

APPENDIX N-2: Results of Total Organic Carbon Analysis of Waste Rock



524 Professional Drive
P.O. Box 1685
Bozeman, MT 59718 (59771)
(406) 581-8261

5 July 2017

To: Jerry Zieg, Todd Johnson
Tintina Montana

Cc: Allan Kirk, Geomin

From: Katharine Seipel, Senior Environmental Scientist
Lisa Kirk, PhD, PG, Principal Biogeochemist

RE: Results of Total Organic Carbon Analyses of Black Butte Copper Waste Rock

Enviromin Inc, has analyzed the total organic carbon (TOC) content of waste rock composites from Tintina Montana's Black Butte Copper Project deposit. These analyses were made in response to comments received as part of the Montana Department of Environmental Quality (MT DEQ) review of Tintina's Mine Operating Permit application, which requested that Tintina provide evidence of organic carbon content for the black shales of the Lower Newland Formation. This was described, based on observations in hand specimen, as a possible sink for oxygen from infiltrating groundwater, which is likely consumed via (1) aerobic microbial metabolism, (2) oxidation of sulfide minerals and (3) reaction with available organic carbon (DEQ, 2017).

The tested composites were those constructed for use in kinetic testing of the rock units listed below, as reported in Appendix D of Tintina's Mine Operation Permit application. These analyses were conducted on materials that have been held in storage at McClelland Laboratories following construction of humidity cell tests; these samples were not weathered in the HCT columns and therefore represent a side-wide composite of each rock type prior to testing. The following composites were tested for TOC content:

- Ynl A (From 2012 HCTs)
- USZ (From 2015 HCTs)
- Ynl B (From 2015 HCTs)
- LZ FW (From 2015 HCTs)
- Ynl Ex (From 2016 HCTs)

Prior to TOC analysis, the samples were pulverized and treated to remove carbonate (inorganic carbon). The prepared samples were then combusted using a LECO furnace; the resulting CO₂ was measured and converted into % carbon by weight. Results of these 2017 TOC analyses are included in **Table 1** and the attached laboratory report. They confirm that these waste rock materials do contain organic carbon.

5 July 2017

Table 1. Results of 2017 TOC analyses of waste rock and reference values.

SAMPLE ID	TOC (wt%)
2012 Ynl A	0.81
2015 USZ	0.41
2015 Ynl B	0.5
2015 LZ FW	0.39
2016 Ynl Ex	0.3
<u>Lyons <i>et al</i> 2000*</u>	<u>0.13-3.39</u>

* range of values for samples collected at
Tintina's Black Butte Copper Project site, averaging 1.30 %.

Also shown in Table 1 are results reported for the Lower Newland Formation by Lyons *et al.*, 2000. These results are comparable to the values measured in the Enviromin composites and support the hand specimen observations of organic carbon in these sediments.

References

DEQ 2017. Third Deficiency Review, Pending Operating Permit 00188. June 8.

Lyons, T.W., Luepke, J.J., Schreiber, M.E., Zieg, G.A. 2000. Sulfur geochemical constraints on Mesoproterozoic restricted marine deposition: lower Belt Supergroup, northwestern United States. *Geochimica et Cosmochimica Acta*. Vol. 64, No. 3, pp. 427–437.

APPENDIX: 2017 TOC Laboratory Report



WORK ORDER.: 17-0493
LAB ID: B17-1630
Date Received: June 20, 2017
Report Date: June 21, 2017
PROJECT: 3767-01

CLIENT MLI (MCCELLAND LABS, INC.)
ATTN: Mike Medina

FROM: 3767 Ynl A
TO: 3767-01 Ynl Ex

CERTIFICATE OF ANALYSIS

Final Report

Analysis of 5 Analysis Split - Head Samples

The following analytical packages were requested.
Please see our current fee schedule for elements and detection limits

Sample Preparation:

STD-PREP Crush, split and pulverize

Analysis:

C-O Organic Carbon

The results of these assays were based solely upon the content of the samples submitted. Any decision to invest should be made only after the potential investment value of the claim or deposit has been determined based on the results of assays of multiple samples of geologic materials collected by the prospective investor or by a qualified person selected by him/her and based on an evaluation of all engineering data which is available concerning any proposed project. This report may not be altered or reproduced without our consent. Our liability is limited solely to the analytical work performed on these samples

CERTIFIED BY : Rose Baker



McClelland Laboratories, Inc.

Client: Client MLI (McClelland Labs, Inc.)
 Project: 3767-01
 Sample type(s): Analysis Split - Head
 Submitted by: Mike Medina

ANALYSIS CERTIFICATE
B17-1630
 21-Jun-17

RESULTS

	Analyte Name	Carbon
	Unit Symbol	%
	Scheme Name	C-Organic
Sample ID	Method Code	Leco
1	3767 Ynl A	0.81
2	3767-01 USZ Composite	0.41
3	3767-01 Ynl B Composite	0.50
4	3767-01 LZFW Composite	0.39
5	3767-01 Ynl Ex	0.30



McClelland Laboratories, Inc.

Client: Client MLI (McClelland Labs, Inc.)
 Project: 3767-01
 Sample type(s): Analysis Split - Head
 Submitted by: Mike Medina

ANALYSIS CERTIFICATE

B17-1630

21-Jun-17

QUALITY CONTROL

Analyte Name	Carbon
Unit Symbol	%
Scheme Name	C-Organic
Method Code	Leco
3767 Ynl A Orig	0.80
3767 Ynl A Dup	0.82
3767-01 USZ Composite Orig	0.42
3767-01 USZ Composite Dup	0.41
3767-01 Ynl B Composite Orig	0.50
3767-01 Ynl B Composite Dup	0.50
3767-01 LZFW Composite Orig	0.39
3767-01 LZFW Composite Dup	0.38
3767-01 Ynl Ex Orig	0.29
3767-01 Ynl Ex Dup	0.31