities of competing mining companies. These actions have delayed issuance to PEM of water rights permits and waivers to drill wells and divert water therefrom. The recent passage of Nevada Assembly Bill 52 holds promise to streamline the process of exploration for lithium brine, but the impacts of these various issues on permitting and construction of a lithium mine must be considered.

1.9   Pricing Forecast

At its steady-state production rate, the Clayton Valley Project ("CV Project") is designed to produce approximately 11,500 tonnes per year (12,500 tons per year) of LiOH·H_2O primarily for use in lithium-ion batteries for EVs. Analysts' consensus forecasts indicate that the increase in worldwide EV sales is expected to drive annual growth in lithium demand for these applications to more than 20 percent per annum through 2025.

Pure Energy's independent lithium market consultant, Benchmark Mineral Intelligence ("Benchmark"), anticipates that lithium hydroxide demand will grow considerably in the next five years, as EVs increasingly use nickel-cobalt-aluminum ("NCA") cathode chemistries to achieve higher energy density and extend range between charges. Benchmark forecasts that annual demand for lithium hydroxide will grow at a compound average rate of more than 23 percent from 2016 through 2025.

On the supply side, Benchmark estimates that lithium hydroxide production accounted for approximately 20% of global lithium chemical production in 2016, or around 39,000 tonnes. Based on company announcements and its professional judgment on when announced company plans might actually materialize, Benchmark estimates that the annual world supply of lithium hydroxide will grow from 39,000 tonnes (42,990 tons) in 2016 to almost 135,000 tonnes (148,812 tons) in 2024-2025.

In the context of Benchmark's global supply-demand balance for lithium hydroxide, substantial price increases over the past 12-18 months are stimulating a significant supply-side response, but long-lead times to production and relative lack of sufficient lithium feed materials are expected to keep the overall market in a relatively tight balance until the mid-2020's, when steadily growing demand is again expected to outstrip planned capacity.

The projected lithium hydroxide prices used in the economic analysis of the CV Project were developed by Benchmark in conjunction with their supply and demand forecast. As illustrated in Figure 1-3. Outlook for

lithium hydroxide prices, 2017-2040, below, Benchmark developed three scenarios for the period 2017-2040 – a base price forecast, a conservative (downside) price case and a bullish (upside) price scenario. All three price scenarios are projected from an average 2016 lithium hydroxide price of US$12,683/tonne. The summary PEA economics described in this report and announced in the PEM press release dated June 26th, 2017 were based on the base price forecast.

Figure 1-3. Outlook for lithium hydroxide prices, 2017-2040

Source: Benchmark Mineral Intelligence, Lithium Hydroxide Market Forecast, April 2017

1.10 Capital Cost Estimate

A capital cost estimate was developed for a process plant with an annual capacity of 10,000 tonnes (approximately 11,000 tons) of LCE, which correlates to about 11,500 tonnes (approximately 12,500 tons) of LiOH·H$_2$O. The estimate is regarded as a Class 5 estimate, as defined by the AACE International and has an accuracy of +30/-20 percent. The capital expenditure (Capex) estimate includes costs associated with the development of basin extraction systems, processing plant, administrative and maintenance infrastructure, and associated indirect costs. Table 1-2 summarizes the total estimated capital costs, including contingency.

Table 1–2. Estimated Capital Costs

Description of Capital Costs	US $
Basin Activities	$ 29 M
Plant Facilities & Equipment	$ 100 M
Infrastructure & Utilities	$ 30 M
Direct Costs	**$ 159 M**
Indirect Costs	$ 28 M
Contingency	$ 56 M
Owner's and Other Costs	$ 54 M
Total Initial Capital Costs	**$ 297 M**
Sustaining Capital Costs (LoM)	$ 62 M

1.11 Operating Cost Estimate

Operating costs (Opex) were determined based on the production schedule, process equipment requirements, operating hours, equipment operating costs, and Project labour force requirements. The operating costs are considered to have an accuracy of ± 30 percent. For the purpose of the economic analysis, the operating costs were separated into the following categories: labour; power; operating supplies & services, and maintenance. Table 1-3. Summary of Operating Costs for 10,000 tonne / year LCE, provides a summary of the operating costs.

Table 1-3 Summary of Operating Costs for 10,000 tonne / year LCE

	Operating Costs $/tonne LCE	Percent
Labour	$485	13%
Power	$447	12%
Operating Supplies & Services	$2,528	69%
Maintenance supplies	$192	5%
Total	**$3,652**	**100%**

	Operating Costs $/tonne LiOH.H$_2$O	Percent
Labour	$428	13%
Power	$394	12%
Operating Supplies & Services	$2,227	69%
Maintenance supplies	$169	5%
Total	**$3,217**	**100%**

1.12 Economic Analysis

The economic analysis and the PEA described in this Technical Report are based on inferred resources, which are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. The PEA is preliminary in nature, and there is no certainty that the PEA will be realized. See Section 22.2 – Economic Model Parameters for a discussion of the key parameters and assumptions used in the preparation of the economic analysis.

An economic analysis was conducted to determine the net present value (NPV) and internal rate of return (IRR) of the Project. The analysis was completed using a Discounted Cash Flow model. The analysis was based on average annual production of 10,300 tonnes (11,350 tons) per year of LiOH·H$_2$O. The economic indicators determined are presented in Table 1-4. Economic Analysis Results. The pre-tax and after-tax NPV at an 8 percent discount rate was US$ 356.8 million and US$ 264.1 million, respectively; with a respective pre-tax and after-tax IRR of 24 percent and 21 percent. The payback period is estimated at 4.4 years from first production of saleable product.

Table 1-4. Economic Analysis Results

Financial Metric	Pretax Values	After-Tax Values
NPV at 8%	$356.8 million	$264.1 million
IRR	24.2 %	21.0 %
Payback period, years (after commencement of operations)	4.1 years	4.4 years

A sensitivity analysis was completed for the Project economics to determine which variable(s) had the greatest impact on the Project economics. The results are presented in Figure 1-4. After-Tax Sensitivity Chart.

Figure 1-4. After-Tax Sensitivity Chart
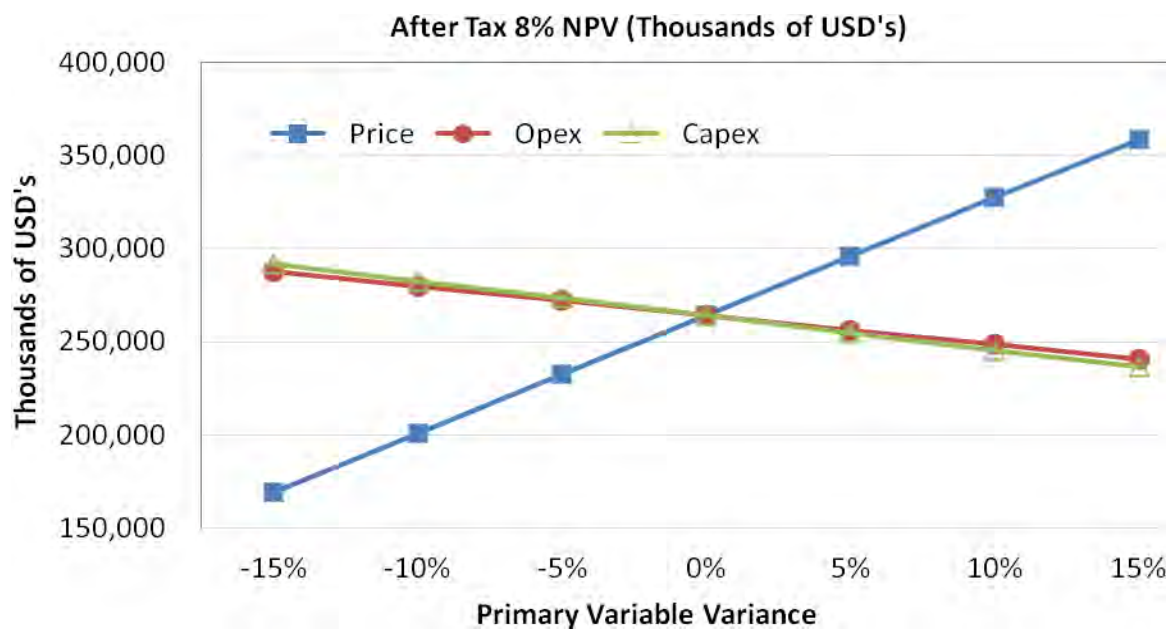
1.13 Conclusions

The Clayton Valley Lithium Project is a lithium-enriched brine aquifer deposit in Clayton Valley, Nevada, USA that is amenable to mining using wells to extract brine for processing to a saleable lithium hydroxide monohydrate ($LiOH \cdot H_2O$) product. The process plant design is a novel approach based on the TAT

proprietary process to produce LiOH·H$_2$O from the brine input as received from PEM for the mini-pilot test work. This approach has not yet been used to extract and process lithium from brines at a commercial scale. The annual capacity of the plant has been selected on the basis of 10,000 tonnes (approximately 11,000 tons) of lithium carbonate equivalent (LCE), which correlates to about 11,500 tonnes (approximately 12,500 tons) of LiOH·H$_2$O.

The Resource Estimate in the Inferred category is estimated at 247,300 tonnes (272,600 tons) of lithium contained as LiOH·H$_2$O and 217,700 tonnes (239,970 tons) on an LCE basis. The average lithium concentration is 123 mg/L in the volume of the Resource Estimate, based on the calculated lithium mass and the theoretical drainable volume of the host brine aquifer. A substantial part of the brine volume falls between concentrations of 65 mg/L and 221 mg/L lithium.

The study projects an estimated average "steady-state" operating cost of $3,217 per tonne of LiOH·H$_2$O and product sale pricing ranging between $9,000 and $16,500 per tonne. Having these margins and an estimated initial capital cost of $297 million, the project would achieve pay-back in just over 4 years. The project after-tax NPV at an 8 percent discount rate is forecast to be US$ 264.1 million, with an estimated IRR of 21 percent.

The economic analysis and the PEA described in this Technical Report are based on inferred resources, which are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. The PEA is preliminary in nature, and there is no certainty that the PEA will be realized.

1.14 Recommendations

It is the opinion of the authors that the results of this study warrant continued efforts to advance PEM's Clayton Valley Lithium Project. The authors believe that the content of this PEA is sufficient to justify proceeding with the additional drilling to upgrade the Resource Estimate, the process pilot plant program, the permitting for both the pilot plant & the commercial plant, and the preparation of a Feasibility Study.

The authors recommend the following work be undertaken to support further project development:

- Drilling, sampling, well construction and testing, at depth in areas in the vicinity of SPD-8, northwest of CV-8, and on newly acquired properties west of CV-8, to upgrade the Resource Estimate to Indicated and Measured categories and eventually to an Extractable stage leading to a Proven or Probable Mineral Reserve estimate;

- Update the geologic block model with data collected during the exploration field activities described above. The updated geologic block model should be used to project an updated Resource Estimate at the Indicated and Measured category and provide the framework for a numerical model to simulate lithium brine mining operations to support a Mineral Reserve Estimate;

- Construct and operate a numerical flow, solute transport, and fluid density model to support a Mineral Reserve Estimate. This model should include:

  o Optimization of a planned extraction wellfield and pumping schedule for further development of the mining method (e.g., phased wellfield build-out zones, phased pumping strategies, etc.);

  o Assessment of the potential changes in brine mineral concentrations during long-term pumping of a brine extraction wellfield and operation of infiltration basins for spent brine.

- Integrated pilot plant testwork to confirm the TAT mini-pilot plant results, mitigate process-related risks, and develop design information for a commercial, full-scale processing facility. Objectives of the pilot plant would include:

  o To confirm the performance of individual unit processes (LiP^{TM}, LiSX^{TM} and LiEL^{TM}), at a demonstration scale, in cooperation with Tenova's technology partners GE and Noram;

  o To demonstrate continuous operation of the complete process flowsheet at a larger scale and identify and address issues relating to the integration of the different process modules;

  o To identify and address issues relating to scalability to a commercial plant;

  o To determine and provide first hand evidence of the chemistry of the aqueous raffinate (the calcium and magnesium salts as well as the lithium-depleted brine) so that its suitability for return to the basin can be confirmed;

  o To identify and mitigate potential deleterious species that may build up at different points in the process flowsheet;

  o To confirm reagent and solvent consumption and energy requirements, and to identify opportunities for improvement in overall cost of consumable materials;

o To identity opportunities for improvement in process kinetics and/or operating costs;

o To develop information regarding operating parameters and data needed for design of a commercial-scale plant; and

o To produce sufficient quantities of battery grade lithium hydroxide to provide potential customers with enough material to confirm that it meets their specifications and requirements.

• Field work to support the permitting process for both the pilot plant and the commercial plant.

• The preparation of a Feasibility Study.

Table 1-5. Estimated Costs for the Feasibility Study Stage summarizes the estimated costs to accomplish the recommendations above.

Table 1-5. Estimated Costs for the Feasibility Study Stage

Activity	Estimated Cost ($)
Pilot Plant Design, Supply and Construction	6,000,000
Operation of Pilot Plant (6 months)	4,000,000
Permitting	1,500,000
Additional Drilling	2,100,000
Hydrogeological Modeling	200,000
Hydrogeology Costs	500,000
Process Plant Modeling	100,000
Preparation of Feasibility Study	1,800,000
Preparation of NI 43-101 Technical Report	200,000
Owner's Costs	1,600,000
Total Estimated Costs =	**18,000,000**

These costs have been included in the capital cost estimate.

2 Introduction

2.1 General

PEM is a Canadian-registered mining company domiciled in Vancouver, British Columbia and publicly listed on the TSX Venture Exchange under the ticker symbol "PE", the OTCQB Marketplace under the ticker symbol "PEMIF" and the Frankfurt Börse under the ticker symbol "AHG1". PEM is a development-stage, pre-revenue lithium company primarily focused on a lithium project at Clayton Valley in Esmeralda County, Nevada.

This revised report provides technical information for the Project. PEM, through its indirect wholly-owned subsidiary Esmeralda Minerals LLC, controls directly or through agreement mineral leases on more than 10,643 hectares (ha) (26,300 acres) in the Clayton Valley in Esmeralda County, Nevada.

PEM intends to deploy a novel lithium recovery process, developed by TAT and its partners (the Tenova Process), to recover lithium and produce lithium hydroxide monohydrate (LiOH·H_2O) without the need for conventional evaporation ponds. As a result, the consumptive use of water would be small compared to conventional processing. Most of the brine pumped from the aquifer would be returned and infiltrated into the basin. The proposed Tenova Process involves the conversion of the lithium in the Clayton Valley brines into a LiOH·H_2O product.

The selection of lithium hydroxide monohydrate as the product is driven by the requirements of potential customers, such as Tesla Motors, Inc. (Tesla), for use in the production of lithium-ion batteries. The hydroxide form of lithium is becoming more important in the Electric Vehicle (EV) market due to evolving cathode chemistries in lithium-ion batteries used to power EVs.

The circuit design is such that the lithium in the input brines can be converted to the LiOH·H_2O product without having to produce lithium carbonate as an intermediate step. Combined with the avoidance of the long evaporation cycle, this results in a much faster time to final product than conventional lithium brine mines (hours vs. months).

The annual capacity of the plant has been selected on the basis of 10,000 tonnes (approximately 11,000 tons) of LCE which correlates to about 11,500 tonnes (approximately 12,500 tons) of LiOH·H_2O.

The proposed Tenova Process would use unit operations related to technologies already in use in industrial practice. The application of these unit processes in this sequence and for the recovery of lithium are what could make the Clayton Valley project a first-of-a-kind. This is especially important for Clayton Valley

because it would enable lithium recovery from relatively low grade feed brines as compared with the typical South American high grade feed brines.

The overall lithium recovery of the plant is expected to be about 90 percent. This compares favorably to recoveries of 30 – 60 percent for conventional evaporation pond-based flowsheets.

2.2   Purpose and Terms of Reference

PEM retained Montgomery & Associates and Geochemical Applications International Inc. (GAII) of Denver, Colorado; MetNetH$_2$O of Peterborough, Ontario, Canada, Andeburg Consulting Services (ACSI) of Toronto, Canada; SRK of Elko, Nevada; and Ray Spanjers, an independent consulting geologist, to provide input to the PEA for the potential development and operation of a lithium processing plant at the Project.

2.3   Project Team, Responsibilities, and Personal Inspection

The following people served as the Qualified Persons (QPs) as defined in NI 43-101, Standards of Disclosure for Mineral Projects, and in compliance with Form 43-101F1:

- Dr. Ron Molnar, Ph.D., P. Eng. (MetNetH$_2$O) is the QP responsible for the mineral processing, metallurgical testing, and recovery methods;

- Mr. Ray Spanjers, RM-SME is the qualified person responsible for the property description, the history, the geological setting and the adjacent properties;

- Ms. Valerie Sawyer, P.E., (SRK Consulting) is the qualified person responsible for the environmental and permitting sections of the report;

- Mr. Daniel S. Weber, RM-SME (Montgomery) is the qualified person responsible for the resource estimate, summary of sources of information, and descriptions of reliance on other experts;

- Dr. Jeff Jaacks, Ph.D., C.P.G., (GAII) is the qualified person responsible for the sample preparation and security and the data verification sections;

- Mr. Ernie Burga, P. Eng. (ACSI) is the qualified person responsible for the mining methods and infrastructure, capital cost and operating cost estimates, and the economic analysis.

The dates of the site visits conducted by the QPs are listed in Table 2-1 Qualified Persons. This information is presented in more detail in Table 2-2 Report Sections of Responsibility.

Table 2-1. Qualified Persons

QPs	Designation	Company	Most Recent Site Visit	Initials
Ron Molnar	Ph.D., P. Eng	MetNetH$_2$O	None	RM
Ray Spanjers	RM-SME	Independent Consultant	April 2nd, 2015	RS
Valerie Sawyer	P.E.	SRK	November 3rd, 2016	VS
Dan Weber	RM-SME	Montgomery & Associates	December 6th, 2016	DW
Jeff Jaacks	Ph.D., C.P.G.,	Geochemical Applications International Inc.	December 8th, 2016	JJ
Ernie Burga	P. Eng	Andeburg Consulting Services	November 3rd, 2016	EB

Dr. Molnar has not visited the Clayton Valley project site. His areas of expertise and responsibility encompass mineral processing, metallurgical testing, and recovery methods. The assessments of these items are not dependent on visiting the project location. Dr. Molnar visited the TAT facility in Katzrin, Israel from June 1, 2016 through June 15, 2016 to observe the mini-pilot testing of the proposed Tenova lithium recovery process.

The authors of the various sections are identified in Table 2-2. Report of Sections of Responsibility. Each QP is responsible for sections of the report as outlined in Table 2-3. Report Sections by Author. Certificates for each QP are included in this Technical Report.

Table 2-2. Report Sections of Responsibility

	Section	Title of Section	QP
1	**SUMMARY**		
	1.1	Introduction	Dan Weber
	1.2	Property Description And Location	Ray Spanjers
	1.3	Geology And Mineralization	Dan Weber
	1.4	Exploration	Dan Weber
	1.5	Mineral Resource Estimates	Dan Weber
	1.6	Mining	Dan Weber
	1.7	Processing	Ron Molnar
	1.8	Environmental And Permitting	Val Sawyer
	1.9	Pricing Forecast	Ernie Burga
	1.10	Capital Cost Estimate	Ernie Burga
	1.11	Operating Cost Estimate	Ernie Burga
	1.12	Economic Analysis	Ernie Burga

Section	Title of Section	QP
1.13	Conclusions	Dan Weber
1.14	Recommendations	Ron Molnar
2	**INTRODUCTION**	Dan Weber
3	**RELIANCE ON OTHER EXPERTS**	Dan Weber
4	**PROPERTY DESCRIPTION AND LOCATION**	
4.1	PROPERTY LOCATION	Ray Spanjers
4.2	PROPERTY DESCRIPTION	Ray Spanjers
4.3	PROPERTY MINING CLAIMS	Ray Spanjers
4.4	PROPERTY ENVIRONMENTAL LIABILITIES	Val Sawyer
5	**ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY**	Ray Spanjers
6	**HISTORY**	Ray Spanjers
7	**GEOLOGICAL AND HYDROGEOLOGICAL SETTING**	
7.1.	GEOLOGICAL SETTING	Ray Spanjers
7.2	HYDROGEOLOGICAL SETTING	Dan Weber
7.3	BRINE GEOCHEMISTRY AND SOURCES OF LITHIUM	Ray Spanjers
7.4	MINERALISATION	Ray Spanjers
8	**DEPOSIT TYPES**	Dan Weber
9	**EXPLORATION**	Dan Weber
10	**DRILLING**	
10.1	INTRODUCTION	Dan Weber
10.2	PREVIOUS DRILLING PROGRAMS	Ray Spanjers
10.3	CURRENT DRILLING PROGRAMS	Dan Weber
10.4	PREVIOUS TESTING PROGRAMS	Ray Spanjers
10.5	CURRENT TESTING PROGRAMS	Dan Weber
11	**SAMPLE PREPARATION, ANALYSES AND SECURITY**	
11.1	INTRODUCTION	Dan Weber
11.2	BOREHOLES SPD-8 AND SPD-9	Dan Weber
11.3	WELLS CV-1 THROUGH CV-8	Dan Weber
11.4	LABORATORY DRAINABLE POROSITY MEASUREMENTS	Dan Weber
11.5	BRINE SAMPLING	Dan Weber
11.6	ANALYTICAL METHODS	Jeffrey Jaacks
11.7	QUALITY CONTROL	Jeffrey Jaacks
11.8	QUALITY CONTROL PROGRAM CONCLUSIONS	Jeffrey Jaacks

SECTION 2

Section		Title of Section	QP
12	**DATA VERIFICATION**		Jeffrey Jaacks
13	**MINERAL PROCESSING AND METALLURGICAL TESTING**		Ron Molnar
14	**MINERAL RESOURCE ESTIMATES**		Dan Weber
15	**MINERAL RESERVE ESTIMATE**		Dan Weber
16	**MINING METHODS**		
	16.1	OVERVIEW	Dan Weber
	16.2	BASIN AND FACILITY LOCATION	Dan Weber
	16.3	MINING METHOD SELECTION	Dan Weber
	16.4	CONSIDERATIONS FOR WELL OPERATIONS	Ernie Burga
	16.5	EXTRACTION PHASING	Ernie Burga
	16.6	WELL FIELD EQUIPMENT	Ernie Burga
	16.7	CONCLUSION AND RECOMMENDATIONS	Ernie Burga
17	**RECOVERY METHODS**		Ron Molnar
18	**PROJECT INFRASTRUCTURE**		Ernie Burga
19	**MARKET STUDIES AND CONTRACTS**		Ernie Burga
20	**ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT**		Val Sawyer
21	**CAPITAL AND OPERATING COSTS**		Ernie Burga
22	**ECONOMIC ANALYSIS**		Ernie Burga
23	**ADJACENT PROPERTIES**		Ray Spanjers
24	**OTHER RELEVANT DATA AND INFORMATION**		
	24.1.	PROJECT SCHEDULE	Ernie Burga
	24.2	OPPORTUNITIES	Ron Molnar
	24.3	PROJECT RISKS	Ron Molnar
25	**INTERPRETATION AND CONCLUSIONS**		Dan Weber
26	**RECOMMENDATIONS**		Dan Weber
	Items 1,2,3, and 5		Dan Weber
	Items 4 and 6		Ron Molnar
	Table 26.1		Ernie Burga

Section	Title of Section	QP
27	**REFERENCES**	Dan Weber
28	**GLOSSARY**	Dan Weber

Table 2-3. Report Sections by Author

Author	Section Numbers										
Ron Molnar	1.7	1.14	13	17	24.2	24.3	26(4,6)				
Dan Weber	1.1	1.3	1.4	1.5	1.6	1.13	2	3	7.2	8	9	10.1
	10.3	10.5	11.1	11.2	11.3	11.4	11.5	14	15	16.1	16.2	16.3
	25	26(1-3,5)	27	28							
Ernie Burga	1.9	1.10	1.11	1.12	16.4	16.5	16.6	16.7	18	19	21	22
	24.1	Table 26.1									
Ray Spanjers	1.2	4.1	4.2	4.3	5	6	7.1	7.3	7.4	10.2	10.4	23
Jeff Jaacks	11.6	11.7	11.8	12							
Val Sawyer	1.8	4.4	20								

2.4   Sources of Information

The information presented in this Technical Report has been derived from a variety of studies and fieldwork completed by consultants on behalf of PEM for the development of the Project. A complete list of references is included in Section 27. Selected information contained in this Technical Report was compiled from the sources and documents listed below.

In their professional judgement, the authors have reviewed the information and data used in this Technical Report and have taken appropriate steps to ensure that the information and data are sound for the purpose of this Technical Report.

Montgomery & Associates have utilised the following sources of information:

- Drilling reports and logs prepared by field geologists

- Surface and downhole geophysical survey reports from independent contractors

- Geophysical laboratory reports from independent contractors

- Geotechnical laboratory reports from independent contractors

- Analytical reports from independent chemical laboratories.

- Spreadsheet of anticipated pumping rates from PEM

MetNetH$_2$O has utilised the following sources of information:

- Tenova Advanced Technologies (TAT) of Yokneam, Israel for the mini-pilot plant testwork. TAT in turn utilised information from:

  o GE Water & Process Technologies (GE) for certain portions of the membrane testwork

  o Noram Engineering and Constructors Ltd. (Noram) for certain portions of the electrolysis testwork

A spreadsheet of the Economic Model used for the development of Section 22 – Economic Analysis, was developed by Lilburn & Associates.

2.5   Units of Measure & Currency

Unless stated otherwise, the primary units of measure reported here are the SI / metric units (e.g., tonne); the corresponding approximate United States (US) Customary units (e.g. tons) are given in brackets for convenience. To provide consistency, the comma has been used as the thousands separator for numbers in both the metric and the US Customary units. To avoid confusion, the use of the thousands space separator has not been used.

The currency used throughout the Report is the United States dollar.

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3 Reliance on Other Experts

The authors have relied on reports, opinions, or statements prepared by others as described below.

Claim Ownership

Walter Weinig, Vice President of Projects and Permitting for PEM provided legal information regarding claim ownership. This information was used to prepare sections 4.2 and 4.3.

Market Study

Pricing information for lithium hydroxide monohydrate, the commodity that is the subject of this PEA, is not publically available. Benchmark Mineral Intelligence ("Benchmark") provided information regarding pricing of $LiOH \cdot H_2O$ in a report dated April 2017. Benchmark is a firm dedicated to providing market information related to the battery industry. A prime factor in selecting Benchmark was the firm's active efforts to maintain regular "on-the-ground" contacts with its global network of battery manufacturers, lithium producers, intermediate processors and end-users.

Information provided by Benchmark was used to prepare sections 19.1, 19.2, 19.3, and 19.5. Price forecasts provided in the Benchmark report were also incorporated into section 22.2. Section 19.5 includes three price forecasts to address potential risks and uncertainties in the market study.

Taxes and Royalties

Pure Energy provided guidance on applicable taxes and royalties, relevant to revenue or income from the Project. This information was used in section 22.

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4 Property Description and Location

4.1   Property Location

The Clayton Valley Property is located in central Esmeralda County, Nevada, see Figure 4-1. Project Location, approximately halfway between Las Vegas and Reno.

Figure 4-1. Project Location

Silver Peak and
Clayton Valley

The nearest town is Silver Peak, which lies approximately 5 km (3 miles) to the northwest. Access to Silver Peak is from Highway 265, which is a regional road that links Silver Peak to Highway 95. Highway 95 is the main road that links Las Vegas to Reno, and the site is equidistant to both main cities (approximately 270 km [170 miles] from each main city). Silver Peak is approximately 61 km (38 miles) from Tonopah, which is the regional commercial centre, and approximately 45 km (28 miles) from Goldfield, which is the County Seat of Esmeralda County. Access to and across the site from Silver Peak is via a series of gravel/dirt roads. The geographic coordinates at the approximate centre of the property are 37° 41' 00" N by 117° 36' 30" W.

4.2   Property Description

The property consists of 1,085 lithium placer claims located in the southern half of Clayton Valley. The placer claims are comprised of blocks to the south and north of the Albemarle property. In their entirety, the claims controlled by PEM occupy approximately 106 km^2 (10,600 ha or 26,300 acres). All 1,085 claims are located on unencumbered public land managed by the United States (U.S.) Bureau of Land Management (BLM), and shown in Figure 4-2. Map of Claims Controlled by Pure Energy Minerals.

Figure 4-2. Map of Claims Controlled by Pure Energy Minerals
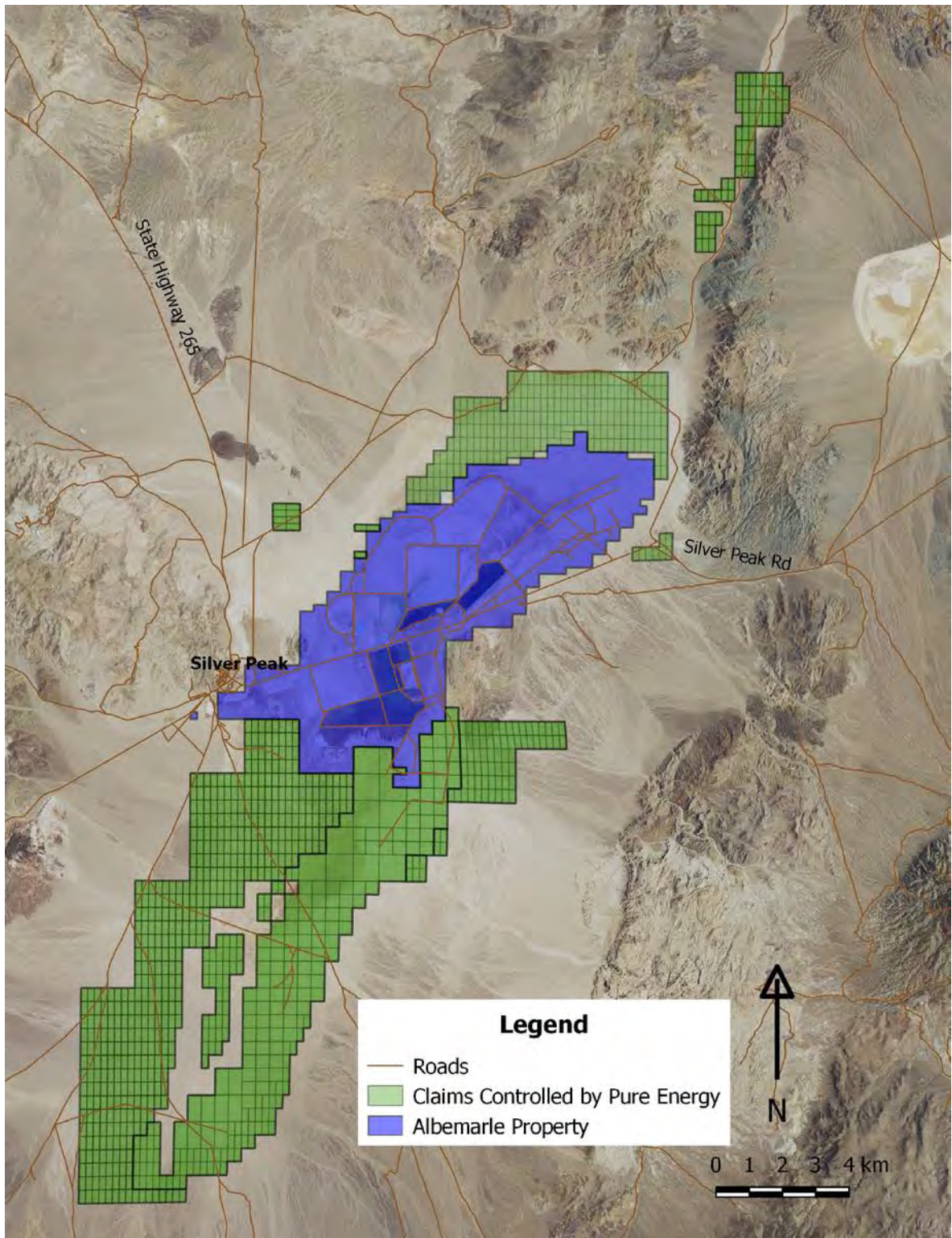
4.3   Property Mining Claims

All claims shown in Figure 4-2. Map of claims controlled by PEM, were established using location monuments during ground staking. During a property visit, the author checked several locations to confirm the presence of claim staking in the field. PEM has unrestricted access to all of the claims to perform exploration work or any other works required to investigate the land or the processing of the resources contained beneath it.

Claims currently controlled by PEM have arisen through a combination of leases, original claim staking, and corporate transactions. The provenance of the claims controlled by PEM is summarized in Table 4-1. Summary of Claim Provenance and Type of Control.

Table 4-1. Summary of Claim Provenance and Type of Control

Description	Number of Claims	Total Area (ha)	Type of Control
GeoXplor CV/DB	80	1806	Lease/Option
Nevada Alaska Mining CD/CE	54	1044	Lease/Option
Esmeralda Minerals CA/CL/NC	125	1012	Owned
Cypress Angel/Glory/McGee	76	631	Lease/Option
Lithium X NSP/PM	273	2200	Lease/Option
Lithium X CVL/CVS	477	3938	Owned

4.4   Property Environmental Liabilities

PEM is voluntarily addressing the cleanup of minor amounts of stained soil due to oil drips from past drilling activities. There are no environmental orders associated with the PEM claim areas. There are no known significant factors or risks that may affect access, title or the right or ability to perform work on the PEM claim areas.

5 Accessibility, Climate, Local Resources, Infrastructure, and Physiography

5.1   Accessibility

The PEM placer claims are easily accessed from the small town of Silver Peak, Nevada. They lie to the north and south of the long-established lithium operations currently owned and operated by the Albemarle Corporation (Figure 5-1. Land Status Map). Silver Peak is approximately 61 km (38 miles) from Tonopah, which is the regional commercial centre, and approximately 45 km (28 miles) from Goldfield, which is the County Seat of Esmeralda County. Access to and across the site from Silver Peak is via a series of gravel/dirt roads. The main gravel roads that run south and southeast from Silver Peak into the project area are well maintained and easily accessible with a normal two-wheel drive (WD) vehicle. The minor gravel/dirt roads that criss-cross the property are typically not maintained and can require four-WD vehicles to negotiate safely, particularly after high winds have caused drifting sand to form on the roads.

5.2   Climate and Vegetation

Clayton Valley has a generally arid to semi-arid climate, characterised by hot dry summers and cold winters. The climate is influenced strongly by the Sierra Nevada Mountains to the west, which produce a pronounced rain shadow, and have the general effect of making Nevada the driest state in the US. Precipitation is scattered throughout the year, with slightly more precipitation in late winter/early spring. During the winter months high-pressure conditions predominate, resulting in west-to-east trending winds and precipitation patterns. During the summer months low-pressure conditions predominate, resulting in southwest-to-northeast trending precipitation patterns. Winter storm events tend to last longer and produce more precipitation than the summer events, which tend to produce widely scattered showers of short duration; drought is common and can last for more than 100 days.

The average potential evaporation rate for Esmeralda County exceeds the average annual precipitation and, on an annual basis, as much as 95 percent of the total annual precipitation is lost through evaporation and transpiration (less than 10 percent recharges to groundwater). Localised dust storms are common in Clayton Valley, and typically form later in the day, after pronounced solar heating of the ground surface (all general climate information sourced from Esmeralda County Water Resource Plan; accessesmeralda.com). Average weather data for Silver Peak are provided in Table 5-1. Average Weather Data for Silver Peak, Nevada, below (source: Western Regional Climate Centre).

The operating season for the purposes of exploration is effectively year-round. There are periods where heavy rainfall may cause minor localised flooding of access roads, and in this instance, access onto the playa floor may be limited for a few days.

An overall view of the landscape in the southern half of Clayton Valley is provided in Figures 5-3. Looking East across Pure Energy Claims South of Albemarle Property and Figure 5-4. Looking Southeast across Southern Half of Pure Energy Claims.

Vegetation coverage across the site area is generally very sparse, with many areas on the flat playa floor and the sand dune area having effectively no vegetation cover at all. Away from the very lowest part of the playa floor, the vegetation consists of a mixture of low scrub and grasses forming high desert, prairie or shrub-steppe vegetation populations. Previous biological fieldwork completed at the site reported a mix of Saltbush, Greasewood Bush, Pickleweed, Saltgrass and Russian Thistle, with other occasional minor species (EPG Inc. Sept 2011).

Figure 5-1. Land Status Map
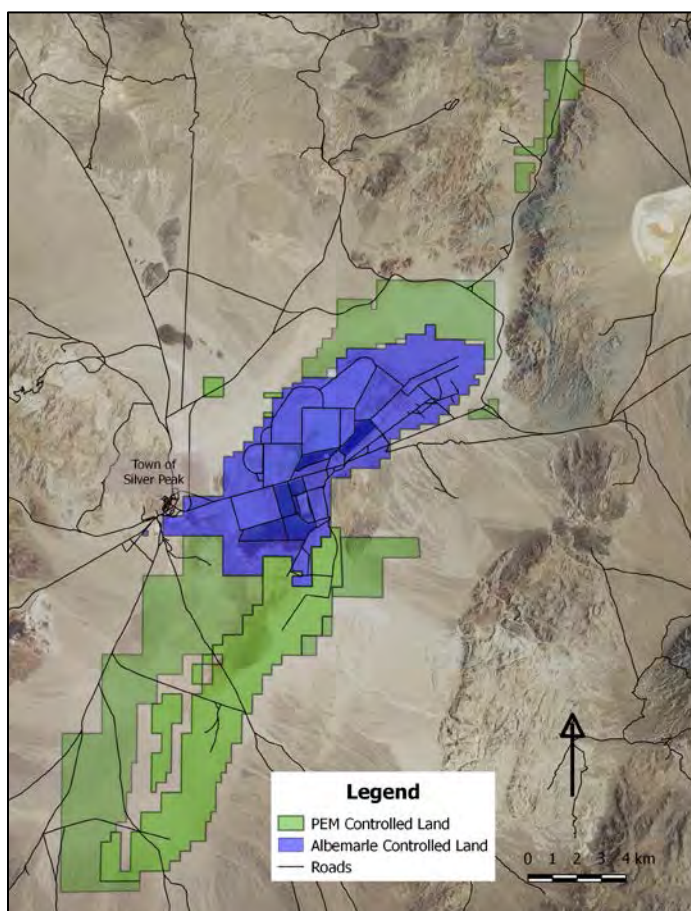
Table 5-1. Average Weather Data for Silver Peak, Nevada

Month	Average Max Temp °F	Average Min Temp °F	Average Total Precip. inches	Average Total Snowfall inches
Jan	47.3	18.8	0.31	0.3
Feb	54.2	24.7	0.38	1.2
Mar	61.8	31.7	0.54	0.5
Apr	69.5	38.1	0.39	0.1
May	79.4	47.9	0.36	0.0
Jun	90.3	56.9	0.25	0.0
Jul	97.5	62.6	0.44	0.0
Aug	95.2	59.9	0.48	0.0
Sep	86.6	50.5	0.44	0.0
Oct	72.9	38.2	0.36	0.2
Nov	57.5	26.4	0.29	0.1
Dec	46.4	17.6	0.17	0.1
Annual Average or Total	**71.6**	**39.4**	**4.43 (total)**	**2.4 (total)**

Note: Data sourced from Western Regional Climate Centre for Silver Peak weather station

(Station # 267463); Oct 1967 to Jan 2015. Data is shown using the US Customary units.

5.3   Local Resources

Silver Peak is the nearest census-designated settlement, with a population of approximately 117 at the 2006 census. However, the population of the town varies depending on various economic factors, as there are a significant number of temporary workers from the hard-rock mining operations that lie to the immediate west and southwest of Silver Peak that live often year-round in a series of mobile homes and trailers on the northern side of the town. The unincorporated town has a US Post Office (ZIP code 89047), fire/EMS station, small school and a tavern. There are no significant services/shops in Silver Peak. The main employers are the lithium-brine operation of Albemarle Corp. and other hard-rock mining operations in the Clayton Valley area.

Goldfield is the County Seat for Esmeralda County with a population of 430 at the 2006 census. It has a series of small markets/convenience stores, a small restaurant, motel and a gas station. As with Silver Peak, the population fluctuates depending on economic factors, as there are several small mining operations close to Goldfield that open and close with varying commodity prices. The County buildings in Goldfield house all the claim records for the various mining claims in Clayton Valley.

Tonopah is the main commercial centre closest to Clayton Valley and has a full range of services, including grocery stores, restaurants, hotels/motels, banks, hardware stores and government offices (e.g., local BLM office for recording claims, making permit applications etc.). The population of Tonopah was 2,478 in the 2010 census, and it is the County Seat of Nye County. Employment in Tonopah is a mixture of service jobs, military (Tonopah Test Range), mining and industrial jobs related to the nearby Crescent Dunes concentrating solar plant.

5.4   Infrastructure

A series of well-maintained state highways connect Silver Peak to the main road network in Nevada and beyond, and graded and maintained gravel roads link Silver Peak to the southern half of Clayton Valley. These roads connect Silver Peak to the local community of Lida in the south and allow year-round access to the project area. A series of unmaintained, but good condition, gravel roads run along the site and allow access to almost all parts of the project area.

The nearest rail system is in Hawthorne, Nevada, approximately 145 km (90 miles) by road to the north of Silver Peak. This rail system is operated by Union Pacific and links northwards towards the main Union Pacific rail system in the Sparks/Reno area. There is a County-owned, public-use airport in Tonopah that has two runways, each approximately 2 km (7,000 feet) long.

Electrical connection is possible at the sub-station in Silver Peak Figure 5-2. Silver Peak Electrical Sub-station. This sub-station connects a pair of 55 kV lines that form an electrical inter-tie between the Nevada and California electrical systems (maximum power capacity exchange allowed of 17 MW across the inter-tie), with two 55 kV lines that link the sub-station to the main electrical grid in Nevada. One of the 55 kV lines from the sub-station runs northwards to the Millers sub-station that lies approximately 47 km (29 miles) northeast from Silver Peak, and at this point, the 55 kV line interconnects to the 120 kV transmission system (and then the 230 kV system just north at the Crescent Dunes plant and Anaconda Moly sub-station). The other 55 kV line runs east from Silver Peak and feeds back into Goldfield and Tonopah. Total electricity usage by the existing Albemarle lithium facility is reported as averaging 1.89 MW, with maximum usage of

2.54 MW (DOE/EA-1715, Sept 2010); note that a typical 55 kV line is capable of transferring 10-40 MW of power depending on local factors.

Figure 1-2. Silver Peak Electrical Sub-station

Water supply is currently served by the Silver Peak municipal water supply. This is serviced by three wells that abstract water from alluvial fans on the western flank of Clayton Valley, approximately 1 km (0.62 miles) southwest of the town. Transmission lines, roads and main landholdings are shown in Figure 5-3 Looking East across Pure Energy Claims South of Albemarle Property.

The current claim areas, shown in Figure 5-1. Land Status Map, are sufficient for all proposed exploration activities. Although the final process for removing lithium from the brine has not been decided to date, there is sufficient room on the claim area to locate extraction wells, pumps and the necessary cabling and pipework to power the equipment and move brine from the wells to the processing site.

5.5   Physiography

Clayton Valley lies in a complex zone of disrupted structure between the northwest trending Sierra Nevada Mountain Range to the west, and the north-south trending Basin and Range province to the north and east.

The valley has a total watershed area of 1,437 km^2 (555 mi^2) and the floor of the valley lies at an altitude of approximately 1,320 metres (4,320 feet) above sea level (ASL). The surrounding mountains rise generally several hundred meters above the valley floor, with the highest surrounding mountain being Silver Peak at 2,859 meters ASL (9,380 ft ASL). The valley is bounded to the west by the Silver Peak Mountain Range, to the south by the Palmetto Mountains, to the east by Clayton Ridge and the Montezuma Range, and to the north by the Weepah Hills.

There is no permanent surface water in the Clayton Valley watershed, with the exception of the man-made evaporation ponds operated by Albemarle Corp. All watercourses are ephemeral and only active during periods of intense precipitation.

Clayton Valley lies at a lower elevation than the surrounding basins (Big Smoky Valley lies approximately 122 meters (400 ft) higher; Alkali Flats Valley lies approximately 140 meters (460 ft) higher, and it is interpreted to receive some sub-surface groundwater flow from these basins based on regional static groundwater levels.

Figure 5-3. Looking East across Pure Energy Claims South of Albemarle Property
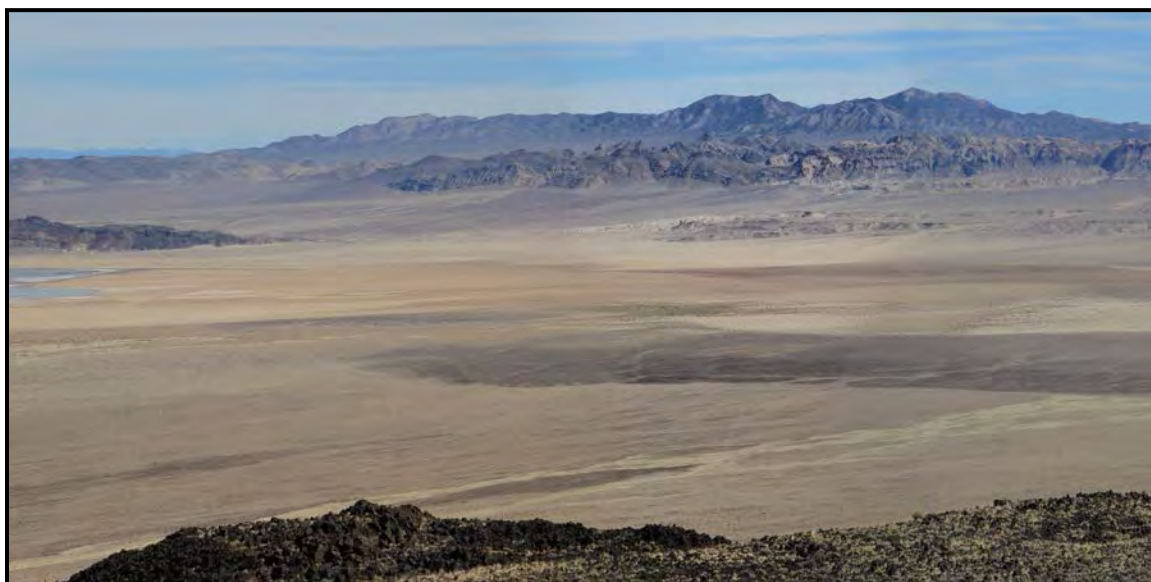
Figure 5-4. Looking Southeast across Southern Half of Pure Energy Claims

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6 History

6.1   Historical Drilling

The United States Geological Survey (USGS) drilled 5 exploration holes in Clayton Valley in 1997 on what is now the Silver Peak operations patented property, all north of the Pure Energy claims. Zampirro (2004) states that several hundred exploration and production wells, which ranged in depth from 70 metres to 355 metres (230 feet to 1160 feet), were drilled in the valley by the Silver Peak operation between 1964 and 2004. The drilled area encompassed some of the southern portion of Clayton Valley, including part of the Pure Energy claims.

6.2   Rodinia Lithium Exploration 2009-2010

Rodinia Lithium, Inc., under its wholly owned Wyoming subsidiary Donnybrook Platinum Resources, Inc. and GeoXplor Corp., acquired 1,012 lode and placer claims, a total of 29,275 hectares (72,340 acres), on BLM land in Clayton Valley. The claims surrounded, and were adjacent to, the existing Silver Peak lithium operations to the north, east and south. The preponderance of the claims covered the south valley and included portions of the current PEM interest. In 2009, Rodinia completed a 3.6 km (2.4 miles) seismic survey on the north side of Clayton Valley to define the depth to basement and location of the Paymaster Fault, a north-south structure thought to control lithium brine movement. Rodinia followed the seismic survey with a gravity survey by Hasbrouck Geophysics Inc. and completed a 274-point gravity survey and subsequent report on the Rodinia claims. The results defined a 1.0 - 1.7 km (0.6 – 1.1 mile) deep structural trough oriented northeast-southwest across the southern valley. Rodinia completed 9 Dual Wall Reverse Circulation (DWRC) boreholes during 2010 around the perimeter of the existing Albemarle operation, see Table 6-1 Rodinia Lithium Exploration Drill Hole Summary. Of significance to this report are 2 drill holes, SPD-8 and SPD-9, located near the southeast portion of the Albemarle patented claims (northeast portion of the Pure Energy claims). These holes penetrated zones of anomalous Li content; (Table 6-2. Rodinia Lithium Selected Analyses from SPD-8 and SPD-9; plus also see Keast, 2011, Tables 4 & 5).

Table 6-1. Rodinia Lithium Exploration Drill Hole Summary

Hole #	BLM	East (UTM)	North (UTM)	Elev (est. in ft)	Depth (ft)	Depth (m)	
SPD-1	SPD-1	11454878	4186762	4268	380	116	Hole not logged, No lithium values
SPD-2	SPD-13	11455000	4186000	4268	1040	317	
SPD-3	SPD-21	11456900	4183700	4280	600	183	
SPD-4	SPD-6	11454878	4186762	4340	60	18	Hole abandoned
SPD-5	SPD-7	11455280	4182010	4230	1390	424	
SPD-6	SPD-8	11456770	4182593	4380	1040	317	
SPD-7	SPD-10	11448350	4183430	4260	540	165	No sample return
SPD-8	SPD-25	11449597	4174732	4280	1280	390	
SPD-9	SPD-24	11450751	4176749	4280	1620	494	
					7,950	**2423**	

Table 6-2. Rodinia Lithium Selected Analyses from SPD-8 and SPD-9

Rodinia Lithium DrillHole SPD-8 and SPD-9 Selected Analyses										
	Meters		mg/L							
Well	From	To	Li	B	Ca	Mg	K	Na	SO4	Cl
SPD-8	323.1	384.0	37	1	1820	283	631	10480	843	22600
SPD-9	146.3	170.7	145	24	470	195	2525	23000	2575	45750
	170.7	201.2	370	29	672	452	6540	61400	9080	10800
	201.2	341.4	259	15	1105	475	4186	46095	8333	83095
	341.4	493.8	139	9	866	481	1600	33920	4696	67240

In 2010, Rodinia completed several segments of an Exploration Plan of Operation, a document required for further exploration and land disturbance beyond the initial five-acre BLM permit. Cultural and environmental surveys were completed by independent contractors on acreage proposed for an extensive drilling program in the south portion of Clayton Valley. Rodinia eventually dropped all claims in order to concentrate resources on its Salar de Diablillos lithium project in the Puna region of Argentina.

7 Geological and Hydrogeological Setting

7.1 Geological Setting

The following review of the geological setting of Clayton Valley was provided by Dr. LeeAnn Munk in Spanjers (2015).

Clayton Valley is located within the Basin and Range Province in southern Nevada. It is a closed-basin that is fault-bounded on the north by the Weepah Hills, the east by Clayton Ridge, the south by the Palmetto Mountains and the west by the Silver Peak Range and Mineral Ridge. The general geology of Clayton Valley is illustrated in Figure 7-1. Geologic Map. This area has been the focus of several tectonic and structural investigations because of its position relative to Walker Lane, the Mina Deflection and the Eastern California Shear Zone (McGuire, 2012; Burris, 2013). The basement rock of Clayton Valley consists of late Neoproterozoic to Ordovician carbonate and clastic rocks that were deposited along the ancient western passive margin of North America. During late Paleozoic and Mesozoic orogenies, the region was shortened and subjected to low-grade metamorphism (Oldow et al., 1989; Oldow et al., 2009), and granitoids were emplaced at ca. 155 and 85 million years ago (Ma). Extension commenced at ca. 16 Ma and has continued to the present, with changes in structural style as documented in the Silver Peak-Lone Mountain Extensional Complex (Oldow et al., 2009; Burris, 2013). A metamorphic core complex just west of Clayton Valley was exhumed from mid-crustal depths during Neogene extension. There is a Quaternary cinder cone and associated basaltic lava flows in the northwest part of the basin.

The basin is bounded to the east by a steep normal fault system toward which basin strata thicken (Davis et al., 1986). These basin-filling strata compose the aquifer system which hosts and produces the lithium-rich brine (Zampirro, 2003; Munk et al., 2011). The north and east parts of Clayton Valley are flanked with Miocene to Pliocene sediments containing multiple primary and reworked volcanic ash deposits within fine-grained clay and silt units. These deposits are a part of the Esmeralda Formation first described by Turner (1900) and later by Stewart (1989) and Stewart and Diamond (1990). The Esmeralda Formation is a sedimentary sequence grading from coal-bearing siltstones, sandstones and conglomerates at the base to fine-grained, tuffaceous lacustrine sediments at the top of the section. This formation is primarily mapped in the areas north of Clayton Valley (Stewart and Diamond, 1990), but there are also lacustrine deposits composed primarily of clays and fine-grained sediments with volcanic ash layers on the east side of Clayton Valley described as Esmeralda Formation by Kunasz (1974) and Davis (1981).

Figure 7-1. Geologic Map

Recent work by Burris (2013) aimed at unravelling the tectonic and structural history of the Weepah Hills area to the north of Clayton Valley reports a series of zircon helium ages for three volcanic-sedimentary depositional units from the upper plate in the Weepah Hills area. These are considered eruptive ages and include the Lone Mountain (23-18 Ma) unit, the Esmeralda Formation (12-10 Ma) and the Alum Mine Formation (10-6 Ma). Ongoing work by L. Munk (pers. comm.) includes efforts to date volcanic sedimentary units from the east side of the basin as well as from downhole samples, in order to further understand the depositional history of these units and possible correlation with surface outcrops.

Multiple wetting and drying periods during the Pleistocene resulted in the formation of lacustrine deposits, salt beds, and lithium-rich brines in the Clayton Valley basin. The Late Miocene to Pliocene tuffaceous lacustrine facies of the Esmeralda Formation contain up to 1,300 ppm lithium and an average of 100 ppm lithium (Kunasz, 1974; Davis and Vine, 1979). Hectorite (lithium bearing smectite) in the surface playa sediments contains from 350 to 1,171 ppm lithium (Kunasz, 1974). More recent work by Morissette (2012) confirms elevated lithium concentrations in hectorite in the range of 160 to 910 ppm from samples collected on the northeast side of Clayton Valley. Miocene silicic tuffs and rhyolites along the eastern flank of the basin have lithium concentrations up to 228 ppm (Price et al., 2000).

Prior to development of the brine resource in Clayton Valley, a salt flat and brine pool existed in the northern part of the basin, but groundwater pumping has eliminated the surface brine pool. The presence of travertine deposits which occur in the northeast part of the valley, as well as the west and central parts of the valley are also evidence of past hot spring activity on the valley floor. At the base of Paymaster Canyon, gravity and seismic surveys have been used to map the Weepah Hills detachment fault and also reveal the presence of tufa at depth coincident with a geothermal anomaly (McGuire, 2012). This area and another just north of the town of Silver Peak are underlain by aquifers that contain hot water (~50 to 60°C) and approximately 40 ppm lithium (L. Munk, pers. comm.). Hot spring deposits in these locations and others in the basin have also been mapped by Hulen (2008).

7.2   Hydrogeological Setting

The Clayton Valley hydrographic basin is shown on Figure 7-2. Watershed Boundary with the controlled claim area of the Project. The basin is approximately 46.7 km (29 miles) in length and averages approximately 30.6 km (19 miles) in width. Regionally, the basin is internally-drained and bounded by mountain ranges. The approximate area of the topographically closed basin is 143,744 hectares (555 square miles or 355,200 acres). At smaller scale, Figure 7-3. Location Map, is a map that includes the controlled claim area, well and borehole locations, and the area encompassing the Resource Estimate.

Figure 7-2. Watershed Boundary
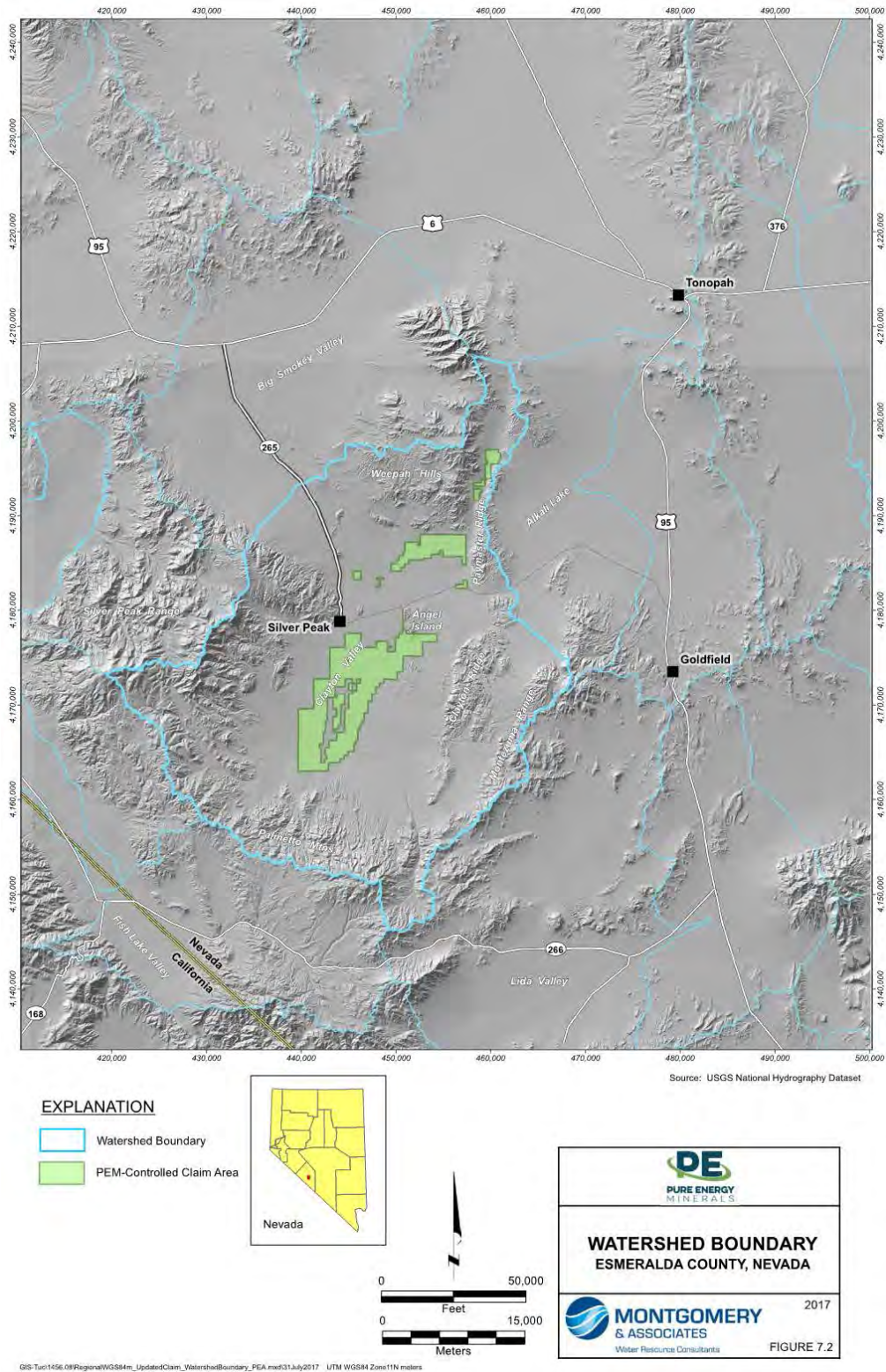
Figure 7-3. Location Map

EXPLANATION

- CV-3 ▲ Well Location and Identifier
- SPD-8 ✕ Plugged and Abandoned
- (green) PEM-Controlled Claim Area
- (dashed box) Inferred Resource Model Domain
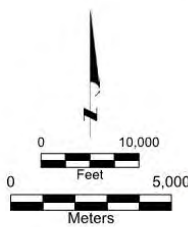
LOCATION MAP
ESMERALDA COUNTY, NEVADA

MONTGOMERY & ASSOCIATES
Water Resource Consultants

2017

FIGURE 7.3

GIS-Tuc\1456.08\LocationMapWGS84m_pea.mxd\31July2017   UTM WGS84 Zone11N meters

Recharge to the basin from surface water is by precipitation and runoff, controlled by unnamed ephemeral streams in alluvial washes and at mountain fronts. Precipitation estimates range from 76 to 127 mm (3 to 5 inches) per year at the valley floor, 102 to 152 mm (4 to 6 inches) at higher elevation alluvial aprons, and as much as 381 mm (15 inches) at the higher mountainous regions. Recharge via groundwater to the basin is from Big Smoky Valley inflow and to a lesser extent inflows from Alkali Springs Valley, and potentially from Fish Lake Valley and Lida Valley basins. Outflow from the basin is solely from evapotranspiration at the lowland areas of the valley.

Previous studies and reports that detail the hydrogeology of Clayton Valley include Rush (1968), Albers and Stewart (1972), Davis and others (1986), Price and others (2000), Zampirro (2003), Hasbrouck (2009, 2015a, 2015b, 2016, and 2017) and Spanjers (2015). A brief description of the regional and local hydrogeologic setting follows and is based on review of these previous works and analysis of existing hydrogeologic and geophysical information.

An interpretative regional depth to bedrock and geologic map is shown on Figure 7-4. Regional Geology and Depth to Bedrock, based on work by Hasbrouck (2009 and 2015a, b) and reported in Spanjers (2015). The gravity surveys indicate the regional depth to bedrock is largest within a northeast-southwest trending trough within the Project. Using geophysical results and reporting by Albers and Stewart (1972) and Price and others (2000), the east side of the area of the Resource Estimate shows the contact between basin-fill and bedrock is steep and consistent with high-angle, normal faulting. Older rocks outcrop in the highlands surrounding Clayton Valley and include Precambrian metamorphic and sedimentary rocks, Paleozoic marine sediments, and Mesozoic intrusions. The bedrock outcrop on the northeast side of the study area (Angel Island) includes: the Campito Formation siltstone; Poleta Formation siltstone, limestone, and quartzite; Emigrant Formation claystone; and Palmetto Formation shale. South of Angel Island and along the east border of the study area and generally following the NE-SW trending trough of the basin are Tertiary shale, siltstone, sandstone, limestone, and tuffaceous units.

