36th Annual
Yellowknife Geoscience Forum
Abstracts of Talks and Posters
November 18-20, 2008

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http://www.nwtgeoscience.ca/forum/

TUESDAY, NOVEMBER 18 (MORNING)

Theatre 1 – Exploration and Geoscience

Chairpersons: Edith Martel and Don James

08:40 Cairns, S. and Ketchum, J. - The Northwest Territories Geoscience Office – 2008 Activity Overview

09:00 Percival, J.A. - The Geomapping For Minerals Program

09:20 Goff, S. - A Mineral Exploration overview Of The Northwest Territories

09:40 Ham, L. - A Mineral Exploration Overview Of Nunavut

10:00 Coffee (*sponsored by Discovery Mining Services Ltd, and Sub-Arctic Surveys Ltd.)*

10:20 Bleeker, W. - A Review of Mafic-Ultramafic Occurrences Of The Slave Craton And Their Ni-Cu Potential, With Emphasis On The Ca. 2.8 Ga Central Slave Cover Group

10:40 Ernst, R.E. and Bleeker, W. - Summary of Proterozoic Magmatic Events Of The Slave Craton And Environs And Assessment Of Their Metallogenic Potential

11:00 Kivi, K.R., Doyle, B.J., and Senn, M.J. - The Providence Nickel Discovery, Slave Province, NT.

11:20 McLean, K. - Geological Setting and Update On Exploration Activities, Providence Greenstone Belt, NWT.

11:40 Coffee *(sponsored by Seabridge Gold Inc.)*

12:00 Pratico, V. - Tyhee Development Corp's Yellowknife Gold Project

12:20 Lindsay, D. - The Hope Bay Project 2008 Update - Hope Bay, Nunavut, Canada

12:40 Welcome

13:00 Lunch *(sponsored by Boart Longyear Drilling Services, Diavik Diamond Mine (a Rio Tinto operation), and NWT & Nunavut Chamber of Mines)* – Weledeh and St. Patrick's School gymnasium

Theatre 2 – Energy in Canada's North

Chairperson: Thomas Hadlari

08:40 Pyle, L.J., Gal, L.P., Hadlari, T., Jones, A.L., Lemieux, Y., Zantvoort, W.G., Allen, T.L., and Fraser, T.A. - Overview Of Peel Petroleum Project Final Deliverables

09:00 Thomson, D., Schröder-Adams, C., Hadlari, T. - Foraminiferal Biostratigraphic Framework For The Cretaceous Of The Peel Plateau Region

09:20 Davison, J.E., Chesterman, J.P., Giovanni, M.K., Hadlari, T., and Hubbard, S.M. - Preliminary Outcrop Insights Into The Stratigraphy And Sedimentology Of The Lower Cretaceous Of The Mackenzie Plain, NWT

09:40 Hadlari, T., Thomson, D., Schröder-Adams, C.J., Lemieux, Y., MacLean, B., and Gabites, J.E. - Cretaceous Evolution Of A Northern Cordilleran Foreland Basin Inferred From Stratigraphy, Seismic Sections, And Detrital Zircons, Mackenzie Mountains, Canada

10:00 Coffee *(sponsored by Discovery Mining Services Ltd, and Sub-Arctic Surveys Ltd.)*

10:20 Gal, L.P. - An assortment Of Observations And Analyses Regarding Petroleum Potential Of Paleozoic Rocks, Peel Plateau And Plain, Northwest Territories And Yukon

10:40 Corlett, H.J. and Jones, B. - Middle Devonian Sea Level Rise In the Mackenzie Basin, NWT: Case Study Of A Devonian Ramp Carbonate System

11:00 Fallas, K.M. - Structural Style Of The Fold-Belt to Thrust-Belt Transition, Central Mackenzie Mountains, NWT, And Its Implications For Structural Trap Development

11:20 Price, P. and Enachescu, M. - The Nogha Gas Discovery – A Cambrian Clastic Gas Discovery Within The Sahtu Settlement Region Of The Central Mackenzie Valley, NWT

11:40 Coffee *(sponsored by Seabridge Gold Inc.)*

12:00 Enachescu, M., Price, P., Cody, J., Dyke, A., Heim, J., Bogstie, D., Whidden, S., Vestrum, R., and Gittins, J. - "Marine" Mackenzie River Seismic Line, NWT: Data Reprocessing And Basin Research

12:20 Fowler, M.G. - Geomapping for Energy – A New Federal Geoscience Program For The North

12:40 Welcome (Theatre One)

13:00 Lunch *(sponsored by Boart Longyear Drilling Services, Diavik Diamond Mine (a Rio Tinto operation), and NWT & Nunavut Chamber of Mines)* – Weledeh and St. Patrick's School gymnasium

Theatre 3 – Mining and Environmental Management

Chairpersons: Jennifer Galloway and Julie Ward

09:00 Sego, D.C., Pham, N., Blowes, D., Smith, L. - Heat Transfer In Waste Rock Piles At Diavik Diamond Mine

09:20 Bailey, B.L., Smith, L., Neuner, M., Gupton, M., Blowes, D.W., Smith, L., Sego, D.C., and Gould, D. - Diavik Waste Rock Project: Early Stage Geochemistry And Microbiology Of Effluent From Low Sulfide Content Waste Rock Piles

09:40 Smith, L., Neuner, M., Gupton, M., Bailey, B.L., Blowes, D., Smith, L., and Sego, D. - Diavik Test Piles Project: Design And Construction Of Large-Scale Research Waste Rock Piles In The Canadian Arctic

10:00 Coffee *(sponsored by Discovery Mining Services Ltd, and Sub-Arctic Surveys Ltd.)*

10:20 Biggar, K.W., Richardson, A., and Iwakun, I. - Characterization Of Fuel Contamination In A Fractured Bedrock Permafrost Environment At The Colomac Mine

10:40 Bourke, R., Connell, R., and Galloway, J.M. - Groundwater Monitoring At Newmont Con Mine

11:00 Mace, J. - Determining the Most Appropriate Soil Criteria For The Remediation of Northern Contaminated Sites

11:20 Silcock, K. - Developing A Remediation Plan For The North Inca Advanced Exploration Site, NWT

11:40 Coffee *(sponsored by Seabridge Gold Inc.)*

12:00 Modeste, O. and Ward, J. - Addressing Historic And Present Concerns About The Former Port Radium Uranium Mine

12:20 Carrière, S. - Risk Assessment Of Invasive Alien Species In The NWT

12:40 Welcome (Theatre One)

13:00 Lunch *(sponsored by Boart Longyear Drilling Services, Diavik Diamond Mine (a Rio Tinto operation), and NWT & Nunavut Chamber of Mines)* – Weledeh and St. Patrick's School gymnasium

TUESDAY, NOVEMBER 18 (AFTERNOON)

Theatre 1 – Exploration and Geoscience

Chairpersons: Edith Martel and Don James

14:50 **Burgess, S. -** 2008 Hackett River Project Update: At The Threshold Of Development

15:10 **Grant, H.L.J., Layton-Matthews, D., Peter, J.M., Klatt, H., and Venance, K.E**. - The Distribution And Controls On Silver Mineralization In The Main Zone Of The 2.68 Ga Hackett River Zn-Pb-Cu-Ag Volcanogenic Massive Sulfide (VMS) Deposit, Nunavut, Canada

15:30 **Kjarsgaard, B.A. and Wright, D.** - Mineral And Energy Resource Assessment (Mera) For The Proposed East Arm National Park

15:50 **Mercer, W., Pedersen, J.C., and Trueman, D.L.** - The Lake Zone Heavy Rare Earth Deposit, NT, Canada

Theatre 2 – Energy in Canada's North

Chairperson: Thomas Hadlari

14:50 **Smith, I.R.** - Shothole Drillers' Logs As A Regional Geoscience Resource: Project Update, Applications, And Future Directions

15:10 **Bennett, R., Blasco, S., MacKillop, K., and Kostylev, V**. - Update On Beaufort Sea Seabed Environmental And Geotechnical Research

15:30 **Whalen, D., Solomon, S.M., Forbes, D.L., Craymer, M. , Lavergne, J.C. , and Marsh, P.** - Coastal And Nearshore Geohazards In The Southern Beaufort Sea

15:50 **Hadlari, T. and Bedard, J.H.** - Reconnaissance Fieldwork On Cambrian Siliciclastic Rocks, Victoria Island, NT

16:10 **Drummond, K.J.** - Discovered And Undiscovered Oil And Gas Resources of the Beaufort Sea

Theatre 3 – Mining and Environmental Management

Chairpersons: Jennifer Galloway and Julie Ward

14:50 **Gerein, K.M., Machtans, H., and Mitchell, W.** - Environmental Effects Monitoring At Giant Mine

15:10 **Fitzsimons, J.D., Machtans, H., Majewski, S.** - Use Of An Artificial Reef As Habitat Compensation In An Arctic Lake

15:30 **Vescei, P., Machtans, H., and Metikosh, S.** - Baker Creek: Results Of Arctic Grayling Monitoring In 2008

15:50 **MacNeill, W.S, Ash G.R, and Schryer, R.** - Changes In Baseline Water Quality Characteristics Following The 2008 Forest Fire At Fortune Minerals Ltd. NICO Project

TUESDAY, NOVEMBER 18 (EVENING)

Charles Camsell Talk

Tuesday November 18, 2008; 7 pm

Northwest Territories Legislative Assembly

Sponsored by NAPEGG, open to the public (free)

Dr. Mark Hannington, University of Ottawa

Exploring Active Volcanoes on the Ocean Floor

Speaker Biography

Mark Hannington received a PhD. from the University of Toronto in 1989 and spent 15 years as a Research Scientist at the Geological Survey of Canada before joining the University of Ottawa in 2005. His research combines the study of active volcanoes on the ocean floor, and associated metal depositing hot springs ("black smoker vents"), with research on ancient volcanic environments that host many of the world's largest and most valuable mineral deposits on land. During the last 24 years, Dr. Hannington has participated on 25 research cruises to submarine volcanoes on the East Pacific Rise, the Juan de Fuca Ridge, the Mid-Atlantic Ridge, Iceland, New Zealand, Antarctica, Tonga, and Papua New Guinea. This work has focused on understanding the origins of base and precious metal deposits at submarine volcanoes and has led to the discovery of a number of previously unknown mineral deposit types on the seafloor. Recently, Dr. Hannington's work has made important contributions to the understanding of natural loading of metals to the oceans from volcanic and hydrothermal sources, including metals with potential far-field environmental significance. His comparisons between modern volcanoes and ancient volcanic environments in Canada are also leading to new and improved models for land-based mineral exploration. Dr. Hannington is the chief editor of the international research journal Economic Geology, which deals with the geosciences applied to mineral deposits. Economic Geology is one of the oldest scientific publications in North America and is celebrating its 100th anniversary this year. Dr. Hannington is only the 5th editor of the journal and the first to be located outside the United States.

WEDNESDAY, NOVEMBER 19 (MORNING)

Theatre 1 – Exploration and Geoscience

Chairpersons: Steve Goff and Don James

08:40 Ootes, L., Falck, H., Gleeson, S., Turner, E., Rasmussen, K., Gordey, S., and Pierce, K. - Metallogenic Evolution Of The Mackenzie Mountains, NWT

09:00 Falck, H. and Day, S. - Stream Sediment Sampling In The Mackenzie Mountains: A Status Report For 2008

09:20 Dunning, J.K. - Selwyn Project: Truly Undiscovered World-Class Zinc Country

09:40 Taylor, A. - Prairie Creek Mine: Application For Operations

10:00 Coffee *(sponsored by Hope Bay Mining - Newmont Mining)*

10:20 Martel, E., Gordey, S., Roots, C., Fallas, K., MacNaughton, R., and Fischer, B. - Sekwi Mountain Project Year 3: Overview of Bedrock Mapping And Collaborative Studies In Central Mackenzie Mountains, NT

10:40 Leslie, C.D., Sandeman, H.A., and Mortensen, J.K. - Lower Paleozoic Rift Related Alkaline Volcanic Rocks, Mackenzie Mountains, NT

11:00 Mercier, M., Marshall, D., Ootes, L., Lalonde, A.E., and Martel, E. - Geology And Mineralogy Of The Mountain River Beryl (Variety Emerald) Showing, Mackenzie Mountains, NT, Canada: Insights From Preliminary Fluid Inclusion Studies

11:20 MacDonald, J., and Lin, S. - The Plateau Thrust: A Detailed Investigation And Characterization Of The Deformation In Its Footwall, NTS Sheet 106A, Mackenzie Mountains, NT, Canada

11:40 Coffee *(sponsored by Canadian Zinc Corporation)*

12:00 Turner, E.C., Neuweiler, F., and Burdige, D. - Evidence Of Early Neoproterozoic Metazoans (Animals), Little Dal Group, NWT

12:20 St-Onge, M.R., Harrison, C., Strelnikov, S., Lopatin, B.G., Wilson, F., Bergman, S., Jepsen, H.S., and Solli, A. - A New Geological Map of the Arctic – Prelude To A Geo-Mapping For Energy & Minerals (Gem) Tri-Territorial Compilation Project

12:40 Duke, N.A. - Remnant Neoarchean Ash Flow Fields, Diagnostic Of Orogenic Settings With Lode Gold Mineralization: Examples From The Canadian Shield

13:00 Lunch *(sponsored by Yellowknife Inn) – Capitol Theatre*

Theatre 2 – Regulatory

Chairpersons: Andy Graw and Angie Norris

08:40 Ellis, S. - An Akaitcho Exploration Agreement: Securing First Nation Consent For Mineral Exploration Projects

09:00 Bonham, O., and Hepelle, B. - Professional Geoscience In Canada - An Update

09:20 Cliffe-Phillips, M. - Uranium Mineral Exploration Policy (Draft) – Wek'eezhii Land & Water Board

09:40 Hamre, K. - NWT Protected Areas Strategy: Status Of Land Access And Information

10:00 Coffee *(sponsored by Hope Bay Mining - Newmont Mining)*

Theatre 2 – Geoscience Outreach

Chairpersons: Diane Baldwin and Louise Corriveau

10:20 Corriveau, L., Jackson, V.A., Mumin, H., McMartin, I. , Bleeker, W. - Reaching Out With Sciences: Why We Are So Keen On Potential Iron Oxide Copper-Gold Deposits In The Great Bear Lake Area, NT

10:40 Daniel, S. - Experiential Science

11:00 Griller, N., Taptuna, P., and O'Neil, J. - Collaborating To Support Community Involvement In Environmental Consulting: Golder And Angoniatit Niovikvia Ltd., Kugluktuk, Nunavut

11:20 Ham, L.J., Chakungal, J., and Prosh, E.C. - Geoscience Outreach In Nunavut

11:40 Coffee *(sponsored by Canadian Zinc Corporation)*

Theatre 2 – Energy in Canada's North - Pipeline

Chairperson: Thomas Hadlari

12:00 Duk-Rodkin, A., Huntley, D., Smith, I.R., Singhroy, V., and MacDonald, L. - Surficial Geologic Research Program In The Southern Mackenzie Valley, Northwest Territories, Canada: Its Significance And Use In Planning Pipeline Construction And Resource Development

12:20 Lemay, D.A., MacDonald, L.E., Davenport, P.H., and Duk-Rodkin, A. - Towards An Integrated Work Flow For Surficial Geological Maps Of The Southern Mackenzie Corridor In GIS And Printed Formats

12:40 Wang, B., Paudel, B., and Li. H. - An Update On Landslide Retrogression Rate And Its Implication To Design Of Cut Slopes In Ice-Rich Permafrost

13:00 Lunch *(sponsored by Yellowknife Inn) – Capitol Theatre*

WEDNESDAY, NOVEMBER 19 (AFTERNOON)

Theatre 1 – Keynote Talk

14:00 Hannington, M.D. - The Metallogeny Of Modern Submarine Volcanic Arcs And Implications For Ancient Greenstone Belts

Abstract: Exploration of submarine hydrothermal systems in the western Pacific region and elsewhere is leading to enhanced models of arc metallogeny, with implications for understanding the origin and distribution of ancient ore deposits. An analysis of the formation conditions, tectonic settings, and likelihood of preservation of submarine hydrothermal systems in the western Pacific sheds light on the observed time-space relationships of diverse mineral deposit types in ancient greenstone belts. Microplate tectonics that characterize the western Pacific today also were likely important in Archean and Paleoproterozoic volcanic belts. In such complex settings, oblique collisions, opposing subduction zones, and rapid changes in stress regimes (e.g., from compressional to tensional and back to compressional) are common, causing juxtaposition of diverse styles of mineralization. Similar factors are considered to have been important for the metallogenic evolution of volcanic arcs of the Superior province. Major ore deposits of the southern Abitibi belt, for example, were formed within a span of ~50 m.y., in response to successive arc rifting, back-arc basin development, and exhumation of the adjoining accretionary complexes along major arc-parallel crustal-scale faults. Active marginal basins of similar size and representing similar stages of this evolution are well represented in the western Pacific and contain a similar suite of mineral deposit types. Examples from the eastern Manus Basin and adjoining New Ireland Basin (PNG) and in the Lau-Tonga-Kermadec arc-backarc system illustrate these similarities. However, much greater spatial and temporal resolution of magmatic and structural events will be needed to recognize these relationships in ancient greenstone belts and thereby achieve the same level of confidence in prediction of ore deposit locations that is presently possible in modern submarine volcanic arcs.

Capitol Theatre Lobby – Poster and Soap Box Session

Chairpersons: Hendrik Falck and Beth Fischer

15:00 to 16:30

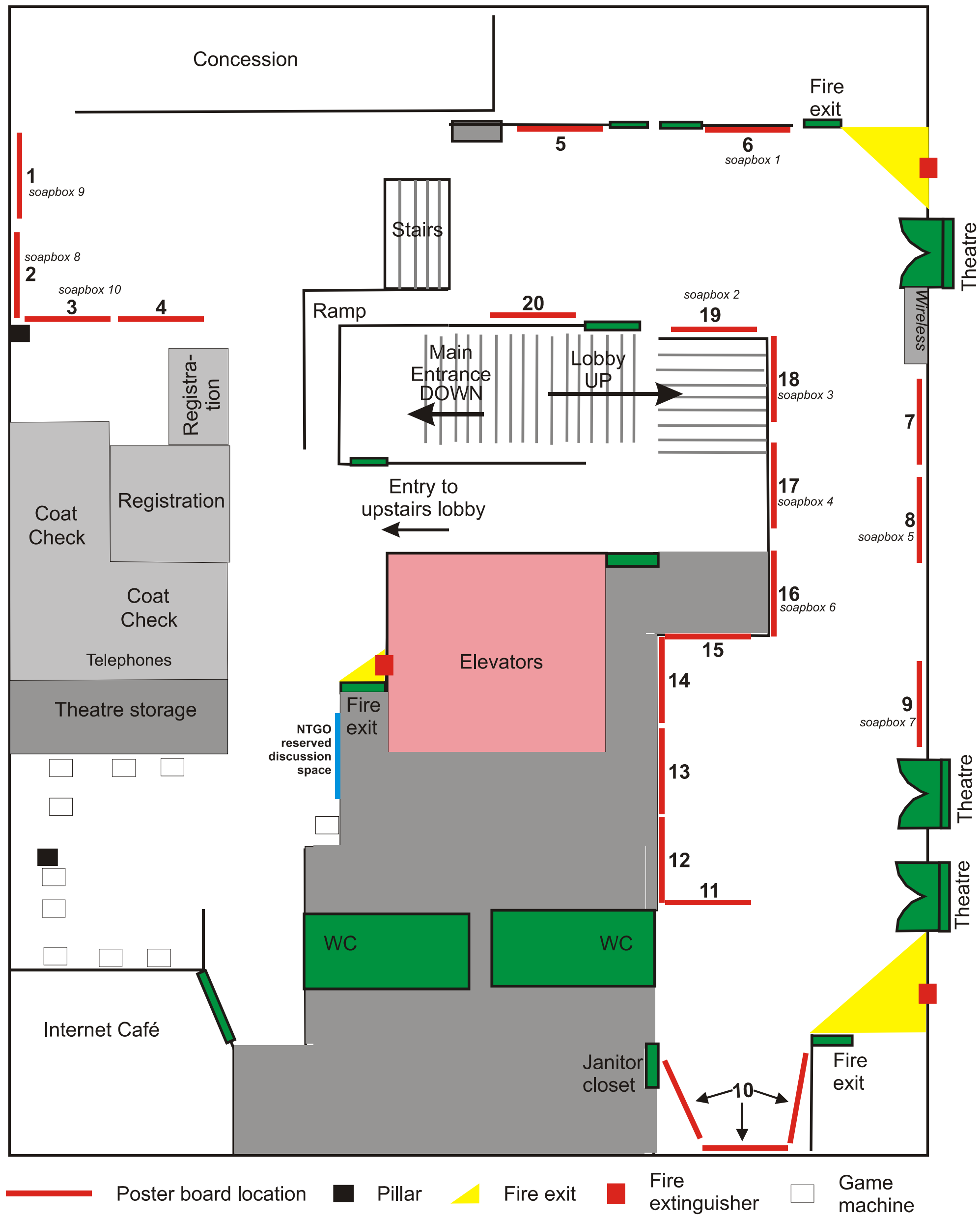
Poster 20 Allen, T.L. and Fraser, T.A. - Upper Devonian To Lower Carboniferous Tuttle Formation, Northeastern Yukon: Potential Source, Reservoir and Trap

Poster 4 Baldwin, D.K. - Community Mapping Program: Deline, NWT.

Poster 7 Bédard, J.H. et al. - The Plumbing System Of The Franklin Magmatic Event On Victoria Island, N.W.T., Preliminary Results

Poster 8 Bleeker, W. and LeCheminant, A.N. - The Proterozoic Dessert Lake Red-Bed Basin, A Target For Uranium Exploration—An Update *(Soap Box – 15:47)*

Poster 12 Chakungal, J. et al. - Natural Resource Potential – Yes Or No? The Southampton Island Integrated Project: A Summary Of 2007 & 2008 Results And Investigations



Poster 19 **Dickson, A.J. et al.** - A New Geological Model For Oil Prospectivity In The Great Bear Plains, NWT *(Soap Box – 15:23)*

Poster 14 **Gordey et al.** - Sekwi Project: Revision Maps For The Central Mackenzie Mountains, NWT

Poster 15 **Harris et al.** - Remote Predictive Mapping: Phase II With Emphasis On Recent Activities In The Wopmay Orogen

Poster 10 **Harrison, C. et al.** - New Geological Map Of The Arctic – Geological Survey Of Canada Open File 5816

Poster 6 **Heppelle, B.** - Professional Geoscience: New Legislation In The Northwest Territories And Nunavut *(Soap Box – 15:15)*

Poster 11 **Kerr, D. et al.** - Tri-Territorial Surficial Geoscience Compilation

Poster 5 **McKnight, M. D. and Wiebe, H.** - Draft Sahtu Land Use Plan: Ongoing Progress

Poster 1 **Mercer, D. G. et al.** - Effective Groundwater Monitoring For Mining Projects In Permafrost Environments *(Soap Box – 16:19)*

Poster 13 **Okulitch, A. et al.** - An Update: Geological Compilation Of The Mackenzie Mountains, NWT.

Poster 16 **Ootes, L. et al.** - A Conceptual Ni (Cu-Co-Pge) Play In The Archean Central Slave Cover Group *(Soap Box – 15:55)*

Poster 18 **Podolsky, M.H. et al.** - Whole Rock Chemistry Investigations Of The 5034 And Tuzo Kimberlites And Potential Applications To Improving Geology And Resource Models, Gahcho Kué Project, Northwest Territories *(Soap Box – 15:31)*

Poster 9 **Rasmussen, K. L., and Mortensen, J. K.** Using Fluorine And Chlorine Contents Of Magmatic Fluids To Target Undiscovered Tungsten Mineralization In The Selwyn-Mackenzie Mountains, NWT *(Soap Box – 16:03)*

Poster 2 **Snijders, M. and Cameron, K.** - Advanced Research Initiatives Using The Mackenzie Delta Air Photo Project Spatial Data *(Soap Box – 16:11)*

Poster 17 **Webb, K.J. et al.** - Coherent Kimberlite At Ekati, Northwest Territories, Canada: Textural And Geochemical Variations And Implications For Emplacement *(Soap Box – 15:39)*

Poster 3 **Wilson, J. M.** - Important Wildlife Areas in the Western Northwest Territories (Soap Box – 16:27)

(POSTER ABSTRACTS FOLLOW ORAL PRESENTATION ABSTRACTS)

THURSDAY, NOVEMBER 20 (MORNING)

Theatre 1 – Exploration and Geoscience

Chairpersons: Edith Martel and Ben Borkovic

08:40 **Jackson, V.A., Corriveau, L., Harris, J., Ootes, L., and Bennett, V.** - South Wopmay Bedrock Mapping Project - Phase II (Parts Of NTS 86B, C, And D): Status And Objectives

09:00 **McMartin, I., Corriveau, L., Beaudoin, G., Averill, S., and Neale, K.** - Indicator Mineral And Till Geochemical Signatures Of The NICO Co-Au-Bi Deposit, Great Bear Magmatic Zone, NWT: Results And Progress Report

09:20 **Corriveau, L., Mumin, H., Jackson, V.A., Ootes, L., McMartin, I., Bleeker, W., Pelleter, E., and Neale, K.** - Validation Of The Iron Oxide Copper-Gold Deposit Model For The Great Bear Magmatic Zone: From Known Deposits To Virgin Territories

09:40 **Byron, S.J., Gleeson, S.A., Ootes, L. , Samson, I.M., Jackson, V.A., and Goad, R.E.** - Giant Quartz Veins In The Great Bear Magmatic Zone

10:00 **Coffee** *(sponsored by Aurora Telenet (Canada) Inc.)*

10:40 **Breen, W.R. and Mumin, A.H.** - Geology Of The Port Radium Iron-Vanadium Deposits, Great Bear Magmatic Zone, Northwest Territories, Canada

10:40 **Ootes L., Goff, S., Gleeson, S., Jackson, V., Creaser, R., Evensen, N., Samson, I., Corriveau, L., and Mumin, A.H.** - Field Relationships, Petrography, Chronology, And Fluid Character Of The Nori/RA Cu-Mo-U (± Ree & W) Prospect: An 'Early' IOCG Example In The Great Bear Magmatic Zone?

11:00 **Ernst, R.E., Bleeker, W., Svensen, H., Planke, S., and Polozov, A. G.** - Formation Of Vent Complexes Above Underlying Mafic Sills Associated With Large Igneous Provinces (LIPS): Implications For LIPS And IOCG Deposits Of The Slave Craton And Environs

11:20 Schleiss, W.A., Swisher, D.D., and Burns, R.R. - Developing The World-Class Pine Point Property

11:40 Coffee *(sponsored by Saskatchewan Research Council)*

12:00 Sanborn-Barrie, M., Chakungal, J., James, D.T., Whalen, J., Rayner, N., Berman, R.G., Craven, J., and Coyle, M. - New Understanding Of The Geology And Diamond Prospectivity Of Southampton Island, Central Nunavut

12:20 Ryan, J.J., Nadeau, L., Davis, W.J., Berman, R.G., James, D.T., and Brouilette, P. - Mineral Assay Results And Geology Of The Boothia Mainland Area, Kitikmeot Region, Nunavut

12:40 Ross, M., Kosar, K., Sanborn-Barrie, M., and Chakungal, J. - Till Geochemical And Indicator Mineral Reconnaissance Of Southampton Island, Nunavut

13:00 Lunch *(sponsored by De Beers Canada Inc., First Air – The Airline of the North, and Sandvik Mining and Construction)* – Weledeh and St. Patrick's School gymnasium

Theatre 2 – Diamonds (remote feed to Theatre 3)

Chairperson – Steve Goff and Don James

9:20 Eichenberg, D. - The Diavik A154 Open Pit – Geology And Mining From Start To Finish

9:40 Snyder, D.B. - Mantle Structures In The Slave And Rae Cratons Inferred From Seismic Discontinuities

10:00 Coffee *(sponsored by Aurora Telenet (Canada) Inc.)*

10:20 Scott Smith, B.H., Nowicki, T.E., Russell, J.K., Webb, K.J., Hetman, C.M., Harder, M., and Mitchell, R.H. - Kimberlites: Descriptive Geological Nomenclature And Classification

10:40 Nowicki, T., Hetman, C., Gurney, J., van Collar, B., Galloway, M., and Mukodzani, B. - Optimising Kimberlite Evaluation Programs By Integrating Geological, Mineralogical And Geophysical Data

11:00 Janson, G.F., Muehlenbachs, K., Stachel, T., and Eichenberg, D. - Microscale Variations In $\delta 13C$: Evidence For Growth Of Coated Diavik Diamonds From Kimberlite-Derived Fluid

11:20 Smart, K.A., Heaman, L.M., Chacko, T., Simonetti, A., Kopylova, M., Mah, D., and Daniels, D. - The Origin of Diamond-Rich, High MgO Eclogite Xenoliths From the Jericho Kimberlite, Nunavut

11:40 Coffee *(sponsored by Saskatchewan Research Council)*

12:00 Armstrong, J.P. - New Advances In The Geology Of The Aviat Kimberlites, Aviat Project, Melville Penisula, Nunavut

12:20 Holmes, P.K., Grenon, H., Sell, M.V., Pell, J. and Neilson, S. - The Chidliak Property, A New Diamond District On Baffin Island, Nunavut

12:40 Hunt, L., Stachel, T., Simonetti, T., Armstrong, J., and McCandless, T.E. - Microxenoliths from the Renard Kimberlites, Quebec

13:00 Lunch *(sponsored by De Beers Canada Inc., First Air – The Airline of the North, and Sandvik Mining and Construction)* – Weledeh and St. Patrick's School gymnasium

THURSDAY, NOVEMBER 20 (AFTERNOON)

Theatre 1 – Exploration and Geoscience

Chairpersons: Edith Martel and Ben Borkovic

15:10 Hunter, R., Zaluski, G., and Savinova, E. - Turqavik & Aberdeen Projects, Nunavut: How Do We Take Uranium Exploration In The Eastern Thelon Basin To The Discovery Stage?

15:30 Hahn, K., Rainbird, R.H., and Armitage, A.E. - Sequence Stratigraphy Of The Upper Hornby Bay Group, Hornby Bay Basin, Nunavut

15:50 Wollenberg, P. and Morrison, D. - Areva's Kiggavik-Sissons Project, An Exploration Update

16:10 Mercer, B. - Health and Safety In Mineral Exploration – What the PDAC Is Doing For You

16:30 Closing Remarks & NAPEGG Education Foundation Student Presentation Awards

Theatre 2 – Diamonds (remote feed to Theatre 3)

Chairperson – Steve Goff and Don James

15:10 Walker, E.C. - MW-93 Diamond Discovery, Courageous Lake, NWT

15:30 Doyle, B.J., Gill, T., and Thompson, V. - The Discovery Of The Dharma Kimberlite Complex: Evidence For A Previously Unknown Archean Terrain North Of Great Bear Lake?

15:50 Reford, S.W., and La Prairie, L.L. - Exploring For Metals And Diamonds At Darnley Bay, NT

NEW ADVANCES IN THE GEOLOGY OF THE AVIAT KIMBERLITES, AVIAT PROJECT, MELVILLE PENISULA, NUNAVUT

Armstrong, J.P.
Stornoway Diamond Corporation, North Vancouver, BC jarmstrong@stornowaydiamonds.com

The 486,000 acre Aviat Project is located on the Melville Peninsula in eastern Nunavut, Canada, and is a joint venture between Stornoway Diamond Corporation (90%) and Hunter Exploration Group (10%). Three kimberlite pipes have been identified along a 4km strike length, within and south of a NW-trending sinistral strike-slip regional fault zone (Centennial Fault). North of the fault zone, kimberlite sheet complexes comprise sets of stacked, subhorizontal to shallow-dipping hypabyssal kimberlite intrusions; collectively these are referred to as the Eastern Sheet Complex (ESC). Increased understanding of the geometry of what were once considered disparate kimberlite occurrences coupled with new drill information has culminated in a new conceptual model for the ESC.

SRK Consulting (Canada) Inc. (SRK) was engaged to (i) develop a conceptual geological model for kimberlite dykes of the ESC, (ii) provide a range of potential kimberlite volume and tonnage, and (iii) estimate conceptual total diamond content within the extent of the bodies as known from current drilling. The historical naming convention of the outcropping sheet-like kimberlites have been re-classified into four main sheets referred to as ES 1, ES 2, ES 3 and ES 4; previously referred to as AV267, AV3 Upper, and AV8 Upper (ES 1), AV2 Upper (ES 2), AV3 Lower, AV8 Middle and AV8 Lower (ES 3 and ES 4). Kimberlite dykes/sheets of the ESC comprise a series of stacked, subparallel, shallowly dipping (8-20 degrees) sheets that cover an area of approximately 260 hectares and are composed of macrocrystic, hypabyssal kimberlite and kimberlite breccia. ES 1, is interpreted to extend continuously from the original AV6 surface discovery southeast to the original AV8 discovery, average 1.7m true thickness and underlie the entire 260 hectare area. ES 2 (1.3m average thickness), is a hanging wall dyke situated 10-20m above the northwest part of ES 1, and the two other bodies, ES 3 (1.3m thick) and ES 4 (0.9m thick), are stacked footwall dykes situated 10-20m, respectively, below the southeastern extent of ES 1. Additional drilling could potentially expand the outlines of the sheets as well as allowing the correlation and delineation of unincorporated kimberlite intersections.

A 202 tonne (wet weight) sample of the ES 1 sheet (45 tonnes from the original AV6 outcrop, 157 tonnes from the original AV2 outcrop) was collected in 2008 for processing to recover commercial sized diamonds. It is expected that this sample will be large enough to give a more authoritative indication of diamond content and an initial indication of diamond value within this portion of ES 1. A 20.6 tonnes sample of ES1 collected in 2007 returned a diamond content of 162 carats per hundred tonnes (cpht), including the recovery of a 3.64 carat gem quality white dodecahedron. Details regarding tonnage and total diamond content estimations generated by SRK for the conceptual model will be discussed during the oral presentation.

