APPENDIX O

LABRADOR AND CARIBOU LICHEN TEAS: AUXILIARY STUDY

MEDICINAL CONSUMPTION – Labrador tea and Caribou Lichen

Labrador tea (*Ledum groenlandicum and/or L. decumbens*) and caribou lichen (*Cladina mitis*) were determined to be valuable traditional resources to the LSCFN. Tea made these plants is used by the First Nation to treat an array of ailments. Recently there have been questions within the LSCFN community regarding how the preparation of traditional foods/medicine affects the consumability of tissues from the mine. According to the Tolerable Intake Analysis completed in 2005, consumption of Labrador tea and caribou lichen were quite restrictive in order to avoid the maximum daily intake of arsenic.

On October 27, 2006, EDI staff travelled to Carmacks to make tea with Clyde and Rowena Blackjack using a traditional First Nations method. Samples collected from Mt. Nansen were chosen from locations that have been previously found to have significantly higher concentrations of particular metals. Labrador tea was collected from plot Pony-3, approximately 100 m downstream of the Pony adit, and, Caribou lichen was sampled at plot B1, directly adjacent to the tailings pond.

Four cups of water were added to each old, tin coffee container, as per the 'current' traditional method. Once the water came to a boil (using a conventional stove top), approximately 6 tbsp. of either Labrador tea or lichen were added. These were rough measurements, however each portion was identical. The tea was then boiled for approximately half an hour and then strained, using cheesecloth, into the sample bottle. While preparing the tea, all materials and samples were handled using nitrile gloves.

Five samples in total were analyzed for total metal content (see Table 1). Two tea samples made from Labrador tea (TEA-LELA-PONY-1 & 2) from the pony creek site were sent to the laboratory. One tea sample made from caribou lichen (TEA-CLMI-B1-1) was sent from transect plot: B1 and a Labrador tea sample (TEA-LELA-CP-1) was sent from control plot 1. Also included in the analysis was a sample (TEA-CH20-1) taken directly from the kitchen tap, which was also boiled and treated in the same manner as all other tea samples. This was undertaken to provide reference to any results that may be influenced by the water source used to make the tea.

In 2005, arsenic levels in lichens collected from transect plot B1 were significantly elevated (36.9 ppm) when compared to other plots in the study area. However, the lichen tea sample from the same location had a dramatically lower arsenic concentration of 0.016 ppm. Other metals from lichen at transect plot B1 that were high in 2005 include antimony (3.5 ppm), iron (933 ppm) and lead (39.4 ppm). In comparison, the tea solution again exhibited very low concentrations of antimony (<DL), iron (0.38 ppm), and lead (0.0006 ppm).

Table 1. Summary of selected metal levels in teas made with caribou lichen and Labrador Tea leaves.

Sample ID	Al	As	B	Ba	Cd	Cu	Sr
TEA-LELA-PONY-1 (ppm)	0.24	0.031	0.118	0.119	<DL	0.112	0.188
TEA-CLMI-BI-1 (ppm)	0.17	0.016	<DL	0.0314	<DL	0.097	0.0494
TEA-CH2O-1 (ppm)	0.05	<DL	<DL	0.0469	<DL	0.012	0.127
TEA-LELA-PONY-2 (ppm)	0.24	0.034	0.12	0.124	<DL	0.078	0.194
TEA-LELA-CP-1 (ppm)	0.12	<DL	0.414	0.199	<DL	0.076	0.234
CCME Guidelines for Drinking Water (ppm)	**100**	**25**	**5000**	**1000**	**5**	**1000**	**5**
Sample ID	**Cr**	**Fe**	**Mo**	**Ni**	**Pb**	**Sb**	**U**
TEA-LELA-PONY-1 (ppm)	0.0016	0.5	0.004	0.018	<DL	<DL	<DL
TEA-CLMI-BI-1 (ppm)	0.0014	0.38	0.003	0.008	0.006	<DL	<DL
TEA-CH2O-1 (ppm)	<DL	<DL	0.002	0.005	<DL	<DL	<DL
TEA-LELA-PONY-2 (ppm)	0.0023	0.52	0.003	0.015	<DL	<DL	<DL
TEA-LELA-CP-1 (ppm)	0.0045	0.1	<DL	0.03	<DL	<DL	<DL
CCME Guidelines for Drinking Water (ppm)	**50**	**40**	**70**	**200**	**0.1**	**6**	**20**

In 2005, Labrador tea collected at plot PONY-3 showed high concentrations of various metals including aluminum (72.4 ppm), antimony (1.4 ppm), arsenic (12.5 ppm), boron (25 ppm), cadmium (0.27), copper (5.1 ppm), iron (509 ppm), lead (5.2 ppm) and strontium (22.7 ppm). These concentrations were not reflected in the tea samples. In fact, a relatively small percentage of metals were found to be present in the tea.

