

# **NI 43 – 101 Technical Report**

for the

## **Peace River Lithium Project**

Northwest Alberta, Canada

*prepared for*



**NeoLithica Ltd.**

*by*



Enlighten Geoscience Ltd.

Report Date:

June 9, 2022

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## Certificate of Author

I, Neil Watson, P. Geol. / P. Geo., as 'The Author' of the technical report entitled 'NI 43-101 Technical Report on the Peace River Lithium Project, Alberta, Canada' with the effective date of June 9, 2022, and with the issue date of June 9, 2022, and prepared for NeoLithica Ltd. ("Issuer"), do hereby certify that:

- I am currently employed as the Director, Geology of Enlighten Geoscience Ltd. with offices at 2710 – 21 Avenue SW Calgary AB, T3E 0H4.
- I graduated with a Bachelor of Science (Specialization in Geology) from the University of Alberta in Edmonton, Alberta in 1983.
- I am a Professional Geologist registered with the Association of Professional Engineers and Geoscientists of Alberta (APEGA Member# 44713) and the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC Member # 53971).
- I have worked as a geologist for a total of 39 years since my graduation from university. My experience includes exploration and technical management on a variety of conventional and unconventional oil and gas prospects in the Alberta Basin (Alberta and British Columbia, Canada and Montana, United States of America [USA]), the Williston Basin (Saskatchewan and Manitoba, Canada and North Dakota, USA), the Foreland Fold and Thrust Belt (Alberta and British Columbia, Canada and Montana, USA), the Delaware Basin (Texas, USA), the Ucayali Basin (Peru), and the Neuquén Basin (Argentina). This experience includes many evaluations in the geological formations considered in this report.
- 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.
- I am responsible for the entirety of the technical report entitled 'NI 43 – 101 Technical Report on the Peace River Lithium Project, Alberta, Canada' with the effective date of June 9, 2022.
- As of the effective date of the certificate– to the best of my knowledge the Technical Report herein contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
- I have no personal knowledge, as of the date of this certificate, of any material fact or material change that is not reflected in this Technical Report.
- I am independent of the Issuer, NeoLithica Ltd., applying all the tests in section 1.5 of the NI 43-101 instrument.

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- I have no interest or involvement in the Property, or with the Issuer.
- I have read NI 43-101 and Form 43-101F1, and the Technical Report has been prepared in accordance with that instrument and form.

This report replaces an earlier version dated and authenticated on June 8, 2022.

Dated on June 9, 2022

Neil Watson, P. Geol., P. Geo.

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## I. Executive Summary

The Author was engaged by the Issuer, NeoLithica Ltd., to produce an independent NI 43-101 Technical Report on the Peace River Property in northwest Alberta. The Author employed data and software provided by commercial data sources, open-source software, public domain analyses and technical reports, the Issuer, and Coal and Mineral Development Unit of the Alberta Department of Energy.

The Peace River Project (PRP or Permits) is comprised of thirty contiguous Metallic and Industrial Minerals Permits issued by the Alberta Energy Ministry. As summarized on the Alberta Energy website, Metallic and Industrial Minerals Permits grant the Permit holder "...the exclusive right to explore for Alberta-owned metallic and industrial minerals in a specified location. Other jurisdictions in Canada use the term "mineral claim" for this type of agreement. A permit can be held for up to 14 years and is not renewable. While there is no annual rent, permit holders are required to conduct exploration work and must report on the work every two years...". Permits can be converted to Metallic Minerals Leases once a deposit has been confirmed.

These parcels extend from Twp 74, Rge 4W6M to Twp 85, Rge 17W5. The southern edge of the PRP is 20 km by highway from the regional centre of Grande Prairie, and the Town of Peace River is 35 km west of the northernmost Permits. Scheduled and charter air service is available at both municipalities. The Permits are intersected by Primary and Secondary Highways and other road access is present along numerous points along the property.

The property straddles the Plant Hardiness Regions 3a and 3b with temperatures down to -40.0°C. The Average High Temperature of 22.8°C. occurs in June. Although these temperature ranges may appear extreme, there is a long-established ability to be able to operate year-round.

Although Petroleum and Natural Gas Leases and Licences completely intersect the Permits locations conflict between the production of oil and natural gas with lithium brine production is not expected.

The Permits lie along the southeastern edge of the Peace River Arch (PRA). The PRA was a structurally positive feature from the Proterozoic through the immediately post-Devonian. The PRA served as a significant control on the development of various pore-space resources in the Devonian. From the earliest Carboniferous onwards, the Peace River Arch collapsed through a series of normal faults, with down-warping in the range of 1,000 m. Transpression during the Columbia and Laramide orogenies modified some pre-existing faults into flower structures.

Understanding the lithium potential of the Devonian Fms in the PRP requires an understanding of the nature and distribution of the pore-space resources and the relationship to faulting and fracturing.

The Granite Wash is a diachronous lithostratigraphic siliciclastic unit derived from the granitic and metamorphic rocks of the PRA and is both the substrate of and interbedded with the Middle to Upper Devonian carbonate-based formations. The highly variable thickness of the Granite Wash is controlled by the infilling of horst-and-graben features of the Precambrian surface. The Devonian age of the Granite Wash is assigned due to the interbedding with the Devonian Fms.

Detailed reservoir mapping of the Granite Wash was not conducted for this report. Given the discrete fault-controlled distribution of the Granite Wash and the onlapping against the Peace River Arch, the potential exists for thick Granite Wash lithium-rich water reservoirs.

The Lower to Middle Devonian Elk Point Gp is a series of clastics, redbeds, evaporites, and carbonates onlapping against the PRA. The end of Elk Point time is marked by a regressive series of deposits and the development of a widespread exposure surface. The Elk Point has little pore space to contribute to this project due to onlap against the PRA. There are, however, aspects contributing to the Devonian hydrodynamic continuity.

The Beaverhill Lake Gp manifests the interplay between transgressive and regressive cycles. A post-Elk Point transgression led to the deposition of the Watt Mountain Fm shales and the Gilwood sandstone. Continued transgression led to the development of the Fringing Reef Complex of the Swan Hills and Slave Point Fms. Periods of regression led to the shales and argillaceous carbonates of the Waterways Fm. Pore-space resource is primarily located in the Fringing Reef / Bank Margin Complex proximal to the PRA. The Beaverhill Lake reservoirs along the Permit periphery has the potential to contribute to the production of lithium-rich brines, particularly where the permeability has been fault enhanced.

The Woodbend Gp developed in three main regions: the East Shale Basin, West Shale Basin, and the Peace River Arch Fringing Reef during a basin-wide transgression. In the East and West Shale Basins, the Leduc Fm developed on the Cooking Lake and Majeau Lake platforms, respectively. In the case of the Peace River Arch Leduc Fringing Reef (PRALFR), the Leduc is built on top of the crystalline basement or the Granite Wash to thicknesses of over 300 m. The shales and argillaceous/silty carbonates of the Ireton Fm dominated deposition towards the end of the Woodbend Gp due to a basin-wide regression.

The Nisku and Blue Ridge Fms of the Winterburn Gp thin as they onlap against the PRA. This carbonate shelf complex develops reservoir facies similar to the prolific Meekwap Shelf. The overall low amount of oil and gas pool development is due in large part to the highly interconnected nature of the reservoir lithologies and lack of local seals.

The PRA remained a dominant topographic feature during Wabamun time. Proximal to the exposed Precambrian basement, siliciclastics dominate the Wabamun. In locales more distal from the basement, complex relationships develop within each of the Wabamun members (in order of decreasing age: Dixonville, Whitelaw, Normandville, Lower Cardinal Lake, Upper Cardinal Lake, and Big Valley. The Upper Cardinal Lake and Big Valley have largely been removed by erosion in the vicinity of the Permits.

It is important to understand the overall thickness of the relatively continuous sediments of the Frasnian to Famennian interval due to their contribution to the pore-space volume, overall permeability, and hydrodynamics of the PRP.

When considering the lithium potential of the Devonian formations it is important to understand the stature of the Devonian within the western Canada oil and gas industry. The post-World War II oil and gas industry was inaugurated by the discovery of oil in the Nisku formation by the 1947 Imperial Oil Leduc #1 well.

The broad areal extent and thick reservoir sections lent themselves to the creation of very large oil and gas fields. The correspondingly high permeability led to very strong fluid production rates. The Devonian is, by a significant factor, the largest single host for petroleum resources in the WCSB. At the time of publication, Hay (1994) noted that Devonian reservoirs contained 50.7 and 23.0 percent of western Canada's conventional oil and gas reserves, respectively.

The conventional nature of these pools resulted in a significant portion of the reservoir height being water bearing. These 'wet' intervals are connected to a widespread aquifer, or waterdrive. A strong aquifer drive often resulted in the abundant flow of water to the wellbore. This characteristic, while deleterious to maximizing oil

and gas recovery, is expected to be a strong and beneficial factor in providing the high volume of brine necessary for the commercial production of lithium from formation waters.

The hydrodynamic setting of the Devonian is critical in establishing the capability of the Devonian formations to produce sufficient lithium-rich brine. This understanding is developed through evaluating the pressure continuity using pressure vs elevation plots (PEP) and total hydraulic head.

Observations of mineralization in the Devonian is hampered by the several hundreds of metres of overburden. With regards reservoir enhancement through mineralization, the diagenetic alteration from limestone to dolomite can result in significant increases in both porosity and permeability.

Lithium in formation waters is sourced from lithium-bearing aluminosilicates such as spodumene, petalite, and eucryptite, and in hectorite, a smectitic clay. The aluminosilicates are hosted in pegmatites.

The requirements for commercial-grade lithium concentrations include lithium-rich source rocks, tectonically driven subsidence, sufficient aquifers, geothermal activity, and sufficient time to concentrate the lithium content of the brine. All these factors are present to some extent in the region surrounding the PRP.

The Issuer has not done any exploration beyond the technical work provided in this report. The exploration information in this report is related to historical data captured through oil and gas exploration.

The issuer has not undertaken any drilling on the Permits with regards lithium or other minerals. All data considered in this report are sourced through oil and gas industry sources.

A single water sample of approximately 1 m<sup>3</sup> was taken by a representative of the Issuer on March 23, 2022, from 100/11-23-078-25W5/00, a Wabamun oil producer, for use in a test of the lithium extraction process. There was an imperative to obtain this sample due to the imminent suspension of this well. The Issuer is in the process of designing a more rigorous and comprehensive sampling program. This program will include samples from all accessible Group C producers on or proximal to the PRP.

All these data sets were reviewed for the correctness of the data and information supplemented for omissions and errors as required

The Issuer has formed a Joint Venture with Conductive Energy Inc (Conductive) to develop lithium brine resources in Alberta. Conductive has developed a proprietary medium to facilitate the extraction of lithium from brine to create battery-grade lithium carbonate. The details and methodology are beyond the expertise of the author. An evaluation of this Conductive process should be referred to an appropriate Qualified Professional.

The following sections were not applicable to or included in this Technical Report: Mineral Resource Estimates, Mineral Reserve Estimates, Mining Methods, Recovery Methods, Project Infrastructure, Market Studies and Contracts, Environmental Studies, Permitting, Social or Community Impact, Capital and Operating Costs, and Economic Analysis.

As an early-stage exploration prospect for lithium extraction, the PRP displays a number of intriguing attributes. The PRP is located in an area with well developed transportation and other infrastructure. The history and ongoing oil and gas industry activity has provided a strong capability for exploiting deep subsurface reservoirs. The PRP provides the Issuer with access to a promising combination of potential for large-scale pore-space volume, high levels of indicated permeability, and several water analyses with lithium samples above the regional exploration threshold.

Although the PRP displays significant geological potential several risk factors exist, and it is recommended that these issues be evaluated and mitigated to the extent reasonably possible. These risks include but are not limited to the following:

- Geological
  - The pore-space volume might be less than required to support the necessary volume of lithium brines.
  - The reservoirs might have inadequate permeability.
  - The reservoir pore volume, permeability and lithium concentrations must be evaluated to determine an Inferred Resource Estimate for the PRP.
  - Lithium concentrations might not reach the threshold.
  - Unforeseen reservoir effects related to the large-scale production of highly saline water.
- Engineering
  - The program and costs for drilling and completing wellbores for large volumes of fluid production.
  - The extent of the surface production facilities must be designed and estimates of the costs to construct these facilities should be developed.
  - Access to services such as drilling and completion rigs, experienced crews and facility operators, and electrical power needs to be considered.
- Processing
  - Although the mineral extraction and processing workflow developed by Conductive Energy appears to be well along the path to commercial application, it is still a relatively new technology.
- Financial and Commodity Risks
  - The Issuer might not be able to arrange the financing necessary to complete the project.
  - The future price for lithium constitutes a financial risk to the project.

