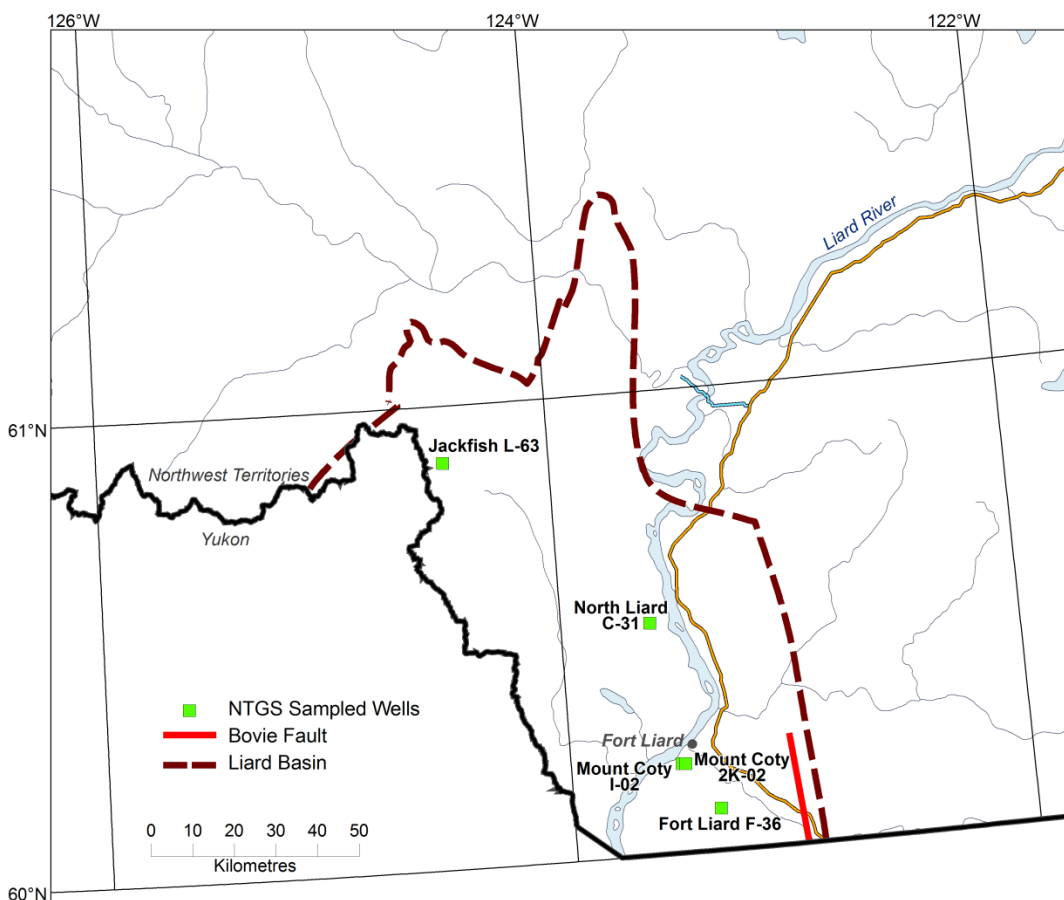


**Laboratory Analytical Results from Sampling of Five Wells in  
the Northwest Territories  
NEB Sampling ID #12612 (November 2014)  
Report Submitted: July 2016**

## INTRODUCTION

The Liard Basin has multiple shale horizons that have been identified as potential sources of hydrocarbon resources. Since 2012, the Northwest Territories Geological Survey (NTGS) has been evaluating the source rock potential of the Besa River and Horn River formations. Five exploratory wells were selected for study based on their locations in the Liard Basin, formations penetrated, and lack of previous sampling by the NTGS or other organizations (Figure 1). The objectives of this sampling program were to further characterize the source rock potential of Devonian and Mississippian shales, mapping source rock maturity “fairways” and to establish one or more geochemical “index wells” that could be used for the purpose of regional correlation.



**Figure 1:** Locations of wells sampled in this study.

## TESTING/ANALYSIS PROCEDURES

Well cuttings are stored at the Core and Sample Repository, Geological Survey of Canada (GSC) in Calgary Alberta. Table 1 shows the sampled intervals that were approved by the National Energy Board (NEB). Samples of fifteen grams were collected from the unwashed cuttings, weighed, sieved, washed and air-dried. The dried sample was picked under a stereo microscope to remove any contaminants (drilling mud, cavings, wood chips, etc.). The picked sample was divided into portions for various analyses.

The following analyses were carried out:

- 1) Rock-Eval Pyrolysis at GSC-Calgary, AB on 234 samples (analytical data are in Appendix 2; plots from this dataset are in Appendices 3 and 4).
- 2) Thermal maturation analysis through reflected light microscopy (vitrinite reflectance) at GSC Calgary, AB on 49 samples (Appendix 5).
- 3) Whole-rock geochemistry by inductively coupled plasma-mass spectroscopy (ICP-MS) at Bureau Veritas Commodities Canada Ltd. in Vancouver, BC on 234 samples (Appendix 6).

**Table 1:** Sampled wells and sampling interval.

<b>Well Name</b>	<b>UWI</b>	<b>Interval</b>	<b>Sample Interval</b>
Jackfish L-63	300/L-63-6100-12415	200m – 2342.7m 2453.5m – 2523.3m	5m – 20m (formation based)
Mount Coty 2K-02	302/K-02-6020-12330	2265.5m – 4486m	15m – 20m (cuttings quality)
Mount Coty I-02	300/I-02-6020-12330	1643.8m – 1712.5m	10m – 15m (cuttings quality)
Fort Liard F-36	300/F-36-6010-12315	2013.8m – 2097.2m	10m
North Liard C-31	300/C-31-6040-12330	1542m – 2740m	10m – 20m (cuttings quality)

## DATA & RESULTS

Preliminary interpretations of the analytical results are listed below. Full results will be disseminated in an Open Report later this year:

- The average TOC of the Golata Formation equivalent interval within the Besa River Formation from the L-63, I-02 and F-36 wells is 1.27 wt. %. This would classify the Golata Formation equivalent as a “fair” source rock.
- The Exshaw Formation equivalent within the Besa River Formation from the L-63, 2K-02 and C-31 wells has an average TOC of 3.35 wt. %. This classifies the Exshaw Formation as a “good” source rock.
- The Horn River Formation from the L-63 and 2K-02 wells has an average TOC of 3.82 wt. %. This classifies it as a “good” source rock.
- Rock-Eval data of the Golata Formation from the I-02 and F-36 wells indicates predominantly Type II kerogen with some minor Type I input. Data from the L-63 well plots in the Type III field.
- Rock-Eval data of the Exshaw Formation from the L-63 and C-31 wells plots near the origin and/or x-axis on a Van Krevelen plot, and is interpreted to be the result of overmaturity. Data from the 2K-02 well plots in the Type I kerogen field (likely

shifted toward the y-axis due to maturation effects). Original kerogen type for the Exshaw Formation is expected to be Type II with minor Type I input based on the interpretation of its depositional setting.

- Rock-Eval data of the Horn River Formation from the 2K-02 well indicates predominantly Type II kerogen with minor Type I input. The Horn River Formation is overmature at the L-63 well and therefore plots near the origin of the Van Krevelen plot.
- Average %Ro results for the Golata Formation equivalent by well are as follows: L-63 (2.55 %Ro, dry gas window), I-02 (0.83 %Ro, mixed oil & gas window) and F-36 (1.05 %Ro, mixed oil & gas window).
- Average %Ro results for the Exshaw Formation equivalent by well are: L-63 (3.81 %Ro, overmature), 2K-02 (2.2 %Ro, dry gas window) and C-31 (2.01 %Ro, dry gas window).
- Average %Ro results for the Horn River Formation by well are: L-63 (4.29 %Ro, overmature), 2K-02 (4.31 % Ro, overmature) and C-31 (2.32 %Ro, dry gas window).
- Lithogeochemistry trends will be used to correlate with previously sampled outcrop sections and wells.

## APPENDICES

1. Wells sampled, intervals, and materials sampled (.xlsx file)
2. Rock-Eval and TOC data (.xlsx file)
3. TOC and TMAX values plotted by well with Gamma Ray API log (.pdf files)
4. Pseudo van Krevelen (HI vs OI cross plots) by well (.pdf files)
5. Vitrinite Reflectance data and reports (.xlsx file)
6. Whole rock major oxide and trace element geochemistry (.xlsx file)
7. Lithogeochemical plots by well (.pdf files)