Figure 7-4. Regional Geology and Depth to Bedrock

EXPLANATION

CV-3   Well Location and Identifier

SPD-8   Plugged and Abandoned

PEM-Controlled Claim Area

Inferred Resource Model Domain

Fault, dashed where uncertain

High-angle Fault, ball on downthrown side

Low-angle Fault or Thrust

Seismic Line

Gravity Station

GEOLOGIC UNITS

Q   Quaternary Alluvium and other Quaternary Units

Ts/Te   Tertiary Shale, Siltstone, Sandstone, Limestone, and Tuff

Taf/Tafu   Tertiary Ash Flow Tuff and Rhyolitic Airfall Tuff

G   Jurassic to Tertiary Granitic Rocks

O   Other Bedrock

NOTE: Generalized geology modified from Price and others (2000), and Albers and Stewart (1972)

Depth to Bedrock from Hasbrouck (2009, 2015a, b)

REGIONAL GEOLOGY AND DEPTH TO BEDROCK
ESMERALDA COUNTY, NEVADA

MONTGOMERY & ASSOCIATES
Water Resource Consultants

2017

FIGURE 7.4
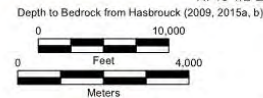
GIS-Tuc\1456.08\RegionalGeology_Depth2Bedrock_PEA\31July2017 UTM WGS84 Zone11N meters

Except for the freshwater aquifers occurring in alluvial fans composed of coarse-grained sediments on the higher elevation flanks of mountain fronts, the primary aquifer system within the Clayton Valley basin, and in particular the area of the Resource Estimate, is composed of multi-layer sequences of unconsolidated to semi-consolidated Quaternary playa (ephemeral lake) sediments and volcanic ash units; the age of deeper sediments in the basin composed of lacustrine sediments, ash, and tuffaceous units may be Late Miocene to Pliocene. The playa deposits are predominantly fine-grained clastic sediments with some salt deposits and localized sand and gravel facies. Steeply dipping normal faults largely control the basin geometry and fault scarps forming on the east side of the valley expose tuffaceous and lacustrine sediments (claystones and siltstones); exposed bedding of older sedimentary units in this area dip gently toward the basin center.

7.3   Brine Geochemistry and Sources of Lithium

The lithium brine geochemistry and composition were first investigated by Davis and Vine (1979) and Davis et al. (1986) and more recently and extensively studied by Munk et al. (2011), Jochens and Munk (2011) and L. Munk (pers. comm.). In general, the brines from the north part of Clayton Valley are Na-Cl in composition and have Li concentrations in the range of 60 to 400 mg/L lithium. The brines extracted from the Pure Energy CV-1 well in 2015 are most similar in terms of sodium and lithium concentration to the brines pumped from the "MAA or Main Ash Aquifer" described in Zampirro (2003).

Ongoing work (L. Munk, pers. comm.) since 2010 to investigate the origin of the lithium brine in Clayton Valley has resulted in a detailed study of the brines pumped from all six of the aquifers described by Zampirro (2003) in the north part of the basin, as well as surface water (hot and cold springs within and outside the basin) and subsurface geothermal waters in the basin. The investigation by L. Munk and her colleagues includes detailed field parameters for all waters including temperature, specific conductivity, pH, dissolved oxygen, and oxidation-reduction potential. The geochemical parameters investigated include lithium, major cations and anions, water stable isotopes, lithium and strontium isotopes, tritium, chlorofluorocarbons (CFCs) and noble gases in order to test multiple hypotheses about the brine origin. The research also involves a detailed investigation of the geochemistry and ages of key geologic units in the basin.

The following is a summary of some of the major findings to date from the research by L. Munk and her colleagues. Water stable isotope data (δ^{18}O and δD) for the brines collected in the north part of the basin indicate that there is influence from water-rock interaction related to geothermal activity as well as from evaporation (Munk et al., 2011; Munk pers. comm.). Preliminary δ^7Li (Munk et al., 2011) and ^{87}Sr/^{86}Sr signatures (Munk, pers. comm.) of the brines indicate that the lithium in the brines may be leached from

clays in the subsurface by geothermal waters and then transmitted into the various aquifers. Araoka et al. (2014) report δ^7Li values for clay samples collected from the surface of Clayton Valley. These values match those from the lithium brines and two geothermal waters from Clayton Valley (Munk et al., 2011; Munk pers. comm.). High temperature leaching of clays could result in the brines having a similar δ^7Li composition as the clays, whereas low temperature leaching of lithium from clays or rocks would result in a higher δ^7Li signature. Further analysis of clays from the subsurface and surface should be performed in order to better understand the processes responsible for concentrating lithium in the brines. Additionally, it is possible that lithium may be leached from the volcanic ash layers within the aquifers, but that process is even less understood at this point and should be further investigated from downhole and surface samples.

Low temperature leaching of lithium from Tertiary rhyolites from the surrounding bedrock in Clayton Valley likely plays a small to insignificant role as the source of lithium to the brines. Jochens and Munk (2011) showed that experimental leaching of these rocks results in only a few micrograms per liter (µg/L) of lithium released into water, whereas Kunasz (1974) reports up to 140 mg/L water soluble lithium from the clay-sized fraction in the Esmeralda Formation on the east side of the basin. Additionally, Kunasz (1974) reports up to 623 ppm lithium in a sequence of altered volcanic ashes on the east side of Clayton Valley with 2,290 ppm in the less than 2 micrometer (µm) fraction from that sample which is composed of hectorite. Morissette (2012) reports lithium concentration in the clay size fraction from samples collected in the upper member of the Esmeralda Formation in the range of 1,140 to 4,950 ppm for six samples with a bulk lithium concentration ranging from 496 to 2,740 ppm. Morissette (2012) also reports the cation exchange capacity (CEC) of the clay size fraction for samples from the Esmeralda Formation in Clayton Valley to be approximately 32 to 52 meq/100g with 56 to 136 mg/L recoverable lithium from the CEC solutions. These clay size fractions within the Esmeralda Formation are clearly good candidates for sources of lithium to the brines in the basin as these same units are expected to occur in the subsurface.

The ultimate source of the lithium to the basin, whether it is within the clays or the brines, is still unknown. However, recent work by Hofstra et al. (2013) on high-silica rhyolite tuffs in the western United States provides evidence that lithium is concentrated within melt inclusions in quartz phenocrysts, which is subsequently released through micro fractures during post-depositional processes. The lithium would be leached relatively quickly from these volcanic deposits in basins through weathering processes and subsequently concentrated through evaporation of playa lakes. This could be a viable model for the source of lithium in Clayton Valley, Nevada. However, no work on melt inclusions from the high-silica volcanic rocks at the surface or in the subsurface has been undertaken for this site.

7.4 Mineralization

As discussed above, the lithium resource is hosted as a solute in a predominantly sodium chloride brine, and it is the distribution of this brine that is of relevance to this report. As such, the term 'mineralization' is not wholly relevant, as the brine is mobile and can be affected by pumping of groundwater (for example from the adjacent Albemarle property), and by local hydrogeological variations (e.g. localized freshwater lenses in near-surface gravel deposits being affected by rainfall, etc.).

However, as discussed in previous Technical Reports for the Clayton Valley area (Harrop, 2009; Keast, 2011), and as mentioned in Section 7.3 above, lithium is present in the basin not only as a solute, but also within the solid matrix that forms the basin infill deposits within the graben structures, particularly within the finer clay and silt fractions. Based on the isotopic signature of the lithium within the brines, there is a strong likelihood that exchange reactions occur between the solid matrix materials in the clastic basin and the brines, and therefore, it is possible that lithium is released from the solid phase into the aqueous phase and hence acts to supplement the resource. Currently, there are insufficient data to confirm this hypothesis, and the resource model considers only the brine encountered in porosity during drilling and pumping activities. Future work may be conducted that allows for expansion of the resource to include some portion of the solid material within the basin.

8   Deposit Types

The deposit type for the Project is a continental, mineral-enriched brine aquifer within a hydrographically closed basin (endorheic basin). The principal mineral resource is lithium and is a dissolved product in a predominately sodium chloride brine. The brine is hyper-saline groundwater that saturates the pore spaces and fracture-apertures of basin-fill deposits (brine aquifer) that have accumulated over time in the basin. Dissolved minerals in the brine, such as lithium, originate from multiple processes of mineral dissolution and precipitation, remobilization, geothermal circulation, and evaporation occurring in the basin aquifer.

For classification purposes, groundwater in an aquifer is generally considered "freshwater", if its total dissolved solids (TDS) is less than 1,000 mg/L, and is "brackish" when TDS concentrations are in the range of 1,000 to 10,000 mg/L. Seawater contains about 35,000 mg/L of TDS. Once concentrations exceed the TDS level of seawater, groundwater is hyper-saline and classified as brine.

Continental brines are the primary source for lithium products worldwide. Bradley and others (2013) noted that "all producing lithium brine deposits share a number of first-order characteristics: (1) arid climate; (2) closed basin containing a playa or salar; (3) tectonically driven subsidence; (4) associated igneous or geothermal activity; (5) suitable lithium source-rocks; (6) one or more adequate aquifers; and (7) sufficient time to concentrate a brine." Because the lithium atom does not readily incorporate with evaporite minerals, it remains in solution and concentrates to high levels, reaching 4,000 ppm at Salar de Atacama. Large deposits are mined using production wells in the Salar de Atacama, Chile (SQM and Albemarle), Salar de Hombre Muerto, Argentina (FMC) and Clayton Valley, Nevada (Albemarle), the only North American producer.

A simplified conceptual model for the Clayton Valley brine aquifer is based on exploration of similar basins (salars) in Chile, Argentina, and Bolivia. These basins are characterized by closed topography and internal drainage where the lowest exposed parts of these basins often contain salt encrusted playas, or "salars." Typically, no significant groundwater discharges from these basins as underflow to other basins. All groundwater discharge that occurs within the basin is by evapotranspiration, which is a combination of direct evaporation and transpiration from vegetation. All surface water that flows into the basin is either evaporated directly, or enters the groundwater circulation system and is later evaporated. This concentrates solutes, and over large timescales, produces solute concentrations in groundwater exceeding the salinity of seawater.

Several of the salar brines of Chile, Argentina, and Bolivia contain relatively high concentrations of lithium, likely due to the presence of lithium bearing rocks and local geothermal waters associated with Andean volcanic activity. Salar basin locations and basin depths are typically structurally controlled grabens and half grabens, but may be influenced by volcanism that may alter drainage patterns. Basin-fill deposits within salar basins generally contain thin to thickly bedded evaporite deposits in the broad, low-relief or low energy depositional part of the basin, together with thin to thickly bedded low-permeability, fine-grained, lacustrine silt and clay sequences. Coarser-grained, high-permeability sand and gravel deposits associated with high-energy, active alluvial fans are commonly observed along the edges of the salar. Similar alluvial fan deposits and associated higher energy ancient drainage systems can occur buried within the finer-grained sequences of basin-fill deposits. Other permeable basin-fill deposits that may occur within salar basins include pyroclastic deposits, ignimbrite flows, lava-flow rocks, and spring deposits.

Conceptual lithium brine deposit models have been discussed by Houston and others (2011), Bradley and others, (2013) and Munk and others (2016). Houston and others (2011) classified the salars in the Altiplano-Puna region of the Central Andes, South America in terms of two end-members, "immature clastic" or "mature halite," primarily using (1) the relative amount of clastic versus evaporate sediment; (2) climatic and tectonic influences, as related to altitude and latitude; and (3) basic hydrology, which controls the influx of fresh water. Figure 8-1. Conceptual Model of Brine Aquifer Evolution, conceptually shows brine aquifer evolution from young to old salar settings.

The immature clastic classification, which most closely resembles Clayton Valley, refers to basins that generally contain alternating terrigenous sedimentary sequences and a general low abundance of halite (Kunasz, 1974 and Zampirro, 2004). Mature halite salars refer to basins in hyper-arid climates such as Salar de Atacama with extensive and massive halite deposition. Immature salars can contain larger volumes of extractable lithium-rich brines because they are comprised of thick mixtures of clastic and evaporite aquifer materials that have higher primary porosity, or interconnected pore spaces. Typically, these aquifers have high-density brine at the center of salars where high evaporation rates concentrate solute in near-surface waters; at depth, and away from the center of the basin, the brine can become more dilute.

Mature salars are characterized by thick sequences of evaporites (halite, gypsum, borates), referred to as an evaporite core or nucleus, with intercalated fine sand to silt and clay deposits. Often the evaporite deposits' aquifers have low primary porosity, but may have zones of high secondary porosity made up of fracture networks and void spaces from dissolution processes. Extractable brine from these aquifers is typically from shallow depths where high secondary porosity is located closer to the land surface. As dissolution processes

occur, and because brine is denser than freshwater, the associated, more dense brine sinks, resulting in a basin-wide circulation pattern that concentrates brine in the center of the basin within the evaporite core and radially outward. In these instances, solute concentrations and brine density typically increase with depth.

Figure 8-1. Conceptual Model of Brine Aquifer Evolution
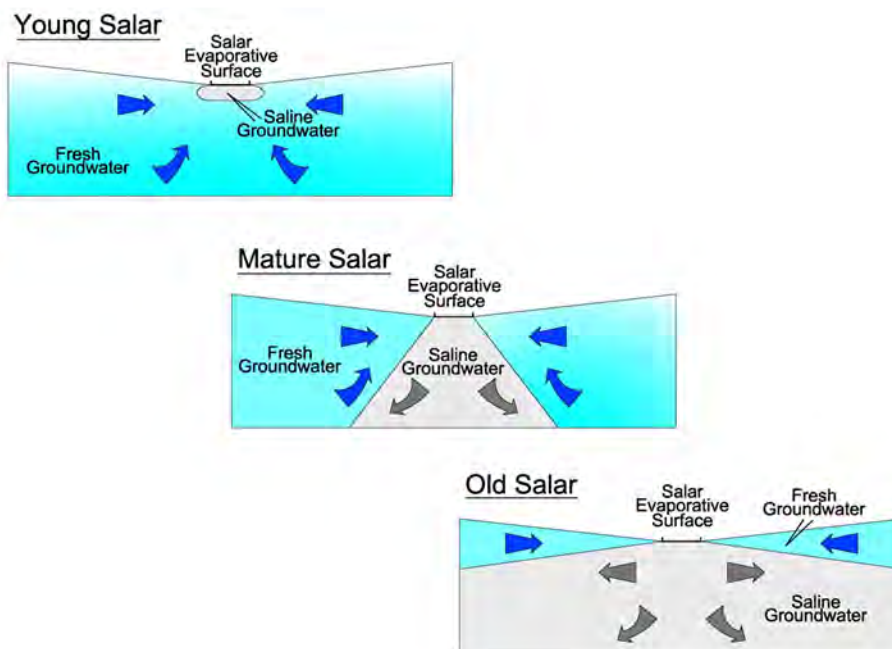
Where fresher water enters the basin via mountain front recharge and overland flow, the influx can dilute the brine and also form an interface of less dense, lower TDS groundwater floating over more dense, high TDS brine (brine interface) in the aquifer at the basin margins. Sedimentary sequences of varying permeability controlled by historical depositional events may also lead to the transmission of fresher water from basin margins to the center of salars. Often times, these permeability contrasts in some of the clastic depositional sequences at shallow depths in salar basins allow for fresher water from the higher elevation parts of the basin to reach to the interior of the salar. This can also cause a brine interface and potential source of dilution of the brine aquifer at the salar center. Additionally, flux of fresher water from basin margins can occur along preferred, structurally controlled flow paths caused by regional tectonic activity and again lead to a brine interface and brine aquifer dilution.

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9 Exploration

9.1 Introduction

Previous exploration at the Property was completed by Rodinia in 2009 and 2010 and by PEM in late 2014 and early 2015. The current phase of exploration by PEM is for work conducted from late 2015 through June 15, 2017.

The total work program completed at the Property to date has included the following:

- Surface geophysics

    o Reconnaissance gravity survey by Rodinia in 2009 to develop a general understanding of the size and extent of the basin and depth-to-bedrock (Hasbrouck, 2009 and Spanjers, 2015)

    o Detailed gravity survey by PEM in the area of the Resource Estimate in late 2014 to better define the shape and depth of the basin (Hasbrouck, 2015a and Spanjers, 2015)

    o Seismic reflection survey in the area of the Resource Estimate by PEM in early 2015 to help define location and extent of bounding and in-basin faults, identify depth-to-bedrock and identify and trace key stratigraphic horizons laterally and vertically throughout the basin (Hasbrouck, 2015b and Spanjers, 2015)

    o Controlled-Source Audio-Magnetotellurics / Magnetotellurics (CSAMT / MT) survey in late 2016 to map the stratigraphy near the PEM drill holes and determine resistivity contrasts between the freshwater – brine interface and contrasts in concentrations of brine (Hasbrouck, 2016).

    o Re-interpretation of CSAMT / MT data and depth-to-bedrock incorporating data collected from exploration boreholes CV-7 and CV-8 (Hasbrouck, 2017).

- Drilling and borehole geophysics

    o Dual Wall Reverse Circulation (DWRC) drilling and sampling program completed by Rodinia in 2009 and 2010 and combined DWRC and mud rotary drilling and sampling program completed by PEM in late 2014 and early 2015 at exploration wells CV-1 and CV-2 to develop vertical profiles of brine chemistry and to provide geological and hydrogeological data in the upper part of the basin (Spanjers, 2015)

     o   Borehole geophysical logging in exploration well CV-1 by PEM in late 2014 to better profile brine-bearing zones in the borehole, followed by reaming for construction of a pilot production well, followed by a pumping test to estimate aquifer parameters and conduct bulk brine sampling (Spanjers, 2015)

     o   Mud rotary and core drilling by PEM in late 2015 through early 2017 for exploration wells CV-3 through CV-8 to further develop brine aquifer profiles using borehole geophysics, discrete sampling methods, and bulk sampling methods (Montgomery, 2017a and 2017b)

- Hydrogeologic evaluations

     o   Measurement of lithium concentrations in brine and assessment of spatial variation in brine characteristics (Spanjers, 2015; Montgomery, 2017a; Montgomery, 2017c)

     o   Pumping tests by PEM at exploration wells CV-3, CV-7, and CV-8 in late 2016 and early 2017 to estimate aquifer parameters and conduct bulk brine sampling (Montgomery, 2017c)

     o   Water level monitoring at exploration wells to determine direction of groundwater movement and hydraulic gradients (Montgomery, 2017d);

Summaries of the results from this work are provided below and in Sections 10 and 11. Potential future exploration work is described in Section 26.

9.2 Surface Geophysics

9.2.1 Reconnaissance Gravity Survey

Hasbrouck Geophysics completed a reconnaissance level gravity survey for Rodinia in 2009. The survey consisted of 274 points, which were positioned to the north, east and south of the existing Albemarle (Rockwood at the time) operations. The survey identified a large, generally NE-SW trending basin, with a maximum depth of over 1,600 meters (1 mile) that runs southwest for approximately 15 km (9.3 miles) from the edge of the existing Albemarle operations. Based on the geometry of the basin infill, it appears that steeper structures, likely normal faults bound the basin on its eastern side.

9.2.2 Detailed Gravity Survey

PEM contracted Hasbrouck Geophysics to conduct a detailed gravity survey on the northern part of the Clayton Valley claims south of Albemarle in December, 2014. The purposes of the survey were to expand upon the original Rodinia 2009 reconnaissance-level gravity survey to improve delineation of the basal feature that trends south-southwest from exploration drill hole CV-1, map depth-to-bedrock, or thickness of

sediments and map geologic structures, such as basin-bounding faults that may influence aquifers containing lithium. A LaCoste and Romberg Model G gravity meter (serial number 546) was used to acquire the data. A total of 146 new gravity stations (numbered 701 to 857) were acquired along seven lines at nominal station spacing of 200 meters (656 ft) and line spacing of 1 km (0.6 mi) (Hasbrouck, 2015a).

Subsequently, the data from the detailed gravity survey were incorporated with the data from the 2009 study, and an integrated depth-to-bedrock map was produced as shown in Figure 9-1 below. Note that the line of the later seismic survey has been included for information purposes.

It can be seen from Figure 9-1. Integrated Map of Depth-to-Bedrock, that the gravity low, interpreted to be an infilled basin, is elongated and that the eastern boundary of the basin is steeper than that of the western edge. This may be due to steeper or more pronounced normal faulting along the eastern edge, and/or the presence of more complex faulting along the western edge of the graben. As the presence, location and orientation of the faults are likely important factors in controlling the lateral extent of lithium bearing brines, it was decided that conducting seismic reflection work, to better define the faults, would be warranted. This work is described in more detail in Section 9.2.3.

Figure 9-1. Integrated Map of Depth-to-Bedrock (Hasbrouck, 2009 & 2015a)
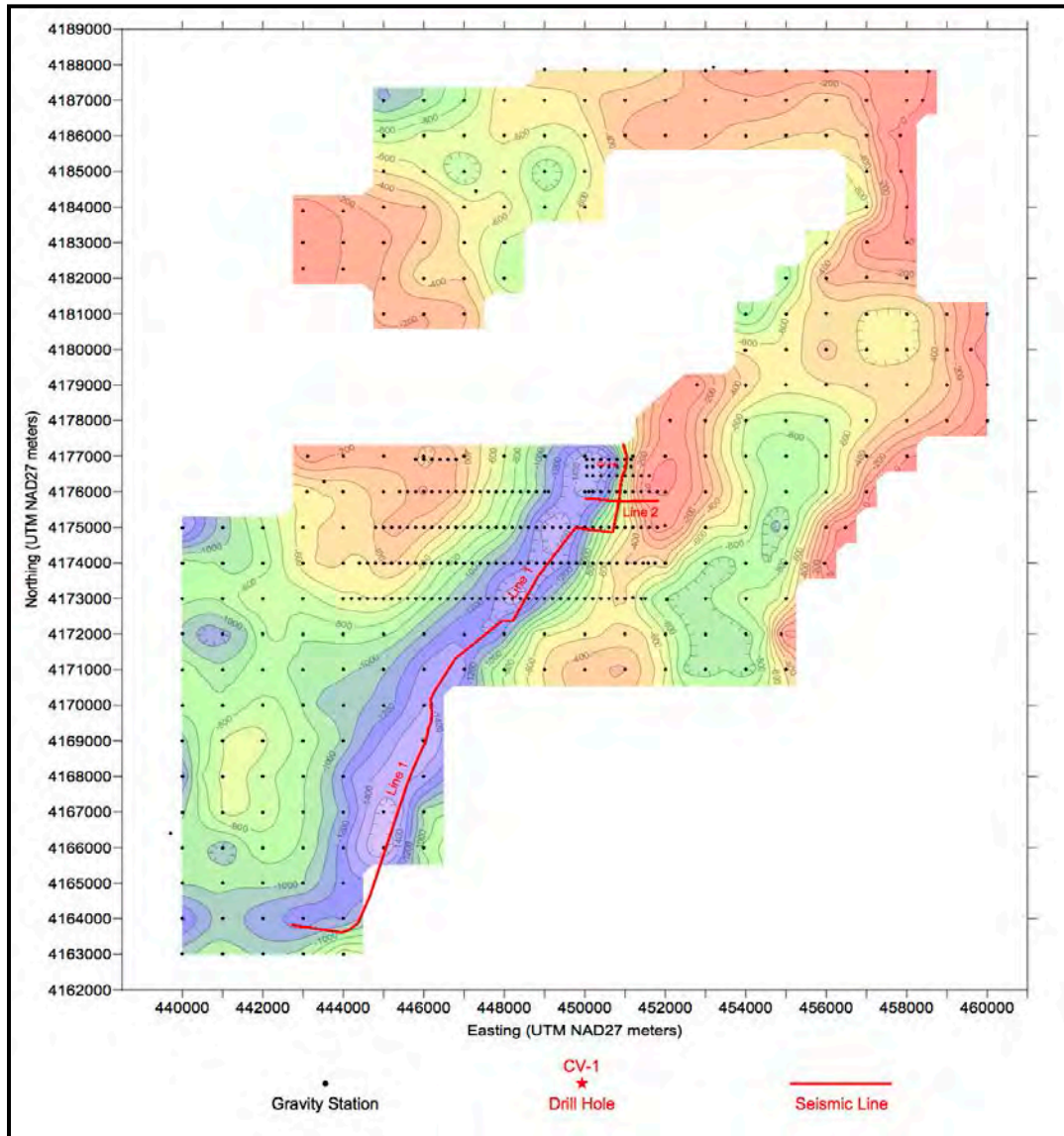
Note: Seismic Line location added after gravity surveys completed for information. North is up. Contours showing depth to bedrock are in meters.

9.2.3   Seismic Reflection Survey

Pure Energy contracted Hasbrouck Geophysics, Inc. (2015b) to conduct a seismic reflection survey on its claims in southern Clayton Valley with the goals of better defining the basin shape, stratigraphic dip, continuity and extent of aquifer units, aquifers and bedrock structure and possibly provide gravity modeling constraints. A total of 19.9 km (12.4 mi) of seismic reflection data along two lines (Figure 9-1.) were acquired by Bird Seismic Services, Inc. with design and field supervision by James Hasbrouck.

SECTION 9

The seismic data identified numerous stratigraphic reflectors due to the extremely high resolution. A total of 20 reflectors (R1 to R19), including Paleozoic bedrock, were delineated based on data consistency and strength and can be summarized as follows:

- Reflector R2 at a depth of 24 meters (78 ft) is weak to moderate and may represent the CV-2 slightly denser lithic tuff.

- R3 is a moderate response (slightly greater than R2) related to silty clay beds between 43-52 meters (140-170 ft).

- R4 is a strong reflector throughout most of the survey area and corresponds to the coarse rock logged in CV-2 at 80m (262 ft).

- R5, at 110 meters (362 ft), is also prominent throughout much of the survey and corresponds with coarse gravels, sand and silt.

- R6, at 155 meters (509 ft), corresponds in CV-2 to a noted lithologic change to clay, with lithic tuff and silty clay above. SPD-8, along seismic line 1c, nearly a mile southwest of CV-2, shows interbedded tuff and clay at the R6 depth.

- R7, at 180 meters (592 ft), may be the top of a Li brine zone similar to one or more mapped Li units of the Esmeralda Formation. SPD-9 brine samples between 140-170 meters (460-560 ft) contained 71-190 ppm Li.

- R8 (207 meters /678 ft) and R9 (251 meters/ 822 ft) are moderately strong throughout the survey and are within the CV-2 Li brine zone. The highest SPD-9 Li concentrations, 420-400 ppm, were found within the 170-201 meters (560–660 ft) interval. SPD-9 Li values between 200 to 280 ppm were consistently measured throughout the 201-341 meters (660-1120 ft) interval.

- R10 is generally strong and indicative of clay. CV-2 terminated at 293 meters (960 ft) in heavy clay.

- R11 (375.5 meters /1232 ft), R12 (413.3 m/1356 ft) and R13 (444.5 m/1458 ft) are found in SPD-9 in zones logged as dense gray clay and interbedded sand 341 to 494 meters (1120-1620 ft). Li concentrations ranged from 120-160 ppm. The remaining reflectors, R14 to Paleozoic basement were not intercepted by Rodinia or Pure Energy boreholes.

The seismic data also show a series of intra-basin faults east of CV-2 (Figure 9-2). Hasbrouck (2015b) interpreted these faults as representative of a major fault, possibly the Paymaster Fault.

Figure 9-2. Clayton Valley Seismic Reflection Line 2 (Hasbrouck, 2015b; Figure 4)
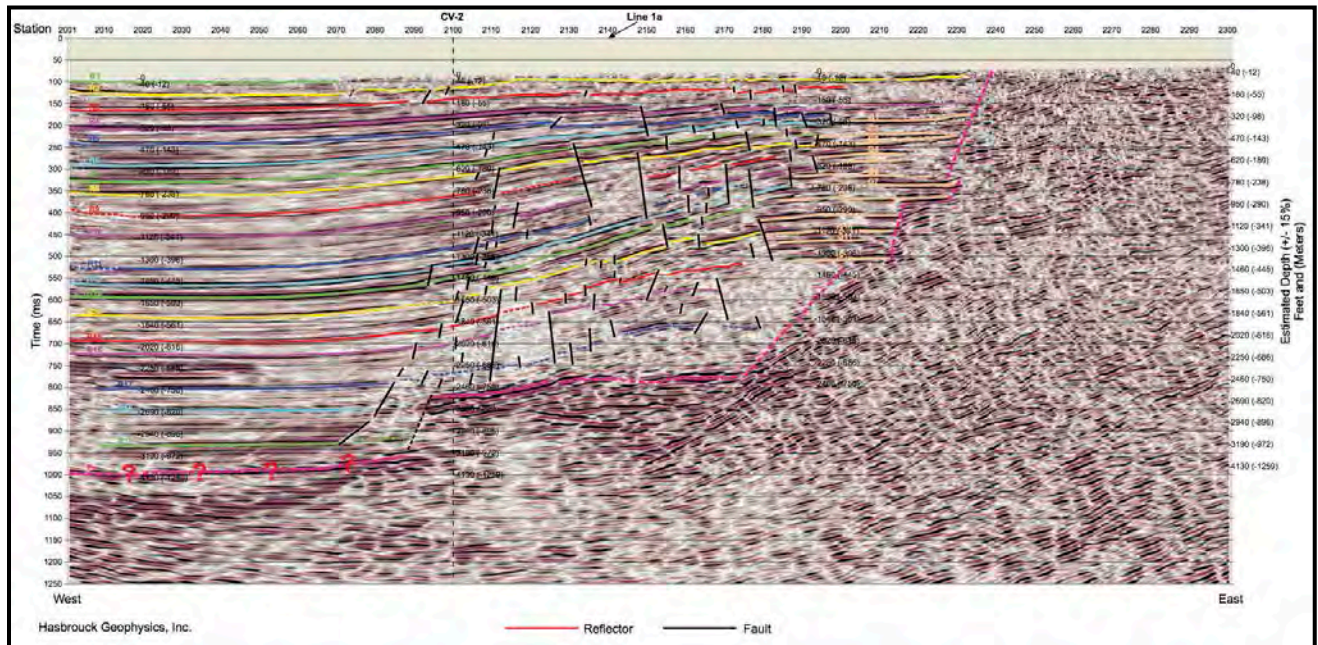
Note: Section is looking northwards. West (left) to East (right). (See Figure 9-1 for location).

Figures 9-3 and 9-4 present interpretations of the depositional environments along Line 2 (across dip) and Line 1C (along strike). These figures originally appeared in Spanjers (2015). They were supplied by PEM and approved by Hasbrouck at that time.

Figure 9-3. Summary of Seismic Reflection Line 2 (Spanjers, 2015)

WEST — EAST

0 m   250 m   500 m   750 m   1,000 m   1,250 m

CV-2

Alluvial gravels/fan deposits

Approx. Depth

150 m (490')
250 m (820')
500 m (1,640')
750 m (2,460')
1,000 m (3,280')

Lacustrine sediments - more gravels above the main ash sequence and mostly interbedded sand/silt with ash and occasional gravel below

Faulted and laterally discontinuous gravels and marginal lake/basin sediments

Discrete marginal sequence of gravels and fan deposits with less faulting

Bedrock (mostly Paleozoic)

Notes:
- - - - Major fault/group of faults
——— Top of main ash sequence
——— Base of main ash sequence/top of interbedded finer-grained lacustrine sequence
——— Denser clay band noted in base of CV-2

Figure 9-4. Summary of Seismic Reflection Line 1C (Spanjers, 2015)
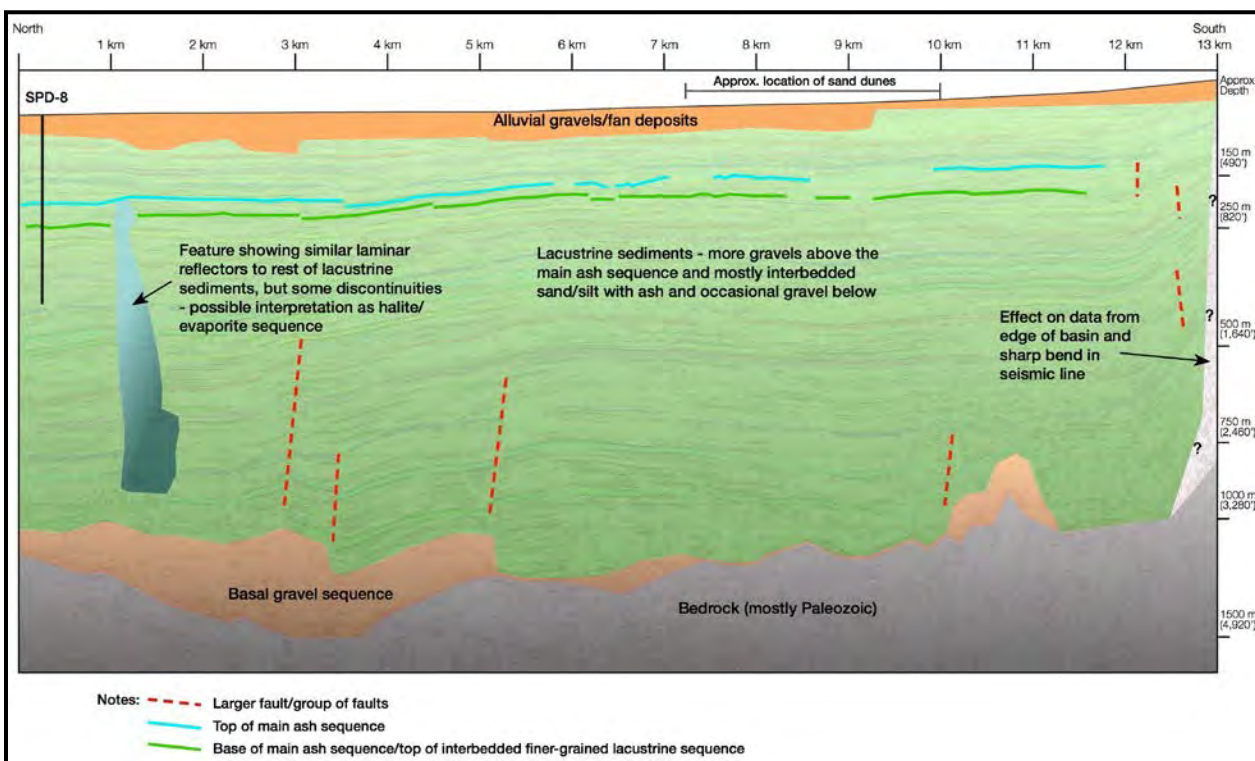
9.2.4   CSAMT / MT Survey

Hasbrouck Geophysics conducted a Controlled-Source Audio-Magnetotellurics / Magnetotellurics (CSAMT / MT) survey in late 2016 to map the stratigraphy near the PEM drill holes and determine resistivity contrasts between the freshwater – brine interface and contrasts in concentrations of brine. The information in this section comes from the report of that investigation (Hasbrouck, 2016).

Data were acquired for this survey with a *StrataGem EH4* CSAMT / MT system manufactured by Geometrics Inc. of San Jose, California. The Geometrics *StrataGem EH-4* instrument was calibrated at the factory and required no field calibration. Because of anticipated extremely low resistivities in the survey area, it was necessary to acquire data in two frequency options (termed "low" and "high") at each station in order to investigate to depths of at least 1,200 meters (3,940 ft). Details of the methods used in the CSAMT / MT survey are presented in Hasbrouck (2016).

A total of 17 separate CSAMT / MT soundings were acquired along three lines as shown in Figure 9-5. Line A is located midway between exploration boreholes CV-1 and CV-3, line B extends from exploration borehole CV-8 to beyond exploration borehole CV-7 with a portion of line B parallel to existing reflection seismic line

#1b, and line C begins north of borehole CV-4, intersects line B, passes near boreholes SPD-8, CV-7, CV-2, and ends at the middle of line A with portions of line C along or near reflection seismic lines #1a, #1c and #2.

Figure 9-5. CSAMT / MT Survey Station and Line Locations (Figure 3 from Hasbrouck, 2016)
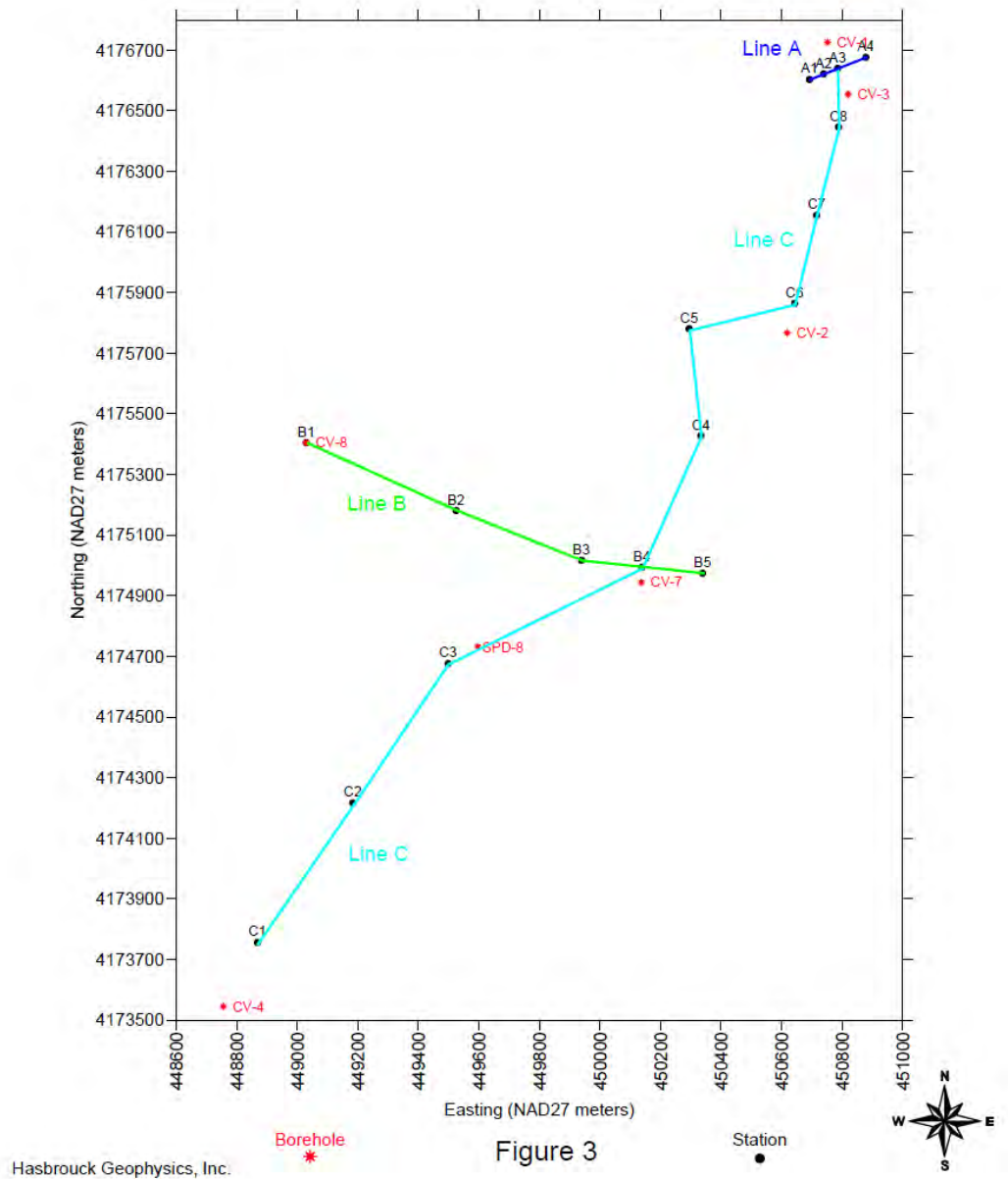
SECTION 9

Using information supplied by Montgomery for wells CV-1 and CV-3, lithium brine at station A3 is assumed to be present from about 130 to at least 560 meters depth (427 to 1,837 ft). Using this information, the results of the survey were modeled for resistivity contrasts. Figure 9-6 (Figure 8 from Hasbrouck, 2016) is a three dimensional (3D) view of the three modeled lines. The 3D plot provides spatially correct views of the resistivity variances that are referenced to the lithium brine concentrations at station A3. Modeled concentrations are interpreted to show the top of the brine interface and changes in concentration at the southeast end of line C (station C1). At depth, modeled concentrations are less uncertain given the likelihood of lithologic changes affecting the resistivity measurements.

Figure 9-6. CSAMT / MT survey, Lines A, B, and C Depth Sections View #2 (Figure 8 from Hasbrouck, 2016)
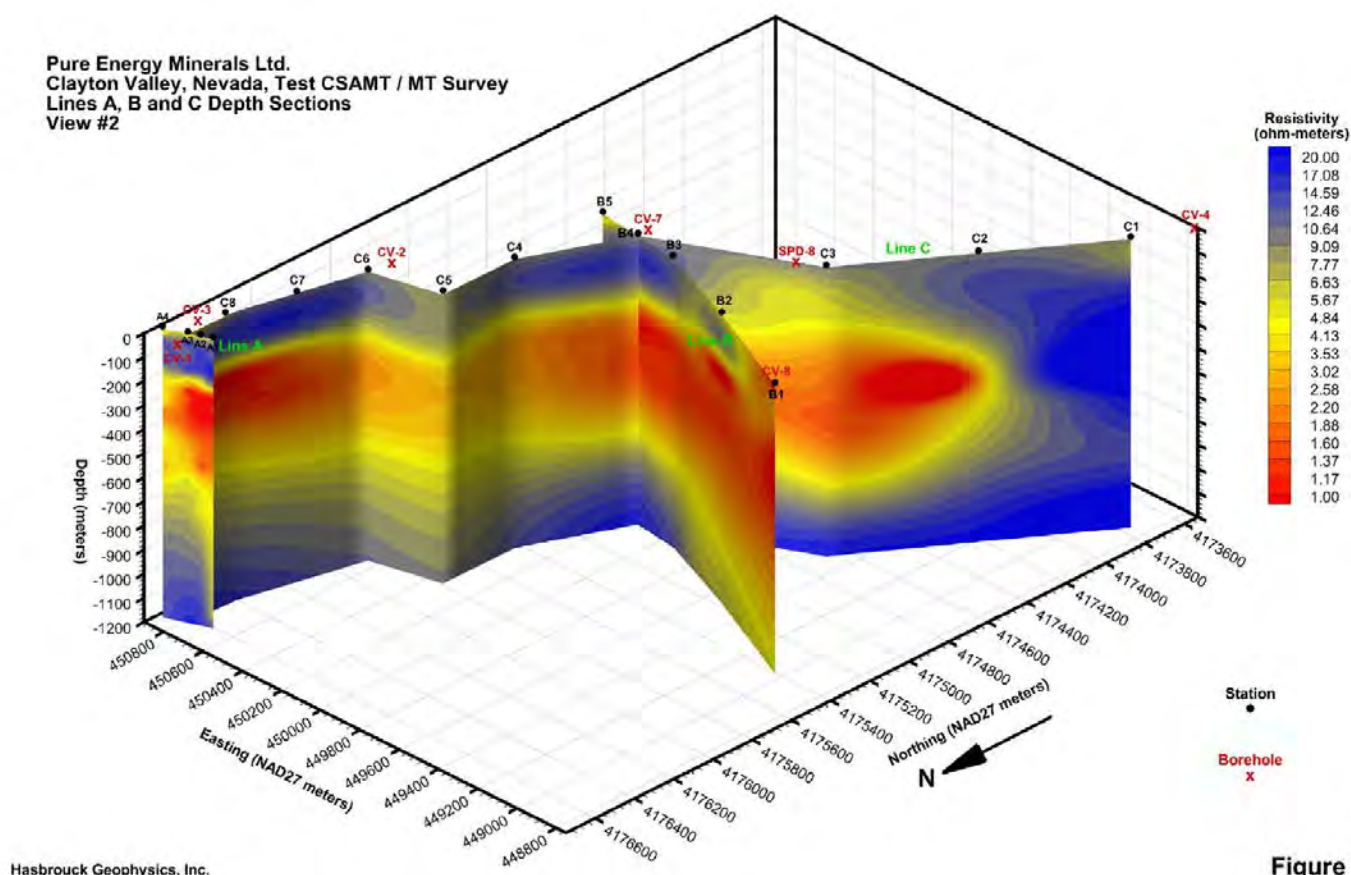
Along line A, what is interpreted as the "best" lithium brine concentration has a relatively constant depth to the top (around 220 meters [722 ft]). Along line B, the thickness of lithium brine increases significantly towards the northwest to greater than 1,000 meters (3,281 ft) near CV-8. Line C shows the absence of lower resistivities at station C1. Well CV-4 is 240 meters (787 ft) southwest of station C1 and reported no brine,

and because of the significantly higher resistivities at station C1 it is also interpreted that no brine is present at station C1. Station C3 is 110 meters (361 ft) away from borehole SPD-8, where lithium brine is reportedly first encountered at approximately 130 meters (427 ft).

9.2.5   Reinterpretation of CSAMT/MT Data and Depth-to-Bedrock

Data collected during drilling of exploration boreholes CV-7 and CV-8 provided an opportunity to further refine the interpretation of the earlier gravity and CSAMT / MT surveys. Sections 10.3.5 and 10.3.6 of this report describe drilling of exploration boreholes CV-7 and CV-8, respectively. Hasbrouck (2017) incorporated the data developed from drilling and testing those boreholes into the interpretation of the CSAMT / MT results and the depth-to-bedrock in the resource area.

The detailed gravity survey station, modeling line and borehole locations map discussed above and presented in Figure 9-1 are a combination of 2009 and 2014 gravity data acquired in the vicinity of PEM's Clayton Valley Project. In the initial modeling conducted, the only bedrock constraints were from outcrops on the eastern ends of the modeling lines where bedrock depth is taken as zero. With the inclusion of bedrock depth information from exploration borehole CV-8, an additional bedrock depth constraint was available and thus the data were remodeled understanding its location is about 400 meters (1,312 ft) from the nearest gravity modeling line. Also available were density values from bulk or core samples. The bulk samples extend to a depth of about 700 meters (2,297 ft) and have a median value of 1.55 g/cm^3 when outliers are discarded. Bedrock densities have an average value of 2.16 g/cm^3.

Using the new basin bedrock constraint from exploration borehole CV-8 and a gravity modeling approach consisting of a three-layer case with the inclusion of a variable near surface low density layer (1.90 g/cm^3, which is generally considered quite low) and the typical 2.17 g/cm^3 for basin fill and 2.67 g/cm^3 for bedrock, a new depth-to-bedrock map was developed for the resource area. That map is integrated with the CSAMT / MT results and geology information in Figure 7-3 and used as a bedrock boundary condition for the model of the Resource Estimate presented in Section 14.

9.3   Borehole Geophysics

Following drilling of exploration wells CV-1 through CV-8 (Section 10), downhole geophysics was used to characterize the stratigraphy of the aquifer penetrated at the wells. This work was performed by two geophysical logging companies: Southwest Exploration Services LLC (SwExp), Chandler, AZ and CARDNO, Reno, NV. Logging operations were conducted in both open boreholes and completed and cased wells after well development. Borehole geophysical logs included caliper, deviation, fluid temperature, fluid

conductance and specific conductance, natural gamma, and normal and induction resistivity. SwExp logging included sonic (acoustic-velocity) and nuclear magnetic resonance (NMR) in the surrounding formation. Well schematics shown on Figures 9-7 through 9-14 include a summary of results for a suite of logs obtained at each well. Data compilations are provided in Montgomery (2017a).

Fluid conductance logs and resistivity logs generally show the brine interface in some boreholes and completed wells (increasing fluid conductivity and induction and decreasing in normal resistivity) and overall patterns of brine concentration in the surrounding aquifer materials. The shorter 'saw-tooth' increases and decreases in resistivity logs are interpreted to represent the interbedded nature of the aquifer materials.

The natural gamma data show the presence of clay-rich layers (increasing natural gamma) throughout the aquifer thicknesses penetrated by the wells and generally increasing with depth. Fluid temperatures in boreholes and wells increase with depth and geothermal gradient without major anomalies. Breaks in slope of the temperature gradients do occur at exploration wells CV-3, CV-7, and CV-8 toward warmer conditions and at exploration wells CV-5 and CV-6 toward cooler conditions.

Sonic logging at well CV-8 showed overall consolidation of the aquifer system increasing with depth and clear indication of lithologic changes such as the basal conglomerate and bedrock unit contacts. NMR logging provided estimates of the porosity distribution in the aquifer materials penetrated by exploration wells in CV-3, CV-7, and CV-8 in terms of total porosity and water content distribution: free water or producible water (equivalent to drainable porosity), clay-bound water that is electrochemically bound in the clay matrix, and capillary-bound water that it is physically bound to the rock (by capillary forces such as surface tension) in small pores (also known as specific retention or irreducible water). A casing restriction in well CV-3 at approximately 255 meters (838 ft) prevented NMR borehole logging of the lower part of well. After integrating over the depth of the logs for variations in the sampling frequency of the logging tool and in the thickness of the sedimentary layers, drainable porosity using NMR methods results are: 0.10 for exploration well CV-3, 0.04 for exploration well CV-7, and 0.05 for exploration well CV-8. Complete description, analysis and results of NMR logging are provided in Montgomery (2017b).