It is emphasized that analysis or commentary on risk factors beyond those listed under the *Geological* heading are beyond the expertise of the Author and it is recommended an appropriate Qualified Professional be engaged to fully cost these recommendations.

This exploration program is divided into two phases: a Phase One Exploration Work Program and a Phase Two Exploration Work Program. Initializing work on Phase Two is dependent on a successful completion of Phase One providing evidence that the Phase Two work is warranted.

Phase One is designed to further the understanding of the Devonian reservoirs. This understanding would entail capturing reservoir height (h), effective porosity ( $\Phi$ ), and permeability estimations. Mapping this data will be an important input to a reservoir model to predict the nature of water flow through the combined reservoirs.

A comprehensive water sampling and analysis program of all possible Devonian water producers in the area will help understand the lithium concentration, develop a resource estimate, be an important input to an economic analysis, and help define the best location to locate wells and production facilities. The delivery of a test sample with an adequate lithium concentration to Conductive Energy will confirm the suitability of the lithium brines associated with the PRP for the Conductive Energy process.

Phase Two would undertake the development of a Pilot Plant for testing the feasibility of lithium production, establish relationships with local community and area stakeholders, communicate the aims and benefits of

lithium production at the PRP, and conduct the economic evaluation to allow for the expansion of the PRP to a full-scale lithium production project.

Phase One is expected to cost approximately \$650,000 and Phase Two is projected to cost approximately \$600,000 for a cumulative Exploration Work Program cost of \$1,250,000.

The Author is not a professional engineer and estimating the costs of drilling, completion, production facilities, and performing economic evaluations is beyond his expertise. These costs are provided as a very provisional estimate rather than predictive costing.

## II. Introduction

### A. Issuer

The Issuer of this report is NeoLithica Ltd. NeoLithica offices are located at Suite A17, 6120 - 2nd Street SE, Calgary, Alberta, Canada, T2H 2L8.

### B. Terms of Reference

The Author was engaged on February 15, 2022, to write an independent NI 43-101 Technical Report on the Peace River Project in northwest Alberta, Canada as part of its ongoing disclosure.

## III. Reliance on Other Experts

The Author relied on data from the Issuer and the Alberta Mineral Rights Inquiry online reports reviewed on March 8, 2022, for the current Metallic and Industrial Minerals tenure titles. The information about the Issuer's Interest was provided by the Issuer as public communications. No separate legal opinion was sought. No other expert information was used.

The author is not qualified to provide an opinion or comment on issues related to legal agreements, royalties, permitting, or environmental matters, and therefore, relied on the representations of the Issuer for disclaims certain portions associated with Section IV: Property Description and Location.

### A. Information, Data Sources, and Software

Several information and data sources were utilized during the composition of this report. These include:

- Petro Ninja™: Petro Ninja is an online provider of oil and gas industry data including well data, petrophysical logs, Petroleum and Natural Gas Agreements, pools, and other data types.
- Metallic and Industrial Minerals data were accessed through the *Minerals permits and leasing overview* website maintained by Alberta Energy, the provincial department governing natural resource licencing.
- AltaLIS™: is a data vendor providing a variety of spatial and imagery data for Alberta.

Software used in the composition of this report includes:

- Quantum Geographic Information System™ (QGIS): QGIS is an open-source software package designed to enable mapping of a variety of data sets.

- Golden Software™: Products used include Surfer™ (gridding of geospatial datasets), Strater™ (cross-section construction), and Grapher™ (graphing application).
- Microsoft Office™: Excel™ and Word™ were used for a significant amount of data collation, manipulation, and calculations.

A variety of technical and scientific publications and other resources were accessed to create this report. These sources are documented in the References section of this report.

A site visit of the property was not conducted for this report since such a visit was deemed unnecessary. The factors making a site visit unwarranted include:

- The Devonian formations from which lithium brines will be produced are at significant depths (>1,500 m) below the current topographic surface. This depth precludes the inspection of any outcrops or exposures of the target formations, including the observation of any mineralization correlatable to the presence of lithium. Evaluation of the Project was conducted based solely on data retrieved by subsurface methods commonly applied in the oil and gas industry.
- The surveyed coordinates, elevation of wellbores, and other geodetic information is based on survey data submitted by industry operators to the Alberta Energy Regulator (AER).
- The location information of the Permits (including that in the ESRI shapefiles) has been sourced from Alberta Energy. This provincial ministry has a long-established record of successfully managing natural resource rights in Alberta. Managing resource rights in this fashion prevents the occurrence of 'overstaking' of MIM and PNG rights and clarifies title issues.

The Province of Alberta recently proclaimed Bill 82, the Mineral Resource Development Act, designed to align the authority of the AER with regards minerals exploration and production to that of other energy resources in the province. This advancement of the fiscal and regulatory framework for minerals development is expected to provide clarity for investors and operators.

## B. Units and Abbreviations

Units of measurement in this report, unless otherwise stated, are quoted in the International System of Units (SI; commonly referred to as 'metric'). Where applicable, common conversion formulas are included in parentheses.

AB	Alberta
AER	Alberta Energy Regulator
AGS	Alberta Geological Survey
AOI	Area of Interest
asl	Above Sea level
bbl	Oil industry measure of produced liquid quantity (equal to 159 litres)
BC	British Columbia
bcf	Billion Cubic Feet
°C	Degrees Celsius ((1.8*°C) +32 = °F)
CAD	Currency in Canadian dollars
cm	Centimetre (equal to 0.393701 inches)
core	Diamond drill core
DIG	Alberta Geological Survey Digital Data Set
DLS	Dominion Land Survey

ESRI	Environmental Systems Research Institute
Fm	Stratigraphic formation
Ga	Billion years old
GIS	Geographic Information System
Gp	Stratigraphic group
GSC	Geological Survey of Canada
ha	Hectare (equal to 2.47105 acres)
kg	Kilogram (equal to 2.205 pounds)
kilo	Metric prefix indicating one thousand
km	Kilometre (equal to 0.621371 miles)
kV	Kilovolt = 1,000 Volts
l	Litre (equal to 0.219969 imperial gallon)
Li	Lithium
Ma	Million years old
MAR	Mineral Assessment Report
M	Meridian: North-south baseline; a key component of the Dominion Land Survey
µm	Micron (equal to one millionth of a metre)
m	Metre (equal to 3.2808 feet)
m <sup>3</sup>	Cubic metre
mcf	Thousand Cubic Feet (of gas)
MMbbls	Million Barrels
mmcf	Million Cubic Feet (of gas)
mg/l	Milligram per Litre
MAR	Mineral Assessment Report
MIM	Metallic and Industrial Mineral (category of natural resource rights in Alberta)
NTS	National Topographic System
OFR	Alberta Geological Survey Open File Report
ppm	Parts per Million
ppb	Parts per Billion
PRA	Peace River Arch
PRALFR	Peace River Arch Leduc Fringing Reef
Rge	Range; East-west nomenclature of townships in DLS
RET	Regional Exploration Threshold (Hitchon, et al., 1995)
Sec	Section; DLS term referring to a 1 x 1 mile unit
Tonne	1,000 kg (equal to 2,204.6 lbs)
Twp	Township; Refers to both area (6 x 6 block of sections) and north-south nomenclature of townships in DLS
TCF	Trillion Cubic Feet
WCSB	Western Canada Sedimentary Basin

*Table 1. Summary of Units and Abbreviations*



## IV. Property Description and Location

### A. Property Description

#### 1. Peace River Arch Group of Permits

The Peace River Project (PRP or, alternatively, Permits) consists of a series of thirty (30) contiguous Metallic and Industrial Minerals Permits issued by the Energy Ministry of the Alberta Provincial Government. The parcels extend over 165 km from Twp 74, Rge 4W6M in the southwest to Twp 85, Rge 17W5M in the northeast. The Permits lie within the following NTS 1:50,000 Map Sheets:

- 83-M-08 and 09
- 83-N-12, 13, and 14
- 84-C-02 and 84-C-07

The lands overlie parts of the following Municipal Districts and Counties (from southeast to northwest):

- County of Grande Prairie No. 1
- Birch Hills County
- M. D. of Greenview No. 16
- M. D. of Smoky River No. 130
- Northern Sunrise County

The city of Grande Prairie, a major regional centre, is located approximately 20 km by highway from the southeast corner of the lands. The Town of Peace River is approximately 35 km west of the northern portion of the Permits. Both municipalities are serviced by airports controlled by NavCan, the non-profit corporation managing civil aviation in Canada. The location of the PRP Permits relative to a map of Alberta and key transportation infrastructure is shown in Figure 1.

N. B., Due to the large scale of the project, details in the maps, plots, and graphs may not be legible at the scale of the Figures presented in the report (e.g., Twp and Rge labels, data labels). These materials have also been included in Appendix A as Large-format Maps, Plots, and Graphs.

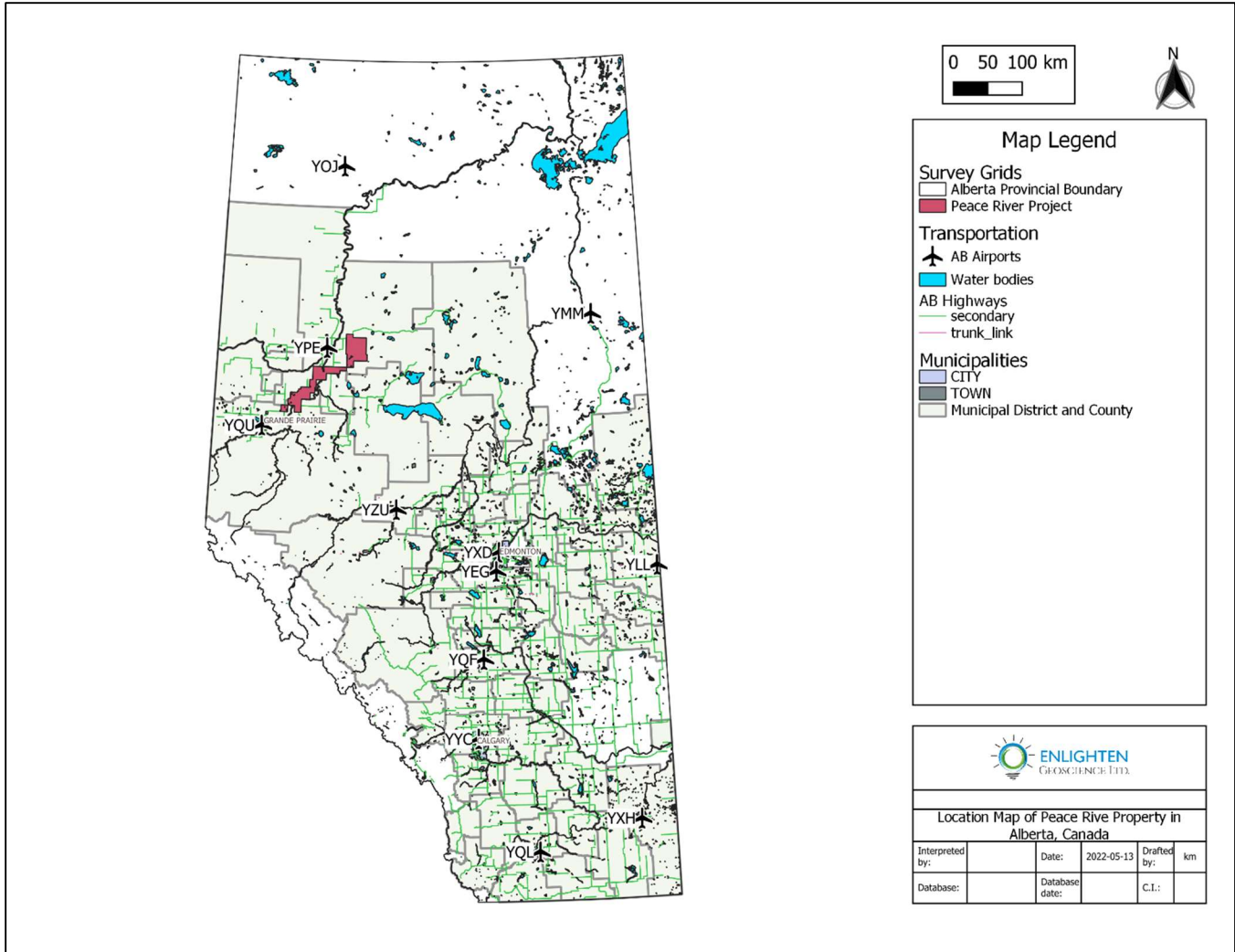


Figure 1. Map of the Province of Alberta including key transportation infrastructure (primary and secondary highways, major cities, and airports) proximal to NeoLithica MIM Permits.