DIAVIK WASTE ROCK PROJECT: EARLY STAGE GEOCHEMISTRY AND MICROBIOLOGY OF EFFLUENT FROM LOW SULFIDE CONTENT WASTE ROCK PILES

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Mining is known to have adverse affects on the environment. With an active mining industry in northern Canada, there is an increased demand for information pertaining to environmental concerns in the Arctic, where unique climatic and physiographic conditions exist. In particular, the oxidation of low sulfide mine waste rock has the potential to be an environmental concern in the continuous permafrost region. Sulfide mineral oxidation is catalyzed by bacteria and results in the generation of acidic drainage with high sulfate and dissolved metals concentrations. Further information pertaining to these processes in regions with continuous permafrost is required.

Diavik diamond mine is located 300 km north of Yellowknife, NWT on a 20 km^2 island in Lac de Gras. Mine waste rock generated from the open pit mine operation is stockpiled on site and at mine closure will consist of two 200Mt waste rock stockpiles. A research project was initiated to predict and assess the long-term quality of drainage water from mine waste rock piles. Three waste rock test piles were constructed at Diavik, one with a sulfide content of <0.04 wt% S (Type 1 pile), another with >0.05 wt% S (Type 3 pile) and a covered pile constructed based on the mine closure plan (Covered pile). On-going monitoring of the waste rock test piles effluent geochemistry and microbiology began in 2007. Effluent and pore water samples were collected and analyzed for pH, Eh, EC, TDS, acidity/alkalinity, sulfate, major ions, and trace metals. Three groups of iron and sulfur oxidizing bacteria were also enumerated in order to examine the processes associated with the oxidation of sulfide minerals over time. The initial geochemical and microbiological characteristics of effluent emanating from these piles will be presented. This research will aid in understanding the potential effects of stockpiling waste rock in northern regions and therefore, will help improve waste rock management techniques and mine regulations in the north.

UPDATE ON BEAUFORT SEA SEABED ENVIRONMENTAL AND GEOTECHNICAL RESEARCH

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The Geological Survey of Canada in collaboration with the Canadian Hydrographic Service conducted a seabed-mapping program in the Beaufort Sea from the Canadian Coast Guard ship NAHIDIK during August-September 2008. Multibeam bathymetry, sidescan sonar, subbottom profiler, multi-channel seismic reflection data, as well as sediment corers were used to investigate active geological processes and geotechnical issues related to offshore hydrocarbon exploration and related activities in the Beaufort Sea. Research has been focused in water depths less than 100m however occasional data has been collected in greater depths when weather and ice conditions permit.

Through repetitive seabed mapping with side scan sonar, 17 new extreme ice scours (ice scours that have incised more than 2m into the seabed) were observed with depths ranging from 2.0 to 3.2 m in water depths of 16 to 35 m. This year's observation of 17 new extreme scours represents 6% of the total number of extreme scours observed in the Beaufort Sea over 18 years of repetitive mapping which is much greater than most years. The multilayered structure of subsea permafrost to depths of 200m below seabed on the Central Beaufort Shelf was investigated using a digital multichannel seismic reflection system. Two abandoned artificial islands used as the foundation for exploration drilling in the 1980s were surveyed to determine the fate of the submerged islands over the last 25 years. These islands have continued to erode since their abandonment due to ice, current, and wave action. Shallow gas continued to vent from the seabed at a known area of pockmarks in Kugmallit Bay which have been observed to be active episodically for the last 5 years. Seabed video imagery revealed the presence of benthic fauna in water depths of 450m on the upper continental slope. Sediment samples were collected both inside seabed ice scours and on the adjacent berm for insight into the effect of the ice scour process on the physical properties of the sediment. An underwater acoustic positioning system was used to accurately maneuver the box and gravity corers to assure that sediment samples were collected at the bottom of ice scours or the top of scour berms.

CHARACTERIZATION OF FUEL CONTAMINATION IN A FRACTURED BEDROCK PERMAFROST ENVIRONMENT AT THE COLOMAC MINE

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The Colomac mine is currently undergoing significant remedial work under the oversight of DIAND. During mining operation numerous fuel spills occurred in and around the fuel storage facility. Impacted overburden has been removed and treated using ex-situ biotreatment, however, residual contamination is present in the underlying bedrock. The site conditions are further complicated by permafrost, deep seasonal frost, and taliks beneath heated facilities and adjacent to the nearby lake. There is little precedent for dealing with these conditions, so the University of Alberta in conjunction with the National Water Research Institute in Burlington, ON have been working with DIAND to study the site since the spring of 2005. To effectively develop a remedial plan it is necessary to develop insight into the fate and transport of the spilled fuel in the fractured bedrock, and the impact of the thermal regime on these processes.

To better understand the flow field and groundwater geochemistry detailed sampling and testing has been done since June 2005 including the following:

- Frequent water level measurements in approximately 35 monitoring wells to measure free product thickness, depth to water, and depth to ice in the bottom of the well,
- Installation of level loggers in 5 wells to observe water table fluctuations with time in greater detail,
- Frequent water samples from approximately 14 wells to measure inorganic chemical concentrations as the active layer thawed and the water depth changed,
- Periodic bail tests to examine free product recovery in select wells,
- Packer tests conducted in numerous wells to obtain hydraulic conductivity versus depth profiles,
- Thermistor and datalogger installations in various locations around the site to measure temperature profiles over time.
- A large excavation in the most highly impacted portion of the site to attempt free product recovery.

The depth of the active layer, seasonal frost penetration and taliks are highly variable across the site. Near the lake, a thaw bulb extends inland, so the wells along the shoreline are thawed at their base year round, with seasonal freezing in the upper regions. Away from the lake, the depths of thaw vary, becoming less moving away from the lake, except for a deep talik adjacent to a heated building on site.

Hydraulic conductivities in the bedrock ranged from 3×10^{-5} m/s to being too tight to measure at depths greater than approximately 4.5m in some wells, but not others. Median values were approximately 4×10^{-6} m/s. Response measured in wells away from those being tested for hydraulic conductivities indicated interconnectivity in a line parallel to the lakeshore. There is evidence of both supra-permafrost and deeper groundwater regimes at the site.

Large seasonal water table fluctuations upslope from the lake were accompanied with large amounts of free product recharge in two wells during low water periods in the winter, but not in other wells nearby, illustrating a very complex hydrogeologic and contaminated regime.

A REVIEW OF MAFIC-ULTRAMAFIC OCCURRENCES OF THE SLAVE CRATON AND THEIR NI-CU POTENTIAL, WITH EMPHASIS ON THE CA. 2.8 GA CENTRAL SLAVE COVER GROUP

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The Slave Craton, an archetypal granite-greenstone terrain and a mere fragment of a larger Archean supercraton, preserves a considerable proportion of mostly Neoarchean supracrustal rocks. Yet its endowment of ultramafic rocks, as potential host and ultimate parent rock for Ni-Cu-PGE mineralization, appears relatively sparse. Suitable Mg-rich mafic to ultramafic intrusions and volcanic rocks do occur however, in a number of relatively well-understood stratigraphic and tectonic settings. Some of the known mafic-ultramafic rocks are an integral part of much larger magmatic events, perhaps on the scale of large igneous provinces (LIPs), thus increasing the potential for hot and dynamic magma regimes and hence economic mineralization. Here I will briefly review the key mafic-ultramafic events.

At a general level, relevant magmatic events can be divided into Meso- to Neoarchean events, and post-cratonization Proterozoic events associated with younger LIPs and (attempted) rifting episodes.

A large proportion of the Archean ultramafic occurrences are associated with the Central Slave Cover Group (CSCG), a thin but widespread, ca. 2.8 Ga supracrustal succession present along the periphery of a large Hadean to Paleoarchean basement complex underlying much of the west-central craton. This succession, including conglomerates, fuchsitic quartzites, ultramafic rocks and iron formation, was associated with stretching and rifting of the ancient basement complex and compares nearly one for one with, for instance, the ca. 1.9 Ga Ospwagan Group along the western margin of the Superior craton. The latter succession hosts the world-class (~80 Mtonnes) Thompson Ni sulphide camp. Both at Thompson and in the Slave craton, of critical importance are the direct spatial and temporal association and interaction of hot komatiitic magmas, in both sills or flows, with sulphidic sedimentary rocks. Tracing the CSCG across the central and western Slave craton, around the margins of numerous domal basement culminations, the highest proportion of ultramafic rocks appears to be present in the central part of the craton, from Winter Lake to Desteffany Lake and Point Lake, and possibly extending westward to the Acasta area. At Desteffany Lake, a contact between ultramafic rocks and sulphidic iron formation was observed and has been the focus of a recent drill campaign by junior mining companies.

Overlying the CSCG, the dominantly mafic ca. 2.73-2.70 Ga Kam Group locally contains ultramafic lenses near its base, particularly in the Point Lake area.

A few sporadic ultramafic occurrences occur at higher stratigraphic levels, including true komatiite flows in the Yellowknife belt (although the detailed stratigraphic setting of these spinifex-bearing flows remains to be established).

Remaining occurrences of mafic-ultramafic rocks with Ni-Cu-PGE potential are associated with younger Proterozoic intrusions, layered complexes, and flow and sill sequences, many of which remain under-explored. These will be reviewed in a separate contribution by Ernst & Bleeker (this volume). One example of a differentiated gabbro sill, with substantial basal sulphide accumulations, occurs northeast of Yellowknife, in proximity to the winter road. A grab sample of the basal sulphides returned 2-3 wt% combined Cu and Ni (by XRF gun), demonstrating that many of these younger intrusions deserve a careful assessment.

PROFESSIONAL GEOSCIENCE IN CANADA - AN UPDATE

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This paper will provide an update on various initiatives, issues and legislation relating to the practice of Professional Geoscience across Canada, the Northwest Territories and Nunavut.

Some examples of topics that will be addressed include: the new national knowledge and experience requirements for licensure; professional mobility; the Canadian Council of Professional Geoscientists' participation in the Third International Professional Geology Conference held recently, September 2008, in Flagstaff, Arizona; and new legislation governing the practice of Professional Geoscience recently introduced in the NWT and Nunavut.

The paper is jointly authored by Oliver Bonham, P.Geo., Chief Executive Officer, Canadian Council of Professional Geoscientists and Brian Heppelle, P.Eng., Executive Director, Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists.

GROUNDWATER MONITORING AT MIRAMAR NORTHERN MINING LTD., CON MINE

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Con Mine, located within the city of Yellowknife, was the first gold producing mine in the Northwest Territories and operated from 1938 until September 2003. Miramar Northern Mining Ltd, a division of Newmont Mining Corporation, currently owns Con Mine and is carrying out the Con Mine final Closure and Reclamation Plan. As part of this plan, groundwater is sampled monthly during open water season to determine groundwater flow patterns and the impact of former mining operations on groundwater quality within and around the mine property. The first groundwater monitoring wells on site were drilled in 2004 and 2005 and monitored from 2004 to 2007. As expected, the data collected indicated that arsenic concentrations in the tailing containment areas were above Metal Mining Effluent Regulations and Water License limits. Groundwater wells near the perimeter of the property showed lower arsenic concentrations, which demonstrated that the arsenic was being contained within the mine lease area. In order to more fully understand the groundwater quality and flow characteristics of the mine site, the groundwater surveillance program was expanded in the fall of 2008 to include 12 new wells including two greater than 35 metres depth, and three geotechnical wells.

GEOLOGY OF THE PORT RADIUM IRON-VANADIUM DEPOSITS, GREAT BEAR MAGMATIC ZONE, NORTHWEST TERRITORIES, CANADA

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The Port Radium Iron-Vanadium Deposits are located approximately 450 km northwest of Yellowknife, NWT, Canada, and consist of an assemblage of irregular, undelineated Magnetite-Actinolite-Apatite pods and lenses up to 100m thick, of indeterminate length, located on the south-western peninsula of

Labine Point, Echo Bay, on the eastern shore of Great Bear Lake. They occur within the well-exposed 1.8-1.9 Ga Echo Bay andesitic stratovolcano complex.

The lithology in this area generally comprises a supracrustal andesitic lapilli tuff sequence and questionable metasedimentary rocks, often of substantial extent and thickness. Locally, gabbroic dikes and sills are present, and large exposures of a sub-volcanic monzodiorite are common to the east and south of the study area. The Echo Bay stratovolcanic complex is surrounded by granitoids, with syenodiorite to the south, and a regional scale emplacement of Rapakivi-textured granitoids is found to the immediate east of the assumed centre of the collapsed stratovolcanic complex.

The iron-vanadium deposits comprise extensive zones of magnetite veining, stockwork and replacement of the andesitic tuffs and metasediments, with iron values assayed up to 54%. The associated hydrothermal gangue assemblage consists of intergrowths of megacrystic actinolite, pink apatite, and pegmatitic potassium feldspar, with accessory biotite and albite. Vanadium occurs in the magnetite-rich deposits at a vanadium/iron content ratio of 1:200 to 1:250. However, no obvious vanadium minerals are observed in hand sample or thin section, which is suggestive of hydrothermal, solid-solution replacement of iron in the magnetite. Vanadium content of a pure magnetite concentrate from this deposit is estimated to be approximately 0.79 wt% V2O5.

The iron-vanadium deposits in the study area are thought to have been formed as a result of hydrothermal veining associated with exsolved fluids from subvolcanic intrusions emplaced during construction of the Echo Bay stratovolcanic complex. They share many similarities with the types of Kiruna IOA (Iron Oxide Apatite) deposits in the classification scheme of Williams (2008). The composition, large size, and shallow depth of these deposits, when viewed in light of ready access to seaports, the suitability of bulk mining techniques, and high demand for vanadium and iron, make these deposits a possible future resource, and amenable to economic extraction.

2008 HACKETT RIVER PROJECT UPDATE: AT THE THRESHOLD OF DEVELOPMENT GEOTECHNICAL RESEARCH

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Sabina Silver's Hackett River Project is located approximately 480 km NE of Yellowknife, and approximately 75 km from Bathurst Inlet. The project is located 23 km from the proposed all season Bathurst Inlet Port and Road to Bathurst Inlet, and 105 km by road from the proposed tidewater port facility. The settlement of Bathurst Inlet, the closest community, is 100 km to the North. The Hackett River VMS project consists of three main silver/zinc-rich deposits: Main Zone, Boot Lake and East Cleaver Lake, as well as a satellite deposit, the JO Zone. All the deposits are located within a 2 km by 5 km window, along the contact between underlying felsic volcanics and overlying pelitic sediments.

Since Sabina optioned the property, in 2004, we have drilled approximately 64,625m, in 266 holes to date. All told, approximately 86,575m has been drilled in 408 holes. A Preliminary Economic Assessment (PEA), completed by Wardrop Engineering in early 2007 to NI 43-101 requirements, established mineable mineral resources of 48.9 million tonnes, which include 7,280.45 million g (234 million oz) silver, 2.24 million tonnes (4.9 billion pounds) of zinc, and appreciable lead, copper and gold. The Hackett River PEA outlined a mining operation that could produce an estimated 385.43 million grams (12.4 M oz) of silver, 147,300 tonnes of zinc, 9,400 tonnes of copper, 16,800 tonnes of lead and 17,200 grams of gold annually. Mine life is estimated to be 13.6 years, at a 10,000 tonne per day milling rate. Sabina has commenced a Pre-Feasibility Study (PFS) as the next step toward development and production.

The Hackett River project development model is based on production of copper, lead and zinc concentrates, which will be trucked over an all-season road, to a port and concentrate storage facility currently proposed for construction at tidewater on Bathurst Inlet, approximately 45 km south of the community of Bathurst Inlet.

The majority of the work done in 2008, at Hackett River was done in support of the PFS, due for release in Q2, 2009. The 2008 program at Hackett River included drilling, a geological mapping program, and environmental baseline studies in support of the prefeasibility study. This year, 43 holes, totaling 5,325 metres were drilled. Much of the drilling was concentrated on the Main and East Cleaver Lake deposits, for Acid Rock Drainage characterization and geotechnical purposes. Currently, work is ongoing to update the outdated geological maps, with integration of the geophysical database, as well as producing a revised geological model. Work is also ongoing with whole rock sampling and petrography to better understand alteration patterns and mineral zoning around the existing deposits and numerous exploration targets within the core area of the property.

The exploration highlight of the year was the continued drill success at the JO Zone deposit, located immediately to the SE of the Main Zone. The zone shows metal zoning, and is open to depth and along strike.

GIANT QUARTZ VEINS IN THE GREAT BEAR MAGMATIC ZONE

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Within the Great Bear magmatic zone (GBmz) are numerous quartz veins and stockwork zones of unknown age and origin. These quartz vein zones can be up to 100 metres wide and 10 kilometres long and crosscut the magmatic and metamorphic rocks of the area. Nine giant quartz vein zones were sampled; these samples have been taken from base metal mineralization associated veins (NICO, Sue-Dianne, Sloan, FAB Lake), uranium mineralized systems (Wopmay fault, Beaverlodge Lake) and barren veins (Hardisty Lake, Margaret Lake, and Arm Lake). This study will evaluate petrographic, trace element, stable isotope, and fluid inclusion data on a subset of the veins.

Most vein zones show two or three phases of veining based on cross-cutting relationships. These phases consist of early, cloudy, stockwork veining, followed by late milky-white euhedral veins, and both these phases are occasionally cross-cut by microveinlets of clear quartz ± hematite ± chlorite. Quartz textures vary greatly between veins, and include crustiform, mosaic, bladed, and feathery quartz. A scanning electron microscope-cathodoluminescence (SEM-CL) study revealed complex light and dark banded zones within quartz crystals that are otherwise unidentifiable with regular petrography. A laser ablation inductively coupled plasma-mass spectrometry trace element study was carried out on SEM-CL zoned crystals and suggests that the banded zones are the result of fluctuations in concentration of Al and Li in the quartz lattice.

The oxygen isotopes of the quartz veins vary within a single zone and between vein zones. The δ18O (qtz) from the giant quartz vein zones range between +8 to +14.6 ‰ (VSMOW), with one outlier of +16.6 ‰ in a North trending vein along the Wopmay fault. Microthermometry completed on the Hardisty quartz vein fluid inclusions show a variety of temperatures and salinities. Early, cloudy, stockwork quartz contains small (3 to 8 µm) liquid-vapour inclusions that have low salinities and homogenization temperatures (Th) between 175 and 200°C. Late milky-white quartz contains inclusions that are 8 to 15 µm in size. These inclusions have variable salinities and a Th range between 180 to 240°C. Some late euhedral zoned quartz crystals contain liquid-vapour-solid inclusions that contain a halite cube. These three phase inclusions can be up to 20 µm and have an average Th of ~300°C.

It has been suggested that the giant quartz veins are a low-temperature end-member of a larger hydrothermal continuum (which includes porphyry and IOCG-like systems), within the GBmz. The results of this study are consistent with an epithermal origin for these veins. The small range in δ18O(qtz) ratios suggests that the hydrothermal fluids have equilibrated with the igneous host rocks prior to crystallization of the quartz veins, but the variability in fluid inclusion chemistry and temperatures suggests that multiple fluid pulses and re-fracturing events formed the numerous giant quartz vein zones in the GBmz.

THE NORTHWEST TERRITORIES GEOSCIENCE OFFICE – 2008 ACTIVITY OVERVIEW

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The Northwest Territories Geoscience Office (NTGO) carries out geological survey activities for the Northwest Territories. The office is staffed by both Government of the Northwest Territories - Industry Tourism and Investment, and Indian and Northern Affairs Canada federal employees. The NTGO carries out geological survey-style activities including geological mapping, non-renewable resource assessments, geochemical and geophysical surveys, outreach and education, data management and delivery, and administering portions of the Canada Mining Regulations.

This year the NTGO has carried out a variety of field-based projects across the Northwest Territories. These include mapping projects and related studies in the Mackenzie Mountains and southern Wopmay Orogen. An airborne magnetic and radiometric survey contracted in the Wopmay Orogen was released in early

2008. An airborne gravity survey is being contracted, and is expected to be flown later this year in the Mackenzie Valley. The NTGO carried out regional geochemical drift sampling programs in the Mackenzie Mountains (stream sediments), the Ramparts proposed protected area (stream sediments and tills), the Trout Lake proposed protected area (tills), and in the Churchill province (tills and eskers). NTGO field programs provide excellent opportunities for hands-on training of university geology students.

Outreach activities at the NTGO are designed to increase awareness of geology and mineral exploration within NWT communities as well as inform the public of NTGO research around their communities. Activities run the spectrum from short school visits and rock walks to our popular Community Mapping Program and the University of Alberta Field School.

The NTGO continues to host an excellent Earth Science library and to upgrade its web presence for client discovery and data dissemination. Efforts continue to get our remaining paper copy-only collections of geological data scanned and available to clients online.

RISK ASSESSMENT OF INVASIVE ALIEN SPECIES IN THE NWT

Carrière.S.

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The North lags behind other jurisdictions in North America in preventing the introduction of, controlling and eradicating invasive alien species (IAS) that could threaten native ecosystems, habitats, or species. There is a general lack of knowledge and research on these species in the NWT. Organizations, groups and communities are preparing to increase their awareness of the risks related to IAS and to help reduce that risk. Many communities have expressed concern over the potential effects of IAS in our northern ecosystems. This project will increase opportunities to act early and to share resources now, to reduce future needs for large and expensive eradication/control programs in the North. Preliminary findings and results of the project will be presented, including lessons from other northern regions, entry pathway analysis, map of known location of IAS, standard monitoring protocols for detecting IAS, set of information sheets on the 20 most invasive species already present or expected to appear soon in the NWT.

URANIUM MINERAL EXPLORATION POLICY (DRAFT) – WEK'EEZHII LAND & WATER BOARD

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This Policy Paper is a summary of the Wek'èezhìi Land and Water Board's (WLWB) recent review of the regulatory requirements for uranium mineral exploration projects within the Wek'èezhìi Management Area. This review included an examination of all pertinent legislation, including the *Mackenzie Valley Land Use Regulations, Northwest Territories Waters Act* and the *Northwest Territories Waters Regulations*.

A key outcome of this review was the WLWB's determination that a Type "B" Water Licence is required for all uranium mineral exploration projects within the Wek'èezhìi management area. Additionally, legislation, guidelines and best practices pertaining to uranium mineral exploration in other Canadian jurisdictions were evaluated and used to develop standard Water Licence conditions for the WLWB.

With the increasing interest in uranium mineral exploration within the Northwest Territories in recent years, the WLWB believes that developing clearly defined regulatory requirements for uranium mineral exploration will provide significant benefits to industry, the WLWB, review organizations and the general public by providing clarity on the following issues:

i. What regulatory authorizations are required from the WLWB;
ii. What are the information requirements for uranium related land use permit and water licence applications; and
iii. What are the WLWB's expectations for uranium specific concerns, such as waste disposal, storage and site remediation through standard Water Licence conditions.

The WLWB recently followed the procedures outlined within this policy paper during the processing of Anglo American Exploration (Canada) Ltd's application for a uranium mineral exploration project, located near the North Arm of Great Slave Lake. Anglo American was issued both a Water Licence (W2008L1-0002) and Land Use Permit (W2008C0010) without the requirement for an Environmental Assessment. The project is currently ongoing.

MIDDLE DEVONIAN SEA LEVEL RISE IN THE MACKENZIE BASIN, NWT: CASE STUDY OF A DEVONIAN RAMP CARBONATE SYSTEM

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The MacKenzie Basin, located in the southern part of the Northwest Territories, was bordered by the Canadian Shield on the east, the Tathlina high to the south, and the open ocean to the north. Paleozoic strata representing sediments that accumulated in the MacKenzie Basin out crop on the west side of Great Slave Lake. These strata are divided into the Cambrian La Matre Falls Formation, which rests on the Precambrian shield, the Ordovician Chedabucto Lake Formation, and a thick succession of Devonian strata that include the Chinchaga Formation, Lonely Bay Formation, Horn Plateau Formation, and the Horn River Formation.

Devonian strata exposed on the west side of Great Slave Lake record a transgressive succession that began in the Eiflian (australis conodont Zone) and continued into the middle to late Givetian (disparilis conodont Zone). Deposition was on the shallow portion of a ramp that gently dipped to the west, southwest. Rapid deepening periodically interrupted the gradual increase in water depth associated with this transgression. The facies successions evident in the Middle Devonian strata of this region reflect these changes in water depth.

The Chinchaga Formation is formed of evaporites, collapse breccias, hard resistant dolomite, and limestone breccias. The collapse breccias were a consequence of evaporite dissolution. Limestones overlying Lonely Bay formation are formed largely of micrite with scattered corals and brachiopods. Fossil lags indicate that the water depth was above storm wave base. A significant sea level rise in the early Givetian triggered reef growth. These reefs, belonging to the Horn Plateau Formation, range in thickness from 60-120 m. The Horn Plateau Formation, which outcrops only in the Fawn Lake area and is also found in numerous wells to the southwest, is formed of isolated coral and/or stromatoporoid reefs. These reefs are encased by calcareous shales of the Horn River Formation that formed in response to ever deepening seas at the end of the Middle Devonian.

REACHING OUT WITH SCIENCES: WHY WE ARE SO KEEN ON POTENTIAL IRON OXIDE COPPER-GOLD DEPOSITS IN THE GREAT BEAR LAKE AREA, NT

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We live, play, work, and create beauty needing base (copper, lead, zinc), precious (gold, silver), rare (rare earths), strategic (cobalt, bismuth) and nuclear (uranium) metals. In general, each metal tends to be extracted from distinct mineral deposits (like the former gold mines at Yellowknife). In iron oxide copper-gold (IOCG) deposits, many or all of these metals occur in economic quantities. The atypical metal combinations found in IOCG deposits are the building blocks of modern and future technology. Copper brings us water, cobalt and rare earths fuel the hybrid electric vehicle revolution, bismuth emerges as a healthy replacement for lead, and uranium provides clean base power load for millions of people and industry. Worldwide, the polymetallic nature, clustering and potential large amount of metals of these deposits make them very attractive for modern exploration and increases the robustness of mining and exploration investments. For example, the giant Olympic Dam deposit in Australia has the highest uranium resources in the world and the fourth in gold and copper. Based on the total reserve alone (the current known amount of metals) the mine will be operating for more than 36 years.

It takes decades of mineral exploration to find and evaluate an economic deposit. Olympic Dam was made public after a decade of exploration and research. In the same geological terrain, another 20 years of exploration led to the discovery of a second deposit and another 5 years to a third one. The rocks forming these deposits are unusual and geologists need specific training to map and explore them. Like all mineral resources, the deposits are distributed very unevenly at the Earth's surface and hence not all land has the same mineral potential.

The land between Great Slave and Great Bear lakes is an area referred to as the Great Bear magmatic zone (GBMZ) which is now recognized as having high potential for IOCG deposits. The GBMZ is not only exposed at surface, it also extends to the west and to the north under younger sedimentary rocks where it remains within reach of current mineral exploration methods. The GBMZ straddles the Wekeezhii settlement area, the Tlicho private lands and the Sahtú settlement area. Recent government and academic research in partnership with the private sector has validated the IOCG model for deposits across the GBMZ. Under the umbrella of the Geo-mapping for Energy and Minerals program, the federal and territorial governments are teaming up to undertake strategically targeted public Earth science research and mapping in partnership with academia and industry to clarify the mineral potential of the GBMZ. This information can be used in making informed land use decisions and stimulate investment in mineral and energy exploration. The project is in its planning stage and we welcome opportunities to share knowledge with all and be as inclusive as possible in its realisation.

VALIDATION OF THE IRON OXIDE COPPER-GOLD DEPOSIT MODEL FOR THE GREAT BEAR MAGMATIC ZONE: FROM KNOWN DEPOSITS TO VIRGIN TERRITORIES

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Known for its vein-type past-producing mines, the Great Bear magmatic zone (GBMZ), NT, also ranks highly in terms of its potential for polymetallic iron oxide copper-gold (IOCG) deposits. Both magnetite-group and hematite-group IOCG deposits occur; comparison of these deposits with global analogs unearths commonalities in regional- to deposit-scale alteration, brecciation, zoning patterns, clustering of deposits and chemical signature that discriminate between IOCG and other types of mineralizing systems. Intense and extensive early Na (albite) to Ca-Fe (amphibole-magnetite) alteration zones demarcate areas of interest at regional scale and are known worldwide to evolve to magnetite-apatite deposits. Alternatively, such alteration can evolve to high temperature K-Fe (magnetite-K-feldspar or biotite), skarn (clinopyroxene or garnet) and/or lower temperature K-Fe (sericite/K-feldspar-hematite-chlorite-carbonate) alteration that have the capacity to produce significant polymetallic IOCG deposits. This simplified evolutionary scheme of alteration positions the multitude of deposits into a coherent exploration framework. Backed-up by field U-Th-K analysis with a portable gamma-ray spectrometer, alteration mapping forms a practical vectoring approach for exploration. Telescoping during differential exhumation, tilting or overprinting complicate zoning patterns but do not decrease the effectiveness of the method.

Current validation of the IOCG model for the southern Au-Co-Bi-Cu NICO and Cu-Ag Sue Dianne deposits, the northern Port Radium-Echo Bay district and the central DeVries and Fab lakes areas opens the entire GBMZ to exploration. Additionally, comparison with world-class Andean (Candeleria) and Australian (Olympic Dam) deposit settings better frames the NICO deposit within the spectrum of magnetite-group IOCG deposits and the potential for both magnetite-group and hematite-group uranium-rich IOCG deposits across the GBMZ.

Beyond known deposits, local exploration models remain immature. Only recently have seemingly disparate Ag, Cu, U and Co showings started to be reassessed as parts of single, regional-scale IOCG systems through identification of diagnostic alteration zones and breccias. Virgin territories are also shown to be prospective following high resolution airborne geophysical surveys, remote predictive mapping exercises, structural analysis and reconnaissance field work over geophysical anomalies. For example, a large area with overlapping equivalent potassic and magnetic anomalies east of Hottah Lake corresponds to a zone of severe potassic alteration with local brecciation and IOCG-type alteration occurs at the Ham, Bode and JLD showings. All these zones warrant systematic alteration mapping to investigate their IOCG potential.

Remarkable industry support to this joint government-academia research and mapping program gives access to the vast extent of the GBMZ, reduces costs and increases efficiencies of all parties involved. It also ensures transfer of private sector geological data to the public domain and efficient sharing of public domain information with industry. Future efforts are planned to formulate new vectors for IOCG deposits, identify new targets, understand the geological parameters and processes that control mineralization and distribution of deposits, establish the mineral potential of the GBMZ beneath younger cover sequences, and further document the potential for other deposit types such as porphyry copper, epithermal and volcanic-hosted uranium deposits. Through new and renewed partnerships, we hope to significantly clarify the mineral potential and augment the economic attraction of this extensive and largely untapped territory.

EXPERIENTIAL SCIENCE

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The Department of Education, Culture and Employment, for the NWT, Has developed a new pathway for high school science education called Experiential Science. These courses, offered at grades 10, 11 and 12 respectively, are designed to engage students in hands on learning while applying scientific knowledge, processes and protocols in a context based learning environment. The program of studies is designed to appeal to a wide variety of students by providing learning opportunities that engage their own learning style. The curriculum for Experiential Science integrates Western science and Aboriginal knowledge and principles through field and laboratory experiences and applications. The program of studies investigates ecology and geology through the systems approach. Each course has a specific focus: Grade 10 - Arctic and Subarctic Terrestrial Systems; Grade 11 - Arctic and Subarctic Marine Systems; and Grade 12 - Arctic and Subarctic Freshwater Systems. A balance between classroom and field investigations allows students to learn in a dynamic environment, which fosters a better understanding of ecological and geological principles and processes. The presentation will focus on the completion of grade 10 student textbook, its implementation in schools and a glimpse of things to come.

PRELIMINARY OUTCROP INSIGHTS INTO THE STRATIGRAPHY AND SEDIMENTOLOGY OF THE LOWER CRETACEOUS OF THE MACKENZIE PLAIN, NWT

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The Cretaceous Martin House Formation in the Mackenzie Plain has been identified as a hydrocarbon target. There are few cored wells drilled through the Cretaceous units, making outcrop data particularly significant in understanding the nature of the subsurface. This study area is focused on the Mackenzie Plain, near Norman Wells, due to the value of integrating seismic and wireline log data as the study progresses. The variations in the deepest Cretaceous units may provide insight into the basin architecture and may be a northern analogy to the Peace River Arch of the Western Canadian Sedimentary Basin.

A transect has been constructed from five outcrop sections measured from the edge of the Mackenzie Mountains, across the Mackenzie Plain and the Brackett subbasin to east of the Franklin Mountains. Outcrop sections were measured at A) Imperial River, B) northwest of Bear Rock, C) south of Tulita, D) north of Kelly Lake, and E) south of Mahoney Lake. Variations seen in the deepest exposed Cretaceous sandstone at the different locations include grain-size, composition, degree of bioturbation, sedimentary structures and underlying stratigraphy.

On the western side of the study area, the Imperial River section records the transgression of the Martin House Formation with a thin (<0.5m) chert pebble conglomerate lag and thin shale overlying which sit unconformably on the Devonian Imperial siltstone. At this location, the 35m thick Martin House is subdivided into five units. The first represents shoreface progradation with a highly bioturbated, glauconitic sand (unit a) which was incised by a high-energy channel sandstone (unit b). Overlying is a lower shoreface bioturbated, glauconitic quartz muddy sandstone (unit c) which fines upwards to an off-shore marine mudstone (unit d). The shallow marine, high energy, storm-dominated sandstones (unit e) overlying, form the top of the formation.

Northwest of Bear Rock (B) is interpreted as a lower shoreface overlain by storm-deposits and fining upwards into a marine mudstone. There is no glauconite present; it is finer grained with lower intensity and smaller sized ichnofossils than those at Imperial River. The section south of Tulita (C) forms an anticline with nearly vertically dipping beds. These sediments have been interpreted as a storm-deposited fine-grained sandstone overlain by a marine mudstone and a highly bioturbated, muddy lower shoreface sand. At Kelly Lake (D), the conglomerate lag is much thicker and more complex than elsewhere. The sandstone unit overlying the basal conglomerate is a medium-grained, quartz sandstone with trough laminations; bioturbation is absent. Mahoney Lake (E) is interpreted as a fluvial deposit. It consists of a 9.6m coarse to granular, moderately sorted, subangular, lithic sandstone with minor cross-stratification, coal fragments, and no evidence of bioturbation. Clasts from the underlying Franklin Mountain formation, coral rubble and chert are scattered withinthe lower part of the sandstone with a paleokarst at the base of the unconformity.