Figure 9-7. CV-1 Schematic Diagram of Well Construction, Geophysics, and Sampling
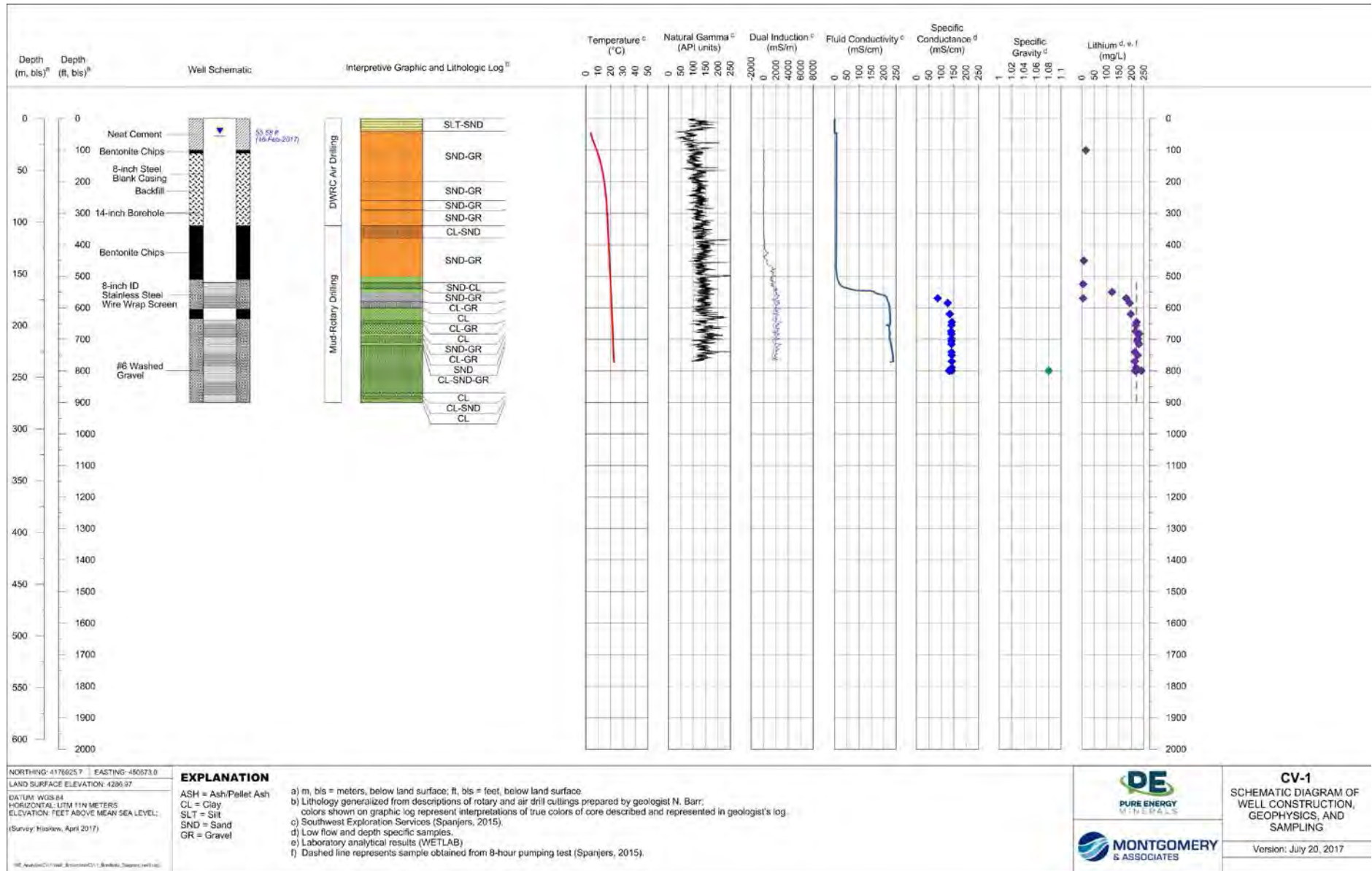
Figure 9-8. CV-2 Schematic Diagram of Well Construction, Geophysics, and Sampling
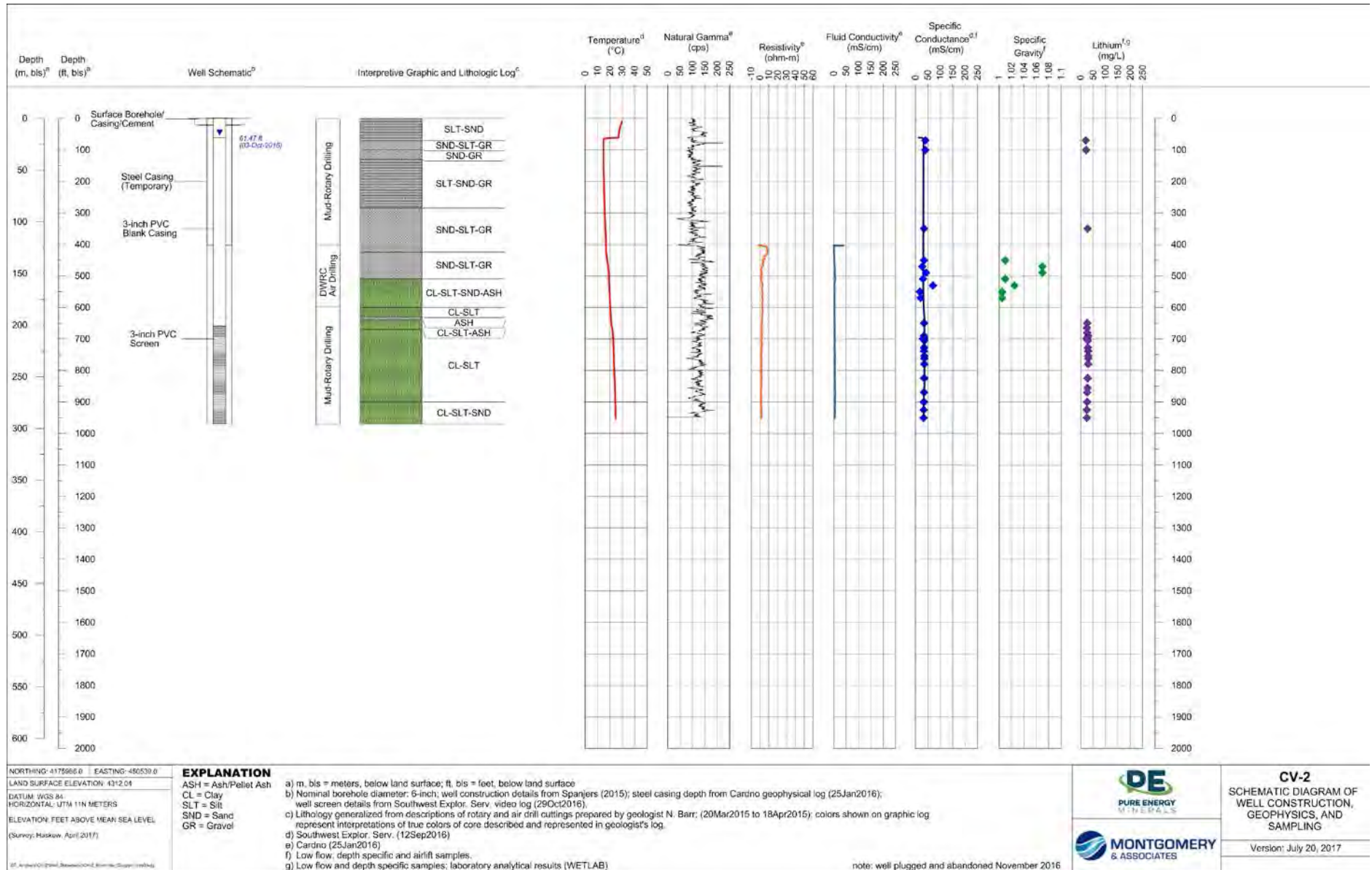
Figure 9-9. CV-3 Schematic Diagram of Well Construction, Geophysics, and Sampling
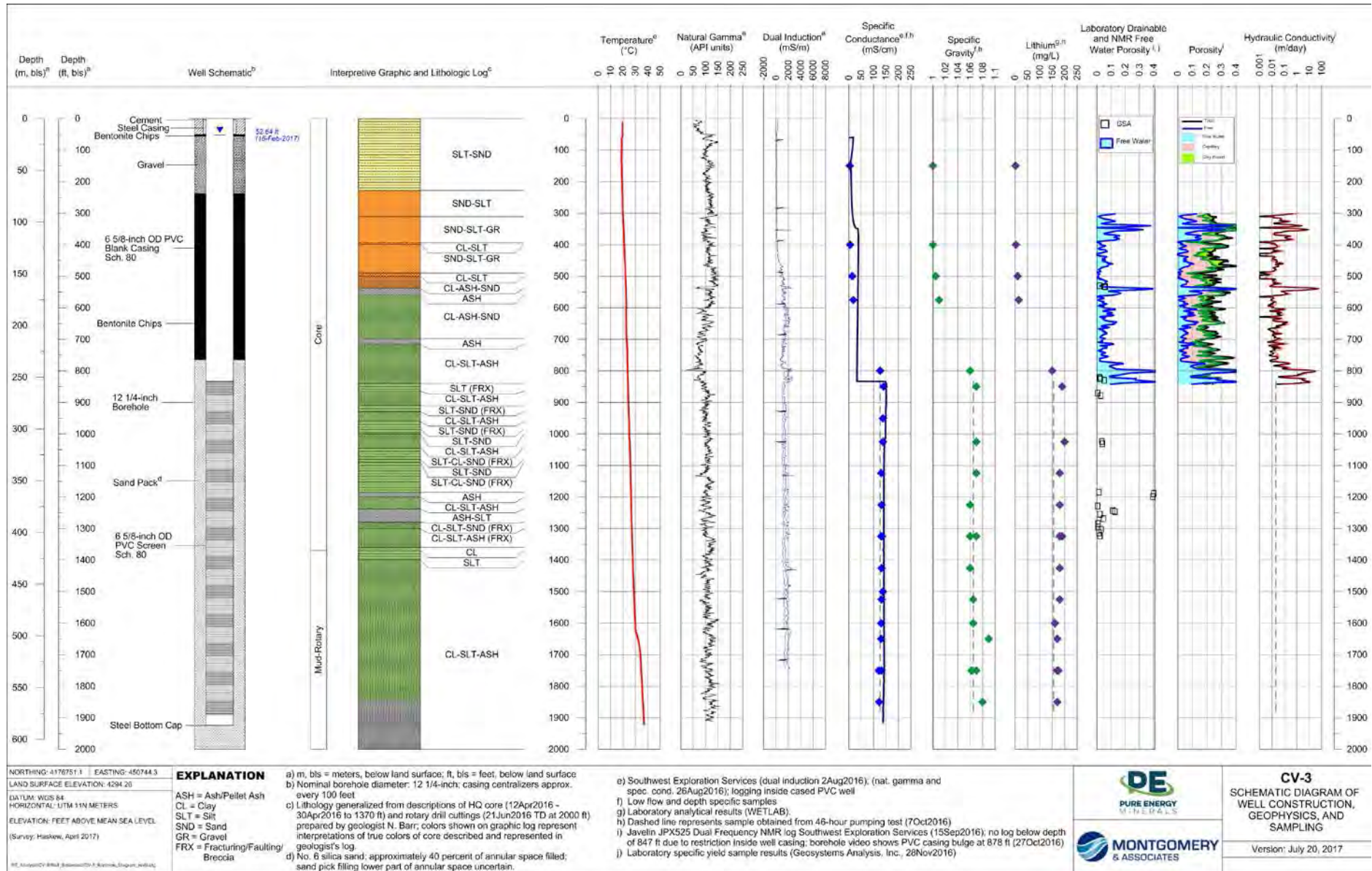
Figure 9-10. CV-4 Schematic Diagram of Well Construction, Geophysics, and Sampling
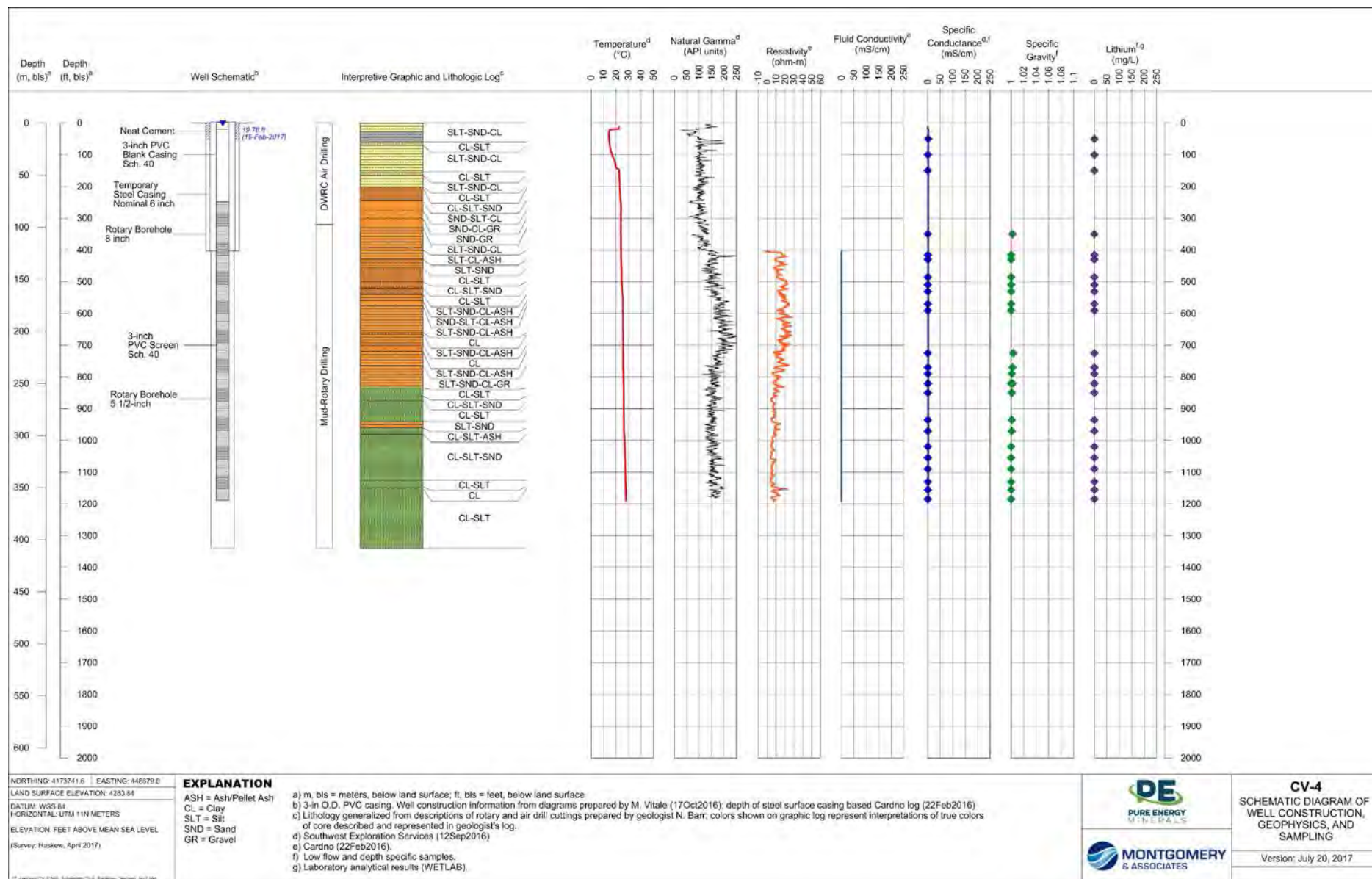
Figure 9-11. CV-5 Schematic Diagram of Well Construction, Geophysics, and Sampling
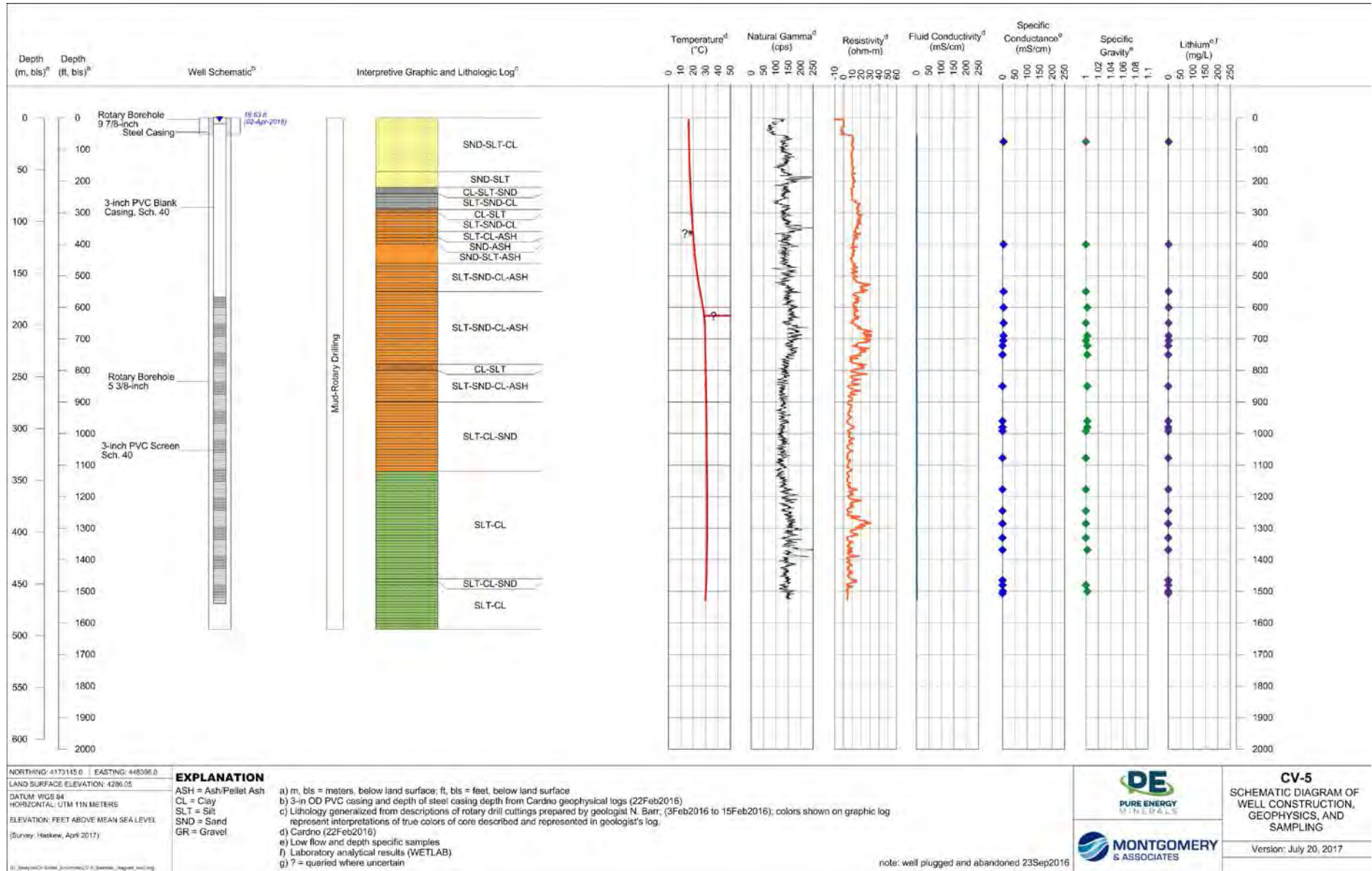
Figure 9-12. CV-6 Schematic Diagram of Well Construction, Geophysics, and Sampling
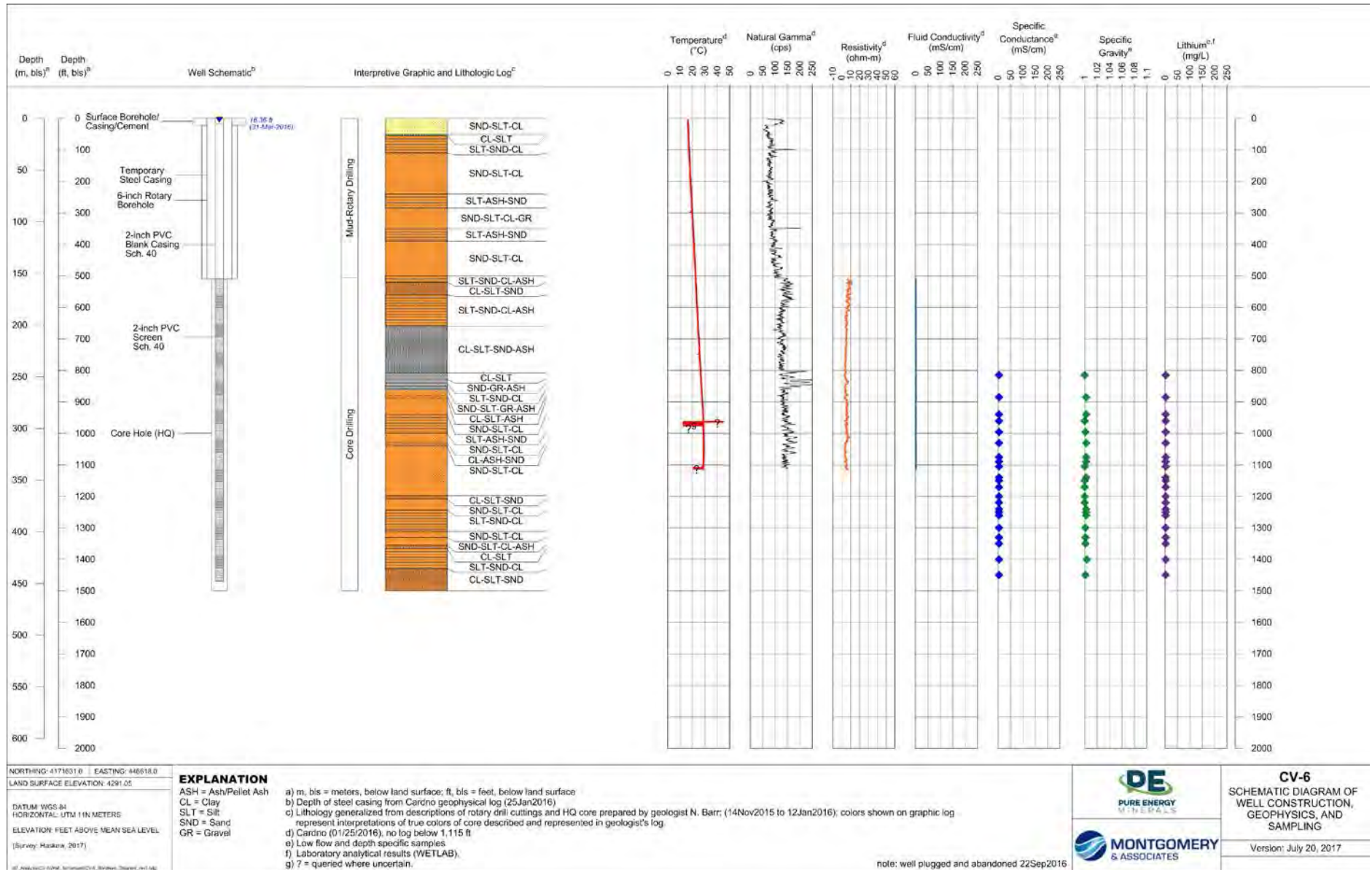
Figure 9-13. CV-7 Schematic Diagram of Well Construction, Geophysics, and Sampling
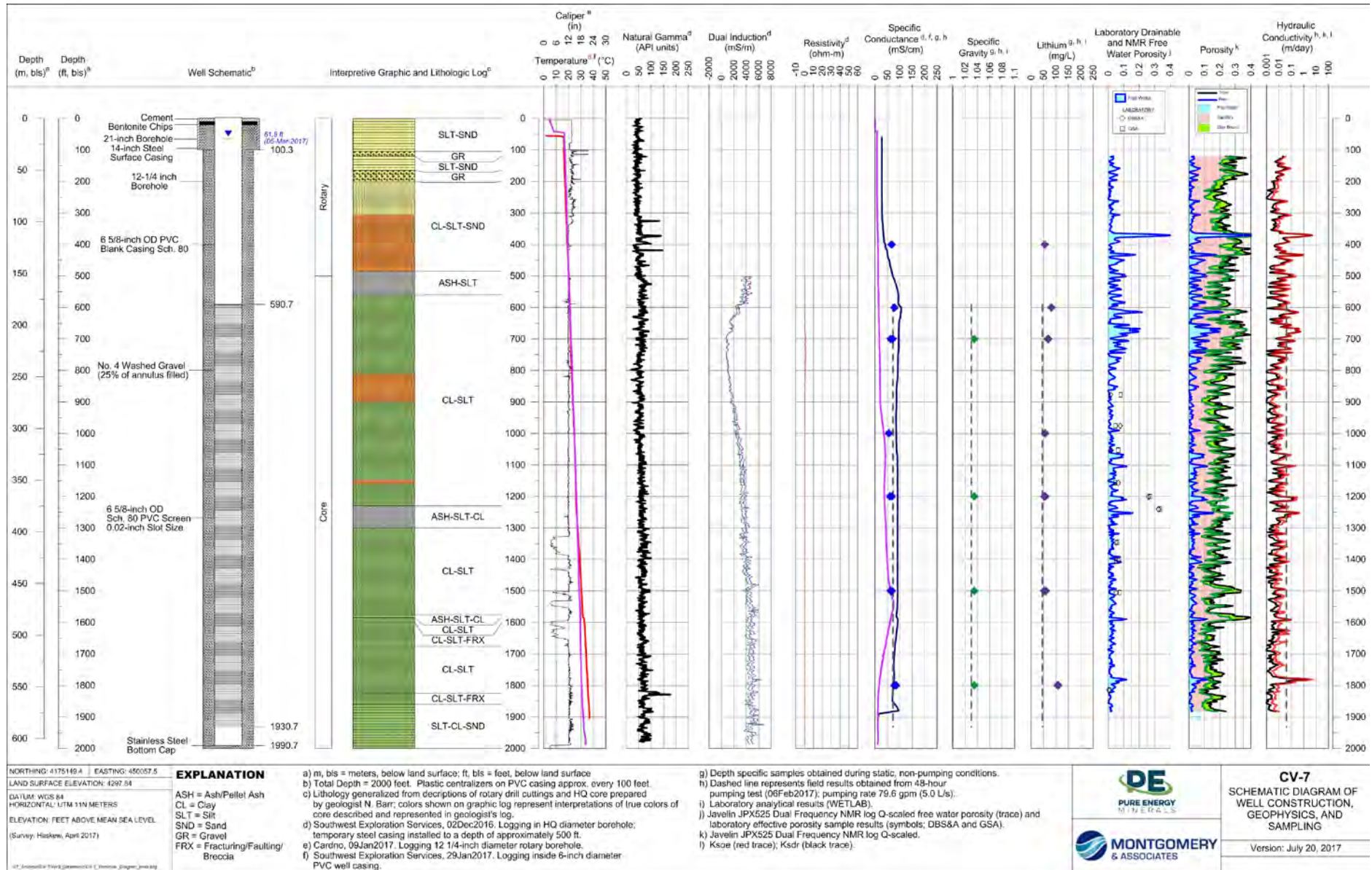
Figure 9-14. CV-8 Schematic Diagram of Well Construction, Geophysics, and Sampling
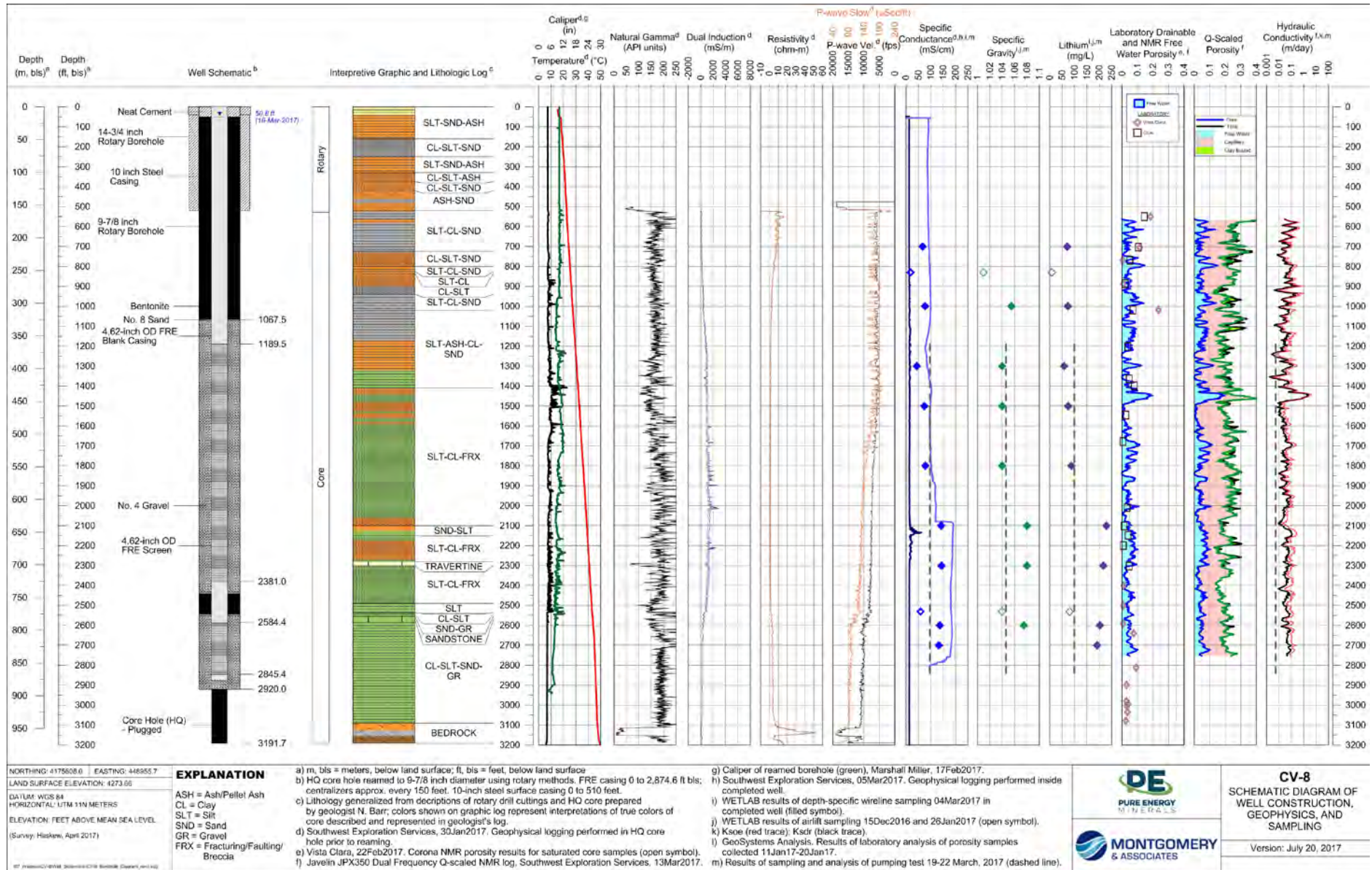
9.4 Hydrogeology

9.4.1 Spatial Variation of Brine

Drilling and sampling work conducted by Rodinia at exploration boreholes SPD-8 and SPD-9 (Section 10) provided important preliminary information regarding the depth to the brine interface in the area of the Resource Estimate of about 122 meters (400 ft). Brine concentrations were highest at SPD-9, with lithium concentrations ranging from 194 mg/L to 370 mg/L, and lowest at SPD-8, ranging from 37 mg/L to 102 mg/L (Spanjers, 2015). This relationship is consistent with results of logging and sampling conducted in the vicinity of these boreholes at exploration wells CV-1, CV-3, and CV-7. At these wells, below the depth of the brine interface lithium concentrations tend to increase with depth. Laterally, concentrations of lithium are highest at CV-1 and CV-3 and lowest at CV-7.

Some variation in brine concentration was evident in exploration borehole SPD-8, where lithium concentrations appeared to show dilution in some of the deeper intervals sampled. Similar variability was evident during drilling and sampling at CV-2 (Spanjers, 2015). This is interpreted to be the result of bounding structural faulting on the eastern edge of the basin allowing less saline groundwater to penetrate and dilute the brine aquifer along the basin margin. Similarly, deeper structural anomalies to the south of SPD-8 are believed to allow for brine dilution at CV-4, CV-5, and CV-6.

Lithium brine concentrations are shown on Figure 9-15. Lithium Concentrations in Brine Samples Collected During Pumping Tests, for samples collected during the pumping tests at exploration wells CV-3, CV-7, and CV-8. The lithium concentrations in brine discharge are representative of bulk sampling of large aquifer intervals at the well locations. During pumping, lithium concentrations stabilize soon after pump start-up and show no evidence of dilution. It is important to note that these exploration wells are not optimized in their construction to extract brine from the highest grade zones of the aquifer.

Figure 9-15. Lithium Concentrations in Brine Samples Collected During Pumping Tests
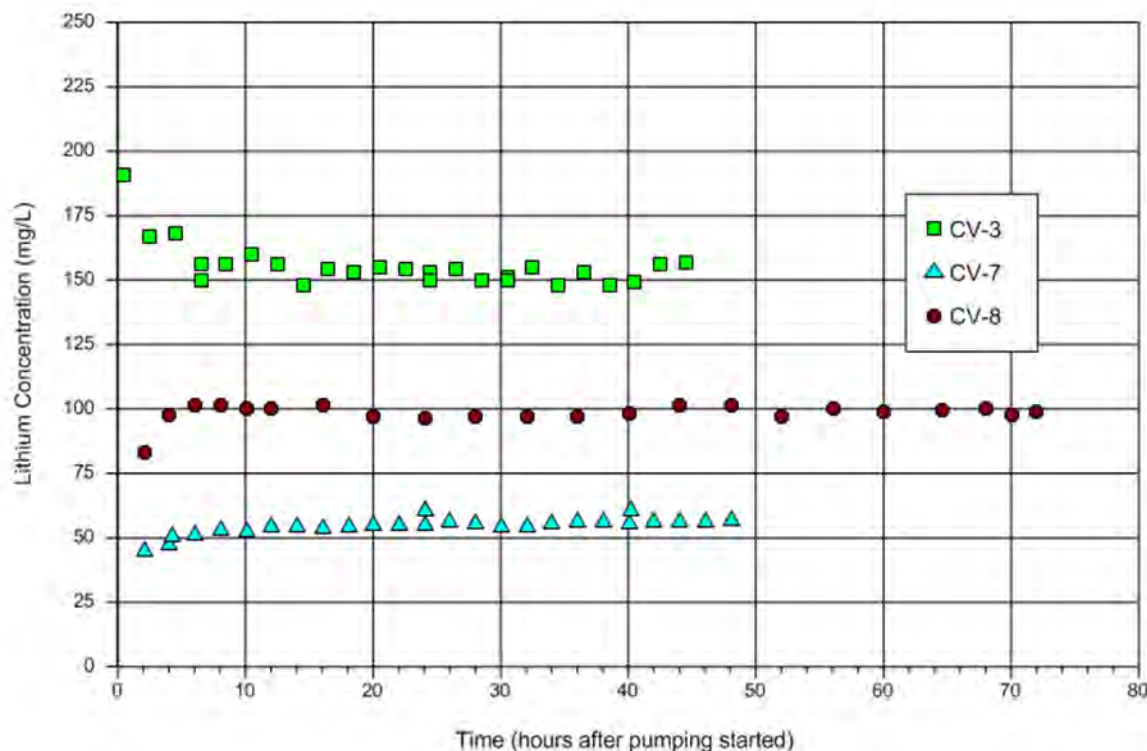
9.4.2   Hydrostratigraphy

Logging results from the boreholes and wells show sequences of interbedded alluvial sediments and volcanic ash above depths of approximately 152 meters (500 ft). Below this depth are increasing fractions of silt and clay lacustrine sequences and occasional tuff/ash beds. At well CV-8, the deepest well drilled, a basal conglomerate sequence was intercepted at a depth of 772 meters (2,534 ft) and continued to bedrock contact at 942 meters (3,090 ft). Total thickness of the basal conglomerate was 170 meters (558 ft). The upper contact of the basal conglomerate unit is a travertine sequence. The basal conglomerate is predominantly matrix supported pebble conglomerate. Core recovery was moderate to poor in many areas of the basal conglomerate sequence. Bedrock is composed of brecciated meta-siltstones and sandstones with partially silicified carbonates. Representative photographs of units are shown on Figures 9-16 and 9-17.

Figure 9-16. HQ Core Samples from Well CV-7 (629 to 644 ft and 1,572 to 1,582 ft)

Figure 9-17. HQ Core Samples from Well CV-8 (2,741 to 2,814 ft and 3,184 to 3,191 ft)

Hydrostratigraphy show no clear correlations between well locations, such as pervasive thick clay sequences acting as a hydraulically confining unit or conversely, thick sand units with high permeability.

9.4.3   Aquifer Parameters

The aquifer penetrated at the well locations is characterized as a multi-layer unconfined aquifer system consisting of thin, interconnected fine- to coarse-grained sedimentary sequences. Methods and results used to compute aquifer parameters from pumping tests at exploration wells are provided in Section 10 – Drilling and Testing and detailed in Montgomery (2017c). Results are summarized as follows:

Well Completion, Hydrostratigraphy, and Conceptual Aquifer Model: The production intervals for the wells are predominately in deeper lacustrine and volcanic ash units of the area of study. Aquifer thicknesses tested by the well are assumed to be equivalent to the difference between the top of the saturated zone and the bottom of the screened interval of the pumped well. Aquifer thicknesses penetrated by the wells range from approximately 253 meters at exploration well CV-1 to 852 meters at exploration well CV-8 (831 to 2,795 ft).

Pumping Rate and Specific Capacity. The average pumping rates for the tests ranged from 1.9 L/s at well CV-8 to 9.5 L/s at exploration well CV-1 (approximately 30 to 150 gpm). Pumping rates and water level drawdowns are limited by well construction, as these are exploration wells and not optimized for performance or efficiency. Using the maximum drawdown near the end of the pumping periods and average pumping rates, specific capacities ranged from 0.03 L/s/meters at exploration well CV-8 to 0.17 L/s/meter at exploration well CV-3 (0.12 to 0.82 gpm/ft). Specific capacity is defined as the unit volume of water discharged per unit drawdown of water level in the well.

Transmissivity and Hydraulic Conductivity. For the exploration well CV-3 pumping test, transmissivity (T) and hydraulic conductivity (K) estimates were obtained using the drawdown data from the pumped well and observation exploration well CV-1. No discernible drawdown was apparent at observation wells during testing at exploration well CV-7 and exploration well CV-8. Therefore, the transmissivity and hydraulic conductivity estimates were obtained using the drawdown data from only the pumped well results. The transmissivity of the brine aquifer ranged from 5.2 m^2/d at exploration well CV-8 to 20 m^2/d at exploration well CV-7 (53 to 220 ft^2/d). Using the corresponding aquifer thickness, hydraulic conductivity ranges from 7.1E-06 cm/s at exploration well CV-8 to 6.9E-05 cm/s at exploration well CV-1 (0.02 to 0.19 ft/d).

The overall aquifer parameter estimates are compatible with hydrostratigraphy dominated by larger proportions of fine sand, ash and silt sequences in the upper parts of the aquifer, showing higher

transmissivity (T) and hydraulic conductivity (K); silt to clay sequences with minor ash and travertine dominate in the lower parts of the aquifer (lower T and K). Given the nature of sedimentary layering, radial hydraulic conductivity (Kh) is much larger than vertical hydraulic conductivity (Kv), which is consistent with the thinly layered sedimentary sequences observed in core samples from the exploration wells.

9.4.4   Water Levels

Water level data combined with barometric pressure response analysis indicate the aquifer conditions are hydraulically unconfined, displaying essentially water table conditions where the system is open to the atmosphere through permeable aquifer material (Montgomery, 2017c and 2017d). Confined aquifer conditions are defined when overlying impervious layering separates the aquifer from the atmosphere. It is likely that deeper fine grained units may act locally to cause hydraulically "semi-confined" aquifer conditions, however due to large intervals of well screen installed in the wells, these conditions have not been evident during testing and monitoring.

The basal conglomerate unit intercepted at exploration well CV-8 has yet to be hydraulically tested, measured for hydraulic head, or sampled for brine quality. Hydraulic head measurements in this unit may potentially exhibit either confined or semi-confined conditions where head in the basal conglomerate may be above or below the head in the well screen interval above.

Table 9-1 provides a summary of representative water levels collected at well locations. Depth to water is shallow in the study area, generally between 5 to 20 meters (16 to 62 ft) below land surface.

Table 9-1. Summary of Water Level Measurements for Clayton Valley Wells

Well Identifier	Measurement Date	Depth to Water (m, bls)[a]	Depth to Water (ft, bls)[a]	Water Level Elevation (m, amsl)[b]	Water Level Elevation (ft, amsl)[b]
CV-1	16-Feb-2017	16.94	57.08	1,289.73	4,231.39
CV-2	03-Oct-2016	18.74	62.17	1,295.57	4,250.57
CV-3	16-Feb-2017	16.04	54.22	1,292.84	4,241.62
CV-4	16-Feb-2017	6.03	22.55	1,299.68	4,264.06
CV-5	02-Apr-2016	5.68	19.83	1,300.71	4,267.42
CV-6	31-Mar-2016	4.99	17.33	1,302.93	4,274.69
CV-7	05-Mar-2017	18.85	63.01	1,291.14	4,236.01
CV-8	16-Mar-2017	15.49	53.33	1,287.12	4,222.83

a) meters or ft below land surface
b) meters or ft above mean sea level

Long-term hydrographs compiled since January 2017 are shown on Figure 9-18. Water Level Hydrographs for Clayton Valley Wells, for water levels measured at exploration wells CV-1, CV-3, CV-4, CV-7, and CV-8. The measurements represent 30-minute readings from pressure transducers/data logger set-ups in the wells. Measurements are corrected to water level measurements obtained with a manual electrical water level sounder and for barometric pressure effects.

Figure 9-18. Water Level Hydrographs for Clayton Valley Wells
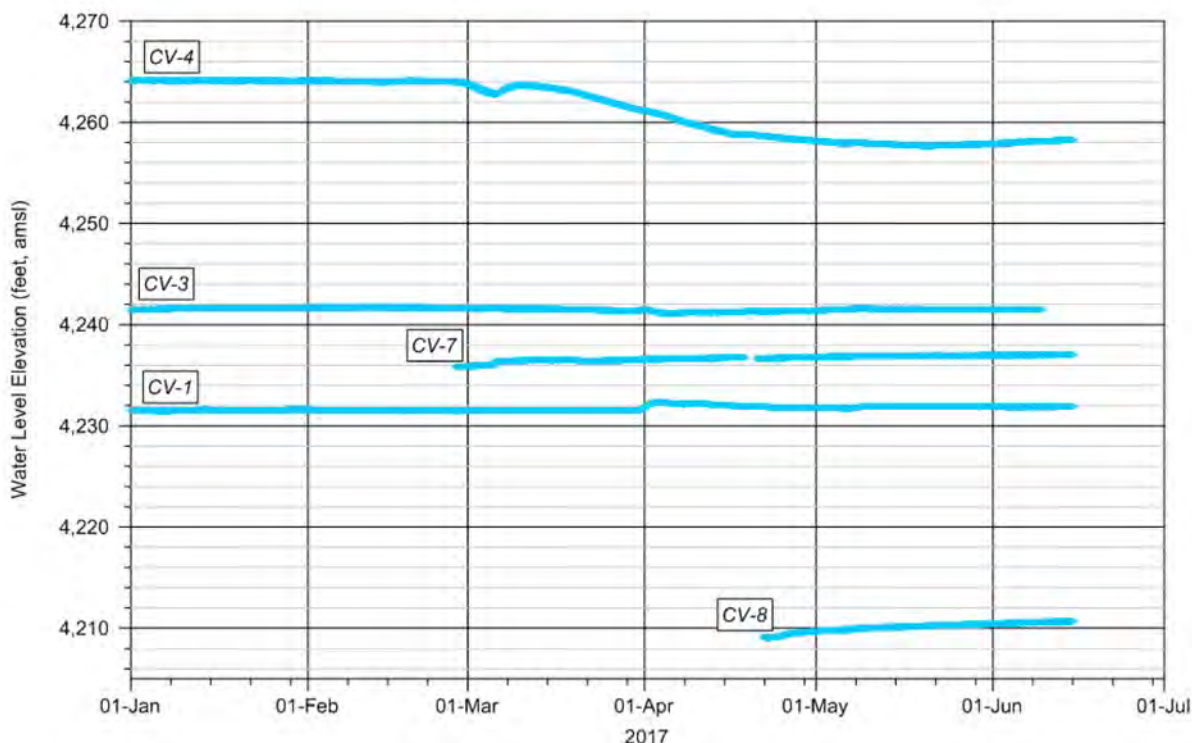
The trends in the water level hydrographs for the 2017 period of record show small rises in water levels at CV-7 and CV-8 resulting from water level recovery due to the effects of well installation and pumping tests. Small, short-term changes in water level were apparent at exploration wells CV-1 and CV-3 potentially due to brine extraction wells cycling on and off or drilling operations at nearby lithium brine mining operations operated by Albemarle. Overall, long-term regional-scale trends influencing water levels were only apparent at well CV-4. Although water level decline and recovery measurements collected in early March 2017 were apparently the result of nearby pumping, additional long-term monitoring is needed in order to determine if the apparent trends continue to recover to water levels measured earlier in the year. Because exploration well CV-4 lacks annular seals and water level is shallow, the water level may be influenced by seasonal effects of evaporation and precipitation.

Figure 9-19. Water Level Elevation Map, is a map of the study area showing the water level elevations. Based on the water level elevation contours, the direction of groundwater movement is from the southeast to the northwest and toward the lowest elevations of the salar basin floor and active lithium brine mining operations operated by Albemarle.
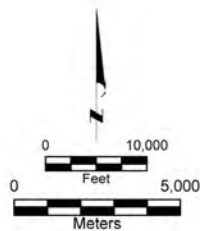
Figure 9-19. Water Level Elevation Map

10 Drilling

10.1 Introduction

For reporting purposes, the drilling and testing phases of the Project have been separated into "Previous" field programs included in historical reporting, and "Current" field programs which are new since completion of the preliminary NI 43-101 Resource Estimate (Spanjers, 2015). The deposit type being evaluated is a brine type; therefore, included in this section, are results of pumping tests conducted during the field programs. Figure 7-3. Location Map shows locations for Project wells and boreholes. Table 10-1. Well Location Details for Clayton Valley Exploration Wells, and Table 10-2. Construction Details for Clayton Valley Exploration Wells, provide a summary of location and construction details for the exploration boreholes and wells. Schematic diagrams of well construction and logging results are shown on Figures 9-7 through 9-14. Results and data compilations for the drilling programs are provided in Montgomery (2017a).

Table 10-1. Well Location Details for Clayton Valley Exploration Wells

Well Identifier	Coordinates[a]		Land Surface Elevation (m, amsl)[b]	Land Surface Elevation (ft, amsl)[b]	Completion	Comments
	East (m)	North (m)				
CV-1[c]	450673.0	4176925.7	1306.67	4287.0	Feb 2015	---
CV-2[c]	450539.0	4175966.0	1314.31	4312.0	Apr 2015	P&A[e]
CV-3	450744.3	4176751.1	1308.89	4294.3	Jul 2016	---
CV-4	448679.0	4173741.6	1305.71	4283.8	Feb 2016	---
CV-5	448396.0	4173145.0	1306.39	4286.1	Feb 2016	P&A
CV-6	446618.0	4171631.0	1307.91	4291.1	Jan 2016	P&A
CV-7	450057.5	4175149.4	1309.98	4297.8	Jan 2017	---
CV-8	448955.7	4175608.0	1302.61	4273.7	Feb 2017	---
SPD-8[c,d]	449516.8	4174929.9	1305.50	4283.1	Feb 2010	P&A
SPD-9[c,d]	450670.8	4176946.9	1305.60	4283.5	Feb 2010	P&A

a) WGS84 Zone 11N UTM meters; surveyed coordinates (Haskew, 2017)
b) meters or feet above mean sea level; surveyed coordinates (Haskew, 2017)
c) Spanjers (2015)
d) Coordinates from Spanjers (2015)
e) P&A = Plugged and Abandoned

Table 10-2. Construction Details for Clayton Valley Exploration Wells

Well Identifier	Borehole Diameter (inches)	Borehole Total Depth (feet)	Drilling Method[a]	Casing Diameter (inches)	Casing Depth (feet)	Perforated Casing Depth Interval (feet)	Casing Type
CV-1[b]	14-3/4	900	DWRC: 0 - 340 MR: 340 - 900	8-5/8	900	520 -600 640 - 890	Steel Stainless Steel
CV-2[b]	12 6	20 970	MR: 0 – 400 DWRC: 400 – 598 MR: 598 - 970	6 3	20 970	670 - 970	Steel PVC
CV-3	12-1/4	2000	Core: 0 - 1368 MR: 1368 - 2000	8 6-5/8	49 1924	833.5 - 1888.5	Steel PVC
CV-4	8 5-1/2	403 1340	DWRC: 0 - 320 MR: 320 - 1340	6 3	403 1188.6	248.6 - 1188.6	Steel PVC
CV-5	9-7/8 5-3/8	50 1820	MR: 0 - 1820	3	1820	568.8 - 1538.8	PVC
CV-6	12-3/4 6 4-1/2	21 500 1500	MR: 0 - 500 Core: 500 - 1500	8 2	21 1469.0	509.0 - 1469.0	Steel PVC
CV-7	21 12-1/4	100.3 2000	MR: 0 - 500 Core: 500 - 2000	14 6 5/8	100 1990.7	590.7 - 1930.7	Steel PVC
CV-8	19 14-3/4 9-7/8	40 519.4 3191.7	MR: 0 - 528 Core: 528 - 3191.7	10 4.62	519.4 2874.6	1189.5 – 2381 and 2584.4 – 2845.4	Steel FRE[c]
SPD-8[b]	---	1280	DWRC: 0 - 1280	---	---	---	---
SPD-9[b]	---	1620	DWRC: 0 - 1620	---	---	---	---

a) DWRC = Dual-wall Reverse Circulation; MR = Conventional Mud Rotary; Core = Core Drilling (HQ). Values in feet below land surface.
b) Spanjers (2015)
c) FRE = Fiberglass Reinforced Epoxy casing

10.2 Previous Drilling Programs

Rodinia drilled two exploration boreholes, designated SPD-8 and SPD-9, using dual wall reverse circulation (DWRC) drilling methods in the area of the Resource Estimate in 2009 and 2010 (Keast, 2011 and Spanjers, 2015). Drilling work performed by Rodinia at SPD-8 and SPD-9 was useful in determining the depths to the water table and brine interface, as the DWRC drilling method does not introduce additional fluids into the aquifer materials.

The exploration boreholes were drilled by the DWRC method until ground conditions prevented further advancement. Tricone drill bits were used initially to drill 10-inch diameter boreholes for surface casing. Temporary casing was installed to variable depths to stabilize the upper section of each hole and to prevent compressed air blowouts around the casing. Drilling muds and paper products were used to stabilize the hole in these sections. Once casing was installed, 6-inch diameter dual wall pipe with an open face drag bit was used to drill and collect lithologic cuttings and fluid samples. Drill bit plugging was a common occurrence when coarse gravel, hard clays and fine flowing sand were encountered. After drilling and sampling was completed, the boreholes were plugged and abandoned.

PEM commenced exploration drilling at the Property in 2014 and 2015 at wells CV-1 and CV-2 (Spanjers, 2015). The problems associated with borehole stability for DWRC drilling in unconsolidated sediments resulted in the drilling method for CV-1 and CV-2 to include conventional mud rotary methods (MR). Both downhole geophysics and depth specific sampling were conducted at wells CV-1 and CV-2; a pumping test was also conducted at well CV-1 for estimation of aquifer parameters and bulk sampling for hydrochemistry analysis (Figure 9-7).

10.2.1 Well CV-1 Drilling

The location for exploration well CV-1 was chosen to allow the data gathered to be easily correlated with SPD-9. Harris Exploration Drilling, of Fallon, NV (Harris) started the well in September 2014 using DWRC techniques to a depth of approximately 104 meters (340 ft). At this depth, instability in the open hole necessitated switching to rotary mud drilling to complete the borehole to a total depth of 274 meters (900 ft). The drilling from 104 meters (340 ft) to 274 meters (900 ft) was completed using a nominal 6-inch diameter tricone bit with freshwater and bentonite mud additives (small amounts of polymer were added to the mud to help stabilize the borehole walls). Following downhole geophysics work in CV-1, the borehole was reamed to a nominal 14-inch diameter using a two-stage tricone bit and mud-rotary techniques. This work was performed by Harris in February 2015.

The reaming diameter was chosen to allow sufficient annulus between the well casing and the borehole walls so that filter pack and cement seals could be installed without unnecessarily high risk of bridging. Following reaming, nominal 8-inch diameter blank steel casing and stainless steel well screen were installed, and gravel pack and seals were installed in the annulus. The diameter of the completed well was sufficient to allow installation of a high-capacity, electric submersible pump so that the aquifer could be adequately stressed during testing.

10.2.2 Well CV-2 Drilling

Harris started drilling at exploration well CV-2 in March 2015 (note this borehole was also called CV-3 in some notes/samples as this was the name used on the BLM Notice of Intent paperwork). Using information from adjacent holes, the borehole was drilled using 6-inch diameter mud-rotary drilling to a depth of 122 meters (400 ft) and cased with temporary, 6-inch blank mild-steel casing. The intent of this casing was to prevent blow-outs/short-circuits to surface when using DWRC drilling, as experienced during of CV-1.

DWRC drilling using a modified drag-bit was used from depths of 122 to 152 meters (400 to 500 ft) and was then switched to a skirted tricone DWRC bit to avoid plugging with gravel-sized lithic tuff. This modified tricone bit was used in DWRC mode to a depth of 182 meters (598 ft), at which point all returns and air circulation were lost and some air return to surface at distance from the well was noted (i.e., short-circuit). Drilling using the same tricone bit was resumed in mud-rotary mode to a depth of 191 meters (625 ft), where DWRC drilling was attempted again. This was unsuccessful, as no returns were made, and mud-rotary drilling using the same bit was used to the base of the borehole at total depth of 296 meters (970 ft). Additives used during drilling consisted of freshwater, bentonite mud and some occasional polymer to help maintain borehole wall stability. The driller noted that due to the saline conditions, the bentonite mud broke-down very quickly below approximately 213 meters (700 ft) and greater than usual quantities of bentonite were used.

After drilling to total depth, the drill string was removed and 3-inch inside diameter PVC well casing was installed, with slotted section from 204 to 296 meters (670 to 970 ft) and blank well casing section to surface. No filter pack or hydraulic seals were used in the installation. The well was then developed by airlifting for approximately 9 hours using 1-inch inside diameter steel pipe installed inside the PVC well casing. After the well was cased and developed, downhole geophysical logging and depth specific sampling were performed inside the PVC well casing to bottom of the well. The well was plugged and abandoned in November 2016.

10.3   Current Drilling Programs

The drilling methods for PEM exploration wells CV-3 through CV-8 included DWRC, MR, and diamond core drilling (HQ core size). Exploration wells CV-3, and CV-5 through CV-8 were drilled using core drilling and mud rotary methods; CV-4 was drilled using the DWRC method until ground conditions prevented further advancement and then completed using mud-rotary. The addition of core drilling to the drilling program allowed for high quality geological logs. Given favorable ground conditions, core drilling can also provide high quality hydrogeologic information using packer and drive point sampling and testing methods in open borehole. These methods were attempted at wells CV-3 and CV-8, however results were unsatisfactory due to borehole instability, plugging of packer by very fine sand and silt, and inadequate seals for isolation. Additional techniques to gather supplemental data in completed boreholes and wells included downhole geophysics, depth specific sampling using no purge and passive methods, and bulk sampling and testing during pumping tests (Figures 9-9 through 9-14).

10.3.1   Well CV-3 Drilling

Exploration well CV-3 (referred to incorrectly as CV-2 in some historical notes and samples) was drilled to a total depth of 610 meters (2,000 ft) during the period April 2016 through June 2016. HQ diameter core drilling was used to depth of 417 meters (1,368 ft). Below this depth, mud rotary drilling was used to total depth. The mud-rotary borehole size was 12-1/4 inches.

The well was cased with 6-5/8 outside diameter schedule 80 PVC casing from land surface to 586 meters (1,924 ft). The perforated well casing consisted of 0.02-inch slots and was installed from a depth of 254 to 576 meters (833 to 1,890 ft) and blank well casing elsewhere. Casing centralizers were installed approximately every 30 meters (100 ft). The bottom of the casing was capped using a stainless steel bottom cap. Swelling and caving conditions in the annulus between the borehole wall and perforated interval prevented complete installation of the gravel pack; the volume of gravel installed was enough to fill approximately 40 percent of the annular space. After the well was cased and developed, downhole geophysical logging and sampling were performed inside the PVC well casing to bottom of the well, and a pumping test was conducted. Casing diameter was restricted due a bulge in the PVC at 258.1 meters (847 ft); this is believed to have occurred during construction and/or development. Because of this restriction the NMR logging tool could not log below 258.1 meters (847 ft).

10.3.2 Well CV-4 Drilling

Exploration well CV-4 was drilled to a total depth of 408 meters (1,340 ft) and completed during the period December 2015 through February 2016. The well was drilled using DWRC to 98 meters (320 ft). Below a depth of 98 meters (320 ft), mud rotary was used as the DWRC method, but was unable to advance the borehole. Temporary mild steel casing (nominal 6-inch) was installed from land surface to a depth of 123 meters (403 ft) for borehole stability while drilling the bottom part of the borehole. Nominal borehole diameter size was 8 inches from land surface to a depth of 123 meters and then 5 1/2 inches to total depth.

The well was cased with 3-inch inside diameter schedule 40 PVC casing from a depth of land surface to 362 meters (1,188.6 ft); casing was slotted from a depth of 76 to 362 meters (248.6 to 1,188.6 ft) and blank elsewhere. No filter pack or hydraulic seals were used in the installation. After the well was developed using air-lift methods, downhole geophysical logging and depth specific sampling were performed inside the PVC well casing to bottom of the well.

10.3.3 Well CV-5 Drilling

Exploration well CV-5 was drilled to a total depth of 555 meters (1,820 ft) and completed during February 2016. The well was drilled using mud rotary drilling. The nominal borehole diameter size was 9 7/8 inches from land surface to a depth of 15 meters (50 ft) and then 5 3/8 inches to total depth. Blank steel casing was installed to stabilize the borehole in the larger diameter borehole.

The well was cased with 3-inch schedule 40 PVC casing from land surface to a depth of 469 meters (1,539 ft); the casing was slotted from a depth of 173 to 469 meters (568.8 to 1,539 ft) and blank elsewhere. No annular filter pack or hydraulic seals were used in the installation. After the well was developed using air-lift methods, downhole geophysical logging and sampling were performed inside the PVC well casing to bottom of the well. The well was plugged and abandoned in September 2016.

10.3.4 Well CV-6 Drilling

Exploration well CV-6 was drilled to a total depth of 457 meters (1,500 ft) during the period November 2015 through January 2016. The well was drilled using MR to a depth of 154 meters (505 ft); below this depth the well was drilled using core drilling methods. The nominal borehole diameter size was 12-1/4 inches from land surface to 6 meters (21 ft) to accommodate steel surface casing; 6 inches from 6 to 155 meters (21 to 510 ft); and HQ diameter to total depth. Temporary blank steel casing (nominal 6-inch diameter) was installed above the HQ borehole to stabilize drilling conditions.

After drilling to total depth, the well was cased with 2-inch diameter schedule 40 PVC casing from land surface to depth of 448 meters (1,470 ft); the casing was slotted from 155 to 448 meters (509 to 1,470 ft) and blank elsewhere. No filter pack or hydraulic seals were used in the installation. After the well was developed, downhole geophysical logging and depth specific sampling were performed inside the PVC well casing to bottom of the well. The well was plugged and abandoned in September 2016.

10.3.5 Well CV-7 Drilling

Exploration well CV-7 was drilled to a total depth of 610 meters (2,000 ft) during the period from early November 2016 through late January 2017. The well was initially drilled using mud rotary drilling from land surface to 152 meters (500 ft) to accommodate temporary steel casing for borehole stability. Below this depth, core drilling method (HQ) was used. After reaching total depth, the borehole was reamed to a nominal diameter of 12-1/4 inches. Final borehole diameter sizes were 21 inches from land surface to a depth of 30 meters (100 ft) for installation surface casing and 12-1/4 inches below this depth.

Steel surface casing (nominal 14-inch diameter) was installed from land surface to a depth of 30 meters (100 ft). Below this depth, the well is cased with 6-5/8 inch outside diameter schedule 80 PVC casing to total depth. The casing is slotted with 0.02 inch slots from a depth of 180 to 588 meters (590.7 to 1,930.7 ft) and blank elsewhere. A stainless steel bottom cap was installed at the end of the casing string. The annular space between the borehole wall and the perforated interval was filled using tremmie methods with No. 4 gravel. Due to difficulties of borehole wall swelling and instability, volume calculations show approximately 25 percent of the annulus is filled with gravel. The upper blank interval is filled with bentonite chips and drill cuttings. Downhole geophysical logging was performed prior to and after well completion; depth specific sampling, NMR logging, and a pumping test were conducted after well installation.

10.3.6 Well CV-8 Drilling

Exploration well CV-8 was drilled to a total depth of 973 meters (3,191.7 ft) from late November 2016 through late February 2017. The well was drilled using mud rotary to a depth of 161 meters (528 ft). Below this depth core drilling (HQ) was used. After drilling, the hole was reamed to a nominal diameter of 9-7/8 inches to a depth of 890 meters (2,920 ft) using MR drilling. The HQ corehole from 890 meters to total depth was plugged and abandoned prior to reaming.

Steel surface casing (10-inch nominal diameter) was installed from land surface to a depth of 158 meters (519.4 ft). The well was cased with 4.62-inch OD blank FRE casing (nominal 3.98-inch ID) from land surface to depth of 876 meters (2874.6 ft). The well has two perforated intervals with 0.02-inch slots:

363 to 726 meters (1189.5 to 2381 ft) and 788 to 867 meters (2584.4 to 2845.4 ft); a blank section of FRE

casing was installed below the lowermost perforated section as a sump. The annular space between

borehole wall and FRE perforated intervals is filled with No. 4 gravel. Elsewhere, the annular space is filled

with bentonite/sand/grout seals. Downhole geophysical logging was performed prior to and after well

completion; depth specific sampling, NMR logging, and a pumping test were conducted after well

installation.

10.4   Previous Testing Programs

10.4.1   Well CV-1 Testing

Spanjers (2015) reported that, following well installation and well development at CV-1, a nominal 6-inch

diameter Grundfos NP6 25 hp electric submersible pump was installed at a depth of 152 meters (500 ft),

with 3-inch inside diameter steel riser pipe and check valve. Discharge at surface was measured using a

calibrated sonic flow meter. The discharge flow rate from the pump was controlled using a variable

frequency drive to control the revolutions per minute (rpm) of the pump. Water discharged from the well

was pumped to a water truck and spread on local roads for dust control.

An 8-hour, single-well constant-rate pumping test was conducted on April 2, 2015 (Spanjers, 2015). A rate of

9.5 L/s (150 gpm) was chosen based on the potential output from the pump and the relative drawdown vs.

discharge rate during a preliminary step-discharge rate test. Depending on the analytical model used to

estimate aquifer parameters, analysis of the pumping test data indicated a transmissivity ranging from

15 to 33 m^2/d. Using an aquifer thickness of 253.3 meters (831 ft), hydraulic conductivity ranged from

6.9E--5 to 1.5E-04 cm/s, indicative of fine grained sand to silt aquifer materials (Heath, 1983). Depending on

thickness of the aquifer and well construction, long-term sustainable pumping rates from wells completed in

aquifer materials of this nature are estimated as 6 to 9 L/s (95 to 140 gpm). This estimate is in line with

anecdotal evidence that suggests that production wells on the adjacent Albemarle operation operate at

3 to 16 L/s (50 to 250 gpm) from various producing hydrostratigraphic units in the brine aquifer.

10.5   Current Testing Programs

10.5.1   Wells CV-3, CV-7, and CV-8 Testing

Montgomery directed the current pumping test program and provided technical input prior to and during

the tests, as well as data processing and analytical modeling for aquifer hydraulic parameters. Methods and

results are detailed in Montgomery (2017c). A summary of the tests and measurements of hydraulic parameters are provided in Table 10-3. Summary of Hydraulic Parameters Measured During Pumping Tests.

The test pump and discharge assembly for the pumping tests was installed by Harris. The test pump assembly consisted of a Goulds model 85GS100 pump with a Franklin 10 hp, 460 V 3 phase motor and soft-start control panel. At land surface, the discharge assembly included two Blancett flow meters used with Blancett B2800 flow monitor digital readouts, a pressure gauge, gate valve to adjust flow rate, and a hose bib for obtaining water samples. Best management practices were employed to manage discharge of pumped groundwater in accordance with temporary groundwater discharge permits obtained by PEM and authorized by the NDEP. Discharge was directed approximately 30.5 meters (100 ft) from the wellhead to a sump and then diverted down-gradient in a ditch lined with a 4-inch diameter perforated PVC pipe. Flow rate and water quality parameters were monitored periodically during testing.

Water levels during the test were monitored in the well bores with pressure transducers and verified for fluid density corrections using measurements from electrical water level sounders. During the pumping period, field parameters of pH, temperature, specific electrical conductance, and specific gravity (fluid density compared to freshwater) were periodically measured. Barometric pressure was monitored during the pumping test in order to help distinguish water level stresses due to pumping from stresses caused by changes in atmospheric pressure. Water quality parameters were measured with a MyronL multi-meter. Sand content of the water was measured using a 1-liter calibrated Imhoff cone. Figure 10-1. Photographs of Set-ups for Pumping Tests, shows photographs of a typical set-up for the pumping tests.

The computed aquifer parameters from the analysis of pumping test data are provided in Table 10-4. Computed Aquifer Parameters Derived from Pumping Tests. The analysis of the tests assumes the brine aquifer at the test sites to be a single, unconfined aquifer system consisting of fine- to coarse-grained sediments. In the zones of blank casing penetrating the aquifer unit, non-horizontal flow is assumed to occur toward the intervals of well screen during pumping. Therefore, the aquifer thickness tested by the well is assumed to be equivalent to the difference between the top of the saturated zone and the bottom of the screened interval of the pumped well.

Table 10-3. Summary of Hydraulic Parameters Measured During Pumping Tests

Well CV-3 Test

Well Identifier	Type [a]	Date Test Started	Test Duration (hours)	Pre-pumping Water Level[b]		Water Level Change at End of Pumping Period		Average Pumping Rate[c]		Specific Capacity (gpm/ft)[d]	
				(m bls)	(ft bls)	(m)	(ft)	(L/s)[c]	(gpm)	(L/s/m)	(gpm/ft)
CV-3	P	05-Oct-2016	46.5[e]	21.94	71.98	48.99	160.72	4.4	69	0.09	0.43
CV-1	O			16.92	55.52	0.48	1.56	---	---	---	---
CV-2[f]	O			18.73	61.44	0.03	0.11	---	---	---	---
CV-4[f]	O			5.96	19.55	0.02	0.05	---	---	---	---

Well CV-7 Test

Well Identifier	Type	Date Test Started	Test Duration (hours)	Pre-pumping Water Level		Water Level Change at End of Pumping Period		Average Pumping Rate		Specific Capacity (gpm/ft)	
				(m bls)	(ft bls)	(m)	(ft)	(L/s)	(gpm)	(L/s/m)	(gpm/ft)
CV-7	P	04-Feb-2017	48	17.48	57.36	26.37	86.50	5.0	79.7	0.19	0.90
CV-3[f]	O			16.06	52.70	-0.05	-0.17	---	---	---	---
CV-1[f]	O			16.94	55.58	0.00	0.01	---	---	---	---
CV-4[f]	O			5.97	19.60	0.02	0.05	---	---	---	---

Well CV-8 Test

Well Identifier	Type [a]	Date Test Started	Test Duration (hours)	Pre-pumping Water Level		Water Level Change at End of Pumping Period		Average Pumping Rate		Specific Capacity (gpm/ft)	
				(m bls)	(ft bls)	(m)	(ft)	(L/s)	(gpm)	(L/s/m)	(gpm/ft)
CV-8	P	19-Mar-2017	72	19.56	64.16	73.51	241.19	1.9	29.8	0.03	0.17
CV-7[f]	O			18.71	61.38	0.01	0.03	---	---	---	---
CV-4[f,g]	O			6.33	20.78	0.11	0.37	---	---	---	---
CV-3[f]	O			16.08	52.76	-0.01	-0.04	---	---	---	---
CV-1[f]	O			16.92	55.50	-0.01	-0.04	---	---	---	---

a) P - Pumped Well; O – Observation Well
b) meters bls and ft bls = meters below land surface and feet below land surface
c) L/s and gpm = liters per second and gallons per minute
d) L/s/m and gpm/ft = Liters per second per meter of drawdown and gallons per minute per foot of drawdown at end of test
e) After 46.5 hours of pumping and near the end of the planned 48-hour pumping period, an electrical short in the pump motor caused pumping to stop prematurely. Because the pumping period was nearly complete and sufficient samples and measurements had been obtained, rather than restart the pumping period the water level recovery phase of the test was initiated after pump shut-down.
f) Observation well showed insufficient water level response to the pumping well for analysis of aquifer parameters.
g) No water level change after correcting for antecedent water level trend
--- = not applicable

Figure 10-1. Photographs of Set-ups for Pumping Tests

Table 10-4. Computed Aquifer Parameters Derived from Pumping Tests

Pumping Test Identifier	Estimated Aquifer Thickness		Transmissivity[a]		Hydraulic Conductivity[b] (m/d)		S [c]	S$_y$ [d]	Ratio K$_v$/K$_h$ [e]
	(m)	(ft)	(m^2/d)	(ft^2/d)	(cm/s)	(ft/d)			
CV-1[f]	253.3	831	15	161	6.9E-05	0.19	NA	NA	NA
CV-3	558.4	1,832	12	125	2.5E-05	0.07	1.4E-04	0.06[g]	0.001
CV-7	572.4	1,878	20	220	4.0E-05	0.12	NA	NA	0.01[g]
CV-8	851.9	2,795	5.2	53	7.1E-06	0.02	NA	NA	0.01[g]

a) T = Transmissivity; in square meters per day or square feet per day
b) K = Hydraulic Conductivity; in meters per day or feet per day
c) S = Storativity; unitless;
d) Sy = Specific Yield; unitless
e) Ratio Kv/Kh = anisotropy ratio of vertical hydraulic conductivity to horizontal hydraulic conductivity
f) reported in Spanjers (2015)
g) The parameter has low sensitivity in analytical modeling. In order to increase parameter confidence, longer duration of pumping is required with observation well data.
NA = not applicable; analytical method not appropriate for calculation of specified aquifer parameter

Notes:
Transmissivity is defined as the rate at which water flows through a vertical strip of aquifer that is one unit wide and extends through the full, saturated depth of the aquifer. It is expressed in units of length squared divided by time. Hydraulic conductivity, symbolically represented as K, is equivalent to transmissivity divided by aquifer thickness. In practical terms K is the amount of water flowing through a 1 m x 1 m cross-sectional area of an aquifer under a hydraulic gradient of 1 m/1 m in a given amount of time (usually a day, and expressed as m/d).

Storativity is the volume of water released from an aquifer per unit surface area, per unit change in head. For unconfined aquifers, storativity equals specific yield (also known as the drainable porosity); it is the volume of water released per unit surface area of the aquifer per unit decline of the water table. Storativity and specific yield are dimensionless.

Anisotropy ratio relates vertical to horizontal hydraulic conductivity and is given by Kv/Kh where Kv is vertical hydraulic conductivity and Kh is horizontal (radial) hydraulic conductivity. Sedimentary formations are generally anisotropic in hydraulic conductivity (Kh>Kv).

11 Sample Preparation, Analyses and Security

11.1 Introduction

The characterization of the lithium brine resource and quantification of the Resource Estimate requires collection and laboratory analysis of representative lithologic samples and brine samples. The lithologic samples provide information on the hydrostratigraphy of the brine aquifer as well as drainable porosity parameters. Brine samples provide an indication of the concentration or grade of lithium and other ions.

The hydrochemical sample results have been verified by the independent QPs for this section as well as chain of custody documentation for samples and control standards. Original laboratory assay certificates were reviewed for consistency and verified results were directly uploaded and processed in a database management system using Microsoft Access. The database accurately reflects the data used in the Resource Estimate. These verifications confirm that the analytical results delivered by the participating laboratories and the exploration data are sufficiently reliable for the purpose of the Resource Estimate.

The following discussions provide methods and approaches for sampling during previous and current field programs, sample preparation and sample security, laboratory analytical methods and results, and quality assurance and control.

11.2 Boreholes SPD-8 and SPD-9

Rodinia boreholes SPD-8 and SPD-9 were drilled using DWRC drilling methods in the area of the Resource Estimate in 2009 and 2010. According to Keast (2011) and Spanjers (2015), Rodinia used a rigidly enforced sampling program to ensure sample integrity. Drilling fluids and water were used to stabilize the hole until groundwater was encountered. Additives did not contain lithium or other concentrated salts that could contaminate samples. Drilling water was purchased from Silver Peak's potable water wells. Each truck load was sampled, analyzed and found to be free of lithium.

Bulk sediment samples and chip samples were collected every 1.5 meters (5 ft) as drill cuttings passed through a cyclone. Detailed notes were taken during the sample interval as to changes in composition. Groundwater samples were collected at the end of each 6 meters (20 ft), or when lithology changed, by the following method: the completed rod was raised 0.6 meters (2 ft) off the borehole base and air was circulated for 5 to 10 minutes to remove any residual fluids or sediment from the rod and to allow the flow to clear up. A 19 L (5 gal) plastic bucket was inserted under the cyclone flow and fill time was recorded. Temperature was taken immediately. The bucket sample was allowed to settle, if necessary, before

measurements of conductivity, total suspended solids, pH and specific gravity were taken by hand-held instruments.

Duplicate water samples were taken in triple-rinsed plastic bottles filled to the top by dipping into the bucket, and sealed with tamper-proof caps. The geologist stored the samples in his room until they could be shipped to the laboratory.

11.3   Wells CV-1 through CV-8

Sampling methods for Pure Energy wells CV-1 through CV-8 varied depending on the drilling method used and the type of well installation. Boreholes for wells CV-1, CV-2, and CV-4 were drilled by the DWRC method until ground conditions prevented further advancement. Mud-rotary drilling was used to either advance DWRC drilling or ream core holes for installation of well casing (Section 10).

DWRC drill cutting samples were assessed continuously by catching cyclone discharge in a washed sieve and assessing with a hand lens. At the same time, any variations in water discharge quantity or characteristics were noted. Sieve samples of each 6 meter (20 ft) run (one drill rod length) were merged and split and transferred both to chip trays and to clean laboratory-supplied sample jars for future analysis if required. Continuous sieve samples were laid out on a clean surface and logged immediately, and larger sample amounts, where required, were transferred to clean, sealable zip-lock bags.

At the end of each 6-meter (20 ft) drill run, the bit was lifted for approximately 0.6 to 1 meter (2 to 3 ft), and the hole was air-lifted for more than 5 minutes to allow the discharged fluid to reduce in sediment content. Towards the end of the 5 minutes, the discharged fluid was allowed to fill a graduated 57 L (15 gallons) tub and timed so that air-lift discharge rate could be calculated.

Following this, a water sample from the cyclone was caught in a clean 19 L (5 gallons) bucket and allowed to settle for a few minutes. A water sample was then decanted from the bucket into rinsed water sample containers provided by the laboratory (acid preservatives were introduced into the bottles following rinsing). The water samples were then placed into a cooler containing ice and then stored securely with completed chain of custody paperwork. Water quality parameters were taken from the bucket after samples had been removed. Selected duplicate samples were taken to provide additional Quality Assurance/Quality Control (QA/QC) checks on the laboratory.