## 2. [Permit Descriptions](#)

The Permit summaries for the mineral titles being addressed by the report were downloaded through the *Metallic and Industrial Minerals Interactive Map* published online by Alberta Energy. The summaries are provided as PDF files in Appendix B – Permit Summary Printouts. The particulars of these thirty Permits are collated in *Table 2. Alberta Metallic and Industrial Mineral Permit Summary* (included in Appendix B – Large Format Tables). A map outlining the permits is included as Figure 2. This figure also presents the Area of Interest (AOI) considered within this report as well as the Detailed Area of Interest encapsulating the Permit area. The AOI extends from Twps 66 to 91 and Rge 10W5 to 9W6.

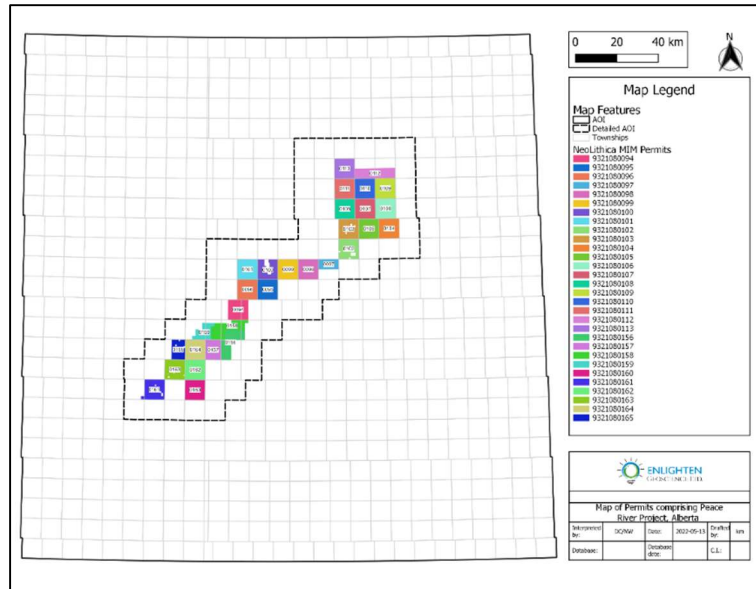


Figure 2. Map outlining location of MIM Permits in the Peace River Project. The total area of all the Permits in the PRP is 260,055 ha.

### 3. Property Rights and Maintenance

As summarized on the Alberta Energy website, Metallic and Industrial Minerals Permits grant the Permit holder “...the exclusive right to explore for Alberta-owned metallic and industrial minerals in a specified location. Other jurisdictions in Canada use the term "mineral claim" for this type of agreement. A permit can be held for up to 14 years and is not renewable. While there is no annual rent, permit holders are required to conduct exploration work and must report on the work every two years...”. Permits can be converted to Metallic Minerals Leases once a deposit has been confirmed. Further details on the tenure system may be derived from Government of Alberta Queen’s Printer in online format through [www.gp.alberta.ca/Laws Online.cfm](http://www.gp.alberta.ca/Laws Online.cfm).

As a matter of record, the Permits intersect or are contiguous with portions of several Alberta Administrative Regions. Based on the operational experience of the oil and gas industry none of these regions are expected to provide significant impediments to operations within the Peace River Project. These Regions are tabulated in Appendix B as *Table 3. Administrative Regions.*:

#### 4. [Coexisting Petroleum and Natural Gas Rights](#)

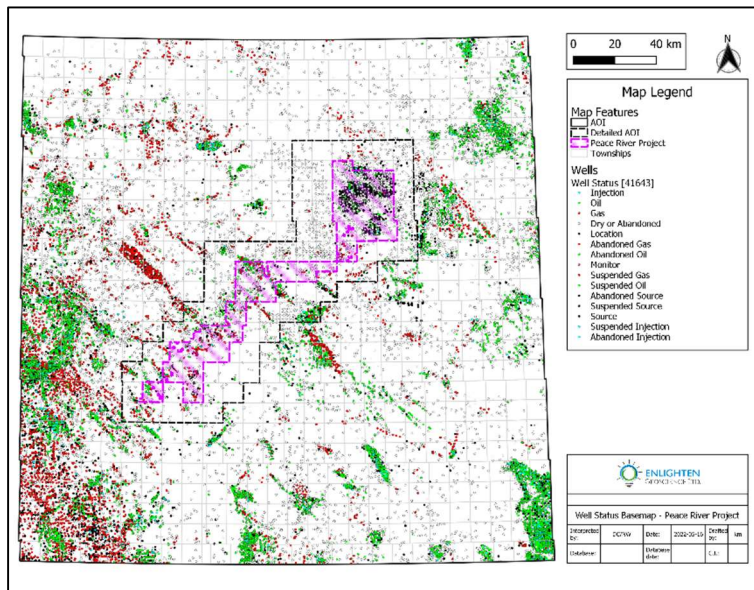


Figure 3. Well status base map.

Pre-existing Petroleum and Natural Gas Leases and Licences fully overlap with the Permits’ locations. Given the differentiation in natural resource tenure under which Metallic and Industrial Minerals exist, the author does not expect any conflict between the production of oil and natural gas with the production of lithium brines. Oil and gas industry operators have drilled 2,523 wells and resulting in 5,909 well events (some wellbores have more than one completion event) in the area of the Permits. Of these wells, 473 have penetrated Devonian formations. The distribution of the wellbores is illustrated in Figure 3. A total of 41,643 well events have been drilled within the Area of Interest.

## V. [Accessibility, Climate, Local Resources, Infrastructure, and Physiography](#)

### A. [Accessibility](#)

#### 1. [Surface Transportation](#)

The Permits are well serviced by Primary and Secondary Highways. The major Alberta north-south road artery Highway 2 (also referred to as the Queen Elizabeth Highway) traverses through the southern third of the Permits. Road access is provided at numerous points along the property through Secondary Highways, including (from north to south):

- 674
- 733
- Range Road 243
- 744
- 986

Numerous other high-grade roads have been established in the region to support oil and gas industry and farming operations.

## 2. [Air Transportation](#)

The area is served by two regional airports. The Grande Prairie Airport (IATA code YQU) is approximately 45 km from the southernmost permit and is serviced by Air Canada™ and WestJet™ airlines. Additional charter services are provided by companies including Northern Air Charter Inc.™.

The Peace River Regional Airport (IATA code YEP) is a similar distance from the northernmost permit. Northern Air Charter Inc.™ is the primary company providing air service to YEP.

## B. [Climate](#)

The property straddles the Plant Hardiness Regions 3a and 3b (Extreme Minimum Temperatures ranging from -40.0°C to -37.2°C and -37.2°C to -34.4°C, respectively) as defined by the Plant Hardiness Zone Maps published by Natural Resources Canada. The Average High Temperature in Grande Prairie of 22.8°C. occurs in June, according to Environment and Climate Change Canada. Although these temperature ranges may appear extreme, there is a long-established ability to be able to operate year-round in the Grande Prairie to Peace River region.

# VI. [Geological History](#)

At this point, a description of the terms “reservoir” and aquifer” is advisable. A significant portion of this report relies on standard oil and gas evaluation techniques. In the oil and gas industry, the porous and permeable portion of a prospective formation is referred to as the reservoir. An aquifer is a subordinate type of reservoir. The term aquifer is most commonly applied in shallow water hydrogeology. In the deeper subsurface, aquifer is used to denote formations with water as the regionally dominant reservoir phase and reservoir for more local characterizations. The Author has followed this conventional to the best extent possible.

## A. [Summary of Devonian Hydrocarbon-Bearing Formations in Area of Interest](#)

An advantage of developing a lithium project in a region that has been the subject of significant hydrocarbon exploration such as the Peace River Arch region of the WCSB is the extensive research that has been performed on the various formations. A keystone accomplishment of this research has been the Geological Atlas of the Western Canada Sedimentary Basin; colloquially referred to as the ‘Atlas’ (Mossop and Shetsen, 1994). This resource has been a very valuable reference for this section, particularly Halbertsma (1994), Hay (1994), Meijer Drees (1994), O’Connell (1994), Oldale et al. (1994), and Switzer et al. (1994). The AGS Geological Framework (Alberta 3D Model) has been another valuable resource for mapping and understanding the distribution of the pre-Exshaw formations in the vicinity of the PRP. Additional references are provided for the work of authors who supplemented the information available through the Atlas and Alberta 3D Model.

### 1. [Structure](#)

The Permits lie along the southeastern edge of a major structural feature known as the Peace River Arch (PRA). The PRA has a long and complex history that had ongoing effects with the development of pore-space resources

in the northwest and west-central regions of Alberta.

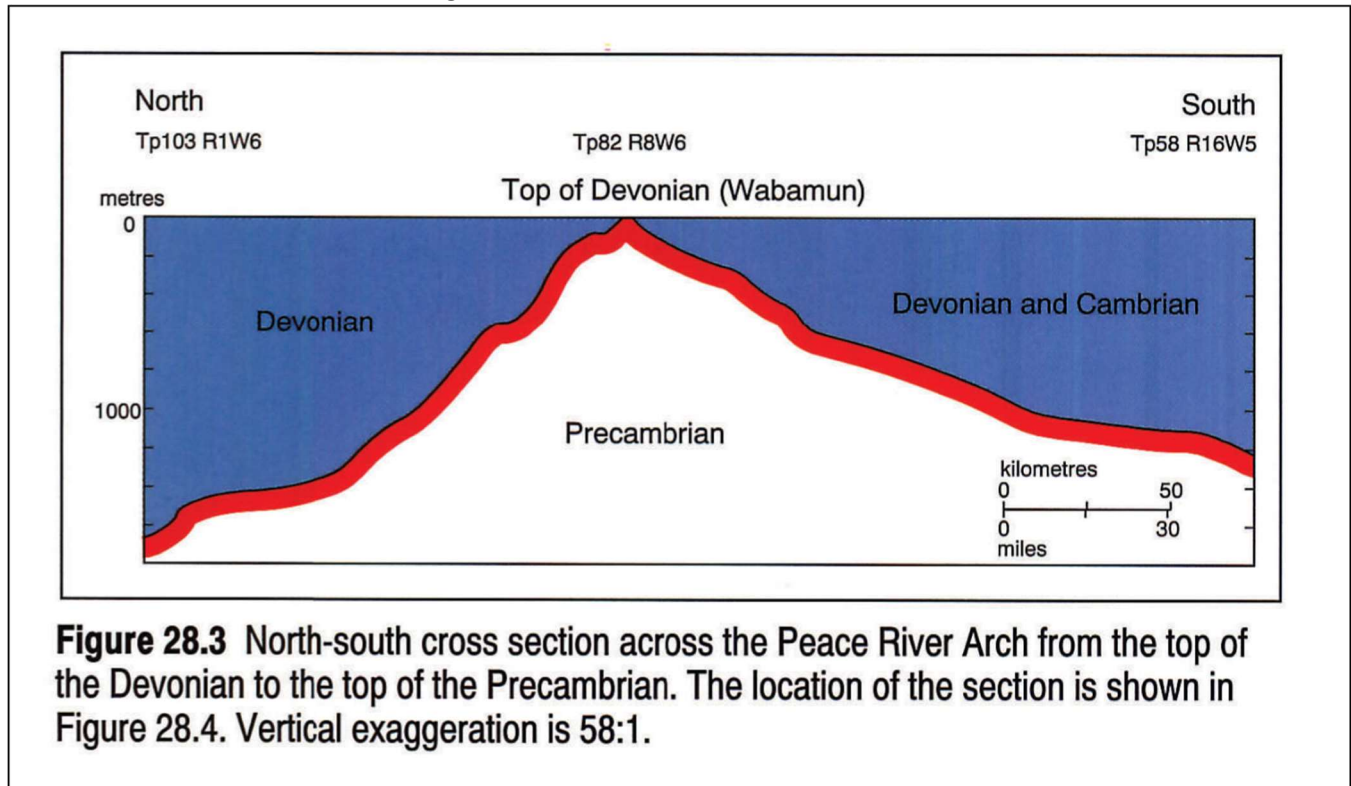


Figure 4. North-south schematic cross-section over Peace River Arch (O’Connell, 1994).