Based on the results of this analysis, it appears that although the Labrador tea leaves and lichen used to make the teas were sampled from areas showing the highest concentrations of metals during the 2005 tissue analysis, all results remain well below CCME (2002) guidelines for drinking water. The complete laboratory results are presented in the following pages.

NORWEST LABS

LOT: 508966　　Control Number

Environmental Sample Information Sheet

Note: Proper completion of this form is required in order to proceed with analysis
Visit www.norwestlabs.com for your nearest Norwest location and proper sampling protocol

Billing Address:

Company: Environmental Dynamics
Address:
407-B Steele St
Whitehorse, YT, CAN
Y1A 2C7

Attention: Pat Tobler
Phone: (867) 393-4882
Fax: (867) 393-4883
Cell: (867) 333-5487
e-mail: ptobler@edynamics.com

Report Result: Fax [ ] Mail [X] Courier [ ] e-mail [X] e-Service [ ]

Report To:　　Copy of invoice: [ ]

Company: Environmental Dynamics
Address:
407-B Steele St
Whitehorse, YT, CAN
Y1A 2C7

Attention: Pat Tobler
Phone: (867) 393-4882
Fax: (867) 393-4883
Cell: (867) 333-9058
e-mail: ptobler@edynamics.com

Report Result: Fax [ ] Mail [X] Courier [ ] e-mail [X] e-Service [ ]

RECEIVED
NOV 21 2006
6:05pm

Information to be included on Report and Invoice

Project ID: MH NANSEN
Project Name:
Project Location:
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 64493

RUSH: Please contact the laboratory to confirm rush dates and times before submitting samples.
Upon filling out this section, client accepts that surcharges will be attached to this analysis
Required on: all analyses [ ] or as indicated [ ]
Date Required:
Signature:
Norwest Authorization:

Sample Custody (Please Print)
Sample by: MATT POWER
Company: EDI
Method:　　Coolers
Waybill #:　　Boxes
Company　　Samples
Rec'd by:
Location
Log in by:
Location

Special Instructions / Comments

SAMPLE (TEA-LELA-CP-1) IS NOT FULL. IF IT CANNOT BE ANALYZED, THAT'S OK. PLEASE SEE WHAT CAN BE DONE IN ORDER TO ANALYZE WHAT IS THERE.
-WE DID NOT HAVE HARD COPY FORMS. PLEASE SEND SOME ASAP.

Enter tests above (✓ relevant samples below) ☑ indicates a rush analysis
Tests: TOTAL METALS (ICP-OES) T32Y

	Lot Ref	Sample Identification	Time	Date Sampled	Matrix	Sampling Method	Number of Containers	TOTAL METALS (ICP-OES) T32Y
1		TEA-LELA-PONY-1		NOV 17	H_2O		1	✓
2		TEA-CLM1-B1-1					1	✓
3		TEA-CH2O-1					1	✓
4		TEA-LELA-PONY-2					1	✓
5								
6		TEA-LELA-CP-1					1	✓
7								
8								
9								
10								
11								
12								
13								
14								
15								

NOTE: All hazardous samples must be labelled according to WHIMIS guidelines.
Accredited by the Standards Council of Canada for specific tests.

Report Transmission Cover Page

Norwest Labs
#104, 19575-55 A Ave.
Surrey, BC. V3S 8P8
Phone: (604) 514-3322
Fax: (604) 514-3323

Bill to: Environmental Dynamics
Report to: Environmental Dynamics
3128 Third Avenue
Whitehorse, YT, Canada
Y1A 1E7
Attn: Pat Tobler
Sampled By: Matt Power
Company: EDI

Project ID: Mt. Nansen
Name:
Location:
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **508966**
Control Number:
Date Received: Nov 22, 2006
Date Reported: Nov 27, 2006
Report Number: 940420

Contact	Company	Address
Pat Tobler	Environmental Dynamics	3128 Third Avenue
Web		Whitehorse, YT Y1A 1E7
Email Notification		Phone: (867) 393-4882 Fax: (867) 393-4883
		Email: ptobler@edynamics.com

	Copies	Delivery Strategy	Format
	1	Post	
A	1	Email - Multiple Reports	PDF
A	1	Email - Multiple Reports	Standard Crosstab

NOTE: **P** indicates a preliminary report is required
NOTE: **A** indicates report is delivered using automated delivery

_____ # OF PAGES IN THIS TRANSMISSION

Report Transmission Notes

Agreement Notes

Lot Notes

Sample Notes:

Notes to Clients

Lot Notes:

Sample Notes:

Batch Notes:

Method Notes:

Method Result Notes:

Reports associated with this Lot

Id/Format/Reported Date	Id/Format/Reported Date	Id/Format/Reported Date
940420 Env2 3 Smp & DL		

Comment:
See Methodology and Notes page of Analytical Report for all comments pertaining to this report.