MR drill cuttings samples were assessed continuously by collecting the mud-flush in a washed sieve, rinsing with clean water to remove drilling mud and assessing with a hand lens. Washed sieve samples of each 6 meter (20 ft) run were merged and split and transferred both to chip trays and to clean laboratory-

supplied sample jars for future analysis if required. Continuous sieve samples were laid out on a clean surface and logged immediately, and larger sample amounts, where required, were transferred to clean, sealable zip-lock bags for subsequent descriptions if required. Water sampling during rotary-mud drilling is not possible due to effects from the drill water and mud introduced into the borehole during drilling.

During core drilling, HQ diameter cores were collected using a wireline core barrel, and percent recovery was noted. The cores were taken directly from the sample tube and placed in core boxes for geologic logging, sample collection and storage. Geological logging protocols followed a set of procedural management program documents developed by Pure Energy and included either logging on-site or at the core storage container a short distance away in the town of Silver Peak. When on-site, Montgomery personnel verified methods for sample lithologic descriptions and preservation. Detailed lithologic logs were prepared for cuttings and core samples by independent consulting geologist Mr. Nick Barr, who recorded attributes such as rock types and color of sediments, grain-size, angularity of sand and gravel fractions, induration, and percentages of sediment fractions.

Geologic logging data were then entered into standard spreadsheets and graphical geological logging software using Microsoft Excel and Golden Software Strater. Digital photos of core were taken and archived for all boreholes completed during the field campaigns.

11.4 Laboratory Drainable Porosity Measurements

Undisturbed samples of core from CV-3, CV-7, and CV-8 were selected and inserted in brass liners (2.5-inch diameter by 1-inch length), Figure 11-1. Core Sample Inserted in 1-Inch Brass Liner Prior to Relative Brine Release Capacity (RBRC) Testing, and submitted to one or both of the following labs for drainable porosity measurements: GeoSystems Analysis (GSA), Tucson, AZ, and Daniel B. Stephens & Associates, Albuquerque, NM (DBS&A). GSA and DBS&A measurements were conducted using the RBRC vacuum method (Stormont and others, 2011). GSA has modified the method using the Tempe cell method [American Society of Testing and Materials (ASTM) D6836-02].

Figure 11-1. Core Sample Inserted in 1-Inch Brass Liner Prior to RBRC Testing

The samples for RBRC testing were initially taken from core boxes at the core storage location in Silver Peak. These samples (15 to 25 cm long) were wrapped in both plastic and bubble wrap and sealed at both ends to avoid desiccation, Figure 11-2. Core Samples for RBRC Testing.

Figure 11-2. Core Samples for RBRC Testing

Additional core samples were sent in PVC sleeves to Vista Clara Inc., Mukilteo, WA for drainable porosity measurements using an NMR core analyzer (Corona). The Corona uses the same physics as an MRI scanner and provides a view into the pore space of the core sample. The measured NMR signal reflects the quantity of pore fluids and detailed information about the pore space (Behroozman and others, 2015).

11.5 Brine Sampling

Following well installation and prior to taking brine samples, the wells were developed using either a single pipe or dual-pipe airlift development procedure. Wells were developed from top of well screen to bottom of the well until the flush from the well was clear and showed no evidence of drilling mud.

After development of the wells, groundwater samples were collected from wells using discrete sampling methods or bulk sampling methods. Discrete sampling methods consisted of low-flow purging and sampling pumped brine (low-flow method), and passive borehole fluid sampling using a Snap Sampler® and a sampler deployed on a geophysical rig wireline (wireline sampler). Bulk sampling consisted of a submersible pump installed in select wells. Before initiating sampling procedures, wells were left undisturbed for a period of one week or longer, to allow brine in the well column to reach equilibrium with the aquifer system.

The goal of discrete sampling methods is to collect samples that are representative of in-situ conditions and to minimize changes in groundwater chemistry during sample collection and handling. Samples are taken from the shallower depths in the well first, and then deeper samples later to avoid disturbing the brine column and mixing upper and lower brines. The low-flow method (typically less than 1 L/min) is used to minimize drawdown within the well and formation so that the sample is most representative of the ambient groundwater conditions near the well (Puls and Barcelona, 1996). The Snap Sampler® (ASTM, 2014) and wireline sampler (see equivalent at http://mountsopris.com/items/bhfs-borehole-fluid-sampler/) are both passive methods and seal the sampler at the desired depth in the well using rubber gaskets and sample chambers. This minimizes the risk of dilution while extracting the sample from the well (Figure 11-3).

A comparison between the different discrete sampling methods shows little difference in brine concentrations. However, due to large screen lengths and low-permeability aquifer materials, the low-flow method has the highest risk for sample dilution as pumping will have a tendency to favor less dense brine in the well column rather than potentially denser brine in the adjacent aquifer materials. The passive methods (Snap Sampler® or wireline sampler) perform equally as well. However, discounting the geophysical rig mobilization costs, the wireline method typically can retrieve samples with greater efficiency and accuracy at depths greater than 460 meters (1,500 ft).

Figure 11-3. Photographs Showing Low-flow Sampling Pump, Snap Sampler®, Wireline Sampler, and

Collection of Brine Sample (clockwise from upper left)

In concert with depth specific sampling, installation of submersible pumps for constant-rate pumping tests at wells CV-1, CV-3, CV-7, and CV-8 allowed for bulk sampling for brine concentration. During the pumping tests, water quality parameters of the discharge were monitored closely and several brine samples were taken at regular intervals during the pumping periods. This technique of sampling at large sustained flow rates provides the best understanding of the bulk aquifer brine chemistry of the wells. Furthermore, given that no dilution was evident during pumping periods, the brine concentrations are judged to be the most robust for assessing resource characteristics (Montgomery, 2017). However, it is important to note that the exploration wells tested have considerably large perforated intervals and are not optimized in their construction to pump from the highest brine concentration or most permeable zones of the aquifer.

Sample collection using both discrete and bulk methods used standard protocols that included filling pre-rinsed, laboratory-supplied sample bottles from the samplers or pump discharge assembly. Water quality measurements of the samples in the field included temperature, pH, specific conductance, and specific gravity. Samples were then placed into a cooler and stored securely with completed chain of custody paperwork. Duplicate samples were taken where possible to provide additional QA/QC checks on the laboratory.

Brine samples were delivered using chain of custody protocols to the Project reference laboratory for sample analysis: Western Environmental Testing Laboratory ("WETLab"), Sparks, Nevada. WETLab is accredited by the Nevada State Division of Environmental Protection for determination of lithium, magnesium and other elements in non-potable water by EPA method 200.7. ALS Minerals (ALS), Vancouver, British Columbia provided systematic blind and independent check analyses on the lithium and other anolytes. ALS Minerals is accredited under ISO 17025 for provision of mineral analysis. Results are provided in Table 11-1. Summary of Results of Laboratory Analysis for Selected Concentrations of Analytes in Brine Samples Collected from Clayton Valley Wells.

SECTION 11

Table 11-1. Summary of Results of Laboratory Analysis for Selected Concentrations of Analytes in Brine Samples Collected from Clayton Valley Wells

Well CV-1											
Sample ID	Sample Date	Sample Method	Depth (m)	Depth (ft)	Lab	Li (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Cl (mg/L)
1603580-014	15-Mar-2016	low flow	160	525	Wetlab	4.71	50	48	50	1500	2700
1603580-015	15-Mar-2016	low flow	137	450	Wetlab	7.46	370	59	170	1700	3000
1603580-016	15-Mar-2016	low flow	30	100	Wetlab	15.9	400	72	320	3800	5900
1603580-017	15-Mar-2016	low flow	168	550	Wetlab	122	590	240	2200	25000	36000
1603580-020	15-Mar-2016	low flow	189	620	Wetlab	197	770	370	3600	39000	61000
1603580-021	15-Mar-2016	low flow	178	585	Wetlab	193	800	390	3500	34000	56000
1603580-003	16-Mar-2016	low flow	213	698	Wetlab	226	840	450	4200	42000	63000
1603580-004	16-Mar-2016	low flow	215	705	Wetlab	223	830	440	4100	42000	63000
1603580-007	16-Mar-2016	low flow	206	675	Wetlab	217	800	420	4000	41000	64000
1603580-008	16-Mar-2016	low flow	197	645	Wetlab	220	790	420	4100	40000	64000
1603580-009	16-Mar-2016	low flow	208	682	Wetlab	232	860	440	4200	40000	63000
1603580-011	16-Mar-2016	low flow	200	655	Wetlab	218	800	420	4000	39000	64000
1603580-012	16-Mar-2016	low flow	174	570	Wetlab	179	770	350	3200	33000	50000
1603580-013	16-Mar-2016	low flow	174	571	Wetlab	169	730	330	3100	32000	50000
1603580-022	16-Mar-2016	low flow	241	790	Wetlab	219	810	440	4100	39000	67000
1603580-023	16-Mar-2016	low flow	244	800	Wetlab	215	800	430	4000	40000	65000
1603580-024	16-Mar-2016	low flow	235	770	Wetlab	214	780	410	4000	40000	65000
1603580-026	16-Mar-2016	low flow	208	682	Wetlab	223	800	430	4100	37000	64000
16042669-001	16-Mar-2016	low flow	174	570	ALS	180	770	328	2800	28700	50800
16042669-004	16-Mar-2016	low flow	241	790	ALS	230	810	400	3600	36600	60700
1603580-005	17-Mar-2016	low flow	218	715	Wetlab	231	870	460	4300	38000	65000
1603580-006	17-Mar-2016	low flow	226	740	Wetlab	213	810	430	4000	41000	64000
1603580-010	17-Mar-2016	low flow	229	750	Wetlab	225	820	440	4100	41000	64000
8041	31-Aug-2016	Snap	174	570	Wetlab	5.2	290	44	140	1400	2400
8042	31-Aug-2016	Snap	244	800	Wetlab	240	680	330	4300	46000	55000
8045	12-Sep-2016	Wireline	244	800	Wetlab	221	710	400	4100	37000	65000

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SECTION 11

Well CV-2											
Sample ID	Sample Date	Sample Method	Depth (m)	Depth (ft)	Lab	Li (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Cl (mg/L)
1603796-001	23-Mar-2016	low flow	21	70	Wetlab	21	1000	140	680	6300	11000
1603796-002	23-Mar-2016	low flow	30	100	Wetlab	22	1000	140	740	6700	11000
1603796-003	23-Mar-2016	low flow	107	350	Wetlab	27	1000	150	830	7200	12000
1603796-004	23-Mar-2016	low flow	198	650	Wetlab	26	1200	170	850	7500	13000
1603796-005	23-Mar-2016	low flow	203	665	Wetlab	25	1200	160	840	7400	13000
1603796-006	23-Mar-2016	low flow	207	680	Wetlab	26	1300	170	870	7500	13000
1603796-007	24-Mar-2016	low flow	212	697	Wetlab	26	1200	160	860	7500	13000
1603796-007	24-Mar-2016	low flow	212	697	ALS	---	1140	142	---	---	13100
1603796-008	24-Mar-2016	low flow	213	698	Wetlab	30	1400	180	910	7400	13000
1603796-009	24-Mar-2016	low flow	215	705	Wetlab	29	1400	180	920	7500	13000
1603796-010	24-Mar-2016	low flow	251	825	Wetlab	29	1400	180	920	7900	13000
1603796-011	24-Mar-2016	low flow	261	855	Wetlab	28	1300	170	880	7600	13000
1603796-013	24-Mar-2016	low flow	265	870	Wetlab	26	1200	160	860	7200	13000
1603796-014	24-Mar-2016	low flow	274	900	Wetlab	26	1200	150	860	7200	12000
1603796-018	24-Mar-2016	low flow	222	727	Wetlab	29	1300	160	920	7600	13000
1603796-019	24-Mar-2016	low flow	225	738	Wetlab	30	1300	170	940	7800	13000
1603796-020	24-Mar-2016	low flow	230	755	Wetlab	30	1400	180	980	8100	13000
1603796-021	24-Mar-2016	low flow	232	762	Wetlab	30	1400	170	940	7800	13000
1603796-023	24-Mar-2016	low flow	238	780	Wetlab	30	1400	170	950	8200	13000
1603796-024	24-Mar-2016	low flow	210	690	Wetlab	30	1400	170	950	8200	13000
1603796-015	25-Mar-2016	low flow	282	925	Wetlab	25	1200	150	840	7000	12000
1603796-016	25-Mar-2016	low flow	290	950	Wetlab	25	1200	150	850	7300	12000
1603796-016	25-Mar-2016	low flow	290	950	ALS	---	1070	130	---	---	11700
1603796-017	25-Mar-2016	low flow	290	951	Wetlab	27	1300	160	900	7400	12000
8046	14-Sep-2016	Snap	213	700	Wetlab	23.1	1100	130	620	7000	11000
8047	14-Sep-2016	Snap	251	825	Wetlab	27.0	1300	140	700	8000	13000
8048	14-Sep-2016	Snap	274	900	Wetlab	25.9	1300	140	670	7400	13000

Well CV-3

Sample ID	Sample Date	Sample Method	Depth (m)	Depth (ft)	Lab	Li (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Cl (mg/L)
1608343-001	03-Aug-2016	low flow	46	150	Wetlab	2.6	150	25	67	800	1400
1608343-002	03-Aug-2016	low flow	122	400	Wetlab	3.5	140	25	73	1000	1800
1608343-003	03-Aug-2016	low flow	152	500	Wetlab	11	180	42	180	3000	4800
1608343-004	04-Aug-2016	low flow	175	575	Wetlab	15	210	50	240	3800	6100
1608343-004	04-Aug-2016	low flow	175	575	ALS	10	250	56	>10.0	3300	5990
1608343-005	05-Aug-2016	low flow	244	800	Wetlab	150	1100	400	1900	45000	57000
1608343-006	05-Aug-2016	low flow	245	805	Wetlab	150	1100	390	1800	42000	59000
1608343-008	05-Aug-2016	low flow	259	850	Wetlab	190	1600	490	3000	47000	67000
1608343-010	06-Aug-2016	low flow	312	1025	Wetlab	200	1600	510	3000	45000	65000
1608343-011	06-Aug-2016	low flow	343	1125	Wetlab	180	1400	480	2700	44000	62000
1608343-011	06-Aug-2016	low flow	343	1125	ALS	160	1570	473	2200	31500	65800
1608343-012	06-Aug-2016	low flow	373	1225	Wetlab	180	1600	540	2800	46000	63000
1608343-013	06-Aug-2016	low flow	375	1230	Wetlab	180	1500	480	2700	44000	62000
16131125-001	06-Aug-2016	low flow	345	1131	ALS	170	1640	488	2200	32800	64000
1608343-016	07-Aug-2016	low flow	404	1325	Wetlab	190	1600	500	2800	47000	62000
1608343-017	07-Aug-2016	low flow	434	1425	Wetlab	180	1500	480	2700	45000	61000
1608343-018	07-Aug-2016	low flow	465	1525	Wetlab	180	1500	480	2800	44000	62000
1608931-003	28-Aug-2016	low flow	404	1325	Wetlab	180	1600	510	3000	43000	58000
1608931-004	29-Aug-2016	low flow	488	1600	Wetlab	160	1400	460	2600	39000	54000
1608931-005	30-Aug-2016	low flow	503	1650	Wetlab	170	1500	480	2700	40000	57000
1608931-006	30-Aug-2016	low flow	533	1750	Wetlab	170	1400	470	2600	42000	57000
1608931-007	30-Aug-2016	low flow	535	1755	Wetlab	170	1400	470	2600	40000	57000
1608931-010	30-Aug-2016	low flow	564	1850	Wetlab	160	1300	420	2300	45000	58000
16145585-001	30-Aug-2016	low flow	536	1760	ALS	---	1440	473	---	---	57300
16145585-002	30-Aug-2016	low flow	538	1765	ALS	---	1430	471	---	---	57400
8043	12-Sep-2016	Wireline	533	1750	Wetlab	175	1600	550	2700	38000	58000
8044	12-Sep-2016	Wireline	564	1850	Wetlab	171	1400	520	2200	38000	59000

SECTION 11

Well CV-3									
Sample ID	Sample Date and Time	Sample Method	Lab	Li (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Cl (mg/L)
8059	05-Oct-2016 10:30	Pumping	Wetlab	191	1640	560	2700	39300	69900
8060	05-Oct-2016 12:30	Pumping	Wetlab	167	1610	578	2370	37300	65700
8061	05-Oct-2016 14:30	Pumping	Wetlab	168	1680	587	2400	37700	66000
8062	05-Oct-2016 16:30	Pumping	Wetlab	156	1590	564	2220	35300	65800
8063	05-Oct-2016 16:40	Pumping	Wetlab	154	1590	552	2220	34500	65800
8064	05-Oct-2016 16:30	Pumping	ALS	150	1640	496	2000	31900	57500
8065	05-Oct-2016 16:40	Pumping	ALS	150	1600	498	1900	31500	57000
8070	05-Oct-2016 18:30	Pumping	Wetlab	156	1560	520	2220	34400	65800
8071	05-Oct-2016 20:30	Pumping	Wetlab	160	1600	535	2310	35900	66500
8072	05-Oct-2016 22:30	Pumping	Wetlab	156	1610	541	2280	35000	66700
8073	06-Oct-2016 00:30	Pumping	Wetlab	148	1570	522	2230	34200	66400
8074	06-Oct-2016 02:30	Pumping	Wetlab	154	1600	525	2280	34000	66900
8075	06-Oct-2016 04:30	Pumping	Wetlab	153	1560	508	2250	33600	66800
8076	06-Oct-2016 06:30	Pumping	Wetlab	155	1630	532	2290	34100	67100
8077	06-Oct-2016 08:30	Pumping	Wetlab	154	1650	546	2310	34300	68000
8078	06-Oct-2016 10:30	Pumping	Wetlab	153	1660	550	2330	34400	68400
8079	06-Oct-2016 10:40	Pumping	Wetlab	151	1660	552	2320	33800	67000
8080	06-Oct-2016 10:30	Pumping	ALS	150	1600	493	1900	31900	56100
8081	06-Oct-2016 10:40	Pumping	ALS	150	1600	489	1900	31900	56600
8084	06-Oct-2016 12:30	Pumping	Wetlab	154	1570	507	2300	34300	66900
8085	06-Oct-2016 14:30	Pumping	Wetlab	150	1570	513	2250	33400	66700
8086	06-Oct-2016 16:30	Pumping	Wetlab	151	1630	540	2320	33800	67000
8087	06-Oct-2016 16:40	Pumping	Wetlab	148	1640	535	2280	32700	66700
8088	06-Oct-2016 16:30	Pumping	ALS	150	1590	480	1900	31500	56400
8089	06-Oct-2016 16:40	Pumping	ALS	150	1550	480	1900	31000	56100
8092	06-Oct-2016 18:30	Pumping	Wetlab	155	1580	510	2320	34300	66700
8093	06-Oct-2016 20:30	Pumping	Wetlab	148	1570	517	2240	32800	66900
8094	06-Oct-2016 22:30	Pumping	Wetlab	153	1670	550	2370	34600	66800
8095	07-Oct-2016 00:30	Pumping	Wetlab	148	1640	552	2270	33600	91600
8096	07-Oct-2016 02:30	Pumping	Wetlab	149	1650	541	2320	33500	67300
8097	07-Oct-2016 04:30	Pumping	Wetlab	156	1640	524	2340	34600	67300
8098	07-Oct-2016 06:30	Pumping	Wetlab	157	1590	507	2360	34800	67100

Well CV-4

Sample ID	Sample Date	Sample Method	Depth (m)	Depth (ft)	Lab	Li (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Cl (mg/L)
1603797-001	25-Mar-2016	low flow	30	100	Wetlab	0.88	17	1.4	18	230	230
1603797-002	25-Mar-2016	low flow	46	150	Wetlab	0.81	15	0.89	16	220	200
1603797-006	25-Mar-2016	low flow	15	50	Wetlab	0.94	19	2.1	20	250	340
1603797-003	26-Mar-2016	low flow	107	350	Wetlab	0.80	15	0.95	15	210	200
1603797-004	26-Mar-2016	low flow	126	415	Wetlab	0.81	16	1.0	16	210	200
1603797-005	26-Mar-2016	low flow	131	430	Wetlab	0.82	16	1.0	16	210	200
1603906-001	26-Mar-2016	low flow	148	485	Wetlab	0.74	15	0.87	12	190	200
1603906-002	26-Mar-2016	low flow	155	510	Wetlab	0.77	16	0.93	13	200	200
1603906-003	26-Mar-2016	low flow	162	530	Wetlab	0.73	15	0.87	12	190	200
1603906-004	26-Mar-2016	low flow	174	570	Wetlab	0.76	16	0.88	13	200	200
1603906-004	26-Mar-2016	low flow	174	570	ALS	---	10.7	0.6	---	---	195
1603906-005	26-Mar-2016	low flow	180	590	Wetlab	0.77	16	0.86	13	200	200
1603906-009	26-Mar-2016	low flow	221	725	Wetlab	0.75	15	0.85	13	190	190
1603906-010	27-Mar-2016	low flow	235	770	Wetlab	0.71	14	0.82	12	180	200
1603906-011	27-Mar-2016	low flow	241	790	Wetlab	0.76	15	0.82	13	190	200
1603906-012	27-Mar-2016	low flow	250	820	Wetlab	0.74	15	0.78	12	190	200
1603906-013	27-Mar-2016	low flow	259	850	Wetlab	0.73	14	0.80	11	190	200
1603906-014	27-Mar-2016	low flow	285	935	Wetlab	0.76	14	0.77	11	210	210
1603906-015	27-Mar-2016	low flow	296	970	Wetlab	0.77	14	0.78	11	210	210
1603906-016	27-Mar-2016	low flow	311	1020	Wetlab	0.83	16	0.89	10	220	230
1603906-017	28-Mar-2016	low flow	322	1055	Wetlab	0.74	14	0.75	9.0	190	190
1603906-018	28-Mar-2016	low flow	332	1090	Wetlab	0.74	15	0.85	8.2	180	180
1603906-018	28-Mar-2016	low flow	332	1090	ALS	---	10.2	0.6	---	---	182
1603906-019	29-Mar-2016	low flow	344	1130	Wetlab	0.75	15	0.88	7.8	180	180
1603906-020	29-Mar-2016	low flow	352	1155	Wetlab	0.74	15	0.95	7.2	180	190
1603906-021	29-Mar-2016	low flow	361	1185	Wetlab	0.76	16	0.98	7.4	180	190
1603906-030	29-Mar-2016	low flow	333	1091	Wetlab	0.75	15	0.80	8.4	180	180
8049	15-Sep-2016	Snap	250	820	Wetlab	0.752	15	0.88	13	200	---
8050	15-Sep-2016	Snap	332	1090	Wetlab	0.762	14	0.81	12	200	210
8051	15-Sep-2016	Snap	352	1155	Wetlab	0.746	14	0.86	12	200	210

SECTION 11

Well CV-5											
Sample ID	Sample Date	Sample Method	Depth (m)	Depth (ft)	Lab	Li (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Cl (mg/L)
1604026-001	02-Apr-2016	low flow	23	75	Wetlab	2.1	280	37	130	600	1400
1604026-002	02-Apr-2016	low flow	122	400	Wetlab	2.0	280	36	120	640	1400
1604026-003	02-Apr-2016	low flow	168	550	Wetlab	2.0	260	34	120	570	1400
1604026-003	02-Apr-2016	low flow	168	550	ALS	10	280	35	>10.0	600	1450
1604026-004	02-Apr-2016	low flow	168	551	Wetlab	2.1	280	36	120	610	1400
1604026-005	02-Apr-2016	low flow	183	600	Wetlab	2.0	280	34	120	600	1400
1604026-006	02-Apr-2016	low flow	198	650	Wetlab	2.0	280	35	120	620	1400
1604026-007	02-Apr-2016	low flow	210	690	Wetlab	1.8	250	32	110	580	1500
1604026-010	03-Apr-2016	low flow	215	705	Wetlab	1.0	110	13	50	310	550
1604026-011	03-Apr-2016	low flow	220	722	Wetlab	0.43	8.6	<0.50	9.1	140	63
1604026-012	03-Apr-2016	low flow	229	750	Wetlab	0.44	9.0	<0.50	9.2	140	63
1604026-013	03-Apr-2016	low flow	259	850	Wetlab	0.44	9.1	<0.50	9.0	140	63
1604026-014	03-Apr-2016	low flow	293	960	Wetlab	0.42	8.4	<0.50	8.7	140	63
1604026-015	03-Apr-2016	low flow	299	980	Wetlab	0.43	8.4	<0.50	8.8	140	63
1604026-016	03-Apr-2016	low flow	302	992	Wetlab	0.41	8.0	<0.50	8.6	140	64
1604026-016	03-Apr-2016	low flow	302	992	ALS	5.17	7.8	9.42	>10.0	200	69
1604026-017	03-Apr-2016	low flow	303	993	Wetlab	0.46	8.4	<0.50	9.3	140	64
1604026-018	03-Apr-2016	low flow	328	1077	Wetlab	0.42	8.3	<0.50	8.8	140	64
1604026-019	03-Apr-2016	low flow	359	1177	Wetlab	0.41	7.9	<0.50	8.4	130	63
1604127-003	03-Apr-2016	low flow	379	1245	Wetlab	0.42	8.5	<0.50	7.8	130	66
1604127-004	03-Apr-2016	low flow	392	1285	Wetlab	0.38	8.2	<0.50	7.8	130	67
1604127-005	04-Apr-2016	low flow	405	1330	Wetlab	0.38	8.3	<0.50	8.0	130	66
1604127-006	04-Apr-2016	low flow	417	1368	Wetlab	0.40	8.1	<0.50	8.2	130	66
1604127-007	04-Apr-2016	low flow	447	1465	Wetlab	0.48	7.3	<0.50	8.6	130	70
1604127-007	04-Apr-2016	low flow	447	1465	ALS	---	6.7	<0.5	---	---	72.3
1604127-008	04-Apr-2016	low flow	447	1466	Wetlab	0.47	7.0	<0.50	8.3	130	69
1604127-011	05-Apr-2016	low flow	451	1480	Wetlab	0.50	6.9	<0.50	8.5	130	71
1604127-012	05-Apr-2016	low flow	457	1500	Wetlab	0.52	6.9	<0.50	8.5	130	73
1604127-013	05-Apr-2016	low flow	459	1506	Wetlab	0.50	8.0	<0.50	8.8	140	70

Sample ID	Sample Date	Sample Method	Depth (m)	Depth (ft)	Lab	Li (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Cl (mg/L)
Well CV-6											
1603905-001	30-Mar-2016	low flow	248	815	Wetlab	2.1	200	13	37	700	1200
1603905-002	30-Mar-2016	low flow	270	885	Wetlab	1.9	180	12	35	610	1200
1603905-003	30-Mar-2016	low flow	287	940	Wetlab	2.0	190	12	36	610	1200
1603905-004	30-Mar-2016	low flow	293	960	Wetlab	2.0	190	12	36	620	1200
1603905-005	30-Mar-2016	low flow	303	995	Wetlab	2.0	190	13	37	530	1200
1603905-006	30-Mar-2016	low flow	314	1030	Wetlab	2.1	200	13	37	630	1200
1603905-007	31-Mar-2016	low flow	328	1075	Wetlab	2.0	200	12	38	660	1200
1603905-007	31-Mar-2016	low flow	328	1075	ALS	---	192	12.4	---	---	1340
1603905-008	31-Mar-2016	low flow	328	1076	Wetlab	2.1	200	13	38	650	1300
1603905-009	31-Mar-2016	low flow	332	1090	Wetlab	2.0	190	12	36	630	1300
1603905-010	31-Mar-2016	low flow	337	1105	Wetlab	2.1	200	13	38	670	1200
1603905-011	31-Mar-2016	low flow	347	1140	Wetlab	2.0	180	12	35	620	1300
1604027-001	31-Mar-2016	low flow	351	1150	Wetlab	2.4	210	13	54	740	1200
1604027-002	31-Mar-2016	low flow	357	1170	Wetlab	2.4	200	13	51	700	1300
1604027-003	31-Mar-2016	low flow	366	1200	Wetlab	2.4	210	13	52	760	1300
1604027-004	31-Mar-2016	low flow	372	1220	Wetlab	2.4	210	12	53	750	1300
1604027-005	31-Mar-2016	low flow	378	1240	Wetlab	2.3	210	12	52	690	1300
1604027-008	01-Apr-2016	low flow	381	1250	Wetlab	2.4	210	12	55	770	1200
1604027-009	01-Apr-2016	low flow	384	1260	Wetlab	2.4	200	12	52	690	1200
1604027-010	01-Apr-2016	low flow	396	1300	Wetlab	2.3	210	11	53	720	1200
1604027-011	01-Apr-2016	low flow	397	1301	Wetlab	2.3	210	12	54	720	1200
1604027-012	01-Apr-2016	low flow	405	1330	Wetlab	2.3	210	12	55	700	1200
1604027-013	01-Apr-2016	low flow	411	1350	Wetlab	1.9	200	9.6	50	680	1200
1604027-014	01-Apr-2016	low flow	427	1400	Wetlab	2.3	220	12	57	700	1200
1604027-015	01-Apr-2016	low flow	442	1450	Wetlab	2.1	210	10	53	690	1200

SECTION 11

Well CV-7											
Sample ID	Sample Date	Sample Method	Depth (m)	Depth (ft)	Lab	Li (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Cl (mg/L)
8124	14-Feb-2017	Snap	122	400	Wetlab	55.6	2020	343	852	15900	28000
8125	14-Feb-2017	Snap	183	600	Wetlab	82.3	4380	776	737	13000	35800
8126	14-Feb-2017	Snap	213	700	Wetlab	68.8	5110	858	663	10900	28900
8127	14-Feb-2017	Snap	305	1000	Wetlab	57.1	4210	692	586	9410	25500
8128	14-Feb-2017	Snap	366	1200	Wetlab	56.4	3530	603	760	11900	27200
8129	14-Feb-2017	Snap	457	1500	Wetlab	59	3290	565	818	13500	29000
8130	14-Feb-2017	Snap	457	1500	Wetlab	58.9	3280	568	819	13400	28500
8171	14-Feb-2017	Snap	549	1800	Wetlab	109	205	55.5	413	22300	35600
8172	14-Feb-2017	Snap	549	1800	ALS	100	209	50.1	<500	18800	35100
8173	14-Feb-2017	Snap	549	1800	ALS	110	210	52	<500	20500	36100
8193	04-Mar-2017	Wireline	213	700	Wetlab	67.5	4770	747	660	11700	32300
8194	04-Mar-2017	Wireline	366	1200	Wetlab	53.2	3150	515	803	13100	29700
8195	04-Mar-2017	Wireline	457	1500	Wetlab	52.1	3110	505	772	13000	29700
8196	04-Mar-2017	Wireline	549	1800	Wetlab	107	175	47.3	378	21600	37700
8199	04-Mar-2017	Wireline	457	1500	ALS	60	3370	580	600	10500	24900

SECTION 11

Well CV-7									
Sample ID	Sample Date and Time	Sample Method	Lab	Li (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Cl (mg/L)
8131	04-Feb-2017 19:30	Pumping	Wetlab	44.5	2490	412	759	12700	22300
8132	04-Feb-2017 21:30	Pumping	Wetlab	47.4	2330	378	791	13400	25000
8133	04-Feb-2017 21:35	Pumping	Wetlab	46.3	2320	379	774	13000	23500
8134	04-Feb-2017 21:40	Pumping	ALS	50	2690	420	800	13300	25100
8135	04-Feb-2017 21:45	Pumping	ALS	50	2650	409	800	13000	26300
8140	04-Feb-2017 23:30	Pumping	Wetlab	51	2240	364	811	14200	24800
8141	05-Feb-2017 01:30	Pumping	Wetlab	52.8	2160	342	825	14300	27400
8142	05-Feb-2017 03:30	Pumping	Wetlab	52.1	2110	353	806	14700	27500
8143	05-Feb-2017 05:30	Pumping	Wetlab	54	2070	333	829	15700	28500
8144	05-Feb-2017 07:30	Pumping	Wetlab	54.2	2050	328	830	15200	27500
8145	05-Feb-2017 09:30	Pumping	Wetlab	53.3	2010	323	812	14800	28500
8146	05-Feb-2017 11:30	Pumping	Wetlab	54	2010	327	815	15100	31800
8147	05-Feb-2017 13:30	Pumping	Wetlab	54.7	2000	317	824	15000	29200
8148	05-Feb-2017 15:30	Pumping	Wetlab	54.9	2010	321	827	15100	29800
8149	05-Feb-2017 17:30	Pumping	Wetlab	54.8	2010	323	828	15500	30500
8150	05-Feb-2017 17:35	Pumping	ALS	60	2300	356	800	15900	29900
8153	05-Feb-2017 19:30	Pumping	Wetlab	55.8	2000	311	844	15900	30200
8154	05-Feb-2017 21:30	Pumping	Wetlab	55	1960	309	825	15600	29500
8155	05-Feb-2017 23:30	Pumping	Wetlab	53.8	1980	316	804	15500	31200
8156	06-Feb-2017 01:30	Pumping	Wetlab	53.9	1970	314	805	15300	29600
8157	06-Feb-2017 03:30	Pumping	Wetlab	55.1	2000	319	822	15500	30300
8158	06-Feb-2017 05:30	Pumping	Wetlab	55.8	1990	309	830	15500	30400
8159	06-Feb-2017 07:30	Pumping	Wetlab	55.6	2020	320	831	15600	30800
8160	06-Feb-2017 09:30	Pumping	Wetlab	55.4	2000	318	827	15700	28000
8161	06-Feb-2017 09:35	Pumping	Wetlab	56.3	1980	310	834	15600	30500
8164	06-Feb-2017 09:40	Pumping	ALS	60	2000	381	832	15800	29800
8165	06-Feb-2017 09:45	Pumping	ALS	60	2470	368	800	17100	29300

SECTION 11

Well CV-8											
Sample ID	Sample Date	Sample Method	Depth (m)	Depth (ft)	Lab	Li (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Cl (mg/L)
8178	04-Mar-2017	Wireline	213	700	Wetlab	70.5	1230	215	388	16900	29400
8179	04-Mar-2017	Wireline	305	1000	Wetlab	73.9	1290	164	380	18500	32400
8180	04-Mar-2017	Wireline	396	1300	Wetlab	58.3	1160	127	308	15600	26700
8181	04-Mar-2017	Wireline	457	1500	Wetlab	75.3	823	88.4	288	19100	31100
8182	04-Mar-2017	Wireline	549	1800	Wetlab	87	680	70.3	243	19300	33000
8183	04-Mar-2017	Wireline	640	2100	Wetlab	229	184	33.4	261	42500	69700
8184	04-Mar-2017	Wireline	701	2300	Wetlab	217	161	27.2	233	42400	72000
8185	04-Mar-2017	Wireline	792	2600	Wetlab	202	224	35.9	252	40300	68600
8186	04-Mar-2017	Wireline	823	2700	Wetlab	192	844	266	435	38800	65600
8188	04-Mar-2017	Wireline	396	1300	Wetlab	52.2	1180	125	281	15700	25300
8189	04-Mar-2017	Wireline	457	1500	ALS	70	825	78	<500	15500	30300
8190	04-Mar-2017	Wireline	457	1500	ALS	80	910	90	<500	16900	32100

SECTION 11

Well CV-8									
Sample ID	Sample Date and Time	Sample Method	Lab	Li (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Cl (mg/L)
8178p	19-Mar-2017 12:00	Pumping	Wetlab	83.0	1010	70.5	294	21800	36900
8179p	19-Mar-2017 14:00	Pumping	Wetlab	97.4	933	65.2	299	24100	41900
8180p	19-Mar-2017 14:00	Pumping	Wetlab	94.8	907	63.9	301	24100	41900
8191p	19-Mar-2017 14:00	Pumping	ALS	100	950	68.4	<500	23700	37900
8192p	19-Mar-2017 14:00	Pumping	ALS	100	940	68	<500	24200	40400
8193p	19-Mar-2017 16:00	Pumping	Wetlab	101	898	65.0	314	24700	42900
8194p	19-Mar-2017 18:00	Pumping	Wetlab	101	892	68.0	331	25200	42900
8195p	19-Mar-2017 20:00	Pumping	Wetlab	100	898	71.5	346	23900	43000
8196p	19-Mar-2017 22:00	Pumping	Wetlab	99.8	893	72.9	362	24000	42900
8199p	20-Mar-2017 02:00	Pumping	Wetlab	101	902	78.7	390	24300	42800
8201p	20-Mar-2017 06:00	Pumping	Wetlab	97.0	883	80.7	405	24500	42900
8203p	20-Mar-2017 10:00	Pumping	Wetlab	96.5	880	86.1	434	24100	42900
8204p	20-Mar-2017 10:00	Pumping	Wetlab	95.3	867	85.6	429	23700	42100
8205p	20-Mar-2017 10:00	Pumping	ALS	100	970	84	<500	23100	39400
8208p	20-Mar-2017 14:00	Pumping	Wetlab	97.1	878	88.3	437	24100	42100
8210p	20-Mar-2017 18:00	Pumping	Wetlab	96.9	892	92.6	452	25300	42100
8212p	20-Mar-2017 22:00	Pumping	Wetlab	96.7	881	88.7	465	23900	42300
8214p	21-Mar-2017 02:00	Pumping	Wetlab	97.9	889	89.7	478	24100	42500
8215p	21-Mar-2017 02:00	Pumping	Wetlab	101	911	90.1	474	24500	42900
8216p	21-Mar-2017 02:00	Pumping	ALS	100	918	93.6	<500	24200	39500
8218p	21-Mar-2017 06:00	Pumping	Wetlab	101	918	92.2	485	24800	42900
8220p	21-Mar-2017 10:00	Pumping	Wetlab	101	910	92.0	490	25000	42400
8223p	21-Mar-2017 14:00	Pumping	Wetlab	97.0	880	91.9	486	24400	42800
8225p	21-Mar-2017 18:00	Pumping	Wetlab	100	901	92.6	499	24100	41400
8226p	21-Mar-2017 18:00	Pumping	Wetlab	101	909	94.0	504	23900	41500
8227p	21-Mar-2017 18:00	Pumping	ALS	110	922	98	<500	25300	44700
8228p	21-Mar-2017 18:00	Pumping	ALS	100	914	96	<500	24400	39900
8230p	21-Mar-2017 22:00	Pumping	Wetlab	98.5	894	95.6	500	23700	41900
8232p	22-Mar-2017 02:33	Pumping	Wetlab	99.2	894	94.9	514	23600	42600
8234p	22-Mar-2017 06:00	Pumping	Wetlab	100	904	94.8	519	23900	43000
8235p	22-Mar-2017 08:00	Pumping	Wetlab	97.6	875	93.6	515	23900	42700
8236p	22-Mar-2017 08:00	Pumping	Wetlab	99.8	899	94.8	516	24000	43000
8237p	22-Mar-2017 08:00	Pumping	ALS	100	909	99.8	<500	24200	40400
8238p	22-Mar-2017 09:55	Pumping	Wetlab	99.0	888	95.7	521	23600	42700

11.6 Analytical Methods

Laboratories and Certifications. Samples were sent for primary analyses to WETLab in Sparks, Nevada. WETLab is accredited and independently tested by the NDEP, to ensure that the laboratory conforms to The U.S. Environmental Protection Agency (USEPA) analytical methods and standards. WETLab is also accredited for determination of lithium, magnesium and other elements in non-potable water by USEPA Method 200.7.

ALS Minerals in Vancouver, British Columbia provided independent check analyses on the lithium in the sampling program at the Project. ALS Minerals is accredited under ISO 17025 for provision of mineral analyses. All laboratory accreditations were confirmed and up-to-date when this report was written.

Laboratory Analytical Methods. Table 11.2 Analytical Methods, lists the basic suite of analyses and analytical methods requested from both labs. Although the method titles differ, both labs use the same methods based upon American Public Health Association (APHA), Standard Methods for Examination of Water and Wastewater, USEPA, and American Society for Testing Materials (ASTM) protocols. Physical parameters, such as pH, conductivity, total dissolved solids were determined directly upon brine subsamples. Determination of lithium, potassium, calcium, sodium and magnesium was achieved by fixed dilution of filtered samples, acid digestion, and direct aspiration into atomic absorption or induced coupled plasma instruments.

Both laboratories have their own extensive Quality Management Systems (QMS), which involve duplicates, blanks, spikes and spike recoveries. Each laboratory provided a Quality Control (QC) summary with each batch of analyses. Pure Energy Minerals incorporated its own QA/QC program to independently monitor analytical quality. This program is discussed in the following sections.

Table 11-2. Analytical Methods

Analysis	WETLabs	ALS Minerals
pH	SM 4500-H+-B	OA-BRpH
Conductivity	SM 2510-B	OA-BRCON
Density		
Alkalinity	SM 2320-B	OA-BRALK
Alkalinity (carbonates)	SM 2320-B	OA-BRALK
Alkalinity (bicarbonates)	SM 2320-B	OA-BRALK
Total dissolved solids	SM 2540-C	OA-BRTDS
Chloride (Cl)	EPA 300.0	OA-BRANI
Lithium (Li)	EPA 200.7	OA-BRDIS
Potassium (K)	EPA 200.7	OA-BRDIS
Sodium (Na)	EPA 200.7	OA-BRDIS
Calcium (Ca)	EPA 200.7	OA-BRDIS
Magnesium (Mg)	EPA 200.7	OA-BRDIS

11.7 Quality Control

At the request of PEM, Geochemical Applications International Inc. (GAII) conducted a review of the results for the quality control program used in lithium brine analyses for the resource drill programs conducted from 2016-2017 at the Clayton Valley Project in Nevada. The author obtained the current quality control database from Montgomery and organized that information into a format that allowed review of quality control program.

Quality Assurance Program. Analytical quality was monitored through the use of randomly inserted quality control samples, including standards, blanks and duplicates, as well as check assays at an independent lab. Approximately 25 percent of the samples submitted for analysis were quality control samples.

Standard Development. PEM used an internally produced standard developed from bulk sampling of brines from drill hole CV-1. The material was tested for Li prior to use by round robin submittal to 5 different laboratories. A single analysis for Li and other anolytes was conducted at each laboratory. The CV-1 mean in the round robin was determined to be 246 ppm Li with a standard deviation (Std. Dev.) of 35 ppm and a

relative standard deviation (RSD) of 14.2, which makes the standard material provisional (a provisional RSD value is between 5 and 15) for use. Calcium and magnesium were also analyzed in the original round robin.

Historical Data. In a project of this magnitude, where the number of quality control analyses (>40) for the laboratory of choice far exceeds the original number of analyses (five) of the original round robin, it is acceptable practice to use statistics for the standards which are calculated based upon the current analytical method at the laboratories used in the drill program to evaluate quality control results. These statistics (the "historical mean and standard deviation") were used in evaluation of the standards results of this study from the standard histories maintained in Montgomery's quality control database.

Blank Results. Analyses were performed on the blanks to monitor contamination from sample analysis. The blank used in the program was distilled water purchased from the local grocery store. The WETLab detection limit for lithium is 5 ppm. The ALS detection limit for lithium is 10 ppm. All Li analyses for blanks were less than 5 times the lower detection limits for the primary (WETLab) and check (ALS) laboratories. ***Blanks show no analytical carry-over contamination for the lithium analyses at the primary and check laboratories***.

Standards Results. Forty determinations were performed on the CV-1 standard to monitor analytical accuracy. The statistical results from the analysis of the CV-1 standard are listed in Table 11-3. Statistical Results for Standard CV-1 Analyses, and shown in Figures 11-4 through 11-6.

The relative standard deviation, shown at the bottom of Table 11-3, indicates the relative stability of the reference material. The RSD for the 40 analyses was 7.2 for Li, 6.3 for Ca and 5.9 for Mg. These values indicate acceptable reproducibility for analyses of the CV-1 standard.

The original mean determined by round robin analysis of one sample at each of five laboratories was 246 ppm Li with an RSD of 14.2. This RSD value reflects a great deal of inter-laboratory variability used to determine the original value for the Li concentration of the CV-1 standard. This variability is not due to lack of homogeneity, but a difference in analytical protocol followed by the round robin laboratories. For that reason, the author has evaluated the quality control results using the historical analyses (the 40 analyses shown in Table 11-3).

The current historical data shows a mean of 202 ppm Li based upon a much more robust set of analyses (where the RSD = 7.2). With the 2 failures removed the RSD is 4.8 and indicates a certifiable material. In Figures 11-4 through 11-6, the green dots and line represent check analyses conducted at ALS. The orange dots and line represent primary Li analyses conducted at WETLab. The analyses for each laboratory are plotted in chronological sequence. The historical mean is plotted as a solid red line. The different control

limits are plotted as dashed green (mean ± 10%), blue (mean ± 2 standard deviations), and red lines (mean ± 2 standard deviations).

As can be seen in Figure 11-4 and listed in Table 11-3, there were only 2 lithium analyses which exceeded the mean ± 3 standard deviation failure control limits. The first failure (250 ppm) occurred in the analyses of drill hole CV-2. The second failure (250 ppm) occurred in the analyses of drill hole CV-6. Both failures were just outside the upper control limit of 246 ppm listed in Table 11-3. The instrumental increments are in units of 10 ppm for lithium analyses by WETLabs using the EPA 200.7 protocol. So this difference of 4 ppm over the control limit can be attributed to rounding error and is not statistically significant.

All of the CV-1 Standard analyses for Ca and Mg were within the mean ± 3 standard deviation failure control limits. ***The standard analytical results indicate acceptable accuracy for Li, Ca and Mg analyses at the primary and check laboratories.***

Table 11-3. Statistical Results for Standard CV-1 Analyses

Standards Statistics	Li_mg/L	Ca_mg/L	Mg_mg/L
Count	40	40	40
Min	176	634	319
Max	250	860	411
Mean	202.1	759	362
Std. Dev.	14.5	48	22
Historical ±3SD			
Mean + 3SD	246	904	426
Mean - 3SD	159	615	297
Failures > 3SD	2	0	0
% Failures > 3SD	5	0	0
Historical RSD			
RSD	7.2	6.3	5.9
Hist. Mean ± 2SD	202 ± 28.9	759 ± 96	362 ± 43
Hist. Mean ± 10%	202 ± 20.2	759 ± 76	362 ± 36
Certification	Provisional	Provisional	Provisional

The chronological sequence of analyses, shown in Figures 11-4 through 11-6, indicates that the CV-1 standard is slowly (over a period 12 months) losing Li, Ca and Mg from the brine: the analyses are drifting slightly lower over time. From the time period of the CV-1 to CV-8 submittals, the brine lost about 20 ppm Li. No obvious precipitates were observed in the bulk CV-1 storage containers, which would co-precipitate metals out of the brine. But this trend is consistent with trends observed in other Li brine projects which have been evaluated by the author. Recertification of the standard should occur if there is a significant hiatus between drill programs.

Figure 11-4. Results for CV-1 Standard Li analyses
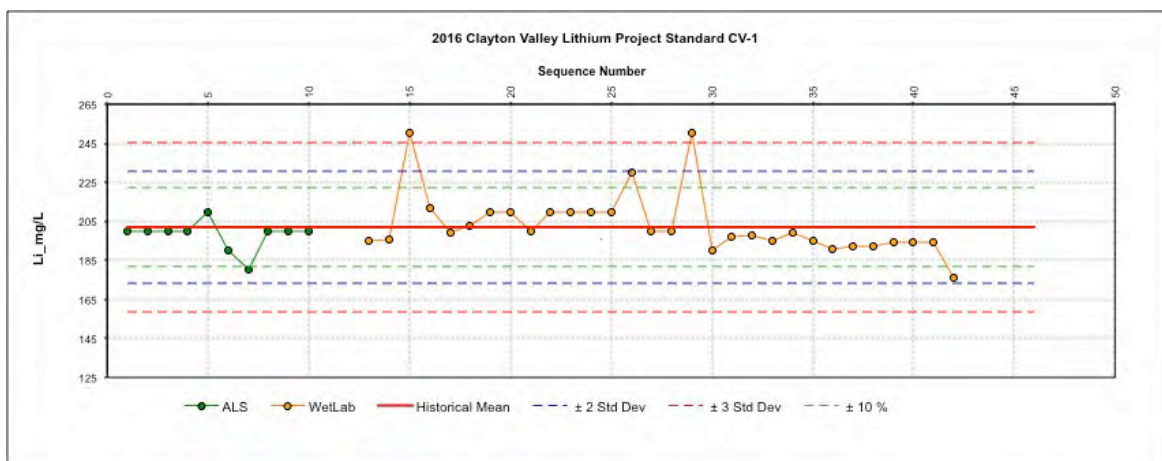
Figure 11-5. Results for CV-1 Standard Ca analyses
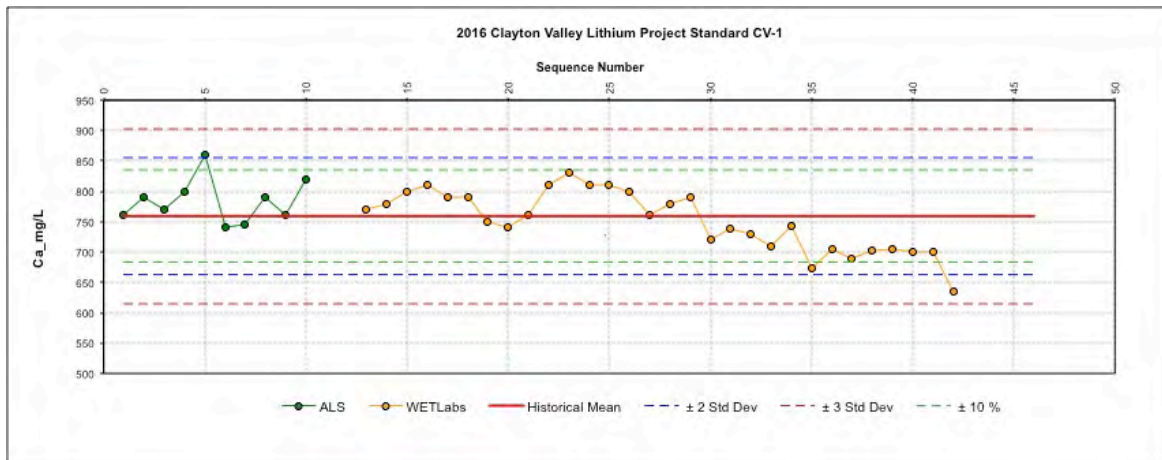
Figure 11-6. Results for CV-1 Standard Mg analyses
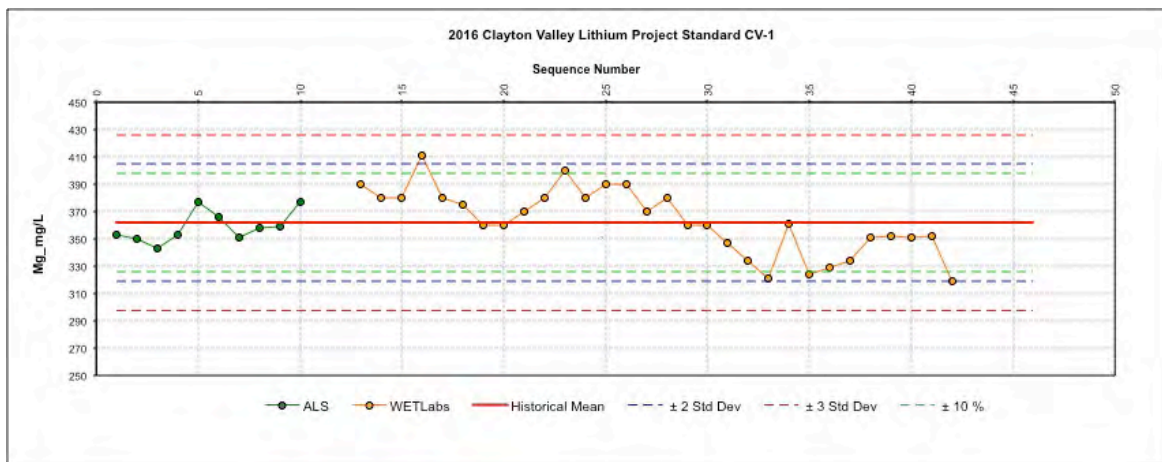
Sample Duplicate Analyses at WETLab. Duplicates were collected from brines sampled at the drill rig and sent to WETLab for analysis. Thirty duplicate samples were collected during the primary sampling of the drill holes and from the pump tests of drill holes CV-3, CV-7 and CV-8.

The statistical results are tabulated in Table 11-4. Statistical Results for WETLab Sample Duplicate Analyses. The Li analyses range from near detection up to 232 ppm Li. Ninety percent of the Li sample duplicate analyses are within 10 percent of one another. The average AMPRD, or precision, (AMPRD = average mean percent relative deviation) is 3.4 percent. The three samples which exceed the control limits lie below 50 ppm Li. All of the samples greater than 50 ppm Li are within 10 percent of one another, which is the acceptable control limit for duplicate analyses.

Ca and Mg duplicate analyses yield similar results. Ninety-three percent of the Ca sample duplicate analyses are within 10 percent of one another. Ninety percent of the Mg sample duplicate analyses are within 10 percent of one another. The average precision is 4.1 percent for Ca and 5.3 percent for Mg, both well within the acceptable 10 percent analytical precision limits.

The sample duplicates analyzed at WETLab are shown in Figures 11-7 through 11-9. The 1:1 line is plotted in red. The ± 10 percent control limits are plotted as dashed blue lines. The excellent reproducibility in the duplicates plot is clearly seen. **_The sample duplicates indicate acceptable precision of analyses for Li, Ca, and Mg conducted at WETLab_**

Table 11-4. Statistical Results for WETLab Sample Duplicate Analyses

WETLabs Duplicates	Original Li_mg/L	Duplicate Li_mg/L	Original Ca_mg/L	Duplicate Ca_mg/L	Original Mg_mg/L	Duplicate Mg_mg/L
Count =	30	30	30	30	30	30
Min. =	0	0	7	7	1	1
Max. =	232	223	3290	3280	565	568
Mean =	88	88	1147	1163	256	258
Std. Dev. =	71	69	814	811	215	210
Average AMPRD Precision =		3.4		4.1		5.3
% < 10% =		90		93		90

Figure 11-7. WETLab Sample Duplicate Li Analyses
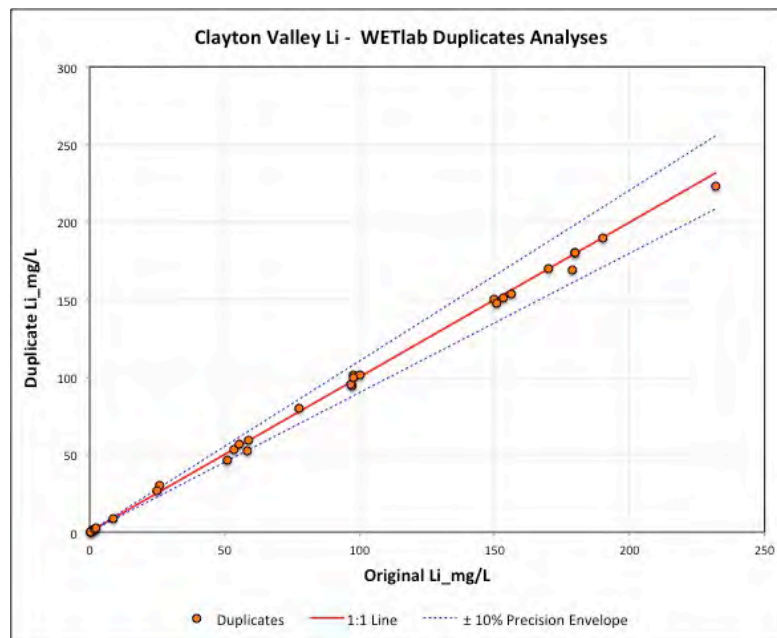
Figure 11-8. WETLab Sample Duplicate Ca Analyses
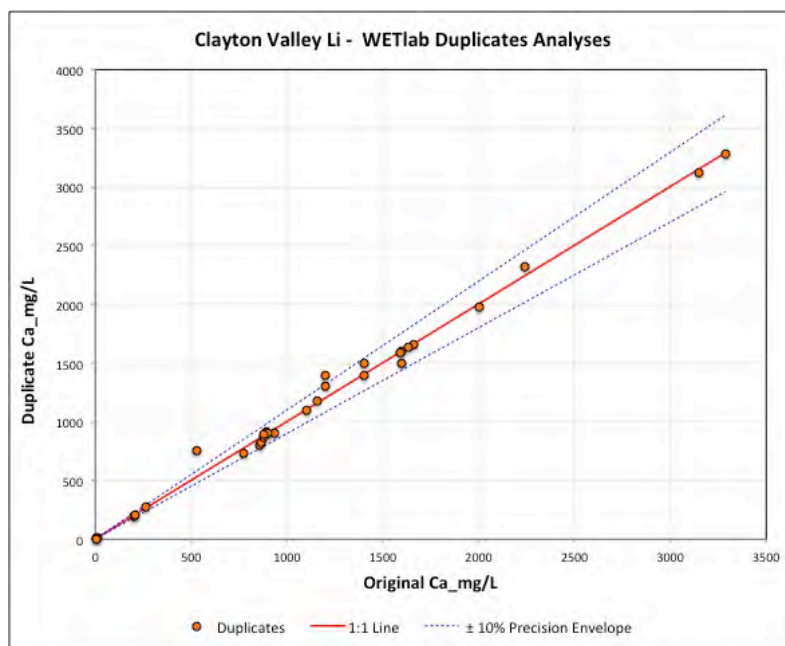
Figure 11-9. WETLab Sample Duplicate Mg Analyses
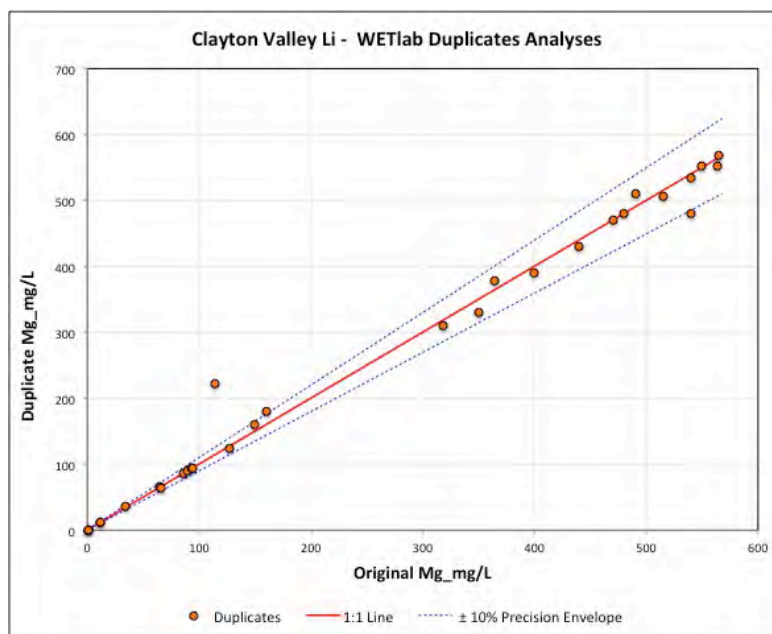
Check Analyses at ALS. Check analysis samples were collected on site at the same time as the original samples and sent to ALS for analysis. Twenty-six check samples were collected from the original sampling and pump tests. Nineteen of these samples were analyzed for Li.

Standard CV-1 and blanks were also included in later submittals to check for accuracy and carry-over contamination. The standard results are plotted in Figure 11-4 through 11-6 (as the green dots). All of the CV-1 analyses were within acceptable control limits. All of the blank analyses were within acceptable limits. These control samples indicated no carry-over contamination and acceptable accuracy for the check analysis program.

The check analysis statistical results are tabulated in Table 11-5. Statistical Results for WETLab versus ALS Check Sample Analyses. The analyses range from near detection up to 230 ppm Li. Seventy-nine percent of the check analyses are within 10 percent of one another. Ninety-five percent of the check analyses are within 15 percent of one another. The average AMPRD, or precision, is 7.9 percent. Four samples exceed 10 percent control limits. However, three of these samples with analyses greater than 10 ppm Li are within the 15 percent control limits. The remaining failure is at 10 ppm, which is the lower detection limit for ALS.

Calcium analyses range from 15 to 3370 ppm. Fifty-eight percent of the check analyses are within 10 percent of one another. Eighty-one percent of the check analyses are within 15 percent of one another. The average AMPRD, or precision, is 11.1 percent. Magnesium analyses range from 1 to 580 ppm. Forty-six percent of the

check analyses are within 10 percent of one another. Eighty-one percent of the check analyses are within 15 percent of one another. The average AMPRD, or precision, is 15.1 percent. The statistics indicate that check analyses for these elements are less reproducible than Li. However, the analytical bias between the laboratories is within 5 percent for each of the elements.

The check samples analyzed at ALS are shown in Figures 11-10 through 11-12. The 1:1 line is plotted in red. The ± 10 percent control limits are plotted as dashed blue lines. One can see the reproducibility in the duplicates plots for Li is acceptable, but that Ca and Mg show analyses exceeding the control limits throughout the linear working range of the analytical method.

The check analyses conducted at ALS validate Li analyses conducted at WETLab. Calcium and Mg analyses are validated at the 15 percent control limit threshold.