The PRA was uplifted during the Proterozoic and remained a structurally positive element influencing sedimentation through the early Carboniferous (O’Connell, 1994) as illustrated in Figure 4. Although the origins of the PRA are unclear, it represents the longest-term tectonic feature in the Western Canada Sedimentary Basin.

The PRA served as a significant control on the development of various pore-space resources in the Devonian strata within the AOI. These controls are discussed in the Stratigraphy and Sedimentology section.

From the earliest Carboniferous onwards, the Peace River Arch began to collapse through a series of normal faults and form the Peace River Embayment. The ultimate extent of down-warping is estimated to have been in the order of 1,000 m. These faults show evidence of continued reactivation and modification from Pekisko time to the Recent. The locus of this collapse was the Dawson Creek Graben Complex (Barclay et al., 1990).

Subsequent compression during the Columbia and Laramide orogenies resulted in transpression-related structures, including flower structures. Although this latter event was focused on regions further west close to the AB/BC boundary, expression of these features can be seen in the locality of the Permits.

The faulting and fracturing associated with the collapse of the PRA has been suggested as a means of hydraulic communication between the Devonian Fms beyond that described by Hitchon et al. (1990) Stratigraphy and Sedimentology

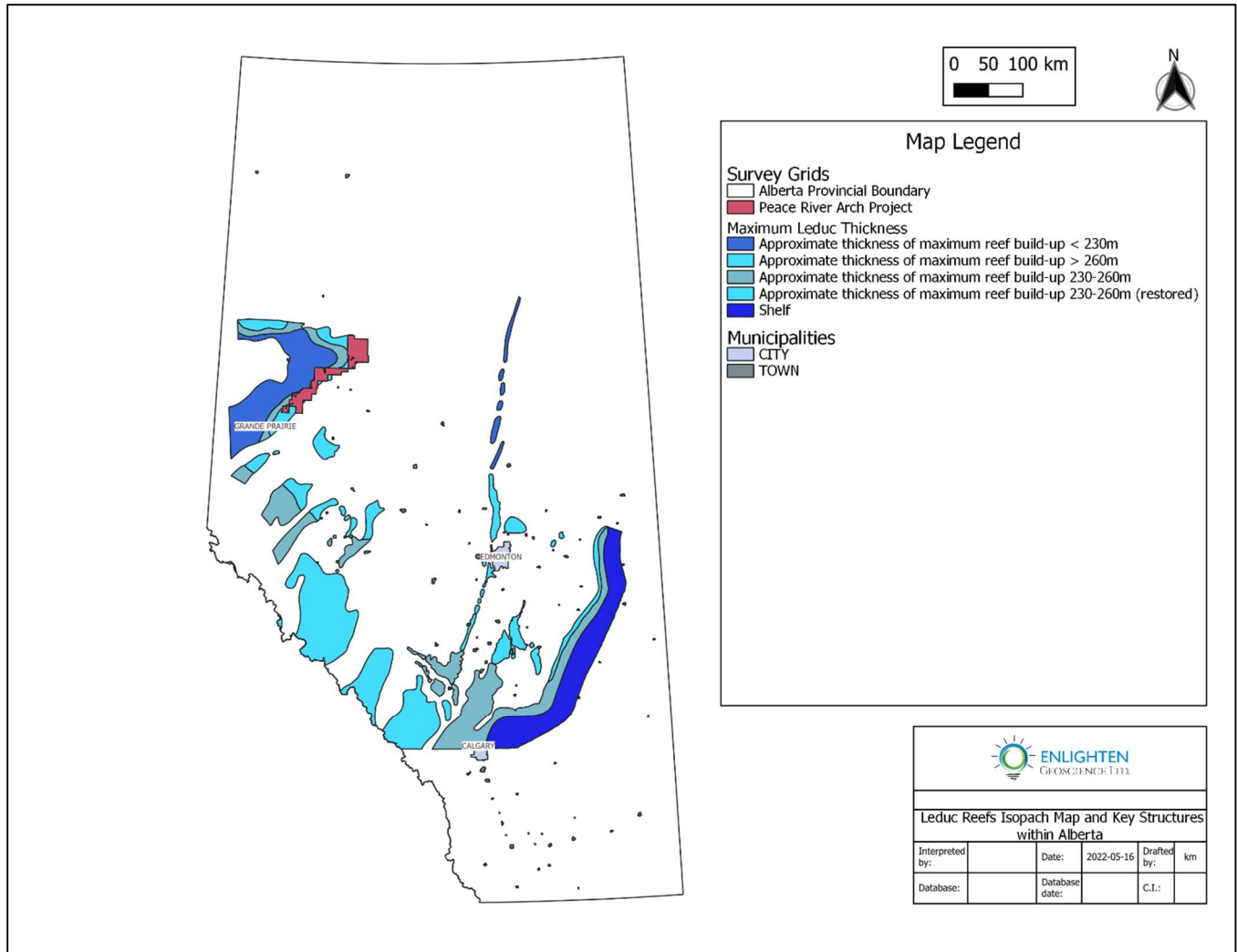


Figure 5. NeoLithica Permits overlain on Leduc Fm Isopach.

The Devonian Fms and Precambrian (referred to as 'pre-Exshaw' for the purposes of this report) underlying the Permits have been the focus of intense study since the discovery of oil in the Nisku Fm at Leduc #1 in 1947. The Leduc Fm has been a significant focus of the exploration effort in the Devonian of Alberta due to the significant hydrocarbon resources located therein. Figure 5 outlines the distribution of major Leduc buildups in Alberta. The location of the Permits relative to the Peace River Arch Leduc Fringing Reef (PRALFR) is also illustrated in Figure 5. The extents of the Leduc Fm are shown on all relevant maps due to the importance of this formation in understanding the Devonian stratigraphy.

Closer to the core of the Permit area, significant faults (primarily normal faults) are displayed relative to the PRLAFR in Figure 6. Understanding the lithium potential of the Devonian Fms in the PRP requires an understanding of the nature and distribution of the pore-space resources and their relationship to faulting and fracturing.

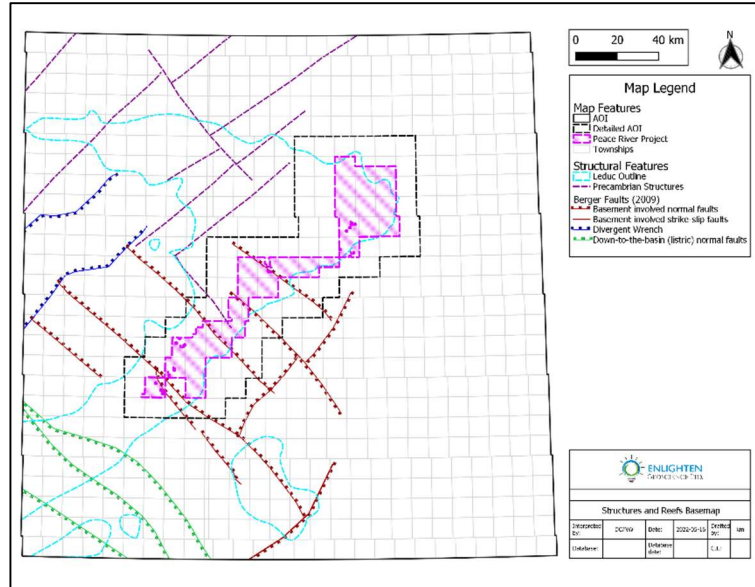


Figure 6. Map of Peace River Project Permits relative to Leduc Fm outline and significant structures. (After Berger, 2008, 2009 and O'Connell, 1994).

The general stratigraphic relationships are outlined in the Table of Formations displayed below in Figure 7. The regional relationship of the Devonian Fms is illustrated by the regional stratigraphic cross-section included below as Figure 8.



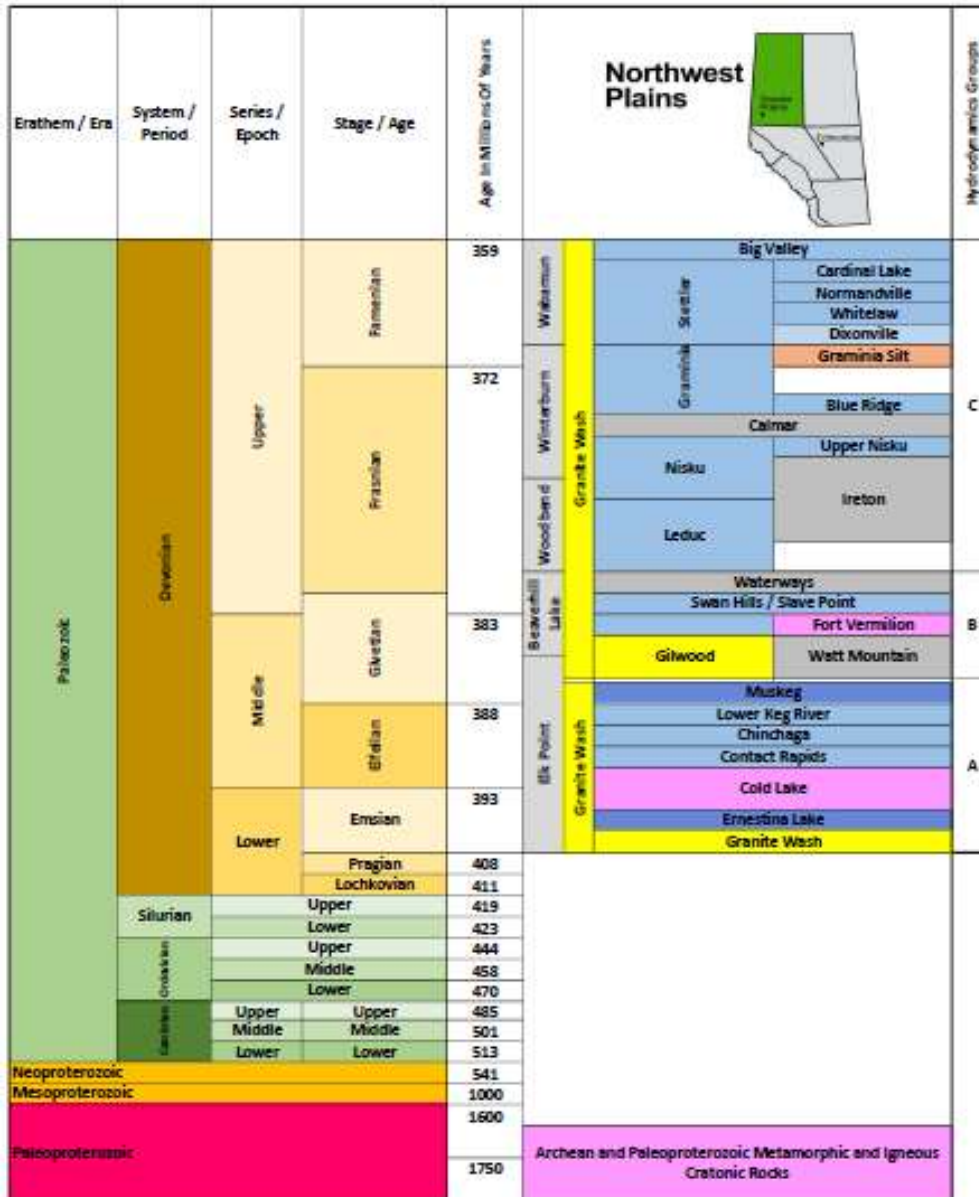


Figure 7. Devonian to Precambrian Table of Formations for West Central Alberta. Modified from Alberta Geological Survey (2019).