If this report transmission is not satisfactory, please send report requirements to the address at the top of this page.

Sample Custody

Norwest Labs
#104, 19575-55 A Ave.
Surrey, BC. V3S 8P8
Phone: (604) 514-3322
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Bill to: Environmental Dynamics
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Y1A 1E7
Attn: Pat Tobler
Sampled By: Matt Power
Company: EDI

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P.O.:
Acct. Code:

NWL Lot ID: **508966**
Control Number:
Date Received: Nov 22, 2006
Date Reported: Nov 27, 2006
Report Number: 940420

Sample Disposal Date: Dec 27, 2006

All samples will be stored until this date unless other instructions are received. Please indicate other requirements below and return this form to the address or fax number on the upper right of this page.

_____ **Extend Sample Storage Until** _____ **(MM/DD/YY)**

The following charges apply to extended sample storage:

Storage for 1 to 5 samples per month	$ 10.00
Storage for 6 to 20 samples per month	$ 15.00
Storage for 21 to 50 samples per month	$ 30.00
Storage for 51 to 200 samples per month	$ 60.00
Storage for more than 200 samples per month	$ 110.00

_____ **Return Sample, collect, to the address below via:**

_____ Greyhound
_____ Loomis
_____ Purolator
_____ Other (Specify) _____

Name: _____
Company: _____
Address: _____
_____
Phone: _____
Fax: _____
Signature: _____

If no other arrangements have been made, samples will be disposed of on Dec 27, 2006.

Analytical Report

Norwest Labs
#104, 19575-55 A Ave.
Surrey, BC. V3S 8P8
Phone: (604) 514-3322
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Date Received: Nov 22, 2006
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			NWL Number	508966-1	508966-2	508966-3	
			Sample Date	Nov 17, 2006	Nov 17, 2006	Nov 17, 2006	
			Sample Description	TEA-LELA-PONY-1	TEA-CLMI-BI-1	TEA-CH2O-1	
			Matrix	Water	Water	Water	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Metals Total							
Aluminum	Total	mg/L		0.24	0.17	0.05	0.02
Antimony	Total	mg/L		<0.01	<0.01	<0.01	0.01
Arsenic	Total	mg/L		0.031	0.016	<0.004	0.004
Barium	Total	mg/L		0.119	0.0314	0.0469	0.0005
Beryllium	Total	mg/L		0.0006	<0.0003	<0.0003	0.0003
Bismuth	Total	mg/L		<0.01	<0.01	<0.01	0.01
Boron	Total	mg/L		0.118	<0.01	<0.01	0.01
Cadmium	Total	mg/L		<0.001	<0.001	<0.001	0.001
Calcium	Total	mg/L		38.3	11.1	27.9	0.03
Chromium	Total	mg/L		0.0016	0.0014	<0.0008	0.0007
Cobalt	Total	mg/L		<0.001	<0.001	<0.001	0.001
Copper	Total	mg/L		0.112	0.097	0.012	0.001
Iron	Total	mg/L		0.50	0.38	<0.02	0.02
Lead	Total	mg/L		<0.005	0.006	<0.005	0.005
Lithium	Total	mg/L		0.008	0.006	0.004	0.002
Magnesium	Total	mg/L		12.7	3.14	5.88	0.02
Manganese	Total	mg/L		0.526	0.541	<0.005	0.005
Molybdenum	Total	mg/L		0.004	0.003	0.002	0.001
Nickel	Total	mg/L		0.018	0.008	0.005	0.002
Phosphorus	Total	mg/L		2.01	1.32	<0.01	0.01
Potassium	Total	mg/L		35.9	15.4	1.5	0.1
Selenium	Total	mg/L		<0.005	<0.005	<0.005	0.005
Silicon	Total	mg/L		7.68	5.39	4.59	0.05
Silver	Total	mg/L		<0.003	<0.003	<0.003	0.003
Sodium	Total	mg/L		3.50	2.75	2.60	0.02
Strontium	Total	mg/L		0.188	0.0494	0.127	0.0004
Sulfur	Total	mg/L		8.1	6.5	4.5	0.1
Thallium	Total	mg/L		0.017	<0.005	<0.005	0.005
Tin	Total	mg/L		0.178	1.37	0.230	0.004
Titanium	Total	mg/L		0.002	0.004	<0.001	0.001
Uranium	Total	mg/L		<0.06	<0.06	<0.06	0.05
Vanadium	Total	mg/L		0.004	0.005	0.005	0.003
Zinc	Total	mg/L		0.084	0.051	0.003	0.002
Zirconium	Total	mg/L		<0.001	<0.001	<0.001	0.001