Table 11-5. Statistical Results for WETLab versus ALS Check Sample Analyses

WETLab vs ALS Check Samples	WETLab Li_mg/L	ALS Li_mg/L	WETLab Ca_mg/L	ALS Ca_mg/L	WETLab Mg_mg/L	ALS Mg_mg/L
Count =	19	19	26	26	26	26
Min. =	15	10	15	10	1	1
Max. =	219	230	3110	3370	564	580
Mean =	106	107	1094	1146	232	226
Std. Dev. =	54	52	744	845	199	198
Average AMPRD Precision =		7.9		11.1		15.1
% Bias =		-1.3		-4.5		2.6
% < 10% =		79		58		46
% < 15% =		95		81		81

Figure 11-10. WETLab versus ALS Check Sample Li Analyses
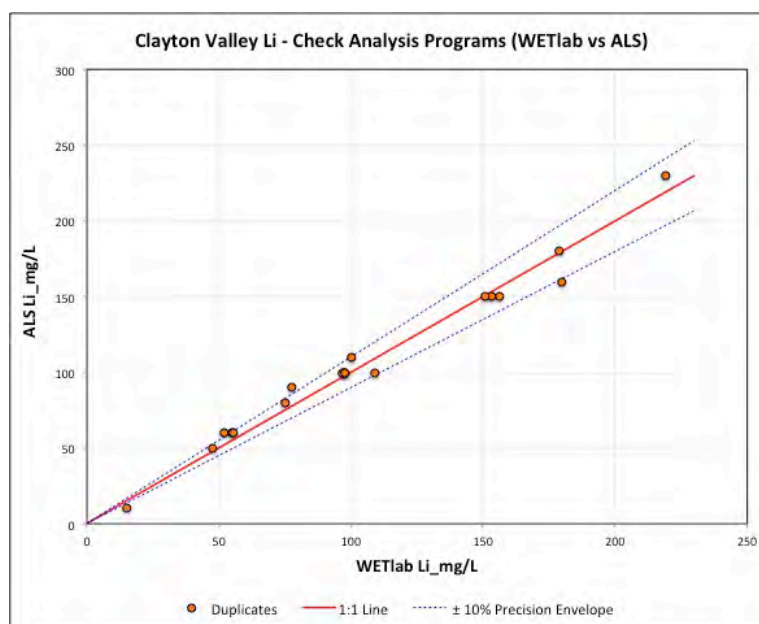
Figure 11-11. WETLab versus ALS Check Sample Ca Analyses
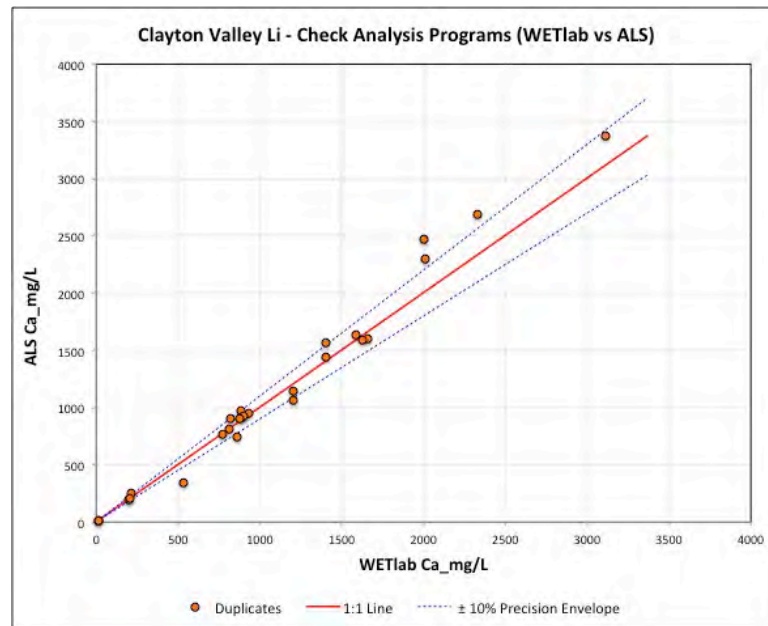
Figure 11-12. WETLab versus ALS Check Sample Mg Analyses
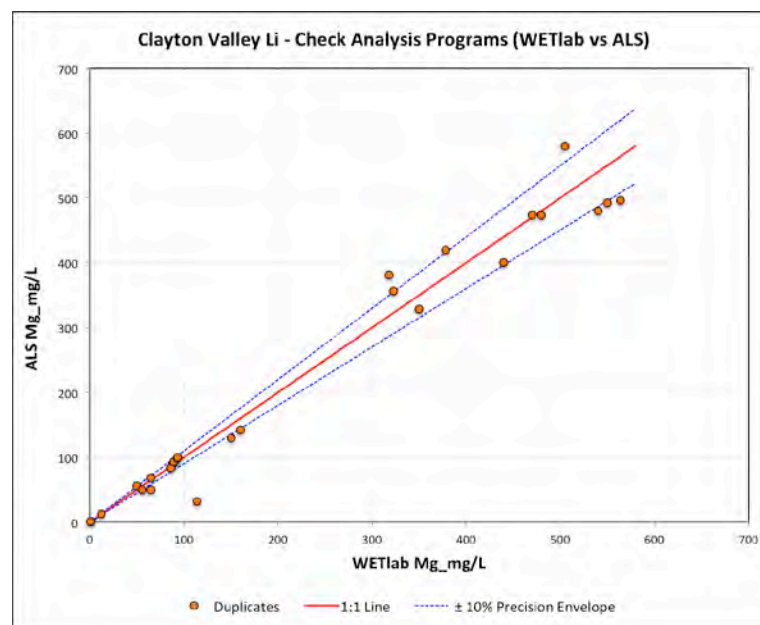
Check Sample Duplicate Analyses at ALS Labs. Check sample duplicates were also collected for analysis at ALS at the same time as the duplicate samples collected for analysis at WETLab. Twelve check duplicate samples were collected during the primary and pump sampling programs.

The statistical results are tabulated in Table 11-6. Statistical results for ALS Check Sample Duplicate Analyses. The analyses range from near detection up to 170 ppm Li. Eighty-five percent of the sample duplicate analyses are within 10 percent of one another. The average Absolute Mean Paired Relative Difference (AMPRD), or precision, is 3.2 percent. The 1 out of 12 samples which exceeds the control limits is at 70 ppm Li. The failure is caused by the difference of an original sample measuring 70 ppm and the duplicate sample measuring 80 ppm Li. The Li duplicate analyses at ALS indicate acceptable precision.

Ninety-two percent of the ALS sample duplicate Ca analyses are within 10 percent of one another. The average AMPRD, or precision, is 3.3 percent. Eighty-five percent of the ALS sample duplicate Ca analyses are within 10 percent of one another. The average AMPRD, or precision, is 5.1 percent. The Ca and Mg duplicate analyses at ALS indicate acceptable precision.

The sample duplicates analyzed at ALS are shown in Figures 11-13 through 11-15. The one Li data point exceeds the 10 percent control limits, but otherwise the reproducibility for Li is excellent. **The check sample duplicates indicate acceptable precision of Li, Ca, and Mg analyses at ALS Labs.**

Table 11-6. Statistical results for ALS Check Sample Duplicate Analyses

ALS Duplicates	Original Li_mg/L	Duplicate Li_mg/L	Original Ca_mg/L	Duplicate Ca_mg/L	Original Mg_mg/L	Duplicate Mg_mg/L
Count =	13	13	13	13	13	13
Min. =	50	50	209	210	50	52
Max. =	160	170	3370	3300	580	569
Mean =	107	108	1508	1501	319	319
Std. Dev. =	41	41	914	882	210	206
Average AMPRD Precision =		3.2		3.3		5.1
% < 10% =		85		92		85

Figure 11-13. ALS Duplicate Sample Li Analyses
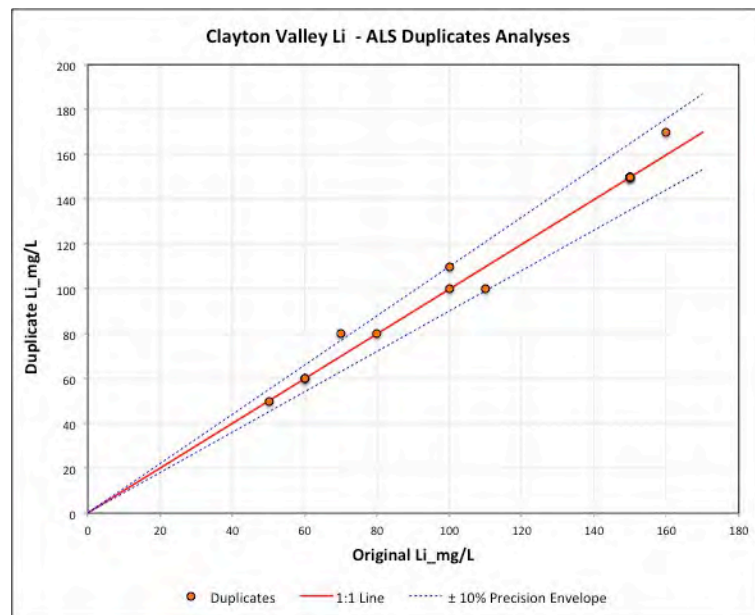
Figure 11-14. ALS Duplicate Sample Ca Analyses
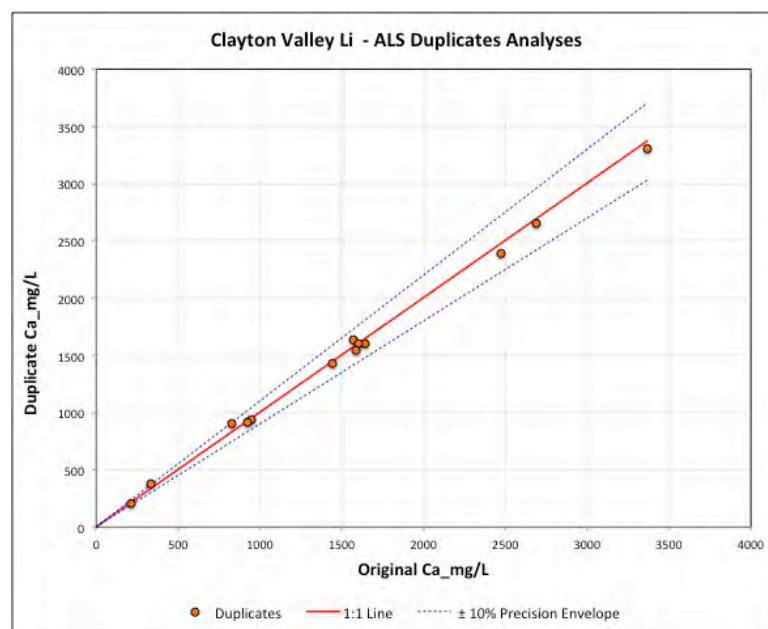
Figure 11-15. ALS Duplicate Sample Mg Analyses
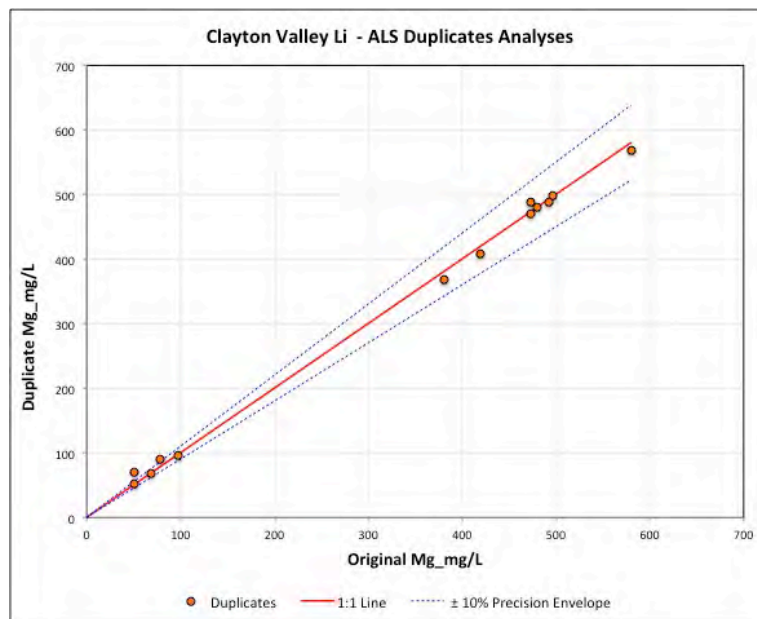
11.8 Quality Control Program Conclusions

- The blanks show no carry-over contamination in analyses at either laboratory.

- The standards show acceptable accuracy although there is a very slight drift as Li, Ca and Mg comes out of the brine solution. The standard should be recertified if there is a significant hiatus between drilling programs on this project.

- The sample duplicates analyzed at WETLab show acceptable precision for Li, Ca and Mg analyses.

- The check analyses analyzed at ALS validate earlier Li, Ca and Mg analyses conducted at WETLabs. Blanks submitted with the check analyses show no carry-over contamination. The standards submitted with the check analyses show acceptable accuracy for Li, Ca and Mg analyses.

- The check sample duplicates show excellent reproducibility of Li, Ca and Mg analyses at the check laboratory (ALS).

Brine samples analyzed from the CV1-8 drill program show acceptable accuracy and precision of the brine Li, Ca and Mg analyses for resource estimation. Check analyses conducted at ALS validate the original analyses performed at WETLab.

12 Data Verification

Geological logging protocols followed a set of procedural management program documents developed by Pure Energy and included either logging on-site or at the core storage container a short distance away in the town of Silver Peak. When on-site, Montgomery personnel verified methods for sample lithologic descriptions and preservation. The samples are sealed on site and stored in a cool location, stored securely with completed chain of custody paperwork, then shipped in sealed coolers to the laboratory for analysis.

Geologic logging data were then entered into standard spreadsheets and graphical geological logging software using Microsoft Excel and Golden Software Strater. Digital photos of core were taken and archived for all boreholes completed during the field campaigns. These spreadsheets were integrated with data received from the laboratories.

Original laboratory assay certificates were reviewed for consistency by Montgomery and verified results were directly uploaded and processed in a database management system using Microsoft Access. The database accurately reflects the data used in the Resource Estimate.

The hydrochemical sample analytical and quality control results have been verified by the independent QPs for this section as well as chain of custody documentation for samples and control standards. These verifications confirm that the analytical results delivered by the participating laboratories and the exploration data are sufficiently reliable for the purpose of the Resource Estimate.

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13 Mineral Processing and Metallurgical Testing

13.1 Overview

After evaluating alternative technologies and technology providers, Pure Energy Minerals Limited (PEM) engaged Tenova Advanced Technologies (TAT) for a staged approach to the testing and development of a flowsheet for the recovery of lithium. The purpose of this flowsheet would be to produce lithium hydroxide monohydrate directly from the brines extracted from PEM's Clayton Valley Project.

The Tenova process solution for lithium hydroxide monohydrate production is composed of several technologies. LiP™ is an innovative membrane process for the removal of alkaline earth elements from brines. This process is used to pretreat lithium containing brine prior to its pH elevation and feed into the lithium extraction stage. Lithium extraction is then performed using the LiSX™ process, a unique method for the recovery, production and purification of lithium salts using solvent extraction. The resulting lithium sulphate solution is subjected to electrolysis, the LiEL™ process, in order to produce the purified lithium hydroxide solution. This solution then goes to crystallization and drying in order to yield the final dry product – lithium hydroxide monohydrate.

The Tenova process described above represents a novel approach to the recovery of lithium and production of lithium hydroxide monohydrate from lithium-bearing brine. This approach has not yet been used at a commercial scale for the recovery of lithium from brine.

On February 26th, 2015, TAT issued a confidential report describing laboratory scale testwork performed at TAT's Research and Development (R&D) facility in Katzrin, Israel. This successful testwork showed the potential feasibility of applying the proprietary technology route developed or enhanced by TAT for lithium recovery from Clayton Valley brine.

Following the laboratory scale testwork, TAT commenced a mini pilot plant campaign in June 2016. The objective of this campaign was to evaluate the performance of the three major process sections which compose the TAT solution for the extraction of lithium using brine with analogous chemical composition to that found in Clayton Valley. These three major process sections are: membrane pretreatment for alkaline earth removal, LiP™; solvent extraction for producing saturated lithium sulphate solution, LiSX™; and electrolysis for converting the lithium sulphate solution into lithium hydroxide solution, LiEL™. The bulk of the campaign was conducted at the TAT R&D facility in Katzrin, Israel. The results of the mini pilot plant campaign were contained in a confidential report dated November 14th, 2016.

This section describes the results of the mini-pilot plant campaign.

The Tenova process is shown in schematic form in Figure 13–1. The Tenova Lithium Process Block Diagram

Figure 13–1. The Tenova Lithium Process Block Diagram
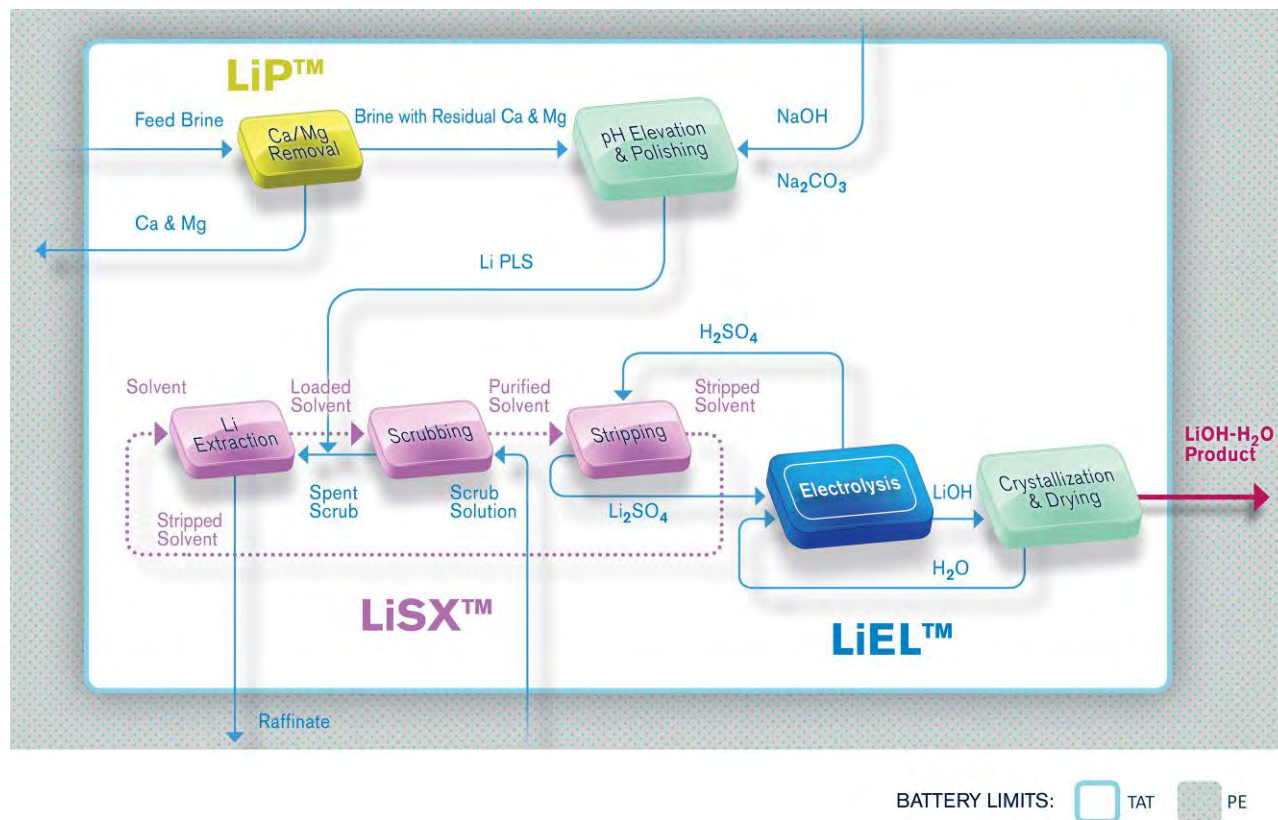
13.2 Feed Solution

The required composition of the feed solution was supplied by PEM, based on the Clayton Valley brine recovered during bulk sampling from exploration well CV-1. Two solutions were synthesized from reagents, the first as designated by PEM to match the composition of brine from well CV-1 for the LiP™ tests and the second with the same composition except without alkaline earth elements to simulate the expected composition of the Clayton Valley solution that would be industrially available for the LiSX™ after passing through the LiP™ circuit.

Table 13–1 Comparison of Clayton Valley and Synthetic Brine Compositions, compares the chemistry of the synthetic test solutions with the chemistry of the brine from the CV – 1 well. As can be seen in Table 13-1,

the composition of the synthetic test solutions is a good match to the composition of Clayton Valley brine from exploration well CV-1.

Table 13–1. Comparison of Clayton Valley and Synthetic Brine Compositions

Element	Li	Na	K	Ca	Mg	Sr	B	SO₄	pH	ρ
Units	mg/L	g/L	mg/L	mg/L	mg/L	mg/L	mg/L	g/L		kg/L
Clayton Valley	209	38.4	3,850	796	409	33	26	4.74	7.35	1.07
For LiP™	200	39.1	3,880	850	395	33	23	4.96	7.7	1.08
For LiSX™	210	35.9	3,670	<3	<3	<3	21	<3	7.4	1.08

13.3 Pre-Treatment – LiP^{TM}

The pre-treatment of the CV brine to remove key interfering elements (particularly calcium and magnesium) is a prerequisite, if selective solvent extraction of lithium is to be used. The CV lithium brine is an ideal candidate for the direct application of modern membrane technology, as it has relatively low concentrations of calcium and magnesium (compared to other brine deposits globally), and is not saturated with other solutes that may cause problems with membranes (e.g. sulphates that form precipitates, for example gypsum). In order to conduct this larger scale test of the use of membranes for pretreating the brine ahead of solvent extraction, the engineering team elected to use a synthetic brine that was analagous to the chemical composition of Clayton Valley brine as noted above.

The membranes were supplied by TAT's partner, GE Water & Process Technologies (GE) and other commercial membrane manufacturers. The first part of the test program consisted of screening eight different membranes in a flat-sheet configuration, and evaluating how the various membranes allowed permeation of lithium whilst retaining the alkaline earth elements in the concentrate. Following completion of the flat-sheet testing, TAT selected a single membrane based on its superior relative performance and proceeded with testing it in a spiral-wound module test rig.

The mini-pilot plant testwork demonstrated that even in a relatively simple, 'single-pass' arrangement (i.e., brine being passed once through a single set of membranes), over 90 percent of the lithium was recovered, while at the same time, approximately 93 percent of the magnesium and 73 percent of the calcium were rejected. TAT and its partner, GE, conducted additional test work to further refine and optimize the use of membranes, including evaluation of variable pressure across the membranes and the use of an anti-scalant in the process.

In a parallel phase of pre-treatment test work (performed by SGS Canada), the SGS laboratory treated CV brine (actual raw brine sample from CV-1) with additions of caustic soda (NaOH) and soda-ash (Na_2CO_3) to determine whether direct chemical precipitation could be used to remove divalent contaminants. This work successfully demonstrated that greater than 99 percent of the calcium, magnesium and strontium could be removed through careful pH control with negligible loss of lithium by co-precipitation. Subsequent work was completed using a High Density Sludge (HDS) circuit that allowed semi-continuous operation over 3 ½ days to investigate whether the solids produced by the direct chemical precipitation could be aggregated and thickened (using a flocculant), and then removed from the brine flow. This phase of work also showed excellent results, and resulted in a steady-state process that produced brines with calcium levels reduced to 2 mg/L, and magnesium and strontium both less than 1 mg/L, also confirming very low lithium losses. While it is unlikely that direct chemical precipitation would be used in isolation to remove divalent impurities from the CV brine (owing to relatively high reagent costs), it is likely that some form of this unit operation will be used after the membrane step to polish the permeate and raise its pH to target levels prior to feeding the lithium solvent extraction circuit.

The results from the LiP™ testwork formed the basis of the chemical composition of the synthetic solution that was prepared for the LiSX™ testwork described below. The comparison of the chemical compositions is shown in Table 13–1. Comparison of Clayton Valley and Synthetic Brine Compositions above.

13.4 Solvent Extraction – LiSX^{TM}

The primary aim of the solvent extraction (LiSX™) part of the process, which forms the core of TAT's novel approach to the CV brines, is to selectively extract lithium from the pretreated brine and at the same time, effectively concentrate the lithium into the high purity stream exiting the solvent extraction (SX) stage. This solvent extraction step is composed of three parts: (1) introduction of the pre-treated brine to barren solvent; (2) scrubbing the loaded solvent with a weak acid solution to clean the solvent of any low concentrations of co-extracted impurity ions; and (3) stripping the lithium from the purified solvent to produce a high-purity lithium sulphate solution and generate a clean barren solvent that can be recycled back to step (1) of the SX loop.

All of the SX test work was completed by TAT at its test facility in Katzrin, Israel, and was performed in a mixture of 40 mm (1.6 inch) and 100 mm (4 inch) diameter, 7 meter (23 feet) tall Tenova Pulsed Columns. The initial work looked at optimizing the extraction of lithium into TAT's proprietary solvent by adjusting the pH of the brine entering the column, and adjusting the ratio of solvent to brine being contacted in the pulsed column. The tests demonstrated that optimal mass transfer of lithium from brine into solvent was

achieved by adding 1.35 g/L of NaOH (on dry basis) to the input brine, and with the extraction column working in an 'organic continuous' mode, i.e., discrete droplets of brine pulsing down through a continuous solvent matrix. Operating under these conditions produced a loaded organic containing 1,750 mg/L of lithium plus a raffinate (the barren 'waste' brine) containing lithium at concentrations well below the available analytical method detection limits (<3 mg/L) and in a practically neutral pH solution.

Scrubbing of the loaded solvent was tested using a dilute acid solution (0.6 percent sulphuric acid [H_2SO_4]). The resulting scrubbed (purified) solvent effectively contained only lithium, with all other potential contaminants (sodium, potassium, boron etc.) present at concentrations well below available analytical detection levels (<3 mg/L).

Lithium was stripped off the purified solvent using sulphuric acid. The acidic strip solution was the spent electrolyte generated during the subsequent electrolytic stage (see below), and therefore required little or no additional reagents. The strip solution produced was essentially a lithium sulphate solution with a near-neutral pH (7.7). At the end of the three-step LiSX™ process, the SX product going into electrolysis had a purity greater than 99.9 percent lithium, and had concentrated the lithium by a factor of approximately 38 times. Only one waste solution, the aqueous raffinate, was produced in the SX steps, as the spent scrub liquor was recycled to extraction where any lithium that might have been scrubbed off was recaptured by the extractant. Lithium concentrations measured in the raffinate were below available analytical detection levels, indicating that Li conservation through this stage approached 100 percent.

13.5 Electrolysis – LiEL™

The electrolysis stage (LiEL™) of the process is designed to convert a high purity lithium sulphate solution into a high purity lithium hydroxide solution. The reason for doing this is partly based on PEM's strategic view on demand vs. supply dynamics for lithium hydroxide monohydrate in the coming decades, and also on PEM's conditional supply contract with Tesla, which envisages delivery of battery-grade lithium hydroxide monohydrate to supply its Gigafactory battery production facility in Sparks, Nevada.

The electrolysis testing work was performed by a sub-contractor to TAT at a dedicated testing facility in the USA, using TAT's novel two compartment electrochemical cell process (see Figure 13-2). Conceptual Diagram of Electrochemical Cell. TAT worked with its technology partner, Noram Engineering and Constructors Ltd. (Noram), on the electrolysis testing. The first phase of the testing evaluated potential membranes suitable for a mixed sulphate / hydroxide environment, and a very specialized but commercially available candidate membrane was shown to exhibit superior performance. The selected membrane was formulated to limit hydroxide transport, while still allowing lithium to migrate through it. The second phase of testing looked at

optimizing current efficiency in the cell while varying the concentration of lithium hydroxide in the catholyte. The results from this stage of the test revealed that a current efficiency of 80 percent was attainable in the cell. It was also demonstrated that constant operating temperatures in the cell of approximately 60°C resulted in the best efficiencies (note that the cell was effectively self-heating due to the currents used during electrolysis and the internal resistance). After testing in the cell in batch and continuous modes, TAT found that steady state operation could be readily achieved, producing lithium hydroxide solution at the cathode; at the anode, the sulphuric acid solution was suitable for recycling back to SX to strip the purified loaded organic.

Figure 13–2. Conceptual Diagram of Electrochemical Cell
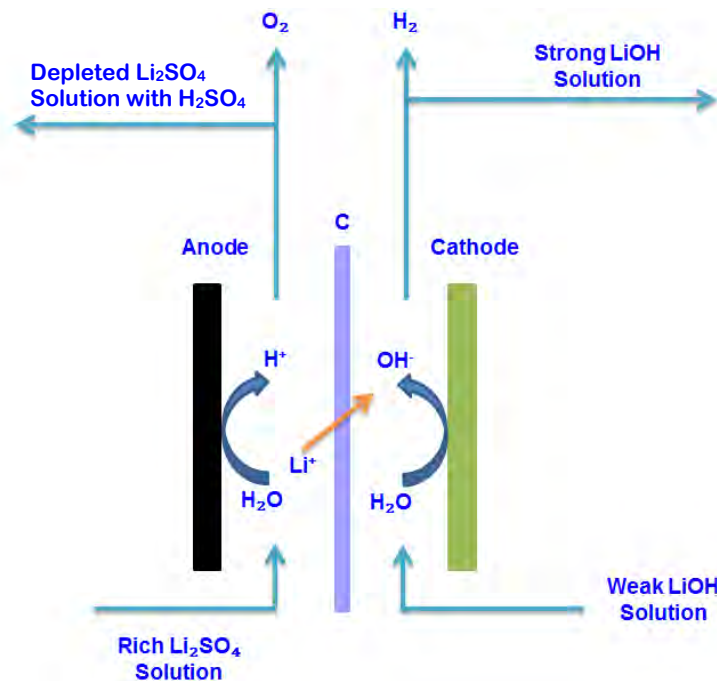
To reduce the level of possible impurities in the electrolysis feed solution, an intermediate pre-electrolysis polishing step may also be required between the SX stripping and the electrolysis. Ion exchange (IX) is being considered for this step aimed at removing any divalent cations that are collected and concentrated by the solvent exchange process. While the concentrations of these contaminants are not expected to be high, preliminary testwork has been performed at a dedicated testing facility in the USA, to evaluate IX as a means of purifying the SX strip solution, should it be required. To test the feasibility of this interim step, a synthetic solution was prepared and one resin was evaluated. The results demonstrated that the effluent from the SX

step, treated with that specific IX resin, could meet the purity requirements for the feed to the electrolysis step. Further work is required to understand the engineering of the IX step and its incorporation into the flowsheet; this will be part of the test program when the pilot plant is run with natural brine from the Project.

13.6   Evaporation and Crystallization

The final stage of the process was to concentrate the lithium hydroxide solution produced by the electrolysis step using evaporation until it reached saturation, and subsequent production of lithium hydroxide monohydrate crystals from the solution. Evaporative crystallization is a known technology and is currently in use to produce crystalline lithium hydroxide monohydrate at various operations around the world. The crystals were separated and washed using a centrifuge and then dried in an inert atmosphere to avoid carbonation. This test work was performed by a sub-contractor to TAT at a dedicated testing facility in Illinois, USA. The crystallization test work commenced with a synthetic lithium hydroxide solution made with American Chemical Society (ACS) Reagent grade lithium hydroxide. The work was conducted at bench scale, and high-quality lithium hydroxide monohydrate, satisfying battery-grade criteria (crystal shape, particle size and purity) was produced.

13.7   Discussion of Results

The process is designed such that the potential for lithium loss from the system is limited to the brine pre-treatment section of the circuit. The likely areas for any potential lithium losses are: in the pretreatment stage, where a portion of the brine is rejected by membranes for discharge back to the basin, or, to a much lower extent, by entrainment with calcium carbonate and magnesium hydroxide during the polishing step. The flowsheet is designed to capture essentially all lithium-bearing intermediate streams for recycling back into the process so that recycled lithium stays within the process. After the first stage of SX extraction, all bleed and wash liquors from the process would be looped back into the process at various points, and hence, would not result in any net lithium loss from the system.

Test work completed during this mini-pilot program demonstrated that the only accountable loss of lithium from the process is caused by the efficiency of the membrane separation step at the pre-treatment stage (LiP™). As such, the flowsheet described above can be expected to achieve about 90 percent recovery of the lithium from the raw feed brine. It is possible that recovery can be improved and such possibility will be investigated during operation of a pilot plant. Notwithstanding possible future increases in efficiency, recovery of about 90 percent of the lithium is extremely encouraging. This is especially true given oft-quoted

industry figures of lower than 60 percent efficiency at most lithium brine plants operating today using conventional evaporation routes, even for significantly higher lithium contents in the feed brines.

Potential process risks relate primarily to the uncertainties inherent in the level of testwork performed at the PEA level of this report. Examples of such risks and uncertainties include:

- Performance of the individual unit processes over an extended period of time;

- Potential buildup of deleterious elements at different points in the flowsheet;

- Reagent consumption that may differ from that experienced during the mini-pilot test;

- Metallurgical recovery that may differ from that measured during the mini-pilot test;

- Scalability of the flowsheet to a commercial plant

Some risks also offer opportunities for improving efficiency and economics, such as reduced reagent consumption or improved metallurgical recovery.

Design, construction, and operation of a pilot plant would be the major factor mitigating the overall risk due to uncertainty, at the PEA level, of the study performed as of the effective date of this report. Recommendations regarding pilot plant scale testing are presented below.

13.8   Quality Assurance

Consistent with the recommendations in the CIM Best Practice Guidelines for Mineral Processing (CIM, 2011), the process testwork has been peer reviewed by outside experts engaged by PEM. The peer-review process has included assessment of the type, extent, and results of testwork performed and an on-site audit of the TAT test facility in Katzrin, Israel.

13.9   Conclusion and Recommendations

The Tenova flowsheet represents a novel approach to the recovery of lithium and production of lithium hydroxide monohydrate from lithium-bearing brine. This approach has not yet been used on a commercial scale in the recovery of lithium from brine.

The mini-pilot plant succeeded in demonstrating the "proof-of-concept" of the Tenova flowsheet for recoverability of lithium and production of lithium hydroxide monohydrate from synthetic brines that are analagous in chemical composition to the Clayton Valley brine . The results strongly suggest, in the opinion of the author, that the Tenova process can be successfully applied to recover lithium from Clayton Valley brine.

The concept development and testwork performed as of the effective date of this report are sufficient for the PEA level of this Technical Report and development of a PEA. To address uncertainties, risks and opportunities the author recommends that PEM consider integrated pilot scale testing on Clayton Valley brine. One option is to locate the pilot plant at the Clayton Valley site while another would be to transport brine to a fully serviced piloting facility.

There would be several key objectives for the Clayton Valley pilot plant:

- To confirm the performance of individual unit processes (LiP^{TM}, LiSX^{TM} and LiEL^{TM}), at a commercial scale, in cooperation with Tenova's technology partners GE and Noram;

- To demonstrate continuous and integrated operation of the complete process flowsheet at a larger scale and identify potential issues of scalability to a commercial plant, if any;

- To determine and provide first hand evidence of the chemistry of the aqueous raffinate (the calcium and magnesium salts as well as the lithium-depleted brine) so that its suitability for return to the basin can be confirmed;

- To identify and mitigate potential deleterious species that may build up at different points in the process flowsheet;

- To confirm reagent and solvent consumption and identify opportunities for improvement in the ongoing cost of consumable materials;

- To identity opportunities for improvement in process kinetics and/or operating costs;

- To develop information regarding operating parameters and data needed for design of a commercial-scale plant; and

- To produce battery grade lithium hydroxide monohydrate in quantities sufficient to demonstrate that it meets the specifications of potential customers.

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14 Mineral Resource Estimate

14.1 Overview

The following Resource Estimate, with an effective date of June 15, 2017, represents an Inferred Mineral Resource. The Resource Estimate incorporates data collected during three phases of exploration performed in 2015 through 2017. The Resource Estimate also includes data from exploration by Rodinia Minerals, Inc. in 2009 and 2010. Figure 7-1. Geologic Map, shows the claim area controlled by the Project, regional geology, well and borehole locations, and the area encompassing the updated Resource Estimate.

A maiden Resource Estimate was presented in a technical report entitled "Inferred Resource Estimate for Lithium, Clayton Valley Project, Clayton Valley, Esmeralda County, Nevada, USA" with a date of July 17th, 2015 (Spanjers, 2015). This updated Resource Estimate based on Montgomery (2017) has a surface area projection of approximately 1,633 hectares (4,035 acres), whereas the maiden Resource Estimate covered a total area of approximately 3,240 hectares (8,004 acres). The reduction is due to excluding a substantial area in the southern part of the Project from the Resource Estimate, based on negative results of brine concentration in samples collected at representative well locations. However, there remains significant exploration potential at depth in this area, as well as in newly acquired properties to the north.

14.1.1 Statement for Brine Mineral Prospects and Related Terms

Mineral Resource and Reserve estimates for brine are not "solid mineral deposits" as defined under the Canadian Institute of Mining and Petroleum (CIM) Estimation of Mineral Resources & Mineral Reserves Best Practice Guidelines (CIM 2003), Best Practice Guidelines for Lithium Brine (CIM 2012), and the CIM Definition Standards (CIM 2014), each of which is incorporated by reference into NI 43-101. However, there are still sufficient similarities between brine and solid mineral deposits that the current guidelines and standards published by the CIM are applicable and followed in this Report.

Brine is a fluid and hosted in an aquifer and thus has the ability to move and mix with adjacent fluids once extraction starts using production wells as a mining method. Mineral Resource estimation for brine mineral prospects is based on knowledge of the geometry of the aquifer, the variation in specific yield (the yield of drainable fluid obtained under gravity flow conditions from the interconnected pore volume and also referred to as drainable porosity), and brine grade within the aquifer. To estimate the Mineral Reserve, in addition to economic, process, and other potentially modifying aspects, further information on the permeability (hydraulic conductivity), transmissivity, storativity, diffusivity and the overall groundwater flow

regime in the aquifer and its surroundings are necessary, in order to predict how the resource will change over the life of mine (CIM, 2012).

Classification standards for a Mineral Resource are applied as indicators of confidence level categories as follows: Measured, Indicated, and Inferred. According to these classification standards, Measured is the most confident category and Inferred is the least confident category (CIM, 2014). Figure 14-1 Methodology for Evaluating Brine Mineral Resources and Reserves, shows the evaluation framework used by Montgomery for brine Mineral Resource and Resource evaluation.

Figure 14-1. Methodology for Evaluating Brine Mineral Resources and Reserves[a]

	Exploration Results BRINE MINERAL RESOURCE	BRINE MINERAL RESERVE
Increasing Chemical, Geologic and Hydrogeologic Confidence	Inferred	
	Indicated	Probable
	Measured	Proven
	• Definition of the aquifer geometry • Determination of the Specific Yield (Sy) of the aquifer • Determination of the concentration of the elements of interest	• Determination of permeability, hydraulic conductivity, transmissivity, storativity, dispersivity and other aquifer mechanics • Wellfield Production Parameters; Hydrochemical Database; Flow, Transport and Density Modeling of the mining method. • Pre-feasibility or Feasibility level studies that include application of Modifying Factors from disciplines such as: process engineering, metallurgy, hydrodynamic modeling, production-scale well design and construction, capital and operating economics, legal, social, environmental, etc.

a — based on CIM (2012 and 2014)

The Mineral Resource estimate is determined by quantifying the brine volume and associated mass able to drain by gravity effects, and is computed as the product of the estimated resource area, resource thickness, mineral concentration dissolved in the brine (grade), and specific yield of the resource. The Mineral Resource estimate is typically advanced to a Mineral Reserve estimate by projecting the producing capacity of the proposed operating facilities and local or global current mineral concentrations or grade to be produced. This involves flow, transport and density numerical modeling for simulating an extraction wellfield mining method using production-scale well design and construction results.

14.2   Definition of Resource-Bearing Formations

The Resource Estimate incorporates the following parameters from exploration well drilling and construction, downhole geophysics, brine sampling, and pumping tests in order to characterize the host brine aquifer:

- Depth-specific concentrations of lithium, magnesium, calcium, chloride, sulfate, and other cations and anions of interest;

- Multi-day pumping test samples measuring concentrations of lithium, magnesium, calcium, chloride, sulfate, and other cations and anions of interest over time;

- Depth-to-bedrock in the resource area as determined by geophysical methods and drill logs;

- Lithology;

- Specific yield (sometimes referred to as drainable porosity and is less than or equivalent to effective porosity) of the aquifer matrix measured from core samples by physical drainage methods and by nuclear magnetic resonance (NMR) laboratory methods, and by NMR borehole logging;

- Electrical resistivity of brine in wells and boreholes to define upper limit of brine-saturated sediments and depth of the brine and brackish water interface;

- Downhole geophysical profiles including temperature, natural gamma, dual induction resistivity, fluid electrical conductance, fluid specific gravity, and NMR.

Results from Hasbrouck Geophysics, Inc. (Hasbrouck) incorporating correlation to drilling and sampling results were used in order to construct a depth-to-bedrock surface, interpret basin-fill sediments and boundaries, and correlate brine concentrations in the aquifer system. Reconnaissance and detailed surface geophysical surveys that were conducted in 2009 and 2014 by Hasbrouck were also used for 3D geologic modeling controls. Surface geophysical results are reported in Spanjers (2015), and Hasbrouck (2009, and

2015a, b, 2016, and 2017). The geophysical surveys included gravity, seismic, and Controlled-Source Audio-Magnetotellurics / Magnetotellurics (CSAMT / MT).

Depth-to-bedrock is based on gravity survey interpretations by Hasbrouck (2009 and 2015a) and reported in Spanjers (2015). The gravity surveys indicate the regional depth to bedrock is largest within a northeast-southwest trending trough within the Project (Figure 7-3. Regional Geology and Depth to Bedrock). The east side of the area of the Resource Estimate shows the contact between basin-fill and bedrock is steep and consistent with high-angle, normal faulting. In addition to the gravity surveys, seismic reflection surveys (Hasbrouck 2015b), more recent CSAMT / MT surveys (Hasbrouck 2016 and 2017), and drill logs at exploration wells were used to better define the basin shape, structural offsets, continuity and extent of the aquifer, and add constraints to the gravity-based, depth-to-bedrock model.

14.3 Extent of Resource-Bearing Areas

The boundaries of the Resource Estimate are presently defined laterally north, east, and west by property claim boundaries controlled by PEM and in the subsurface by bedrock contacts. To the south, an east-west boundary is identified between SPD-8 and CV-4 based on brine sampling results and results of surface geophysical surveys (CSAMT / MT and seismic). Vertically, the inferred resource brine volume extends from saturated basin-fill deposits at the brine interface to as deep as the bedrock contact at CV-8 (942 meters [3,090 ft]) or the bedrock surface (determined by seismic and gravity surveys), whichever is shallower.

14.4 Resource Estimate Methodology

The Resource Estimate is based on lithium brine grade in the host brine aquifer volume within PEM claim boundaries and its specific yield or drainable porosity. Figures 9-7 through 9-14 show schematic diagrams of wells within the Resource Estimate area that include results of lithium concentration measurements of brine samples (wells CV-1 through CV 8) and specific yield (wells CV-3, CV-7, and CV-8).

14.4.1 Lithium Concentrations

Laboratory results of depth-specific samples and pumping test samples collected at boreholes and wells were reviewed to determine the brine-interface depth and representative average lithium grades for brine volumes intersected at borehole and well locations. Analyses were conducted by the Project reference laboratory, WETLab, Sparks, Nevada. A summary of results for lithium concentrations is shown in Table 14-1. and illustrated on well logs in Figures 9-7 through 9-14.

Representative average lithium concentrations for brine volumes in the Resource Estimate model were determined using results of depth specific samples and averaging methods weighted based on thickness of depth intervals at the wells. The averages for the brine volumes in the Resource Estimate model are: 22, 65, 132, and 221 mg/L. Relatively higher concentration brine occurs on the northeastern side of the resource area and in the deeper extents of the basin. Lower grade brine (22 to 65 mg/L lithium), typically occurring in the shallower parts of the system and lateral boundaries, may represent brine diluted by brackish or fresh water. A substantial part of the brine volume falls between concentrations of 65 mg/L and 221 mg/L lithium.

Table 14-1. Summary of Results for Lithium Concentrations Measured in Brine Samples
Collected from Boreholes and Wells

Identifier	Sample Method	Sample Interval Depth		Number of Samples Collected[b]	Lithium Concentration Range (mg/L)
		Top (m)	Bottom (m)		
SPD-9[c]	Airlift[d]	52	494	70	2 to 400
SPD-8[c]	Airlift	37	384	53	2 to 130
CV-1	Discrete Sampler[e]	30	250	25	5 to 240
	Pumping Test[f]	158	274	4	200 to 230
CV-2	Discrete Sampler	21	290	25	21 to 30
CV-3	Discrete Sampler	46	564	22	3 to 200
	Pumping Test[g]	254	576	32	148 to 191
CV-4	Discrete Sampler	15	361	29	0.7 to 0.9
CV-5	Discrete Sampler	23	459	26	0.4 to 2.1
CV-6	Discrete Sampler	248	442	23	1.9 to 2.4
CV-7	Discrete Sampler	122	549	13	53 to 109
	Pumping Test[h]	183	591	31	45 to 60
CV-8	Discrete Sampler	213	823	10	52 to 229
	Pumping Test[i]	363	867	34	83 to 101

a) using the discrete sampler method, the top depth represents the shallowest sample and the bottom depth represents the deepest sample; using the pumping test method, top and bottom represent the depth to top and bottom of the screened interval of the well.

b) using the discrete sampler, the value represents the number of samples collected ranging from top to bottom of the depth interval; using the pumping test method, the value represents number of samples collected during the pumping period. Total samples analyzed by WETLab and ALS including duplicates.

c) Spanjers, 2015

d) Airlift = sample collected during dual-wall, reverse circulation air-drilling

e) low-flow sampling method, Snap™ sampling method, and/or wireline sampling method

f) duration of pumping 8 hours; average pumping rate 9.5 L/s (150 gpm)

g) duration of pumping 46.5 hours; average pumping rate 4.4 L/s (69 gpm)

h) duration of pumping 48 hours; average pumping rate 5.0 L/s (80 gpm)

i) duration of pumping 72 hours; average pumping rate 1.9 L/s (30 gpm)

14.4.2 Specific Yield

Specific yield, also known as the drainable porosity, represents interconnected pore space that is drainable by gravity effects and is given as a ratio or percent of the total volume of saturated sediments. Specific yield as defined in classical aquifer mechanics and determined using aquifer testing methods is the volume of water released from storage by an unconfined aquifer per unit surface area of aquifer per unit decline of the water table. Specific yield, generally considered equivalent to or less than effective porosity, is always less than total porosity. Bear (1979) relates specific yield to total porosity as follows:

$n = S_y + S_r$

where n is total porosity [dimensionless], S_y is specific yield [dimensionless] and S_r is specific retention [dimensionless], defined as the amount of water retained by capillary forces during gravity drainage of an unconfined aquifer. In fine grained sediments $S_y \ll S_r$, whereas in coarser grained sediments $S_y \gg S_r$.

Specific yield estimates for exploration wells CV-3, CV-7, and CV-8 were taken to be representative of the current resource area with values determined by:

1) wireline geophysical methods using a nuclear magnetic resonance (NMR) borehole logging tool, for a total of 1,370 meters (4,494 ft), and

2) laboratory methods using relative brine release capacity (RBRC) vacuum methods and NMR core analyzer (Corona) on discrete core samples collected during exploration core drilling, for a total of 73 samples.

Results of NMR borehole logs and RBRC and Corona lab measurements are provided on schematic diagrams in Figures 9-7 through 9-14 and Table 11-1 respectively. Results of RBRC and Corona lab measurements are also summarized in Table 14-2. Laboratory Results for Drainable Porosity.

The range of values from borehole NMR and laboratory (RBRC and Corona) methods are within published ranges of specific yield or drainable porosity for similar lithologies encountered at the wells (Johnson, 1967; Wolff, 1982). Drainable porosity content is highest in areas where borehole geophysical logs and lithologic sampling also indicate potentially permeable sediments and ash sequences. Conversely, values are lower in zones that were identified as silt and clay-rich. Overall, the NMR results indicate an average specific yield of 0.06 and the lab results indicate an average specific yield of 0.07.

Table 14-2. Laboratory Results for Drainable Porosity

Borehole ID	Sample ID	Sample Depth (ft, bls)	Sample Depth (m, bls)	Laboratory[a]	Total Porosity	Drainable Porosity	Lithologic Description[b]
CV-3	DP-007	530.3	161.6	GeoSystems	0.374	0.018	Dominantly green to grey-green, stiff to moderately stiff silty clay/clay
CV-3	DP-006	532.7	162.4	GeoSystems	0.350	0.055	Dominantly green to grey-green, stiff to moderately stiff silty clay/clay
CV-3	DP-010	533.4	162.6	GeoSystems	0.387	0.058	Loose silt to med sand
CV-3	DP-005	821.8	250.5	GeoSystems	0.435	0.019	Loose fine sand
CV-3	DP-003	825.9	251.7	GeoSystems	0.360	0.026	Dominantly green to grey-green, stiff to moderately stiff silty clay/clay
CV-3	DP-004	829.7	252.9	GeoSystems	0.419	0.052	Dominantly green to grey-green, stiff to moderately stiff silty clay/clay
CV-3	DP-002	870.7	265.4	GeoSystems	0.427	0.005	Dominantly green to grey-green, stiff to moderately stiff silty clay/clay
CV-3	DP-001	877.9	267.6	GeoSystems	0.432	0.027	Dominantly green to grey-green, stiff to moderately stiff silty clay/clay
CV-3	DP-009	1024.0	312.1	GeoSystems	0.389	0.033	Dominantly green to grey-green, stiff to moderately stiff silty clay/clay
CV-3	DP-008	1032.0	314.6	GeoSystems	0.469	0.040	50% 1/4 - 2" silt-fn sand interbeds
CV-3	DP-017	1184.5	361.0	GeoSystems	0.366	0.014	Dominantly green to grey-green, stiff to moderately stiff silty clay/clay
CV-3	DP-012	1189.0	362.4	GeoSystems	0.548	0.401	Well sorted wk stiff ash-silt
CV-3	DP-011	1198.4	365.3	GeoSystems	0.556	0.395	Loose 'pellet' med gr ash
CV-3	DP-018	1228.7	374.5	GeoSystems	0.433	0.006	Dominantly green to grey-green, stiff to moderately stiff silty clay/clay
CV-3	DP-014	1244.2	379.2	GeoSystems	0.382	0.111	Well sorted, sugar texture, porous-pellets
CV-3	DP-016	1245.7	379.7	GeoSystems	0.482	0.128	Well sorted, sugar texture, porous-pellets
CV-3	DP-013	1255.2	382.6	GeoSystems	0.373	0.022	Dominantly green to grey-green, stiff to moderately stiff silty clay/clay (salty)
CV-3	DP-015	1268.7	386.7	GeoSystems	0.441	0.046	Dominantly green to grey-green, stiff to moderately stiff silty clay/clay (salty)
CV-3	DP-019	1284.3	391.5	GeoSystems	0.425	0.007	Pellet ash
CV-3	DP-020	1295.6	394.9	GeoSystems	0.432	0.007	Loose med gr ash
CV-3	DP-021	1302.7	397.1	GeoSystems	0.395	0.029	Loose silt-med gr ash
CV-3	DP-022	1313.5	400.4	GeoSystems	0.424	0.014	Dominantly green to grey-green, stiff to moderately stiff silty clay/clay (sheared/broken)
CV-3	DP-023	1323.3	403.3	GeoSystems	0.401	0.022	Dominantly green to grey-green, stiff to moderately stiff silty clay/clay (sheared/broken)
CV-7	DP-024A	877.0	267.3	GeoSystems	0.410	0.079	Silt/Silty Clay: stiff, green, 'waxy', fine ash 'marbling'
CV-7	DP-024B	877.5	267.4	DB Stevens	0.392	0.014	Silt/Silty Clay: stiff, green, 'waxy', fine ash 'marbling'
CV-7	DP-025A	975.3	297.3	GeoSystems	0.436	0.046	Silt/Fine Sand: wk dense, green-grey, moderate sorting
CV-7	DP-025B	975.8	297.4	DB Stevens	0.379	0.077	Silt/Fine Sand: wk dense, green-grey, moderate sorting
CV-7	DP-026A	1053.3	321.0	GeoSystems	0.432	0.065	Silty Fine to Medium Sand: medium density-locally loose, green-grey, minor clay 'ripups' (scour & fill?)
CV-7	DP-026B	1053.8	321.2	DB Stevens	0.429	0.017	Silty Fine to Medium Sand: medium density-locally loose, green-grey, minor clay 'ripups' (scour & fill?)
CV-7	DP-027A	1156.8	352.6	GeoSystems	0.425	0.045	Silty, Fine Sand: medium density to very loose, brown, well sorted, cross bedding, local clay 'ripups' (scour & fill?)
CV-7	DP-027B	1157.3	352.7	DB Stevens	0.393	0.063	Silty, Fine Sand: medium density to very loose, brown, well sorted, cross bedding, local clay 'ripups' (scour & fill?)
CV-7	DP-028A	1200.2	365.8	GeoSystems	0.435	0.271	Ash: weakly dense to loose, off-white to pale pink, silt to .5mm (pellet texture), airfall-->(sharp basal contact)
CV-7	DP-028B	1200.6	365.9	DB Stevens	0.510	0.259	Ash: weakly dense to loos, off-white to pale pink, silt to .5mm (pellet texture), airfall-->(sharp basal contact)
CV-7	DP-029A	1240.2	378.0	GeoSystems	0.497	0.333	Silty, Fine Sand (minor thin Ash layers): weakly density and locally loose, medium grey, mod. well-sorted, weak acid response
CV-7	DP-029B	1240.7	378.2	DB Stevens	0.499	0.325	Silty, Fine Sand (minor thin Ash layers): weakly dense, locally loose, med. grey, moderately well-sorted, weak acid response
CV-7	DP-030A	1345.8	410.2	GeoSystems	0.425	0.061	70% Silt/Very Fine Sand: medium dense, green; 30% Silty Clay: stiff, green, 'waxy'; 1-4" interbeds
CV-7	DP-030B	1346.3	410.3	DB Stevens	0.438	0.051	70% Silt/Very Fine Sand: medium dense, green; 30% Silty Clay: stiff, green, 'waxy'; 1-4" interbeds
CV-7	DP-031A	1403.3	427.7	GeoSystems	0.464	0.050	50% Silt/Fine Sand: dense, green-brown, local channel fill; 50% Silty Clay: stuff, green, 'waxy' > irregular bedding contacts
CV-7	DP-031B	1403.8	427.9	DB Stevens	0.424	0.067	50% Silt/Fine Sand: dense, green-brown, local channel fill; 50% Silty Clay: stuff, green, 'waxy' > irregular bedding contacts
CV-7	DP-032A	1505.3	458.8	GeoSystems	0.435	0.075	50% Silty Clay: stiff, green, 'waxy'; 50% Silt/Fine Sand: med. dense, green-grey, minor cse snd
CV-7	DP-032B	1505.8	459.0	DB Stevens	0.426	0.050	50% Silty Clay: stiff, green, 'waxy'; 50% Silt/Fine Sand: med. dense, green-grey, minor cse snd
CV-7	DP-033A	1814.8	553.1	GeoSystems	0.432	0.009	Silty Clay/Clay: stiff, green, waxy, hackly fracture, 3-4% 1/4-1" fine black pyrite as crude layers
CV-7	DP-033B	1815.8	553.3	DB Stevens	0.387	0.003	Silty Clay/Clay: stiff, green, waxy, hackly fracture, 3-4% 1/4-1" fine black pyrite as crude layers
CV-8	DP-034A	550.3	167.7	GeoSystems	0.450	0.145	Fine Sand: med grey, med-wk dense, mod sorted, quartz-rich
CV-8	DP-034B	550.8	167.9	VistaClara	0.357	0.185	Fine Sand: med grey, med-wk dense, mod sorted, quartz-rich
CV-8	DP-035A	704.6	214.7	GeoSystems	0.471	0.105	Silty Fine Sand: grey, med dense, poorly sorted, 10% silty clay interbeds
CV-8	DP-035B	705.1	214.9	VistaClara	0.314	0.115	Silty Fine Sand: grey, med dense, poorly sorted, 10% silty clay interbeds
CV-8	DP-036A	768.8	234.3	GeoSystems	0.435	0.051	Clay-Silty Clay: brown, stiff, 'waxy', 1-2%, 1/2-3/4" pumice 'floaters'
CV-8	DP-036B	769.3	234.5	VistaClara	0.253	0.003	Clay-Silty Clay: brown, stiff, 'waxy', 1-2%, 1/2-3/4" pumice 'floaters'
CV-8	DP-037A	886.2	270.1	GeoSystems	0.391	0.020	Silty Clay/Clay: stiff, 'waxy', vy sparse pebble pumice 'floaters'
CV-8	DP-037B	886.6	270.2	VistaClara	0.299	0.008	Silty Clay/Clay: stiff, 'waxy', vy sparse pebble pumice 'floaters'
CV-8	DP-038A	1018.8	310.5	GeoSystems	0.427	0.071	Ash: off white, wk dense, silt to fn grain size, mod sorted, local ash 'pellet' texture
CV-8	DP-038B	1019.3	310.7	VistaClara	0.390	0.235	Ash: off white, wk dense, silt to fn grain size, mod sorted, local ash 'pellet' texture
CV-8	DP-039A	1201.3	366.1	GeoSystems	0.501	0.037	Ash-silt/clay
CV-8	DP-040A	1363.3	415.5	GeoSystems	0.441	0.047	Pellet ash
CV-8	DP-041A	1399.3	426.5	GeoSystems	0.442	0.080	Silt/ash
CV-8	DP-042A	1546.3	471.3	GeoSystems	0.463	0.024	Silty clay
CV-8	DP-043A	1678.6	511.6	GeoSystems	0.390	0.006	Silt-silty clay
CV-8	DP-044A	2011.3	613.0	GeoSystems	0.377	0.032	Weakly lithified conglomerate
CV-8	DP-045A	2101.3	640.5	GeoSystems	0.368	0.013	Weakly lithified conglomerate
CV-8	DP-046A	2149.3	655.1	GeoSystems	0.339	0.039	Weakly lithified conglomerate
CV-8	DP-047A	2199.8	670.5	GeoSystems	0.368	0.009	Weakly lithified conglomerate
CV-8	DP-048A	2302.8	701.9	GeoSystems	0.369	0.047	Weakly lithified conglomerate/Travertine
CV-8	CV8-47A	2401.0	731.8	VistaClara	0.235	0.011	hard green siltstone
CV-8	CV8-48A	2500.0	762.0	VistaClara	0.316	0.008	thin-bedded claystone and ash, bedding approx. 5 degrees from axis
CV-8	CV8-49A	2590.4	789.6	VistaClara	0.102	0.007	interbedded conglomerate and siltstone
CV-8	CV8-50A	2639.5	804.5	VistaClara	0.180	0.075	multi-lithic green conglomerate
CV-8	CV8-51A	2812.8	857.3	VistaClara	0.218	0.090	multi-lithic brown conglomerate
CV-8	CV8-52A	2898.3	883.4	VistaClara	0.178	0.029	multi-lithic brown conglomerate, about 0.5 cm from full tube
CV-8	CV8-CONG1	2980.4	908.4	VistaClara	0.180	0.029	Fine to Cr Pebble Gravel cgl; matrix muddy brown silty fn sand; local evidence of CaCO3 (?)-sinter cemented matix.
CV-8	CV8-CONG2	2994.6	912.7	VistaClara	0.222	0.040	Fine to Cr Pebble Gravel cgl; matrix muddy brown silty fn sand; local evidence of CaCO3 (?)-sinter cemented matix.
CV-8	CV8-CONG3	3004.7	915.8	VistaClara	0.191	0.031	Fine to Cr Pebble Gravel cgl; matrix muddy brown silty fn sand; local evidence of CaCO3 (?)-sinter cemented matix.
CV-8	CV8-CONG4	3035.3	925.1	VistaClara	0.209	0.034	Fine to Cr Pebble Gravel cgl; matrix poorly sorted, silty to sand (varies soft clayey to qtz sand).
CV-8	CV8-CONG5	3078.7	938.4	VistaClara	0.207	0.023	Fine to Cr Pebble Gravel cgl; matrix poorly sorted, silty to sand (varies soft clayey to qtz sand).

a) GeoSystems = GeoSytems Analysis, Tucson, AZ; DB Stephens = Daniel B. Stephens and Assoc., Albuquerque, NM; VistaClara = Corona NMR, Vista Clara Inc., Mukilteo, WA.

b) Lithologic description from core log.

14.4.3 Hydrogeologic Conceptual Model

To better understand the framework of the aquifer system and hydrostratigraphy, Montgomery formulated

a hydrogeologic conceptual model (HCM) of the basin using the software Leapfrog Geo (ARANZ, 2017). The

HCM incorporates the depth-to-bedrock surface generated from the gravity model and integrated with the

bedrock contact at CV-8 and seismic reflection data, results of exploration drilling, lithium concentration

categories, and specific yield estimates, in order to evaluate the Resource Estimate. The basin structure of

the HCM for the Resource Estimate is shown on Figure 14-2. Basin-Fill Volume and Bedrock Surface (A) and

Lithium Concentration Volumes (B) for the Inferred Mineral Resource Estimate, as well as lateral and vertical

lithium concentration volumes.

Figure 14-2. Basin-Fill Volume and Bedrock Surface (A) and Lithium Concentration Volumes (B) for the Inferred Mineral Resource Estimate
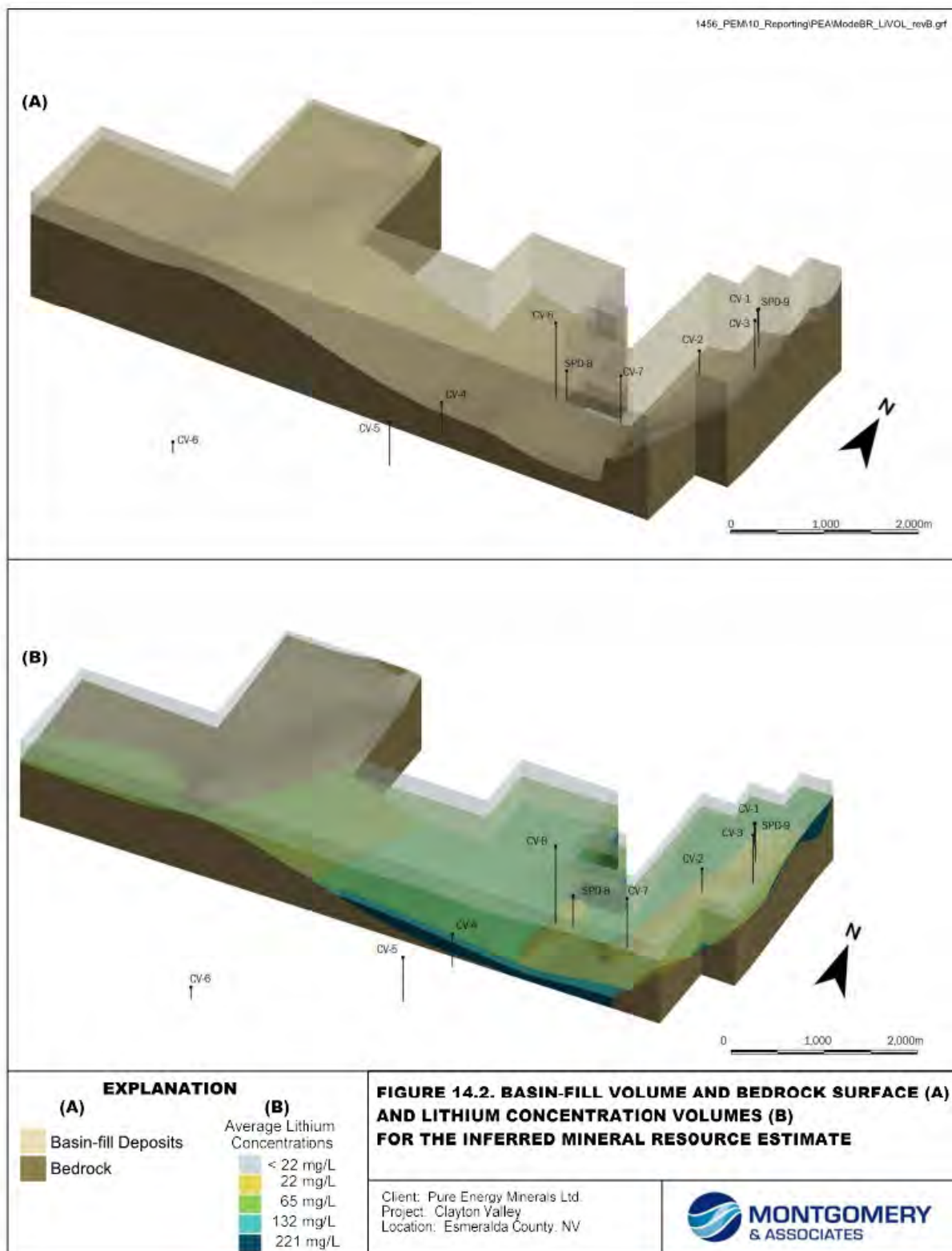
The HCM boundaries for the Resource Estimate of lithium are presently defined laterally north, east, and west by property claim boundaries controlled by PEM which in the subsurface are further limited by the bedrock surface. To the south, the east-west boundary is identified between SPD-8 and CV-4 based on brine sampling results and results of surface geophysical surveys (CSAMT / MT and seismic). Vertically, the volume of the Resource Estimate extends from saturated basin-fill deposits at the brine interface to as deep as the bedrock contact at CV-8 of 942 meters (3,090 ft) bls or the bedrock surface (determined by seismic and gravity surveys), whichever is shallower.