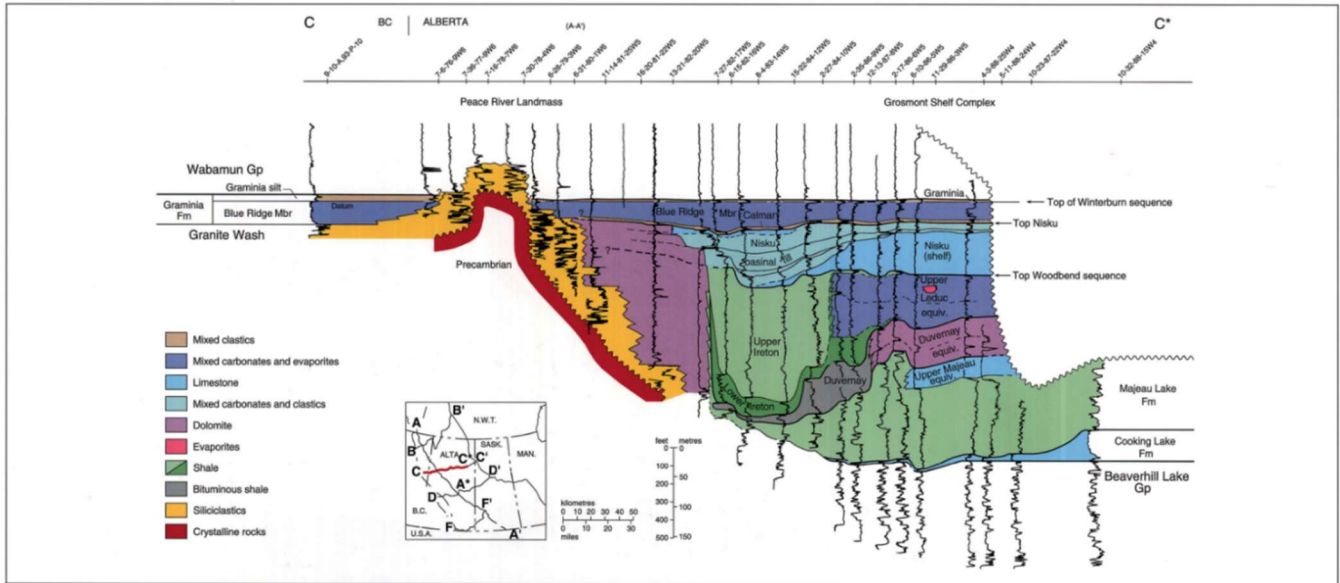


Figure 8. Regional Stratigraphic Cross-section. After Switzer et al.,1994.

## 2. Granite Wash Formation

The Granite Wash is a colloquial name for a diachronous lithostratigraphic unit that onlaps the PRA and is both the substrate to and interbedded with the Middle to Upper Devonian carbonate-based formations. The lithology of the Granite Wash is characterized by siliciclastic sediments primarily derived from erosion of the granitic and metamorphic rocks of the PRA (O’Connell, 1994). The highly variable thickness of the Granite Wash is controlled in significant part by the infilling of accommodation space created by horst-and-graben features of the Precambrian surface (Tomasz et al., 1996). See Figure 9 for an Isopach map of the Granite Wash overlain with the Permits. The isopach map illustrates the thickness of the Granite Wash over the southern portion of the PRP

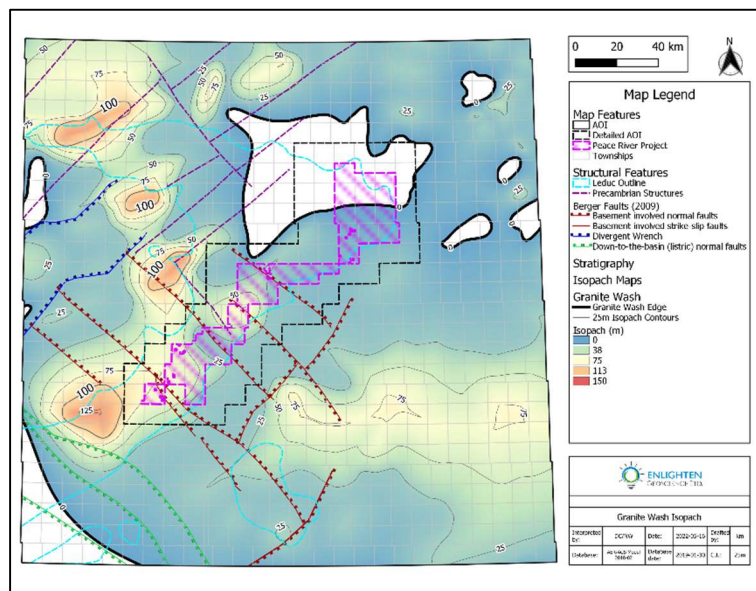


Figure 9. Isopach map of the Granite Wash. After O’Connell, 1994.

The age of the Granite Wash is indeterminate due to a lack of paleontological data recovered from the formation (O'Connell, 1994). The Devonian age is assigned in large part due to the interbedded relationship with the Devonian Fms.

Current public domain mapping of the Granite Wash is regional in nature and is unlikely to reflect the depositional pattern proximal to the Permits. The Granite Wash Isopach presented in Figure 9 indicates the potential for reservoir development in the southern third of the Permits. Detailed reservoir mapping of the Granite Wash was not conducted for the purposes of this report. Given the discrete fault-controlled distribution of the Granite Wash and the focus of previous drilling on oil and gas targets, the potential for thick Granite Wash water-bearing reservoirs exists. The onlapping of these clastics on the Precambrian basement has the potential to improve the likelihood for the waters to be lithium rich.

### 3. [Elk Point Group](#)

The Lower to Middle Devonian (Emsian to Givetian) Elk Point Gp consists of a series of clastics, redbeds, evaporites, and carbonates that onlap against the exposed PRA landmass. These sediments accumulated in local microbasins. During a transgression at the beginning of the Middle Devonian, fossiliferous carbonate and evaporitic sediments began to develop. During pauses in the transgression, clastics - intermittently referred to as Granite Wash - interfingered with these deeper-water sediments.

The end of Elk Point time is marked by a regressive series of deposits and the development of a widespread exposure surface.

The Elk Point onlap on the PRA occurs east and south of the PRP Permits. As a result, the Elk Point has little pore space to contribute to this project, although there are aspects that contribute to the degree of hydrodynamic continuity of the pre-Exshaw underlying the Permits

### 4. [Beaverhill Lake Group](#)

VII. The Beaverhill Lake Gp is characterized by the interplay between transgressive and regressive cycles. A transgression developed soon after Elk Point time allowing the development of the shales of the Watt Mountain Fm and the marine clastics of the Gilwood sandstone member. Continued transgression led to the development of the Fringing Reef Complex of the Swan Hills and Slave Point formations. Periods of regression led to the basin-filling events of the shales and argillaceous carbonates of the Waterways Fm.

Pore-space resource is primarily located in the Fringing Reef / Bank Margin Complex proximal to the PRA.

The Beaverhill Lake reservoirs along the periphery of the Permits have the potential to contribute to the production of lithium-rich brines, particularly in areas where the permeability has been enhanced through faulting and dolomitization.

### 1. [Woodbend Group](#)

VIII.

The Woodbend Gp developed in three main regions of AB and BC. These regions are the East Shale Basin, West Shale Basin, and the Peace River Arch Fringing Reef. Deposition began during a basin-wide transgression. During

this deepening event, the Cooking Lake carbonate platform developed in the East Shale Basin as a substrate for the growth of the Leduc reefs. The stratigraphic affinity of the Cooking Lake is less distinct in the West Shale Basin and in the Peace River Arch area. In these latter areas, the Leduc is built up either on a thin veneer of the Cooking Lake, the mixed argillaceous carbonates and siltstones of the Majeau Lake, or directly on top of the Beaverhill Lake Gp in a conformable to disconformable fashion. In case of the Peace River Arch Leduc Fringing Reef (PRALFR), the Leduc is built on Precambrian basement-derived clastics or directly on top of the crystalline basement. Regardless of the type of platform, the Leduc grew out in at least three stages to form, at thicknesses of over 300 m, the most significant portion of the Woodbend pore-space resource

A regression characterized the end of the Woodbend. During this period, the shales and argillaceous/silty carbonates of the Ireton Fm dominated the succession.

The Leduc Fm has been identified as a significant lithium exploration target in a number of potential projects in AB due to its thickness and relatively continuous pore space. Consistent with this exploration interest, the Leduc is the primary lithium exploration target of the PRP. While the distribution of Leduc reservoir facies is complex and has not been mapped for this report, the thickness of the Leduc along the PRP indicates the likelihood of a significant resource of lithium brine in place. The deliverability of this resource is expected to have been accentuated in areas experiencing dolomitization, fracturing or some combination of the two processes of the entire Devonian section. This potential deliverability is illustrated by the high level of water co-produced with oil from Leduc reservoirs along the PRA despite the efforts of operators to prevent this water flow.

Public domain detailed reservoir mapping and modelling is not available for use in this report. It is recommended that a thorough and rigorous mapping of the Leduc be conducted to confirm this potential.

## 1. [Winterburn Group](#)

The Nisku and Blue Ridge formations of the Winterburn Gp thin as they approach and onlap against the PRA. This shallower water, progradational, carbonate shelf complex developed reservoir facies similar to the prolific Meekwap Shelf complex in the southern portion of the West Shale Basin. The overlying Blue Ridge is less well understood due to the lack of hydrocarbon accumulations associated with this formation. The overall low amount of oil and gas pool development is due in large part to the highly interconnected nature of the reservoir lithologies and lack of local seals.

The Nisku/Blue Ridge represented the culmination of basin infilling with most of the Western Canada Sedimentary Basin accommodation space, except for the westernmost portions, was filled with a complex variety of carbonate, clastic and evaporitic sediments. Local variations in facies distribution occurred due to small-scale structural depressions.

The PRA region was subjected to periods of uplift, exposure, and truncation of Frasnian depositional cycles and the incursion of Upper Graminia siliciclastics. In some locations, the Winterburn contacts with the underlying Woodbend and overlying Wabamun are less defined due to the stratigraphic uncertainties related to the generally continuous carbonate deposition throughout Woodbend –Wabamun time. The variable reservoir character has not been mapped in detail for this project. The Winterburn reservoir has the potential to contribute to the water bearing pore space available for lithium rich brine production.

## 2. [Wabamun Group](#)

The PRA remained a dominant topographic feature during Wabamun time. Proximal to the exposed Precambrian basement, siliciclastics dominate the Wabamun. In locales more distal from the basement, complex relationships develop within each of the Wabamun members (in order of decreasing age: Dixonville, Whitelaw, Normandville, Lower Cardinal Lake, Upper Cardinal Lake, and Big Valley. The Upper Cardinal Lake and Big Valley have largely been removed by erosion in the vicinity of the Permits. The discussion of depositional facies that follows is in reference to variations local to the PRP

The thickness of the primarily lime mudstones of the Dixonville member varies considerably as the PRA is progressively overlapped.

Within the Whitelaw member, local structural variations along the flank of the PRA dominate the development of facies patterns. Along the trend of the PRP, the sediment trends vary from mudstone-dominated sediments to the southeast to bioturbated wackestones and grading to dolomite sequences in the northwestern regions.

The Normandville Member expresses considerable facies variation including patch reefs, open shelf, platform, reef, reef flank, off-reef, and cap facies. The patch reefs are widely distributed across the Peace River Project as exemplified by the Normandville area (in the central portion of the PRP) where a stromatoporoid patch reef extending 4 km by 1 km and over 10 m in thickness has been documented. These intermittent accumulations can provide a significant contribution to the extent of the Wabamun aquifer.

The Lower Cardinal Lake Member sediments are generally muddier than the Normandville because of a regression during this phase of deposition. The lithologies are represented by packstones to supratidal carbonates with birdseye structures, cryptalgal laminates, stromatolites, and dolomite. These lithologies can vary broadly within the Permit area. Leaching and brecciation related to exposure and erosion of the Big Valley through uppermost Lower Cardinal Lake occurred in discrete locations.

While the Wabamun reservoirs distal from the PRP was often developed in discrete areas, the presence of the Normandville patch reefs and hydrothermal dolomitization and karsting related to faulting indicate the Wabamun has the potential to be significantly accretive to the lithium-brine resource potential in the PRP.