The changes in outcrop across the study area are consistent with stratigraphic changes and paleotopography interpreted in the subsurface mapping of proximal well logs and seismic.

THE DISCOVERY OF THE DHARMA KIMBERLITE COMPLEX: - EVIDENCE FOR A PREVIOUSLY UNKOWN ARCHEAN TERRAIN NORTH OF GREAT BEAR LAKE?

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Sanatana Diamond Inc. began exploring the Arctic Platform cover sequence of the Sahtu region north of Great Bear Lake and east of the Mackenzie River in 2004 after a fellow diamond exploration company, Diamondex Resources Ltd. reported the occurrence of diamonds and favourable indicator minerals in the Iroquois and Anderson River systems.

In late 2007 the Company intersected the Dharma kimberlite by drilling a magnetic anomaly at the head of an indicator mineral train about 25km inland from the Dease Arm shoreline of NE Great Bear Lake. Later in March of 2008 a second kimberlite named Dharma Uttar was discovered 50 metres north of the Dharma discovery. Together they appear to form a kimberlite complex of dykes, sills and pipes intruding into Mid-Proterozoic platform carbonates of the Dismal Lakes Group. Petrographic analysis confirms the pipes consist of volcanic breccias and the sills and dykes are magmatic kimberlite micro breccias.

Coral and bi-valve shell fragments have been observed in the volcanic breccias in this complex. These fragments cannot be derived from the surrounding country rock and must have been sourced from a younger rock higher in the sequence when the kimberlite erupted. This sequence has since eroded. This indicates that the kimberlite complex is Devonian (Cambrian?) or younger. Radiometric dating efforts have not yielded an age for the Dharma kimberlite complex yet. (Indicator mineral dispersion patterns in the area require the presence of sources other than the Dharma complex, however the company has not yet located more kimberlite in the area.)

The mineral dispersion train from the Dharma complex has been detected for 18km in the down Ice direction to the ESE. The chemistry of the indicator minerals in the train shows a poorer representation of high chrome low calcium garnets than those extracted from the kimberlite. Our best explanation for this is that these garnets are being shattered by glacial and post-glacial processes. This has implication for explorers prioritizing exploration program based on chemistry.

Dr. William Griffin of Macquarie University in Sydney Australia, using Laser Ablation ICP-MS techniques, reports that the indicators from the Dharma kimberite plot at temperatures and pressures within the diamond stability field, and derive a 38mW/m2 geotherm. The base of the lithosphere at Dharma plots at 180km depth, implying a 30km thick diamond window.

The presence of diamonds in the Dharma kimberlite complex, the low geotherm and the chemical evidence for an Archean like keel beneath the Hornby Basin is good evidence for a previously unreported Archean terrain buried beneath this platform. The diamonds reported in the Anderson and Iriqous rivers and the indicator minerals discovered in the till in the region the company has been exploring suggest this Archean lithospheric keel extends to the west, occupying the northern zone of what has previously been interpreted to be the Proterozoic Hottah Terrane.

DISCOVERED AND UNDISCOVERED OIL AND GAS RESOURCES OF THE BEAUFORT SEA

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The Beaufort Sea has a large resource of discovered oil and gas and a very significant potential for future undiscovered oil and gas. The discovered resource occurs in a total of 26 oil and gas fields, found by 63 wells, for a success rate of 41%. An additional 5 wells have tested oil and or gas.

The discovered and undiscovered oil and gas potential will be reviewed for seven geological plays. The geological plays adapted from GSC Bulletin 474, include; Netserk, Tarsiut-Amauligak Fault Zone, Kopanoar, Adlartok, Deep Marine West, Herschel and Demarcation. Three of the plays, Deep Marine West, Herschel and Demarcation, have no discoveries. No wells have been drilled in the Deep Marine West or Herschel play areas and only one in the Demarcation play area.

A thick favorable stratigraphic section ranging from the early Tertiary to the Pleistocene occurs in the Beaufort Sea, with discovered oil and gas fields in a variety of structural and stratigraphic settings. The primary reservoirs are in delta plain, delta front and basinal submarine fan facies of the Oligocene Kugmallit Sequence. Discoveries also occur in the Aklak, Taglu, Richards and Akpak Sequences. The Netserk play is the delta plain facies of the Kugmallit Formation. The Tarsiut-Amauligak Fault Zone play is within the delta front sandstone facies of the Kugmallit. The delta front facies at Amauligak is proximal and becomes more distal towards Tarsiut to the west. The Kopanoar play is in the slope and basin plain, with submarine fan facies, of the Kugmallit Sequence.

Beaufort Sea exploration began in 1974 with the spudding of Imperial Pullen E-17, on a sandbag retained island. The first wells with a drill ship were Dome et al Tingmiark K-91 and Dome et al Nektoralik K-59 in the summer of 1976. During the years 1974 to 1989 a total of 62 wells were drilled in the Beaufort Sea, resulting in the issue of 25 Significant Discovery Licences. The last well of this phase was the gas discovery Amoco Kingark J-54. Since then one well Devon Paktoa N-60, was drilled in 2006, resulting in a significant discovery with 250 million barrels of recoverable oil.

The only production is from Gulf et al Amauligak I-65B, which was production tested in the summer of 1986. Combined drill stem tests and extended flow tests produced a total of 422 thousand barrels of oil, of which 302 thousand barrels was shipped via tanker through the Bering Sea. The well flowed at a maximum rate of 18,060 barrels per day.

SURFICIAL GEOLOGIC RESEARCH PROGRAM IN THE SOUTHERN MACKENZIE VALLEY, NORTHWEST TERRITORIES, CANADA: ITS SIGNIFICANCE AND USE IN PLANNING PIPELINE CONSTRUCTION AND RESOURCE DEVELOPMENT

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Surficial geologic research conducted by the Geological Survey of Canada in the southern Mackenzie Valley from 2005 to 2007 covered approximately 100,000 km^2 and has yielded a large amount of geoscience data, including: surficial geology maps, till geochemistry, geotechnical analyses, drift isopach maps, stratigraphic correlations, and clast lithology-till provenance studies. In recognizing the pressing need for geoscience data in planning for the proposed Mackenzie Valley Gas Pipeline, the project has involved a wide variety of disciplines and each of these has produced published data in a variety of formats.

Geological data is being published in digital format as: 1) Surficial geology maps placed on digital topography at a scale of 1:100 000; 2) Radarsat image maps; and 3) Landslide maps linked with a database. A CD-ROM will be produced containing all of the above mentioned maps, plus geochemical data, drift isopach (thickness) maps, and potential granular aggregate maps. Surficial geologic polygons will be linked to field sites and their description, and are captured as figures showing stratigraphy accompanied by photographs, sample locations, lithology pie charts, and geochronological data where available. Sample numbers will be linked with geochemical data, geochronology reports, and macrofossil reports, etc.

Of special significance to the pipeline and resource development is the detailed mapping of landslide data, which in some areas has been carried out up to 50 km east and west of the pipeline. Till, glaciolacustrine sediments and shale bedrock are the most common lithologies along the eastern boundaries of the Mackenzie Mountains and plains to the east: the area covered by this program. Here, postglacial stream incision reaches depths of over 100 metres. Landslide development is most common in areas of recent river and stream development and is widespread and active today, often changing the appearance of a landscape over the span of a single year.

REMNANT NEOARCHEAN ASH FLOW FIELDS, DIAGNOSTIC OF OROGENIC SETTINGS WITH LODE GOLD MINERALIZATION: EXAMPLES FROM THE CANADIAN SHIELD

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Ash flow tuff blankets are a common component of young orogens, though are not well preserved in the geological record due to rapid erosion. As well demonstrated in the Basin and Range Province of the southwest U.S. Cordilleran, classic ash flow terranes are tectonically extended and characterized by widespread epithermal mineralization. The sediment-hosted Carlin-type, volcanic-hosted Round Mountain-type and detachment fault-hosted Picacho-type deposits clearly demonstrate a rich diversity in stratigraphic/structural traps for concentrating precious and semi metals within the environs of intense geothermal activity attending sites of volcani-tectonic collapse.

A broadly similar orogenic setting is indicated by remnant ash tuff blankets preserved within Neoarchean lode gold districts. Prime examples from the Superior Province include the tuff-breccias of the Krist Formation in the Porcupine Gold Camp and the Moose Lake Porphyry Complex at Hemlo. At Kirkland Lake and Springpole Lake alkaline tuff/syenite porphyry complexes, identifying deep-seated rift environments, are preserved at the base of the Temiskaming Series polymictic conglomerates. Felsic volcanic centers with central porphyry complexes mantled by pyroclastic aprons are very well preserved in the eastern Kaminak belt of the Hearne Subprovince, an area with widespread lode gold prospects. Felsic ash-tuff units are interlayered with the cross-bedded quartzite and quartz pebble conglomerates capping the upper Woodburn Lake Group of the Committee Bay Belt within the Rae Subprovince, and the Woodburn Group has numerous associated lode gold prospects including the Meadowbank Deposit. Further examples from the Slave Province include the felsic ash-tuffs of the Banting Formation, preserved together with the polymictic conglomerates of the Jackson Lake Formation in the historic Yellowknife District, as well as the Windy Lake Formation in the developing Hope Bay Gold Camp on the Arctic coast.

The significance of uniquely preserved orogenic ash flow deposits at major gold camps has been broadly overlooked in targeting the Neoarchean gold mineralization. That Neoarchean mesothermal and Tertiary epithermal lode gold settings share in common very similar volcanically active extensional orogenic domains suggests the apparent differences between these two deposit-types have been overemphasized. The km-scale, non-zoned mesothermal vein systems versus the 100-meter scale, strongly-zoned epithermal vein systems likely testify to hotter, more mobile, near surface conditions within the terminal Archean orogenic setting. That the Neoarchean ash flow units are sometimes interlayered with pyritic black shale indicates that volcani-tectonic depressions of this age more commonly collapsed below sea-level to form starved marine sedimentary environments. Rapid erosion of hotspring sinters occurring in bordering highlands can well account for the sometimes associated pyritic, vein-quartz pebble conglomerates with under-explored paleoplacer gold potential.

SELWYN PROJECT: TRULY UNDISCOVERED WORLD-CLASS ZINC COUNTRY

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Selwyn Project is currently the largest undeveloped SEDEX zinc-lead deposit and is equal or better grade than any of its comparables its zinc-lead deposit peer group. Since 2005, Selwyn has spent more than $55M on exploration activities in the Yukon demonstrating the size of the deposits and their ever expanding mineral potential. With more than 41 billion pounds of zinc and 13 billion pounds of lead, Selwyn Project dwarfs all other projects. What is remarkable is that known mineral resources are spread out over a 38 kilometre long deposit that remains open to expansion. The other large zinc-lead deposits around the World are largely depleted and on track for shutdown over the next 5 to 7 years; noting that with the shutdown of Sullivan in 2006 and Brunswick in 2010, Canada is loosing its status as a major zinc producer and its smelters will have to source and compete for feed in the world concentrate markets.

Selwyn Project is located along the Yukon-NWT border approximately 80 kilometres north-northwest of Tungsten, NWT. Placer Development Limited and US Steel Corporation spent approximately $20 million on the Howard's Pass property during the period 1972 through 1981; however initial prospecting and geochemistry started in 1968. During that period, extensive work programs were carried out including underground test mining (1,200 metres of development) and bulk sampling for preliminary metallurgical studies and limited economic evaluation.

Currently, there are 9 open-pit deposits and 5 underground deposits defined by diamond drilling along the 38 kilometre strike length of this continuous zinc-lead deposit. The Indicated mineral resources for the Selwyn Project now total 154.35 million tonnes grading 5.35% zinc and 1.86% lead and the Inferred mineral resources total 231.54 million tonnes grading 4.54% zinc and 1.42% lead. In addition to the Indicated and Inferred mineral resources estimated in 2008, a very conservative mineral potential estimated to contain 245 to 255 million tonnes with an estimated grade of between 4.0-5.0% zinc and 1.0-2.0% lead. The mineral potential represents the down dip and strike extension of the Indicated and Inferred resources taken from a polygonal long-section model. The mineral potential represents a small portion of the interpreted extent of the Active Member that hosts all known zinc-lead mineralization in the Howard's Pass District.

It is important to note that the global mineral resource includes a high-grade subset with Indicated mineral resource of 16,063,800 tonnes grading 10.25% zinc and 4.43% lead and Inferred mineral resource of 23,156,000 tonnes grading 8.86% zinc and 2.80% lead. These high-grade mineral resources are spread out over 22 kilometres and are amenable to underground mining methods. The 2008 discovery of XY West, a 1.1 kilometre step-out northwest of the XY Central high-grade underground deposit, means that there remains significant additional opportunity for further discoveries within the known mineral potential. It is these high-grade underground deposits that will drive the permitting, and development future of Selwyn Project.

THE DIAVIK A154 OPEN PIT – GEOLOGY AND MINING FROM START TO FINISH

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The A154 open pit represents the first stage of mining at the Diavik Diamond Mine, located 300 km northeast of Yellowknife. Canada's largest producer of diamonds, Diavik first encountered kimberlite during pre-stripping of the A154 open pit in November 2002 and diamond production began shortly after in early 2003. The A154 Pit hosts two kimberlite pipes – A154 South and A154 North – which are among the worlds highest in grade and in value per tonne. After nearly 6 years of mining, production from the open pit is nearing completion and provides a convenient opportunity to reflect on the significant geological and engineering knowledge gained to date.

With the kimberlite pipes discovered in Lac de Gras beneath 10-20 metres of water, open pit mining of them became a challenging undertaking. Construction of an innovative 3.9km long dyke enclosing an area of 1.5 sq km made mining them possible. As the first such design constructed in the world, the A154 dyke has created a viable model for future projects, and in recognition, Diavik received both territorial and national engineering awards.

The geology of the A154S and A154N kimberlites contained within this first open pit has been observed sampled and studied in detail. Diavik has provided rock samples, data and financial backing to support several undergraduate, post graduate, and post doctoral research projects to the Universities of Alberta and British Columbia. In providing access to world class experts and professional development opportunities to our own geologists, Diavik have gained valuable knowledge including a better understanding of emplacement structures and new ways of assessing the economic potential of our kimberlites.

The kimberlites reveal extraordinary individual uniqueness. A better understanding of two kimberlite volcanoes erupting on to the landscape at very close to the same time is emerging. High grade pyroclastic (PK) infill in the A154S kimberlite dominates the majority of the volume of the kimberlite. Adjacent to, and overlying the pyroclastic units is resedimented volcaniclastic kimberlite (RVK), representing depositional processes of both concentration and dilution as kimberlite fell outside the volcanic vent and collapsed in from the crater walls. These RVK units form some of the highest grades seen in any of the Diavik kimberlites.

A154 North shows a unique mix of RVK and PK units, starting with a 30m cap of very well sorted PK kimberlite overlying a coarse base comprised of upwards of 40% mantle material. Beneath the graded pyroclastic cap is evidence of a crater lake overlying a succession of RVK units.

As open pit mining nears completion in the A154 open pit, we realize it has been an extraordinary mining venture that has provided significant engineering, geological, and academic achievements. We now look toward the open pit mining of the adjacent A418 pit and the expansion into underground mining to reveal even more wealth of knowledge.

AN AKAITCHO EXPLORATION AGREEMENT: SECURING FIRST NATION CONSENT FOR MINERAL EXPLORATION PROJECTS

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Aboriginal consultation is a modern reality of mineral exploration in the NWT. Recently, the key limiting factor in the regulatory approval of exploration programs has become meaningful engagement with First Nations. The courts have clearly mandated that prior to the conduct of an exploration activity in the traditional territory of a First Nation, consultation and accommodation must occur.

Unfortunately, the nature of meaningful consultation and the respective roles of industry and government in achieving such consultation are murky at best. The MVRMA regulatory boards do not acknowledge that their processes are a proxy for consultation, and Canada is not implementing a proactive strategy to dispense of its consultative obligations under law. As a consequence, the burden of on-the-ground consultation often falls to individual companies. This has created significant challenges for companies who are receiving little guidance with regards to putting consultation into practice, and consequently regulatory approvals are often significantly delayed or otherwise frustrated.

With input from industry representatives, the Akaitcho Dene First Nations (AKFNs) have taken a leadership role in developing an *Akaitcho Exploration Agreement*. This contract between an exploration company and an AKFN clearly defines how consultation and accommodation is to be actualized in the Akaitcho Territory of the NWT. An executed *Akaitcho Exploration Agreement* provides AKFN consent for a specific exploration program, and the AKFN agrees to not recommend the program for environmental assessment. In return, a company agrees to certain terms and conditions. These include provisions for information sharing and confidentiality, encouraging First Nation employment and business opportunities, protection of heritage resources, and environmental monitoring.

An *Akaitcho Exploration Agreement* would be entered into prior to a company seeking regulatory approvals, and subsequently the AKFN would provide written support for the exploration program to the regulatory authorities. It is expected that a signed *Akaitcho Exploration Agreement* would thus greatly increase regulatory and consultative certainty for mineral exploration companies, and should significantly streamline both the permitting/licensing process and future First Nation relations.

"MARINE" MACKENZIE RIVER SEISMIC LINE, NWT: DATA REPROCESSING AND BASIN RESEARCH

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Oil and gas accumulations in the Northwest Territories (NWT) are of considerable size and they will become increasingly important to the North America resource supply. However, without an improved grid of modern seismic, increased levels of drilling activity and the imperative pipeline access, the area will remain underdeveloped when compared to other petroleum rich Arctic regions (e.g. Alaska, Offshore Norway, Eastern and Western Siberia, Okhotsk Sea). While the logistical, operational, environmental and regulatory challenges for exploring in the Canadian north are many, seismic work and drilling activity were carried out in the area since the 1940s and numerous basins and sub-basins with petroleum potential have been identified. To overcome the environmental and logistical challenges, innovative seismic acquisition techniques are being constantly tested in the Arctic where traditionally data collection takes place only during the winter on the frozen tundra. After numerous environmental tests were completed, a relatively continuous, long seismic line was recorded down the Mackenzie River during the summer season of 2002. Using an air source array and a variable length streamer with hydrophones, this typically "marine" acquisition layout was applied along the river course as a "first ever" experiment for Canada. The purpose of the survey was to obtain a long tie line across various sub-basins stretching the NWT from the Mackenzie Corridor in the south to the Mackenzie Delta in the north. Unlike parallel land based lines, the Mackenzie River line is high fold with great coupling in the shallow beds and recorded with minimum environmental impact.

This regional seismic line was recently reprocessed using new techniques for multiple suppression and pre-stack time and depth migration. Reprocessing efforts focused on two main areas for improvement: multiple attenuation and imaging. The original data was riddled with obvious short period water column multiples particularly in the shallow section and short-medium period peg-leg multiples in the deeper section. Water column multiples were modeled and subtracted in XT space before the longer period peg-leg multiples were modeled and subtracted in the TauP domain. These demultiple routines created a superior input for the other processing challenge, imaging. Anisotropic depth migration was applied because the river data shows: a) vertical velocity variation through the shallow section; b) lateral velocity variation associated with stratigraphic changes along the line and c) evidence of structural deformation and dense faulting. From the initial velocity model building, we observed improvements in imaging of shallow reflectors on the depth section as compared to the pre-stack time migration section. Current reprocessing also included a geological model-based multiple elimination routine and real formation velocities to guide the selection of migration velocities. With this better imaging, the Mackenzie River line becomes an important tool for deciphering the NWT petroleum geology and for directing regional prospect generation.

SUMMARY OF PROTEROZOIC MAGMATIC EVENTS OF THE SLAVE CRATON AND ENVIRONS AND ASSESSMENT OF THEIR METALLOGENIC POTENTIAL

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A detailed review of the Proterozoic Magmatic Record of the Slave craton and environs is being undertaken in order to: 1) identify the timing of breakup along all margins of the Slave craton, 2) compare the magmatic 'barcode' of the Slave craton with other blocks to identify former 'neighbours', and 3) assess the metallogenic potential of each event in order to develop new ideas for deposit targeting.

The record includes the following event ages (extracted from Buchan et al. [GSC Open File 5985 in prep]; Ernst and Buchan 2004 [Geosci. Can.]): 2230-2210 Ma, 2190-2175 Ma, 2110 Ma, 2040 Ma and 2025 Ma, 1900-1870 Ma, 1750-1740 Ma, 1670 Ma, 1590 Ma, 1270 Ma, ca. 1170 Ma, 780 Ma, 725 Ma.

The Slave craton is a fragment of a larger Archean supercraton, and all margins have experienced breakup (Bleeker 2003 [Lithos]). Breakup must precede the 1.9 Ga Wopmay and Thelon orogens on the west and east sides of the craton and the 1970 Ma passive margin sequence on the western side (Bowring and Grotzinger 1992 [Am. J. Sci.]; Gandhi and van Breemen 2005 [Can. J. Earth Sci.]). Magmatic events that may have been associated with breakup include: the 2230-2210 Ma MacKay and Malley events, the 2190-2170 Ma Southwestern Slave Magmatic Province (Bleeker and Hall 2007 [In GAC Min. Dep. Div., Spec. Pub. No. 5]), the 2110 Ma Indin event, and the ca. 2025 Ma Lac de Gras – Booth River event (LeCheminant et al. 1996 [In: GSC Open File 3228]; Davis and Bleeker 2007 [GAC-MAC Ann. Mtg.]).

Magmatic barcode matches at 1870, 1740, and especially 725 Ma suggest a reconstruction of southern Siberia against northern Laurentia. The 780 Ma LIP event of western Laurentia (extending into the Wopmay) can be linked with Rodinia breakup.

LIP events are key targets for Ni-Cu-PGE and Fe-Ti-V deposits (in layered mafic –ultramafic intrusions), IOCGs (in hydrothermal vent complexes formed above diabase sills), and REE, Ta, Nb and other rare metals (in associated carbonatites and alkaline complexes). The largest magmatic events, because of their greater magma flow-through and greater heat budget, are potentially the most prospective for both magmatic sulphide and hydrothermal ore deposits.

The largest events are the 1.27 Ga Mackenzie Large Igneous Province (LIP) (nearly 3 million sq km), the 0.72 Ga Franklin LIP (>1 million sq km), the 0.78 Ga Gunbarrel LIP (>200,000 sq km) and possibly the 1.9 Ga Hearne event which can now be linked with other components of the "Snowbird" LIP in the Rae and Hearne cratons. Those events with strong Ni-PGE potential include the Mackenzie, Franklin and Booth River- Lac de Gras LIPs. Events with IOCG potential include those featuring sill complexes intruding sediments (e.g. Mackenzie, Franklin). The Blatchford Lake alkaline intrusion, associated with the 2.19-2.17 Ga Southwestern Slave Magmatic Province, hosts ores of Be, Y, REE, Nb, Ta, Zr and Ga.

FORMATION OF VENT COMPLEXES ABOVE UNDERLYING MAFIC SILLS ASSOCIATED WITH LARGE IGNEOUS PROVINCES (LIPS): IMPLICATIONS FOR LIPS AND IOCG DEPOSITS OF THE SLAVE CRATON AND ENVIRONS

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New insights into the origin of IOCG (iron oxide copper gold, e.g. Hitzman, 2000 [In: Porter (ed.) v.1; PGC Publishing]; Williams et al., 2005, [Econ. Geol]; Corriveau, 2007 [GAC Min. Dep. Div. Spec. Pub 5]) deposits follows from recent studies of Phanerozoic Large Igneous Provinces (LIPs). Detailed seismic studies of the 62-55 Ma North Atlantic Igneous

Province (Norwegian Sea) and complementary studies in the 183 Ma Karoo and 250 Ma Siberian LIPs reveals large (up to 5-10 km across) hydrothermal vent complexes (HVCs) emplaced at the paleosurface in low-permeability sequences and connected by pipe-like structures to underlying dolerite sills at depths of up to 8 km (Jamtveit et al., 2004 [In: Geol. Soc. London, Spec. Publ. 234]; Planke et al., 2005 [In: Dore & Vining (eds) Geol. Soc. London]; Svensen et al., 2006 [J. Geol. Soc. London]; 2008 [EPSL, submitted]). In each case, many hundreds of HVCs have been identified. HVCs originate from thick (>50 m) sill intrusions by explosive release of gases from contact aureoles of host sediments shortly (tens of years) after sill emplacement. HVC architecture strongly depends on the type of host rocks (black shales at Karoo and evaporites at Siberian LIPs) and its fluid (brines) saturation at emplacement time. Compositions of host rock and magma-driven hydrothermal systems determine the style of mineralization, morphology of ore bodies and economic potential of IOCG deposits. Some of those associated with the Siberian LIP are being mined (Korshunovskoe and Rudnogorskoe) and more then 40 were prospected as magnetite-rich deposits. Their economic potential for copper and gold mineralization is understudied. Our observations suggest a robust association between LIPs. the generation of hundreds of HVCs during sill emplacement into fluid (brines) saturated host rocks, and the formation of IOCG deposits.

This model may have relevance to the Slave craton and environs. Franklin (725 Ma) and Mackenzie (1270 Ma) LIP events have sill complexes emplaced into sedimentary sequences. Are there numerous associated vent complexes remaining to be identified and could some be hosts for IOCG deposits? Are some of the IOCGs in the Great Bear Magmatic Zone linked to regional sill events at 1.89-1.87, 1.59 or 0.78 Ga? Could 1.59 Ga sills be responsible for the Wernecke Breccias of the Yukon and also the Olympic Dam giant IOCG deposit of Australia, which were probably neighbours at this time (Thorkelson et al., 2001 [Prec. Res.]; Hamilton and Buchan 2007 [GSA Ann. Mtg]).

STREAM SEDIMENT SAMPLING IN THE MACKENZIE MOUNTAINS: A STATUS REPORT FOR 2008

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Stream Sediment Sampling programs conducted by the NWT Geoscience Office (NTGO) and the Geological Survey of Canada are improving the coverage in the Northwest Territories for this important data set. Regional stream sediment surveys have historically been implicated in the discovery of many of the major economic deposits in the Canadian Cordillera. The contribution of these surveys towards economic development in hinterland regions has encouraged provincial and territorial governments to ensure nearly complete coverage for both British Columbia and Yukon. This year, stream silt sediment data for the headwaters of the Arctic Red River (Western half of NTS 106 B and 106C) will be released.

In 2007, a survey was conducted over the Arctic Red River headwaters. The samples were collected to achieve a density of one sample per 13km2 across the survey area. The results, which have been released as an NTGO Open File, include the chemical analyses of over 50 elements from stream sediment samples and 54 variables from water samples collected at 916 sites. The sample collection and analyses followed the methodology published at http://gsc.nrcan.gc.ca/geochem/ngr/method_e.php.

The lithostratigraphy exposed in Arctic Red River area is composed of five assemblages which reflect distinct tectonic and depositional settings 1) Mackenzie Mountains Supergroup represents a stable platformal deposition during the Proterozoic, 2) Windermere Supergroup deposited during the Neoproterozoic rifting and disintegration of Laurentia, 3) Mackenzie Platform consisting of Lower Cambrian to Early Devonian siliciclastic and carbonate rocks deposited on a passive continental margin with the coeval Selwyn Basin representing deeper water facies equivalents, and 4) the Earn Group recording mid Devonian and Mississippian submergence and deformation of the Platform. These assemblages were deformed by folding and thrusting from the Jurassic (~170 Ma) and to the Paleocene (~55 Ma), and shed an extensive sedimentary sequence during the Cretaceous (~90 Ma) collision of an island arc with western North America.

The complex regional geology has resulted in remarkably few mineral deposits when the area is compared to other parts of the Mackenzie Mountains. The main showings have been classified into a series of ‘types’, including: banded iron formation (BIF); redbed-associated Cu, carbonate-hosted Pb-Zn (Irish-type; minor Mississippi Valley-type); and shale-hosted SEDEX Pb-Zn. Occurrences within the survey area can be identified by the anomalous silt sample analyses. More exciting, our results include additional anomalous samples, which do not appear to be associated with known mineral showings, suggesting that future exploration is required in this area.

STRUCTURAL STYLE OF THE FOLD-BELT TO THRUST-BELT TRANSITION, CENTRAL MACKENZIE MOUNTAINS, NWT, AND ITS IMPLICATIONS FOR STRUCTURAL TRAP DEVELOPMENT

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The central Mackenzie Mountains can be subdivided into two structural belts: an eastern fold-belt with subordinate faulting and a western thrust-belt with subordinate folding. The belts are separated by thrust faults that trend northwestward across Wrigley Lake (NTS 95M) and Mount Eduni (NTS 106A) map areas. In Wrigley Lake map area the fold-belt and the thrust-belt are separated by the Plateau Fault. Across the Plateau Fault, interplay between folded Paleozoic strata in the footwall and thrusted Proterozoic strata in the hanging-wall provides structural conditions that could favour development of small-scale traps for hydrocarbons.

In the footwall of the Plateau Fault in northeast Wrigley Lake and Mount Eduni map areas, folds mainly have long (8-12 km) wavelengths; anticlines are cored by competent quartzite of the Proterozoic Katherine Group and detached within the older Tsezotene Formation. Superimposed on these folds are shorter (1 km) wavelength folds at the level of the Middle Devonian Nahanni Formation, which probably are detached within the underlying Headless Formation.

Within splays along the leading edge of the Plateau Fault, and in its hanging-wall, several Proterozoic units (Little Dal Group and Windermere Supergroup) are preserved, whereas these units are largely absent to the east on the Redstone Arch. Thus, the trace of the Plateau Fault coincides spatially with the western edge of the Redstone Arch. The detachment level of the Plateau Fault is developed within the Gypsum and Rusty shale formations of the Little Dal Group; neither formation is present on the arch.

A large geographic area of essentially flat lying strata in the hanging-wall of the Plateau Fault, centered on Wrigley Lake map area, was formerly suggested to have potential for significant hydrocarbon trapping within Paleozoic strata preserved in the footwall. More recent studies have identified several difficulties associated with source rocks and reservoirs in the vicinity of the Plateau Fault. Additionally, a structural cross-section across the Plateau Fault suggests that westward thickening of the Proterozoic succession does not leave room in the footwall for an extensive area of preserved Paleozoic strata. Paleozoic strata likely are preserved only in a narrow band along the leading edge of the fault, where they are folded and truncated against the fault. These small-scale structures may be facilitated by detachments within mechanically incompetent Paleozoic units, such as the Rockslide and Headless formations.

To trap hydrocarbons within potential Paleozoic reservoir units, further structural complications are required to juxtapose reservoir facies against the Middle Devonian Canol Formation, the only known potential source rock in the area. This may be accomplished via buried fault repeats or overturned folds within the Paleozoic succession; both have been observed along the trace of the Plateau Fault. These geometries may be present in the subsurface along some segments along the Plateau Fault, and along smaller thrust faults immediately east of the Plateau Fault in the central Mackenzie Mountains.

USE OF AN ARTIFICIAL REEF AS HABITAT COMPENSATION IN AN ARCTIC LAKE

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Integral to the DFO's goal of maintaining the current productive capacity of fish habitats in Canada is the guiding principle of No Net Loss (NNL), by which the department strives to balance unavoidable habitat losses with habitat replacement on a project-by-project basis (Policy for the Management of Fish Habitat,1986) . To ensure NNL is achieved, there is a need to monitor the effectiveness of the habitat that has been enhanced or created as compensation. We quantitatively evaluated the effectiveness of an artificial reef intended to compensate for the loss of a small lake and its outlet stream connected with the construction and operation of a diamond mine. The primary goal of the reef was to provide spawning habitat for lake trout as well as habitat for aquatic invertebrates and small fish. We compared use of the artificial reef with that of two putative natural reefs of similar substrate and depth and quantified lake trout egg and small fish density and potential for egg displacement at each reef. Lake trout spawned on the artificial reef (egg density 38±11.7 eggs.m^{-2}), using approximately 30% of the reef area for spawning. No spawning was detected on the natural reefs but egg densities at the artificial reef were in the range of what has been reported for the Laurentian Great Lakes. Potential for egg predation based on the presence of potential egg predators (e.g. sculpins) and egg displacement based on loss of artificial eggs, was extremely low and much lower than what has been reported for the Laurentian Great Lakes. Small fish were virtually absent from all of the reefs. The work confirms that artificial reefs can provide additional spawning habitat in arctic lakes but more work is required to understand their contribution to recruitment and ultimately productive capacity.

GEOMAPPING FOR ENERGY – A NEW FEDERAL GEOSCIENCE PROGRAM FOR THE NORTH

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The 2008 Federal budget announced funding for a new geoscience initiative, GeoMapping for Energy and Minerals (GEM). The Prime Minister has since indicated that this funding will be $100 million over five years. At least 75% of these funds must be spent on work in the territories on activities that help to increase economic growth through increased exploration effectiveness and success rates leading to stable, long term investment in resource development.

GEM will be delivered by two Geological Survey of Canada (GSC) programs, one for Minerals and one for Energy. The latter will be discussed here. GEM Energy will be principally accomplished by a detailed resource assessment for oil, gas and uranium supported by maps that indicate the major geological factors controlling the distribution of these resources. It will require new framework geoscience done by a multidisciplinary team that will include airborne geophysical surveys, fieldwork, seismic interpretation, studies of subsurface materials such as core and cuttings and petroleum systems analysis. Data will be compiled into publicly available databases that will be released in a timely fashion.

Six projects will be responsible for delivering this geoscience. Five of these are regional projects looking at petroleum resources, Yukon, Mackenzie Corridor/Delta, Western Arctic Islands, Eastern Arctic Islands and Hudson Bay/Foxe Basin, with a sixth project looking at uranium resources throughout the north. We will also modernize our resource evaluation technology and information management. Planned activities for these projects have been developed after consultation with the territories with additional input from industry and other interested parties. They will be done in collaboration with territorial geoscientists. Activities that will take place in the NWT include an airborne gravity survey followed by a new bedrock mapping program in the central Mackenzie Corridor, a re-examination of petroleum systems in the western Arctic Islands including some new bedrock mapping, and investigations of the uranium potential of the Dessert Lake and Hornby Bay basins.