14.5 Reasonable Prospects for Eventual Economic Extraction

After evaluation of the technical and economic factors described throughout this report, it is clear that there are reasonable prospects for eventual economic extraction. Several of the elements that go into the assessment of reasonable prospects for eventual economic extraction are described elsewhere in this report as required by Form 43-101F1. This section summarizes the information presented elsewhere in this report that is relevant to the evaluation of reasonable prospects for eventual economic extraction.

- **Recoverability:** The recoverability of lithium, and the production of LiOH·H_2O, using the Tenova process was demonstrated in the mini-pilot test that is described in Section 13 of this report, Mineral Processing and Metallurgical Testing. The Tenova process represents a novel approach to the recovery of lithium and production of lithium hydroxide monohydrate from lithium-bearing brine. This approach has not yet been used at a commercial scale in the recovery of lithium from brine. Potential risks, uncertainties, and opportunities related to the Tenova process are disclosed in Section 13.

- **Flow Rate and Number of Wells:** The anticipated flow rate for the extraction wells is presented in Section 16, Mining Methods. The flow rate in the early years of full production is expected to be about 1,170 m^3/hr (5,100 gpm). An estimated 30 wells are planned to extract brine from the aquifer at commencement of full production. The flow rates may change based on conditions encountered during operation and both flow rate and number of wells may increase over time to compensate for potential reductions in lithium concentration over time. Given the proximity of several of Albemarle's production wells to Pure Energy's claim area, and the broadly consistent hydrogeology that is similar beneath the two properties, it is probable that drawdown from the Albemarle wells affects the movement of lithium brines beneath the PEM claim area. The commencement of pumping by PEM at mine startup is also anticipated to have an impact on the

patterns of lithium brine movement beneath the Albemarle claim area. The full extent of these likely effects on flow rates and lithium brine extraction by wells are not known at this time and will be evaluated in future phases of work.

- **Commodity Price Projections:** Price projections for LiOH·H_2O are presented in Section 19, Market Study. Recent reports of LiOH·H_2O prices have been in the range of US$16,000-$20,000 per tonne, and even as high as US$22,000 per tonne. The economic analysis is based on a dynamic pricing model prepared by an independent market-research firm based on its forecasts of supply and demand. In the base case price forecast, product prices stay relatively stable until 2024, fluctuating in a range of US$11,000-$14,000 per tonne until 2024, when the projected shortage of LiOH·H_2O supply triggers a price response. The average expected price for battery-grade LiOH·H_2O rises to $15,000 per tonne in 2024, peaks at US$16,500 in 2025, then falls gradually to the US$9,000 per tonne range by the mid- to late 2030's.

- **Mining, Processing, and General and Administrative Costs:** Estimated costs are presented in Section 21, Capital and Operating Costs. The estimated total operating cost, which would include mining, processing, and general and administrative costs, is US$3,217 per tonne of LiOH·$H_2O$. This cost compares favorably with both current prices and long-term price projections.

14.6 Mineral Resource Statement

The Resource Estimate at an Inferred mineral resource category (CIM, 2014) for lithium is based on the total amount of lithium that is theoretically drainable from the aquifer system. The volumes within each zone or polygon where lithium concentration is inferred to be less than the cutoff grade of 22 mg/L are not included in the resource calculations. In some areas, there are volumes of brine included in the Resource Estimate even where they extend beyond data points from wells. These zones (usually at depth below known data points or extending laterally from known data points) are included in the Resource Estimate based on the substantial amount of geophysical information obtained that justifies extrapolating the resource to its logical boundary conditions (such as lateral property or geological boundaries, lithological characteristics, or basin depth constraints imposed by the deepest project data point in well CV-8). The Resource Estimate does not include brine aquifer volumes at depths greater than the bedrock contact at CV-8 (below elevations of approximately 361 meters or 1,184 ft amsl). In some cases, deep brine aquifer volumes remain open for further exploration and characterization.

The lithium concentration volumes within the Leapfrog model basin-fill deposit volume are used to calculate the drainable brine volume of the aquifer for the Resource Estimate using an estimated specific yield of 6 percent. Table 14-3 Inferred Resource Estimate for Lithium summarizes the Resource Estimate for elemental lithium (Li), LiOH·H$_2$O and LCE at the Inferred category.

Table 14-3. Inferred Resource Estimate for Lithium

	Average Lithium Concentration in Brine Volume (mg/L)	Brine Volume (m^3) x 10^3	Specific Yield	Drainable Brine Volume (m^3) x 10^3	Lithium (kTonnes)	LiOH·H$_2$O (kTonnes)	LCE (kTonnes)
Resource Volumes by Average Lithium Concentration	22	550,600	0.06	33,040	0.7	4.39	3.87
	65	2,424,000	0.06	145,400	9.5	57.16	50.32
	132	579,200	0.06	34,750	4.6	27.73	24.41
	221	1,971,000	0.06	118,200	26.1	158.00	139.09
Total	**123**	**5,524,000**	**0.06**	**331,500**	**40.9**	**247.3**	**217.7**

Notes:

1) The concentration and mass estimates represent the Inferred Resource of elemental lithium prior to pumping. To obtain the resource tonnage expressed as LiOH·H$_2$O and LCE, the estimated mass of elemental lithium was multiplied by a factor that is based on the atomic weights of each element in lithium hydroxide monohydrate and lithium carbonate to obtain the final compound weight. The conversion factor from lithium to LCE is 5.322785. The conversion factor from lithium to LiOH·H$_2$O is 6.046398.

2) The average lithium concentration is based on the final calculated lithium mass and drainable volume. Brine with estimated lithium concentrations below the cutoff grade of 22 mg/L was not included in the resource calculation.

3) The Resource Estimate is for claims controlled by PEM based on an effective date of June 15, 2017

4) Comparisons of values in the table may differ due to rounding and averaging methods.

5) Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability.

6) The preliminary economic assessment is preliminary in nature and includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the preliminary economic assessment will be realized.

The Resource Estimate totals 40,900 tonnes (45,085 tons) of elemental lithium. This can also be represented as 217,700 tonnes (240,000 tons) on an LCE basis or 247,300 tonnes (272,600 tons) as LiOH·H$_2$O. The average lithium concentration is 123 mg/L based on the calculated lithium mass and the theoretical drainable volume of the host brine aquifer. A substantial part of the brine volume falls between concentrations of 65 mg/L and 221 mg/L lithium.

The updated Resource Estimate represents a substantial decline from the reported maiden Resource Estimate (Spanjers, 2015). The main components of the reduction are a smaller surface area projection of the resource and a lower estimated specific yield. These factors are partially offset by a significant increase in the depth and thickness of the brine resource and the addition of higher lithium grades at depth. Although a significant area in the south part of the Project was excluded from this updated Resource Estimate based on negative brine drilling results in the upper 500 m (1,640 ft) of the basin, there remains significant exploration potential at depth in this area based on the analytical results from deep samples at exploration well CV-8 and seismic results indicating that the basin could be deeper than 1,000 m (3,281 ft). Newly acquired properties to the north also represent areas of further exploration potential.

The Resource Estimate at the Inferred category is based on the available lithologic and hydrochemical data from boreholes, and augmented by surface and borehole geophysical results. To upgrade the Resource Estimate to Indicated and Measured categories further exploration results are required from drilling, sampling, well construction, and testing at depth in areas in the vicinity of SPD-8, northwest of CV-8, and on newly acquired properties west of CV-8 . Prior to conducting an exploratory drilling program, geophysical surveys (seismic and CSAMT / MT) should further delineate exploration targets in these areas. This information will aid in better defining limits of the resource extending to property boundaries to the west, north, and east, as well as better definition of the inferred limit to the south.

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15 Mineral Reserve Estimate

There are no declared mineral reserves at present. Mineral reserves will be claimed after completion of the work detailed in the recommendations specified in Section 26.

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16 Mining Methods

16.1 Overview

PEM plans to use wells to extract brine from the aquifer in the currently defined area of the Resource Estimate. The wells in the wellfield would be drilled and constructed in order to optimize brine production rates and lithium concentrations.

Economic extraction of lithium brine requires favorable hydrogeological conditions within the deposit, including: (1) sufficient saturated thickness of the brine aquifer, (2) sufficient hydraulic conductivity and drainable porosity within the brine aquifer, and (3) sufficient levels of brine concentrations of lithium during mine life to offset eventual dilution of the deposit. Site characterization efforts as part of the Feasibility Study will focus on gathering data to assess these hydrogeological conditions. The Feasibility Study will include assessment of the mining method for extracting lithium brine from the aquifer using numerical modeling methods and projecting lithium concentrations from a potential wellfield for an upgraded Resource Estimate and eventual Reserve Estimate (Section 14; Figure 14-1. Methodology for Evaluating Brine Mineral Resources and Reserves).

16.2 Basin and Facility Location

The overall basin and mining facility, as currently defined within the area of the Resource Estimate, is presented in Figure 16-1. Basin and Process Facility Location. The area of a potential process plant site is planned for a location in the nearby town of Silver Peak.

16.3 Mining Method Selection

Wells installed at the Project would include extraction wells producing brine for the process facility and monitoring wells for collecting physical and chemical data to assess aquifer conditions during the life of mine. Several possible well designs, including varying well depths and production intervals (screened intervals of well casing) are expected to be planned for the extraction wells to allow for operational flexibility. Boreholes for extraction wells would be drilled using reverse circulation or casing advance drilling methods in order to allow for hydraulically efficient wells. Borehole diameters would be sufficient to allow for installation of casing that will accommodate the submersible pumps. The cased portions of the boreholes are planned as 8-inch nominal diameter. The casing annulus would be grouted above the screened area of the well casing to prevent the potential leakage of dilute brine.

Casing strings would be of appropriate size and grade to have sufficient collapse, pressurization, and tensional strengths to maintain integrity during well construction and for the life of the well. Identifying locations of wells, determining well design, and specifying submersible pumps will be included in the Feasibility Study. Construction and operation of extraction wells would be phased during initial years of mining. Throughout the life of mine, as existing extraction wells lose efficiency, replacement wells are planned and would be funded by sustaining capital.

Figure 16-1. Basin and Process Facility Location
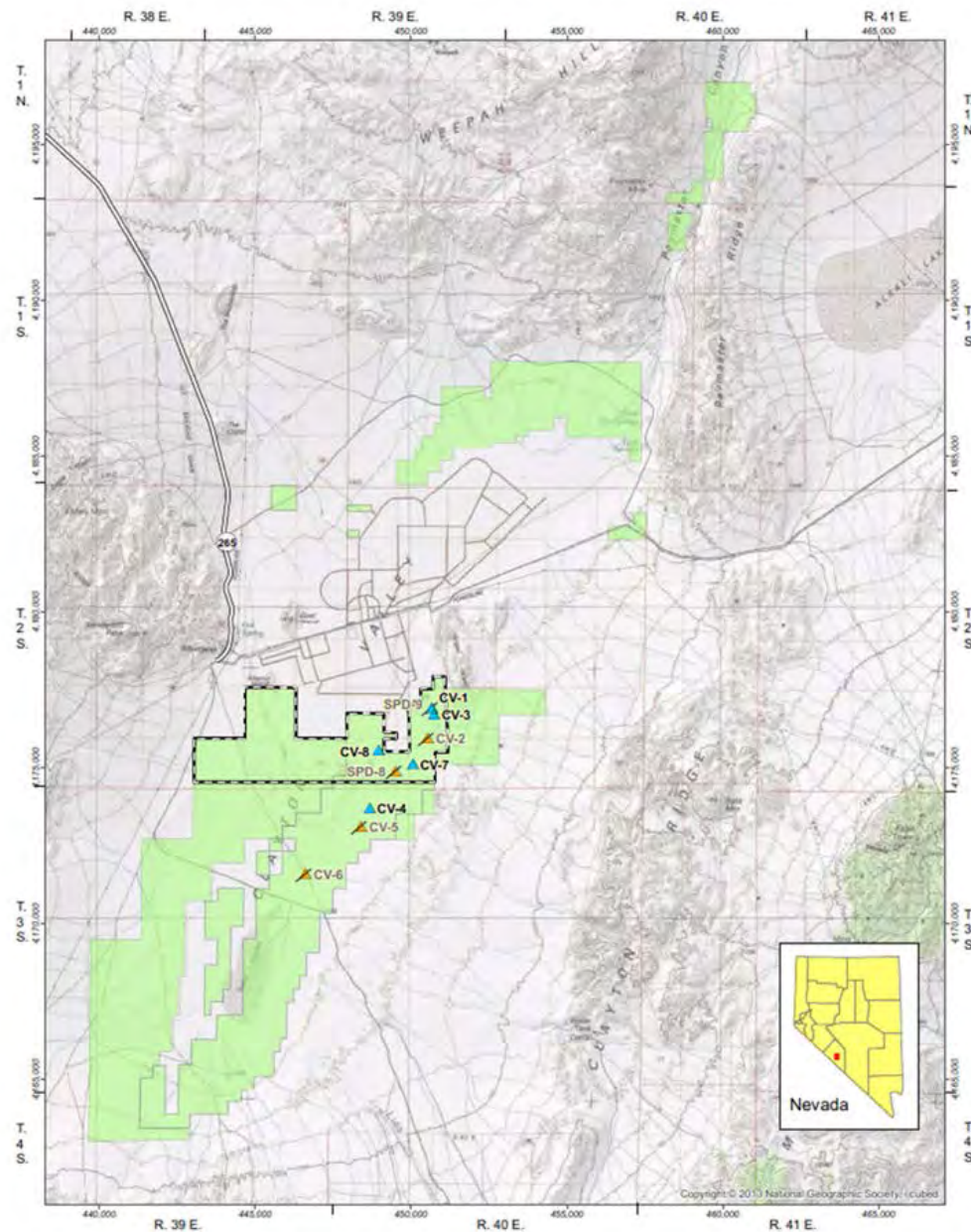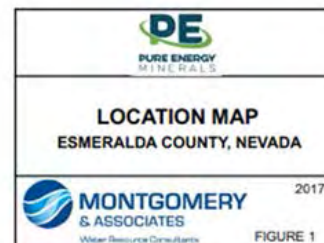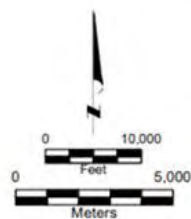
16.4 Considerations for Well Operations

As part of wellfield operations, the main operating parameters would be continuous monitoring of the lithium concentrations in the brine, flow rates, and depth to fluid levels in wells. Depending on well location and depth, lithium concentrations are projected to vary over time. Therefore, the facility design includes mixing of the brine and homogenization in the surface pipeline system which benefits plant operations by providing a more constant feed of lithium brine grade. The brine transfer system would provide the first step in the mixing of brines by using intermediate transfer pools.

Brine pumped from extractions wells would discharge into collecting lines as shown in Figure 16-2. Wells and Brine Handling. The preliminary schematic diagram shows pipelines collecting brine discharge from wells in subsets of the wellfield leading to mixing pools. From the mixing pools, transfer pumps would pump brine through pipelines to a large-capacity surge feed pond for the processing plant.

Figure 16-2. Wells and Brine Handling

PURE ENERGY MINERALS

WELLS AND BRINE HANDLING

MIXING POOL A

WELLS

TYPICAL SET UP FOR COLLECTING PIPES AND TRANSFER POOLS.
- Each collecting line recieves discharge from 5 well pumps
- Each Mixing pool recieves two collecting lines or 10 wells
- A Transfer station with two pumps will transfer brine to feed surge pond

MIXING POOL B

MIXING POOL C

12 Hr FEED SURGE
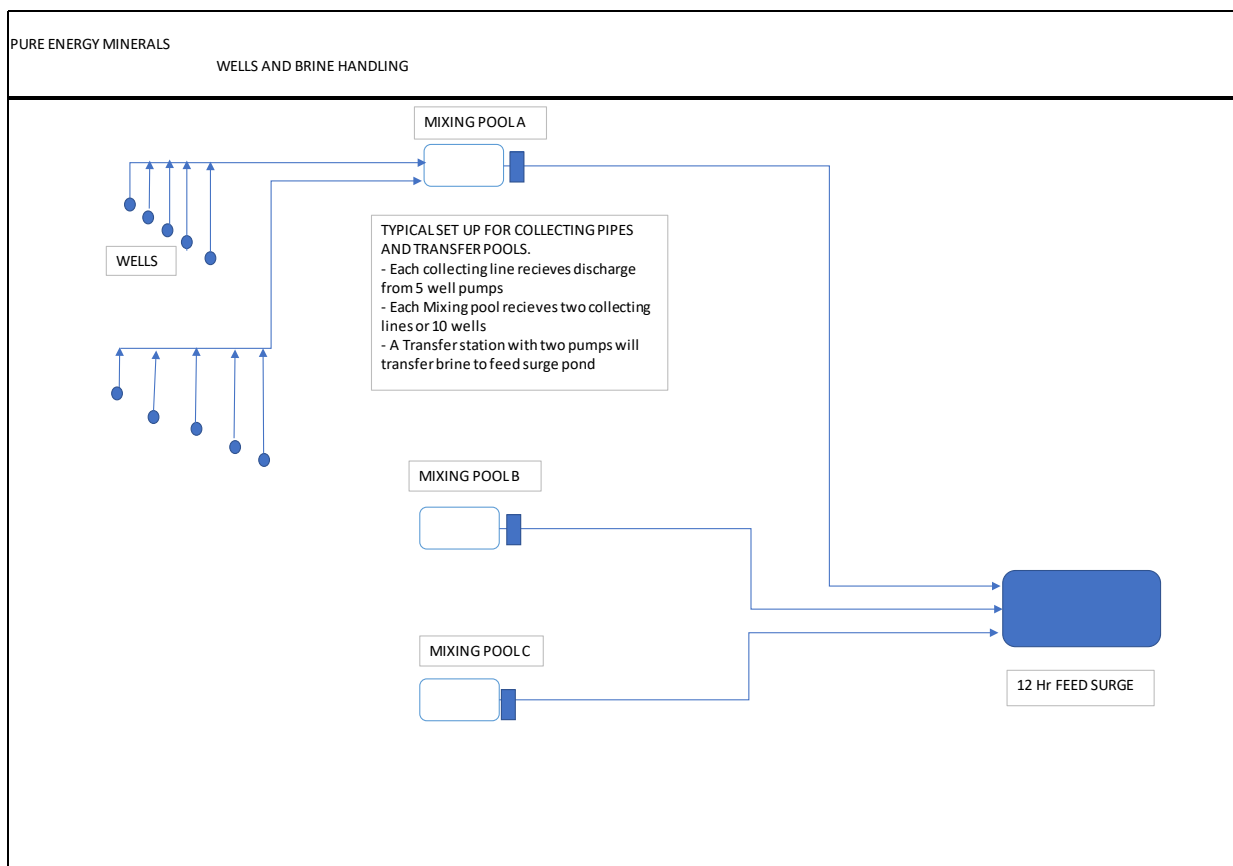
16.5   Extraction Phasing

Using the brine mineral resource and reserve model to be developed during the Feasibility Study, subdivisions within the wellfield will be evaluated and identified to facilitate well field design and production scheduling. Figure 16-3. Preliminary Production Schedule and Results of Phasing Extraction Wellfield Operations, shows a preliminary production schedule that maximizes brine grade from wellfield subdivisions during early years of mining as wellfield production rates increase. The production schedule was generated with the goal of plant production of an average of approximately 11,500 tonnes (12,650 tons) of LiOH·H$_2$O per year after an initial ramp-up period. As mining progresses, additional wellfield subdivisions pumping lower-grade lithium would be brought on line over the life of mine to maintain the desired production rate. This would result in an increase of the total amount of extraction wells and overall wellfield pumping rate to maintain the required mass of lithium delivered to the plant. Eventually, near the end of the mine life, production would decrease as the dilution increases and total extraction from the wellfield becomes uneconomical to maintain operations.

Figure 16-3. Preliminary Production Schedule and Results of Phasing Extraction Wellfield Operations
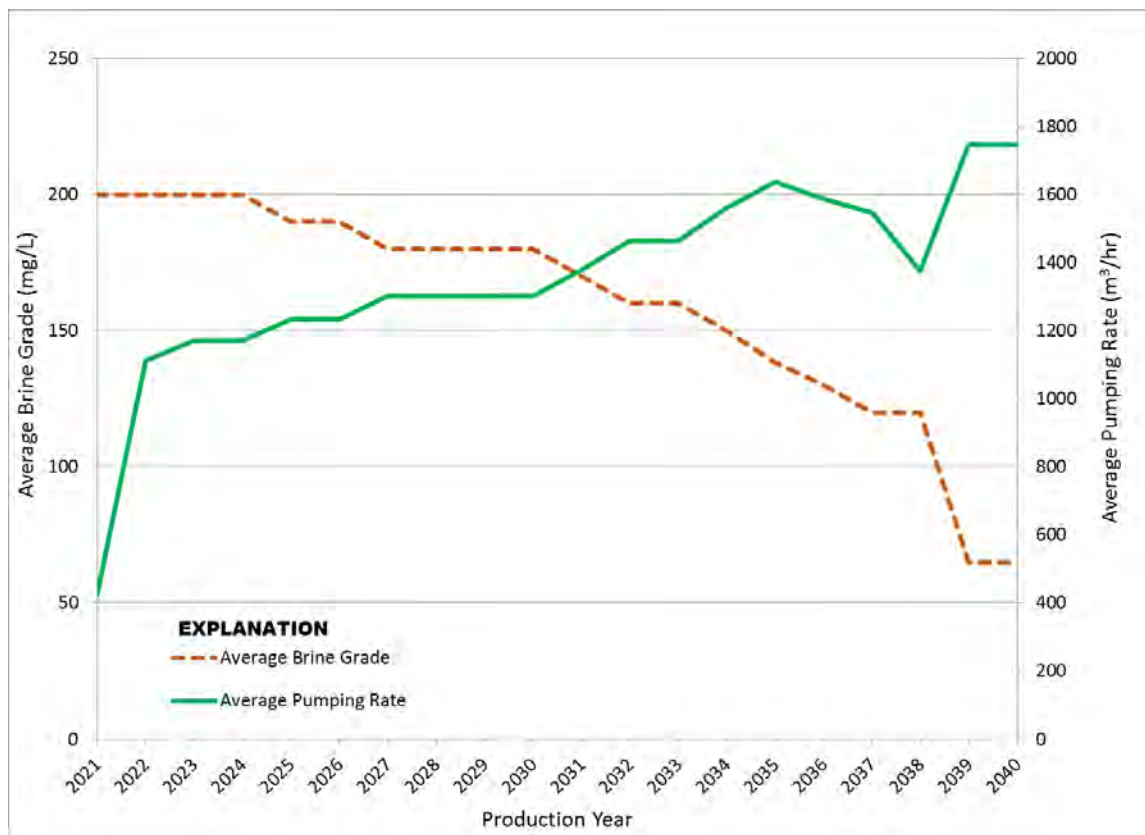
16.6   Wells and Well Field Equipment

The project design includes 30 wells initially. This is a preliminary estimate based on flow rates and conditions observed during a limited number of short-term pumping tests. Wells would be equipped with 3-phase electrical submersible pumps installed at sufficient depths to maintain pumping water levels and pump efficiency. The control set-up would include a variable speed controller and a flow meter. Low voltage power supply to each pump would be provided from a suitable power transformer located in the main basin distribution line. Booster pumps may be required.

As described in Section 16.5, the flow rate and number of wells will likely change over time in response to conditions encountered during operation. Given the proximity of several of Albemarle's production wells to Pure Energy's claim area, and the broadly consistent hydrogeology that is similar beneath the two properties, it is probable that drawdown from the Albemarle wells affects the movement of lithium brines beneath the PEM claim area. The full extent of this likely effect on flow rates or the number of wells for brine extraction that may be needed is not known at this time and will be evaluated in future phases of work.

16.7   Conclusion and Recommendations

Extraction wellfield planning and development, including the location, depths and number of wells, requires confirmation during the next stages of Project development. Additionally, understanding of the hydrogeological conditions within the deposit is required at higher level confidence in order to adequately assess an upgraded Brine Mineral Resource Estimate and Brine Mineral Reserve Estimate. Operating parameters are required to be monitored at well locations in order to forecast the mixed feed to the plant. Sizing of the transfer pools should be studied as part of the Feasibility Study to improve the mixing of the brine prior to transfer of brine to the feed surge pond in the plant.

17 Recovery Methods

17.1 Introduction

The proposed Tenova process involves the conversion of the Clayton Valley brines into a lithium hydroxide monohydrate product. The selection of lithium hydroxide monohydrate as the product is driven by the requirements of potential customers, such as Tesla, for use in the production of lithium ion batteries.

The Tenova circuit design is such that the input brines can be converted to lithium hydroxide monohydrate product without having to produce lithium carbonate as an intermediate step. The Tenova process represents a novel approach to the recovery of lithium and production of LiOH·H_2O from lithium-bearing brine. This approach has not yet been used at a commercial scale for the recovery of lithium from brine.

The target annual capacity of the plant is the production of 10,000 tonnes (approximately 11,000 tons) of LCE which correlates to about 11,500 tonnes (approximately 12,650 tons) of lithium hydroxide monohydrate.

The proposed Tenova Process would use unit operations based on technologies already in use in industrial practice. The application of these unit operations in this sequence and for the recovery of lithium are what would make the Clayton Valley Project the first of its kind. This is especially important for Clayton Valley because it would enable lithium recovery from relatively low grade feed brines, as compared with the typical South American higher grade feed brines. The relatively low levels of calcium and magnesium (and other potentially deleterious elements) in the Clayton Valley brine are also favorable indications for the applicability of the Tenova Process.

The overall process would consist of the following seven steps:

1. Brine Reception

2. Pre-Treatment - LiP™ process

3. pH Elevation and Polishing

4. Solvent Extraction - LiSX™ process

5. Electrolysis - LiEL™ process

6. Evaporation and Crystallization

7. Product Drying, Packing and Handling

As part of the overall project Work Breakdown Structure, the seven steps indicated above have been allocated Area Numbers. These are indicated in Table 17 – 1. Area Numbers.

Table 17 – 1. Area Numbers

Area Identification Table

AREA	DESCRIPTION
100	Basin Activities
200	Brine Reception
300	Pretreatment
400	Solvent Extraction
500	Electrolysis
600	Crystallization, Drying & Product Handling
700	Reagents
800	Infrastructure-Utilities
900	General and Administration

The basin brines would be collected from a wellfield in the basin and pumped to the brine reception area. The pre-treatment stage would, as efficiently as possible, remove the alkaline earth metal ions while maximizing the recovery of lithium ions. Elevating the pH of the permeate would precipitate any remaining calcium and magnesium ions. These calcium and magnesium precipitates would be removed using a clarification and / or filtration stage.

The solvent extraction step would incorporate Tenova Pulsed Columns in each of the extraction, scrubbing and stripping stages. As measured during the mini-pilot test (Section 13), the LiSX™ step would increase the lithium concentration relative to the feed brine by an expected factor of approximately 38 with negligible loss of lithium. The process design allows for the installation of an ion exchange post-SX solution polishing stage to remove any deleterious ions that may also have been co-extracted with lithium and concentrated in the solvent extraction step.

Through a process of electrolysis, LiEL™, the lithium sulphate produced in the previous solvent extraction step would be transformed into lithium hydroxide. The focus on lithium hydroxide stems from PEM's requirements based on its potential customers' needs.

The dry $LiOH \cdot H_2O$ produced by the subsequent crystallization process would be bagged for shipment.

Based on the results of the mini-pilot plant, the overall lithium recovery of the plant is expected to be about 90 percent. This is an exceptionally high recovery compared with conventional solar evaporation based plants, which typically struggle to achieve 60 percent recovery, despite higher lithium grades in many of the feed brines.

The overall process block flow diagram is presented in Figure 17-1. The Tenova Lithium Process Block Diagram.

Figure 17–1. The Tenova Lithium Process Block Diagram
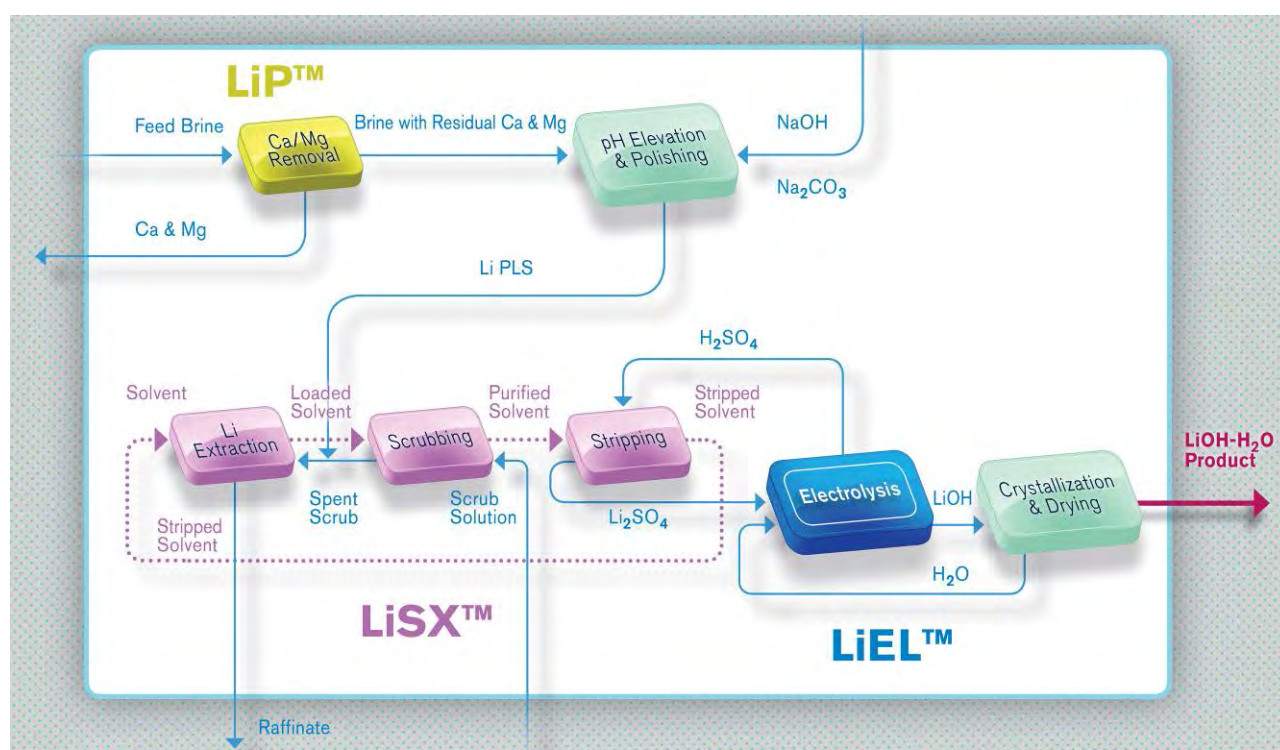
17.2 Brine Reception and Spent Brine Discharge

The brine fluids from the basin would be collected and pumped to storage at the main plant. The storage ponds would provide approximately 12 hours of storage.

The brine, at a rate of about 1,250 m^3/h (5,500 gpm), would be pumped to the pre-treatment stage.

The concentrated reject brine from the pre-treatment step would be returned to this area, blended with the raffinate (barren solution) from the solvent extraction step, and stored in the reject pond prior to being returned to the basin. The methodology of returning the reject brine to the basin is likely to be use of rapid infiltration basins. The head on the return pumps would be significantly lower than would be required for injection wells, were they to be selected as the return methodology. Rapid infiltration basins are in use elsewhere in Nevada. PEM has identified candidate areas for possible infiltration basins, so additional site characterization studies and other testwork will be conducted as part of ongoing project development.

17.3 Pre-Treatment - LiP™

The purpose of the pre-treatment step would be to reduce as much as possible the concentrations of the alkaline earth ions in the brine without affecting the lithium ion concentration. To achieve this the brine would be pumped, at relatively high pressure, through a number of parallel nanofiltration membrane elements. The membranes would be supplied by TAT's partner GE, a specialty water technology company.

The current design allows for a single pass through the membranes which was shown to be effective during the mini-pilot test. The number of passes will be further tested as part of the pilot plant campaign to assess potential increases in efficiency.

The reject brine solution, at a rate of approximately 125 m^3/h (550 gpm) – roughly 10 percent of the pumped brine - would be returned to the brine storage section prior to return to the basin after blending with the barren solution from solvent extraction.

After passing through the membrane section, the pH of the permeate brine solution would be raised using both NaOH and Na$_2$CO$_3$. Any remaining calcium, magnesium and strontium ions would be precipitated from the brine. The precipitated solids would be recovered using a clarification and / or a filtration stage. The nature of the filtration stage will be defined during the pilot plant testwork. The recovered precipitates would be re-dissolved and returned to the basin as part of the spent brine return circuit.

17.4 Solvent Extraction - LiSX™

The purpose of the solvent extraction stage would be to selectively recover the lithium ion from the initial brine and to concentrate it by a factor of approximately 38 from the initial head grades, producing a highly pure and saturated lithium sulphate solution. The principal separation performed by LiSX™ is to extract lithium away from the significantly larger concentration of sodium and potassium remaining in the pre-treated brine.

The organic solvent would be composed of a diluent to which would be added an active extractant.

The first part of the SX step would be the extraction stage in which the lithium ions from the feed aqueous phase would be taken up into the organic phase. This would take place in a series of Tenova Pulsed Columns. The Tenova Pulsed Columns would be approximately 3.5 meters (11.5 feet) in diameter with an active height of approximately 22 meters (72 feet). Disc-and-doughnut internal parts would facilitate the establishment of a stable dispersion of the advancing aqueous in the advancing organic phase through the application of pulsation. The frequency and the amplitude of these pulsations, which can be varied to control the energy input, have already been evaluated during the mini-piloting program and those factors would be further assessed in the pilot plant program to potentially increase the efficiency of the lithium transfer between the aqueous and organic phases. Using gravity and density differences, the two phases would move counter-currently through the column. The results of the TAT mini-pilot plant program have indicated that for the PEM brine composition, the extraction stage would perform best using an organic continuous dispersion. The final selection of phase continuity would be confirmed during the pilot plant program.

The aqueous solution exiting the extraction stage, from which the lithium has been extracted, is known as the raffinate. Operation of the mini-pilot plant yielded lithium concentrations in the raffinate below the available analytical detection limit (<3 mg/L). A coalescing unit could be installed in the raffinate stream to recover as much of the entrained organic as practical to recycle back into the process. Additional steps for dissolved organic removal would be tested as part of the pilot plant campaign with the objective of removing traces of dissolved organic compounds down to the regulated limits. The treated raffinate would be pumped to the spent brine tank prior to its return to the basin.

The loaded organic stream would be transferred to the scrub stage. Using similar Tenova Pulsed Columns as in the extraction stage, the organic would be mixed with a weakly acidic solution to clean the organic of any low concentrations of co-extracted and entrained impurities. The resulting aqueous solution would be returned to the extraction stage, to ensure that the co-scrubbed lithium ions would not be lost. In the mini-piloting work, the scrubbed organic contained lithium, with all other potential contaminants (sodium, potassium, boron, etc.) present at concentrations below the available analytical detection limits (<3 mg/L).

The purified or scrubbed organic solution would then be advanced to the stripping stage where the chemical conditions would be adjusted, such that the lithium ions would move from the organic phase into an even smaller volume of rich strip solution. Spent electrolyte from the subsequent electrolysis stage would be used as strip feed. During electrolysis, the solution would be acidified, and it is this acid, generated in the electrolysis cell, that would be consumed in stripping the lithium off the scrubbed organic. The resultant

lithium sulphate solution leaving the stripping stage would be effectively neutral in terms of acidity, as the acid would be consumed and exchanged for lithium on the scrubbed organic. The strip solution produced would also be close to saturation with respect to lithium sulphate as has already been demonstrated in test work.

At the end of the LiSX™ process, the SX product going into the electrolysis stage is anticipated to have a purity greater than 99.9 percent. The lithium concentration is calculated to be increased by a factor of approximately 38 times. Anticipated lithium concentrations in the residual solutions throughout the SX circuit would be below detection limits, indicating that the yield of the net recovery of lithium in the SX and subsequent processing steps would approach 100 percent.

17.5 Electrolysis - LiEL™

The electrolysis stage (LiEL™) of the process is designed to convert the high purity lithium sulphate solution into a high purity lithium hydroxide solution.

The electrolysis technology package would be supplied by TAT's partner, Noram.

The TAT mini-pilot plant testwork indicated that an intermediate pre-electrolysis polishing step between the SX stripping and the electrolysis may be required. The proposed flowsheet for the 10,000 tonne (11,000 ton) per year LCE operation includes an ion exchange (IX) step to remove possible divalent cations that could be co-extracted with lithium and similarly concentrated 38-fold by the SX process. IX is a common and well-understood commercial process for this type of polishing step.

The electrolysis would be carried out in a divided compartment cell (schematic in Figure 17 – 2 Conceptual Diagram of Electrochemical Cell,) using a membrane to separate the anode and cathode compartments. The lithium sulphate solution from the LiSX™ process would be fed into the anode compartment. At the anode oxygen ions would be oxidized to elemental oxygen, that would leave the compartment in the gaseous form, resulting in excess of positive charge, while at the cathode hydrogen ions would be reduced to elemental hydrogen, that would leave the compartment in the gaseous form, thereby creating a cation deficit. This difference in electrical balance is the driving force for the lithium ions to migrate through the cation-selective membrane to the cathode compartment. Sulphate cannot pass through the membrane and would remain in the anolyte. The hydrogen ions (H^+) that are left behind at the anode would combine with the sulphate ions left behind by the departing lithium ions to making sulphuric acid. This stream would be returned to the stripping stage of the LiSX™ process where the acid is consumed by exchanging the hydrogen ions for lithium ions on the loaded organic.

Testwork has indicated that the LiEL™ process would work better at elevated temperatures. During operation, it is anticipated that the internal resistance of the cell would generate sufficient heat to maintain the required temperature. The flowsheet can make provision, if necessary, for a cooling heat exchanger to control the temperature of the aqueous solution returning to the SX. Any heating or cooling requirements for the full-scale system will be determined in the pilot plant consistent with normal engineering practice.

Figure 17 – 2. Conceptual Diagram of Electrochemical Cell
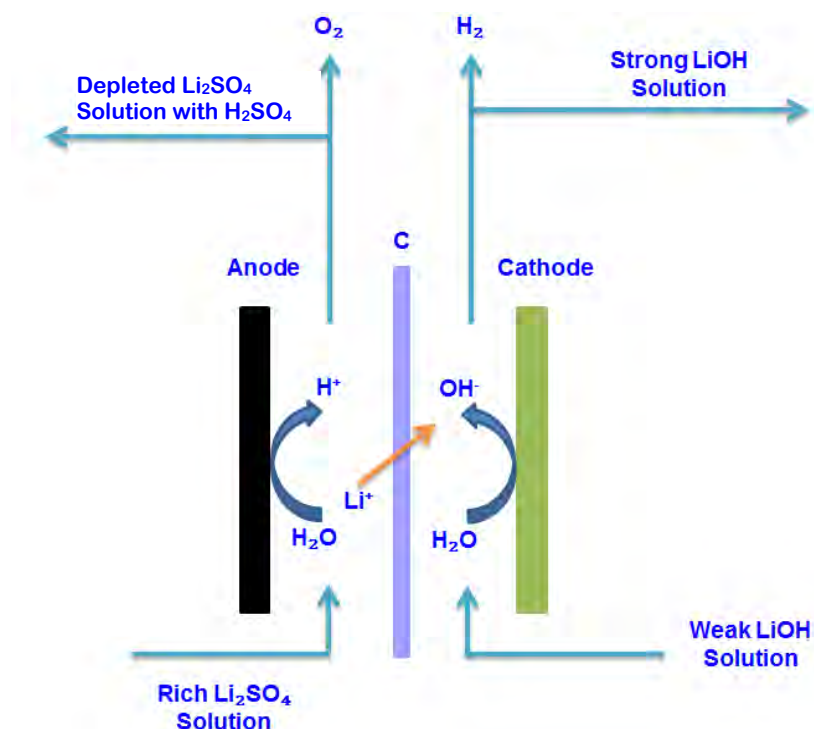
The cathode compartment would be fed by a weak lithium hydroxide solution, returning from the down-stream evaporation stage. In the catholyte, the hydroxyl ions (OH⁻), left following the hydrogen reduction, would combine with lithium ions that have migrated through the membrane to form lithium hydroxide. Thus, the lithium hydroxide concentration of the solution leaving the cathode compartment would be higher than that entering the compartment.

17.6 Evaporation and Crystallization

The final stage of the process would be to concentrate the lithium hydroxide solution produced by the electrolysis step using evaporation until it reached saturation. The saturated solution would be fed into a crystallizer unit to produce LiOH·H$_2$O crystals.

17.7   Product Drying, Packing, Handling and Shipping

The product from the crystallizer would be separated and washed using a centrifuge. The crystals would then be dried and stored in a controlled inert atmosphere to minimize the occurrence of carbonation from carbon dioxide gas in the atmosphere.

Prior to dispatch, the crystalline product would be sampled, accurately weighed and then bagged.

The product handling system would be equipped with a dust control system.

17.8   Plant Layout

The proposed plant site is on the western edge of the Clayton Valley, north of the town of Silver Peak. The coordinates of the proposed plant site are approximately 37° 45' North and 117° 38' West.

The electrical power supply sub-station is located about two km (6,560 feet) to the south of the site, on the other side of the hill.

The proposed plant layout is presented in Figure 17-3, Proposed Plant Layout.

For clarity in the layout, the brine receiving pond and the brine discharge pond have not been shown. The current layout proposes to locate these two ponds to the east of the plant site.

The approach to the plant layout has been to locate the TAT Pulsed Columns on the south side, as close to the hill as possible. Columns would be approximately 3.5 meters (11.5 feet) in diameter with an approximate active height of 22 meters (72 feet). Although no geotechnical soil information is currently available, it is assumed that the ground conditions are likely to be better closer to the hill compared with further away on the alluvial basin. A geotechnical program will need to be conducted as part of the next phase of work, with a specific focus on the solvent extraction area.

Figure 17-3. Proposed Plant Layout
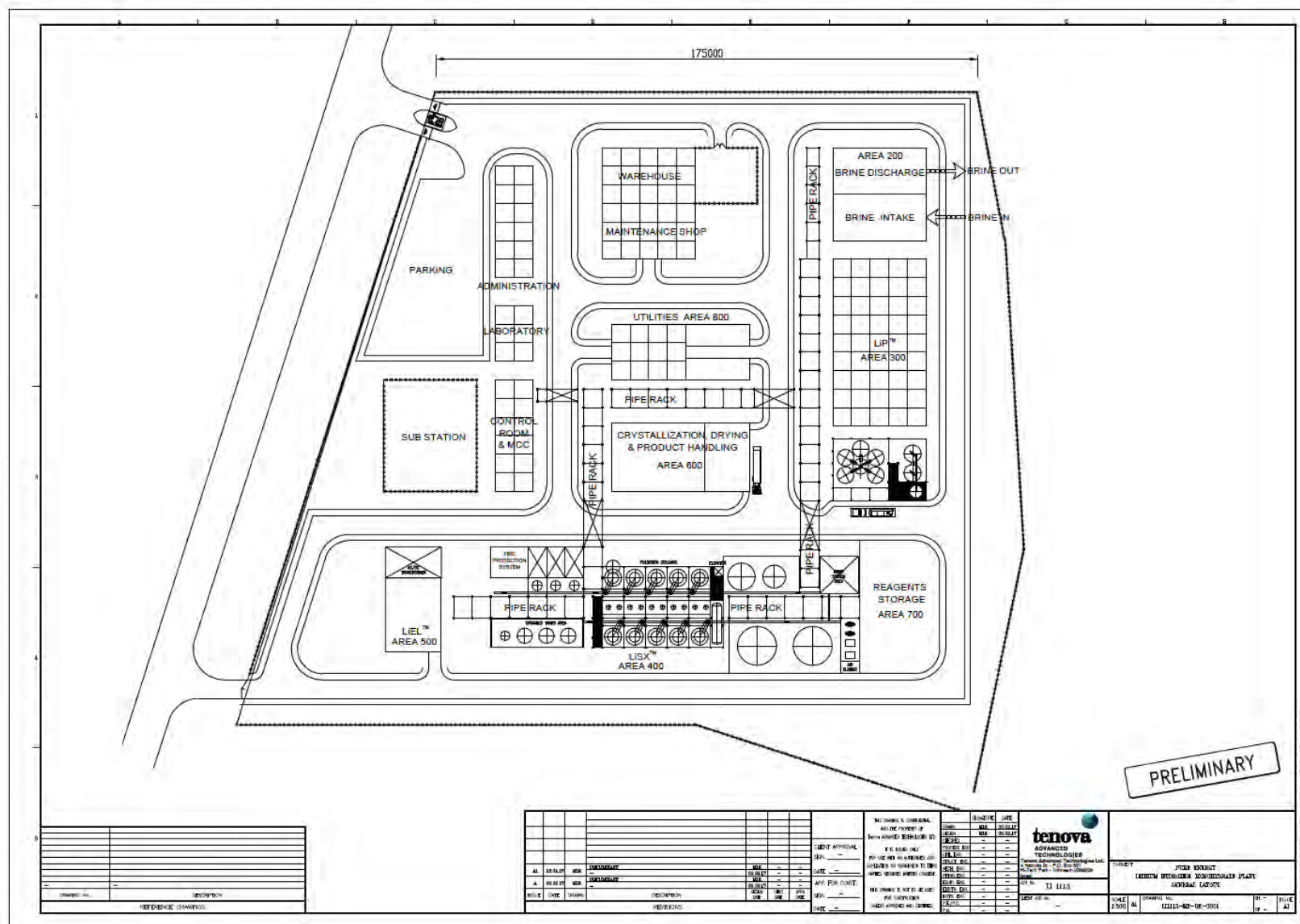
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18 Project Infrastructure

18.1 Site Infrastructure

The Project infrastructure would consist of the following main areas:

- Basin area that would include the production wells, brine handling and spent brine disposal.

- Lithium hydroxide monohydrate plant that would comprise the installation for processing the brine using TAT's technology and supporting services.

18.1.1 Basin Area

The Project infrastructure would include the installation of production wells and reserve wells for extraction of brine. These well fields would be located in areas where the brine has the most favourable hydrological conditions for producing $LiOH \cdot H_2O$ at the production rate allocated for this phase of the project. The methodology of returning the reject brine to the basin is likely to be use of infiltration trenches or basins in order to return the brine to the aquifer as rapidly as possible and reduce overall consumptive use. Extraction wellfield planning and development, including the location, depths and number of wells, as well planning and development of spent brine return, requires confirmation during the next stages of Project development.

Infrastructure in this area includes:

- Extraction wellfield built-out in phases to optimize capture of brine grade

- Compacted type access roads for each well.

- Power lines for energy supply and pipelines for pumping the brine to the processing plants.

- Infiltration basins to discharge the spent brine.

18.1.2 Process Plant Area

The production facilities would be located on private property, in the town of Silver Peak and would include the following buildings and facilities:

- Feed surge pond

- Raw brine pre-treatment area

- Plant to process the brine and to produce $LiOH \cdot H_2O$

- Administration and office buildings

- Product storage building

- Laboratory

- Warehouse

- Main sub-station

- Electrical MCC room

- Main control room

- Facility storage and load out

- Communications systems

- Fuel storage.

18.1.3 Infrastructure for Process Facilities

The site infrastructure to support the processing facilities includes:

- Plant access and dispatch control stations

- Internal access road junctions

- Street lighting

- Electrical power distribution lines

- Plant services including process and potable water, sanitary waste water treatment and solid waste disposal.

18.1.4 Camp Facilities

The project has not allowed for the installation of construction or permanent camps to accommodate labour.

18.2 Access Roads

The Clayton Valley Lithium Project is located in the Clayton Valley, Nevada in a broad and topographically flat basin. The nearest settlement is the town of Silver Peak, which lies approximately 5 km (3 miles) to the northwest. Access to Silver Peak is from Highway 265, which is a regional road that links Silver Peak to Highway 95. Highway 95 is the main road that links Las Vegas to Reno, and the site is equidistant to both main cities, approximately 270 km (170 miles) from each main city. Silver Peak is approximately 61 km (38 miles) from Tonopah, which is the regional commercial center, and approximately 45 km (28 miles) from Goldfield, which is the County Seat of Esmeralda County. Access to and across the site from Silver Peak is via a series of gravel / dirt roads.

18.3 Main Power Supply

Power supply would be at the sub-station in Silver Peak; see Figure 18-1. Existing Sub-station. Currently this sub-station connects a pair of 55 kV lines that form an electric inter-tie between the Nevada and California electrical systems (maximum power capacity exchange allowed of 17 MW across the inter-tie), with two 55 kV lines that link the sub-station to the main electrical grid in Nevada. A 55 kV line is capable of transferring 10 to 40 MW of power depending on local factors. The current PEM processing plan would require approximately 13 MW of power supply. Any requirements needed for upgrading of the sub-station would be determined during subsequent phases of the Project when the electrical loads are known with more certainty.

Figure 18-1. Existing Sub-station

18.4 Communications Infrastructure

PEM expects to use telecommunications and portable two-way radio systems. PEM would need to construct dedicated facilities to provide all local and long distance communication.

Internet and telephone service would originate in Tonopah, Nevada, and would connect to the Administration Building at Clayton Valley by means of a microwave system. Portable two-way radio units would be used for on-site communication

18.5 Water

The town of Silver Peak would be the source of potable water. This would be piped to the plant location.

Water needs within the plant, for example, high-quality water for the LiSX™, would either be taken from the brine or from the potable water supply, depending on the specific requirements.

A fire-fighting system was included in the basis of estimate and would be further detailed during the next design phase.

18.6 Natural Gas

There is no natural gas pipeline near the town of Silver Peak. The nearest pipeline is in the vicinity of Tonopah. As a result, the design of the plant facilities has not incorporated any natural gas usage.

Should the proposed pilot plant need any gas for purposes such as heating, small stand-alone tanks would be used.

18.7 Fuel Storage

On-site fuel storage would be limited to that required for site vehicles and would be located in above ground storage tanks near the maintenance shop. Fuel supply would likely be contracted with a local fuel supplier.

18.8 Waste Management

Solid wastes that may be generated include various chemicals or wastes from the processing plant or from maintenance activities. Additionally, solid waste would be generated from the site workers and administrative operations. All solid waste would be collected, stored, and properly disposed of in a permitted Resource Conservation and Recovery Act (RCRA) landfill. The amount of hazardous waste, such as spent oils and / or solvents, that would be generated is expected to be minimal and would be properly stored while onsite, then would be documented, transported, and disposed of in accordance with RCRA and the Nevada Department of Transportation standards.

Stormwater runoff from the plant and wash-down water would be segregated, as appropriate, in lined holding ponds for subsequent treatment or discharge in accordance with environmental regulations. Sewage would be managed using a permitted leach field.

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19 Market Studies and Contracts

19.1 Introduction

The annual capacity of the Clayton Valley Project ("Project") has been selected on the basis of 10,000 tonnes (11,000 tons) of LCE. However, the actual annual production rate of the plant would be 11,500 tonnes (12,650 tons) of lithium hydroxide monohydrate (LiOH·H_2O). The LiOH·H_2O output is intended primarily for use in lithium ion batteries for electric vehicles ("EVs").

In April 2017, after considering several independent consulting firms with widely recognized knowledge and expertise in the lithium market, Pure Energy Minerals ("PEM") retained Benchmark Mineral Intelligence Ltd. ("Benchmark") to produce a LiOH·H_2O market forecast. A prime factor in selecting Benchmark was the firm's active efforts to maintain regular "on-the-ground" contacts with its global network of battery manufacturers, lithium producers, intermediate processors and end-users.

Key conclusions of the Benchmark report are included below. Benchmark's outlook for the global supply-demand balance for LiOH·H_2O drove three dynamic, long-term price forecasts (base, downside and upside cases), which have been used to analyze project economics in Section 22 of this report.

19.2 Lithium Products

PEM's Project is designed to produce battery-grade LiOH·H_2O for lithium-ion battery manufacturers supplying the electric vehicle industry. Consensus growth estimates for annual global lithium demand (in lithium carbonate equivalent, "LCE" terms) from 2015-2025 approximate 10 percent or more, but most lithium industry forecasters expect growth of lithium demand for battery uses to average significantly higher growth rates. The growth of electric vehicle sales worldwide is expected to drive annual growth in lithium demand for these applications at more than 20 percent per annum through 2025. Figure 19-1. Past and Projected Future Lithium Demand, illustrates the projected growth in demand and the distribution of demand across different lithium applications.

Figure 19-1. Past and Projected Future Lithium Demand 2013-2025
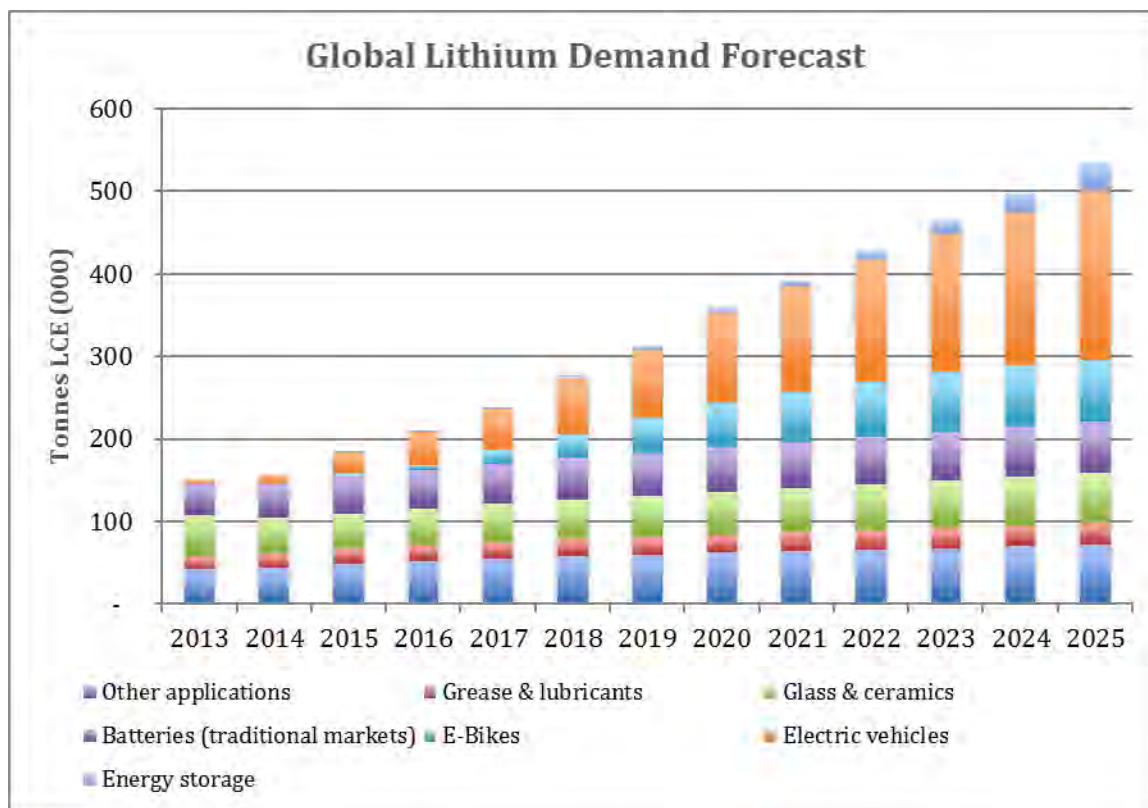
Source: "Lithium 101", Deutsche Bank AG, 9 May 2016

Grease and lubricants were the leading end-use markets for LiOH·H$_2$O in 2016, consuming 19,000 tonnes (20,944 tons) of technical-grade material, but batteries are the fastest growing market and should become the largest end-use in 2017. The demand for LiOH·H$_2$O in batteries will depend mainly on the formulations of the lithium-ion battery cathode materials that will be used in the various EV models that come to market. Based on the announced plans of automakers and battery manufacturers to date, several market experts believe that the dominant cathode formulations for EV batteries will be nickel-cobalt-aluminum ("NCA") and nickel-manganese-cobalt ("NMC"). According to the Benchmark report, the adoption of battery technologies using NCA cathodes will be the primary factor in LiOH·H$_2$O demand growth. Figure 19-2. Anticipated demand for lithium hydroxide by industry 2016-2025, presents anticipated demand for LiOH·H$_2$O by industry through 2025.

Figure 19-2. Anticipated demand for lithium hydroxide by industry 2016-2025
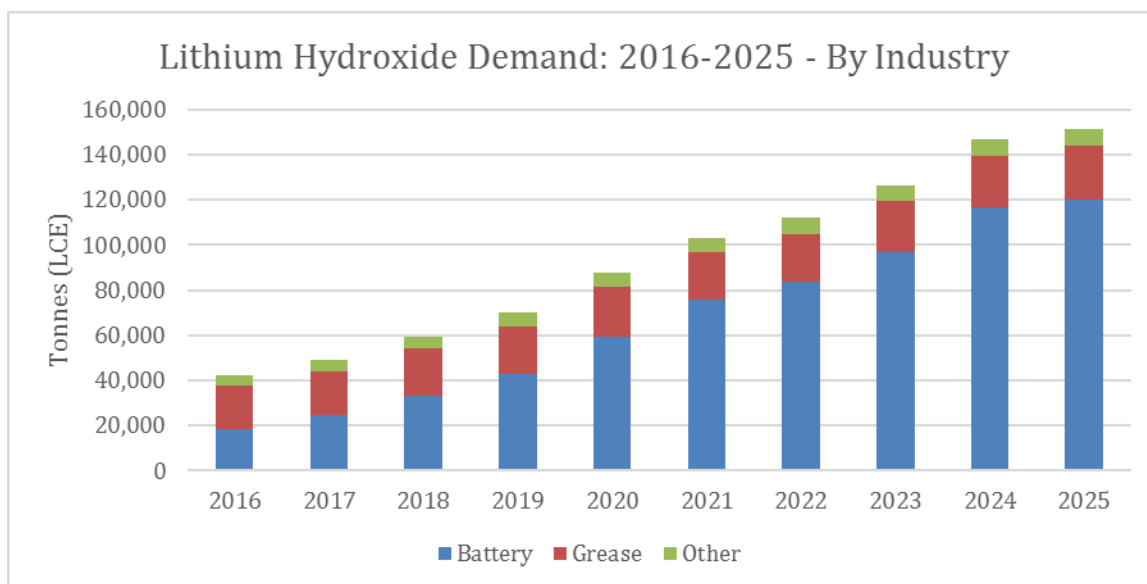
Source: Benchmark Mineral Intelligence, Lithium Hydroxide Market Forecast, April, 2017

Benchmark anticipates that lithium hydroxide demand will grow considerably in the next five years, as EVs increasingly use NCA cathode chemistries to achieve higher energy density and extend range between charges. As a prime example, Tesla's Nevada Gigafactory is using NCA cathode technology to do just that. With the adoption of NCA technology by Tesla and several other battery manufacturers around the world, the introduction of Tesla's Model 3 and tens of other EV models from global automakers and other factors, lithium-ion battery production is expected to increase to over 400,000 MWh by 2025 (Figure 19-3 Past and Projected Lithium-ion Battery Production, 2015-2025).

Figure 19-3. Past and Projected Lithium-ion Battery Production, 2015-2025
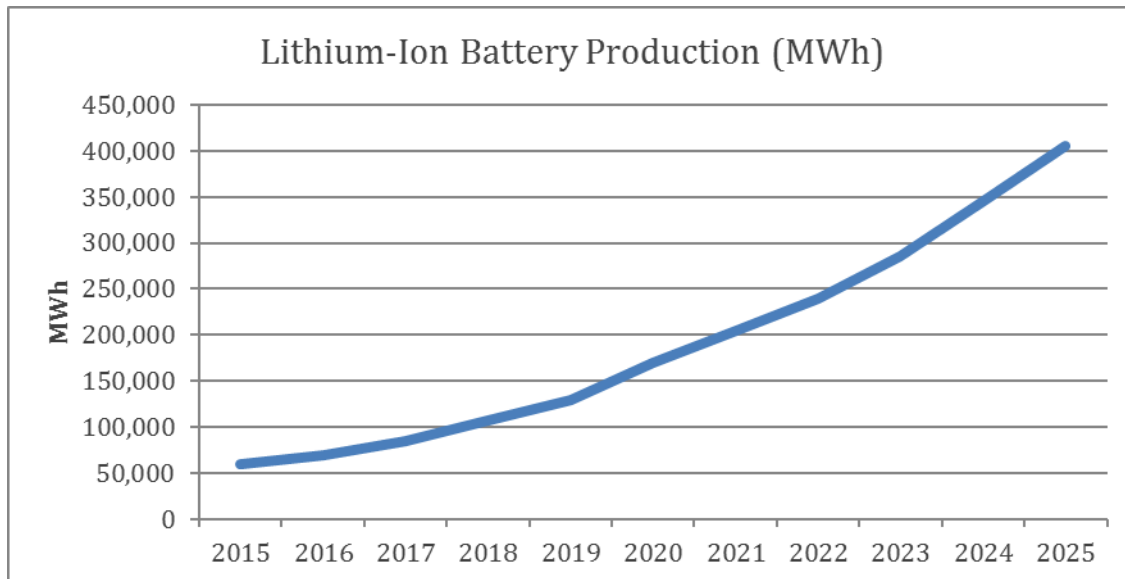
Source: Benchmark Mineral Intelligence, Lithium Hydroxide Market Forecast, April, 2017

Benchmark forecasts that annual demand for LiOH·H$_2$O will grow at a compound average rate of more than 23 percent from 2016 through 2025 to supply this increase in battery production as illustrated in Figure 19-4. Lithium Hydroxide Demand for Batteries.