## 3. [Woodbend to Wabamun Isopach](#)

It is important to understand the overall thickness of the relatively continuous sediments of the Frasnian to Famennian interval because of their contribution to the pore space volume, overall permeability, and hydrodynamics of the PRP.

## 4. [Devonian Hydrocarbon System](#)

When considering the lithium potential of the Devonian formations it is important to understand the stature of the Devonian within the western Canada oil and gas industry. The post-World War II oil and gas industry was inaugurated by the discovery of oil in the Nisku formation with the 1947 Imperial Oil Leduc #1 wildcat exploration well. The Leduc #1 well was followed by a series of other discoveries in biohermal, carbonate reef complexes.

The broad areal extent and thick reservoir sections of the Devonian carbonates lent themselves to the creation of very large oil and gas fields. The correspondingly high permeability led to very strong fluid production rates. The relative contribution of the Devonian to western Canada's resource base is outlined in Hay (1994). The

Devonian is, by a significant factor, the largest single host for petroleum resources in the WCSB. At the time of publication, Hay noted that Devonian reservoirs contained 50.7 and 23.0 percent of western Canada’s conventional oil and gas reserves, respectively.

5. [Estimation of Remaining Established Reserves in Fields/Pools Associated with NeoLithica Properties](#)

The AER maintains a report of the Alberta oil and gas reserves, (referred to as the ST98). The reader should note that the term "Established Reserves" is no longer NI51-101 compliant as per the Canadian Oil and Gas Evaluation Handbook (COGEH). It is believed the term alludes to Proved plus Half Probable (M. Woofter, personal communication). The current ST98 catalogues data up to 2020. This Devonian Oil Reserves data for Alberta is summarized in Table 3.

Summation of Devonian oil pools (10 <sup>3</sup> m <sup>3</sup> )		Summation of Devonian gas pools (10 <sup>6</sup> m <sup>3</sup> )	
Total Oil in Place	3,055,205	Total Initial Gas in Place	1,479,094
Total Initial Established Reserves	1,247,178	Total Initial Established Marketable Gas Reserves	754,721
Remaining Established Reserves	44,881	Remaining Established Marketable Gas Reserves	74,075

Table 3. Summary of Alberta Devonian Oil and Gas Reserves to end of 2020.

The PRP overlaps with the following AER-designated Devonian oil fields:

- BELLOY
- CINDY
- CULP
- DAWSON
- EAGLESHAM
- EAGLESHAM NORTH
- HARMON VALLEY
- NORMANDVILLE
- PEORIA
- PUSKWASKAU
- TANGENT

Table 4 summarizes the Total in Place, Total Initial, and Total Remaining Established Oil and Gas in the Fields overlapping the PRP Permits.

Summation of Devonian oil pools overlapping the PRP (10 <sup>3</sup> m <sup>3</sup> / % of Alberta Total Devonian)		Summation of Devonian gas pools overlapping the PRP (10 <sup>6</sup> m <sup>3</sup> / % of Alberta Total Devonian)	
Total Oil in Place	59,948 / 2.0%	Total Initial Gas in Place	3,165 / 0.2
Total Initial Established Reserves	11,122.8 / 0.9%	Total Initial Established Marketable Gas Reserves	1,684 / 0.2
Remaining Established Reserves	914 / 2.0%	Remaining Established Marketable Gas Reserves	423 / 0.6

Table 4. Summary of Devonian Oil and Gas Reserves to end of 2020 overlapping the PRP.

The conventional nature of these pools resulted in a significant portion of the reservoir height being water bearing. These 'wet' intervals are connected to a widespread aquifer, or waterdrive. The strength of aquifer drive resulted in the flow of water to the wellbore, often overwhelming the oil and/or gas production. This characteristic, while deleterious to maximizing oil and gas recovery, is expected to be a strong and beneficial factor in providing the high volume of brine necessary for the commercial production of lithium from formation waters.

The relatively recent dominance of horizontal drilling has led to a modest increase in growth in the exploitation of thin oil columns at the top of reservoirs (often referred to as 'Attic Oil'). The multi-stage fracturing of horizontal wellbores provided the impetus for the tight-rock plays such as the Leduc-equivalent Duvernay Fm. These low-permeability formations have only an indirect communication with the aquifer in the other, conventional, formations.

## B. Estimation of Lithium Concentration in Brines

### 1. [Alberta Lithium Brines Estimations](#)

After Hitchon et al. (1995) provided the first reconnaissance study, the AGS has issued a series of OFRs mapping the distribution of lithium and other industrial minerals present in formation waters in Alberta. Subsequent OFRs include Eccles and Berhane (2011). These publications have been supplemented by digital datasets (DIGs) of analytical data including Eccles and Jean (2010), Huff et al. (2011), Huff et al. (2012), Huff et al. (2019), and Lopez et al. (2020). An additional source of data is included in Mineral Assessment Reports (MARs) sourced from the Alberta Energy website. Key MARs referred to in the composition of this report include Dufresne (2011), Eccles (2018), Eccles and Dufresne (2017), and Halonen (2017). Notwithstanding this extensive work, to the Author's knowledge there is no commercial-scale lithium production in Alberta at the date of publication. This lack of commercial production is likely a result of operators not having yet been able to combine advanced extractive solutions with promising subsurface geology.

### 2. [Lithium Brine Concentrations Relative to NeoLithica Properties](#)

The Author is maintaining a digital database of all public data domain lithium analyses results and any proprietary results it has the right to publish. The sources for this database include data published in OFRs - specifically, Eccles and Berhane (2011); AGS DIGs including: Eccles and Jean (2010), Huff et al. (2011) Huff et al. (2012), Huff et al. (2019), and Lopez et al. (2020); and MARs including: Dufresne (2011), Eccles (2018), Eccles and Dufresne (2017), and Halonen (2017).

The importance of accurate lithium concentration values has led to the recent development of more stringent and rigorous sampling protocols including the need for detailed history of the sample chain of custody. An additional aspect to consider is the possible impact of water disposal or injection wells offsetting the well being sampled. These factors should be considered when reviewing the variability of lithium concentration values.

A summary of these data is presented in Appendix B as *Table 5. Summary of lithium analyses within AOI*. A regional exploration threshold (RET) for lithium exploration of 55 mg/l was proposed in Hitchon et al. (1995). This RET is presented in the relevant figures as a reference point for the reader when considering the data

Figure 10 hints at a bimodal distribution of the lithium concentration. The following discussion will outline some possible reasons of this distribution and focus on the potential close to the PRP.

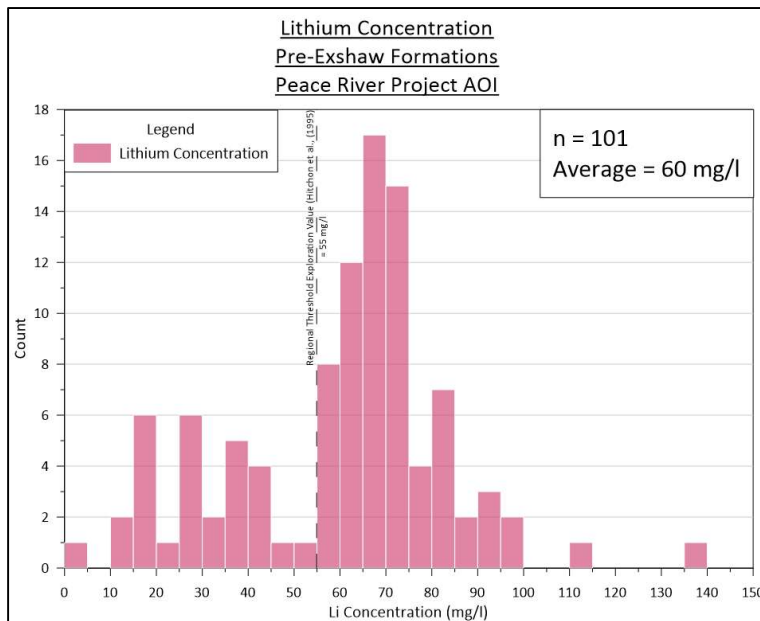


Figure 10. Histogram of lithium concentration for all pre-Exshaw analyses within the AOI.

The Pre-Exshaw lithium concentration histogram indicates that 72 of 101 (71.3%) of samples lie above the RET. When the map of the same data is considered, it is apparent that the lower values are predominately located east of a north-south trend in front of the Sturgeon Lake Leduc reef. The reasons for this trend and whether it represents a sampling phenomenon is currently unclear.



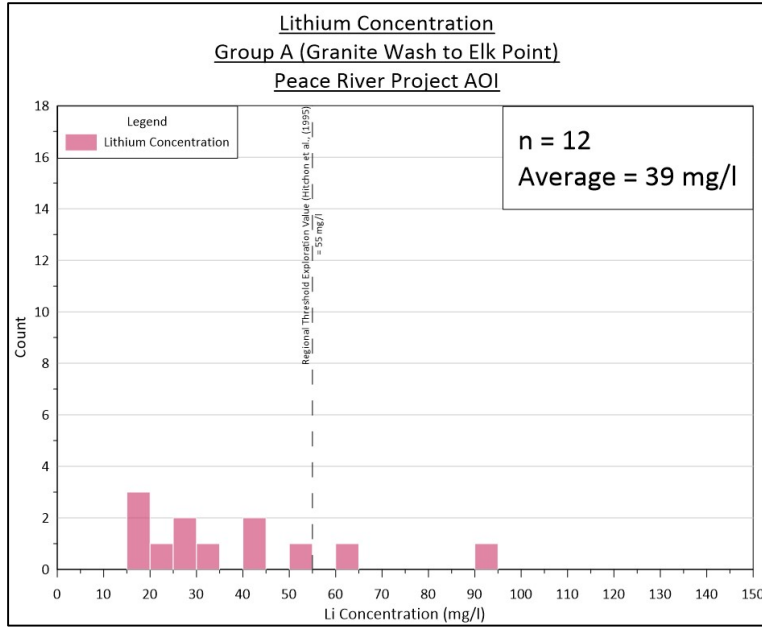


Figure 11. Histogram of lithium concentration for all Group A analyses within the AOI.

The Group A analyses are distributed to the east and northeast of the PRP Permits and are generally below the RET with only 2 of 12 (16.6%) analyses are above the RET.

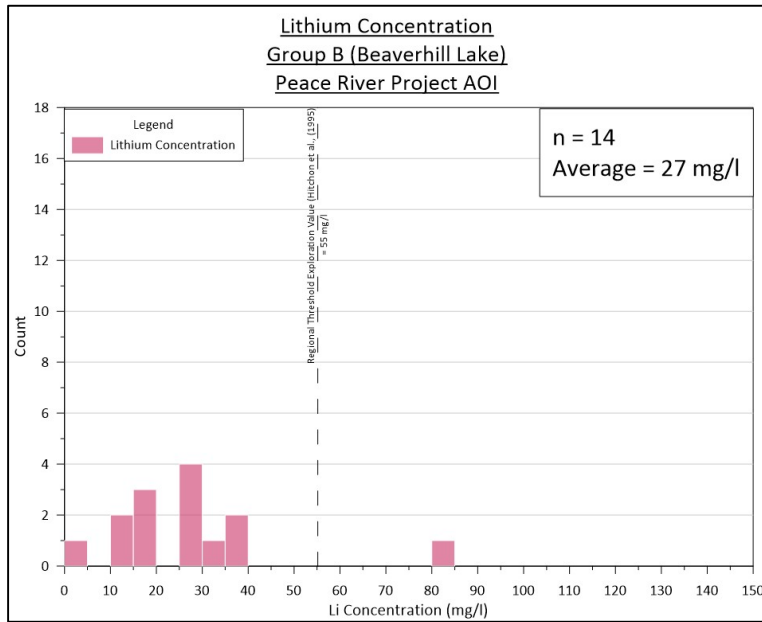


Figure 12. Histogram of lithium concentration for all Group B analyses within the AOI.

Within Group B only 1 of 14 (7.1%) analyses are above the RET. The Group B samples are entirely from wells east of the PRP Permits.

It is unclear if the lower lithium concentrations outboard of the PRP are related to stratigraphic or geographic aspects, or some combination of the two attributes. Additional sampling and consideration of higher quality test data will be needed to gain resolution of this distribution.