AN ASSORTMENT OF OBSERVATIONS AND ANALYSES REGARDING PETROLEUM POTENTIAL OF PALEOZOIC ROCKS, PEEL PLATEAU AND PLAIN, NORTHWEST TERRITORIES AND YUKON

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This talk presents a number of findings related to Paleozoic strata in Peel Plateau and Plain (Peel area), with a focus on petroleum systems and petroleum potential.

Cambro-Ordovician Franklin Mountain Formation is widespread throughout Peel area. It is largely comprised of peritidal dolomudstone, but outcrops west of the Arctic Red River feature intervals that are tens of metres in gross thickness comprising stratabound coarse crystalline vuggy dolomite, that has potential in subsurface as a reservoir. Surface samples have yielded up to 9% porosity and 2 mD permeability. Reconnaissance examination well cuttings reveals coarse white euhedral dolomite crystals (probably from fracture or vug linings) in several wells which may be related to surface exposures. Two wells with cored intervals feature similar vuggy dolomite, and these also bear textural semblance to hydrothermal dolomite (HTD).

Lower Devonian Arnica Formation (mainly peritidal dolostone) has reservoir potential throughout Peel area in a variety of lithologies. In the west near the platform margin, organic limestone biostromes and bioherms are common, with some primary inter-organic porosity. In mid–shelf areas of south Peel area, porous sucrosic dolomite occurs over considerable thicknesses. In southeastern Peel near the facies change to anhydrite (Fort Norman Formation), interpreted solution collapse breccias have considerable (but variable) inter-clast and intra-clast porosity. Possible porous HTD related to the Deadend Fault represents a further reservoir opportunity.

Oil staining is relatively common in southeast Peel area (and adjacent areas) in rocks ranging from Siluro-Ordovician Mount Kindle to Upper Devonian Imperial formations. Several samples at three locations were collected. Analyses has shown that there are two distinct families of oils; one being Devonian and having similarities to the Norman Wells field, the other likely a Cambrian to Ordovician source, more akin to Colville Hills oil samples. Mount Cap Formation is thus a probable potential source rock in the region, although its extent in Peel area is not well delineated.

Using sparse vitrinite reflectance and Rock-Eval data, one-dimensional burial history models were developed for a number of Peel area wells. The models included additional thicknesses of Devono-Mississippian and Cretaceous strata, both of which were subsequently removed by pre- and post- Cretaceous erosion, respectively. In most cases, the resultant burial history diagrams suggest that the Bluefish Member and Canol Formation reached maturity after burial under a thick (about 3 km) pile of Cretaceous (Albian) clastic rocks in the foreland trough of the Mackenzie Mountains. The mid- to late Cretaceous maturity/expulsion has important implications for the timing of structural traps associated with Laramide deformation. Lower Paleozoic rocks (including Cambrian Mount Cap Formation) mainly reached maturity under the Devono-Mississippian clastic pile, and subsequent Cretaceous burial pushed them into high maturity or overmaturity.

These findings, and their impact upon conceptual petroleum plays and petroleum systems will be incorporated into a number of chapters of the forthcoming Regional Geoscience Studies and Petroleum Potential, Peel Plateau and Plain, Northwest Territories and Yukon: Project Volume and the accompanying digital atlas.

ENVIRONMENTAL EFFECTS MONITORING AT GIANT MINE

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Giant Mine is an abandoned gold mine located in the City of Yellowknife, Northwest Territories. In 1999, the former owner of the Mine was assigned into receivership and since that time the Government of Canada has managed the care and maintenance of the Mine. Continued seasonal operation of the effluent treatment plant is necessary to remove arsenic from groundwater that infiltrates the Mine and becomes contaminated. The water level in the Mine is controlled to prevent the arsenic trioxide storage chambers from flooding and potentially releasing arsenic into the environment. After treatment, effluent is discharged to Baker Creek and ultimately into Yellowknife Bay of Great Slave Lake. This practice will continue until a long-term management method for the stored arsenic trioxide is implemented and water quality in the Mine meets discharge criteria.

The effects on the invertebrate and fish community of present day effluent discharged into Baker Creek and Yellowknife Bay were assessed in 2004 and 2006 for Phase 1 and 2 environmental effects monitoring (EEM) programs. Prior to the implementation of effluent treatment in the 1980s, benthic invertebrates were virtually absent from Baker Creek due to high contaminant concentrations. Similarly, fish studies from the 1970s resulted in almost no fish captured in Baker Creek and more surveys conducted between 1998 and 2003 yielded low fish numbers.

In 2004 and 2006, artificial substrate samplers (Hester-Dendy multi-plate samplers) were used for the benthic invertebrate EEM studies. Analysis of the data highlights the low level of effects observed on artificial substrates deployed in the water column, in comparison to the severe effects observed in bottom sediments by previous studies. Fish capture was more successful in 2004 and 2006 compared to previous studies. The Phase 2 fish study was the first to have sufficient numbers of fish to derive conclusions about effects on fish. Differences in EEM health endpoints were detected in 2006 when exposure area fish were compared to fish captured in the reference area. However, it is unclear if the differences were caused by one or a combination of effluent, historical contaminants in the sediment and porewater, or habitat differences.

THE DISTRIBUTION AND CONTROLS ON SILVER MINERALIZATION IN THE MAIN ZONE OF THE 2.68 GA HACKETT RIVER ZN-PB-CU-AG VOLCANOGENIC MASSIVE SULFIDE (VMS) DEPOSIT, NUNAVUT, CANADA

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There are few studies of the behavior and mineralogical residence of silver in volcanogenic massive sulfide (VMS) deposits, particularly those in a high-grade amphibolite metamorphic setting such as the Hackett River Zn-Pb-Cu-Ag VMS deposit, within the Hackett River Greenstone Belt of the Slave Craton. The deposit is enriched in silver (up to 3000 g/t) and is within the 90th to 95th percentile ranking on a global inventory of VMS deposits. The Hackett River Main Zone (HRMZ) is volumetrically the largest deposit on the property grading 127 g/t Ag, 0.30% Cu, 4.67% Zn, 0.75% Pb and 0.50 g/t Au for the massive sulfide lenses and 65 g/t Ag, 0.91% Cu, 0.87% Zn, 0.11% Pb and 0.38 g/t Au for the stringer sulfide zone[1].

The HRMZ consists of a semi-massive to massive sulfide lens that has been folded into an upright, relatively open south-plunging synform. Primary seafloor depositional textures are preserved in pyrite with complex replacement relationships between pyrite and pyrrhotite. All sulfides are overprinted by large inclusion-free pyrites, up to 5mm, composed of smaller amalgamated and annealed pyrite grains or rounded cores of earlier pyrite. Silver bearing minerals occur in discrete and localized secondary patches, particularly within recrystallized metamorphic chalcopyrite-pyrrhotite-galena-freibergite assemblages.

The sulfide mineralization can be subdivided on the basis of mineralogy, mineral textures and relative stratigraphic position with mineral abundances and compositions used to derive an Ag budget. Our work indicates five mineralogical hosts for silver within the different mineralization types: 1) disseminated footwall sulphides, 2) copper-rich stringer sulphides, 3) pyrite poor sphalerite-pyrrhotite-chalcopyrite mineralization located at the top of the stringer zone, 4) mineralization in calc-silicate altered units and 5) sphalerite-pyrite massive sulphide mineralization. In type 1 mineralization, disseminated pyrite, pyrrhotite and sphalerite contains negligible Ag and in type 2, Bi-Ag sulfides and chalcopyrite are the dominant silver hosts. Within type 3, freibergite and galena are the main silver hosts. In type 4, Ag is hosted in electrum and freibergite disseminated in calc-silicate altered units. Within type 5, freibergite hosts 87% of the silver with galena containing 4.5% of the Ag. Pyrite and sphalerite are the predominant sulfides in this mineralization type and contribute 8% of the Ag. Overall within the HRMZ, Ag-rich freibergite contains 69% of the silver and galena, chalcopyrite and sphalerite each contain 3% or greater of the total Ag budget.

Compared to the bulk Ag content, 47% of the silver in the HRMZ resides in type 5 mineralization with 20% of the Ag in type 4. The remainder of the Ag is hosted within types 2 and 3, of which 12% of the Ag is located in a localized Cu-rich stringer sulfide zone on the western limb.

This study has identified the mineralogical residences and overall paragenesis for the silver-bearing phases in the HRMZ and this knowledge can be used to develop an optimized beneficiation plan for production of the Hackett River deposits.

[1] Sabina Silver Corporation, 2006 Technical Report on the Hackett River Property, Nunavut, Canada

COLLABORATING TO SUPPORT COMMUNITY INVOLVEMENT IN ENVIRONMENTAL CONSULTING: GOLDER AND ANGONIATIT NIOVIKVIA LTD., KUGLUKTUK, NUNAVUT

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Golder Associates Ltd. has collaborated with Angoniatit Niovikvia Ltd. on environment-related projects since 1993. Angoniatit Niovikvia Limited (ANL) is the business arm of the Kugluktuk Hunters and Trappers Organization, a respected Inuit organization that handles issues related to land, water, fish and wildlife resources in Nunavut. ANL provides logistical support and contract employees for government and industry projects. Golder Associates Ltd. is an environmental and ground engineering consulting company with offices in the North and across Canada. To further the mutual benefits resulting from their working relationship, Golder and ANL created a Memorandum of Understanding in November 2006. In early 2007, Golder opened an office in Kugluktuk. A central goal of this strategic alliance is to expand ANL's work in consulting, including social development regarding environmental stewardship awareness to bring more Kugluktukmiut into professional, full time employment in environmental science and Inuit Qaujimajatuqangit (Traditional Inuit Knowledge).

Two summer seasons of training and work experience have been provided to Kugluktuk youth through this alliance, supported by team work with additional community organizations like the Kugluktuk High School. Training and field work were done in the areas of: water quality, aquatic invertebrates, fisheries, plants and climate change, and filmmaking, as well as geology, GIS and limnology. Two professional quality TK documentary films were produced, and will be available to the community for enjoyment and education. A highlight of the first year was a month long Traditional Inuit Knowledge camp designed and run by Kugluktuk elders. Highlights of the second year were having local environmental monitoring college students lead our summer students, and hosting visiting scientists and university students. These programs are of high value to the community, and to Inuit organizations, government and industry involved in science training and employment. The mining industry played a significant role in the training programs through financial and in-kind logistical support.

CRETACEOUS EVOLUTION OF A NORTHERN CORDILLERAN FORELAND BASIN INFERRED FROM STRATIGRAPHY, SEISMIC SECTIONS, AND DETRITAL ZIRCONS, MACKENZIE MOUNTAINS, CANADA

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Adjacent to northern Mackenzie Mountains, Cretaceous foreland basin subsidence and relative sea level rise was concurrent with Cordilleran deformation and plutonism. During this transgression, sandstones of the Middle Albian Martin House Formation record nearshore marine processes that reworked available sediment in a basin that deepened westward. Detrital zircon age populations from the basal sandstone do not reflect a significant Late Proterozoic or Paleozoic source, so the earliest deposited sediment was likely derived from the craton farther to the east. Shale of the Upper Albian Arctic Red Formation onlaps the Keele Arch, which together with non-deposition of the Martin House Formation suggest that the Keele Arch was a positive topographic feature during the Albian. Maximum transgression culminated in an extensive Upper Albian shale basin.

A significant unconformity separates Albian strata from the Cenomanian-Turonian Slater River and Trevor formations. Across the unconformity relative sea level drop was probably due to basin uplift, possibly caused by decreased shortening of, and therefore less loading by, the orogen to the west.

During Cenomanian time, rapid relative sea level rise resulted in renewed deposition of shale to form the Slater River Formation. East-prograding clinoforms within the lower part of the Turonian Trevor Formation indicate that a new basin configuration was established in which sediment was supplied from the west. Detrital zircon populations are consistent with derivation from Proterozoic and Paleozoic siliciclastic rocks that were probably uplifted and eroded in mountains to the west during folding and thrusting. Shoreface sandstones of the correlative Trevor and Little Bear formations prograded eastward across the entire study area completing an accommodation creation and infill cycle.

This research was undertaken in conjunction with the multi-agency "Regional Geoscience Studies and Petroleum Potential, Peel Plateau and Plain, NWT and Yukon" project, which is wrapping up in Spring 2009.

RECONNAISSANCE FIELDWORK ON CAMBRIAN SILICICLASTIC ROCKS, VICTORIA ISLAND, NT

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The Geological Survey of Canada has commenced the first year of Geomapping for Energy and Minerals (GEM) projects. In partnership with the Northwest Territories Geoscience Office, reconnaissance level fieldwork was undertaken during the summer of 2008 on northwestern Victoria Island, NT.

The Paleozoic of Victoria Island has only been mapped at reconnaissance level with the most recent geological map published in 1962. There is a dire paucity of petroleum geoscience information, in particular, a total lack of thermal maturity data. Lower Paleozoic stratigraphy in the study area consists of unnamed Cambrian sandstone and shale overlain by Ordovician to Silurian limestone and dolomite of the Read Bay Group. Devonian Blue Fiord Formation limestone and Melville Island Formation sandstone and shale outcrops are restricted to the very northeastern edge of Victoria Island.

Outcrops were visited at the northeastern (Glenelg Bay) and southeastern (Minto Inlet) edgse of Minto Inlier. Sites were selected based on reported exposure of the Proterozoic-Paleozoic unconformity to look at basal

Cambrian siliciclastic rocks. Near the southwestern end of Glenelg Bay, siliciclastic deposits overlying the sub-Cambrian unconformity consist of an approximately 10 m thick interval of grey to dark grey shale. This shale is succeeded by an undetermined thickness of platformal limestone. Inland of the northwestern tip of Minto Inlier, the sub-Cambrian unconformity is overlain by a succession of bioturbated marine sandstone. This sandstone is overlain by an approximately 10 m thick interval of grey to dark grey shale succeeded by an undetermined thickness of platformal limestone.

The observed stratigraphic relations indicate that the basal Cambrian transgressive sandstone is discontinuously distributed above the sub-Cambrian unconformity, likely controlled by paleotopography. The overlying dark grey shale represents a regional transgression followed by widespread carbonate deposition that marks the establishment of the Arctic Platform. Samples were collected from this regional shale from both outcrop locations and will be subject to Rock-Eval / TOC analysis, to provide much needed insight on thermal maturation of the Paleozoic from northwestern Victoria Island.

A set of northeast-southwest trending normal faults cross-cut Lower Paleozoic rocks. Previously this fault set had only been documented to cross-cut rocks as young as Proterozoic. The timing of the most recent offset is therefore much younger than previously thought. It should be noted that the faults are parallel to the continental margin, and that multiple rift events have been documented that are younger than Cambrian – Silurian.

SEQUENCE STRATIGRAPHY OF THE UPPER HORNBY BAY GROUP, HORNBY BAY BASIN, NUNAVUT

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The late Paleoproterozoic Hornby Bay Group and disconformably to unconformably overlying Mesoproterozoic Dismal Lakes Group are preserved in the intracontinental Hornby Bay basin, which is located along the Nunavut-Northwest Territories border north of Great Bear Lake. The Hornby Bay Group lies unconformably on deformed magmatic and supracrustal rocks of the Wopmay Orogen and is a succession of mainly clastic sedimentary rocks deposited in a variety of terrestrial depositional settings. The top of the succession records a marine transgression and ultimately transition into mainly marine carbonate rocks of the Dismal Lakes Group. The Dismal Lakes Group is covered by a thick succession of continental basalt flows and subordinate fluvial sandstones of the Coppermine River Group.

The stratigraphy of the Hornby Bay, Dismal Lakes, and Coppermine River groups is divided into four unconformity-bounded sequences: A1, consisting of the Big Bear and Fault River formations; A2, consisting of the Lady Nye, East River, and Kaertok formations; A3, consisting of the LeRoux Formation and Dismal Lakes Group and; A4, consisting of the Coppermine River Group.

The boundary between sequences A2 and A3 is identified in the subsurface as an important horizon for uranium mineralization and thus was studied in the most detail through examination of exploratory drill cores and surface exposures. In the vicinity of the Mountain Lake deposit, folding and faulting occurred mainly during and after deposition of sequence A2, but there is evidence in deformed strata of the LeRoux Formation that it continued into the early stages of sequence A3. Significant amounts of Sequence A2 strata have been tilted and removed by erosion forming an angular unconformity with Sequence A3. This relationship is interpreted to reflect uplift along the Teshierpi fault in the Mountain Lake region. Deformation may be part of a more regional orogenic event, the Forward orogeny. Northwest of Mountain Lake, strata are less deformed and the Sequence A2-A3 boundary becomes a disconformity, marked in drill core as a thin clay rich regolith.

Hornby Bay Group strata can be correlated with uraniferous intracontinental Proterozoic basins located to the east, including the Thelon, Athabasca, and Elu basins, as well as the Wernecke Supergroup, located to the west, which may represent a deeper water, marine equivalent of the Hornby Bay Group.

GEOSCIENCE OUTREACH IN NUNAVUT

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Nunavut is Canada's youngest territory with both the sparsest and demographically youngest population. Since the territory formed in 1999, exploration expenditures have increased ten-fold; recent NRCan statistics document an all-time high of $338 million in 2007. This same updated survey lists 15 of Nunavut's exploration properties within the top 100 projects Canada-wide, based on expenditures. More than two thousand new mine-related jobs could be available in Nunavut over the next decade. However, participation in exploration and mining by the people of Nunavut has been, and continues to be, traditionally low. Increasing geoscience appreciation, interest and understanding will help Nunavut and its people realize the potential and economic benefits of exploration and mining.

Partners in Nunavut are working to expand outreach efforts within the territory. Multi-party outreach efforts (Indian and Northern Affairs Canada (INAC), Canada-Nunavut Geoscience Office, and the Government of Nunavut, GN) include the Nunavut Mining Week (hosted annually with industry partners and the NWT/NU Chamber of Mines), the Nunavut Mining Symposium (held annually and attracting industry, government and stakeholder participation), community-based prospector training, annual visits to communities with the eventual goal of visiting every community at least once, and community consultations. Increased appreciation of geoscience will lead to feelings of ownership and greater participation in the benefits that research, exploration and mining have to offer.

Geologists from INAC and the GN have focussed recent efforts on the development of comprehensive Rock and Mineral Teaching Kits, for territory-wide distribution in all Earth Science education. Nunavut's Department of Education has developed Middle and High School level Earth Science curricula for use in its schools. These holistic curricula are based on traditional Inuit skills, values, beliefs and knowledge, and developed in conjunction with the Pan Canadian protocol. The idea for a Nunavut-centric Rock and Mineral Kit to support and complement the curricula originated with federal and territorial geologists. The plan was to develop a teaching and student kit that would highlight as much as was practical the rocks and minerals of Nunavut. Each kit contains four individual sub-kits (Igneous Rocks, Sedimentary and Metamorphic Rocks, Rock-forming and Common Minerals, and Ore Minerals), plus an extensive published guide in Nunavut's four official languages (English, French, Inuktitut, Inuinnaqtun) with explanation and characteristics of the samples. This initiative is nearing completion with a target delivery date early in 2009. The kits contain over 60 representative specimens, and will be distributed to each Middle and High School in the territory, to Nunavut Arctic College, for use in prospector training courses, and to mining companies with educational outreach programs. Future releases could involve similar kits being available to younger-aged schoolchildren and other interested parties.

NWT PROTECTED AREAS STRATEGY: STATUS OF LAND ACCESS AND INFORMATION

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The NWT Protected Areas Strategy (PAS) is a community-driven, partnership approach to establishing protected areas in the NWT. The PAS process respects the needs of communities, industries and the environment. This session looks at the PAS process in terms of the overall environmental stewardship framework of the NWT, and the current status of protected areas.

The term 'Protected Areas' often conjures images of National Parks. However, Protected Areas may be designated under a variety of legislation, each with its own suite of protective regulations and permissible activities. The PAS calls for core areas where no new development is allowed, but also recognizes the need for areas where compatible development may be permitted. Compatible development is based on identifying an area's cultural, ecological and economic values, which values need protection, and the most effective way to protect them.

Good information helps in the assessment of these values. The PAS works with the Geological Survey of Canada and the Northwest Territories Geoscience Office to ensure the timely completion of quality non-renewable resource assessments of possible protected areas. This information is incorporated into socio-economic assessments and boundary recommendations. The PAS is one of several processes that attempt to identify and assess cultural, economic, and ecological values in the NWT. The PAS continues to work with and improve linkages to land use planning, the regulatory process, and scientific programmes in pursuit of this goal. The PAS welcomes input from the mining industry on mineral and economic values.

The status of protected areas is often closely tied to land claims, interim measures agreements, land use planning and regulation. Through the PAS or other complementary processes, land access may be limited in that new prospecting and/or development activities may not be permitted in some areas. These limitations may be temporary (interim basis) or longer term. The status of PAS areas, and how they relate to other land management mechanisms, will be reviewed, highlighting areas where access is limited and the timelines associated with these limitations.

The PAS tries to make protected area status and knowledge information readily available. We encourage land users to speak to us about the PAS process, their land values, the opportunities to work with communities, and the implications for land access.

THE CHIDLIAK PROPERTY, A NEW DIAMOND DISTRICT ON BAFFIN ISLAND, NUNAVUT

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The 980,000 hectare Chidliak property is located approximately 150 kilometres northeast of Iqaluit, capital of Nunavut. The property was originally acquired by Peregrine Diamonds Ltd. ("Peregrine") in February 2007 to secure an area defined by anomalous concentrations of mantle-derived kimberlite indicator minerals. The regional mineral anomaly was initially identified by Peregrine and BHP Billiton through a jointly funded reconnaissance till sampling program in 2005. Subsequent till sampling defined four broad dispersion plumes dominated by abundant pyrope garnet, chromian diopside and ilmenite aligned along a north-south axis of approximately 50 kilometres. The mineral chemistry of the prospecting grains showed evidence of sampling within the diamond stability field by the presence of pyrope garnets (both G10 and G9 types) as well as diamond inclusion field (DIF) eclogitic garnets and DIF chromites. Ilmenite provenance studies indicate numerous sources are located within the property. Clinopyroxene thermobarometry indicated the area was characterized by a cool geotherm, similar to that of the Slave Province.

No regional airborne geophysical data exists for most of the Hall Peninsula where Chidliak is located. A reconnaissance helicopter-borne aeromagnetic/FDEM survey was flown over four blocks. A total of almost 12,000 line-kms of data was acquired from which approximately 175 kimberlite-like anomalies were identified. Ground geophysical surveys were completed over four high priority targets. Groundchecking of anomalies resulted in the discovery of two outcropping kimberlite pipes, CH-1 and CH-2, and a collection of kimberlite boulders interpreted to represent a third kimberlite occurrence, CH-3.

CH-1 is described as a magmatic kimberlite comprised of at least three different phases. The geophysical signature of CH-1 is characterized as a magnetic high with an associated electromagnetic response. The kimberlite has a geophysically inferred surface area of six hectares. The second outcropping kimberlite, CH-2, with an estimated surface area of 4.5 hectares, appears less complex with minor variations in olivine coarseness and mantle-derived indicator mineral abundance observed in hand specimens. The CH-3 body is also described as a magmatic kimberlite with abundant pyrope garnets that are enclosed in thick kelyphitic rims.

The initial diamond results from CH-1 show that the kimberlite hosts significant quantities of stones including larger diamonds. The CH-1B unit was reported with 146 diamonds from a 95 kg sample with over 90% of stones described as white/transparent and ten diamonds larger than the 0.600 mm sieve size. Results are pending for an additional two tonnes of material collected from CH-1 and material collected from the CH-2 and CH-3 kimberlites.

Chidliak represents a brand new Canadian diamond district; the nearest known kimberlite is located approximately 700 kilometres to the east in Greenland. Peregrine is highly encouraged by the initial results from the property and planning is underway for mounting a systematic exporation program in 2009. Activities contemplated for the 2009 Chidliak program include till sampling, ground geophysical surveys and drill-testing of high priority targets. The collection of mini-bulk samples from the surface of one or more kimberlites is also under consideration.

MICROXENOLITHS FROM THE RENARD KIMBERLITES, QUEBEC

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The Renard kimberlites are located within the Superior Province of eastern Canada. Since the first discovery in 2001, nine kimberlite bodies have been identified, located within a 2km2 area in the northern Otish Mountains of Quebec. The bodies were emplaced into Archean amphibolite to lower granulite facies basement gneisses.

Radiometric dating of the hypabyssal Renard 1 kimberlite body indicates Neoproterozoic emplacement, with a 206Pb/238U model age of 631.6 ±3.5 Ma (2σ) (Birkett et al., 2004). This makes this kimberlite district one of the oldest in Canada, similar in eruption age to the Wemindji kimberlites (629±29Ma: Letendre et al., 2003). Collectively, these emplacement events are broadly coeval with the transition from subduction magmatism to rifting in northern Laurentia (Birkett et al., 2004).

From their nitrogen contents and aggregation states the Renard diamonds are similar to typical cratonic diamonds worldwide. The mineral inclusion assemblage is more unusual, with two distinct assemblages identified: (1.) A peridotitic (harzburgitic) assemblage was recognised based on the identification of olivine, Mg-chromite and a single G10 garnet inclusion. (2.) Five diamonds containing SiO2 inclusions only were observed and may document an eclogitic, silica rich source. The absence of other eclogitic inclusion phases is, however, not in support of an eclogitic subpopulation but rather suggests derivation from a peridotitic source with coesite forming during localised intense carbonation along veins (Hunt et al., 2008).

To better constrain diamond sources in the lithospheric mantle beneath Renard, 116 microxenoliths and xenocrysts were collected for this study. The dominant peridotitic microxenoliths/xenocrysts are composed mainly of purple garnet and emerald green clinopyroxene, with lesser amounts of olivine and orthopyroxene, and a few pink and red garnets. A minor eclogitic assemblage consists predominantly of orange garnets with lesser amounts of clinopyroxene. Detailed mineral chemical characterization and geothermobarometric evaluation of the microxenolith samples is currently in progress.

A new technique of Pb-Pb dating of clinopyroxene xenocrysts, developed at the University of Alberta, was applied to the microxenoliths. Initial results indicate a date of ~2.7 Ga for the age of the subcratonic lithospheric mantle beneath Renard. This date is significant, coinciding with beginning break up of Vaalbara and a major phase of continental crust generation. Also at 2.7 Ga, Kenorland (including the Superior Province) was formed by accretion of granitoid-greenstone terranes at convergent margins (Barley et al., 2005).

TURQAVIK & ABERDEEN PROJECTS, NUNAVUT: HOW DO WE TAKE URANIUM EXPLORATION IN THE EASTERN THELON BASIN TO THE DISCOVERY STAGE?

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The Turqavik and Aberdeen exploration projects are owned 100% by Cameco Corporation and are operated out of our Qamanaarjuk Lake Camp in the Thelon Basin, Nunavut. The Turqavik and Aberdeen claims were staked in 2005 and 2006, respectively, and cover 240,881 hectares. The projects are located adjacent to Areva’s Kiggavik-Sissons projects, and consequently we are exploring for shallow- to deep-seated basement-hosted, as well as unconformity-hosted uranium mineralization. We have been conducting exploration since 2005 and have taken two main approaches: 1) project-scale and detailed geophysical surveys, and 2) property-wide regional and detailed geological mapping. The objectives of these approaches were to gain understanding of the Thelon Formation and basement rock under the Thelon Basin, as well as a better comprehension of the structural geology and lithological variations in the Woodburn Lake Group and Hudson Intrusive Suite. Evaluation of the Thelon Basin and basement units for prospective hydrothermal alteration was also a primary focus.

Geophysical surveys completed since 2005 consisted of property-scale airborne radiometric, magnetic, MEGATEM EM, hyperspectral, and RESOLVE EM, as well as regional and detailed ground gravity, and limited TAMT. Spot sampling was initiated in 2005, and regional bedrock mapping, sampling and prospecting over the entire project areas were conducted in 2006 and 2007. Detailed geological mapping of the Woodburn Lake Group and Hudson Intrusive Suite was a focus of 2008. Most importantly in 2008, we completed our first diamond drilling program, which comprised 7 holes totalling ~1,500 m, with drill holes between 70 and 350 m depth.

There are a number of obstacles when exploring in the Thelon Basin, which include a limited exploration season, wildlife constraints, drilling problems, remote location, and high cost. Another major obstacle is the ‘washing out’ of subsurface geophysical data, which makes assessing the basement terrane under the Thelon Formation cover extremely difficult. The exact reasons for the loss of resolution in our geophysical data are unknown, although it is suggested that interference related to permafrost, thick sandstone cover and/or conductive overburden might be key factors. Our strategy moving forward into 2009 and beyond will be continuation of diamond drilling and detailed gravity surveys to further delineate prospective alteration halos. Unfortunately, these approaches only apply to basement-hosted targets so prospective trends will also be projected under the Thelon Basin for unconformity-related deposit potential. For the rest of the property, standard Athabasca unconformity exploration methods will be used to propel the project onward, which includes utilizing better penetrating EM techniques, along with further processing of the data we already have. In addition, a shallow RC drilling program may be initiated after 2009 to determine if there are prospective clay and geochemical alteration halos in the sandstone. The objectives of these techniques will be to further assess the uranium mineralization potential of the Thelon Basin and, hopefully in conjunction with new or better-resolved EM techniques, will enhance our targeting and subsequently, advance our exploration to the discovery stage.

SOUTH WOPMAY BEDROCK MAPPING PROJECT - PHASE II (PARTS OF NTS 86B, C, AND D): STATUS AND OBJECTIVES

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In 2004, the NWT Geoscience Office undertook a two-phase bedrock mapping project that transects the southern Wopmay Orogen. Phase I was completed in 2007; the focus is now on Phase II. Project collaborators include the Geological Survey of Canada and universities.

The Paleoproterozoic Wopmay Orogen evolved along the west margin of the Archean Slave Craton and is bisected by the Wopmay fault zone (WFZ). East of the fault, rocks of the ca. 1.9 Ga Coronation margin were deposited on and thrust toward the Slave Craton; west of the fault the Great Bear magmatic zone represents a ca. 1.85 Ga continental arc that resulted during convergence of the enigmatic Hottah Terrane with the Slave Craton.

Western Wopmay Orogen has several past-producing mines and the NICO Au-Bi-Co deposit is currently in Mine Plan; however, there has been no systematic bedrock mapping of the southern Wopmay Orogen prior to Phase 1 of this project. Pre-existing maps of southern Wopmay Orogen date from between 1936 and 1995 and are at a variety of scales. A critical product from the project will therefore be a unified map of this part of the orogen.

Bedrock mapping will continue to benefit from thematic studies including geochemistry, geochronology, geophysics, and alteration and mineral deposit investigations. For example, during Phase I magnetotelluric and teleseismic data were collected and much of the area encompassed in Phase II is now covered by a combined radiometric and magnetic airborne survey.

Results from Phase I bedrock mapping and associated studies will be tested and refined during Phase II. For example: 1) bedrock geology and supporting isotopic studies indicate that plutonic phases west of WFZ did not interact with Archean basement but detrital zircon analyses indicate proximity of an Archean source; 2) geophysical data from Phase I indicate that the Archean Slave lithospheric root may extend beyond WFZ, as far west as the Paleozoic Platform; 3) Paleoproterozoic intrusions on both sides of WFZ are of a similar age, but IOCG/U-style alteration and mineralization is restricted to the area west of the WFZ; and 4) stratigraphic correlation across the orogen remains questionable; where does the Akaitcho Group fit in the stratigraphy and how does it relate to the Snare and Bell Island Bay groups?

Data collected by the airborne survey will not only aid bedrock mapping but will assist with mineral potential assessment, alteration mapping with particular reference to IOCG/U-style mineral systems, and will form a major component of a remote predictive mapping-oriented PhD thesis investigation. Phase II remote predictive mapping techniques will help focus field work, identify areas with anomalous "signatures," and provide complimentary spectral, geophysical and geological information.

In 2008, during two weeks of reconnaissance fieldwork we evaluated existing geological maps and examined some of the anomalies outlined on the predictive maps that were developed from the airborne geophysical survey. We also visited some of the known mineral showings and collected samples for geochemistry in order to provide point data to test remote predictive models. Phase II thus began; it will encompass full-blown mapping and targeted studies in 2009-2011.

MICROSCALE VARIATIONS IN $\delta^{13}C$: EVIDENCE FOR GROWTH OF COATED DIAVIK DIAMONDS FROM KIMBERLITE-DERIVED FLUID

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Coated diamonds comprise approximately 6% of the production at Diavik Mine. Despite their obvious importance as records of unique and unusual diamond growth conditions, diamond coats have been understudied relative to inclusion bearing gem diamonds. It has been suggested that growth of diamond coats upon gem-quality cores is related to kimberlite magmatism, but these growth processes have yet to be examined in detail.

We have measured the carbon isotopic composition of coated Diavik diamonds at very high spatial resolution using secondary ion mass spectrometry (SIMS). Individual diamond cores are generally homogeneous in δ13C and have δ13C of -5 ± 1‰. Crossing the core-coat interface the carbon isotopic composition changes sharply TO -9 ‰, and then increases gradationally towards approximately -6.5 ‰ at the outside of the diamond coat.

The outwards increasing carbon isotopic compositions measured in diamonds coats in this sample suite are consistent with diamond growth from an oxidized fluid, i.e. one bearing carbonate or possibly free CO^2. Modelling coat growth as a closed system Rayleigh fractionation process - with diamond coats in isotopic equilibrium with a CO^2 or CO_3^{2-}-rich fluid - indicates that coat precipitation consumes up to 50% of the available carbon from the growth medium. A corollary inference is that the coats grew from small isolated pockets of fluid or melt. We calculate that diamond coats of the size observed in this sample set (diamonds up to 5mm across; coats up to 1mm thick) must have equilibrated locally with ONLY 0.08 to 0.85 cm3 of CO^2-rich fluid.

The abundance of fluid microinclusions in diamond coats is strong evidence that coats grow rapidly, from a fluid supersaturated in carbon. Kimberlites are fairly oxidized melts and expected to exsolve large amounts of CO^2 during their ascent through the lithospheric mantle. This suggests that upwelling kimberlite magma could provide ideal conditions for the growth of diamond coats. Supporting this hypothesis, a number of nitrogen aggregation studies on gem diamonds and their coats have shown that the coats are are much younger than the gem cores. This has been taken as evidence to suggest that formation of coats occurs penecontemporaneously with kimberlite emplacement. Our conclusion that the coats grew from very small reservoirs in combination with the observation that several diamonds exhibit multiple concentric zones of "coat" growth may imply that these diamonds record multiple pulses of fluid associated with 'failed' kimberlite eruptions.

THE PROVIDENCE NICKEL DISCOVERY, SLAVE PROVINCE, NT.

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The Providence Nickel Discovery is located 270 km NE of Yellowknife NT, and 55 km west of the E'kati diamond mine. The discovery is situated near Desteffany Lake on the claims held by Arctic Star Diamond Corp. (ADD-TSX). Ni-Cu-Co-PGE bearing massive and disseminated sulphides occur in ultramafic rocks near the base of the Central Slave Cover Sequence (CSCS) (Bleeker, *et. al.*[1]).

Massive sulphides were intersected in diamond drill hole 08-CR10, in April 2008. This discovery hole was targeted using a ground based Max-Min survey conducted over a nickel and copper anomaly derived from an orientation till sampling survey. The drill targeted EM responses south of a prominent sulphide-facies Fe-formation. The highest geochemical results from massive sulphide zones in 08CR-10 returned assays of Cu – 0.46%, Ni – 1.77%, Co- 0.16%, Pt – 0.66 g/t, Pd – 2.2 g/t, Ir 0.19ppm, Rh 0.46ppm from 0.6m.

Infill drilling of the discovery recommenced in July, 2008. Massive and disseminated sulphides were intersected in16 of 17 diamond drill holes, extending mineralization for 450 metres along strike and to a 150 metre vertical depth. The discovery remains open to extension in all directions.

The drilling has shown the mineralization to be hosted by fine-grained ultramafic bodies metamorphosed to upper amphibolite facies. The main mineral constituents of these ultramafics are horneblende, talc, anthophyllite and tremolite, +/- sulfides. Probable relic spinifex textures are present. Ultramafic intrusives that occur in the upper part of basal quartzites of the CSCS have komatiitic composition, based on MgO content and other oxides.

In the discovery area, a sulphide facies Fe-formation occurs above ultramafics and basal sediments and below metabasalts. Mapping and airborne geophysics trace the iron formations throughout the survey area. To date, drilling has intersected massive sulphide units up to 4.95m width and zones of mixed massive and disseminated mineralization to 24.5m width. Assays are awaited. Recent microprobe work by R.L. Barnett has demonstrated abundant pentlandite and chalcopyrite in massive pyrrhotite with grains of zoned Iridium-Rhodium within Cobaltite and Bismuth-Palladium Telluride.

Grid soil sampling was completed over the eastern part of the 21km long belt of favourable geology on Arctic Star's claims this summer. Early results present new anomalies with geochemical signatures comparable to those in the discovery area. Highly prospective VTEM conductors also occur in similar stratigraphy elsewhere along the volcanic belt.

[1] "The Central Slave Basement Complex, Part I: its structural topology and autochthonous cover", Wouter Bleeker, John WF Ketchum, Valerie A. Jackson, and Michael E. Villeneuve, Canadian Journal of Earth Sciences, Volume 36, Number 7, July, 1999, Pages 1083-1109, ISSN 1480-3313.

MINERAL AND ENERGY RESOURCE ASSESSMENT (MERA) FOR THE PROPOSED EAST ARM NATIONAL PARK

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An area of the East Arm of Great Slave Lake and adjacent lands and waters was withdrawn under the Territorial Lands Act for proposed national park purposes in 1970. Additional lands and waters between Artillery Lake and the Hoarfrost River were incorporated into the proposed park area in 1985 (Parks Canada, 1985). The Geological Survey of Canada completed a mineral resource assessment on the area of interest (7,425 km^2) between Artillery Lake and the East Arm of Great Slave Lake in 1987 (Roscoe et al., 1987; GSC Open File 1434). Significant additional lands and waters were incorporated into the area of interest for a national park in the East Arm of Great Slave Lake in January 2006, such that the area of interest now covers a surface area of 33,525 km^2. The increased size of the area of interest encompasses regions with deposit types previously not considered in detail by Roscoe et al. (1987) because they were outside the 1985 study area. In addition, deposit types not known in the 1980's e.g., kimberlite-hosted diamond, are now known to exist within the area of interest.

The Mineral and Energy Resource Assessment (MERA) process was established in 1980 as the mechanism to ensure that the economic and strategic significance of mineral and energy resource potential is duly considered in the national park establishment process in Federal lands north of the 60th parallel. In June 2007, at the request of Parks Canada, the GSC initiated Phase I of the MERA process. This involved compiling an inventory of all existing public domain data in the study area and identifying data gaps to determine if field work is required and assist in the design of Phase II of the MERA process. Phase II of the MERA process was approved in February 2008 and involves fieldwork, and analysis of the new data coupled with the compiled data from Phase I to generate mineral potential maps for the proposed park area. In the summer of 2008, Quaternary, bedrock, geophysical and metallogeny field investigations were undertaken in the proposed park area. Analysis of this new data will be undertaken during winter/spring 2009, with a follow-up studies (were warranted) to be undertaken in summer 2009. A final report write-up, including results from these various studies and incorporating mineral potential maps will be published in spring 2010 for public consultation purposes.

TOWARDS AN INTEGRATED WORK FLOW FOR SURFICIAL GEOLOGICAL MAPS OF THE SOUTHERN MACKENZIE CORRIDOR IN GIS AND PRINTED FORMATS

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New procedures to prepare digital geologic maps have been implemented for surficial geology a project in the southern Mackenzie corridor to produce 23 surficial geology maps, as well as several other thematic map sets. These procedures eventually will become the basis of a standard workflow for producing maps in the GSC. This new workflow consists of the creation first of a Geodatabase from which the final printed map and GIS map layers are produced. The Geodatabase is prepared in a series of stages beginning with the author's interpretation of aerial photographs which is scanned and georeferenced. The surficial geological features are returned in the E00 exchange format with a separate "coverage" (ArcInfo file type) for each of the features on the map, (e.g. contacts, ice flows, kames points, drumlins etc.). The coverages are then converted into a Geodatabase that contains feature classes that correspond to the various geological feature types. A master legend is created in the Geodatabase which contains all the features anticipated for the area, their descriptive attributes and a reference to the appropriate symbol. Plots are then created by applying this legend through a style file to the Geodatabase with the proper graphical representation of each. When the author is satisfied that the geological features are correctly identified in the Geodatabase and represented on the map plot, the field observations are added to the Geodatabase, and reconciled with the interpretation based on the aerial photographs. A complete draft plot is then created, which includes all map surround information so the author can perform a final check and make any necessary corrections. The corrections are made to the Geodatabase which can now be used to print the final map product, and produce a set of shapefiles for the published GIS version.

LOWER PALEOZOIC RIFT RELATED ALKALINE VOLCANIC ROCKS, MACKENZIE MOUNTAINS, NT

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Alkaline volcanic deposits of the Marmot Formation in the Mackenzie Mountains, NT, were locally erupted onto the western margin of ancestral North America as a result of Early Paleozoic rifting. A local 100 x 150 km, rift controlled basin, termed the Misty Creek Embayment (MCE), hosts the voluminous Marmot Formation. We present robust isotopic, geochemical and geochronological data coupled with field and petrographic investigations from the Marmot Formation. These new data provide critical information regarding the character of the mantle source in Early Paleozoic time and the volcanic and tectonic evolution of the MCE. Fieldwork for this study was carried out in collaboration with the Sekwi Mountain Project of the NWT Geoscience Office, Yellowknife, NT.

Petrographically the Marmot Formation can be broadly divided into three distinct suites; (1) volcaniclastic, breccia filled diatremes (e.g., Mountain Diatreme); (2) clinopyroxene phyric basalts, and; (3) widespread strata bound lapilli tuffs. Abundant phlogopite macrocrysts in these deposits and variable element enrichments (e.g., Nb and Ba) suggest that phlogopite contributed to the melting process. Therefore, ArAr geochronology methods on phlogopite macrocrysts, from multiple deposits across the MCE, were used to provide timing constraints on volcanic activity. These results indicate that Marmot Formation volcanism consisted of two episodes at 460 Ma and 444 Ma. Furthermore, on the basis of age, lithogeochemisty, mineral geochemistry, and Nd isotopic composition we suggest that all three suites were intimately related. Collectively these suites represent derivation from an enriched OIB-type mantle. Incompatible trace element ratios indicate that the magmas were derived by low degrees of partial melting of a lherzolitic source that contained minor garnet and spinel. On the basis of this initial interpretation we can further constrain possible depths of melt generation, which is critical for evaluating the diamond potential of these rocks (including the Mountain Diatreme, which has long been of economic interest). Furthermore, a comparison of ArAr ages with trace element ratios and sample locations indicate that there are no spatial variations on geochemical signatures associated with episodes of emplacement. The Marmot Formation thus represents volcanic activity associated with derivation from a large, relatively long-lived, and homogeneous enriched source.

THE HOPE BAY PROJECT 2008 UPDATE - HOPE BAY, NUNAVUT, CANADA

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The Hope Bay project is an advanced exploration and development project located in the Western Kitikmeot Region of Nunavut. The project has been estimated to contain an indicated resource of 36.0 million tonnes @ 4.5 g/t Au and an inferred resource of 46.6 million tonnes @ 3.6 g/t Au in three main resource areas, Doris, Boston and Madrid. This is one of the larger undeveloped gold resources in Canada.

The project was acquired by Newmont Mining Corporation in March 2008 for $1.5B. Newmont believes that this Project has the potential to become a sustainable and profitable gold producing district for many years. Hope Bay is a top priority for Newmont and the company has made major commitments to the long-term development and evaluation of the district's potential.

Newmont has made safety its top priority while continuing to improve the existing camps and the overall project infrastructure. New additions this year include the approval of the Tail Lake permit, a new 118-person camp at the Doris site, a 900m all-weather airstrip, a 16 km road between the Doris and Windy sites, a 5 million litre fuel storage facility, and upgrades to existing facilities.

Exploration and development drilling fluctuated throughout the year with up to 5 drills turning at any one time. Work focused on collecting additional geotechnical information, selective drilling at the resource areas, and regional exploration. Overall exploration was reduced in order to complete the infrastructure projects, which are now in place to support extended and aggressive exploration and development efforts to confirm the full potential of the Hope Bay district.

THE PLATEAU THRUST: A DETAILED INVESTIGATION AND CHARACTERIZATION OF THE DEFORMATION IN ITS FOOTWALL, NTS SHEET 106A, MACKENZIE MOUNTAINS, NT, CANADA

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The Plateau Thrust is the most significant NW-SE striking structure in the Mackenzie Mountains. The thrust changes dramatically along strike from a “thin skinned” structure to the SE, to a more “thick skinned” structure to the NW. In the study area, the structure behaves as a steeper, short travelled thrust fault rather than a low angle far travelled thrust sheet. Evidence for this is apparent in the immediate footwall where an intense deformation zone is exceptionally well-exposed exposed.

An obvious pattern is visible at the map scale whereby the hanging wall of the thrust consists of relatively undeformed, gently to moderately southwest dipping sedimentary rocks, and the immediate footwall is intensely shortened, with steeply southwest dipping strata that is in some instances overturned. In the 106A map sheet, the deformation in the immediate footwall is confined to a zone that is bounded on the southwest by the Plateau Thrust and on the northeast by the Shattered Range Anticline, a gentle box fold. This zone is approximately 10 kilometers wide and is locally continuous along the strike of the thrust, and was the focus of 2006/2007 detailed structural mapping.

The shortening in this deformation zone is primarily accommodated by high angle imbricated thrust faults. Other styles of faulting include tear faults and back thrusts. Large scale open to tight cylindrical folding (mostly asymmetric) is observed in the carbonate units, while chevron and kink folds are often observed in the Devonian clastic units. A pervasive NW-SE axial planar cleavage is observed throughout the area.

The immediate footwall sedimentary rocks are thought to deform above a large detachment occurring at the level of the Gypsum Formation, upper Little Dal Group. Farther to the southwest there is evidence for another detachment that is stratigraphically lower than the main Gypsum Formation detachment, whereby Katherine Group sedimentary rocks structurally overly the younger Upper Carbonate Formation, Little Dal Group. In addition, detailed mapping identified a unique structure in the form of a folded thrust fault. This structure might have formed by contemporaneous thrusting and folding, resulting in an anticline where the Paleozoic Bear Rock Formation is exposed in the core and is structurally overlain by the Proterozoic Gypsum Formation, Little Dal Group. To further complicate issues, this thrust is then truncated by a later thrust that originated as a fault propagation fold. This area will be the focus of a balanced cross section and several smaller schematic cross sections to demonstrate the complexities in the map pattern.

DETERMINING THE MOST APPROPRIATE SOIL CRITERIA FOR THE REMEDIATION OF NORTHERN CONTAMINATED SITES

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Across Canada there are a number of different criteria that are used for remediating contaminated sites. As most are aware, Canadian Council of Ministers of the Environment (CCME) provides a standardized system that includes generic criteria for the remediation of contaminated sites throughout Canada. Through the CCME framework, Site Specific Criteria or Target Levels (SSTLs) can be developed. These are developed if the site conditions don’t meet the generic site requirement or conditions. Although this may seem like a simple system in principle, there are a number of other criteria that must be taken into account when determining the appropriate criteria for a site. For example, in the Atlantic Provinces there is the Risk-Based Corrective Action (RBCA) that is used for the clean up of hydrocarbon contaminated sites. Most provinces have a set of provincial criteria that may or may not be more stringent than the CCME criteria. For the north specifically, the Distant Early Warning (DEW) Line criteria has been developed based on northern research including the impacts of permafrost.

CHANGES IN BASELINE WATER QUALITY CHARACTERISTICS FOLLOWING THE 2008 FOREST FIRE AT FORTUNE MINERALS LTD. NICO PROJECT

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Fortune Minerals Limited (Fortune) proposes to develop a new gold-cobalt-bismuth deposit ("NICO Project") in the Tli Cho Region of the Northwest Territories (NT). The project is located 150 km northwest of Yellowknife and 40 km northeast of the community of Wha Ti. Golder Associates Ltd. began collecting seasonal baseline water quality data in 2004, as part of the environmental impact review process for the mine development. Baseline water quality sampling in the watershed (Grid Pond through to Burke Lake and eventually the Marion River system) has shown that background concentrations of arsenic, copper, lead and iron exceeded the Canadian Council of Ministers of the Environment (CCME 2007) water quality guidelines for the protection of aquatic life. As the only activity in the area is exploration, these exceedances are apparently due to the natural weathering of sulphide minerals in the area. The surrounding terrain has an abundance of arsenopyrite mineralization, and oxidation of this mineral could account for the elevated sulphate and metals observed in the surface water samples. This is supported by similar dissolved chemistry for the ground-water monitoring wells located in the vicinity of the deposit. Recently there has been increasing concerns related to arsenic associated with mine development in the north. The NICO Project area is unique in that natural concentrations of total arsenic significantly exceeded the CCME guideline (0.005 mg/L) along the hydrologic path from Grid Pond through Little Grid Pond by as much as 260 fold. In general, total arsenic concentrations continue to exceed the CCME guideline farther along the flow path into Nico and Peanut lakes, although at decreased concentrations. The high levels of natural arsenic concentrations found throughout most of the project area were of particular concern and were monitored seasonally throughout the baseline program. Over the entire study period, total arsenic concentrations generally were consistent within each of the waterbodies until the summer of 2008 when a forest fire impacted sections of the watershed. The portions of the watershed impacted by the forest fire were apparent following comparisons of the August 2008 water quality data with previous years. While arsenic concentrations in the upper portions of the watershed not impacted by the forest fire were similar to previous years, concentrations increased by as much as four fold in burnt areas. In Peanut Lake, it appears that this increase in arsenic levels may have impacted fish populations.

The importance of establishing several seasons of baseline data for potential developments was apparent following the forest fire. The impacts of the forest fire on NICO baseline water quality characteristics and the potential implications to fish populations are discussed.

SEKWI MOUNTAIN PROJECT YEAR 3: OVERVIEW OF BEDROCK MAPPING AND COLLABORATIVE STUDIES IN CENTRAL MACKENZIE MOUNTAINS, NT

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The Sekwi Mountain project, initiated by the Northwest Territories Geoscience Office, is a 3-year multidisciplinary study of the central Mackenzie Mountains and is being conducted in collaboration with the Geological Survey of Canada, University of British Columbia, Laurentian University and University of Waterloo students and researchers, as well as industry partners (Eagle Plains Resources Ltd. and Freeport McMoRan Copper and Gold Inc.). The project is aimed at providing an up-to-date understanding of the stratigraphy, tectonic history, metallogeny, geochronology, and geochemistry of Proterozoic and Paleozoic strata exposed in NTS map sheets 105P, 106A, and 95M. This presentation will provide an overview of the Sekwi Mountain Project bedrock mapping, collaborative studies, and five graduate and undergraduate theses.

The highlights of three years of regional mapping include: 1) an improved understanding of the stratigraphy of the Windermere Supergroup and Backbone Ranges Formation; 2) increased resolution of

Mackenzie Mountain Supergroup stratigraphic thicknesses distribution; 3) subdivision of Earn Group equivalents in the Selwyn Basin; 4) distribution of the Coates Lake Group; 5) improved understanding of structures along the Plateau Thrust, and; 6) presence of new mineral occurrences.

Detailed studies in concert with regional mapping include the investigation of: 1) map-scale deformation in the footwall of the Plateau Thrust; 2) potential hydrocarbon source and reservoir rocks; 3) stratigraphy of Cretaceous coal-bearing strata, Imperial Formation, Whittaker Formation, Katherine Formation, and Little Dal Group; 4) structural and stratigraphic controls of carbonate hosted Zn-Pb showings; 5) geochemistry of volcanic rocks and associated diatremes; and 6) examination of newly discovered mineral prospects.

Of possible economic interest are new occurrences of: 1) vein-hosted green beryl in the Twitya Formation; 2) Cu in the Coppercap, Redstone River, Little Dal and Twitya formations; 3) carbonate-hosted Zn-Pb. The structural and stratigraphic controls on some of these prospects are being investigated as part M.Sc. and B.Sc. research projects. Several diatremes in, and west of, NTS 106A (including the Mountain diatreme), are being studied as part of a M.Sc. study.

GEOLOGICAL SETTING AND UPDATE ON EXPLORATION ACTIVITIES, PROVIDENCE GREENSTONE BELT, NWT

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GGL Diamond Corp (GGLD) has 100% interest in claims covering the majority of the Providence Greenstone Belt, a suture running through the central Archean Slave Province, NWT, Canada. Identified and mapped by the GSC as the Winter Lake greenstone belt, it was renamed by GGLD in 2007. Some komatiitic rocks were mapped in the OF3676 1:50,000 scale mapping and subsequent mapping by GGLD has identified many more ultramafic rocks in the belt including both intrusive sills and extrusive flows. These ultramafics have been confirmed as komatiitic by whole rock geochemistry.

Three distinct supracrustal sequences have been identified in the Providence greenstone belt. The oldest includes the Newbigging Formation mixed volcanogenic rocks and the North Shore Formation quartz arenites and iron formation. The second distinct sequence is volcanic and is comprised of the Snare Formation mafic volcanics and Credit Formation ultramafic volcanics. The youngest distinct sequence is sedimentary and is comprised of the greywacke, siltstone and mudstone of the Itchen Formation, and stratigraphically and also the younger conglomerates of the Sherpa Formation.

The North Shore Formation, has been correlated with the Central Slave Cover Group (CSCG) and is an important target for Ni exploration. The CSCG is a rift-related sequence of volcanics and sediments including fuchsitic quartzite and iron formation, and it occurs throughout the central Slave craton stratigraphically beneath the younger greenstone belts, and in the case of the Providence greenstone belt underneath the Snare Formation. It is proposed here that the CSCG sequence is more extensive in the Providence greenstone belt than previously mapped in OF3676, partly due to difficulties in distinguishing from the older Newbigging Formation. The CSCG has also been discovered by Arctic Star south of DeSteffany Lake in the same greenstone belt, and is the host to nickel-bearing massive sulfides there.

Since the initial discovery of Ni mineralization at the end of 2006, GGLD has staked to the north and south to a total of 120km along the length of the greenstone belt. Subsequent prospecting, mapping, rock and soil sampling and a VTEM airborne electromagnetic/magnetic survey in spring 2008, culminated in the 2008 drill testing of Ni targets.

While the Providence greenstone belt was initially a Ni project, as for many greenstone belts, the Au and VMS potential was soon apparent. Some exciting VMS targets have been uncovered at the north end of the property within felsic and intermediate volcanics of the Providence Formation. Of great significance are two Au showings, hosted within the upper levels of the Snare Formation mafic volcanics, with highlight grab samples of 0.58, 0.62, 0.81 and 1.33 oz/ton.

INDICATOR MINERAL AND TILL GEOCHEMICAL SIGNATURES OF THE NICO CO-AU-BI DEPOSIT, GREAT BEAR MAGMATIC ZONE, NWT: RESULTS AND PROGRESS REPORT

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To establish a practical guide to geochemical and mineralogical exploration for Iron Oxide Copper-Gold±U (IOCG(U)) deposits in glaciated terrain, an orientation study around the NICO cobalt-gold-bismuth deposit in the Great Bear magmatic zone (GBMZ) of NWT was initiated in 2007. This work is part of a joint government-industry-academia research project taking place under the government TGI-3, GEM and SINED program umbrellas. Bedrock and till samples from mineralization, host rocks, alteration zones, and background terrain of the NICO deposit were analyzed to characterize the indicator mineral and alteration geochemical signatures of these domains.

Indicator mineral picking (0.18-2 mm, S.G.>3.2) from 27 bedrock samples indicates the presence of arsenopyrite, magnetite, tourmaline and ferroactinolite in various concentrations in the suite of ore/gangue/alteration heavy minerals, essentially in the 0.25-0.5 mm fraction. The magnetite occurs as individual grains but is also disseminated in crushed bedrock fragments. When present, the tourmaline is very fine grained and intercalated with quartz so that few grains are heavier than S.G. 3.2 in the >0.18 mm fraction. Ferroactinolite is abundant in a few samples in association with arsenopyrite. Bismuthinite is also present but is so fine grained that it is recovered only in the pan concentrate or as inclusions in coarser-grained arsenopyrite. Gold is rarely present in the bedrock concentrates, suggesting that most of the gold is encapsulated in the arsenopyrite. Except for magnetite, very few mineral species present in the bedrock samples appear to have been preserved in the 13 till samples collected in the upper C-horizon soils. Indicators of mineralization are essentially restricted to samples near the Bowl Zone and consist of chalcopyrite, bismutite, gedrite and ferroactinolite. Pyrite and (rarely) pyrrhotite are present but only in the pan concentrate (<0.1 mm). Pristine gold grains are relatively abundant in till immediately down-ice (<200 m) of #2 Zone and #3 Zone. Electron microprobe analysis and examination of selected grains will help to develop criteria that contribute vectors to mineralization.

Lithogeochemistry and till geochemical methods are used in conjunction with indicator mineral methods to identify important pathfinder elements and extract geochemical criteria for IOCG(U) mineralization. Additional orientation studies in the GBMZ are planned to further develop reference rock, mineral indicator and geochemical databases.

THE LAKE ZONE HEAVY RARE EARTH DEPOSIT, NT, CANADA

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The Lake Zone Heavy Rare Earth Element ("HREE") deposit is located on Avalon Ventures' Thor Lake property, 100 km east of Yellowknife, NWT, in the Akaitcho Territory. The property has more than 30 years of exploration for niobium and tantalum, then beryllium and now rare earth elements (REE). Recent drilling has changed the geological interpretation of the mineralization and highlighted the fact that the Lake Zone is an exceptional deposit in its size, concentration of REE and especially in its unusually high content of HREE (Eu through Lu + Y). Avalon Ventures' objective is to demonstrate the economic viability of production of REE with a high proportion of HREE, with by-product Ta-Nb-Zr from the Lake Zone.

REE are increasingly important for a range of electronics, automotive and aerospace applications, In particular, REE magnets are critical to energy efficiency applications, especially hybrid and electric vehicles. Outside of China, Thor Lake is unique in the world for its size and content of HREE.

The Lake Zone is hosted by the Aphebian Blachford Lake peralkaline layered intrusive complex emplaced within Archean supracrustals of the Slave Structural Province. The Lake Zone REE mineralization is hosted in a tabular hydrothermal alteration zone, exposed over an area in excess of one km2 and averaging 100-150m thick in thickness. It is characterized by near-complete replacement of the primary mineral assemblage by chlorite, magnetite, biotite, zircon, bastnaesite, monazite, allanite and fergusonite. The deposit exhibits a distinct horizontal layering with HREE content generally increasing towards the base of the deposit. The lowermost layer, called the "Basal Zone" contains between 1.5 and 2.5% total rare earth oxides (TREO) over thicknesses of order of 20m, with HREE ranging between 15% and 30% of the total REE present.

Avalon acquired Thor Lake in 2005, commencing exploration in July 2007. Prior to field activities, community meetings were held with nearby communities in the Akaitcho territory and have continued since. Some 85 drill holes totalling over 16,000 meters have been added to the historic drilling and a new 43-101 resource estimate is in preparation. A one tonne bulk sample was obtained by drilling, for mineralogical and metallurgical testwork needed to develop a process flowsheet for REE recovery. The probable processing route will be flotation to produce a mineral concentrate followed by hydrometallurgical "cracking" producing a mixed REO product. A prefeasibility study is targeted for completion in 2009.

A proactive program of community engagement has led to the development of specific programs to respond to community needs and concerns. Employment opportunities are being created through training of geological technicians and additional training programs are being developed for First Aid responders and drillers in cooperation with local organisations. In response to community concerns about waste material from previous operators, the company has funded a substantial clean-up effort and employed local community members in this.

HEALTH AND SAFETY IN MINERAL EXPLORATION – WHAT THE PDAC IS DOING FOR YOU

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The Prospectors and Developers Association of Canada (PDAC) recognises that health and safety (H&S) are integral parts of responsible mineral exploration. The PDAC H&S Committee was formed to assist industry in achieving zero fatalities and decreased accidents.

Mineral exploration has unique health and safety issues because working conditions are complex and often in remote regions subject to extremes of weather and terrain. The industry is increasingly dominated by junior companies and small contractors, which often lack the internal health and safety resources of major companies. With the recent expansion in mineral exploration there has been a significant increase in accidents and fatalities. Due to difficult access to advanced care while working in remote sites, minor accidents have the potential to become major issues.

The PDAC H&S committee has a number of initiatives to advance H&S good practice among its membership. These include issuing advisory guidelines for the boards of junior companies, an annual industry survey, development of a manual, sponsorship of training and issuance of bulletins on specific H&S issues.

For three years the PDAC committee has assessed exploration safety performance through an annual Canadian national exploration accident survey by partnering with the Association for Mineral Exploration in British Columbia (AME BC), which for over 20 years has conducted such an accident survey in the Canadian Cordillera. The results of the latest survey will be given in the presentation. Helicopters continue to be the major cause of fatalities.

The PDAC committee believes it is critical to raise awareness within the industry and is preparing comprehensive field health and safety guidelines that is planned to be freely available on the internet by early 2009 in two forms – a large manual and a pocket sized version. No company or contractor should lack a current relevant health and safety manual.

In addition, the association has sponsored pilot Wilderness First Aid courses through commercial organisations. The success of these has encouraged the association to seek partnerships with local exploration associations to take this national. This initiative opens the door to such training for individuals and smaller companies that otherwise could not financially meet the minimum requirements for courses.

The association will issue bulletins periodically to its membership to advise of recent serious accidents and their causes.

GEOLOGY AND MINERALOGY OF THE MOUNTAIN RIVER BERYL (VARIETY EMERALD) SHOWING, MACKENZIE MOUNTAINS, NT, CANADA: INSIGHTS FROM PRELIMINARY FLUID INCLUSION STUDIES

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The Mountain River beryl showing (MRBS) was discovered in 2007 during regional mapping in the Mackenzie Mountains, as part of the Sekwi Mountain project. The occurrence outcrops on a steep hillside south-southeast of Shale (Palmer) Lake, where beryl is found in numerous vuggy quartz-albite-dolomite and minor pyrite veins hosted in thinly-laminated to medium-bedded pyritic siltstones and sandstones of the Neoproterozoic Twitya Formation. The veins are 1 cm to 1 m in thickness and are observed in at least 3 zones that extend over 20 m. Powder X-ray diffraction, SEM and electron microprobe analyses confirm that the mineral is beryl. This occurrence is the first to be documented in the region.

Beryl occurs as euhedral hexagonal prismatic crystals that are 1 to 5 mm in diameter and up to 4 cm in length. The crystals are vitreous, translucent, and are commonly disposed in radiating clusters or grow perpendicular to the vein margins. They are brilliant green in colour, which corresponds to the 5G 6/6 reference of the Munsell rock colour chart. The arrangement of the crystals and the vuggy nature of the veins suggest that the veins are extensional fracture fillings. Trace element analyses of the crystals reveal elevated amounts of V and Cr, both recognized for giving green pigment in minerals (Nassau, 1975), along with Fe and Sc. The green colour of the beryl along with specific trace element concentrations within the minerals indicates that the variety is emerald.

Preliminary fluid inclusion studies reveal that they are CO_2-bearing, highly saline (20 wt. % NaCl), and dominantly two-phase (brine + carbonic vapour). H_2O and CO_2 mole fractions are approximately 0.92 and 0.01. Vapour dominant and three-phase (liquid + vapour + halite) fluid inclusions are present, but rare and likely result of post-entrapment volume changes (necking-down), and are not necessarily characteristic of fluids precipitating emeralds. The source of hydrothermal fluids responsible for the veining and associated beryl at this locality is uncertain. The closest known Cretaceous intrusions, responsible for other emerald occurrences in the northern Cordillera, are located 80 km to the south and the Silurian alkali Mountain diatreme is 14 km to the west. The lack of evidence of igneous activity or metamorphism, but the presence of thrust faults suggest that the fluids channeled along these structures.

MRBS has many geological similarities with the well-documented black-shale-related hydrothermal emerald occurrences of Colombia, such as its association with sedimentary rocks, its fault-related nature suggested by extensional structures and nearby thrust faults, vein mineralogy and fluid compositions.

ADDRESSING HISTORIC AND PRESENT CONCERNS ABOUT THE FORMER PORT RADIUM URANIUM MINE

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In 1998, Deline First Nations approached Canada about historic and present day concerns related to the former Port Radium Uranium Mine. After a year of internal discussion Deline agreed to Canada's offer to begin a partnership approach to investigate health and environment issues and develop a common understanding relating to concerns. This approach started the Canada-Deline Uranium Table (CDUT) in 2000, which took five years to complete studies identified in an action plan developed by subject matter experts, government officials and Deline community members. Both Indian and Northern Affairs Canada and Deline First Nations were happy with the process on which issues were being discussed. Due to the success of this approach the CDUT process became the foundation for consultations under the Contaminated Sites Remediation Program through Indian and Northern Affairs NT region. The CDUT ended with a final report identifying 26 recommendations which consisted of a number of health, environment, capacity and knowledge. Though remediation of this site is occurring in 2007 this site will not be remediate to the community of Deline until all recommendations are addressed.

OPTIMISING KIMBERLITE EVALUATION PROGRAMS BY INTEGRATING GEOLOGICAL, MINERALOGICAL AND GEOPHYSICAL DATA

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Bulk sampling and evaluation of kimberlites for diamonds is an expensive and risky process. It is critical that bulk samples are not only large enough to be statistically meaningful, but that they adequately represent the main kimberlite types present. In situations where there are numerous kimberlites that require testing, it is critical to ensure that costly evaluation work is focused on bodies with the greatest potential for economic quantities of diamond. With the increasing scarcity of high-grade kimberlites and the consequent need to evaluate lower-grade, more marginal deposits, there is an even greater need for smart evaluation programs that are focussed on the appropriate portions of kimberlite ore bodies and that maximise the information obtainable from bulk samples. In this contribution, we review the application of key geological, mineralogical and geophysical tools to maximise the reliability and value of bulk sampling programs.

A reliable geological framework is an essential starting point for all kimberlite evaluation work. Kimberlites are commonly highly complex ore bodies comprising multiple geological domains each with the potential for significant differences in the quantity, distribution and value of diamonds present. High-resolution ground geophysical surveys can be valuable in providing an early indication of the dimensions of the kimberlite and of major internal geological variations present. This provides a basis for planning drill holes and / or surface excavations needed to more reliably constrain the boundaries of the body as well as the distribution and character of major kimberlite types present. Detailed characterisation of kimberlite types in terms of key components and textures provides valuable information on the mode of emplacement and factors relevant to the quantity and distribution of diamonds. However, because diamond is an accidental component of kimberlite, a xenocryst phase derived primarily from the deep lithospheric roots of cool Archean cratons and sampled by kimberlite magmas en route to surface, it is not possible to estimate diamond content on the basis of the geological characteristics of the kimberlite alone. Assessment of diamond potential requires quantitative evaluation of the abundance and composition of key mantle-derived minerals that are sampled by the kimberlite in much greater quantities than diamond and, therefore, can be readily investigated without the need for large bulk samples. These minerals provide valuable information on the nature and quantity of lithospheric material contained within each kimberlite phase and provide a very powerful tool for early assessment of the relative diamond potential of different kimberlite units or bodies. By combining the indicator mineral data with results of petrographic and micro-diamond analysis, the relative diamond content of different kimberlites can be reliably assessed, providing a solid basis for planning of bulk sampling programs and for improving the confidence of diamond grade and value projections into portions of the kimberlite that have not been bulk sampled.

The principles of the above-described methods will be reviewed, together with examples from Africa and Canada illustrating their value in enhancing the planning of bulk sampling programs and interpretation of results therefrom.

METALLOGENIC EVOLUTION OF THE MACKENZIE MOUNTAINS, NWT

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The Mackenzie Mountains, the now thrust-stacked ancient continental margin of western North America, comprise the northeastern most sub-province of the Cordilleran orogen. The oldest exposed units are <1080 to 780 Ma Neoproterozoic clastics, carbonates, shales, and evaporites that were deposited in an extensional epicratonic setting. These are overlain by <780 Ma Neoproterozoic clastic-dominated and glacially-related units deposited during the rifting and breakup of the supercontinent Rodinia, which evolved into the passive margin of ancestral North America. Cambrian through Devonian strata accumulated in this passive-margin environment and consist of shelf-facies in the northeast (Mackenzie Platform) and basinal facies in the southwest (Selwyn Basin) with the proto-Pacific Ocean somewhere to the west. Some Devonian-Mississippian sedimentary rocks may be resultant from the Ellesmerian Orogeny and uplift of the Arctic Archipelago. The Cretaceous geological record reflects collisional events along the margin to the west. Strata of the Selwyn Basin were intruded by granitic plutons of the Tombstone-Tungsten Suite between ca. 110 Ma and 90 Ma, presumably in a distal back-arc, post-collisional setting. Some Cretaceous sedimentary rocks are preserved. Recognizable deformation is generally related to the Cretaceous-Tertiary Laramide Orogeny, which is responsible for thrusting and folding, and the associated uplift and exposure of older strata. Neoproterozoic strata have more complex deformation histories, recording subtle Neoproterozoic tectonic events.

Due to this protracted and diverse tectonic evolution, an equally diverse array of over 300 known mineral deposits and prospects is present. These can be grouped into five distinct ‘deposit types’ on the basis of genetic characteristics such as host-rocks, structural style, and ore mineralogy. The oldest recognized deposit type is the rift-related, ca. 750 Ma Kupferschiefer-type Cu (±Ag) hosted by the Coates Lake Group. Similarities with the African Copper Belt suggest that there may be large-tonnage deposits yet to be found. The ca. 700 Ma glacial-marine-related Rapitan Group unconformably overlies the Coates Lake Group, and in its northwestern exposure hosts a large stratiform iron deposit in the form of hematite-jasper nodular iron formation and lesser banded iron formation, interpreted to have been deposited during Neoproterozoic rifting and glaciation. During subsequent Paleozoic extension, a number of Zn-Pb SEDEX deposits formed concurrently with sedimentation in the Selwyn Basin; this includes the giant Howard's Pass Zn District. Also during the Paleozoic, and possibly extending into the Cenozoic and Mesozoic (i.e., Laramide deformation-related), the Mackenzie Platform was the locus of structurally-related carbonate-hosted Zn-Pb mineralization, preserved as a diverse collection of mineral deposits and prospects. During the Cretaceous, in a distal post-collision-type environment, the Tombstone-Tungsten Suite intruded older strata. Associated with the Tungsten Suite are skarn deposits, two of which (Mactung and Cantung) are the largest tungsten deposits in North America. Also associated with the Cretaceous plutons are base metal skarns, intrusion-hosted semi-precious and precious gemstones, and pegmatite-hosted rare-elements. Other deposits of economic interest include Carboniferous and Cretaceous-Tertiary coal, and minor modern placer gold occurrences.

FIELD RELATIONSHIPS, PETROGRAPHY, CHRONOLOGY, AND FLUID CHARACTER OF THE NORI/RA CU-MO-U (± REE & W) PROSPECT: AN 'EARLY' IOCG EXAMPLE IN THE GREAT BEAR MAGMATIC ZONE?

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The Paleoproterozoic Great Bear Magmatic Zone (GBMZ) of the Wopmay orogen, Northwest Territories, hosts polymetallic (two or more of Cu, Ag, Au, Co, Bi, U) iron-oxide-rich deposits and prospects that are now recognized as being part of the iron oxide copper-gold (IOCG) spectrum of mineral deposits. In the GBMZ, the timing of magmatic events has been well-constrained and currently provides relative timing relationships for polymetallic mineralization. Until now, with the exception of U-Pb uraninite, there were no direct dating and no fluid inclusion data available from any of the GBMZ polymetallic mineralization. In this presentation, we provide direct chronology of mineralization and fluid inclusion constraints on multi-element mineralization in the GBMZ.

The Nori/RA Cu-Mo-U (± REE & W) prospect occurs as one of a number of mineral occurrences at DeVries Lake, in the central part of the GBMZ. As part of the South Wopmay bedrock mapping project, we re-investigated the geology and petrography of the prospect. The mineralization occurs as chalcopyrite, molybdenite, and uraninite (± allanite), which precipitated with tourmaline-biotite-quartz-feldspar in hydrothermal veins. The veins were emplaced into previously magnetite-altered metasedimentary rocks of the Treasure Lake Group. Similar veins, albeit non-mineralized, extensively cut the Treasure Lake Group in the northwestern part of DeVries Lake. Molybdenite separates from the veins at the Nori/RA prospect yield a Re-Os weighted average model age of 1873.4 ± 6.1 Ma (n=2; 2σ) and biotite mineral separates yield an 40Ar-39Ar laser step heating age of 1875 ± 8 Ma (2σ). These ages are identical (within uncertainty) to a previously reported 1875 ± 7 Ma U-Pb zircon date from a presumably concomitant, but non-mineralized aplite vein in the DeVries Lake area.

Within the mineralized veins, dravitic tourmaline grains host abundant fluid inclusions. As the tourmaline precipitated concomitantly with the mineralization, the fluids trapped in these inclusions provide direct evidence of the hydrothermal environment of mineralization. The most abundant primary fluid inclusions are a liquid-rich, liquid-vapour-solid type, and contain CO_2. Preliminary results indicate mineralization temperatures of >400°C. Results from ongoing analyses will be reported. Halite is present in inclusions, and preliminary results from Raman spectroscopy of the inclusions indicate that the other solids include calcite and anhydrite, although it remains unclear if these are trapped or daughter phases. Results from secondary inclusions hosted in quartz grains indicate the presence of long-chain hydrocarbons, indicating oil was introduced to the system. We speculate that this oil introduction took place during the Phanerozoic, with basinal fluids circulating through this Proterozoic basement.

The observations and data reported here allow us to suggest that the Nori/RA prospect can be linked with the earliest-recognized stages of plutonism in the GBMZ. When considering the regional metallogenic setting, it is likely that this represents the first phase of the extensive IOCG-type mineralization.

THE GEOMAPPING FOR MINERALS PROGRAM

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The federal government's August 2008 announcement of the 5-year, $100M Geomapping for Energy and Minerals Initiative is intended to improve the geoscience underpinnings for sustainable economic development in Canada's North, through activities of the Geological Survey of Canada and Polar Continental Shelf Project. As part of the government's new northern vision, approximately ¾ of the resources will be dedicated to acquisition and dissemination of geoscience knowledge in the three northern territories, with the remainder cost-shared in the provinces. Consultation and planning with territorial jurisdictions that occurred through the Cooperative Geological Mapping Strategies and Northern Mineral Resource Development Program defined thematic targets within the Minerals portfolio, including mapping in support of diamond, base, precious, and polymetallic mineral exploration, development of predictive mapping and resource assessment methodologies, tri-territorial bedrock/surficial compilations, and data management. Projects are being co-planned and co-delivered with territorial and provincial partners.

Acquisition of geophysical data in advance of groundwork is underway in project areas in Yukon, Nunavut, Manitoba, Quebec and Newfoundland. Framework mapping projects will begin field work in 2009, in accreted terranes of the northwestern Canadian Cordillera and Selwyn Basin (Yukon, B.C.), the Great Bear magmatic zone and Victoria Island (N.W.T.), Melville Peninsula and Cumberland Peninsula (Nunavut), as well as in targeted areas in the provinces.

TYHEE DEVELOPMENT CORP'S YELLOWKNIFE GOLD PROJECT

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Tyhee Development Corp continued the exploration of its wholly-owned Yellowknife Gold Project, 90 km north of Yellowknife in 2008. The company received a favourable economic evaluation of its wholly-owned Yellowknife Gold Project. A combined open pit and underground operation at 3,000 tonnes per day will recover an average of 163,500 troy ounces of gold per annum for the first 7 years (total 1,115,000 ounces) at an average operating cost of $384 per ounce of gold with potential to expand the resource at depth and through further exploration. Initial capital costs are estimated to be $150 million (including 30% contingency) with an additional $26 million required throughout the life of mine as sustaining capital. At a base case of $750 per ounce of gold, and a 5% discount rate the project has a pre-tax IRR of 21.3% and a pre-tax NPV of $145 million. Environmental and engineering studies continued at the Ormsby deposit during 2008. A Project Description Report was filed with the Mackenzie Land and Water Board in August, 2008 and was referred to the Mackenzie Valley Environmental Impact Review Board in September, 2008.

Tyhee Development Corp has purchased a 100% interest in 5 mining leases (Oro Lake Property) covering 338 acres adjacent to its BigSky Property. The Oro Lake Property hosts a gold-bearing shear zone transecting Kam Group volcanic rocks.

During 2008, Tyhee conducted geological mapping, prospecting and diamond drilling on the Clan Lake, Goodwin Lake and Bigsky properties. Positive results encourage Tyhee to plan continued activities on these projects for 2009.

THE NOGHA GAS DISCOVERY – A CAMBRIAN CLASTIC GAS DISCOVERY WITHIN THE SAHTU SETTLEMENT REGION OF THE CENTRAL MACKENZIE VALLEY, NWT

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The Nogha Gas Discovery, located at the Arctic Circle within the K'Asho Got'ine District of the Sahtu Settlement Region in the NWT, is approximately 218 kilometers north-northeast of Norman Wells and 1,850 kilometers (1150 miles) north of Calgary, Alberta. The discovery, operated by MGM Energy Corp., is situated on two exploration licenses (EL 426 and 430) and Sahtu mineral parcel (M-17) and is defined by 4 wells and a grid of proprietary high frequency and high fold vibroseis data together with a network of reprocessed trade data and a regional high resolution aeromagnetic grid. The seismic mapping (both in time and depth) shows a fault-bounded anticlinal structure of significant aerial extent (approximately 12,750 ha) at both the Proterozoic basement and Top of Mt Clark reservoir levels.

The four wells on the structure penetrated a typical Lower Paleozoic sequence and terminated in basalts of Proterozoic age. The oldest well, Nogha O-47, drilled in 1986, found porous gas charged reservoir quality Cambrian-aged marine sands mantling the Proterozoic. The well could not however maintain a sustainable gas flow rate in order to qualify for Significant Discovery status. In 2003, a new well was drilled at Nogha C-49, 2.3 kilometers north of Nogha O-47. The Nogha C-49 well discovered natural gas within the Cambrian Mt Clark Formation and flowed gas to surface at a combined rate of 3.1 MMcf/d with no sign of formation water. The Nogha C-49 well is currently suspended as a potential Mt Clark gas producer. The Nogha C-49 well was followed up by the drilling and testing of the Nogha M-17 well (suspended as a potential Mt Clark gas producer), 4.1 kilometers to the east and down structure and to the south by the Nogha B-23 well (suspended as a potential water disposal well).

Hydrodynamic (Pressure-Elevation) information from the 4 wells suggests a gas-water contact at -1090 mss giving a 165 m gas column for the Nogha Mt Clark gas pool. The net pay in the reservoir ranges from 7 to 12 m with an effective porosity range of 9 to 14% and a water saturation range of 20 to 35 %.

In 2008 MGM, on behalf of itself and its partner Apache Canada Ltd. applied for and was granted by the NEB Significant Discovery Status for the Nogha Discovery on portions of EL 426 and El 430. At the same time, the partners were granted Proven Productive Acreage status on portions of Sahtu Mineral Parcel M-17, under the terms of the concession agreement with the K'asho Got'ine Lands Corporation Ltd. Currently there are no natural gas collection, processing or transmission infrastructure in place in the Nogha area but MGM along with its partner Apache are examining various alternatives to bring this gas to market in a timely manner.

OVERVIEW OF PEEL PETROLEUM PROJECT FINAL DELIVERABLES

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The project "Regional Geoscience Studies and Petroleum Potential, Peel Plateau and Plain" (Peel Petroleum Project) is a four-year (2005-2009), collaborative study among the Northwest Territories Geoscience Office, Yukon Geological Survey, Geological Survey of Canada, universities, and industry. The objective is to advance knowledge of hydrocarbon potential and regional geology in the Peel Plateau and Plain, a prospective area in the northwestern NWT/northeastern Yukon in the vicinity of the proposed Mackenzie Gas Project (MGP) natural gas pipeline route. Although no major discoveries have been reported from the area, some encouraging shows are known from existing wells (74 wells total). Two field seasons on outcrops in the Peel area and proximal mountain ranges (northern Mackenzie Mountains, Richardson Mountains, and Franklin Mountains) were conducted to examine sedimentology, stratigraphic and structural relationships, and improve regional correlation.

A project volume containing several thematic chapters is currently being compiled for release in Spring 2009. It includes a chapter on regional structure and seismic interpretation, followed by a series of chapters that describe Cambrian to Cretaceous stratigraphic assemblages of Peel Plateau and Plain and their respective petroleum plays: Basal Cambrian clastics; Cambro-Ordovician platform; Upper Devonian clastics; Arnica/Landry platform; Kee Scarp; Tuttle Formation; and Cretaceous clastics. These are all conceptual plays (no discoveries or reserves, but that may exist according to geological analyses), with the exception of Kee Scarp which is an established play. A discussion of petroleum systems elements for this exploration area is also included.

This report will be accompanied by a digital geodatabase (or atlas) which contains all of the spatial data associated with the research. The atlas is a demonstrative product complete with GIS-ready files, field and core photographs, seismic profiles, core and measured section descriptions, geochemical analyses, isopach and structural maps, and other pertinent data linked to a spatial database of wells, field-based location data, and seismic tracklines.

The Peel Petroleum Project has resulted in more than 70 publications and products. Visit www.nwtgeoscience.ca/petroleum/PeelPlateau.html for further information on outputs.

EXPLORING FOR METALS AND DIAMONDS AT DARNLEY BAY, NT

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Darnley Bay Resources Limited was founded in 1993 with the express purpose of exploring the source of the Darnley Bay Anomaly centred near Paulatuk NT on the Beaufort Sea coast. The "Anomaly" consists of a 130 mGal gravity anomaly measuring 80 km x 100 km and a coincident 1600 nT magnetic anomaly. The combination of high amplitude and large areal extent of the gravity anomaly makes it a truly unique geophysical feature. The source of the Anomaly is considered by most geoscientists to be a mafic/ultramafic intrusive. Its origin and composition will not be determined until it is intersected by drilling, beneath several sedimentary horizons ranging from Quaternary to Precambrian in age. Nearby outcropping gabbro sills dated to 723 Ma (Franklin event) may be related to the intrusive. The Geological Survey of Canada (GSC Open File 2789) gave the Anomaly a moderate-to-high rating for hosting Sudbury-style Ni-Cu-PGE-Au.

Darnley Bay Resources Limited gained access to the Anomaly for exploration in 1997, after working with the Inuvialuit authorities to establish a framework for mineral exploration and eventual development. Airborne and ground geophysics were undertaken to improve definition of the Anomaly, culminating in a 2001 drillhole that unfortunately was cut short for technical reasons, prior to reaching the intrusive. A by-product of this work led to the discovery of ten kimberlite pipes on the Parry Peninsula, of which six proved diamondiferous. Diamond exploration continues, with new drill targets defined in 2008.

In 2007, the metals exploration program was restarted, with a review of all of the available geophysical and geological data. New 3D modelling of the gravity and magnetic data illuminated the geometry of the Anomaly source, particularly nearer the surface. It showed that the dense and magnetic portions are offset from one another, indicating zonation and/or multiple stages of intrusion. This led to a re-examination of the geological model. Both the source geometry and analysis of the regional geological setting suggest that the environment is conducive to iron oxide-copper-gold (IOCG) deposits. Furthermore, a tectonic reconstruction places the Darnley Bay Anomaly on-strike with Olympic Dam, the world's richest mineral deposit, at the time of emplacement.

The upcoming exploration program of the Anomaly incorporates:

- airborne gravity survey to improve definition of near-surface targets
- airborne electromagnetic survey to detect conductive mineralization
- extensive drilling to intersect the Anomaly source and mineral targets.

In addition, a drilling campaign on the Parry Peninsula will further assess the economic potential of known and new kimberlite pipes. Diamond exploration over and adjacent to the Anomaly will continue.

Exploration in the Paulatuk area is not possible without the continued cooperation of the Inuvialuit residents and authorities. The company has engaged in the processes necessary to conclude a concession agreement, environmental permitting, and a comprehensive cooperation and benefits agreement. An important objective of the ongoing exploration, and eventual development of any mineral deposit, is the participation of the Inuvialuit as a partner.

TRINATIONAL SOIL SURVEY: UPDATE ON PROGRESS

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The North American Soil Geochemical Landscapes Project - a tri-national initiative between United States, Canada, and Mexico – was designed to (1) develop a continental-scale framework for generating soil geochemistry and relevant biological and organic compound data; and (2) provide soil geochemical data that are available and useful for a wide range of applications and disciplines. This project is the first multi-national multi-agency collaboration of its kind starting with common focus and protocols.

The Canadian component of the Project was initiated in 2007 with sampling in the Maritimes and in the Canadian North. Approximately 225 sites were collected. In New Brunswick, at each site, at total of 19 samples were collected for 7 different agencies including Health Canada and Environment Canada. In 2008 a transect along the TransCanada was initiated from Newfoundland to British Columbia. Approximately 250 samples will be collected before the sampling has been completed. Data from the 2007 survey are nearly completed and all results from the survey will be available in spring of 2009. Data from the 2008 survey should be available in late 2008 or early 2009.

Geochemical results from the Maritimes include the total analyses for over 30 elements for four different soil horizons. The data illustrate the spatial variation of the data and the background concentrations. Typically concentrations in the unweathered material are higher in the C horizon than in the overlying soil horizons. However in certain locations such as Belledune the inverse situation is observed, suggesting an anthropogenic source. The spatial patterns in the chemistry strongly reflect the underlying bedrock. Data from the various horizons are compared to a single bulk sample from the 0-30 cm depth level.

Geophysical results from the area include airborne radiometrics as well as ground based spectrometry and soil gas radon. The spatial patterns reflect the underlying geology.

TILL GEOCHEMICAL AND INDICATOR MINERAL RECONNAISSANCE OF SOUTHAMPTON ISLAND, NUNAVUT

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A till geochemical and indicator mineral reconnaissance survey of Southampton Island, in northern Hudson Bay, central Nunavut was completed earlier this year. Samples from the 2008 survey, which included the southeastern part of the island (Bell Peninsula) are currently being processed, whereas results from the 2007 sample grid are now being interpreted.

The 2007 survey focused on the central and more elevated portion of the Island which is underlain by Precambrian rocks. A total of 155 samples (mainly till) were collected for heavy mineral concentrate (HMC) analysis. Another 155 till samples were collected for geochemical analyses (INAA and ICP-MS). Samples were generally collected on a 10 km sample spacing grid (1 sample per 100 km^2). Despite the abundance of carbonate rocks surrounding the upland portion of Southampton Island, the samples from the highlands have a strong "Shield" signature. Chromite grains were picked from 10 different samples, with one till sample yielding >60 grains (approx. 120 grains) and one alluvial sample yielding 40 grains. The grains are dominantly 0.25–0.5 mm in size. The chromite population includes some undifferentiated Cr-hercynite grains. A few grains of Cr-diopside were identified, but most diopside grains have a lighter green color indicating low-Cr. Forsterite grains are abundant (several 1000s). All of these heavy minerals suggest a ultramafic-mafic source region, which may correspond to new exposures of locally layered ultramafic-mafic complexes on the island. In addition, a few gold grains were recovered from the HMCs of various samples, as well as chalcopyrite grains (up to 14 in one sample).

The geochemical data suggest a positive correlation between Ni, Cr and Co. A total of seven samples are considered anomalous with respect to Ni (160 ppm $<$ Ni $\leq$ 1150 ppm) and Cr (290 ppm $<$ Cr $\leq$ 1200 ppm). There is also a relatively good positive correlation between Cu and Zn, and a strong correlation in Th-REE-P. A total of five samples have their $\sum$REE $>$ 700 ppm. Elevated REE is likely derived from monazite-bearing upper amphibolite-facies metasedimentary rocks which are relatively easy to erode but which are rich in metamorphic monazite.

A spatial analysis of the data is currently underway and preliminary results are consistent with our recently developed glacial dynamics model. In summary, transport distances appear to be relatively short over the Precambrian highlands, where radial dispersion from a local ice dome is apparent. Carbonate dispersal trains over Precambrian rocks are restricted to lower areas along the outer fringe of the Precambrian terrain. They provide additional supporting evidence for the presence of topographically-controlled fast ice flow corridors which had been initially inferred from the landform record.

MINERAL ASSAY RESULTS AND GEOLOGY OF THE BOOTHIA MAINLAND AREA, KITIKMEOT REGION, NUNAVUT

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The Boothia mainland area in central Nunavut, located in the poorly known north-central Rae domain of the western Churchill Province, was mapped at a scale of 1:250,000 during 2005 and 2007. The area comprises a amphibolite to granulite facies gneissic terrain with a complex Archean to Paleoproterozoic tectonometamorphic history. Rock types are dominated by Neoarchean metaplutonic rocks, lesser Archean and Paleoproterozoic supracrustal sequences, and migmatitic gneiss. Granitic rocks, and their gneissic equivalents, are dominated by I-type, meta- to peraluminous, polyphase, commonly porphyritic bt-hbl monzogranite to granodiorite of the widespread 2.61-2.59 Ga Rae plutonic event.

We present mineral assay analytical results for 68 widely spaced samples collected from gossanous localities in the area. A large subset of the samples yielded anomalous polymetallic mineral values, which while generally modest, demonstrate that the economic mineral potential for base-metals in the region is significantly greater than previously thought. Despite being dominated by a high-grade metagranitoid terrain, the region includes supracrustal belts of three different ages, all hosting gossans that signal base- and precious metal prospectivity. Bearing in mind that most of these results come from merely grab samples, rather than in-depth prospecting, some of the results are encouraging. Conversely, some very prospective looking outcrops yielded poor mineral assay values.

Lower amphibolite facies Archean rocks of the Barclay belt, which correlates with the regionally prospective Prince Albert Group, outcrop to a limited extent in the southwest part of the region. They yielded notably anomalous values for zinc, coupled with copper and nickel. Gold values are low there despite being subject to only lower amphibolite facies metamorphism. Small inliers of the Paleoproterozoic Chantrey Group in the central part of the region, which we correlate with other Rae Domain sequences of proven prospectivity including the Penrhyn and Piling groups, also exhibit anomalies in gold, copper and zinc. The supracrustal portion of the granulite-grade belt in the northern part of the region has large map extent, and is comprised in part of Barclay belt correlatives at structurally lower levels, and in part of what we informally refer to as the Halkett Inlet belt at structurally higher levels. The Halkett Inlet belt was deposited around ca. 2.5 Ga, and we tentatively correlate it with the Sherman Group, recently defined in the Queen Maud block of the western Churchill Province. The Halkett Inlet belt hosts the most ubiquitous, largest, and most eye-catching polymetallic gossans of the region, and returned some of the best values in copper, zinc and nickel. Based on the better assay results from the granulite-facies belt, and the large number of gossans spotted there from the air during helicopter fly-overs, we consider the granulite-facies belt as being the most prospective ground for base-metal mineralization in the Boothia mainland area. We believe that strong regional deformation under high-grade metamorphic conditions may have enhanced sulphide concentration in structural and/or metamorphic traps, for which identification will require detailed prospecting and structural analysis.

NEW UNDERSTANDING OF THE GEOLOGY AND DIAMOND PROSPECTIVITY OF SOUTHAMPTON ISLAND, CENTRAL NUNAVUT

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The Precambrian rocks of Southampton Island, Nunavut, are situated between the western Churchill Province, and the Baffin-Ungava segment of the Trans-Hudson orogen. They comprise remnants of Archean semi-pelite and psammite with lesser silicate- and oxide-facies ironstone cut by ca. 2.67 Ga peraluminous granite. The metasedimentary sequence is typically associated with gabbroic-dioritic rocks, whose distribution suggest that widespread older (Archean?) mafic plutonism affected much of the basement. A potentially Paleoproterozoic cover sequence along the western margin of the exposed basement is distinguished by calc-silicate – quartzite, with a maximum depositional age of ca. 2.63 Ga. Both the metasedimentary and mafic rocks occur as rafts and inclusions in regionally voluminous orthopyroxene-bearing tonalite-granodiorite (charnockite-mangerite), which at one locality is dated at ca. 1.93 Ga with inheritance of 3.6-3.7 Ga (predominant) and 2.6 Ga (minor). Voluminous, variably foliated, biotite-bearing granodiorite-monzogranite±monzonite cut these high-grade gneissic units. Minor massive to very weakly foliated monzogranite, dated at ca. 1.82 Ga, provides a minimum age on deformation.

Important new insight into the antiquity of exposed basement across Southampton Island comes from 14 Nd isotopic analyses of variable-aged plutonic rocks. Ca. 3.15 – 2.95 Ga Nd model ages are widespread and representative of much of the exposed basement, with the exception of its western margin which is characterized by Paleoarchean model ages (3.5-3.6 Ga). This new evidence for ancient lithospheric crust beneath Southampton Island is an important consideration for evaluation of diamond potential, especially given that ca. 3.6 Ga model ages appear to define a north-striking crustal domain that extrapolates to the diamond-bearing (Qilalugaq) field near Repulse Bay.

The penetrative nature of Paleoproterozoic tectonometamorphism across much of Southampton Island is highlighted by fabrics and structures in Paleoproterozoic rocks (known and inferred), as well as by direct U-Pb monazite dating. D_1 involves development at ca. 1.88 Ga of a penetrative, moderately to steeply inclined, north-trending planar fabric (S_1). During D_2, dated at ca. 1.86-1.84 Ga, S_1 was strongly reworked into tight, recumbent, west-trending, south-vergent F_2 folds and/or relatively straight panels of gently inclined west-striking S_1+S_2 transposition foliation. Broad, open, northeast-trending upright folds (F_3) of the transposition foliation highlight a non-penetrative, component of shortening (D_3).

The D_1 event is interpreted to reflect a collisional event that juxtaposed lithospheric blocks that may have quite different diamond prospectivity. Support for this interpretation comes from magnetotelluric data that image distinct domains in both the crust and mantle. We speculate that D_1 could be a consequence of ca. 1.9 Ga collision between the Rae domain exposed west of, and possibly underlying the western part of the island, and a composite crustal block in the east that may represent "Meta-Incognita-like" crust. D_2 structures extend a belt of south-vergent ca. 1.85 Ga structures from Baffin Island and may reflect convergence during 1.865-1.85 Ga Cumberland Batholith generation, or a separate collisional event. Upper amphibolite facies metamorphism at ca. 1.82 Ga with attendant monzogranite emplacement may have been synchronous with subhorizontal, orogen-normal shortening (D_3).

DEVELOPING THE WORLD-CLASS PINE POINT PROPERTY

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Mineralization at Pine Point is typical of Mississippi Valley Type (MVT) deposits. It is primarily hosted within the middle Devonian Pine Point Formation, an east-west striking barrier reef complex. Structurally, the reef complex lies on or is in close proximity to the McDonald fault, a continental scale dextral strike-slip fault which separates the Slave and Churchill Provinces.

Paleo-karst features, such as caverns, collapse structures and underground channels, formed during sub-aerial exposure, acted as channel ways and traps for mineralizing fluids. Three NE-SW trending zones of mineralization, North, Main and South, have been identified. Alteration consists of pre-mineral stage coarse grained dolomitization, locally called Presquilization. Genetically, Pb-Zn mineralization is thought to have formed by the mixing of metal rich brines derived from dewatering of shales along the north flank of the reef complex and sulfur rich waters derived from evaporites along the south flank of the reef.

Tamerlane recently completed an NI 43-101 technical report and feasibility study on six underground deposits defining proven reserves of 7.8 million tonnes grading 9.26% Zn+Pb located on the western, down plunge extent of the main trend. Additionally, these six deposits contain measured and indicated resources of +8 million tonnes grading 3.4% Zn+Pb and inferred resources of 4.1 million tonnes grading 3.2% Zn+Pb. Combined with known historical resources, the Pine Point camp is host to over 70 million tonnes of commercial zinc and lead ore.

The Pine Point region also has vast exploration potential along the North, Main and South trends. New discoveries during Pine Point's operating and exploration year's (1964-1987) averaged one deposit every 1.5 kilometres. At this rate, Tamerlane could expect 9 additional deposits along a 14 kilometre unexplored section of the main trend. Tamerlane plans to continue its exploration activities during operations.

The Company received its Type A land use permit at the end of May, 2008, and expects to receive its water license by year's end. Project construction and development will commence upon completion of financing. Full production is anticipated by early 2010.

Mining of the Pine Point Project will utilize current and proven technologies that will propel future mining both underground and on the surface. These technologies include underground long-hole stope mining utilizing a 6.7 meter diameter shaft that will encompass a men and materials cage and a vertical conveyor for hoisting ore. Tamerlane will also use proven freezing techniques to form an impervious frozen wall of ice around the entire perimeter of the ore body including all underground infrastructure that will prevent the influx of water. Dense media separation and conventional flotation without the use of cyanide will be used to up-grade the ore to a direct shippable concentrate grading 62% zinc and 72% lead. All tailings generated will be used for cement paste backfill and most of the coarse aggregate will be used for shotcreting and construction.

KIMBERLITES: DESCRIPTIVE GEOLOGICAL NOMENCLATURE AND CLASSIFICATION

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We present a new approach to the nomenclature, classification and interpretation of kimberlites and other complex and unusual rocks encountered during diamond exploration. As far as possible, we align kimberlite terminology with that of mainstream volcanology to present a scheme that is practical, applicable by geologists of varying experience levels, and relevant to the economics of diamond deposits. Reliable evaluation and mining of primary diamond deposits is founded on a good understanding of the geology of kimberlites and related rocks. Description, classification, and interpretation of these rocks underpin the development of three-dimensional geological models which are essential for understanding diamond distribution and generating reliable resource estimates.

The five-stage scheme is subdivided into two broad parts: observations (Stages 1 and 2) and progressive interpretation (Stages 3 to 5). Stage 1, background information (including setting and contacts), and Stage 2, rock description (alteration, structure, components, texture), involve only limited genetic interpretation. The components of samples are ascribed to three classes or groups: crystals, in particular olivine (phenocryst and xenocryst); compound clasts which are magmaclasts, accretionary clasts (pyroclastic and sedimentary) and lithic clasts (xenolith, autolith); and interstitial matrix (groundmass and mesostasis, interclast cement or clastic matrix). Magmaclasts include melt-bearing pyroclasts and melt segregations. Two new terms are proposed for the common components of most pyroclastic kimberlites, i.e. pyromagmaclast and pyrocryst, to describe melt-bearing pyroclasts and melt-free crystals liberated during pyroclastic eruptions. Where possible, further classification of a rock is based on increasing degrees of genetic inference. Stage 3, petrogenetic classification, includes the parental magma type and mineralogical classification. Stage 4 is the broad textural-genetic classification into coherent or volcaniclastic, with further subdivision of coherent into intrusive or extrusive and volcaniclastic into pyroclastic, resedimented volcaniclastic or epiclastic. Stage 5 involves the more detailed genetic/process interpretation. The level to which the scheme can be applied, and thus the degree of confidence in the outcome, depends not only on the nature of the rocks, but also the experience of the user with these rock types. Understanding the different and varying degrees of confidence in the conclusions is important, particularly in the economic application of the results.

HEAT TRANSFER IN WASTE ROCK PILES AT DIAVIK DIAMOND MINE

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Northern mining and disposal of the vast quantities of waste rock generated during open pit mining have unique environmental concerns. Reaching and maintaining sub-freezing temperatures within these waste rock piles is of significant interest as an approach to limiting or eliminating acid rock drainage (ARD). Some of the rock mined to gain access to the valuable ore contains sulfides, which have the potential to generate ARD when exposed to the atmosphere. Temperature data from large scale test waste rock piles constructed at the Diavik Diamond Mine site will be presented. Thermal modeling using measured air temperature data and using parameters (thermal conductivity and air permeability) measured within the pile was used to predict the changes to the internal pile temperatures. The heterogeneous nature of the waste rock piles resulting from the construction method makes selection of the appropriate air permeability challenging and thus the modeling results and measured temperatures disagree. Thus temperatures at select locations within the waste rock pile will be analyzed in detail and compared to modeling results. Two years after construction the temperature at the base of the waste rock is below 0^{o}C and material above follows a damped version of the outside temperature fluctuations with a time lag that depends on the location within the pile.

DEVELOPING A REMEDIATION PLAN FOR THE NORTH INCA ADVANCED EXPLORATION SITE, NWT

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The North Inca Site is located within the Tlicho Territory on the Inca Peninsula, adjacent to the Leta Arm of Indin Lake, approximately 210 km NNW of Yellowknife in the Northwest Territories. It is located approximately 14 km south of the Colomac Mine and approximately 54 km east of the community of Wekweèti. The North Inca Advanced Exploration Site was developed primarily during the period of 1947 to 1949 and is one of many small sites (it is less than 5ha) in the NWT that requires attention.

After a Phase III Site Assessment and a Preliminary Quantitative Risk Assessment was completed in 2007, the project moved into the phase of developing a remediation plan for the site. A site visit with members of the Tlicho communities occurred in 2007 in order to let them gain some familiarity with the area and any potential concerns associated with it. The local communities show an interest in even the small sites with respect to historical and future potential impacts on the local environment. Consultants were then contracted to develop remedial options for the site to be used for consultations with elders from the local Tlicho communities.

While looking at remediation options for sites in the NWT, consideration must be given to the fact that the local communities use the area for recreation and hunting activities. A unique opportunity also exists on the site to use the disposal facilities at the nearby Colomac Mine Site in order to lessen the impact on the North Inca Site and move towards bringing it back as close as possible to the original condition. Aspects of the site that are considered in the remediation plan include physical hazards such as buildings, storage tanks and mine openings, hydrocarbon impacted soils, designated substances, waste rock, and general debris.

THE ORIGIN OF DIAMOND-RICH, HIGH MGO ECLOGITE XENOLITHS FROM THE JERICHO KIMBERLITE, NUNAVUT

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A unique suite of diamond-rich eclogites from the Jericho kimberlite, Nunavut, has an unusual but uniform geochemical and isotopic composition that is unlike any other eclogite suite worldwide. Compared to other eclogite suites, garnets from Jericho diamond-bearing eclogites have high MgO (19.6-21.2 wt.%), Cr_2O_3 (0.28-0.60 wt.%), Sc (88-113 ppm) and Zr (32-36 ppm) contents and are characterized by highly fractionated HREE patterns ($[Lu/Gd]_N$=5.1-6.6) and low Th contents (<1 ppm). Na-poor clinopyroxene has a uniform LREE-enriched pattern (La_N 79-104; Ce_N 90.8-103; Nd_N 77.1-90.4) and radiogenic $^{87}Sr/^{86}Sr$ isotopic composition between 0.7057 and 0.7061, higher than other eclogite groups at Jericho and the Jericho kimberlite itself. Diamonds in these eclogites occur in two modes, as inclusions in garnet and as discrete, larger crystals that occur at grain boundaries.

In contrast, the remaining diamond-barren eclogite suites at Jericho have compositions more typical of "basaltic" eclogites reported worldwide. These eclogite suites have garnets with low MgO (4.97-13.0 wt.%), high FeO (up to 26.5 wt % FeO) and high CaO (up to 17.5 wt.% CaO). Eu anomalies ([Eu/Eu*] =1.12-2.12) and flat or slightly depleted HREE ($[Lu/Gd]_N$~0.5-1.6) are common in the Fe- and Ca-rich eclogites. Interestingly, a Fe-rich garnet was discovered as an inclusion within diamond in one of the high-MgO diamondiferous eclogites described above. Clinopyroxene from the Fe- and Ca-rich eclogite suites are Na_2O rich (up to 8 wt.%), and also have variable (0.7036-0.7044) but less radiogenic $^{87}Sr/^{86}Sr$ than clinopyroxene from the diamondiferous eclogites. The LREE enrichments observed in the diamondiferous clinopyroxene are not evident in the Ca- and Fe-rich eclogites as La, Ce and Nd are markedly lower (La_N 0.2-6.7; Ce_N 0.2-10.2; Nd_N 0.7-20.2). The chemical and isotopic characteristics of the Fe- and Ca-rich eclogites have the hallmarks of a low-pressure, oceanic crust-related origin. Therefore, a plagioclase-bearing protolith such as oceanic basalts or gabbros is probable for these Jericho eclogites suites.

The extreme geochemical and isotopic compositions of the diamond eclogites are not compatible with the two dominant origins proposed for mantle eclogite xenoliths, such that mantle eclogites are either remnants of oceanic crust or high-pressure cumulates. What is striking about the Jericho diamondiferous eclogites are their compositional similarities with mantle peridotites. We propose a multi-stage origin that involves multiple metasomatic events, coupled with hybridization between basaltic eclogite and mantle peridotite. Emplacement of basaltic eclogites in the diamond stability field is followed by an initial carbon-bearing, LREE-enriched metasomatic event recorded by clinopyroxene and diamond inclusions in garnet. Subsequent partial melting of eclogite produces melts that enable diffusional elemental exchange between residual eclogite and local peridotite. Through this stage the eclogites attain their distinct high-Mg and Cr composition. Finally, carbonatite-like modal metasomatism causes the growth of phlogopite, carbonate and apatite and facilitates new growth of diamond, producing the extreme diamond enrichments found in these eclogites.

SHOTHOLE DRILLERS' LOGS AS A REGIONAL GEOSCIENCE RESOURCE: PROJECT UPDATE, APPLICATIONS, AND FUTURE DIRECTIONS

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The relative paucity of near-surface, baseline geoscience information is considered a practical limitation to petroleum and mineral exploration, infrastructure development, and the drafting and evaluation of Environmental Assessments in the Northwest Territories. The Seismic Shothole Drillers' Log Database and GIS project seeks to address aspects of this knowledge gap through the collection and digital enabling of seismic shothole drillers' logs; a formerly unrecognized source of useful geoscience information. An initial version of the shothole database and GIS (transcribed from an old file card archive) was published as GSC Open File 5465 in 2007, and contained 76,000 records. Concurrent, and subsequent to this original project, work was undertaken to secure participation by Industry and the retrieval of as much of the recent and archival drillers log records as existed. Nearing completion, this Version 2 database contains ~300,000 records distributed throughout the NWT and northern Yukon, representing contributions of data from 14 different companies, along with approval for release of data from >70 joint venture partners and/or their present-day derivative companies.

Drillers' logs contain often rudimentary information on sediment types and thicknesses, underlying bedrock, and an array of different descriptors and adjectives that permit greater inferences to be drawn. The logs can also contain information on permafrost conditions, the presence of ice, and such oddities as gas pockets and seeps. While regarded as having questionable merit on their own, the integration of the shothole data into a GIS, along with other regional datasets, has permitted several key stratigraphic and thematic layers to be interpreted, including: drift isopach, potential granular aggregate, geohazards, permafrost and ground ice occurrences, and muskeg thickness. Included as part of the original OF 5465 GIS, these layers are being recompiled as part of the planned Version 2 database release. Additional GIS layers that depict the extent and distribution of massive ground ice layers, estimates of permafrost thicknesses, the nature and distribution of different till facies, subcrop bedrock types, surficial geology characterizations, and an integrated assessment of litholog-based potential granular aggregate deposits and commonly associated morpho-stratigraphic surficial geology map units (i.e., glaciofluvial deposits), highlight the relevance and application of this data to exploration and development activities, remote predictive mapping, and scientific inquiry.

Having established a functional database and GIS structure, plans are currently underway to evolve the database into an online format, whereby it can serve as a depository for all future seismic activity in the territories. Work is also now being expanded to integrate drillers log records with shallow geophysics techniques (GPR and resistivity logging) as a means of evaluating the litholog records themselves, and permitting a broader regional assessment of near-surface geology in areas of active seismic exploration.

DIAVIK TEST PILES PROJECT: DESIGN AND CONSTRUCTION OF LARGE-SCALE RESEARCH WASTE ROCK PILES IN THE CANADIAN ARCTIC

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Sulfide minerals exposed to the atmosphere oxidize and release acidity, sulfate and dissolved metals to infiltrating water. These processes can result in acid rock drainage. However, little is known about the acid rock drainage potential and the associated environmental implications of stockpiling low sulfide mining waste in areas of continuous permafrost. Up to 400 Mt of low sulfide mining waste will be stockpiled at the Diavik diamond mine in the Northwest Territories, Canada.

Three well-instrumented waste rock piles ("test piles") were constructed at the Diavik site and are being monitored as part of a complementary laboratory and field research program. The objectives of the research are to characterize the physicochemical processes occurring in the low sulfide waste rock piles in a permafrost environment, and to quantitatively assess the prediction of drainage quality from laboratory experiments. The test piles were constructed from waste rock excavated from Diavik's open pit mining operations. Diavik waste rock is comprised predominantly of granitic rock with lesser amounts of sulfide-bearing metasediments. One test pile consists of waste rock that contains less than 0.04 wt%S, a second pile consists of waste rock that contains more than 0.05 wt%S, and a third pile consists of the higher sulfide waste rock re-sloped and capped with low permeability till and clean waste rock, as per the current Diavik reclamation plan for the higher sulfide pile. Each pile is about 15 m high and the bases of the first two piles are 50 m by 60 m; the base of the re-sloped pile is 80 m by 120 m. Instruments to characterize flow and geochemistry at various scales, internal gas composition, microbiological populations, and physical properties of the waste rock were installed within the piles and are currently being monitored. The design and construction sequence of the research piles will be presented, and the distribution and description of the instrumentation will be provided.

MANTLE STRUCTURES IN THE SLAVE AND RAE CRATONS INFERRED FROM SEISMIC DISCONTINUITIES

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Long-term teleseismic surveys have now been underway for ten years within the Slave craton and five years within the Rae craton. These studies further establish the existence of several seismic mantle discontinuities at 40-230 km depths that were first observed beneath Yellowknife and now permit lateral, albeit discontinuous, mapping of these discontinuities across many parts of the Slave craton. Interpretation of these discontinuities as boundaries between major mantle layers is possible through joint interpretation of seismic, magnetotelluric, xenolith and xenocryst geochemical observation with known surface geology. The Slave craton is thus interpreted to have been constructed by the underthrusting and stacking of a series of mantle layers and provides a ready mechanism to enrich carbon content at depths relevant to diamond formation. Although surveying is incomplete, inferences on where carbon enrichment might occur can explain known patterns of peridotitic and eclogitic diamond petrogenesis and thus help to guide regional exploration. Stations located across the western, Wopmay margin of the Slave craton suggest that Slave mantle exists well west of the surface contact near the Wopmay fault. A planned array north of Great Bear Lake will trace this margin further northward.

Similar mantle discontinuities are observed beneath most teleseismic stations located in the Churchill area northwest of Hudson Bay, but these observations are generally too widely spaced to permit correlations across the entire survey area with data acquired to date. The similarity of seismic discontinuity signatures observed beneath the Rae craton suggests that underthrust layers similar to those inferred beneath the Slave craton can also be mapped and interpreted beneath the Rae craton. With current observations, most mantle discontinuities are interpreted to dip gently westward, away from Hudson Bay. The recording of more earthquakes at the existing 15 stations will make interpretations of discontinuities more confident. Planned, denser arrays of stations will provide more detailed maps of mantle layer "topography". Deployment of stations in other parts of the Rae craton has also begun.

A NEW GEOLOGICAL MAP OF THE ARCTIC – PRELUDE TO A GEO-MAPPING FOR ENERGY & MINERALS (GEM) TRI-TERRITORIAL COMPILATION PROJECT

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As part of International Polar Year (IPY) 2007-8 activities and related objectives of the Commission for the Geological Map of the World (CGMW), nations of the circumpolar Arctic cooperated to produce a new bedrock geology map at 1:5M scale (published as GSC Open File 5816). The map, in North Polar stereographic projection using the WGS 84 datum, includes complete geological coverage of all onshore and bedrock offshore areas down to 60 degrees North. A print version is 1.3 m in diameter. The legend and correlation charts are given on four separate sheets.

Data sources contributing to the map include new regional and national compilations simplified from original spatial data at scales ranging from 1:50K to 1:5M. New compilation work includes Sweden, onshore and offshore Russia, the United States in Alaska, and two of the northern territories of Canada (Nunavut and Northwest Territories). Existing published material derives from digital maps of northern Europe (1:4M), the Fennoscandian shield (1:2M), Greenland (1:2,5M), Yukon (1:1M), and other selected parts of Arctic Canada (1:5M). Captured analog sources cover the northwest Atlantic and Arctic offshore of North America (1:5M).

Standardization of map unit attributes was facilitated by the ICS time scale, drawing on the absolute scale for the Precambrian and the relative timescale for Ediacaran and younger rocks. The map and map database feature approximately 137 divisions of geologic time based on maximum and minimum age ranges of compilation map units; 107 divisions in the Phanerozoic and 30 in the Precambrian. Lithologic range is expressed by 28 compositional assemblages, including six extrusive, nine intrusive, and ten sedimentary (based on depositional setting). Data on grade of metamorphism have also been assembled.

Map units in the Precambrian are grouped and coded by "tectonic domain". These include Archean cratons (11), microcontinents and ophiolitic belts (6), magmatic arcs (8), orogens (15) and post-orogenic basins (8). These divisions facilitate and highlight the correlation of diverse but once contiguous terrains located within widely separated continental nuclei. In the Phanerozoic geographic/geological domains are identified informally using the compositional and age range characteristics of spatially-associated map units.

Geological vector data portrayed on the map include spreading ridges, geological contacts, and a range of fault types. Point features include impact structures, active volcanoes, diapirs, and kimberlite diatremes.

While a short term objective has been the production of a new hardcopy geology map of the circumpolar Arctic, the true value of this major synthesis effort is the new underlying database. This archive of digital spatial data for the circum-Arctic represents a treasury for the production of formal digital products and also informal user-defined map products accessed via the worldwide web.

Collectively, these data serve as a model and best-practice framework for an expanded, integrated, digital map coverage of the three territories in Canada, as proposed within the federal government's Geo-Mapping for Energy & Minerals (GEM) Program; the Tri-Territorial Geological Map Compilation Project has a 1:500K target-scale and is to be completed in partnership with the Canada-Nunavut Geoscience Office (CNGO), the Northwest Territories Geoscience Office (NTGO), and the Yukon Geological Survey (YGS).

PRAIRIE CREEK MINE: APPLICATION FOR OPERATIONS

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The Prairie Creek Mine, located in the Mackenzie Mountains 200 kilometres west of Fort Simpson in the Northwest Territories, is 100% owned by Canadian Zinc Corporation. A 43-101 compliant mineral resource calculation was completed in October 2007 which defines an overall Measured and Indicated mineral resource within the Vein and Stratabound totalling 5.2 million tonnes grading 10.8% Pb, 11.3% Zn, 175 g/t Ag and 0.4% Cu. In addition to this well defined resource there is an open-ended inferred resource of 5.5 million tonnes grading 11.4% Pb, 13.5% Zn, 215 g/t Ag and 0.5% Cu.

Based on a positive 1980 Feasibility Study new mine infrastructure, which included a 1,000 tpd mill, workshops, accommodations and facilities, was set up by Cadillac Exploration financially backed by the Hunt Brothers of Texas. The mine never achieved production but at the time of closure in 1982 had received all the required operating permits for production and the site infrastructure was 90% complete.

At the Prairie Creek Mine high grade base metal mineralization occurs in two types of geological settings, Vein and Stratabound type. The high grade Vein is located within a steeply dipping fault zone cross-cutting Ordovician to Silurian age sedimentary sequences, which includes the Whittaker and Road River Formations, along the axial plane of a doubly plunging regional antiform. Stratabound base metal mineralization has also been drill located adjacent to the vein within the same stratigraphy.

Based on the successful 2005-7 underground program, which proved up adequate resources on which to base future economics and operations on, Canadian Zinc has recently entered into a Pre-feasibility study with SNC–Lavalin in tandem with submission of applications for operations to the Mackenzie Valley Land and Water Board ("MVLWB") to support a producing mine at Prairie Creek.

Recognizing the eco-sensitive location of the site creative innovative approaches to operations needed to be incorporated in order to mitigate both long and short term impacts to the environment. Canadian Zinc is proposing to paste backfill the entire mill flotation tailings waste product back underground into the voids that have been created from mining. This effectively reduces any long term waste issues along the Prairie Creek floodplain after eventual mine closure. This, along with further water management and upgrade of some facilities will provide a further reduction of environmental impact than the original operation.

The application for operations was submitted to the MVLWB in June 2008 and has now been referred to the Mackenzie Valley Environmental Review Board who are, at this stage, determining the scope of the Terms of Reference for the EA Review.

FORAMINIFERAL BIOSTRATIGRAPHIC FRAMEWORK FOR THE CRETACEOUS OF THE PEEL PLATEAU REGION

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Cretaceous strata in the Peel Plateau have previously had poorly constrained ages. This study samples an extensive Cretaceous section along the Hume River for foraminiferal biostratigraphic analysis. Foraminiferal zonations for the Cretaceous in the Western Interior show different zonal markers for northern and southern regions. Our correlations show greater affinity with zonations proposed for the Arctic Slope of Alaska and the Beaufort-Mackenzie Basin than those of the south. Where possible, existing zonal markers were utilized for a new foraminiferal stratigraphic framework for the region. A total of six zonal markers were identified spanning Middle Albian to Turonian time. Preference was given to species with reported relatively short biostratigraphic ranges. Each zonal marker is associated with an assemblage zone of partly longer ranging species that show increased abundances most likely as a response to favourable paleoenvironments.

Cretaceous outcrops along the Hume River and its tributaries represent a previously proposed formal reference section for the Arctic Red and Trevor formations, which overlie the Martin House Formation. The Martin House Formation produced productive samples along the Imperial River assigning a Middle Albian age. Within the Arctic Red Formation a sequence boundary has been newly recognized lithologically, seismically, and biostratigraphically separating the Albian from the Cenomanian. We propose to make this sequence boundary the new top of the Arctic Red Formation of Middle to Late Albian age. In the Peel and Mackenzie plains region, Cenomanian strata overlying this boundary are recognized as Slater River Formation. For the Peel Plateau region, we tentatively adopt this lithostratigraphic nomenclature for the Cenomanian age shale package that is bounded by this unconformity and the overlying prograding sandstones of the Turonian Trevor Formation. Final stratigraphic assignment of the Slater River Formation in the Peel Plateau region should be reserved until biostratigraphic confirmation is attained.

Over one hundred microfossil samples yielded approximately 65 benthic species, including 57 agglutinated and eight calcareous taxa. No planktonic species were recovered. Previously described agglutinated assemblages of the type section for Martin House, Arctic Red, and Trevor formations in the Snake and Peel river area differ greatly from assemblages described here resulting in contrasting biostratigraphic and lithostratigraphic correlations.

EVIDENCE OF EARLY NEOPROTEROZOIC METAZOANS (ANIMALS), LITTLE DAL GROUP, NWT

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The earliest undisputed evidence of metazoans (multicellular animals) is from Ediacaran rocks (635–543 Ma). This assemblage records a diverse and well-developed fauna that lacks any recognised precursor in the rock record, and provides only a minimum age for the existence of metazoans. An interval of 'hidden' evolution must have preceded the advent of the Ediacaran biota, but nothing is known of such an interval or of its duration.

Early Neoproterozoic reefs from the Little Dal Group, NWT (<1083, >779 Ma) consist of unusual stromatolites that constructed a complex reef framework, but a subtle, less abundant component is complex areas of lime mudstone with variable microscopic texture ("polymuds"). These are associated with early voids that are not the result of stromatolitic frame-building. Both of these microstructures are already familiar from Phanerozoic sponge-rich mud-mounds.

The term 'polymud' refers to a subtle but distinctive petrographic fabric consisting of millimetric to centimetric patches of lithified lime mud. In Recent sediment, this microstructure develops in decaying sponges by patchy calcification of the collagenous matrix that gives sponges rigidity; in older Phanerozoic rocks, this microstructure is commonly associated with undeniable evidence of the former presence of sponges. The Paleozoic cavity-like structure known as stromatactis represents irregular, secondary collapse voids with internal sediment, which formed within mud-grade sediment during the decay of sponge bodies. To form polymuds and stromatactis together, patchy calcification and stromatactis-like void formation proceed in concert in a sort of race between tissue calcification and tissue decay.

Collagenous connective tissue is a fundamental character of the metazoan phylum, and so the understanding that collagen-mediated sediment diagenesis is responsible for the development of polymuds extends the geologic record of metazoans by approximately 200 m.y. The age of the potential metazoan evidence from the Little Dal Group concurs with results of an integrated phylochronology of early metazoans, and supports the idea of a biosphere that persisted through the 'snowball Earth' interval. This way of thinking about carbonate microfabrics in the context of early evolution should also stimulate petrographic and geochemical research focussed on the interval of 'hidden' evolution.

BAKER CREEK: RESULTS OF ARCTIC GRAYLING MONITORING IN 2008

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In the summer of 2006, a 600 m portion of Baker Creek known as 'Reach 4', was realigned to the west side of Ingraham Trail. The primary objectives of the Reach 4 realignment were to isolate the contaminated Mill Pond from Baker Creek to eliminate a source of ongoing arsenic contamination and prevent seepage loss from Baker Creek into areas of the mine itself (the C1 Pit). Secondary objectives of the realignment were to provide a stable flood conveyance channel, maintain or improve fish passage, and provide spawning and rearing habitat for native fish species.

The realignment of Baker Creek was determined to provide suitable habitat for numerous fish species, including Arctic Grayling. The Baker Creek Arctic grayling stock is adfluvial and migrates from Great Slave Lake to Reach 4 for spawning. Adult grayling typically outmigrate shortly after spawning while young-of-year remain in Baker Creek for approximately 1 month, using Reach 4 as nursery habitat. A 2007 survey demonstrated the use of all habitat types throughout Reach 4 during various life history stages of grayling. The study continued in the summer of 2008 because it was thought that increased siltation from the contaminated Baker Pond may adversely affect egg development and food availability. In 2008, further monitoring was done to determine consistency or fluctuations of this habitat and water parameters and how they may affect future recruitment for this remnant stock. Results showed widespread use of spawning habitat by adults and successful hatching and rearing of young-of-year for both grayling and longnose suckers.

MW-93 DIAMOND DISCOVERY, COURAGEOUS LAKE, NWT

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A diamondiferous kimberlitic volcanic eruptive has been discovered by Consolidated Global Diamonds Corp. at the southeast end of Courageous Lake. The relatively large diamondiferous occurrence is located between the Diavik and Ekati diamond mines to the north and the Snap Lake and Gaucho Kue developing diamond mines to the south. Owing to the apparent absence of a geophysical signature, stratigraphic analysis and interpretation has been utilized effectively to determine the characteristics of the crater facies and target the possible location of the diatreme facies and primary diamondiferous rock types. The crater is estimated to be more than 1,100 meters in diameter and more than 500 meters deep. Initial interpretation of the drill core acquired to-date suggests that the kimberlitic magma erupted into a subaqueous semi-consolidated to consolidated quartz-rich sandstone and mudstone (likely Paleozoic age) overlying Archean intermediate metavolcanic and granitic rocks. Microdiamonds have been recovered from volcaniclastic and tuffaceous units that include altered phenocrysts and macrocrysts of olivine.

The crater facies has been generally divided into an upper, lower and basal sequence. The upper sequence is characterized as having variably textured and mixed quartz sandstone and mudstone debris flows overlying a relatively thick sequence of volcanogenic quartz sandstone with intercalated volcaniclastic rocks. The lower sequence is diamond-bearing and characterized by quartz-rich sandy lapilli tuff breccia and pyroclastic volcaniclastics overlying a succession of olivine and ash tuffs that include minor to significant intermediate metavolcanic fragments up to 0.5 meters in size. The basal contact sequence consists primarily of variably sized and brecciated intermediate metavolcanic rocks that are commonly several meters in size that are typically intercalated with olivine and ash tuffs. The characteristics of these units and stratigraphic relationships will be presented and discussed with respect to its potential as a possible resource for diamonds.

AN UPDATE ON LANDSLIDE RETROGRESSION RATE AND ITS IMPLICATION TO DESIGN OF CUT SLOPES IN ICE-RICH PERMAFROST

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A total of 17 landslide sites in ice-rich permafrost in the Mackenzie valley, Northwest Territories have been monitored since 2007 to study their retrogression behaviour. This presentation provides an update of the latest results of the retrogression rate of those slides measured in the summer of 2008. The data indicate that the retrogression rate of those slides increases with increase in height of the head scarp wall. An updated correlation between retrogression rate and headwall height is presented. The effect of slope orientation on slide retrogression rate is also discussed. The results not only improve our understanding of the landslide movement behaviour, but also provide a reference for design of cut slopes in ice-rich permafrost.

COASTAL AND NEARSHORE GEOHAZARDS IN THE SOUTHERN BEAUFORT SEA

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Ongoing oil and gas exploration and development in the Mackenzie-Beaufort region continue to raise questions about geological conditions and potential hazards. Issues of concern include sediment mobility and seabed scour, coastal flooding and land subsidence in the area. The delta-front and nearshore region of the Mackenzie Delta is exposed to storm action during the open water season. Investigations during spring break-up reveal significant changes in seabed morphology during this transition from ice cover to open water.

Synthetic aperture radar (SAR) continues to be an invaluable tool for delineation of bottomfast ice. In addition to its role in maintaining and aggrading nearshore permafrost, we have confirmed that the distribution of bottomfast ice plays a critical role in the distribution of water overflow onto ice during spring breakup. Increasing discharge in the ice-choked channel mouths forces water over the ice surface and back onto the delta. The extent of overflow has been documented over the last three field seasons using satellite imagery, helicopter surveys and in-situ measurements from time-lapse cameras and pressure sensors. Overflow levels rise very rapidly and can exceed 1 m. Evidence of through-ice drainage was observed in 2006 and an active 'strudel' drainage field was documented in 2007 and 2008. Strudel scour depressions as deep as 1.5 m have been mapped through small-boat sonar surveys. In 2007, the scours persisted at least until August when the surveys were undertaken, whereas scours mapped in June 2008 had disappeared by August. The infill can be attributed to a moderate storm in late July. The observation that a storm of this magnitude can re-work sediments in the nearshore environment will lead to a better understanding of the potential for seabed morphological change in this area. Direct measurements of waves, currents, turbidity, temperature and salinity made during the open water seasons in 2007 and 2008 provide additional information about the role of storms in controlling sediment movement in shallow delta front environment.

Flooding in the delta results from local snowmelt, high discharge, ice-induced backwater, and storm surges. The hazard is increased by sea-level rise and land subsidence. Little is known about compaction in ice-bonded sediments. Ice-bonding in the delta extends to depths of tens to hundreds of metres, punctuated by unfrozen taliks beneath lakes and channels, where compaction is unimpeded by ice. Other sources of subsidence include postglacial isostatic adjustment, delta loading, tectonics, and deepening of the surface active layer. Rates of subsidence in the Mackenzie Delta are being determined using a range of techniques (geophysical models, water-level records, continuous and eposidic GPS, InSAR). Preliminary results indicate variable rates of subsidence as high as 10 mm/yr, which seems high for an ice-bonded delta, perhaps pointing to a tectonic component. New epoch GPS monuments on deep industry well-heads will enable measurement of crustal motion independent of compaction. Other factors contributing to increased flooding risk in the outer delta include relative sea level rise (3.5±1.2 mm/yr at Tuktoyaktuk), changes in the spring freshet affecting breakup flooding, or other climate factors in the Mackenzie drainage basin.

AREVA'S KIGGAVIK-SISSONS PROJECT, AN EXPLORATION UPDATE

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The Thelon Basin in Nunavut is one of the most significant targets for uranium exploration in the world. The search for uranium commenced in the Thelon Basin in the late 1960's. To date the most important discoveries are the uranium deposits at Kiggavik (formerly known as Lone Gull), Andrew Lake and End Grid (Sissons area). These are owned by a Joint Venture between AREVA Resources Canada Inc., JCU and Daewoo.

The area of interest is located some 100km NW of Baker Lake in the Kivalliq region of Nunavut. Geologically it is part of the Churchill structural province. The oldest basement rocks are granitic gneiss Archean in age overlain by early Proterozoic meta sediments consisting mainly of meta greywacke and quartzite of upper to lower amphibolite facies. Later Proterozoic fluorite granites, syenites and lamprophyres intrude the older rocks. The basement is overlain by a Mid Proterozoic unmetamorphosed Thelon Formation, consisting primarily of sandstones and mudstones. An unconformity exists between the Thelon sediments and the basement rocks. The youngest rocks in the area are northwest trending Mackenzie diabase dykes of Middle Proterozoic age. Several structural trends have been recognized and the NE-SW and ENE-WSW directions are the most important.

Uranium mineralization outcrops only in rare circumstances. Various geophysical methods have been successfully employed during the past 40 years while seeking new ore bodies. Geophysical surveys exploring the density and resistivity parameters of rocks proved to be the most successful. All identified mineralization is located in basement rocks inside well defined alteration zones which are part of larger structural zones.

Exploration activities on the Kiggavik-Sissons property were suspended in 1997 and resumed again in 2007. New geophysical survey methods in conjunction with advanced data management have further enhanced the potential of the area. Environmental management and protection systems play an integral part in all exploration activities. Certification to the ISO 14001:2004 environmental management standard is planned in 2009 for exploration work in Nunavut.

UPPER DEVONIAN TO LOWER CARBONIFEROUS TUTTLE FORMATION, NORTHEASTERN YUKON: POTENTIAL SOURCE, RESERVOIR AND TRAP

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The Upper Devonian to Lower Carboniferous Tuttle Formation has previously been identified as an oil and gas exploration target. Recent research of the Tuttle Formation, as part of the project "Regional Geoscience Studies and Petroleum Potential, Peel Plateau and Plain" (Peel Petroleum Project), designed to increase understanding of its hydrocarbon potential and regional geology, is presented here.

The Tuttle Formation crops out on the eastern flank of the Richardson Mountains in Yukon, and extends easterly in the subsurface across the Peel Plateau and partly into the Peel Plain in the Northwest Territories. In both outcrop and in subsurface, the Tuttle Formation is recognized as a unit of alternating coarse- and fine-grained siliciclastic intervals. Where the Tuttle Formation is present, it acts as a useful marker horizon separating mudstone of the underlying Imperial Formation from similar lithologies of the overlying Cretaceous formations, as it forms a resistant unit in outcrop and has a distinctive signature in the subsurface.

Shale samples from the Tuttle Formation have been analysed with Rock Eval/TOC pyrolysis to determine their source rock potential. Total organic carbon (TOC) ranges from 0.28 to 40.25 wt %, but typically is from 1 to 2 wt %. Type III, or gas-prone kerogen is predominant, with lesser type II, or oil- to gas-prone kerogen. Strata range from thermally immature with respect to hydrocarbon generation, to within the dry gas zone. The most thermally mature strata occur in the Tuttle's most southeast extent, adjacent to the northern Mackenzie Mountains. Overall, the Tuttle Formation includes good to very good potential source rocks. An oil-stained sandstone collected from Trail River, Yukon, was determined to be sourced from a Paleozoic marine source rock.

The coarse-grained portion of the Tuttle Formation consists of sandstone and lesser conglomerate. The sandstone beds are generally less than 60 cm thick, graded to massive, and have load structures. Conglomeratic beds consist of chert and quartz clasts ranging from granules to small pebbles and locally cobbles. Porosity and permeability in the sandstone and conglomerate beds have been determined mainly from outcrop samples as little to no core exists for the subsurface. Results suggest that the Tuttle Formation contains negligible to very good reservoir rocks with values of 2 to 26% porosity, and permeabilities ranging from 0 to 127 mD. Porosity is both intergranular and intragranular, with higher values associated with the presence of weathered chert.

Due to the nature of the alternating sandstone and shale succession of the Tuttle Formation, this unit has the likelihood of containing stratigraphic traps. Along the eastern flank of the Richardson Mountains, Paleozoic strata are folded and faulted resulting in the exposure of the Tuttle Formation and adjacent units at the surface. Related structures may provide additional structural traps.

COMMUNITY MAPPING PROGRAM: DELINE, NWT.

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The Northwest Territories Geoscience Office undertakes geoscience outreach activities to provide a better understanding of geology, earth science and mineral exploration to students and community members. One of these activities is the Community Mapping Program which in 2008 was carried out near Deline on Great Bear Lake, NWT.

A team consisting of one geologist, five students and two boat guides examined the rocks and landforms around the community. Two weeks of field work was carried out, explaining and demonstrating field techniques by visiting outcrop occurrences, observing and measuring geological features, recording information and documenting GPS locations. All students were involved in photo-documenting geological features and other related natural features such as lichens and plants. Two information sessions were carried out which allowed for contributions from the community, as well as map-viewing and an opportunity to see rock samples collected.

The information collected was used to create a poster for the community of Deline with explanations of the geology. It will be sent to the Deline Land Corporation to be used as an educational tool in the local school and to inform the community, and will be distributed to other NWT schools. A copy will be available to the public on the Northwest Territories Geoscience Office website (www.nwtgeoscience.ca).

THE PLUMBING SYSTEM OF THE FRANKLIN MAGMATIC EVENT ON VICTORIA ISLAND, N.W.T., PRELIMINARY RESULTS

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The feeder system to the Natkusiak flood basalts (723Ma) is superbly exposed in the Minto Inlier of Victoria Island, as 10 to 100m-thick sills extending laterally over 100s of km. The sills are hosted by the Neoproterozoic Shaler Supergroup, composed of clastic metasediments, carbonates, mudstones and evaporites, capped by the Natkusiak lavas. The Neoproterozoic rocks are unconformably overlain by flat-lying Paleozoic sandstones and carbonates. The upper sills, which have been the focus of previous studies, and which resemble distal Franklin sills, are rather monotonous dolerites, with slightly olivine-enriched basal thirds, and granophyric pods and heteradcumulate magnetite in their upper thirds. Recent work has focussed on a set of olivine-rich sills, which have more significant potential for Norilsk-type mineralization. Thin (<1m) olivine-rich upper chilled margins (ca 25% phenocrysts) are locally developed, attesting to the influx of olivine-charged slurries. These give way rapidly to olivine-free diabasic rocks beneath, however, suggesting that the suspended phenocrysts settled out rapidly. Fieldwork, examination of drillcore, and modeling of geochemical data imply that olivine is significantly enriched in the lower third of some sills, and locally reaches ca 55% by weight. Reconnaissance work suggests that there are three types of olivine-rich sills, which differ in their paragenetic sequence. The 1st type has a sharp transition from a peridotitic base to an overlying olivine-bearing diabase, indicating that feldspar succeeded olivine on the liquidus. The 2nd type, for which we have geochemical data, shows a ca. 1m thick transition zone between the basal peridotite and overlying olivine diabase. The transition zone is composed of rhythmically-layered (cm scale) peridotite and olivine clinopyroxenite, with clinopyroxene being euhedral. This implies that clinopyroxene followed olivine on the liquidus. Geochemical modeling suggests that the extracted olivine was roughly of constant composition throughout the peridotite, suggesting injection of a slurry followed by en-masse settling of olivine. The data also suggest that clinopyroxene was a cumulus phase (ss), and that it crystallized after extraction of the olivine. The 3rd type is very similar to the 2nd, save that the rhythmically-layered transition was not observed. Instead, clinopyroxene is ubiquitously poikilitic.

THE PROTEROZOIC DESSERT LAKE RED-BED BASIN, A TARGET FOR URANIUM EXPLORATION—AN UPDATE

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Synthesizing seismic, airborne geophysical data, and diverse geological observations, we recently discovered the large "Dessert Lake" red-bed basin, overlying the southwestern margin of the Slave craton and neighbouring Bear Province to the west (Bleeker & LeCheminant, 2007, GAC abstract). This mildly deformed Proterozoic red sandstone basin is largely blind, occurring under a thin but geophysically transparent veneer of Phanerozoic platformal cover. One outcrop of the basin occurs on the southern shore of Great Slave Lake, south of Wrigley Point. In all likelihood, this basin is merely an outlier, i.e. an erosional remnant of a much more extensive Proterozoic red sandstone cover that may have been present across much of the western Canadian shield. Closest analogues and possibly direct correlatives are the Athabasca Basin to the southeast and the Hornby Bay Basin to the north.

Age constraints on the basin are as follows: we have dated diabase dykes that cut the red sandstones. They are of Mackenzie age (~1270 Ma), thus providing a lower age constraint. Mild tilting (observed in drill core and in outcrop) and some faulting, but no major folding (as observed from the SNORCLE seismic section), suggest the Dessert Lake basin outlier is younger than the last major phase of deformation in Wopmay orogen, and younger than major movement on the Wopmay Fault Zone, which it straddles. This would suggest an upper age bracket of ca. 1820-1840 Ma, consistent with a youngest detrital zircon of 1818±26 Ma (preliminary SHRIMP data, Bill Davis, pers. comm., 2007). We are attempting to tighten this 1.8-1.3 Ga age constraint and a more detailed correlation with Athabasca or Hornby Bay basin stratigraphy. Paleomagnetic sampling of ~20 cores across the ~12 m of exposed red-bed stratigraphy, in the single exposure, may provide a more detailed age estimate by matching with Laurentia's APW path.

A key observation is the apparent juxtaposition of the location of the exposed outcrop on Great Slave Lake immediately east of the Phanerozoic unconformity. This suggest that an originally much more extensive but thin red sandstone cover may have extended across the western Slave craton and across the Great Bear Magmatic Zone, and is slowly being stripped off by uplift of the Slave craton and back stripping of the Phanerozoic cover to the southwest. Much of the western Slave craton and the Great Bear Magmatic Zone, as presently exposed, were thus just underneath a Proterzoic red sandstone cover even though the latter has now been largely removed. This opens up the possibility that uranium enrichment along the western Great Bear Magmatic Zone may be secondary and infiltrated down in the form of oxidizing basinal fluids circulating through red bed cover. A similar model is favoured for U mineralization near the base of the Athabasca Basin.

In recent months, the Dessert Lake basin has been staked and drilled. A more detailed understanding the Dessert Lake basin stratigraphy and its extent to the west are also of importance to a correct interpretation of numerous gas wells drilled on the Phanerozoic platform to the west.

NATURAL RESOURCE POTENTIAL – YES OR NO? THE SOUTHAMPTON ISLAND INTEGRATED PROJECT: A SUMMARY OF 2007 & 2008 RESULTS AND INVESTIGATIONS

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With its aim directed towards resolving the mineral and energy potential of Southampton Island, Nunavut, the Southampton Island Integrated Geoscience (SIIG) project successfully completed its second and final field season in August 2008. The field and subsequent lab based work has advanced the understanding of the island's geology and is helping close a critical knowledge gap in the region between the Archean-dominated western Churchill Province and the Paleoproterozoic Baffin-Ungava segment of the Trans-Hudson Orogen. The most significant results of the integrated project include:

1) The release in May 2008 of the first available aeromagnetic data flown at 400m spacing over Precambrian basement exposed in the central part of the island. (Coyle, M.)

2) Isotope geochemistry (Whalen, J.) complemented with zircon U-Pb data (Rayner, N.) indicate great antiquity of bedrock on Southampton Island. Nd model ages of variably-aged plutonic units range from 3.6 to 2.9 Ga, and inherited zircon as old as 3.6 Ga. Map-scale units comprise minor Archean – Paleoproterozic cover sequences that subsequently experienced several pulses of mafic and felsic magmatism, followed by multiple episodes of penetrative Paleoproterozoic metamorphism and deformation.

3) Magnetotelluric transects indicate that the crust and mantle beneath an inlier in the southwest corner of the map area comprised exclusively of retrogressed mafic granulites intruded by a ca. 1.93 Ga blue quartz porphyry, is characterized by a relatively complicated resistivity low with a SW-NE trend. A simpler phase high that characterizes the mantle beneath the northern part of the island (to the east of the Duke of York Bay), suggests the presence of carbon in the mantle there. (Craven, J. & Spratt, J.)

4) Surficial geology mapping (1:250 000) has established that ice flow during the last ice age was topographically controlled. General ice flow direction was to the northeast with with a local dome over the highlands, which was surrounded by relatively faster flowing ice streams to the north and south. (Ross, M. & Kosar, K.)

5) Detailed study of the Paleozoic has resulted in a new finding of three oil shale intervals in the lower Red Head Rapids Formation, permitting stratigraphic repositioning of the previously reported "Boas River shale" (between Bad Cache Rapids and Churchill River groups) and "Sixteen Mile Brook shale" (top of

Churchill River Group). The three intervals contain significantly higher TOC than has been previously reported. (Zhang, S.)

Based on the work completed to date, and relative to the context for mineral exploration to the west and east, the Precambrian rocks of Southampton Island are of the right age for diamond exploration. With respect to the Paleozoic hydrocarbons, their occurrence on land provides the encouragement required to fuel continued hydrocarbon exploration in Hudson Bay and surrounding basins.

A NEW GEOLOGICAL MODEL FOR OIL PROSPECTIVITY IN THE GREAT BEAR PLAINS, NWT.

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Talisman is the operator of four Exploration Licences (ELs) in the Great Bear Plains, Northwest Territories. The ELs were awarded in 2006 with a four year term and comprise a total area of 3400 sq. km. The play of principle interest in the area is the Cambrian Mount Clark reservoir, where gas, gas condensate and oil discoveries have been made in the Colville Hills area northwest of the Great Bear Lake.

Talisman, and partners Devon Canada and Pine Petroleum, have acquired substantial quantities of geological and geophysical data during the last six years. The analysis and integration of these data has led to the development of a new geological model for the area. An exciting outcome of this model is the potential for oil discoveries in the Great Bear Plains.

This poster describes the variety of geological and geophysical data acquired - the geological information provided by each dataset and the additional value obtained by integrating different datasets. Additionally, the poster describes the interpretation of the data, the development of the geological model and the uncertainties.

SEKWI PROJECT: REVISION MAPS FOR THE CENTRAL MACKENZIE MOUNTAINS, NWT

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A three-year bedrock mapping project initiated by the Northwest Territories Geoscience Office will provide new maps (NTS 105P, 106A and northwestern part of 95M) and an integrated synthesis of stratigraphic and structural information of the Cordilleran fold-thrust belt between 63°N and 65°N. Regional mapping by foot-traverses, spot-checks and measured sections is augmented by improved paleontologic age control, graduate theses and previous stream sediments and water geochemistry, aeromagnetic and radiometric survey data.

The 2008 field season filled in gaps and resolved issues from previous mapping. The unmetamorphosed sedimentary strata range from Late Proterozoic to Cretaceous. The low-angle sub-Cambrian unconformity is a first-order division of the exposed strata, and has allowed greater preservation of Neoproterozoic Sequence C strata to the southwest. In the northern half of the study area (NTS 106A) we documented the telescoped platform and basin assemblages of the Lower Little Dal Group, as well as the great lithologic variation and thickness changes in the Thundercloud Formation of the overlying Coates Lake Group. The Coppercap Formation dolostone (Coates Lake Group) was resolved from lithogically similar strata of the Little Dal Group. An unconformity beneath the Neoproterozoic Keele Formation carbonate cuts out glaciomarine strata of the Rapitan Group, and the Twitya Formation in southwestern 106A. In the northwest, some occurrences of shale previously assigned to the Neoproterozoic Sheepbed Formation have been re-interpreted as a Devono-Mississippian inlier. New mapping in northwestern 95M has updated the stratigraphic nomenclature of Neoproterozoic and Lower Cambrian units in the hanging wall of the Plateau Fault.

Lower Paleozoic units undergo lateral facies transition from Mackenzie Platform to Selwyn Basin. In the northeastern part of the southern half of the study area (NTS 105P) the Gametrail Formation and lower, middle and upper members of the Backbone Ranges Formation were delineated within a previously undivided map unit and are overlain by a succession of nine carbonate formations that constitute the Mackenzie Platform. To the southwest the Backbone Ranges Formation is succeeded by the lower Cambrian clastic Vampire and carbonate Sekwi formations, and in turn overlain by a heterogenous map unit which we resolve into the Hess River, Rabbitkettle and Duo Lakes formations that are classic Selwyn Basin stratigraphy. The northwestern part of 105P lies in the axis of the Misty Creek embayment, where Ordovician-Silurian Cloudy Formation is the facies equivalent of Mount Kindle Formation.

Middle Devonian to Carboniferous units in the western half of 105P include the brown, shale-dominated Misfortune Formation, equivalent to the blue-black Canol Formation farther east. Similarly the Thor Hills Formation shale and conglomerate are time- correlative with the sandstone-dominated Imperial Formation. The Carboniferous Tsichu Group contains quartz sandstone, shale and carbonate divided in four formations. An inlier of Cretaceous shale, sandstone and conglomerate with coal seams lies south of the Ekwi River in central 105P.

The region hosts stratabound Cu occurrences within the Coates Lake Group, carbonate-hosted Zn-Pb prospects in several formations, barite occurrences, and a newly discovered beryl occurrence.

REMOTE PREDICTIVE MAPPING: PHASE II WITH EMPHASIS ON RECENT ACTIVITIES IN THE WOPMAY OROGEN

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Remote Predictive Mapping (RPM) is an important part of Natural Resources Canada's new Geoscience Mapping Program of Canada's North. Field mapping and mineral exploration in the North are an expensive proposition due to the remoteness, lack of infrastructure, logistical problems, and short mapping season. RPM affords the opportunity to analyze and interpret existing geoscience data for a particular target area and make a "best guess" at the geology before embarking on fieldwork. These predictive maps can focus field activities and provide a base of information to build upon in subsequent mapping and exploration campaigns. Furthermore, a predictive map can be re-evaluated and fine-tuned based on results from field mapping. In areas that cannot be mapped on the ground, remote predictive maps can provide first-order geological information.

RPM includes estimation of the mineral potential of Canada's North for various commodities, and identification of areas prospective for discovery of a variety of deposit types (through the Mineral Resource Initiative). The primary objective of this initiative is to provide consistent and homogeneous geoscience data coverage of the North that will enable an estimate of mineral potential using both knowledge- and data-driven modeling algorithms.

This poster gives a brief overview of the Geological Survey of Canada's RPM Phase II activities, focusing on part of the Wopmay orogen of the Northwest Territories. A bedrock mapping project is being carried out in the southern Wopmay orogen by the Northwest Territories Geoscience Office. A variety of RPM techniques have and will be used to facilitate effective field mapping. These include identification of probable bedrock exposures, evaluation of structural features, integration of bedrock information from reconnaissance maps produced in the 1930's with detailed property-scale maps of the 1990's, and interpretation of geophysical data from a recently completed magnetic and radiometric airborne survey. Preliminary target maps for IOCG deposits have been generated.

NEW GEOLOGICAL MAP OF THE ARCTIC – GEOLOGICAL SURVEY OF CANADA OPEN FILE 5816

Harrison, C.[1], St-Onge, M.R.[1], Petrov, O.[2], Strelnikov, S.[2], Lopatin, B.G.[3], Wilson, F.[4], Tella, S.[1], Paul, D.[1], Lynds, T.[1], Shokalsky, S.[2], Hults, C.[4], Bergman, S.[5], Jepsen, H.S.[6], and Solli, A.[7]

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The new bedrock geology map for the Arctic is at 1:5M scale (published as GSC Open File 5816), is in North Polar stereographic projection using the WGS 84 datum, and includes complete geological coverage of all onshore and bedrock offshore areas down to 60 degrees North.

The polar map (sheet 1) includes new regional and national compilations simplified from original spatial data at scales ranging from 1:50K to 1:5M. New compilation work includes Sweden, onshore and offshore Russia, the United States in Alaska, and two of the northern territories of Canada (Nunavut and Northwest Territories). Existing published material derives from digital maps of northern Europe (1:4M), the Fennoscandian Shield (1:2M), Greenland (1:2,5M), Yukon (1:1M), and other selected parts of Arctic Canada (1:5M). Captured analog sources cover the northwest Atlantic and Arctic offshore of North America (1:5M).

The map and correlation charts feature approximately 137 divisions of geologic time based on maximum and minimum age ranges of compilation map units; 30 divisions in the Precambrian (sheet 3) and 107 in the Phanerozoic (sheets 4-5). Lithologic range is expressed by 28 compositional assemblages (sheet 2), including six extrusive, nine intrusive, and ten sedimentary (based on depositional setting). Data on grade of metamorphism are also shown.

Map units in the Precambrian are grouped and coded by "tectonic domain" (sheet 3). These include Archean cratons (11), microcontinents and ophiolitic belts (6), magmatic arcs (8), orogens (15) and post-orogenic basins (8). These divisions facilitate and highlight the correlation of diverse but once contiguous terrains located within widely separated continental nuclei. In the Phanerozoic geographic/geological domains are identified informally using the compositional and age range characteristics of spatially-associated map units (sheets 4-5).

Geological vector data portrayed on the map (sheet 1) include spreading ridges, geological contacts, and a range of fault types. Point features include impact structures, active volcanoes, diapirs, and kimberlite diatremes.

Collectively, these data serve as a model and best-practice framework for an expanded, integrated, digital map coverage of the three territories in Canada, as proposed within the federal government's Geo-Mapping for Energy & Minerals (GEM) Program; the Tri-Territorial Geological Map Compilation Project has a 1:500K target-scale and is to be completed in partnership with the Canada-Nunavut Geoscience Office (CNGO), the Northwest Territories Geoscience Office (NTGO), and the Yukon Geological Survey (YGS).

PROFESSIONAL GEOSCIENCE: NEW LEGISLATION IN THE NORTHWEST TERRITORIES AND NUNAVUT

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The Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists is the self-governing organization responsible to the public of the Northwest Territories and Nunavut for the licensing of professional engineers and professional geoscientists, the regulation of the practices of the professions, maintenance of professional standards, and upholding of the Code of Ethics of the Association.

In May 2008 new legislation was put in place by the NWT and Nunavut legislatures provides for mobility of professional geoscientists, introduces the designation of Professional Geoscientist, P.Geo. to the Northwest Territories and Nunavut.

The poster will outline the changes in legislation, updates to the code of ethics, requirements for licensure, right to title and efforts to enhance national mobility of Professional Geoscientists.

TRI-TERRITORIAL SURFICIAL GEOSCIENCE COMPILATION

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The study of the sources and composition of glacially-transported materials deposited during the recent glaciation is a key component in mineral exploration, especially in the Canadian North. The last edition of the Surficial Materials Map of Canada, prepared by the GSC in 1995, was based on information collected prior to 1992. Since then, new surficial geoscience mapping in digital format has been undertaken, supporting accessible queriable databases.

The mineral exploration industry is active in drift-covered areas of Northern Canada and, therefore, relies greatly on knowledge of glacial sediments, mineral indicators, dispersal trains, and ice-flow history. The exploration sector requires a modern, uniform Quaternary geological database to support more effective drift prospecting relating to diamonds, gold, PGE, and polymetallic deposits in under-explored areas. This must include an updated understanding of ice-flow histories, and effective delivery of web-accessible surficial geology maps.

This project is producing a digital compilation of new and existing surficial geology maps in the form of unconsolidated glacial materials and glacial ice-flow maps of all land north of 60 degrees latitude (Yukon, Northwest Territories, Nunavut), and accompanying queriable map databases. The 1995 map is used as a base to which data from more recent digital surficial geology maps (1:100,000 and 1:125,000 scale), thematic maps and related digital databases and future surficial geology maps are added. Digital maps and ice-flow/landforms data at various scales, together with hardcopy maps at variable scale are being constructed to accompany the Tri-Territorial bedrock compilations. Consistency of surficial geology units is assured through their integration into standard GIS formats on the basis of unified legends.

From the Geomapping for Minerals (GEMS) Program perspective, the surficial geoscience database will enhance understanding of the broad-scale spatial relationships between mineral resources and geology. By providing a seamless geological context for resource and ecosystem management, environmental impact assessment, geotechnical concerns and infrastructure development, it will stimulate more effective exploration, and contribute to streamlining the approval process for resource development. A variety of derivative maps can easily be generated from the data.

DRAFT SAHTU LAND USE PLAN: ONGOING PROGRESS

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The Sahtu Land Use Planning Board was created by the Sahtu Dene and Metis Comprehensive Land Claim Agreement (Section 25.2) and further empowered by the Mackenzie Valley Resource Management Act (Part 2). The Sahtu Land Use Planning Board is responsible for developing and implementing a land use plan for the Sahtu Settlement Area. There are five members on the Board. Two members nominated by Sahtu First Nation, one member nominated by Territorial Minister and one member selected by the Federal Minister. The Chairperson is nominated by Board Members.

The purpose of land use planning is to protect and promote the existing and future well-being of the residents and communities of the Sahtu Settlement Area having regard to the interests of all Canadians. The Land Use Plan must be approved by the First Nation of the settlement area, the Territorial Minister, and the Federal Minister. The Plan takes effect on the date of its approval by the Federal Minister. When the Plan is approved, authorities with jurisdiction to grant licenses, permits, leases or interests relating to the use of land and water must conduct their activities and operations in accordance with the Plan.

Draft 1 of the Sahtu Land Use Plan was released on February 16, 2007. Twenty-two organizations including industry, government and non-government organizations submitted comments to the Board. The Board continues to seek input from all stakeholders as it moves toward completing Draft 2. The poster presenters will display and discuss ongoing changes and challenges to the Sahtu Land Use Plan.

EFFECTIVE GROUNDWATER MONITORING FOR MINING PROJECTS IN PERMAFROST ENVIRONMENTS

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Groundwater monitoring is essential at all stages of mining operations, from site assessment to mine closure. Instrumentation of mining sites with permafrost faces a unique challenge not adequately met by traditional technologies and methods. Most commercially-available instrumentation options for groundwater monitoring and sampling are not freeze-tolerant, leading almost inevitably to a single season of operation with subsequent destruction by freezing.

The Westbay System, already used for multilevel groundwater monitoring at mining and geotechnical projects worldwide, incorporates a closed design that provides year-round access to formation fluids for groundwater investigations in areas of permafrost. Further, because the system allows the completion of large numbers of monitoring zones, much more groundwater data can be collected, improving data quality and the overall understanding of site hydrogeology.

This poster describes some of the attributes of the Westbay System and presents results from De Beers Canada's Gahcho Kué diamond project in the Northwest Territories of Canada.

AN UPDATE: GEOLOGICAL COMPILATION OF THE MACKENZIE MOUNTAINS, NWT.

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The Mackenzie Mountains region of the NWT hosts an operating mine and is the focus of several large scale exploration programs and extensive land use planning exercises. These activities are founded on the availability of modern bedrock geology maps. With a few notable exceptions, geological maps date from over 40 years ago and research in the Mackenzie Mountains has been largely dormant since the 1980's. Several existing maps were issued only in preliminary form and neither all maps nor more recent stratigraphic studies have been integrated into a consistent and seamless regional coverage. The insights offered by the most recent mapping and stream sediment sampling projects have also yet to be integrated with the existing historical maps.

The Mackenzie Mountains compilation project has re-examined the geological database of the Mackenzie Mountains to produce a display of bedrock units as small as individual formations wherever possible, with a minimum of interpretation. Compromise was sought between questionable interpretation and unreadable fragmentation of map units, attempting to produce maps that consistently portray the available information. As compilation evolved over several years, emphasis shifted from maps containing detail decipherable at 1:1 000 000 scale to digital versions containing all available information. Most available maps are at 1:250 000 scale, however local studies at larger scales were incorporated, essentially as digital inserts, also without loss of information. Future work will bring all NWT compilations up to the current standard.

Five maps sheets covering the NWT portion of the Mackenzie Mountains and the adjacent Interior Platform have been compiled and are being prepared and merged in ArcGIS 9.x. These include, in order of compilation, the Slave River (NP-11/12), Redstone River (NP-9/10), Ross River (NP -7/8/9), Great Bear River (NQ-9/10/11/12) and Peel River sheets (NQ-7/8/9).

This poster displays the current status of this compilation as well as outlining the future additions.

A CONCEPTUAL NI (CU-CO-PGE) PLAY IN THE ARCHEAN CENTRAL SLAVE COVER GROUP

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In 2006, GGL Diamond Corp. reported a new Ni discovery northeast of Winter Lake in the Providence greenstone belt of the Archean Slave Province. In 2008, Arctic Star Diamond Corp. reported a new Ni (+ Cu-Co-PGE) discovery in the vicinity of Desteffany Lake in the Providence greenstone belt. Outcrop examinations combined with a regional perspective indicate that the newly identified Ni (Cu-Co-PGE) mineralization is associated with mafic-ultramafic rocks in the Central Slave Cover Group (CSCG) and the mineralization is likely stratabound within this group. The CSCG is a ca. 2850 Ma rift-related sequence that occurs throughout the central part of the Slave craton, stratigraphically over Mesoarchean gneissic basement, and underneath the Neoarchean greenstone belts. In conjunction with its stratigraphic position, the distinguishing features of the CSCG are fuchsitic quartzite, iron formation, and at some locations ultramafic intrusions(?) or flows(?).We promote this as a new conceptual Ni (Cu-Co-PGE) play because there are now two Ni-discoveries in the CSCG, the group is laterally continuous and has been identified across the central Slave craton, and mafic-ultramafic intrusions/flows occur in a number of localities.

The CSCG is known to outcrop at the stratigraphic base of the following greenstone belts: Yellowknife, Cameron River, Beaulieau River, Mackay Lake, Courageous Lake, Providence (Winter Lake), Point Lake, Grenville Lake, Emile River, and Acasta. Mafic-ultramafic intrusions/flows in the CSCG have been observed at the following localities: southwest Point Lake, northeast of Winter Lake, Desteffany Lake, Patterson Lake, Brown Lake, Amacher Lake, Beniah Lake, and ‘W Loop’ Lake. Therefore, all of these localities present the opportunity for new Ni discoveries and all CSCG occurrences warrant re-examination for their Ni (Cu-Co-PGE) potential.

Our poster will highlight: (1) the known distribution of the CSCG in the Slave craton of the NWT; (2) known localities of mafic-ultramafic rocks in the CSCG; (3) publicly available geophysical data that intersect either known, or potential CSCG localities; and (4) geological examples of the CSCG and Ni mineralization.

WHOLE ROCK CHEMISTRY INVESTIGATIONS OF THE 5034 AND TUZO KIMBERLITES AND POTENTIAL APPLICATIONS TO IMPROVING GEOLOGY AND RESOURCE MODELS, GAHCHO KUÉ PROJECT, NORTHWEST TERRITORIES

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The Gahcho Kué Project is an advanced diamond evaluation project in joint venture with Mountain Province Diamonds Inc., located about 300 km northeast of Yellowknife in the Northwest Territories. The Gahcho Kué kimberlite cluster is comprised of the Hearne, 5034, Tuzo and Tesla pipes. New petrographic textural models were developed after core drilling programs were conducted at two of the four main lobes comprising the 5034 kimberlite, the North and East Lobes in 2006-2007, and at the Tuzo kimberlite in 2007. The two other main 5034 kimberlite lobes, the West and Centre Lobes, do not have detailed internal geology models. Both the 5034 and the Tuzo kimberlites have similar major textural kimberlite facies recognized: coherent rocks (distinguishing xenocrysts-macrocrysts, phenocrysts and groundmass minerals) comprising Hypabyssal Kimberlite (HK) and transitional Hypabyssal Kimberlite (HKt), and fragmental rocks (distinguishing framework components – magmatic or xenolithic or cognate-autolithic origin and matrix) comprising Tuffisitic Kimberlite (TK) and transitional Tuffisitic Kimberlite (TKt).

Whole Rock Chemistry (WRC) investigations were conducted to determine if it was possible to improve confidence in the 5034 and Tuzo geology models and support understanding of their diamond distributions in terms of the major rock types. Whole rock samples from the 5034 kimberlite underwent Principal Component Analysis conducted on major and trace elements using JMP® 7.01 Statistical DiscoveryTM. For the Tuzo data set, major and trace elements including REE were variously compared in binary, ternary and trivariate plots and in Spider diagrams. At Tuzo the geochemical signature of the lithologies is strongly influenced by the variable and generally high degree of country rock contamination, with granitic material the most significant chemical contaminant.

The WRC studies provide an opportunity to improve understanding of major rock types and their diamond distributions at 5034 and Tuzo. At the 5034 kimberlite, WRC Principal Component Analysis has supported petrological observations and identified similar HK and HKt units across the four major lobes, with the HK and HKt being geochemically distinct within lobes; TKt and TK units being geochemically distinct between lobes and having variable overlap with HKt units; and two geochemically distinct HK's being evident within the 5034 Centre Lobe which reflect a change in large diameter drill bulk sample diamond grades. It is recommended that a more detailed investigation of the 5034 West and Centre Lobes is undertaken to delineate the major rock types and to increase confidence in the geology model.

At the Tuzo kimberlite, preliminary WRC investigations indicate that there appears to be two distinct, sub-parallel WRC chemistry trends related to the two major petrographic textural facies identified: fragmental and coherent. It is recommended to conduct WRC Principal Component Analysis to fingerprint fragmental and coherent rock type magmas as this could have important implications for constraining diamond population sources. Preliminary studies of diamonds recovered from Tuzo in 2008 show highly comparable size frequency distributions for the various fragmental rock types of the geology model, which may be in part be explained by the multi-event volcanological mixing and mingling processes that are considered to have occurred during emplacement.

USING FLUORINE AND CHLORINE CONTENTS OF MAGMATIC FLUIDS TO TARGET UNDISCOVERED TUNGSTEN MINERALIZATION IN THE SELWYN-MACKENZIE MOUNTAINS, NWT

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A detailed examination of several multi-phase Cretaceous felsic intrusions in southwestern Northwest

Territories (NWT) was conducted in order to compare magmatic fluid conditions (esp. wth respect to to fluorine and chlorine) in tungsten-mineralizing, and non-tungsten-mineralizing intrusive systems. The study area contains numerous occurrences where tungsten is the primary metal of interest, including the world-class Cantung and Mactung deposits. Furthermore, the intrusions were largely derived from partial melting of middle to upper crust and are consequently highly enriched in fluorine and strongly depleted in chlorine. It was hypothesized that for multi-phase intrusions associated with tungsten mineralization: (a) specific intrusive phases not directly associated with mineralization would have increasing fluorine relative to chlorine content with differentiation, typical of normal crystallization processes; (b) intrusive phases immediately associated with mineralization (i.e., proximal to) and that have exsolved a volatile, metal-bearing phase should be depleted in fluorine relative to chlorine content; and (c) altered and mineralized intrusive phases affected by mineralizing fluids should be highly enriched in fluorine relative to chlorine content. Ultimately, the focus of this study was to characterize magmatic fluid compositions in individual intrusions that could form tungsten skarn deposits and to use the data to identify specific intrusive phases that may have been responsible for supplying volatiles and metals to the tungsten mineralizing system. Magmatic and hydrothermal apatite, biotite, muscovite, and hornblende compositions were measured with the electron probe micro-analyzer for forty-four individual intrusive phases from six composite intrusive bodies. Magmatic fluid compositions were approximated as a ratio using HF, HCl, and H2O activities calculated from apatite and biotite compositions, following the methods of Zhu and Sverjensky. Data are reported as the calculated $\log(a_{HF}/a_{HCl})$ ratio, which is used to indicate relative fluorine to chlorine concentrations in the magmatic fluid.

Resulting data from three tungsten-mineralizing systems (Cantung, Lened, and Rudi) and from three non-tungsten-mineralizing systems indicate that the volatile phase becomes progressively more enriched in fluorine relative to chlorine as the intrusive system evolves to more differentiated phases during cooling. However, unaltered and marginal intrusive phases or dykes proximal to tungsten mineralization are significantly depleted in fluorine relative to chlorine, which cannot be explained by a decreased degree of differentiation. For these samples, approximations of $\log(a_{HF}/a_{HCl})$ are low in comparison to more distal intrusive phases. This indicates that a volatile phase, enriched in fluorine relative to chlorine, was exsolved from those intrusive phases proximal to tungsten mineralization and can be recognized by decreased $\log(a_{HF}/a_{HCl})$. Conversely, mineralized intrusive phases and/or altered intrusive phases associated with mineralization have very high fluorine relative to chlorine concentrations; resulting approximations of $\log(a_{HF}/a_{HCl})$ of the magmatic fluid for these samples are very high. This confirms that intrusive phases directly affected by mineralizing fluids, even when not mineralized, are enriched in volatiles phases and may be used as a tool for exploration.

Overall, these data suggest that potential economically significant and/or buried tungsten deposits may be targeted by examining the volatile constituents in magmatic minerals from prospective, multi-phase intrusions.

ADVANCED RESEARCH INITIATIVES USING THE MACKENZIE DELTA AIR PHOTO PROJECT SPATIAL DATA

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The Mackenzie Delta Air Photo Project is a multi-year mapping project (2003-2008) involving four federal departments (INAC, NRCAN,DFO,EC) and Centre for Geomatics and Municipal and Community Affairs of the Government of NWT as partners. This INAC–NT led project has a goal to provide sufficiently detailed mapping products to adequately meet the mapping needs of regulators for issuing permits and licences, to enable assessment of environmental impacts of industry development in the Delta and Mackenzie pipeline corridor area. The Mackenzie Delta Air Photo Project data acts as baseline mapping tool to monitor change due to climate fluctuations. The data is available free of charge in a compressed format from the Centre for Geomatics webpage download site.

The presented Poster will outline some science research topics employing this data. The Mackenzie Delta Air Photo Project data has a general research purpose as framework data, useful for planning field work and logistics – e.g. Bird Surveys.

Four studies or initiatives are highlighted in the poster. These studies employ the high resolution geo-rectified orthophoto tiles used for terrain, vegetation or permafrost analysis. In addition, there are examples of Digital Elevation Model tiles (DEM) used to examine subsidence potential or presence of frozen sediments (methane gas) in a geomorphological context.

The number of research initiatives using the Mackenzie Delta Air Photo Project spatial data can only increase and its use become more integrated as the Mackenzie River watershed region is increasingly affected by physical and climate change.

COHERENT KIMBERLITE AT EKATI, NORTHWEST TERRITORIES, CANADA: TEXTURAL AND GEOCHEMICAL VARIATIONS AND IMPLICATIONS FOR EMPLACEMENT

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The term 'coherent' is used in a non-genetic sense to describe kimberlite characterised by a crystalline groundmass and lacking readily discernable evidence of fragmentation. Coherent kimberlite has been encountered in three main geological settings worldwide: sheet intrusions (dykes and sills), root zone intrusions (irregular pipes) and high-level pipe fills (steep-sided pipes). The EKATI property in the Northwest Territories of Canada provides a unique opportunity to study coherent kimberlite from a range of emplacement settings. The majority of EKATI kimberlites are small pipe-like bodies filled dominantly by volcaniclastic kimberlite (VK), including mainly resedimented and lesser primary deposits (PK). Coherent kimberlite (CK) occurs as minor sheet intrusions, classified as hypabyssal kimberlite (HK), and as volumetrically significant high-level pipe fills, termed pipe-fill CK (pfCK). A recent study of the geochemical trends in a variety of volcaniclastic and coherent EKATI kimberlites provides insight on the formation of these diverse bodies. Variations in bulk composition of selected kimberlites were found to correlate with the emplacement settings and textural character of analysed samples. In this contribution, we confirm, expand and build on this work. A larger set of CK samples from fourteen localities representing six contrasting geological settings are investigated and compared to previously analysed samples of PK. The study focuses in particular on petrographic and geochemical evidence indicative of varying degrees of fragmentation of the kimberlite magma, as well as the extent to which this has interacted with volcaniclastic material.

The results reveal that: i) Subtle geochemical differences are evident between HK intruding host rock and that emplaced into VK-filled pipes. These are accompanied by petrographic evidence in the latter for interaction with VK; ii) The main petrographic difference between samples of HK and pfCK is a higher abundance of broken olivine in the latter. In some cases this is accompanied by heterogeneous textures suggestive of magma fragmentation. The degree of olivine breakage is highest in large volume pfCK localities, but only one of these contains possible true magmaclasts; iii) Petrographic variations correlate with compositional differences between HK and pfCK that suggest a depletion of groundmass constituents in the latter. The pfCK samples define broad linear arrays with respect to several elements and some correlation exists with petrographic characteristics of the large volume localities; iv) The higher broken olivine content and heterogeneous textures of the pfCK samples, combined with the geochemical evidence for fines loss and the fact that different localities together form part of an overall broadly linear HK-pfCK-PK array, supports the contention that volcanic eruption accompanied by varying degrees of magma fragmentation and fines loss is responsible for much of the compositional and textural variations in EKATI pfCK.

This study demonstrates that assessment of geological context, petrographic characteristics and geochemical composition of a particular kimberlite can be combined and used to: confirm the CK type and geological context, predict and delineate the extent, morphology and internal geology of the body, constrain emplacement processes and interpret potential controls on diamond distribution. This has potential for effective application in exploration, evaluation and (to a lesser extent) mining.

IMPORTANT WILDLIFE AREAS IN THE WESTERN NORTHWEST TERRITORIES

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The Department of Environment and Natural Resources has been working to map key wildlife habitat areas – called 'Important Wildlife Areas' – for the western NWT. A public report with maps will be available in early 2009.

Key habitat areas are being mapped for several NWT species of socio-economic importance and/or conservation concern. Areas are identified through the knowledge of experts such as harvesters and biologists. Each Important Wildlife Area must satisfy at least one of the following criteria: 1) areas that many animals use traditionally around the same time each year; 2) concentration areas where animals are usually found in relatively large numbers; 3) areas that animals repeatedly use when conditions are bad (i.e. refugia); 4) areas where there are source populations; 5) year-round range (only for species with very low numbers in NWT or very limited suitable habitat); or 6) unique areas used by many different species, such as mineral licks and some important wetlands. The report also summarizes additional information on the importance of each area for wildlife.

The report and maps will be useful for regulatory decisions, environmental impact assessments, land use planning, and other management decisions.