Figure 19-4. Lithium Hydroxide Demand for Batteries, 2016-2025
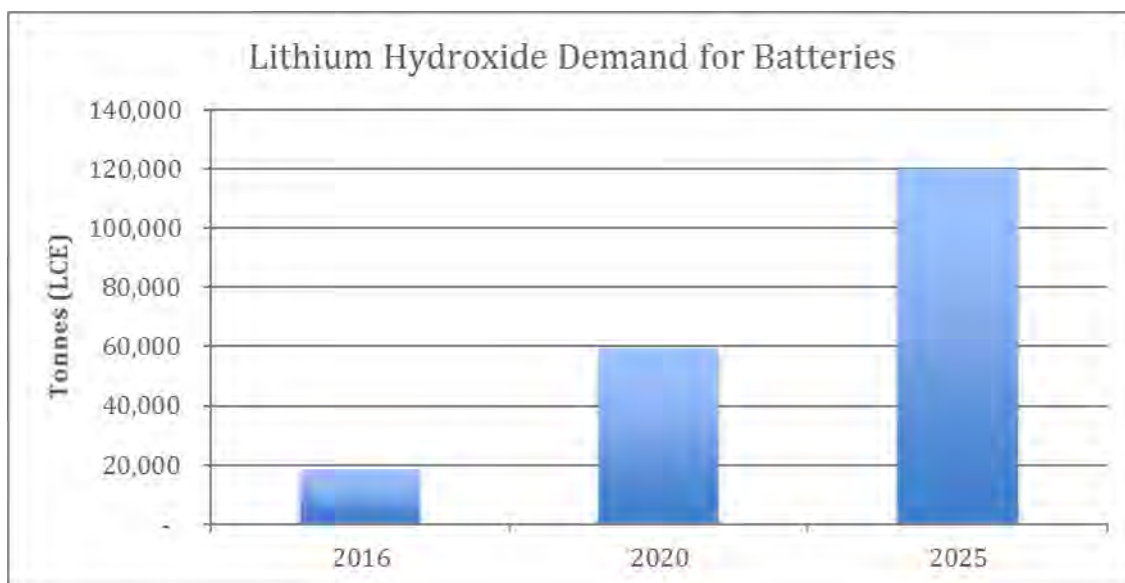
Source: Benchmark Mineral Intelligence, Lithium Hydroxide Market Forecast, April, 2017

19.3 Lithium Hydroxide Supply

On the supply side, Benchmark estimates that LiOH·H_2O production accounted for approximately 20 percent of global lithium chemical production in 2016, or around 39,000 tonnes. China has the most LiOH·H_2O conversion nameplate capacity in the world (48,000 tonnes), but producers there have been hampered by a lack of raw material feedstock. As shown in Table 19-1. Lithium Hydroxide Plants Outside of China, five major plants outside China currently produce LiOH·H_2O.

Table 19-1. Lithium Hydroxide Plants Outside of China

Country	Facility	Ownership	Capacity (Mtpa)
Chile	Salar de Carmen	SQM	6,000
Russia	Krasnoyarsk	JSC Chemical	3,000
U.S.A. (NC)	Kings Mountain	Albemarle Corp.	5,000
U.S.A. (NV)	Silver Peak	Albemarle Corp.	5,400
U.S.A. (NC)	Bessemer City	FMC Corp.	8,000

Source: Benchmark Mineral Intelligence, Lithium Hydroxide Market Forecast, April, 2017

Based on company announcements and its professional judgment on when announced company plans might actually materialize, Benchmark estimates that the world supply of LiOH·H_2O will grow from 39,000 tonnes (42,990 tons) in 2016 to almost 135,000 tonnes (148,812 tons) in 2024-2025. According to Benchmark, the largest increases are likely to come from:

- Albemarle Corp.'s expansion of the recently acquired Chinese plants of Jiangli New Materials;

- SQM's plant expansion at its Salar de Atacama operation in Chile;

- Tianqi Lithium's new lithium hydroxide plant at Kwinana, Western Australia;

- Ganfeng Lithium's expansion of its Jiangxi, China plant;

- Nemaska Lithium's new plant at Shawinigan, Quebec, Canada to process spodumene concentrates from its Whabouchi Project; and

- FMC's Bessemer City, NC plant expansion in the United States.

Figure 19-5. Anticipated Lithium Hydroxide Supply by Company, indicates the proportions of the increase in LiOH·H_2O production attributable to specific companies.

Figure 19-5. Anticipated Lithium Hydroxide Supply by Company, 2016-2025
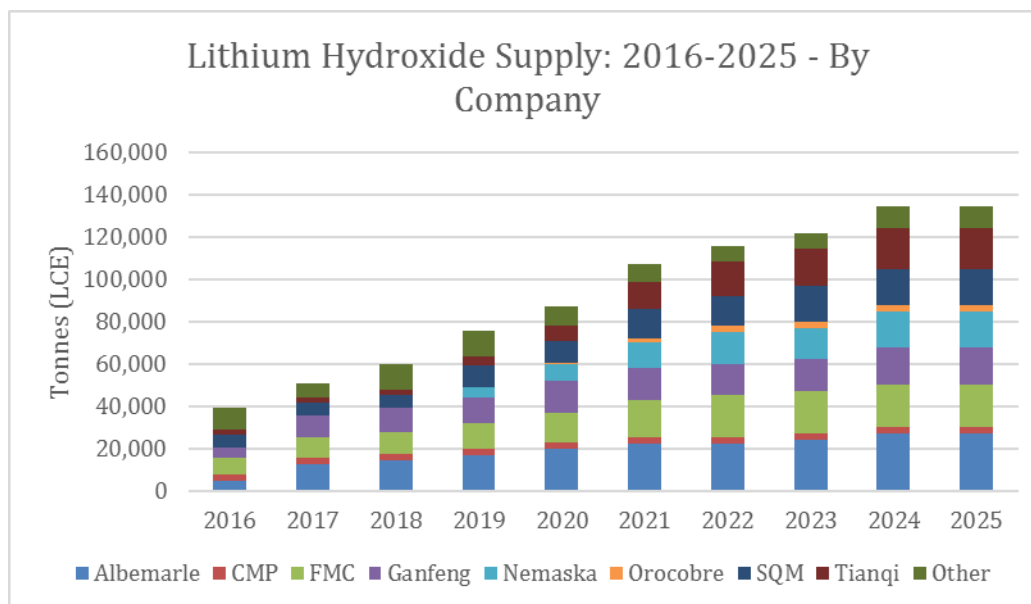
Source: Benchmark Mineral Intelligence, Lithium Hydroxide Market Forecast, April, 2017

Benchmark's global supply-demand balance for LiOH·H$_2$O is shown in Figure 19-6. Projected Lithium Hydroxide Supply / Demand Balance. Although substantial price increases over the past 12-18 months are stimulating a significant supply-side response, the long-lead times to production and relative lack of sufficient feed material are expected to keep the overall market in a relatively tight balance until the mid-2020's, when steadily growing demand is again expected to outstrip planned capacity.

Figure 19-6. Projected Lithium Hydroxide Supply/Demand Balance, 2016-2025
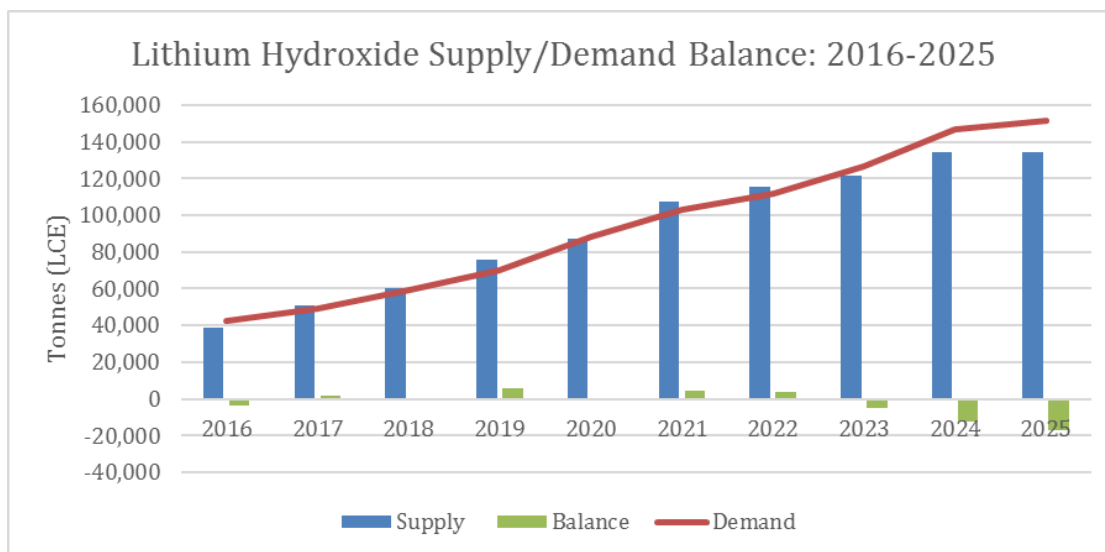
Source: Benchmark Mineral Intelligence, Lithium Hydroxide Market Forecast, April, 2017

19.4 Off-Take Agreement

In September 2015, PEM entered into an agreement with Tesla Motors, Inc. (Tesla) for the potential supply of LiOH·H$_2$O from the Project. Provided that PEM meets certain terms and conditions related to project execution, product quality and timing of delivery, the agreement establishes a commitment for an annual purchase volume of product over a period of five years by Tesla and/or its authorized purchasers. The agreement sets a predetermined price that is below current market rates and is aligned with Tesla's goal to continuously reduce the cost of its lithium-ion batteries.

PEM's product is expected to be used in the battery cell manufacturing process of Tesla's rapidly growing electric vehicle and stationary storage business units (the Gigafactory), which are located approximately 3.5 hours' drive from the Project. Any deliveries from PEM would cover only a portion of Tesla's needs, with the remainder to come from other sources. Certain information relating to future pricing formulas and forecasted deliveries has been omitted from this report on the basis of confidentiality and on the basis that the supply agreement is subject to various conditions, as stated above.

19.5 Pricing

The major lithium compounds like lithium carbonate and LiOH·H$_2$O are generally sold under private term contracts and do not have quoted prices on any recognized metals or minerals exchange. The market pricing of these materials is, therefore, somewhat opaque, but it has been widely reported that prices for lithium compounds have doubled in the past 12-18 months, based on shortages of raw material for Chinese conversion facilities to feed their plants to make lithium chemicals for battery makers. Recent reports of LiOH·H$_2$O prices have been in the range of US$16,000-$20,000 per tonne, and even as high as US$22,000 per tonne. PEM anticipates that the great majority of the Project's output would be sold under contracts, rather than relying on the thinly traded spot markets for lithium chemicals.

The LiOH·H$_2$O price forecasts used in the economic analysis, Section 22, of the Project for this report were developed by Benchmark in conjunction with its supply and demand forecasts. Benchmark developed three 2017-2040 price scenarios – a base price forecast, a conservative (downside) price case and a bullish (upside) price scenario as illustrated in Figure 19-7. Outlook for Lithium Hydroxide Prices. All three price scenarios are projected from an average 2016 lithium hydroxide price of US$12,683 per tonne. The summary PEA economics announced in the PEM press release dated June 26, 2017 and contained in this report were developed from the base price forecast.

Figure 19-7. Outlook for Lithium Hydroxide Prices, 2017-2040
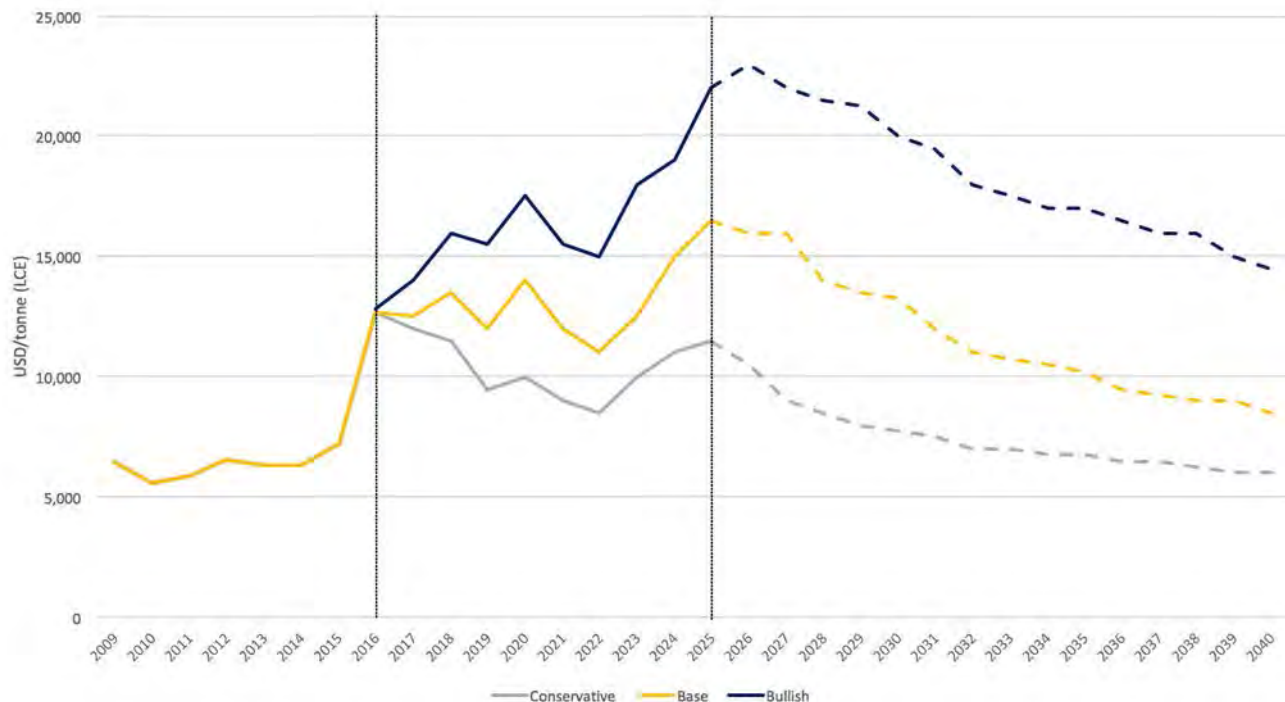
Source: Benchmark Mineral Intelligence, Lithium Hydroxide Market Forecast, April, 2017

19.5.1 Base Price Forecast Details

In the base price forecast, product prices stay relatively flat at US$12,500 per tonne in 2017, then fluctuate in a range of US$11,000-$14,000 per tonne until 2024, when the projected shortage of LiOH·H_2O supply triggers a price response. The average price for battery-grade LiOH·H_2O rises to $15,000 per tonne in 2024, peaks at US$16,500 in 2025, then falls gradually to the US$9,000 per tonne range by the mid- to late 2030's. Key assumptions underpinning this forecast include:

- New announced production capacity coming on-stream slower than projected by existing and aspiring producers;

- A price decline in 2019 when new concentrate supplies become available to feed Chinese conversion facilities;

- Battery capacity expansions post-2020 drive the fastest growth in demand and prices increase accordingly; and

- Higher prices and a more diverse set of battery raw materials in the energy storage market would drive the LiOH·H_2O market into overcapacity post-2025 and ease price pressures.

19.5.2 Conservative Price Forecast Details

Benchmark's conservative price forecast projects an average price decline in 2017 to US$12,000 per tonne, then fluctuates in a lower range ($8,500-$11,500 per tonne) through 2025. Post-2025, prices decline gradually to around US$6,500 per tonne in the late 2030's. Key assumptions in this forecast include:

- Leading lithium producers are able to overcome some significant "headwinds" and bring their production to market on the schedules and at the levels of output announced;

- NCA battery cathode technologies are adopted more slowly than anticipated, with lithium-ion battery producers pursuing NMC chemistries more aggressively between now and 2020;

- Post-2020, there is sufficient concentrate feedstock for new Chinese LiOH·H_2O conversion plants; and

- Tesla's production from the Gigafactory grows more slowly than expected, damping the expected growth of the U.S. battery market.

19.5.3 Bullish Price Forecast Details

The bullish price scenario from Benchmark anticipates a price increase from 2016 to an average of US$14,000 per tonne of lithium hydroxide, then fluctuation in the range of $15,000-$17,500 per tonne until a supply shortfall in the mid-2020's escalates prices. The average price peaks at US$23,000 per tonne in 2026, before declining gradually to around US$15,000 per tonne in the late 2030's. The main assumptions in this scenario are:

- Lithium-ion battery producers meet their announced production targets in terms of timing and output;

- The pace of adoption of NCA cathode technologies increases above base forecast levels and accelerates LiOH·H_2O demand;

- Persistent high prices allow new projects and expansions to come on-stream earlier than anticipated;

- Supply growth, post-2022 is unable to keep up with battery demand from the EV market; and

- New battery technologies fail to meet safety and performance targets and force continued reliance on advanced cathode technologies like NCA.

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20 Environmental Studies, Permitting and Social or Community Impact

20.1 Introduction

This section discusses reasonably available information on environmental, permitting and social or community factors related to Pure Energy Minerals Ltd.'s (PEM) Clayton Valley Project. Where appropriate, recommendations for additional investigation(s), or expansion of existing baseline data collection programs, is provided.

On November 3rd, 2016, Valerie Sawyer, a Qualified Person in accordance with Companion Policy 43 101CP to NI 43-101 – Standards of Disclosure for Mineral Projects, conducted a personal inspection of the Clayton Valley Project area under section 6.2 of the Instrument. The Project area has since been expanded by the acquisition of Lithium X claims and renamed the "Clayton Valley Project". Although Ms. Sawyer did not directly inspect the area of the newly acquired claims, the environmental conditions are anticipated to be the same, given their location relative to the original holdings and a review of commercial aerial photography of the area. This inspection was intended to familiarize Ms. Sawyer with the conditions on the property and any potentially available material information that could affect project development.

The Clayton Valley Project brine pumping, piping, and reinjection/re-infiltration components would be located on the Clayton Valley playa, and the process plant is currently anticipated to be located on private land in the town of Silver Peak. The Project is adjacent to the Albemarle Corporation's Silver Peak Lithium Operation (SPLO), and in some cases may share resources such as fresh water, electrical power supply, and access. The SPLO has been operating its solar evaporation brine facility since 1966 and making lithium carbonate and lithium hydroxide monohydrate products that are transported by truck off site. As of March 2012, the SPLO is authorized to disturb 5,960 acres of private land and 657 acres of public land for a total of 6,617 acres (NDEP, 2012). The Clayton Valley Project would be within the area where environmental resources have been influenced and/or impacted by the SPLO. The principal resources affected generally include groundwater, surface water, air quality, and migratory birds.

20.2 Environmental Studies

Previous environmental and archaeological studies of possible drill pad locations were performed by Rodinia Lithium, Inc. (Rodinia) in 2011 and 2012, and were submitted to the U.S. Department of the Interior, Bureau of Land Management, Battle Mountain District Office, Tonopah Field Office (BLM) as part of a proposed

exploration plan of operations application. More recently, several additional broad-scope environmental studies have been conducted within the Project boundary. While the studies were not officially sanctioned by the federal land management agency as part of the current proposed mining plan, each study does follow approved protocols for data collection with respect to the resource under investigation per Instruction Memorandum NV-2011-004 Guidance for Permitting 3809 Plans of Operation. Section 20.5.1 describes the guidance process. The botanical inventory was initiated early due to the time critical nature of plant identification, which is generally limited to the spring of the year in most locations in Nevada. The wildlife inventory was conducted concurrently as an opportunistic sampling event. The following is a summary of the environmental studies conducted to date.

20.2.1 Wildlife

Rodinia's 2011 review identified that the Dark Kangaroo Mouse (*Microdipodops megacephalus*) and the Pale Kangaroo Mouse (*Microdipodops pallidus*) may occur in the Project area. The dark kangaroo mouse is listed as a sensitive species by the Nevada BLM, and both species are protected by the State of Nevada. At the same time, the Nevada Department of Wildlife (NDOW) reported that bighorn sheep (*Ovis canadensis*) and mule deer *(Odocoileus hemionus*) distributions exist on Mineral Ridge, north and west of the community of Silver Peak, approximately 4.43 km (2.75 miles) northwest of the Project area. Rodinia's 2011 review also cited the potential presence of Desert Kangaroo Rat (*Dipodomys deserti*), Merriam's Kangaroo Rat (*Dipodomys merriami*), Great Basin Whiptail (*Cnemidophorus tigris tigris*), and Zebra-tailed Lizard (*Callisaurus draconoides*). The U.S. Fish and Wildlife Service (FWS) had no listings for threatened or endangered species in the area. Given the potential for these sensitive species to be present, a limited small mammal survey was conducted in 2010 of the proposed drill pad locations.

Golden Eagle and raptor aerial surveys of the Project area were conducted in the spring of 2016. The surveys were conducted within a four-mile buffer zone of the Project area for Golden Eagles (*Aquila chrysaetos*) and a one-mile buffer zone for other raptors. These buffer zone sizes were determined by the BLM field office wildlife biologist, Mr. Austin Brewer. During the first aerial survey conducted in May, four eagle nests were observed. The four nests were again monitored in June. All four nests were inactive for 2016. On-the-ground wildlife surveys would need to be repeated, pending the final layout of the operations.

20.2.2 Botanical Survey

Based on a review of data provided by the Southwestern Regional Gap Analysis Program (SWReGAP) and a biological survey conducted on June 16, 2011, the study area consists of three vegetative communities: inter-mountain basins playa, inter-mountain basins greasewood flat, and inter-mountain basins active and

stabilized dunes (U.S. Geologic Survey [USGS] 2004). Additional seasonally-sensitive botanical inventories were conducted in the Project area between June 19 and June 21, 2016. Playa habitat types were generally void of vegetation, while greasewood flats were dominated by black greasewood (*Sarcobatus vermiculatus*), Bailey's greasewood (*Sarcobatus baileyi*), fourwing saltbush (*Atriplex canescens*), Mojave seablite (*Suaeda moquinii*), shadscale (*Atriplex confertifolia*), pickleweed (*Salicornia ssp.*), and inland saltgrass (*Distichlis spicata*). Limited supplemental surveys may need to be conducted once the layout of the facilities is finalized.

20.2.3 Cultural Inventory

Rodinia contracted Kautz Environmental Consultants, Inc. to complete a cultural resource inventory on approximately 35 hectares (86.5 acres) of drill pads, borrow pit, and associated access roads in 2011. A total of four isolated finds and ten newly identified sites were recorded during the inventory for the project. Isolated finds are categorically not eligible for inclusion on the National Register of Historic Places (NRHP), and therefore require no further management consideration. Of the 10 sites, eight have been recommended as not eligible to the NRHP; these consist of seven prehistoric sites and one historic site. At the time, the BLM recommended to the State Historic Preservation Office (SHPO) that the remaining two sites, including a multicomponent site and an archaeological district, be determined eligible for inclusion to the NRHP under Criterion D. The Rodinia drill pad nearest the multicomponent site was subsequently withdrawn and was avoided by Rodinia. An access road was planned to cross through a contributing element to the archaeological district. An alternate route to the drill pad was then surveyed, allowing the contributing element to be avoided by the project. If avoidance is not possible, a treatment plan to mitigate effects to the contributing element must be prepared and implemented prior to any ground disturbing activities.

No recent cultural inventories have yet been conducted on the currently proposed areas of disturbance, including the process plant site. In general, the valley playas are devoid of cultural artifacts and easily cleared during baseline data collection. The presence and complexity of cultural resources does, however, tend to increase toward the playa edges and adjacent dune systems. These areas would need to be investigated once the facility layout is finalized.

20.2.4 Groundwater Resources

The proposed project would be located within the Clayton Valley Hydrographic Area, which covers 1,437 km^2 (555 square miles), and is designated as Hydrographic Area No. 143 of the Central Region, Hydrographic Basin 10. Clayton Valley, a topographically closed basin bounded by low to medium altitude mountain ranges, is a graben structure. Seismic and gravity surveys reveal numerous horst and graben

features as the basin deepens to the east-southeast. Extensive faulting has created hydrologic barriers, resulting in the accumulation of lithium brines below the playa surface. Jennings (2010) states that satellite imagery and recent geological mapping identifies several parallel north-south trending faults that are semi-permeable barriers separating the fresh water aquifer on the west from the brines beneath the playa. Stratigraphic barriers occur around much of the playa, isolating it from significant freshwater inflows originating in the mountains.

Recharge occurs as underflow into the basin from Big Smoky Valley in the north and Alkali Spring Valley in the west. Recharge derived from precipitation in the basin is low due to high evapotranspiration rates.

The "playa hydrogeologic block" beneath Albemarle's SPLO ponds was determined to be exempt from water pollution control requirements pursuant to Nevada Administrative Code (NAC) 445A.424(2). It is reasonable to expect that the playa hydrogeologic block beneath PEM's project area would also meet the criteria for exemption from Nevada's water pollution control laws and regulations.

20.3 Known Environmental Issues

There are currently no known environmental conditions associated with the Clayton Valley Project. Cultural resources are generally minimal on the playas, and the probability of the presence of threatened and endangered faunal or floral species is considered low. Limited liabilities remain from the reclamation obligations associated with the current exploration program(s).

From a permitting perspective, the hydrographic basin was designated as one in need of additional administration in early 2016 by the Nevada State Engineer. Whether this designation would have material implications on PEM's ability to obtain the necessary water rights to develop the resource into a reserve, and ultimately, produce lithium, is unknown at this time. Because lithium, a locatable mineral under the U.S. General Mining Act of 1872, is dissolved in non-potable water beneath the ground surface, different and competing legal opinions exist regarding whether state water law should limit PEM's ability to explore for lithium, obtain water rights, or develop its federal mining claims. Litigation regarding these interpretations is currently pending.

In addition, the Nevada State Engineer's administration of water rights and waivers for exploration for PEM's mineral exploration activities has been delayed by a nearby lithium producer. These actions have delayed issuance of water rights permits and waivers to drill wells and divert water therefrom. The recent passage of Nevada Assembly Bill 52 holds promise to streamline the process of exploration for lithium brine,

but the impacts of these various issues on permitting and construction of a lithium mine are factors to be considered.

20.4   Environmental Management Planning

At the current phase of the Clayton Valley Project, detailed environmental management plans have not yet been developed. During state and federal permitting of the mineral extraction and processing operations, a number of regulatory plans would be required. State permitting environmental management plans include:

- Process fluid management plans;

- Monitoring plans;

- Emergency response plans;

- Temporary and seasonal closure plans;

- Tentative plans for permanent closure; and

- Reclamation plans.

Federal permitting environmental management plans include:

- Water management plans;

- Rock characterization and handling plans;

- Quality assurance plans;

- Spill contingency plans;

- Reclamation plans;

- Monitoring plans; and

- Interim management plans.

Additional environmental management plans may be developed as part of the environmental impact analysis conducted by the federal land management agency.

20.5   Project Permitting Requirements

The Clayton Valley Project is located primarily on unpatented federal mineral claims within Esmeralda County, Nevada. The federal claims encompass public lands administered by the BLM, and the facilities would be located on private land. The project, therefore, falls under the jurisdiction and permitting requirements of Esmeralda County, the State of Nevada (primarily the Nevada Division of Environmental

Protection (NDEP), and the BLM. The list of likely permits and authorizations for the exploration and operation of the project are presented in Table 20-1. Permits that may be required for the Clayton Valley Project.

Table 20-1. Permits that may be required for the Clayton Valley Project

Permit/Approval	Issuing Authority	Permit Purpose	Status
Federal Permits Approvals and Registrations			
Plan of Operations / National Environmental Policy Act (NEPA) Analysis and Record of Decision	BLM	Prevent unnecessary or undue degradation of public lands, Initiate NEPA analysis to disclose and evaluate environmental impacts and project alternatives.	**REQUIRED.** PEM unpatented mineral claims are located on public land. Exploration and operations would require a plan of operations and NEPA analysis.
Rights-of-Way / NEPA Analysis	BLM	ROW grant authorizes rights and privileges for a specific use of the land for a specific period of time.	**REQUIRED.** Linear infrastructure (e.g., pipelines, utilities, roads, etc.) crossing federal public lands require SF-299 and POD. Action analyzed under a NEPA document.
Explosives Permit	U.S. Bureau of Alcohol, Tobacco, Firearms, and Explosives	Storage and use of explosives	**MAYBE,** if explosives are required for development of the process area site.
EPA Hazardous Waste ID No.	U.S. Environmental Protection Agency (USEPA)	Registration as a small-quantity generator of wastes regulated as hazardous	**REQUIRED** of all mining operations in Nevada that include chemical processing.
Notification of Commencement of Operations	Mine Safety and Health Administration	Mine safety issues, training plan, mine registration	**REQUIRED** of all mining operations in Nevada.
Biological Opinion and Consultation	FWS	Only if project Threatened or Endangered Species are determined present during the NEPA analysis of the project.	**NOT REQUIRED**. There are no current federal T&E species in the Project area.
Incidental Take Permit	FWS	Required when non-Federal activities would result in take of T&E species. A habitat conservation plan must be developed to ensure that the effects of the take are minimized and mitigated	**MAYBE,** if PEM intends to operate large process water ponds or infiltration basins.
Waters of the U.S. Jurisdictional Determination	U.S. Army Corps of Engineers (USACE)	Implementation of Section 404 of the Clean Water Act (CWA) and Sections 9 and 10 of the Rivers and Harbors Act of 1899	**REQUIRED**, although this close hydrographic basin would be non-jurisdictional – need formal agency concurrence.
Federal Communications Commission Permit	Federal Communications Commission	Frequency registrations for radio/microwave communication facilities	**MAYBE,** if PEM intends to use business radios to transmit on their own frequency
State Permits, Authorizations and Registrations			
Nevada Mine Registry	Nevada Division of Minerals	Required operations registration	**REQUIRED** of all mining operations in Nevada.
Surface Area Disturbance Permit	NDEP/Bureau of Air Pollution Control (BAPC)	Regulates airborne emissions from surface disturbance activities	**REQUIRED** of all industrial operations disturbing 5 acres or more of surface area not related to agriculture.
Air Quality Operating Permit	NDEP/BAPC	Regulates project air emissions from stationary sources	**REQUIRED** for proposed lithium processing operation.
Mercury Operating Permit to Construct	NDEP/Bureau of Air Quality Planning	Requires use of Nevada Maximum Achievable Control Technology (MACT) for all thermal units that have the potential to emit mercury	**NOT REQUIRED**. Only applicable to precious metal mining in Nevada.
Mining Reclamation Permit	NDEP/Bureau of Mining Regulation and Reclamation (BMRR)	Reclamation of surface disturbance due to mining and mineral processing; includes financial assurance requirements	**REQUIRED** of all mining operations in Nevada.

Permit/Approval	Issuing Authority	Permit Purpose	Status
Mineral Exploration Hole Plugging Permit or Waiver	Nevada Division of Water Resources (NDWR)	Temporary use of water for exploration and groundwater characterization.	**REQUIRED** of all drilling operations in Nevada.
Groundwater Permit	NDEP/ Bureau of Water Pollution Control (BWPC)	Prevents degradation of waters of the state from surface disposal, septic systems, mound septic systems, unlined ponds and overland flow	**REQUIRED** for post-process infiltration and septic systems.
Water Pollution Control Permit	NDEP/BMRR	Prevent degradation of waters of the state from mining, establishes minimum facility design and containment requirements	**REQUIRED** of all metal mining operations in Nevada.
Underground Injection Control Permit	NDEP/BWPC	Prevent degradation of all potential and current underground sources of drinking water due to underground injection practices.	**REQUIRED** for post-process re-injection if proposed
Approval to operate a Solid Waste System	NDEP/Bureau of Waste Management (BWM)	Authorization to operate an on-site landfill	**MAYBE,** if PEM proposes to utilize on-site landfill
Hazardous Waste Management Permit	NDEP/BWM	Management and recycling of hazardous wastes	**REQUIRED** for mineral processing operations that generate hazardous wastes
National Pollutant Discharge Elimination System (NPDES) Permit	NDEP/BWPC	Management of site discharges	**MAYBE,** required for proposed Waste Water Treatment Plant.
General Industrial Stormwater Discharge Permit	NDEP/BWPC	Management of site stormwater discharges in compliance with federal CWA	**NOT REQUIRED,** but is advised as precautionary; NVR050000, even though no waters of the U.S. at the mine site.
Permit to Appropriate Water/Change Point of Diversion	Nevada Division of Water Resources (NDWR)	Water rights appropriation	**REQUIRED.** PEM is in the process of applying for water rights.
Permit to Construct a Dam	NDWR	Regulate any impoundment higher than 20 feet or impounding more than 20 acre-feet	**NOT REQUIRED.** No impoundments meeting the 20/20 rule are currently proposed.
Potable Water System Permit	Nevada Bureau of Safe Drinking Water	Water system for drinking water and other domestic uses (e.g., lavatories)	**NOT REQUIRED.** PEM to obtain municipal water.
Septic Treatment / Sewage Disposal System Permit	NDEP/Bureau of Water Pollution Control	Design, operation, and monitoring of septic and sewage disposal systems	**LIKELY,** if PEM proposes to utilize septic system(s)
Dredging Permit	Nevada Department of Wildlife (NDOW)	Protection of Nevada waterways	**NOT REQUIRED.** No dredging proposed for operation.
Industrial Artificial Pond Permit	NDOW	Regulate artificial bodies of water containing chemicals that threaten wildlife	**REQUIRED** for all process water ponds.
Wildlife Protection Permit	NDOW	Stream and watershed wildlife habitat protection	**NOT REQUIRED.** No stream or watershed modification anticipated.
Hazardous Materials Permit	Nevada Fire Marshal	Store a hazardous material in excess of the amount set forth in the International Fire Code, 2006	**MAYBE** required for LPG tanks larger than 10 gallons if used on site.
License for Radioactive Material	Nevada State Health Division, Radiological Health Section	Radioactive material licensing	**REQUIRED.** If PEM intends to use a densitometer or similar device at site.
Encroachment Permit	Nevada Department of Transportation	Permits for permanent installations within State rights-of-way and in areas maintained by the State	**REQUIRED.** PEM would need due to proposed improvements, signal installations, and/or commercial off-site use and road crossings
Temporary Permit to Work in Waterways	NDEP/BWPC	Covers temporary working or routine maintenance in surface waters of the State, such as channel clearing and minor repairs to intake structures.	**NOT REQUIRED.** Activity not proposed.
Fire and Life Safety Permit	Nevada Fire Marshal	Review of non-structural features of fire and life safety and flammable reagent storage	**REQUIRED** for buildings in counties with populations fewer than 50,000. Esmeralda Co. only has 926 as of 2014.

Permit/Approval	Issuing Authority	Permit Purpose	Status
Liquefied Petroleum Gas License	Nevada Board of the Regulation of Liquefied Petroleum Gas	Tank specification and installation, handling, and safety requirements	**MAYBE** required for LPG tanks larger than 10 gallons if used on site.
State Business License	Nevada Secretary of State	License to operate in the state of Nevada	**REQUIRED**.
Retail Sales Permit or Exemption Certificate	Nevada State Department of Taxation	Permit to buy wholesale or sell retail	**MAYBE,** if PEM is direct selling product to other processors or selling product directly to the market.
Local Permits for Esmeralda County			
Building Permits	Esmeralda County	Ensure compliance with local building standards/requirements	**NOT REQUIRED.** Encourage adoption of Uniform Building Codes for the State.
Conditional Special Use Permit	Esmeralda County	Provided as necessary under applicable zoning ordinances	**NOT REQUIRED.** Encourage coordination with County Board of Commissioners.
County Road Use and Maintenance Permit/Agreement	Esmeralda County Road Department	Use and maintenance of county roads	**MAYBE,** if PEM intends to maintain, damage, or encroach on any of the area county roads.
Business License	Esmeralda County Sheriff	License for the engagement of business activities	**REQUIRED**.

20.5.1 Federal Permitting

A mine plan of operations (PoO) would have to be prepared for both exploration activities that exceed five acres of disturbance and mineral extraction and beneficiation operations. The PoO will describe the construction, operation, reclamation, and closure of each facility along with a bond cost estimate that presents the reclamation and closure costs, if the BLM is forced to reclaim the operation. Information that would have to be in the PoO includes: well location(s) and lateral and vertical extent of disturbances; pipelines; location of roads, office/laboratory, shops, diesel/lubricant storage and distribution system, landfill; power line locations; generators; schedule of construction and operation; life-of-mine schedule; and equipment/reagent list. Reclamation would be a large part of the PoO, which would have to describe the activities that would take place and be used to prepare the reclamation cost estimate for bonding. The PoO would also function as the reclamation permit application for the State of Nevada.

The "complete" PoO has to provide sufficient detail in order to identify and disclose potential environmental impacts during the mandatory National Environmental Policy Act (NEPA) review process, under which the potential impacts associated with project development are analyzed through the preparation of an Environmental Assessment (EA) and/or an Environmental Impact Statement (EIS). It is important to remember that EAs and EISs are public disclosure documents, not permit or approval documents. They are intended to disclose any environmental impacts that may occur from the project and guide the decisions of the public land managers.

The primary difference between the two types of NEPA documents is that an EA is prepared when no significant impacts are expected or the potential impacts are unknown, and an EIS acknowledges the potential for significant impacts, and analyzes and discloses what those potential impacts are.

The BLM would generally look at several triggers to determine whether an EA or an EIS is the most appropriate document to disclose potential environmental impacts. These triggers include, but are not necessarily limited to:

- Number of acres that are proposed to be disturbed. The BLM would typically, but not always, consider 260 hectares (640 acres) of proposed disturbance the threshold level for preparing an EIS. Depending on other factors, discussed below, projects less than 260 hectares (640 acres) may still have to have an EIS prepared;

- If the proposed project is projected to have significant impacts to a critical element or resource, an EIS would have to be prepared;

- If a large potential for use of or impacts to groundwater exist; and

- The BLM's perception of how defendable an EA would be to the public. If the BLM anticipates that there are factors that may not pass an appeal by non-governmental organizations or public opposition is expected to be significant, they are likely to determine that an EIS is necessary from the beginning.

Both an EA and an EIS would have to consider possible impacts to the following critical elements and resources:

- **Critical elements** – air quality, areas of critical environmental concerns, floodplains, cultural resources, environmental justice, migratory birds, Native American religious concerns, non-native invasive species, threatened and endangered species, wastes (solids/hazardous), water quality (drinking/ground), wilderness, and wild horses and burros.

- **Resources** – soils, vegetation, geology/mineralogy, paleontology, hazardous materials, lands and access, livestock/grazing, recreation, aesthetics (visual resource management and noise), and socioeconomics.

Regardless of which NEPA disclosure document is used, as many potential impacts as possible should be identified during the development of the PoO, and the PoO should be designed to pre-emptively mitigate as many of these impacts as possible. For example, if a cultural site eligible for the NRHP is found along the

route of an access road or pipeline corridor, it might be expedient to re-route the access road, if possible, around the cultural site rather than creating a potentially significant environmental impact.

The Clayton Valley Project would be within the area where environmental resources have been influenced and/or impacted by the SPLO. Known environmental issues associated with the SPLO include subsidence (sinkholes) and migratory bird mortalities. Any NEPA analysis performed would have to address SLPO's impacts in conjunction with the Project under the cumulative impacts section. Cumulative impacts have been defined under 40 CFR §1508.7 as: "The impact which results from the incremental impact of the action, decision, or Project when added to the other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." Cumulative impacts could elevate the level of analysis from an EA to an EIS.

To ensure that most of the potential impacts are identified and addressed during the PoO development phase of the project, the BLM would require that at least one year of baseline data be submitted with the PoO. The Battle Mountain District BLM offices are generally operating under Instruction Memorandum No. NV-2011-004 - Guidance for Permitting 3809 Plans of Operation, which requires a series of meetings to present the project in general terms, discusses data and baseline studies that would have to be undertaken, approval of work plans, and the baseline reports to be submitted with the PoO. The purpose of this guidance is to "improve the efficiency and effectiveness of processing mine Plans of Operation." To that end, the BLM has essentially front-loaded the entire permitting process for the collection of baseline data and environmental studies before the PoO can be officially submitted for BLM review and subsequent NEPA analysis. From an agency perspective, this guidance is considered to lead to a shortened review period and overall NEPA processes; but for the project proponent, the up-front data collection and investigations may make the whole permitting process seem longer, as these activities were formerly conducted during the NEPA process.

The requirements of the PoO document are fairly well defined and prescriptive, and should be relatively easy to comply with for submission. However, virtually all of the baseline data collection necessary for the impact assessment phase of the project would need to be collected, analyzed and interpreted in conjunction with the BLM in order to ensure that the information collected meets the data quality objectives of the program.

The PoO development and baseline data collection process generally involves the following steps:

- **Step 1** – Operator contacts the BLM,

- **Step 2** – Initial Project Presentation,

- **Step 3** – Pre-Plan of Operations Kick-Off Meeting,

- **Step 4** – Documentation of Information Needs,

- **Step 5** – Pre-Plan of Operations Project Schedule,

- **Step 6** – Development of the Plan of Operations, and

- **Step 7** – Submittal of the Plan of Operations.

Only at Step 7, when the PoO has been submitted and deemed "complete" by the BLM, would the NEPA analysis phase begin. A listing of the types of studies that should be undertaken during the mine planning phase and in advance of the NEPA process and in support of the acquisition of various other permits, include:

- Biological resources (update of 2011 program);

- Cultural resources (update of 2011 program);

- Hydrogeological assessment (may include basin-wide impact modeling);

- Geochemical characterization (of groundwater and potential waste streams);

- Air quality/meteorological (monitoring at process site location);

- Traffic study (impacts on Silver Peak); and

- Environmental justice/socioeconomics (potential impacts on Silver Peak).

The longest lead-time item would likely be the development of data and completion of a basin-wide hydrogeological model for Clayton Valley, and the assessment of impacts to other wells and water rights in the vicinity.

On average in Nevada over the past ten years, an EIS for a new mining/mineral processing project has taken a minimum of 36 months based on the complexity of the operation. In many of these cases, the project proponent failed to provide adequate "operational and baseline environmental information for the BLM to analyze potential environmental impacts as required by the NEPA and to determine if the plan of operations would prevent unnecessary or undue degradation." In effect, some of this information was developed post submittal of the PoO, and thus slowed down the overall NEPA process.

Exploration Notices

During early phases of exploration, when surface disturbance is generally limited, authorization from the BLM is conditionally granted under a notice (40 CFR § 3890.21) [Code of Federal Regulations]. A complete notice of the proposed activities must be submitted at least 15 calendar days before commencement of exploration activities causing surface disturbance of five acres or less of public lands on which reclamation has not been completed. While the notice is a useful tool to quickly initiate exploration activities, the BLM specifically warns against segmenting a project area by filing a series of notices for the purpose of avoiding filing a plan of operations. Exploration may be conducted under a notice for a period of two years, though this can be extended by two-year increments with a formal request and update to the required financial guarantee, if warranted.

PEM, through its agreements with exploration company, GeoXplor Corporation, is authorized to conduct limited lithium exploration in Clayton Valley under notices: NVN-093088, NVN-093774, and NVN-094958 (pending). PEM also acquired notice NVN-094560 from the Lithium X transactions which authorized 2.5 acres of disturbance with one acre disturbed (Source: BLM's Land & Mineral Legacy Rehost 2000 System - LR2000).

Rights-of-way

A right-of-way (ROW) grant is an authorization to use a linear route on public land for a certain project, such as roads, pipelines, transmission lines, and communication sites. A ROW grant grants privileges for a specific use of the land for a specific period of time. Generally, a BLM ROW is granted for a term appropriate for the life of the project. Both an SF-299 Application for Transportation and Utility Systems and Facilities on Federal Lands form and the formal Plan of Development need to be submitted when making application for a ROW. While this permitting process is regulated by the BLM under 43 CFR § 2800 as a realty action, the requisite NEPA analysis is generally conducted in conjunction with the mineral development PoO; thus saving the need for two separate permitting tracks.

PEM would require ROWs for some of the pipelines, access roads, and electrical utilities leading to and from the well field and process facilities. These would be delineated once the final facilities layout is completed.

NEPA Connected Actions

When evaluating the permitting strategies of physically separate, though potentially inter-related facilities and/or activities (e.g., well field and extraction point vs. processing facility), the implications of creating a

'connected action' within the realm of NEPA must be fully considered. In many cases, the connection, be it physical or operational, would require that both be considered simultaneously in a single NEPA action even though one or more of the components may be located entirely on private land controlled by PEM. This could have important implications on the duration of the overall NEPA permitting process.

The U.S. Council on Environmental Quality regulations provide three definitions of 'connected actions' that require combined NEPA impact assessments:

- an action that "automatically triggers other actions which may require environmental impact statements";

- an action that "cannot or would not proceed unless other actions are taken previously or simultaneously"; and

- actions that "are interdependent parts of a larger action and depend on the larger action for their justification."

The BLM reserves the authority to evaluate and approve actions that are connected to their jurisdiction, even if the principal actions are on private land.

Federal Reporting Requirements

With the proposed on-site storage and use of certain chemicals in the lithium extraction process, including, but not limited to sodium hydroxide, sulphuric acid, and xylene, the proposed operation would likely be subject to reporting requirements under the Emergency Planning and Community Right-to-Know Act (EPCRA), also known as Title III of the Superfund Amendments and Reauthorization Act of 1986, the Comprehensive Environmental Response, Compensation and Liability Act and section 112(r) of the Clean Air Act. For any proprietary chemical or reagents, PEM would be required to develop material safety data sheets under the Hazard Communication Standard (29 CFR § 1910.1200).

The presence of Extremely Hazardous Substances (EHSs) in quantities at or above the Threshold Planning Quantity (TPQ) would require certain emergency planning activities to be conducted. Reagents that may potentially be used include xylene and sodium hydroxide, both of which may be subject to reporting requirements depending on the quantities being stored on site. The complete inventory of reagents planned to be used should be reviewed to determine their reporting status. Local Emergency Planning Committees (LEPCs) must develop emergency response plans and facility owners or operators must notify the State Emergency Response Commission or Tribal Emergency Response Commission and their LEPC, if a chemical is

present at the facility or above the EHS's TPQ. Among other reporting requirements, emissions, transfers, and waste management data for certain listed chemicals must be reported annually as part of the community right-to-know provisions of EPCRA. These reports are also known as toxics release inventory reports.

20.5.2 State Permitting

The State of Nevada requires a number of operational mining permits regardless of the land status of the project. The following are the principal state permits that would be required for the Clayton Valley Project.

Water Pollution Control Permit – NDEP, BMRR

A water pollution control permit (WPCP) would be issued by the NDEP, BMRR Regulation Branch to an operator prior to the construction of any mining, milling, or other beneficiation process activity. The need for a WPCP is not dependent on whether or not a discharge is intended, or the quantity of mineral resource to be extracted or processed. Facilities utilizing chemicals for mineral processing are generally required to meet zero discharge performance standards which would be addressed in the process design. A separate permit may be issued for certain activities at a specific facility, or a permit may be issued for all activities at a single facility. A WPCP is required for the extraction of minerals or previously processed material for beneficiation at any site. The WPCP is intended to ensure that Nevada's waters are not degraded by mining operations. The timing to obtain this permit is generally nine to 12 months after the application is submitted.

Reclamation Permit – NDEP, BMRR

The Reclamation Branch of the BMRR issues a Reclamation Permit to an operator prior to construction of any exploration, mining, milling or other beneficiation process activity that proposes to create disturbance over five acres or remove in excess of 36,500 tons of material from the earth. The Reclamation Permit, which is typically issued in conjunction with the BLM 43 CFR § 3809 PoO when mixed land status is involved, is intended to ensure that the lands disturbed by mining operations are reclaimed to safe and stable conditions to ensure a productive post-mining land use. Both the BLM PoO and reclamation permit must include a financial surety to ensure that reclamation would be completed as discussed in the Mine Closure section below.

Underground Injection Control Permit - NDEP, BWPC

The Nevada Underground Injection Control Program is intended to prevent degradation of all potential and current underground sources of drinking water due to underground injection practices. Except as otherwise

provided in NAC 445A.8491 to 445A.8499, inclusive, an applicant for a permit to inject fluids must satisfy the Director that the underground injection would not endanger any source of drinking water. An application for a permit must be filed within no less than 180 days prior to the operation of an injection well which does not already have a permit (BWPC, 2016).

Air Quality Operating Permit – NDEP, BAPC

Air quality permits are issued by the NDEP Bureau of Air Pollution Control (BAPC). The Project is located within the Clayton Valley (Hydrographic Area No. 143). Air quality in this basin has been designated as attainment/unclassified, which means it either meets or is assumed to meet the applicable federal ambient air quality standards, for all standard (criteria) air pollutants. The Project area is not located in or adjacent to any mandatory Class I (most restrictive) federal air quality areas, FWS Class I air quality units, or American Indian Class I air quality lands.

To comply with NAC 445B.296.l(a), and NAC 445B.001 to 445B.3497, inclusive, a Class II Air Quality Operating Permit, at a minimum, would likely be required for the mineral processing component of the project. This permit generally takes 12 months to obtain following submittal of a 'complete' application.

Water and Stormwater – NDEP, BWPC

Water-related issues (e.g., stormwater discharges, sanitary septic systems, and underground injection control) are generally regulated by the Bureau of Water Pollution Control (BWPC). Stormwater discharge permits are required for certain activities by the U.S. Environmental Protection Agency regulations at 40 CFR § 122.26(b)(14). In compliance with this regulation, the BWPC would issue General Permit (NVR300000) for Stormwater Discharges Associated with Industrial Activity from Metals Mining Activities. The draft Stormwater Pollution Prevention Plan (SWPPP) is required under this permit.

Water Appropriations – NDWR

The Nevada Division of Water Resources (NDWR) is responsible for quantifying existing water rights; monitoring water use; distributing water in accordance with:

- court decrees;
- reviewing water availability; and,
- reviewing the construction and operation of dams (among other regulatory activities).

Water appropriations, which would be important to PEM's Clayton Valley Project, given the hydrographic groundwater basin in which the Project is located (Hydrographic Area No. 143 – Clayton Valley) has been "designated" (NDWR Order No. O-1275), but has no preferred uses, are handled through the NDWR and the State Engineer's Office.

Groundwater basins are typically designated as being in need of increased regulation and administration by the State Engineer when the total quantity of committed groundwater resources (water rights permits) approach or exceed the estimated perennial yield (average annual groundwater recharge) from the basin. By designating a basin, the State Engineer is granted additional authority in the administration of the groundwater resources within the designated basin. However, designation of a water basin by the State Engineer does not necessarily mean that the groundwater resources are being depleted, only that the appropriated water rights exceed the estimated perennial yield. Actual groundwater use may be considerably less than perennial yield.

The perennial yield from Clayton Valley is estimated to be 24.67 million m^3 / year [20,000 acre-feet per annum (AFA)], and the quantity of committed groundwater resources (underground water rights permits) amounts to 24.67 million m^3 / year (23,681 AFA). Of this amount, 28.43 million m^3 / year (23,050 AFA) are committed for mining and milling purposes. In light of these quantities, groundwater resources in the Clayton Valley hydrographic basin have been over-appropriated, and there appears to be no unappropriated groundwater available from the basin to support a permanent appropriation of groundwater for the Project. However, water rights for mining and milling purposes can be discounted from the committed resource analysis because the State Engineer considers the groundwater used for mining and milling activities to be a temporary use of water, which would not cause a permanent effect on the groundwater resource. Therefore, groundwater rights for mining and milling purposes can be discounted from the long-term committed resource analysis (State Engineer's Ruling 6227) to demonstrate that unappropriated groundwater is available to supply the estimated consumptive use of groundwater for the Project. Furthermore, NDWR's report titled Nevada Statewide Assessment of Groundwater Pumpage Calendar Year 2013 indicates that only 19.02 million m^3 [15,422 acre-feet (AF)] were pumped in 2013; the exact quantity consumed or returned to the aquifer is unknown, but is likely less than the reported pumpage volume. Based upon this report, Clayton Valley is not currently being over-drafted or over pumped, and up to 5.7 million m^3 / year (4,578 AFA) could be temporarily available for appropriation and consumption due to non-use of existing groundwater rights.

In light of these facts, PEM filed Application 85990, in the name of its wholly-owned subsidiary, Esmeralda Minerals LLC, to appropriate 23.52 million m^3 / year (19,067 AFA) of groundwater at a rate of 2,685 m^3 / hour [26.337 cubic feet per second (CFS) or 11,821 gallons per minute (GPM)]. Of this quantity, approximately 96 percent or 22.66 million m^3 / year (18,367 AFA) is anticipated to be returned to the groundwater system and only 4 percent or 0.86 million m^3 / year (700 AFA) is anticipated to be consumptively used as part of PEM's innovative lithium extraction process. Application 85990 was protested by Albemarle Corporation, Esmeralda County, and Intor Resources Corporation. This application was denied by the State Engineer in May 2017 due to "no unappropriated water." PEM subsequently filed a Notice of Appeal and Petition for Judicial Review. In the end, PEM should still be able to file a supplemental application for the minimum amount of water required to conduct a pilot test of a small-scale process/extraction plant and provide test results, as proof of concept, to the State Engineer to demonstrate that the process technology is almost entirely non-consumptive.

20.5.3 Local Permitting

Local permitting requirements are negligible in Esmeralda County. However, a meeting to discuss the project with the Board of County Commissioners is highly encouraged and mandated for issuance of the WPCP issued by the NDEP.

20.5.4 Potential Permitting Timelines and Strategies

The locations of the extraction and potential injection wells are restricted to public lands administered by the BLM. As such, this component of the Project would require the submission of a PoO and NEPA analysis. Given the nature of the operation, the PoO is likely to be analyzed under an EA, as opposed to an EIS. This is generally a 12-month process from the time of submission of a 'complete' PoO following the Instruction Memorandum No. NV-2011-004 - Guidance for Permitting 3809 Plans of Operation (Appendix A-1). Assuming that the 12 months prior to submission of the PoO/Reclamation Permit Application would entail the mandatory meetings with state and federal regulators, completion and approval of all baseline documentation, and completion of the detailed design required for the WPCP, the permitting of the Clayton Valley Project would require at least two years from PEA to permits. The WPCP, reclamation permit, and air quality permit generally run concurrently with the BLM NEPA analysis period, and are completed at approximately the same time.

However, this timeline could be influenced by the ultimate location of the process facilities, and the BLM's decision of those facilities, as a connected action, on the overall project.

Process Facilities on Private Lands

PEM plans to locate the process facilities on private land in the area of Silver Peak. While this action would have no effect on the State of Nevada permitting requirements, the sequestration of chemical storage and processing facilities from public lands may allow the BLM to more easily proceed with analysis of the project under an EA disclosure document as part of their NEPA obligations. With this, the aforementioned timeline would likely still apply.

Process Facilities on Public Lands

If, for logistical and economic reasons, PEM is forced to locate the process facilities on public lands, the inclusion of the additional surface disturbance and the storage/use of chemical reagents on BLM-administered lands, could prompt the agency into considering the use of an EIS rather than an EA for its NEPA analysis of the Project. In this event, the overall timeline for the project could be lengthened by at least one to three additional years, depending on the complexity of the analyses especially with respect to the basin-wide hydrogeological impacts.

NOTE: The selection of one NEPA disclosure document over another (EA vs. EIS) is never an exact science with the BLM, and depends on a number of independent variables, including, but not limited to personal opinions as well as politics. Also, if an EA is initially selected as the appropriate level of analysis, it could identify significant impacts. If significant impacts are identified, the proposed project would have to be analyzed under an EIS, which in effect, would start the NEPA analysis over.

20.6 Performance or Reclamation Bonding

The requirements for performance and/or reclamation bonding of the Clayton Valley Project are discussed under Mine Closure (below).

20.7 Social and Community Requirements

The Clayton Valley Project workforce (including shorter-term construction contractors) would most likely reside in the towns of Silver Peak and Tonopah and the surrounding communities in Esmeralda and Nye counties, respectively. The construction work force is estimated to peak at 400 employees for about 12 months, and the operations work forces is expected to be about 72 full-time employees.

As such, the project proponent would need to coordinate closely with local governments and businesses to ensure that the needs of both the community and the workforce are being met, since most of the workers would necessarily originate from outside of Esmeralda County, which is sparsely populated, rural, and has

no large urban centers. According to the Nevada State Demographer, the population of Esmeralda County was only 926 in 2014, with no cities and only two unincorporated towns: Goldfield (population 272) and Silver Peak (population 128). Nye County is considerably larger, with an estimated population of 45,456 in 2014, 2,578 of whom reside in Tonopah.

An important part of the income of predominantly rural counties in Nevada, like Esmeralda, is produced by sales tax and the net proceeds tax on mining activity within the county. Sales tax revenues are collected by the county in which delivery of the goods are taken. For the Clayton Valley Project, this would be Esmeralda County. The 2015 median household income in the county is in the order of $31,528.

Other current projects in central Nevada have clearly demonstrated the need for open and transparent communications and negotiations with the local government, businesses, and residences, as well as the need for a clearly defined Social Management Plan (SMP). Without the support of this close-knit community, the social license, within the local community and other stakeholders, to operate may not be earned.

20.7.1 Community Agreements

No formal presentations have yet been made to the Esmeralda Board of County Commissioners. Engagement of potential stakeholders in Silver Peak and Clayton Valley are only in early stages. No community agreements are yet in place.

20.8   Mine Closure

Both the BLM's 43 CFR § 3809 and State of Nevada's mine reclamation regulations require closure and reclamation for mineral projects. In addition, from the 2013 Esmeralda County Public Lands Policy Plan, Policy 7-7 for Mineral and Geothermal Resources: Reclamation of geothermal, mine, or exploration sites should be coordinated with the Esmeralda County Commission, and should consider the post-mine use of buildings, access roads, water developments, and other infrastructure for further economic development by industry, as well as historic and other uses pursuant to the federal Recreation and Public Purposes (R&PP) Act.

After extraction and beneficiation operations cease, all buildings, infrastructure, and facilities from the Clayton Valley Project, not identified for a specific post-mining use, would be removed from the site during the salvage and site demolition phase. This would include, but not be limited to the:

- proper abandonment of all extraction and injection wells pursuant to Nevada regulations;

- removal or abandonment of pipelines;

- surface reclamation of roads and other surface disturbance; and

- demolition of process facilities and salvage/removal of equipment and residual reagents for proper disposal.

To the extent practicable, reclamation and closure activities would be conducted concurrently to reduce the overall reclamation and closure costs, minimize environmental liabilities, and limit bond exposure.

The revegetation release criteria for reclaimed areas are presented in the "Guidelines for Successful Revegetation for the Nevada Division of Environmental Protection, the Bureau of Land Management, and the U.S.D.A. Forest Service." The revegetation goal is to achieve the permitted plant cover as soon as possible.

Pursuant to state and federal regulation, any operator who conducts mining operations under an approved PoO or reclamation permit must furnish a bond in an amount sufficient for stabilizing and reclaiming all areas disturbed by the operations. Conceptual reclamation and closure methods were used to evaluate the various components of the project to estimate reclamation costs. Version 1.4.1 Build 17 of the Nevada Standardized Reclamation Cost Estimator (SRCE) was used to prepare this cost estimate. The SRCE uses first principles methods to estimate quantities, productivities, and work hours required for various closure tasks based on inputs from the user. The physical layout, geometry, and dimensions of the proposed project components were based on the current understanding of the site plan and facilities layout. These included current designs for the main project components including well field infrastructure, and process plant components. Equipment and labor costs were conservatively estimated using state and BLM-approved costs for the 2016/2017 year. These costs are updated by the NDEP and BLM in August of every year.

Because some of the closure activities are based on preliminary designs and conceptual approaches, the overall closure cost estimate accuracy is +35 to -10 percent based on the limitations of the design information available, the accuracy of available site plans, and uncertainty regarding a number of the proposed siting approaches. The closure cost associated with the Clayton Valley Project is currently estimated to be $7,566,920. This total is an undiscounted internal cost to reclaim and close the facilities associated with the mining and processing project.

The estimated reclamation cost is based on quantities provided by PEM and converted to imperial units from metric values. The following major features were included in the estimate:

- 30 eight-inch diameter wells drilled to a depth of 488 meters (1,600) feet below ground surface;

- Roads, pipelines, and power lines;

- Four rapid infiltration basins (RIBs) to infiltrate up to 1,817 m^3/h (8,000 gallons per minute);

- 26 monitoring wells for the perimeter, RIBs, and plant area;

- Support buildings, tanks and containment, fences, and laydown areas;

- Reclamation and groundwater monitoring;

- Construction management; and

- Indirect costs.

This estimate would be refined upon detailed engineering and should be considered to be a preliminary estimate.

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21 Capital and Operating Costs

21.1 Capital Cost Estimate

21.1.1 Introduction

The capital cost estimate includes costs associated with the development of the basin extraction infrastructure, processing plant, administrative and maintenance infrastructure, the water supply and other infrastructure items. The QPs for this section have reviewed this data and determined it is adequate for the purposes of this Technical Report.

EBITDA (earnings before interest, taxes, depreciation & amortization), net present value, internal rate of return, net cash flow, free cash flow, payback period, indirect capital costs, owners' costs, sustaining capital costs, contingency, operating costs, and other elements of our project financial model are non-IFRS financial and economic measures that do not have standardized meanings prescribed by IFRS. However, PEM believes that these economic and financial measures can be useful to evaluate a mineral project's future financial and economic prospects. These measures do not have standardized meanings prescribed by IFRS; therefore, readers are cautioned that these measures as used and calculated in PEM's project financial model may not be comparable to similarly titled measures used by other companies for their projects. These measures should also not be construed as alternatives to other measures of financial performance calculated in accordance with IFRS.

21.1.2 Basis of Estimate

The main components of the Basis of Estimate are listed in Table 21-1. Basis of Estimate. The estimate is regarded as a Class 5 estimate, as defined by the AACE International and has an accuracy of +30/-20 percent. This estimate does not constitute a pre-feasibility or feasibility level of analysis.

All costs are presented in Q2 2017 U.S. dollars.

Table 21-1. Basis of Estimate

Item	Basis of Estimate
Process Definitions	
Process selection	Provided by Tenova Advanced Technologies (TAT) and Pure Energy
Design criteria	Provided by TAT and Pure Energy
Flowsheets/plant capacity	Provided by TAT and Pure Energy
Mass balance	Provided by TAT and Pure Energy
Major equipment list	Provided by TAT and Pure Energy
Infrastructure definition	Provided by Pure Energy and Tenova
Capital cost estimating methodology	Provided by Tenova and Pure Energy
Direct costs	
Main site	Scope based on plot plans; site plan
	Includes clearing and grubbing, area grading, fencing, and gravel roads
	All foundations estimated and factored from mechanical equipment
Potable Water	To be supplied from the town of Silver Peak municipal system
Natural Gas	Not required
Basin Construction	Earthworks estimated from Pure Energy experience
	Access road approximately 5 km (3 miles)
	Brine lift pumps from extraction wells to collection tank based on pump vendor quote
	Brine pumps from collection tank to plant based on pump vendor quote
	Cost for 47 km (28.5 miles) aboveground pipelines based on historical piping costs
Buildings/structural steel	Building envelopes defined from General Layout
	Interior platforms, pipe racks, and stairs are included
Mechanical equipment	Equipment definition and sizing defined by the project equipment list
	Equipment pricing is based on major vendor packages, budgetary or historical quotes
Piping	Specification sources include the equipment list and TAT experience
	Piping scope and schedule factored from the mechanical equipment
Electrical	Electrical equipment and loads based on mechanical equipment list
	Includes 2 km (1.6 miles) transmission line from Silver Peak to the process site and basin substation
	Electrical costs factored from the mechanical equipment.
Instrumentation and Controls	Instrument and control costs have been factored from the mechanical equipment
	Communication and DCS have been included
Indirect costs	
Freight and transportation	Based on 6 % of mechanical equipment costs. The transport of the reagent tanks was quoted separately
Taxes	Information and costs supplied by Pure Energy
Permitting	Information and costs supplied by Pure Energy
EPCM	Engineering & Procurement: Based on a percentage of Direct Costs
	Construction Management: Based on a percentage of Direct Costs
Startup Services	Based on a percentage of Direct Costs
Spares and initial fills	Capital spares included per individual equipment packages
	Initial fill of organic / solvent included per TAT estimate
	Startup spares included in Startup Services
	Operating spares are excluded from the Capex. Operating spares, at 4 % of equipment cost per year, are included in the operating cost
Other costs	
Contingency	A 30% contingency, based on Total Field & Home Office Costs, has been included
Escalation	Escalation has been excluded
Owner's costs	Supplied by Pure Energy and include all remaining feasibility study, permitting, project personnel, and other capitalized operating costs required during the preproduction years

21.1.3 Direct Capital Costs

The direct costs for the project are divided into categories based on physical areas of the project. The estimated costs for the direct costs are detailed in Table 21-2. Direct Capital Costs.

Table 21-2. Direct Capital Costs

Area No.	Name	Total
100	Basin Activities	$29,152,000
200	Brine Reception	$5,744,000
300 & 400	Lithium Sulphate Plant	$64,650,000
500 & 600	Lithium Hydroxide Plant	$26,667,000
700	Reagent & Reagent Storage	$2,951,000
800	Utilities and Ancillaries	$29,661,000
900 [1]	General and Administration	$0
	Total direct capital	**$158,825,000**

(1) General and Adminstration (G&A) Costs are operating expenses, not capital expenses. Area 900 is included in this table for completeness. G&A costs are described in Section 21.2 and included in Table 21-7.

It should be noted that the lithium content of the Clayton Valley brines is significantly lower than that produced in the operating lithium brine mines of South America. This lower feed concentration has an understandable impact on capital costs. However, Clayton Valley brines also have very favorable chemistry compared to other productive lithium brines. The content of divalent cations such as calcium (Ca), magnesium (Mg), and strontium (Sr) is low relative to the lithium content. High concentrations of these elements can negatively impact lithium recovery and processing costs. The Process flowsheet is designed for these chemical parameters, and the process plant represents over 60 percent of the initial Direct Capital Costs.

21.1.4 Indirect and Other Capital Costs

The indirect costs were estimated from the total project costs with the exception of the owner's costs that were supplied by PEM and the contingency that was agreed upon by PEM and the section authors. The indirect costs are summarized in Table 21-3. Indirect and Other Capital Costs.

Table 21-3. Indirect and Other Capital Costs

Indirects	Total
Spares	$1,025,000
Freight	$4,227,000
Permitting	In Owner's Costs
Engineering and Procurement Services	$11,751,000
Construction Management	$6,353,000
Start Up Services	$4,765,000
Subtotal - Indirect Costs	**$28,121,000**
Initial Fill of Organic	$21,700,000
Owner's costs	$8,728,000
Taxes and Duties	$4,050,000
Insurance and Bonds	$1,167,000
Feasibility Study	$18,000,000
Contingency	$56,083,000
Subtotal - Other Capital Costs	**$109,728,000**
Indirect and Other Capital Costs	**$137,849,000**

The initial fill of the organic solution is estimated to have a cost of $ 21.7 million.

The contingency has been calculated as 30 percent of the total direct and indirect costs and reported as part of the Other Capital Costs.

An allowance of $ 18 million has been included, in the Other Capital Costs, for the Feasibility Study phase. This phase of work is expected to include, but is not limited to:

- additional basin activities to convert Resources into Reserves,
- the pilot plant to demonstrate the TAT lithium recovery technology
- preparation of a Feasibility Study report
- preparation of an NI 43-101 Technical Report from the Feasibility Study report.

21.1.5 Sustaining Capital

The estimated $ 61.9 million in life of mine (LoM) sustaining capital includes (1) future extraction wells and pipelines together with associated direct and indirect costs and (2) estimates for additional plant equipment to handle increased brine inputs as the lithium concentration decreases over time.

Table 21-4 Sustaining Capital Cost Summary summarizes the approximate $ 61.9 million of sustaining cost.

Table 21-4. Sustaining Capital Cost Summary

Area No.	Name	LoM Total
100	Well and Basin Developments	$16,927,000
300 & 400	Lithium Sulphate Plant	$35,000,000
	Miscellaneous ($500K/Year)	$10,000,000
	Total Sustaining Capital Costs	**$61,927,000**

21.1.6 Exclusions

The following items were not included in this estimate:

- Sunk and legal costs

- Special incentives and allowances beyond those specifically included

- Escalation

- Interest and financing costs

- Start-up costs beyond those specifically included

- Additional exploration expenses.

21.1.7 Summary of Capital Costs

Table 21 - 5 presents a summary of the Estimated Capital Costs.

Table 21–5. Estimated Capital Costs

Description of Capital Costs	US $
Basin Activities	$ 29 M
Plant Facilities & Equipment	$ 100 M
Infrastructure & Utilities	$ 30 M
Direct Costs	**$ 159 M**
Indirect Costs	$ 28 M
Contingency	$ 56 M
Owner's and Other Costs	$ 54 M
Total Initial Capital Costs	**$ 297 M**
Sustaining Capital Costs (LoM)	$ 62 M

21.2 Operating Cost Estimate

21.2.1 Introduction

Operating costs were determined based on the production schedule, process equipment requirements, operating hours, hourly equipment operating costs, and project workforce requirements. For the purpose of the economic analysis the operating costs were separated into the following categories: labour (including G&A costs); power; operating supplies & services; and maintenance supplies. The operating costs are considered to have an accuracy of ± 30 percent. The QP for this section has reviewed this data and determined it is adequate for the purposes of this Technical Report.

21.2.2 Basis of Estimate

The operating costs were determined from a variety of sources that include budgetary estimates from vendors, Tenova and TAT historical information, and regional labour rates supplied by PEM.

The operating costs summarized in Table 21-6. Summary of Operating Costs for 10,000 tonne / year LCE were determined based on the following parameters:

- Production schedule: Plant throughput of 10,000 tonnes per year (11,023 tons per year) LCE, 365 days per year at 92 percent utilization

- Equipment requirements: based on equipment specifications

- Operating hours: three 8-hour shifts per day

- Hourly equipment operating costs: based on equipment specifications

- Project workforce requirements

Maintenance materials for the processing plant are estimated as 4 percent of mechanical equipment capital cost. Power, reagent / consumables, and labour costs were tracked separately. G&A costs primarily include insurance and property taxes.

The total operating cost is US$ 3,652 per tonne of LCE or US$ 3,217 per tonne of lithium hydroxide monohydrate.

Table 21-6 Summary of Operating Costs for 10,000 tonne / year LCE

	Operating Costs $/tonne LCE	Percent
Labour	$485.34	13%
Power	$446.71	12%
Operating Supplies & Services	$2,528.00	69%
Maintenance supplies	$191.56	5%
Total	**$3,651.61**	**100%**

	Operating Costs $/tonne $LiOH.H_2O$	Percent
Labour	$427.61	13%
Power	$393.58	12%
Operating Supplies & Services	$2,227.32	69%
Maintenance supplies	$168.78	5%
Total	**$3,217.29**	**100%**

21.2.3 Project Manpower

The estimated maintenance and operating staff are detailed in Table 21-7. Average Yearly Workforce Costs. Personnel requirements and wage rates were provided by PEM. The authors reviewed these data and determined them to be adequate for the purpose of this Technical Report.

The processing plant is estimated to operate 24 hours per day with three 8-hour shifts. Hourly worker costs have a 10 percent overtime allowance based on base rate. Burden for salaried employees is estimated at 35 percent of base pay. Burden for hourly employees is 35 percent of the sum of hourly rate plus overtime allowance.

Table 21-7. Average Yearly Workforce Costs

Workforce Summary	Total Employees	Annual Total Cost
Basin Activities		
Hourly personnel	5	$207,000
Salary personnel	0	$0
Total – Basin Activities	**5**	$207,000
Plant and processing		
Hourly personnel	24	$1,446,000
Salary personnel	0	$0
Total – Plant and processing	**24**	$1,446,000
Utilities and Ancillaries		
Hourly personnel	25	$1,581,000
Salary personnel	1	$76,000
Total – Utilities & Ancillaries	**26**	$1,657,000
G&A		
Hourly personnel	2	$167,000
Salary personnel	15	$1,377,000
Total – G&A	**17**	$1,544,000
Project Total	**72**	$4,853,000

22 Economic Analysis

The economic analysis and the PEA described in this Section 22 are based on inferred resources, which are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. The PEA is preliminary in nature and there is no certainty that the PEA will be realized. See Section 22.2 – Economic Model Parameters for a discussion of the key parameters and assumptions used in the preparation of the economic analysis.

22.1 Basis of Analysis

The economic analysis was conducted using a discounted cash flow model (Economic Model). The capital and operating costs presented in Section 21 of this Technical Report, and used in this economic analysis, were based on the brine recovery methods and process flowsheet described in Sections 16 and 17 of this Technical Report and the inferred resource estimate described in Section 14. The Economic Model was based on the LoM extraction of approximately 200,000 tonnes (220,500 tons) of lithium hydroxide monohydrate over a 20 year period starting in 2021. Mineral resources that are not mineral reserves do not have demonstrated economic viability.

The IRR, NPV, and payback period were calculated based on 100 percent equity financing, although it is anticipated that PEM would also pursue debt financing alternatives for the Project. Sensitivity analysis was also performed to assess the impact of variances in the Project's capital and operating costs, revenues, inflation, and discount rate to demonstrate the effects of these variances on the Project economics.

22.2 Economic Model Parameters

The key parameters and assumptions used in the Economic Model were as follows:

- Construction of the commercial plant is forecast to start in 2019 and be completed by the end of 2020.

- Commercial production would commence in 2021, with an initial ramp-up production of 4,100 tonnes (4,540 tons) of LiOH·H$_2$O in that year. The ramp-up period would extend into 2022, when the plant is forecast to start producing at the annual design capacity of 11,500 tonnes (12,650 tons) of LiOH·H$_2$O.

- Discount rate – 8 percent.

- Lithium Hydroxide pricing is based on a 20 year forecast provided by Benchmark Minerals Intelligence. The average LoM price is US$ 12,267/tonne of LiOH·H$_2$O. Table 22-2. Lithium Hydroxide Monohydrate Price Forecast, highlights the changes in Benchmark's forecast over the first five years of operation

Table 22-1 – Lithium Hydroxide Monohydrate Price Forcast

Price Forecast, $/tonne, Ex-works

Economic Model Year	LoM	PP-3	PP-2	PP-1	1	2	3	4	5
(Calendar Year)	Average	2018	2019	2020	2021	2022	2023	2024	2025
Lithium Hydroxide Monohydrate Price Forecast, $/tonne, Ex-works	12,267	13,500	12,000	14,000	12,000	11,000	12,500	15,000	16,500

Source: Benchmark Mineral Intelligence, 2017

- Initial capital costs estimated at US$ 297 million.

- Sustaining capital costs estimated at US$ 62 million LoM, including additional basin improvements, sustaining capital, decommissioning and reclamation.

- LoM Direct operating costs, excluding royalties, local and state taxes, are estimated to be US$ 3,217 per tonne of LiOH·H_2O.

- Annual production royalties estimated at 3 percent of gross revenue.

- Estimated effective tax rate of approximately 20 percent, based on assumptions described in Section 22.3.

- All Project-related expenses incurred prior to the effective date of this Report are considered as sunk costs and are not included in this economic analysis.

Additional details of the variables used in the discounted cash flow model, including the annual cash flow and production schedules, can be found in Table 22-5. Summary of Cash Flow Model. The cash flows are shown graphically in Figure 22-1. Annual Cash Flow and Figure 22–2. Cumulative Cash Flow.

Figure 22–1. Annual Cash Flow

Clayton Valley - Annual Cash Flow

Figure 22–2. Cumulative Cash Flow

Clayton Valley - Cumulative Cash Flow

Payback in 4.4 Years
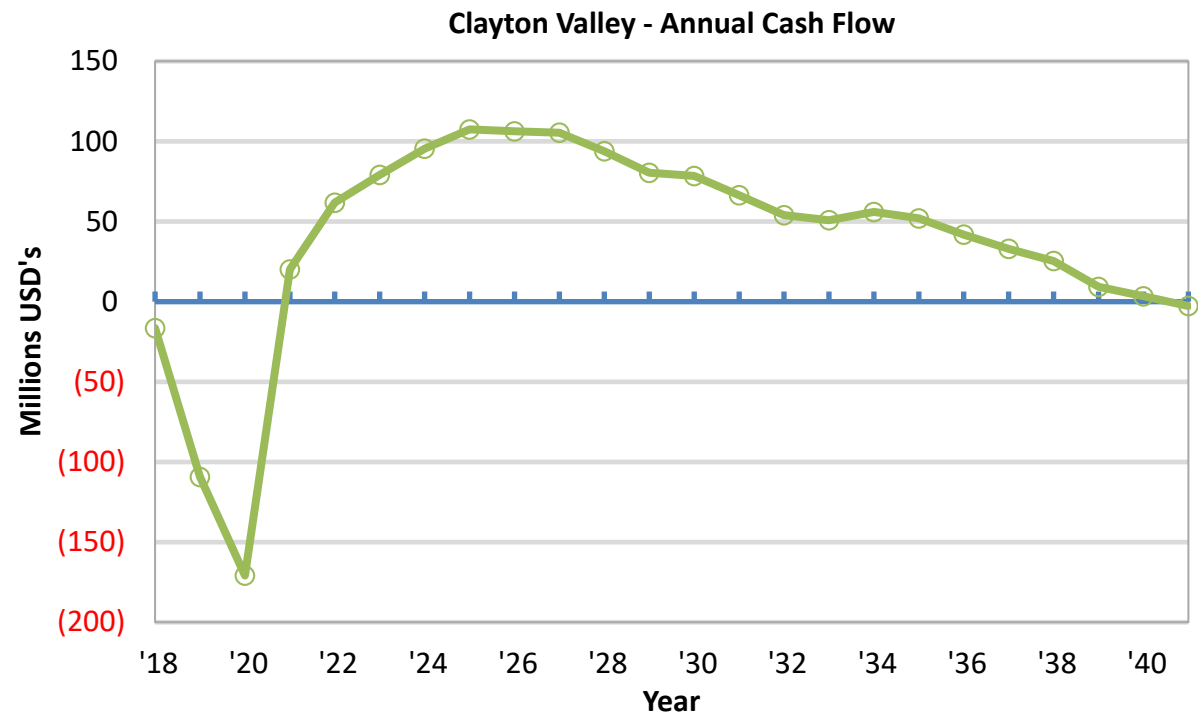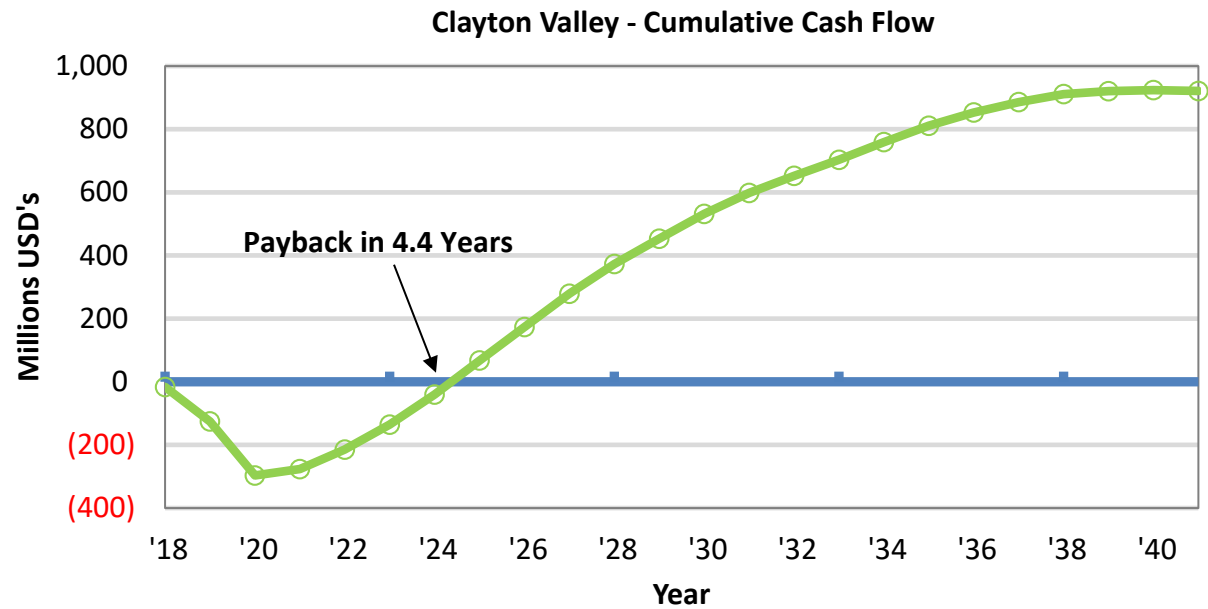
22.3   Taxation

The Project is subject to Federal Income Tax at a statutory rate of 35 percent and Nevada Net Proceeds Tax. Federal taxable income is calculated based on gross revenues less operating expenses, royalties, depreciation, and depletion. The Depletion deduction is the greater of 22 percent of Gross Revenue or Cost Depletion, and is the primary reason that the effective rate of 20 percent is less than the statutory rate of 35 percent.

Net Proceeds for the Nevada Net Proceeds tax are equal to Gross Revenue less Operating Costs, Royalties, and Depreciation. Net Proceeds are taxed at a sliding rate from 2 percent to a maximum of 5 percent. Clayton Valley's effective rate is 4.9 percent.

The Project is also assessed an annual property tax.

22.4   Summary

An economic analysis was conducted to determine the value of the Project using net present value (NPV) and internal rate of return (IRR) financial metrics. NPV is the summation of the present value of all future cash inflows and outflows of the Project. A positive NPV indicates that the Project provides a financial return in excess of the capital requirements. IRR is the annual rate of return that makes the NPV of all cash flows equal to zero. In other words, it is the discount rate at which the present value of all cash flows equal's zero. The payback period, which is based on the undiscounted free cash flow, is the number of production years required to repay the initial capital outflows.

The results of the economic analysis were positive, and NPV, IRR, and payback period are summarized in Table 22-2. Economic Analysis Results. The NPV at an 8 percent discount rate was US$ 357 million on a pre-tax basis and US$ 264 million on an after-tax basis, with a pre-tax IRR of 24 percent and an after-tax IRR of 21 percent. Based on the free cash flow generated by the Project, the payback period is estimated to be approximately 4.4 years from first production of saleable product.

Table 22-2. Economic Analysis Results

Financial Metric	Pretax Values	After-Tax Values
NPV at 8%	$356.8 million	$264.1 million
IRR	24.2 %	21.0 %
Payback period, years (after commencement of operations)	4.1 years	4.4 years

Note: Mineral resources that are not mineral reserves do not have demonstrated economic viability

Over the Project's LoM, the Economic Model is based on the extraction and sale of 200,000 tonnes (220,500 tons) of LiOH·H$_2$O, and projects EBITDA of US$ 1,500 million from Revenues of US$ 2,500 million and Operating Costs of US$ 900 million. The model projects Net Cash Flow of US$ 921 million which is equal to EBITDA less Income taxes of US$ 241 million, Life-of-Mine Capex of US$ 359 million, and US$ 30 million of other costs.

EBITDA (earnings before interest, taxes, depreciation & amortization), net present value, internal rate of return, net cash flow, free cash flow, payback period, indirect capital costs, owners' costs, sustaining capital costs, contingency, operating costs, and other elements of our project financial model are non-IFRS financial and economic measures that do not have standardized meanings prescribed by IFRS. However, PEM believes that these economic and financial measures can be useful to evaluate a mineral project's future financial and economic prospects. These measures do not have standardized meanings prescribed by IFRS; therefore, readers are cautioned that these measures as used and calculated in PEM's project financial model may not be comparable to similarly titled measures used by other companies for their projects. These measures should also not be construed as alternatives to other measures of financial performance calculated in accordance with IFRS.

22.5   Sensitivity Analysis

A sensitivity analysis was completed for the Project economics to determine which variable(s) had the greatest impact on the Project economics. The results, presented in Table 22-3. Results of Sensitivity Analysis, and well as in Figures 22-3. Pre-Tax Sensitivity Chart and 22-4. After-Tax Sensitivity Chart, illustrate the relative sensitivities of the various parameters to the Project NPV, on a pre-tax and after-tax basis. In Figure 22-3, the Capex and Opex lines lie on top of each other, as a result only the green Capex line is visible. In Figure 22-4, there is a slight difference in the lines and both lines are visible.

Table 22-3. Results of Sensitivity Analysis

Item	After-Tax Returns - 8% NPV (Thousands US$'s)						
	-15%	-10%	-5%	Base Case	5%	10%	15%
Price	169,280	201,023	232,604	264,049	295,621	327,086	358,561
Opex	287,520	279,774	271,903	264,049	256,330	248,464	240,574
Capex	291,856	282,648	273,334	264,049	254,866	245,552	236,297

Note: Mineral resources that are not mineral reserves do not have demonstrated economic viability.

The analysis demonstrated that of the variables analyzed, the IRR and NPV are most sensitive to variances in LiOH·H$_2$O price. For each 5 percent increase (decrease) in the LiOH·H$_2$O price, the after-tax 8 percent NPV increased (decreased) approximately US$ 31 million. With respect to capital and operating expenditures, for each 5 percent increase (decrease), the after-tax 8 percent NPV increased (decreased) approximately US$ 9 million and US$ 8 million, respectively.

Figure 22-3. Pre-Tax Sensitivity Chart
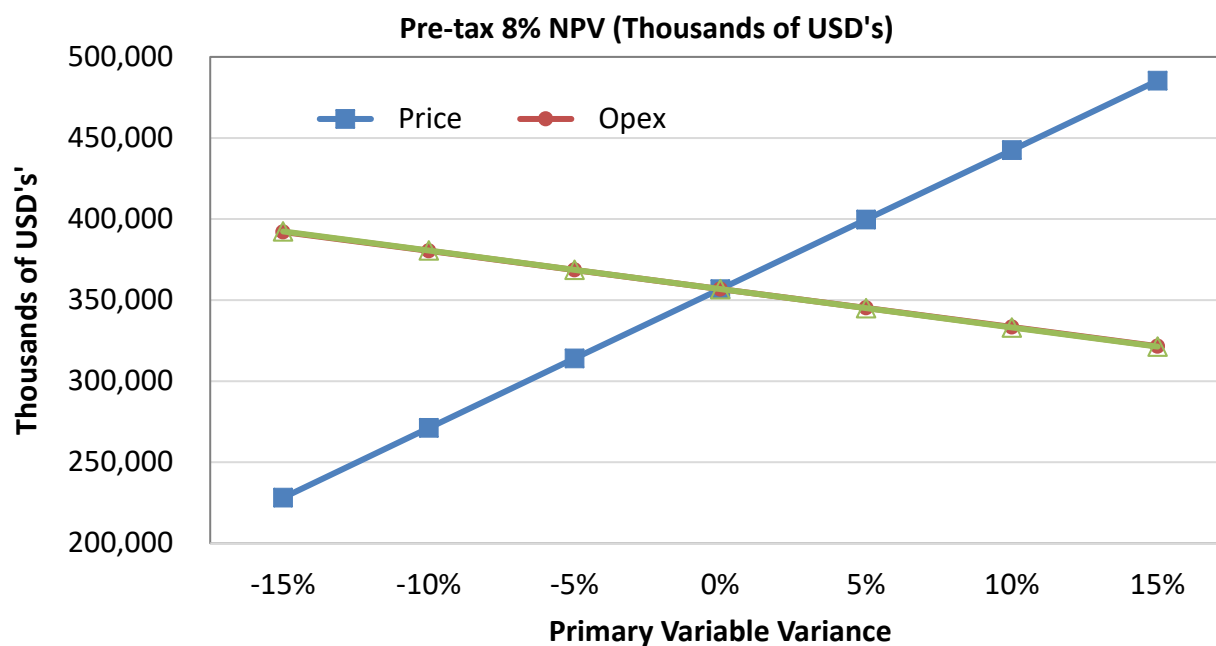
Figure 22-4. After-Tax Sensitivity Chart

After Tax 8% NPV (Thousands of USD's)
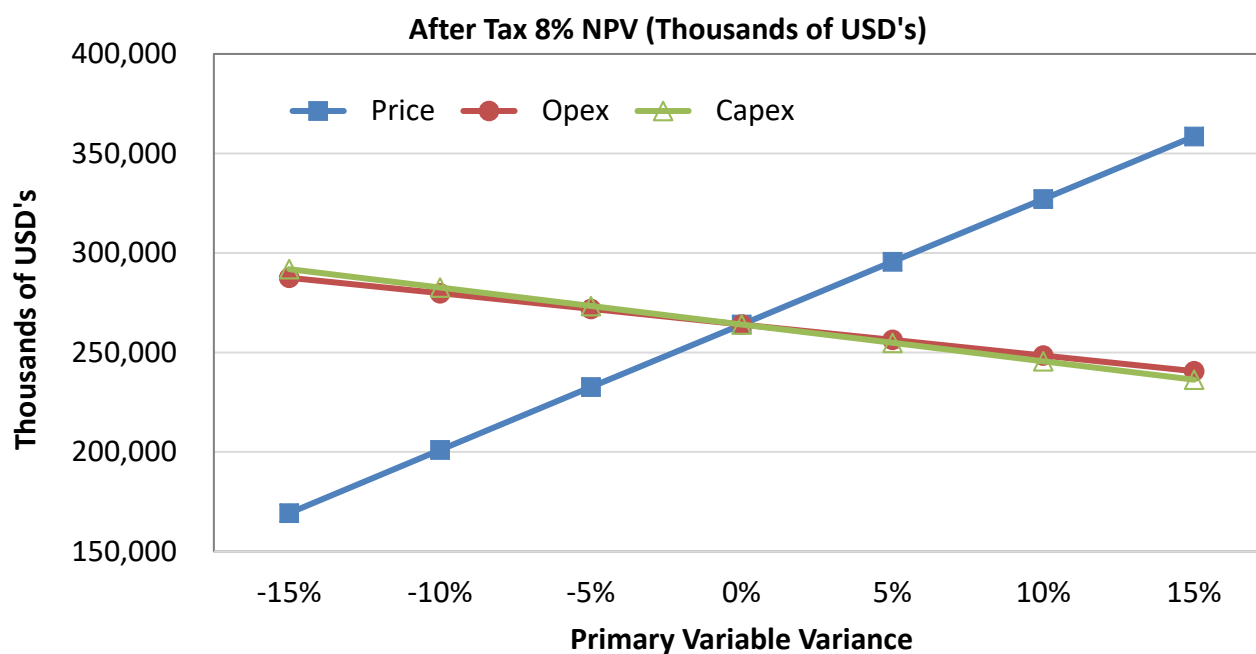
The sensitivity analysis also demonstrates that pre-tax and after-tax NPV are also very sensitive to the discount rate as is illustrated in Table 22-4. Discount Rate Sensitivity.

Table 22-4. Discount Rate Sensitivity

Discount Rate	Pretax NPV	After-Tax NPV
5%	$556 million	$426 million
8%	$357 million	$264 million
10%	$263 million	$189 million
12%	$192 million	$131 million

Note: Mineral resources that are not mineral reserves do not have demonstrated economic viability.

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Table 22-5. Summary of Cash Flow Model

	Totals	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026-'30	2031-'35	2036-'41
Project Years		-3	-2	-1	0	1	2	3	4	5	6 - 10	11 - 15	16 - 21
Income Statement (000's USD)													
Revenue	2,454,256	-	-	-	-	49,373	118,608	141,875	170,250	187,275	825,713	614,663	346,500
Direct Costs													
Labor:	97,067	-	-	-	-	4,853	4,853	4,853	4,853	4,853	24,267	24,267	24,267
Supplies and Services:													
Operating	484,795	-	-	-	-	9,100	23,848	25,103	25,103	25,103	125,513	125,513	125,513
Maintenance	36,996	-	-	-	-	694	1,820	1,916	1,916	1,916	9,578	9,578	9,578
Services	3,426	-	-	-	-	64	169	177	177	177	887	887	887
Subtotal	525,216	-	-	-	-	9,858	25,836	27,196	27,196	27,196	135,978	135,978	135,978
Utilities and Fuels:	86,272	-	-	-	-	1,619	4,244	4,467	4,467	4,467	22,336	22,336	22,336
Total Direct Costs	708,555	-	-	-	-	16,331	34,933	36,516	36,516	36,516	182,581	182,581	182,581
Non-Operating Cash Costs													
Royalties	73,628	-	-	-	-	1,481	3,558	4,256	5,108	5,618	24,771	18,440	10,395
Insurance	10,000	-	-	-	-	500	500	500	500	500	2,500	2,500	2,500
Local & State Taxes													
Nevada Net Proceeds	69,600	-	-	-	-	378	1,819	3,614	5,231	6,229	25,558	19,848	6,923
Property Taxes	63,517	-	-	-	-	2,873	2,878	2,884	2,889	2,894	14,944	16,756	17,399
Other Taxes	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Local & State Taxes	133,118	-	-	-	-	3,251	4,698	6,498	8,119	9,124	40,502	36,604	24,322
Total Cash Costs	925,301	-	-	-	-	21,564	43,689	47,771	50,243	51,758	250,354	240,124	219,798
EBITDA	1,528,955	-	-	-	-	27,809	74,919	94,104	120,007	135,517	575,359	374,539	126,702
Depreciation, reclamation & other non-cash	325,760	-	-	-	-	20,584	38,131	32,464	27,666	24,203	125,464	34,945	22,303
Total Costs	1,251,061	-	-	-	-	42,147	81,820	80,235	77,909	75,961	375,818	275,070	242,102
Profit/(Loss) Before Income Taxes	1,203,195	-	-	-	-	7,225	36,788	61,640	92,341	111,314	449,894	339,594	104,398
Income Taxes	241,448	-	-	-	-	-	2,820	10,825	19,385	24,715	94,758	72,404	16,541
Net Profit/(Loss)	961,748	-	-	-	-	7,225	33,968	50,815	72,956	86,600	355,136	267,190	87,857
Cash Flow (000's USD)													
Net Profit/(Loss)	961,748	-	-	-	-	7,225	33,968	50,815	72,956	86,600	355,136	267,190	87,857
Depreciation	325,760	-	-	-	-	20,584	38,131	32,464	27,666	24,203	125,464	34,945	22,303
Reclamation (Includes refund of bond)	(7,734)	-	-	-	-	-	-	-	-	-	-	-	(7,734)
Other Non-Cash	-	-	-	-	-	-	-	-	-	-	-	-	-
Working Capital	(22,725)	-	-	(4,340)	(18,385)	(7,173)	(9,852)	(3,695)	(4,664)	(2,799)	6,064	6,240	15,879
Capital	(335,875)	-	(16,493)	(104,977)	(152,478)	(500)	(500)	(500)	(500)	(500)	(22,142)	(29,142)	(8,142)
Net Cash Flow	921,174	-	(16,493)	(109,317)	(170,862)	20,136	61,746	79,085	95,457	107,504	464,522	279,233	110,163

	After Tax Returns	Pre-Tax Returns
IRR	21.0%	24.2%
Undiscounted net present value (NPV)	921,174	1,162,621
5% NPV	425,737	555,978
8% NPV	264,049	356,771
10% NPV	188,621	263,391
12% NPV	131,284	192,081
Payback Period (Years)	4.4	4.1

N.B. Mineral resources that are not mineral reserves do not have demonstrated economic viability.

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23 Adjacent Properties

23.1 Silver Peak Operations

As shown in Section 4 (Figure 4-2), the claims controlled by PEM are immediately adjacent to the Albemarle Silver Peak Operations, the only operating lithium mine in North America. Albemarle Corporation is the present owner of the brine processing evaporation pond and plant complex, which has been in production since 1967 using the traditional evaporation pond method to concentrate the brines before processing on-site to make a range of lithium carbonate and lithium hydroxide products. According to Spanjers (2015), Albemarle (Rockwood at the time of award) received DOE matching grants in 2010 to upgrade and rehabilitate several evaporation ponds, drill new production wells and rehabilitate several older wells, as well as provide some upgrades to the processing plant..

Previous owners include Cyprus Minerals, Newmont (Foote Mineral Company), Chemetall-Foote Corporation and Rockwood Holdings, Inc. Albemarle Corporation purchased Rockwood Holdings, Inc. in 2014 for US$ 6,200 million, which included the Salar de Atacama brine operation in Chile, a hard-rock lithium resource and lithium chemical processing plant in North Carolina and the Silver Peak operations in Nevada.

Production data from the Silver Peak Operations is proprietary and unpublished. However, the 2014 Rockwood Holdings Inc. Annual Report cites production in 2013 at 870 tonnes (960 tons) lithium metal equivalent. Previous production was reported by Price, Lechler, Lear and Giles (2000) at 25,600 tonnes (28,220 tons) Li through 1991. Garrett (2004) reported 5,700 tonnes (6,283 tons) of LCE, which is equivalent to 1,072 tonnes (1,182 tons) of Li in 1997. The Li concentration in the production brines averaged 400 ppm initially, dropped to 300 ppm in 1970 and 160 ppm in 2001 (Garrett, 2004). Table 23-1. Selected Albemarle Well Analyses, shows selected analyses from Albemarle's Annual Water Pollution Control Permit reports.

The historical lithium brine resource in Clayton Valley has been estimated at 0.7 Mt Li (Kunasz, 1975), 0.65 Mt Li (Price et al., 2000) and 0.4 Mt Li (Yaksic and Tilton, 2009). These resource estimates cannot be confirmed and are not necessarily indicative of the mineralization on the property that is the subject of this technical report. It is reported that Albemarle believes that the Silver Peak Operations are likely to continue for the next 20 years.

Table 23-1. Selected Albemarle Well Analyses

Laboratory Used		WETLAB	WETLAB	WETLAB	WETLAB	WETLAB	WETLAB
Sampling Date		14-Jan-09	15-Dec-09	15-Dec-10	15-Dec-11	17-Dec-12	30-Dec-13
	Sample ID	**392 Well**	**109 Well**	**392 Well**	**378 Well**	**304 Well**	**8B Well**
Notes		1	2	1	3	4	5
Method for metals analysis	Units	ICPMS	ICPMS	ICPMS	ICPMS	ICPMS	ICPMS
Total Boron (B)	mg/L	50	58	52	40	58	130
Total Lithium (Li)	mg/L	82	170	120	140	120	310
Total Calcium (Ca)	mg/L	160	520	390	350	-	460
Total Magnesium (Mg)	mg/L	92	190	310	260	ND	340
Total Potassium (K)	mg/L	2200	4900	2500	2700	3400	7800
Total Sodium (Na)	mg/L	26000	46000	25000	26000	33000	55000
Dissolved Sulphate (SO4)	mg/L	2200	2600	1800	1600	2400	5400
Dissolved Chloride (Cl)	mg/L	49000	88000	36000	34000	52000	94000
Total Dissolved Solids	mg/L	71000	13000	49000	57000	84000	160000
- = Not analysed	1	Latitude 37°46'56.05"N; Longitude 117°32'57.53"W					
ND=No data	2	Latitude 37°47'35.48"N; Longitude 117°31'35.48"W					
Notes:	3	Latitude 37°46'21.00"N; Longitude 117°33'5.42"W					
	4	Latitude 37°47'7.70"N; Longitude 117°31'23.10"W					
	5	Latitude 37°46'2.21"N; Longitude 117°34'1.14"W					

Source: Annual Water Pollution Control Permits

Spanjers (2015) indicates that, given the proximity of several of Albemarle's production wells to Pure Energy's claim area, and the broadly consistent hydrogeology that is similar beneath the two properties, it is probable that drawdown from the Albemarle wells is affecting lithium brines beneath the PEM claim area. The full extent of this likely effect is not known at this time.

23.2 Other Claimants

Placer claims for lithium exploration in both brine and clay forms are held by other companies in the Clayton Valley area. Advantage Lithium (Advantage) and Nevada Sunrise as a joint venture hold unpatented claims to the west of PEM's claims and immediately east of Albemarle's property. In early 2017, the joint venture completed a six-hole drilling program on the property east of Albemarle known as Clayton NE. In a press release dated April 3, 2017, Advantage announced that all six holes intersected lithium-bearing brine zones beneath the Clayton NE claims.

Other exploration companies also hold claims in Clayton Valley. The author has been unable to independently verify the information regarding the adjacent properties that are not controlled by PEM. The information discussed in this section is not necessarily indicative of the mineralization on the PEM claims.

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24 Other Relevant Data and Information

24.1 Project Schedule

The Economic Model presented in Section 22 has been based on a project schedule presented in Figure 24-1. The Overall Project Schedule for The Clayton Valley Project. This schedule provides a timeline, over a total of 60 months, from the completion of the PEA, through the subsequent phases of Feasibility Study, Detailed Design, Construction, Commissioning and Ramp-up. This last Ramp-up to full operation stage is forecast to start in the middle of 2021 and last for 15 months. The overall timeline shown in the schedule is aggressive with a number of over-lapping major activities. The first production of lithium hydroxide monohydrate would take place in the second quarter of 2021. Nevertheless, the authors believe that the schedule is achievable.

One of the recommendations of this PEA is that PEM proceed with a pilot plant. If accepted by PEM, this pilot plant would form one of the major components of the Feasibility Study. The critical path to start the pilot plant is through the permitting. The authors recommend that this permitting process start as soon as possible. The pilot plant is forecast to be operated for 6 months, over the last quarter of 2018 and the first quarter of 2019. This would overlap with the Feasibility Study program.

The schedule indicates that the Feasibility Study program would commence, at the beginning of 2018, with additional basin-drilling activities in order to transform the Mineral Resources into Mineral Reserves.

The Feasibility Study Report is scheduled to be complete at the end of second quarter of 2019. The NI 43-101 Technical Report would follow after the completion of the Feasibility Study Report.

PEM intends to maintain the continuity of the technical team by initiating a six-month Front End Engineering Design (FEED) phase of the commercial plant towards the end of the Feasibility Study phase. One of the key areas of the FEED phase would be the selection and early engineering of the long lead items. The intention is that the end of the FEED phase would coincide with the completion of project financing and approval of the commercial scale plant by the PEM board.

The construction of the well field would likely be the longest major activity of the project at 24 months. As a result, the start of this activity is scheduled to begin in the third quarter of 2019, in advance of the final board approval.

Nine months has been allowed for the Detailed Design and Engineering phase. Engineering work

performed during the PEA has established that the electrolysis and crystallizer areas

(Areas 500 and 600 respectively) would include the longest delivery items. The technology suppliers,

involved with these two areas, indicated that the delivery durations would be 12 months.

Figure 24–1. The Overall Project Schedule for The Clayton Valley Project
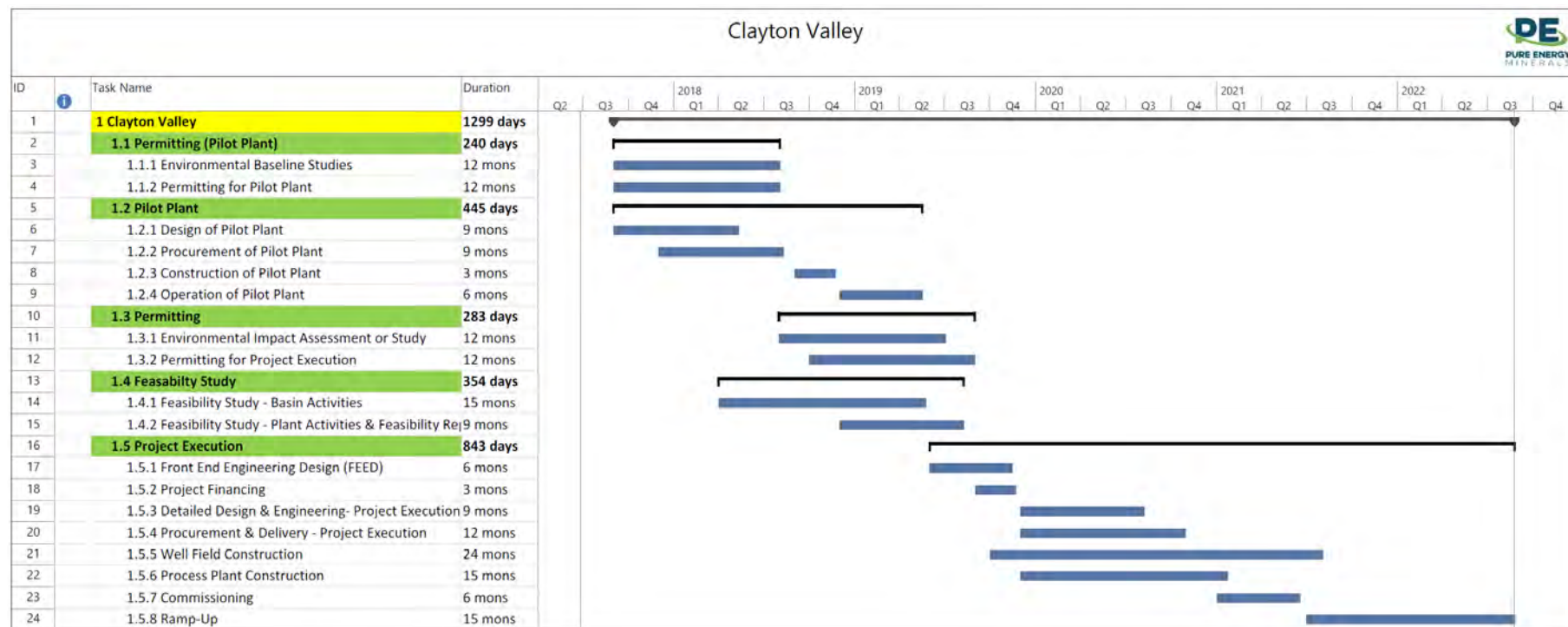
The construction of the process plant is anticipated to require 15 months. The first of the two quarters allocated for commissioning period is scheduled for the fourth quarter 2020, together with the completion of construction.

The ramp up period is scheduled to begin in the second quarter of 2021. The use of the solvent extraction technology for the recovery of lithium represents a first-of-a-kind application of this technology; as a result, a ramp-up period of 15 months has been allowed.

The first production of lithium hydroxide monohydrate would take place in the second quarter of 2021. The authors believe that the schedule is achievable but they caution that there is a degree of risk associated with this schedule.

24.2 Opportunities

One of the goals of the pilot plant would be to establish a more accurate estimate for the consumption of organic solvent. There is an opportunity to reduce the operating costs of the commercial plant if the organic consumption is less than has been forecast during the PEA testwork. The same is true for other reagents which are necessary in the process. The pilot plant will enable evaluation of usage to fix reagent costs more accurately and to identify and test potential operating cost reduction opportunities.

Recent transactions closed by Pure Energy (Pure Energy new release, May 31, 2017) with Lithium X Energy Corp. (LiX), GeoXplor Corp., and Clayton Valley Lithium Inc. have resulted in acquisition of an interest in 756 unpatented mineral claims covering approximately 6,070 hectares (15,000 acres) of LiX claims in Clayton Valley. With the addition of the LiX claims, Pure Energy has an interest in 1,085 unpatented mineral claims covering approximately 10,600 hectares (26,300 acres) in Esmeralda County. Highlights of the transaction include: control of greater than 10,600 hectares (26,300 acres) of Federal mining claims, adding new exploration targets with demonstrated lithium brine in the north part of Clayton Valley, and control of mineral claims surrounding Albemarle's Silver Peak Lithium Mine on the north and south. The newly acquired mineral rights could support a substantial increase to the resource estimate in the future.

A basal conglomerate has been identified in the Clayton Valley basin fill. Where drilled in CV-8, it hosts higher grades of lithium and lower concentrations of divalent cations. Its porosity is also highly variable, ranging from open space to a relatively low porosity clay matrix. This conglomerate unit has not been thoroughly tested and may contain additional brine resource.

24.3 Project Risks

The significant risks that have been identified for the project include, but are not limited to:

General

- Confirmation of access to water for plant operations;

- Delays in environmental approval;

- The future demand and pricing for lithium hydroxide monohydrate different than the forecasts provided by Benchmark Mineral Intelligence Ltd.;

- Project schedule extended beyond that shown in Section 24.1;

- Capital and / or operating costs underestimated;

- Inability to secure a buyer or off-take for some or all of the lithium hydroxide monohydrate product;

- Inability to obtain water rights to develop the resource into a reserve;

- Delayed issuance of water rights permits and waivers to drill wells and conduct hydrologic testing;

- Inability to get the required permitting for the disposal of spent brine.

The major mitigation for these risks is to continue project development in a systematic and stepwise fashion to the feasibility stage and ultimately to commercial construction, such that the initial financial hurdles and downside risk are modest in scale. Demand and pricing forecasts would continue to be assessed during the Feasibility Study and the project economics would be evaluated as part of that study.

Basin Related

Potential risks related to basin operations primarily to the uncertainties inherent in the level of testwork performed at the PEA level of this report. Examples of such risks and uncertainties include:

- Delays in production well drilling;

- Inability to pump brine from the basin at the required rate, requiring additional wells or more complex pumping programs;

- Inability to extract over time the full volume of the resource;

- Rapid infiltration basins do not perform as expected to return lithium-depleted brine to the aquifer;

- Changes in brine grade during wellfield operations different than expected, causing declining or higher-cost lithium production;

- Interference from pumping operations at the adjacent Albemarle Silver Peak Operation different than expected.

The major mitigation for these risks at this level of the project is to reduce the uncertainty through additional field studies, numerical modeling of wellfield operation, and numerical modeling of the potential changes in brine grade during wellfield operations. This work would be performed during the forthcoming Feasibility Study. The long-term history of pumping and lithium production at the adjacent Albemarle Silver Peak Operation provides a positive indication that brine can be extracted from the aquifer at a commercially viable rate.

PEM has prepared a general estimate of the number of wells and flow rates needed to deliver brine to the future mine and there is risk in that projection. The project development timeline includes significant well drilling, pumping tests, and other basin activities during t™he Feasibility Study. These wells and tests will substantially increase the certainty in the well field design and estimated flow rates during commercial extraction.

Process Plant Related

Potential process risks relate primarily to the uncertainties inherent in the level of testwork performed at the PEA level of this report. Examples of such risks and uncertainties include:

- Performance over an extended period of time of the individual unit processes;

- Technical and/or chemical issues related to integration of the unit processes;

- Potential buildup of deleterious elements at different points in the flowsheet;

- Reagent consumption that may differ significantly from that obtained during the mini-pilot test;

- Metallurgical recovery that may differ from that measured during the mini-pilot test;

- Scalability of the flowsheet to a commercial plant.

On the recommendation of the authors, PEM has proposed a pilot plant project in order to decrease the risks associated with the novel process developed by Tenova and its technology partners. Design, construction, and operation of the pilot plant would be the major factor mitigating the overall risk due to uncertainty, at the PEA level, of the study performed as of the effective date of this report. Recommendations regarding pilot plant scale testing are presented in sections 13 and 26. Data from the

pilot plant would be used to reduce the uncertainty and evaluate effective methods to overcome the identified risks in a full-scale commercial facility.

The pilot plant itself would carry risks related to recovery of lithium and production of LiOH·H$_2$O at a commercial scale. Examples of such risks include:

- Potential buildup of deleterious elements at different points in the flowsheet that could not be reduced to acceptable levels;

- Inability of the pilot plant to produce LiOH·H$_2$O product meeting the required criteria;

- The economic results of the pilot plant would not support continuing to commercial production with the Tenova process; this would be determined as part of the subsequent Feasibility Study.

The mitigation for these risks would be to shift to another process technology for the Clayton Valley Project.

Assuming that the pilot plant testing and the Feasibility Study indicated that the project should go to commercial-scale production using the Tenova process and the commercial-scale plant was built, there would be a risk that the commercial plant would fail to achieve the predicted results. This high-level risk could be considered as the aggregate of the following sub-risks:

- Inability of the commercial plant to produce LiOH·H$_2$O product meeting the required criteria;

- Inadequate or missing scale up data from the pilot plant;

- Inability of the commercial plant to process the required volumes of brine;

- Inability of the commercial plant to achieve the forecast metallurgical recoveries;

- The economic results of the commercial plant are materially different from those forecast by the Feasibility Study.

The risks associated with the commercial deployment of a novel technology are partially mitigated by targeting more modest near-term goals, such as the pilot plant discussed above. Further risk assessment would be conducted as part of the forthcoming Feasibility Study for the Clayton Valley Project. Further mitigation pathways for commercial-scale risks would be evaluated and implemented at that time.

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25 Interpretation and Conclusions

The Clayton Valley Lithium Project is a lithium-enriched brine aquifer deposit in Clayton Valley, Nevada, USA that is amenable to mining using wells to extract brine for processing to a saleable lithium hydroxide monohydrate (LiOH·H$_2$O) product. The process plant design has been based on the novel Tenova proprietary process to produce LiOH·H$_2$O from the brine input as received from PEM for the mini-pilot testwork. The Tenova process differs from conventional processing of lithium brine using evaporation ponds. The process relies on solvent extraction to remove the lithium from the brine. The Clayton Valley Project would be the first commercial application of the Tenova process for lithium recovery.

The annual capacity of the plant has been selected on the basis of 10,000 tonnes (approximately 11,000 tons) of lithium carbonate equivalent (LCE), which correlates to about 11,500 tonnes (approximately 12,650 tons) of LiOH·H$_2$O.

The Resource Estimate totals 40,900 tonnes (45,085 tons) of elemental lithium. This can also be represented as 217,700 tonnes (240,000 tons) on an LCE basis or 247,300 tonnes (272,600 tons) as LiOH·H$_2$O. The average lithium concentration is 123 mg/L in the volume of the Resource Estimate, based on the calculated lithium mass and the theoretical drainable volume of the host brine aquifer. A substantial part of the brine volume falls between concentrations of 65 mg/L and 221 mg/L lithium.

The Resource Estimate represents a decline from the reported maiden Resource Estimate described in Spanjers (2015). The main components of the reduction are a smaller surface area projection of the resource and a lower estimated specific yield. These factors are partially offset by a significant increase in the depth and thickness of the brine resource and the addition of higher lithium grades at depth. Although a large area in the south part of the Project was excluded excluded from the resource based on negative results from exploration drilling to a depth of approximately 500 meters (1,640 feet), there remains significant exploration potential in the area of the Resource Estimate, at depth to the south based on analyses of brine from CV-8 and seismic results, and in newly acquired properties to the north.

The study projects an estimated average "steady-state" operating cost of $3,217 per tonne of LiOH·H$_2$O and product sale pricing ranging between $9,000 and $16,500 per tonne over a 20-year mine life. Having these margins and an estimated initial capital cost of $297 million, the project would achieve pay-back in just over 4 years. The project after-tax NPV at an 8 percent discount rate is forecast to be US$ 264.1 million, with an estimated IRR of 21 percent.

The economic analysis and the PEA are based on inferred resources, which are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. The PEA is preliminary in nature and there is no certainty that the PEA will be realized.

26 Recommendations

It is the opinion of the authors that the results of this study warrant continued efforts to advance the Clayton Valley Lithium Project. The authors believe that the content of this PEA is sufficient to justify proceeding with the additional drilling to upgrade the Resource Estimate, the process pilot plant program, the permitting for both the pilot plant & the commercial plant, and the preparation of a Feasibility Study.

The authors recommend the following work be undertaken to support further project development:

1) Drilling, sampling, well construction and testing, at depth in areas in the vicinity of SPD-8, northwest of CV-8, and on newly acquired properties west of CV-8, to upgrade the Resource Estimate to Indicated and Measured categories and eventually leading to a Proven or Probable Mineral Reserve Estimate.

2) Update the geologic block model with data collected during the exploration field activities described above. The updated geologic block model should be used to develop an updated Resource Estimate at the Indicated and Measured category and provide the framework for a numerical model to simulate lithium brine mining operations for a Mineral Reserve Estimate.

3) Construct and operate a numerical flow, solute transport, and fluid density model to project an upgraded Resource Estimate and a Reserve Estimate. This model should include:

   a) Optimization of a planned extraction wellfield and pumping schedule for further development of the mining method (e.g., phased wellfield build-out zones, phased pumping strategies, etc.)

   b) Assessment of the potential changes in brine mineral concentrations during long-term pumping of a brine extraction wellfield and operation of infiltration basins for spent brine

   c) Assessment of potential impacts from existing pumping at the adjacent Albemarle Silver Peak Operation

4) Integrated pilot plant testwork to confirm scalability of the TAT mini-pilot plant results and develop design information for a commercial, full-scale processing facility. The key objectives of the pilot plant program would be:

   a) To confirm the performance of individual unit processes (LiP^{TM}, LiSX^{TM} and LiEL^{TM}), at a demonstration scale, in cooperation with Tenova's technology partners GE and Noram;

   b) To demonstrate continuous operation of the complete process flowsheet at a larger scale and identify and address issues relating to the integration of the different process modules;

   c) To identify and address issues relating to scalability to a commercial plant;

   d) To determine and provide first hand evidence of the chemistry of the aqueous raffinate (the calcium and magnesium salts as well as the lithium-depleted brine) so that its suitability for return to the basin can be confirmed;

   e) To identify and mitigate potential deleterious species that may build up at different points in the process flowsheet;

   f) To confirm reagent and solvent consumption and energy requirements, and to identify opportunities for improvement in overall cost of consumable materials;

   g) To identity opportunities for improvement in process kinetics and/or operating costs;

   h) To develop information regarding operating parameters and data needed for design of a commercial-scale plant; and

   i) To produce sufficient quantities of battery grade lithium hydroxide monohydrate to provide potential customers with enough material to allow them to evaluate and confirm that it meets their specifications.

5) Field work to support the permitting process for both the pilot plant and the commercial plant.

6) The preparation of a Feasibility Study.

Table 26-1. Estimated Costs for the Feasibility Study Stage summarizes the estimated costs to accomplish the recommendations above.

Table 26-1. Estimated Costs for the Feasibility Study Stage

Activity	Estimated Cost ($)
Pilot Plant Design, Supply and Construction	6,000,000
Operation of Pilot Plant (6 months)	4,000,000
Permitting	1,500,000
Additional Drilling	2,100,000
Hydrogeological Modeling	200,000
Hydrogeology Costs	500,000
Process Plant Modeling	100,000
Preparation of Feasibility Study	1,800,000
Preparation of NI 43-101 Technical Report	200,000
Owner's Costs	1,600,000
Total Estimated Costs =	**18,000,000**

These costs have been included in the capital cost estimate.

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28 Abbreviations and Acronyms

2D	two-dimensional
3D	three-dimensional
°C	degree(s) Celsius
°F	degree(s) Fahrenheit
ACS	American Chemical Society
AF	acre-feet
AFA	acre-feet per annum
amsl	above mean sea level
AMPRD	absolute mean paired relative difference
APHA	American Public Health Association
ASTM	American Society of Testing and Materials
bgs	below ground surface
BAPC	Bureau of Air Pollution Control
Benchmark	Benchmark Mineral Intelligence Ltd.
BLM	U.S. Bureau of Land Management
bls	below land surface
BMRR	Bureau of Mining Regulation and Reclamation
BWM	Bureau of Waste Management
BWPC	Bureau of Water Pollution Control
Capex	capital expenditure
CFR	Code of Federal Regulations
cfs	cubic foot (feet) per second
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
cm	centimeter(s)
CSAMT / MT	controlled-source audio-magnetotellurics / magnetotellurics
CV	Clayton Valley
CWA	Clean Water Act
d	day
DBS&A	Daniel B. Stephens & Associates
DWRC	dual wall reverse circulation
EPCRA	Emergency Planning and Community Right-to-Know Act
EA	Environmental Assessment
EHS(s)	Extremely Hazardous Substance(s)
EIS	Environmental Impact Statement

EPCRA	Emergency Planning and Community Right-to-Know Act
FOB	free on board
FRE	fiberglass reinforced epoxy coating
ft	foot (feet)
ft^3	cubic foot (feet)
ft^3/d	cubic foot (feet) per day
ft^3/s	cubic foot (feet) per second
ft^3/yr	cubic foot (feet) per year
FWS	U.S. Fish and Wildlife Service
G&A	general and administrative
g/cm^3	gram(s) per cubic centimeter
g/L	gram(s) per liter
gal	gallon(s)
gpm	gallon(s) per minute
GAII	Geochemical Applications International Inc.
GE	GE Water & Process Technologies
GPS	global positioning system
GSA	GeoSystems Analysis
h	hour
H_2SO_4	sulphuric acid
ha	hectare(s)
HCM	hydrogeologic conceptual model
HDS	High Density Sludge
hp	horse power
in	inch (inches)
IRR	internal rate of return
IX	Ion Exchange
lb(s)	pound(s)
lb/ft^3	pound(s) per cubic foot
lb/in^2	pound(s) per square inch
kg	kilogram(s)
kg/cm^2	kilogram(s) per square centimeter
km	kilometer(s)
km^2	square kilometer(s)
kV	kilovolt(s)
kW-hr	kilowatt-hour(s)
L	liter(s)

LEPC(s)	Local Emergency Planning Committee(s)
Li	lithium metal
LiEL™	TAT's proprietary process using electrolysis for the recovery of lithium
LiSX™	TAT's proprietary Solvent Extraction process for the recovery of lithium
LiP™	TAT's proprietary preparatory process for the removal of calcium and magnesium ions
LiX	Lithium X Energy Corp.
LCE	lithium carbonate equivalent
LiOH·H$_2$O	lithium hydroxide monohydrate
LoM	life of mine
L/min	liter(s) per minute
L/s	liter(s) per second
Lpm	liter(s) per minute
m	meter(s)
m^3	cubic meter(s)
m^3/d	cubic meter(s) per day
m^3/s	cubic meter(s) per second
m^3/yr	cubic meter(s) per year
mg/L	milligram(s) per liter
mi	mile(s)
mi^2	square mile(s)
min	minute
Min.	minimum
mL	milliliter(s)
mL/min	milliliter(s) per minute
mm	millimeters
Ma	million years
MACT	Nevada maximum achievable control technology
Max.	maximum
Montgomery	Montgomery & Associates
MR	mud rotary
msl	mean sea level
Mt	million metric tonne(s)
Mton	million U.S. short ton(s)
MW	Mega watts
NAC	Nevada Administrative Code
Na$_2$CO$_3$	sodium carbonate or soda ash
NaOH	sodium hydroxide or caustic soda

NCA	nickel-cobalt-aluminium, as applied to lithium-ion batteries
NDEP	Nevada Division of Environmental Protection
NDOW	Nevada Department of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
NI	Canadian National Instruments
NMC	nickel-manganese-cobalt, as applied to lithium-ion batteries
NMR	Nuclear Magnetic Resonance
Noram	Noram Engineering and Constructors Ltd.
NPV	net present value
NRHP	National Register of Historic Places
Opex	Operating costs
PEA	Preliminary Economic Assessment
PEM	Pure Energy Minerals Ltd.
PFS	Preliminary Feasibility Study
PoO	plan of operations
Ppm	parts per million
Project	The Clayton Valley Lithium Project
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QC	quality control
QMS	Quality Management Systems
QPs	qualified persons
R&D	Research and Development
R&PP	Recreation and Public Purposes
RBRC	Relative Brine Release Capacity
RCRA	Resource Conservation and Recovery Act
ROW	Right-of-way
rpm	revolutions per minute
RSD	relative standard deviation
SEDAR	System for Electronic Document Analysis and Retrieval
SG	specific gravity
SHPO	State Historic Preservation Office
SLPO	Silver Peak Lithium Operation
SQM	Sociedad Quimica y Minera
SR	State Route

SRK	Steffen, Robertson and Kirsten
SRCE	Standardized Reclamation Cost Estimator
Std. Dev.	Standard Deviation
SwExp	Southwest Exploration Services LLC
SWPPP	Storm Water Pollution Prevention Plan
SWReGAP	Southwestern Regional Gap Analysis Program
SX	Solvent Extraction
Technical Report	NI 43-101 Preliminary Economic Assessment Technical Report
Tesla	Tesla Motors, Inc.
TAT	Tenova Advanced Technologies, formerly Tenova Bateman Technologies
ton	US Customary Ton
tonne or t	metric tonne(s)
TDS	total dissolved solids
TPQ	Threshold Planning Quantity
t/y	tonne(s) per year
US	United States
USEPA	US Environmental Protection Agency
USGS	US Geologic Survey
USACE	US Army Corps of Engineers
V	Volt
WD	Wheel Drive i.e., two or four wheel drive
WETLab	Western Environmental Testing Laboratory
WPCP	Water Pollution Control Permit
µg	micrograms
µm	micrometers

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