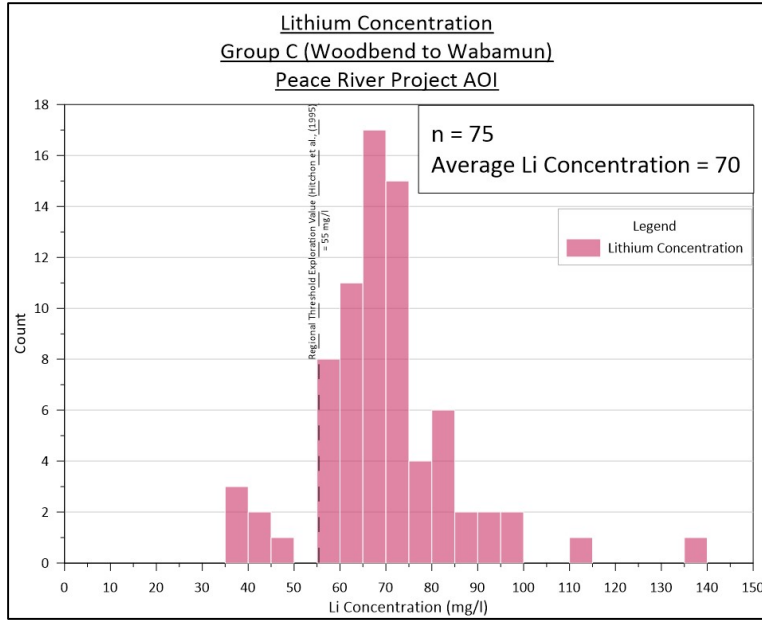


Figure 13. Histogram of lithium concentration for all Group C analyses within the AOI.

For Group C, 69 of 75 (92.0%) of samples are above the RET. These samples are distributed within, proximal to, and along strike from the PRP Permits. This spread of the historical data indicates the high potential for commercial concentrations of lithium along the PRP.

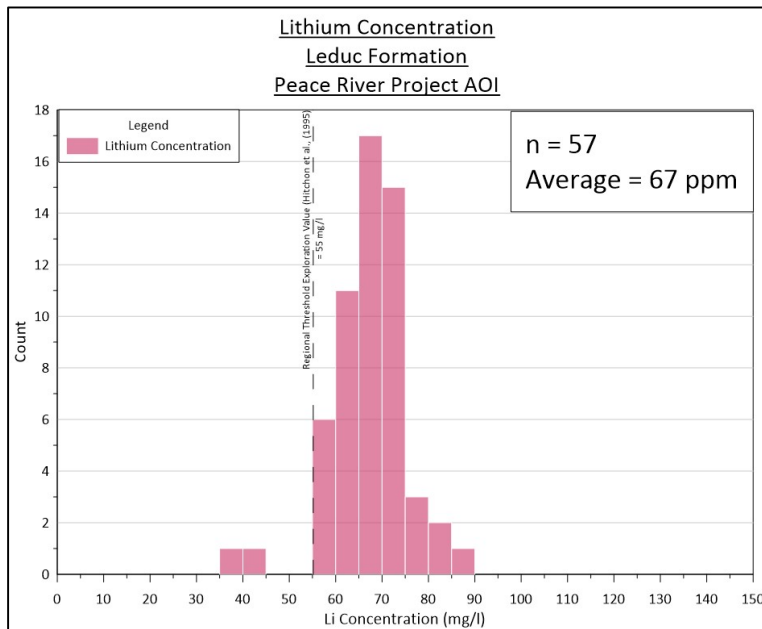


Figure 14. Histogram of lithium concentration for the Leduc within the AOI.

When the Leduc is considered as a single entity it is evident that 55 of 57 (96.5%) samples are above the RET. All but 2 of the 57 samples are from the Sturgeon Lake and Worsley reef complexes.

The AOI only has 8 analyses for the Winterburn Gp. Of these 6 (75%) are above the RET.

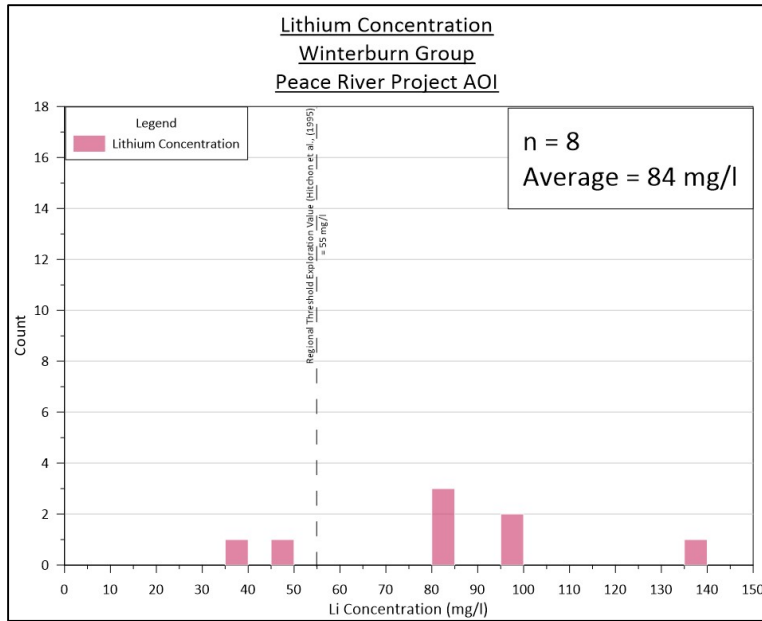


Figure 15. Histogram of lithium concentration for the Winterburn within the AOI.

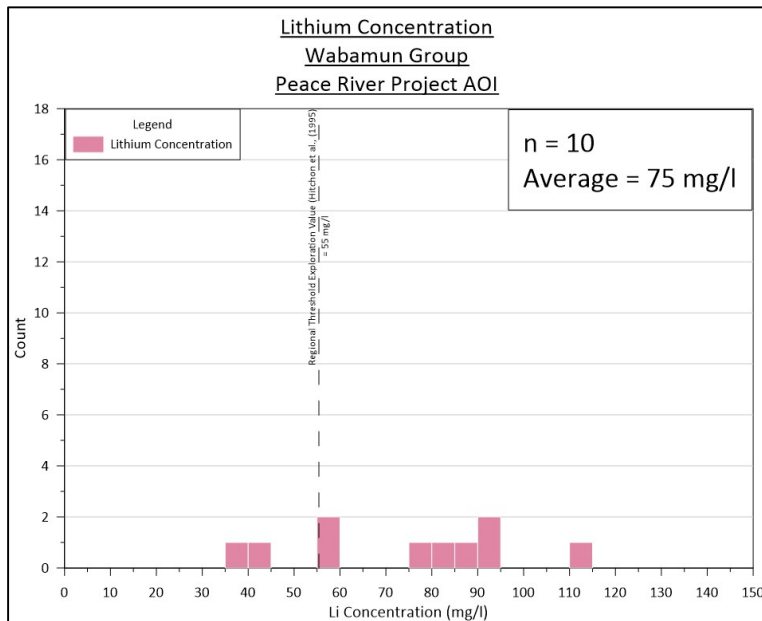


Figure 16. Histogram of lithium concentration for the Wabamun within the AOI.

With 8 of 10 (80%) analyses recording lithium concentrations above the RET, the Wabamun has some of the highest Devonian lithium levels recorded in the AOI, including some of over 100 mg/l on or near the PRP Permits.

Although limited in scope, both the Wabamun and Winterburn display intriguing levels of lithium concentration and are deserving of further sampling.

## IX. Geological Setting and Mineralization

Observations of mineralization in the Devonian within the study area is hampered by the significant overburden totalling several hundreds of metres thickness. It is important to keep in mind that the goal of subsurface lithium extraction projects, including the PRP, are based on processing significant volumes of formation water with an economical concentration of dissolved lithium. For this reason, it is necessary to understand the reservoir attributes (i.e., porosity and permeability) and lithium concentration.

With regards to reservoir enhancement through mineralization, decades of investigation of the Devonian formations based on petrophysical well log interpretations and on core and drill cuttings have established that, regardless of the original lithofacies, the diagenetic alteration from limestone to dolomite can result in significant increases in both porosity and permeability. There are several processes that control these changes from syn-depositional alteration to post-burial dolomitization. An important style of diagenesis in the locality of the PRP is hydrothermal dolomitization.

Hydrothermal (also referred to as thermobaric) dolomitization occurs where basement-related, sub-vertical faults function as a conduit for the upwards movement of relatively high-temperature and magnesium-rich water to induce dolomitization of the host limestones (Davies and Smith, 2006).

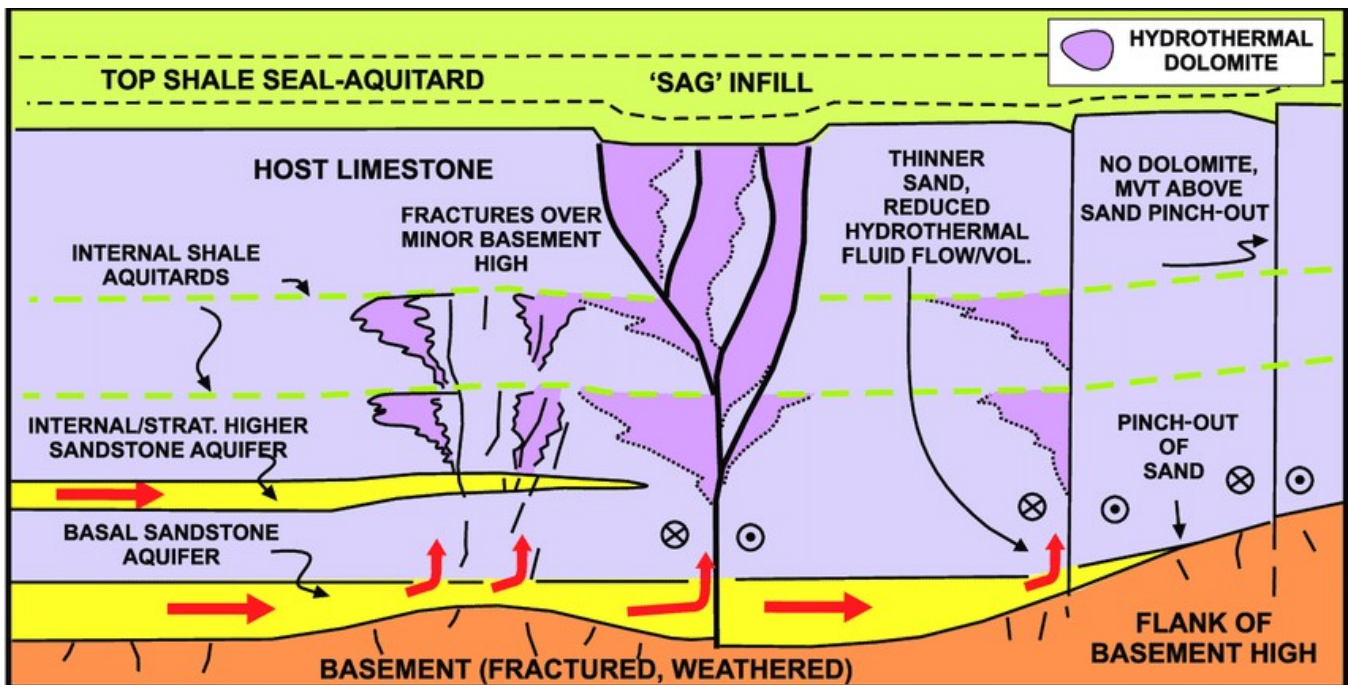


Figure 17. Illustration showing interpreted function of basal sandstone aquifers and shale aquitards in a hydrothermal fluid-flow system (MVT or HTD reservoir setting) and illustrating the influence of basement highs or arches. Faults are shown as strike-slip type with basement involvement and minor dip-slip. Davies and Smith, 2006.

This phenomenon is well known to occur in the Devonian carbonates of the PRA. The central portion of the PRP has been the site of significant investigation to better understand oil exploration targets (e.g., Saller and Yaremko, 1994).

The lithium dissolved in formation waters is sourced from lithium-bearing aluminosilicates such as spodumene ( $\text{LiAlSi}_2\text{O}_6$ ), petalite ( $\text{LiAlSi}_4\text{O}_{10}$ ), and eucryptite ( $\text{LiAlSiO}_4$ ) and phyllosilicates such as hectorite, a smectitic clay  $\text{Na}_{0.3}(\text{Mg,Li})_3(\text{Si}_4\text{O}_{10})(\text{F,OH})_2$ .

The minerals spodumene, petalite, and eucryptite are hosted in pegmatites - late-stage granitic rocks. In the PRA region, granitic intrusions were confined to the Proterozoic uplift of the PRA (O'Connell, 1994). The paucity and discrete distribution of Precambrian penetrations has made the direct identification of pegmatite deposits difficult. As a member of the smectite family of clay minerals, hectorite is formed from a hydrothermal weathering process of felsic tuffs and other phyllosilicates resulting from volcanism. Analysing for and the cataloguing of hectorite has not been a consistent goal of subsurface investigations.

As a result of the difficulties in high-grading source localities of lithium generation, investigations to date have focussed on understanding the distribution of the concentration of lithium dissolved in formation waters.

## X. Deposit Types

Regardless of whether the primary focus of lithium exploitation is on lithium brines found in groundwater and the capture of concentrated lithium through evaporitic processes at surface or lithium-rich formation water brines, the process for development of lithium rich brines is similar. As described in Bradley (2013), the requirements for commercial-grade lithium concentrations suitable for subsurface development of lithium deposits include:

- Lithium-rich source rocks
  - Represented by the granitic basement of the PRA
- Tectonically driven subsidence
  - Post-Devonian collapse of the PRA
- Sufficient aquifers
  - Generally continuous Devonian carbonate and clastic sediments
- Geothermal activity
  - The PRAP overlies thermal anomalies related to basement faulting in the area
- Sufficient time to concentrate the lithium content of the brine

Within the Devonian of Alberta, Huff et al. (2016) proposed evapoconcentration as an important mechanism in the development of lithium in oilfield brines.

## XI. Exploration

The Issuer has not done any exploration beyond the technical work provided in this report. The exploration information in this report is related to historical data captured through oil and gas exploration methods.

## XII. Drilling

The issuer has not undertaken any drilling on the Permits with regards lithium or other minerals. All data considered in this report are sourced through oil and gas industry sources.

### XIII. Sample Preparation, Analyses, and Security

A single water sample was taken by a representative of the Issuer from a Wabamun oil producer, 100/11-23-078-25W5/00, on March 23, 2022. The sample was approximately 1 m<sup>3</sup> of formation water and was captured for potential use in a test of the lithium extraction process. There was an imperative to obtain this sample due to the imminent suspension of this well by the operator. A Wabamun water disposal well, 100/16-33-078-25W5/02, is present approximately 4.4 km north-northwest of the 11-23 well. Any possible dilution of the 11-23 sample has not been evaluated.

The representative followed a provisional sampling protocol that is expected to parallel the eventual process followed for future sampling. The Issuer is in the process of designing a more rigorous and comprehensive sampling program. This program will include samples primarily from all accessible Group C producers on or proximal to the PRP.

### XIV. Data Verification

The oil and gas well data were derived from information maintained by the AER and AGS. These data were evaluated on an ongoing basis to correct any anomalies as the evaluation progressed. All the water analysis and other geochemical data were derived from public-domain sources including the following AGS sources:

- OFRs:
  - Eccles and Berhane (2011)
- DIGs:
  - Eccles and Jean (2010)
  - Huff et al. (2011)
  - Huff et al. (2012)
  - Huff et al. (2019)
  - Lopez et al. (2020)
- MARS
  - Dufresne (2011)
  - Eccles (2018)
  - Eccles and Dufresne (2017)
  - Halonen (2017)

All these data sets were reviewed for the correctness of the data and information supplemented for omissions and errors as required (e. g., missing or incorrect coordinate information).

### XV. Mineral Processing and Metallurgical Testing

The Issuer has formed a Joint Venture with Conductive Energy Inc to develop lithium brine resources in Alberta. Conductive has developed a proprietary Direct Lithium Extraction (DLE) technology and process to extract lithium from brines and refine the resulting concentrate into battery grade lithium compounds. The Author has attended a presentation at which Conductive Energy has described their operation and, while the discussion was

interesting, the details and methodology are beyond the expertise of the author. An evaluation of this Conductive Energy process should be referred to an appropriate Qualified Professional.

## XVI. Mineral Resource Estimates

This item is not applicable to or included in this Technical Report.

## XVII. Mineral Reserve Estimates

This item is not applicable to or included in this Technical Report.

## XVIII. Mining Methods

This item is not applicable to or included in this Technical Report.

## XIX. Recovery Methods

This item is not applicable to or included in this Technical Report.

## XX. Project Infrastructure

This item is not applicable to or included in this Technical Report.

## XXI. Market Studies and Contracts

This item is not applicable to or included in this Technical Report.

## XXII. Environmental Studies, Permitting, and Social or Community Impact

This item is not applicable to or included in this Technical Report.

## XXIII. Capital and Operating Costs

This item is not applicable to or included in this Technical Report.

## XXIV. Economic Analysis

This item is not applicable to or included in this Technical Report.

## XXV. Adjacent Properties

A list of Mineral Agreements contiguous with the PRP Permits is included in Appendix B as Table 6. Summary of adjacent properties. None of these Agreements are actively producing lithium at the time of report composition.



## XXVI. Other Relevant Data and Information

No other relevant data exists to be included in this report.

## XXVII. Interpretation and Conclusions

The Peace River Project consists of a series of 30 Metallic and Industrial Minerals Permit Applications located along the southern flank of the Peace River Arch. These applications were approved, and permits were issued by the Alberta Ministry of Energy and acquired by the Issuer for the purposes of extracting lithium from formation water brines. The Author was commissioned to write an NI 43-101 Technical Report for the Peace River Project including a review of the location of the Permits, accessibility, climate, historical activity of the oil and gas industry and related infrastructure, geological setting and history with a focus on the hydrodynamics of the Devonian Fms as a method to understand the level of hydraulic interconnection between the Devonian Fms. This latter initiative is important to gauge the extent of the lithium-rich brines within the PRP.

The information used to create this Technical Report was derived primarily from data acquired by oil and gas industry operators. The Devonian of the Peace River Arch region has been the locus of significant exploration and has resulted in an in-depth understanding of the Devonian formations. These understandings can be applied to further the development of the PRP.

A significant portion of the reservoir in these conventional pools is water bearing. These intervals are connected to a widespread aquifer resulting in the flow of water to the wellbore. This characteristic is expected to be beneficial in providing the volume of brine needed for the commercial production of lithium from formation waters.

As an early-stage exploration prospect for lithium extraction, the PRP displays a number of encouraging attributes. The PRP is located in an area with well developed transportation and other infrastructure. The history and ongoing oil and gas industry activity has provided a strong capability for exploiting deep subsurface reservoirs.

The PRP provides the Issuer with access to a promising combination of potential for large-scale pore-space volume, high levels of indicated permeability and several water analyses (69 of 75, or 92%, of samples) with lithium samples above the regional exploration threshold described by Hitchon et al. (1995). This intriguing level of lithium concentration is supported by the presence along the Peace River Project of key factors in the development of lithium rich brines, including:

- source rocks rich in lithium bearing minerals,
- tectonic subsidence,
- adequate aquifers,
- geothermal activity and
- sufficient time to allow the concentration of the brines

Although the PRP displays significant geological potential several risk factors exist, and it is recommended that these issues be evaluated and mitigated to the extent reasonably possible. These risks include but are not limited to the ones grouped below:

- Geological
  - The pore space volume might be less than required to support the volume of lithium brines needed to achieve economic production of lithium carbonate.
  - The reservoirs might not have adequate permeability, both near-wellbore and far-field, to deliver the brines to the wellbore at the required rate for the required duration.
  - The reservoir pore volume, permeability and lithium concentrations must be evaluated to determine an Inferred Resource Estimate for the PRP.
  - Lithium concentrations might not reach the threshold required for economic processing to produce lithium carbonate equivalent.
  - Unforeseen reservoir effects related to the large-scale production and re-injection of highly saline brines might result in issues either at the wellbore or within the reservoir.
- Engineering
  - Drilling and completing wellbores for fluid production is a difficult task. While the oil and gas industry have an established methodology for managing the attendant risks, these have not been extensively applied to the production of large volumes of formation water.
  - The extent of the required surface production facilities must be determined and estimates of the costs and timelines to construct these facilities will need to be developed.
  - Although the PRP is in an area of well-developed services and extensive oil and gas industry infrastructure, access to services such as drilling and completion rigs, experienced crews, and facility operators needs to be considered as must the need for connection to an electrical power grid to operate the facilities.
- Processing
  - While the mineral extraction and processing workflow developed by Conductive Energy appears to be well along the path to commercial application, it is still a relatively new technology and, to the author's knowledge, has not been tested at scale.
- Financial and Commodity Risks
  - The possibility exists that the Issuer might not be able to arrange financing necessary to complete the project for a number of reasons.
  - As with any commodity the future price for lithium is speculative and constitutes a financial risk to the project. As evidenced by reports in the financial press, lithium demand is forecast to be quite strong (e.g., Wong, 2022). Other reports predict an optimistic scenario but include a discussion of the downside risk (Burton, 2022).

While it is incumbent upon the Author to make note of these and other unforeseen concerns, there are other known and unknown risks. It must be emphasized that analysis or commentary on risk factors beyond those listed under the *Geological* heading are beyond the expertise of the Author. A Qualified Professional in the field of Engineering and Project Management should be engaged to assess these estimates.

Recommended steps and preliminary plans and cost estimates to mitigate these risks are outlined in the following section of the report.

## XXVIII. Recommendations

It is recommended that the development of the PRP progress to a more detailed program of exploration work. This proposed exploration program is divided into two components: a Phase One Exploration Work Program and

a Phase Two Exploration Work Program. Initializing work on Phase Two should be contingent on a successful completion of Phase One providing evidence that the Phase Two work is warranted.

Phase One is designed to further the understanding of the Devonian reservoirs underlying the PRP. This understanding would entail capturing reservoir height, effective porosity values from petrophysical well logs, and estimations of permeability through pressure test analysis. Seismic data should be incorporated if suitable data can be sourced. Mapping of this data will be an important input to the creation of a reservoir model to predict the nature of water flow through the combined reservoirs.

A comprehensive water sampling and analysis program of all possible Devonian water producers in the area will help understand the lithium concentration, develop a resource estimate, be an important input to an economic analysis, and help define the best location for a pilot testing program and to locate wells and production facilities for a commercial scale project. The delivery of a sample to Conductive Energy for testing will confirm the suitability of the lithium brines associated with the PRP for the extraction process at a laboratory scale. The development of an aquifer management plan to ensure the maximization of lithium recovery is advisable.

Phase Two would undertake the work to develop a Pilot Facility for evaluating the feasibility of lithium production at the PRP, establish relationships with local community and area stakeholders, communicate the aims and benefits of lithium production at the PRP and conduct the economic evaluation to allow for the expansion of the PRP to a full-scale lithium production project.

Phase One is expected to cost approximately \$675,000 and Phase Two is projected to cost approximately \$600,000 for a cumulative Exploration Work Program cost of \$1,250,000.

#### A. Phase One Exploration Work Program

- Geological and geophysical mapping \$95,000
- Reservoir characterization of Devonian reservoirs in the region \$100,000
- Well testing and water sampling \$50,000
- Preliminary well cost and surface facility planning and cost estimate for PEA 43-101 \$100,000\*
- Develop an aquifer management plan: \$25,000\*
- Resource estimation for PEA NI 43-101 \$75,000 \*
- Process test sample at Conductive Energy facility \$50,000
- Project Management and Contingency \$180,000

#### B. Phase Two Exploration Work

- Design Pilot Plant and Full-Scale Facilities \$150,000\*
- Demonstration Pilot Plant equipment and tests \$115,000\*
- Stakeholder consultations and environmental assessment \$50,000
- NI 43-101 economic evaluation and upgrade to PFS. \$150,000\*
- Project Management and Contingency \$170,000

\*The Author is not a professional engineer and estimating the costs of these factors is beyond his expertise. These costs are provided as an indicative estimate rather than predictive or reliable cost estimates.

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