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			NWL Number	508966-4	508966-5		
			Sample Date	Nov 17, 2006	Nov 17, 2006		
			Sample Description	TEA-LELA-PONY-2	TEA-LELA-CP-1		
			Matrix	Water	Water		
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Metals Total							
Aluminum	Total	mg/L		0.24	0.12		0.02
Antimony	Total	mg/L		<0.01	<0.01		0.01
Arsenic	Total	mg/L		0.034	<0.004		0.004
Barium	Total	mg/L		0.124	0.199		0.0005
Beryllium	Total	mg/L		<0.0003	<0.0003		0.0003
Bismuth	Total	mg/L		<0.01	<0.01		0.01
Boron	Total	mg/L		0.120	0.414		0.01
Cadmium	Total	mg/L		<0.001	<0.001		0.001
Calcium	Total	mg/L		39.4	54.3		0.03
Chromium	Total	mg/L		0.0023	0.0045		0.0007
Cobalt	Total	mg/L		<0.001	<0.001		0.001
Copper	Total	mg/L		0.078	0.076		0.001
Iron	Total	mg/L		0.52	0.1		0.02
Lead	Total	mg/L		<0.005	<0.005		0.005
Lithium	Total	mg/L		0.008	0.008		0.002
Magnesium	Total	mg/L		13.2	21.1		0.02
Manganese	Total	mg/L		0.552	1.23		0.005
Molybdenum	Total	mg/L		0.003	<0.001		0.001
Nickel	Total	mg/L		0.015	0.030		0.002
Phosphorus	Total	mg/L		2.11	10.7		0.01
Potassium	Total	mg/L		37.2	106		0.1
Selenium	Total	mg/L		<0.005	<0.005		0.005
Silicon	Total	mg/L		8.00	12.5		0.05
Silver	Total	mg/L		<0.003	<0.003		0.003
Sodium	Total	mg/L		3.50	6.58		0.02
Strontium	Total	mg/L		0.194	0.234		0.0004
Sulfur	Total	mg/L		8.5	14.8		0.1
Thallium	Total	mg/L		0.013	0.009		0.005
Tin	Total	mg/L		0.184	<0.004		0.004
Titanium	Total	mg/L		0.003	<0.001		0.001
Uranium	Total	mg/L		<0.06	<0.06		0.05
Vanadium	Total	mg/L		<0.003	<0.003		0.003
Zinc	Total	mg/L		0.087	0.117		0.002
Zirconium	Total	mg/L		<0.001	<0.001		0.001

Analytical Report

Norwest Labs
#104, 19575-55 A Ave.
Surrey, BC. V3S 8P8
Phone: (604) 514-3322
Fax: (604) 514-3323

Bill to: Environmental Dynamics
Report to: Environmental Dynamics
3128 Third Avenue
Whitehorse, YT, Canada
Y1A 1E7
Attn: Pat Tobler
Sampled By: Matt Power
Company: EDI

Project ID: Mt. Nansen
Name:
Location:
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **508966**
Control Number:
Date Received: Nov 22, 2006
Date Reported: Nov 27, 2006
Report Number: 940420

Approved by:

Walter Brandl
Operations Manager - Surrey

Norwest Labs
#104, 19575-55 A Ave.
Surrey, BC. V3S 8P8
Phone: (604) 514-3322
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Methodology and Notes

Bill to: Environmental Dynamics
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3128 Third Avenue
Whitehorse, YT, Canada
Y1A 1E7
Attn: Pat Tobler
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Method of Analysis:

MethodName	Reference		Method	Date Analysis Started	Location
Metals SemiTrace (Total) in Liquids (Surrey)	US EPA	*	Metals & Trace Elements by ICP-AES, 6010B	23-Nov-06	Norwest Labs Surrey

* Norwest method(s) is based on reference method

References:

US EPA — US Environmental Protection Agency Test Methods

Comments: