Compendium of Research in the Northwest Territories

2011ᐱᕼᒪᒪᕼ

www.nwtresearch.com

This publication is a collaboration between the Aurora Research Institute, the Department of Environment and Natural Resources, the Government of the Northwest Territories and the Prince of Wales Northern Heritage Centre. Thank you to all who submitted a summary of research or photographs, and helped make this publication possible.

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Northwest Territories Environment and Natural Resources

Northwest Territories Education, Culture and Employment

Foreword

The 2011-2012 *Compendium of Research in the Northwest Territories* provides a brief summary of most research that has taken place in the Northwest Territories. The rich and continuing tradition of research in the NWT is showcased in this publication. Over the past two years, researchers traveled from near and far to observe, record and analyse our dynamic region. The results of this work have contributed to an ever-growing body of knowledge on topics ranging from aboriginal languages evolution to climate change impacts, from ancestral ways of life to regional health management. The breadth and depth of this research is truly extraordinary.

The NWT has long been an important location for research. This year, however, I am struck by the growth in research from local community researchers and NWT citizens on their own regions and heritage. This promising trend will benefit this territory as we move towards increasingly more independent governance. The NWT's growing research capacity will be important to help direct the understanding of our home and inform our future decision-making.

In September 2011, the NWT celebrated the opening of the Western Arctic Research Centre in Inuvik.This new facility was supported through the Arctic Research Infrastructure Fund, administered by Aboriginal Affairs and Northern Development Canada, and was one of twenty funded projects in northern Canada. The Western Arctic Research Centre replaces the old Inuvik Research Centre after 47 years of continuous operation. The new state-of-the-art facility will expand research programming and research opportunities for the NWT. This renewed investment in research infrastructure will continue to support and build upon the rich and diverse range of research activity in the NWT.

The summaries in this publication are only a brief outline of the rich findings and scientific advancements researchers have made over the past year. In many cases, more in-depth reports and publication are available. I encourage you to contact the researchers if there is a project that interests you. Additional information can be found at: http://data.nwtresearch.com/.

Pippa Seccombe-Hett
Director, Aurora Research Institute

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INTRODUCTION

This compendium offers a summary of research licences/permits that were issued in the Northwest Territories during 2011 and 2012. The information contained in this book is a product of a collaboration between the Aurora Research Institute (ARI), the Prince of Wales Northern Heritage Centre (PWNHC), the Department of Environment and Natural Resources (ENR) and the Department of Fisheries and Oceans (DFO). The Compendium series began in 1986.

Licensing in the NWT

Under territorial legislation, all research in the NWT requires a licence/permit from one of four agencies, depending on the type of research being conducted:

- *Prince of Wales Northern Heritage Centre* - Archaeology;
- *Department of Environment and Natural Resources, Government of the Northwest Territories* - Wildlife;
- *Department of Fisheries and Oceans* - Fisheries; or
- *Aurora Research Institute* - all other research in the NWT.

Through the licensing process, researchers are informed of appropriate organizations, communities and other licensing/permitting agencies that should be contacted prior to conducting studies. Licensing ensures research activities are communicated to interested parties and provides opportunities for the exchange of information.

The Compendium provides a summary of all licences/permits issued in the NWT by all four licensing/permitting bodies. As each research project is represented by a short abstract, the reader is encouraged to contact the researcher for additional information and results.

How to Use This Book

This book has four main sections. Each of these sections reflects a specific licensing agency and type of licence/permit issued. Within each section, research descriptions have been grouped by subject and listed alphanumerically by the principal researcher's last name. Refer to the Table of Contents for the specific page on which each section and/or subject begins. An index is included at the end of the compendium listing all researchers in each section.

1. File Number

The file numbers shown in each of the Aurora Research Institute's subject areas refer to the file number issued to a particular researcher. It allows cross referencing with research material that may be available on file or in the ARI library. The reference numbers of the other three agencies refer directly to the permit numbers given to each researcher. When requesting information from any of these agencies on specific research outlined in the compendium, please refer to the reference number in your correspondence.

2. Regional Abbreviations

Throughout the book, reference is given to the specific land claim regions in which the research took place. The regions are shown on the following page. Some of the land claim regions are still under negotiation and the boundaries shown are only approximations. The abbreviations shown for each region are as follows:

DC	Deh Cho	**SS**	South Slave
NS	North Slave	**SA**	Sahtú Settlement Area
IN	Inuvialuit Settlement Region	**GW**	Gwich'in Settlement Area

3. Glossary

A glossary of terms has been added to the Compendium. The intent of the glossary is to allow the reader to better appreciate the research descriptions.

Available in Print or Free Download

This compendium is available as a printed publication or can be downloaded from the Aurora Research Institute's website (www.nwtresearch.com). Copies can also be requested by contacting the Aurora Research Institute.

Send Us Your Comments

Whether you are a researcher or an interested member of the public, the Aurora Research Institute welcomes your comments and suggestions concerning this publication. Contact us by mail, fax, email or telephone (see address on page vi).

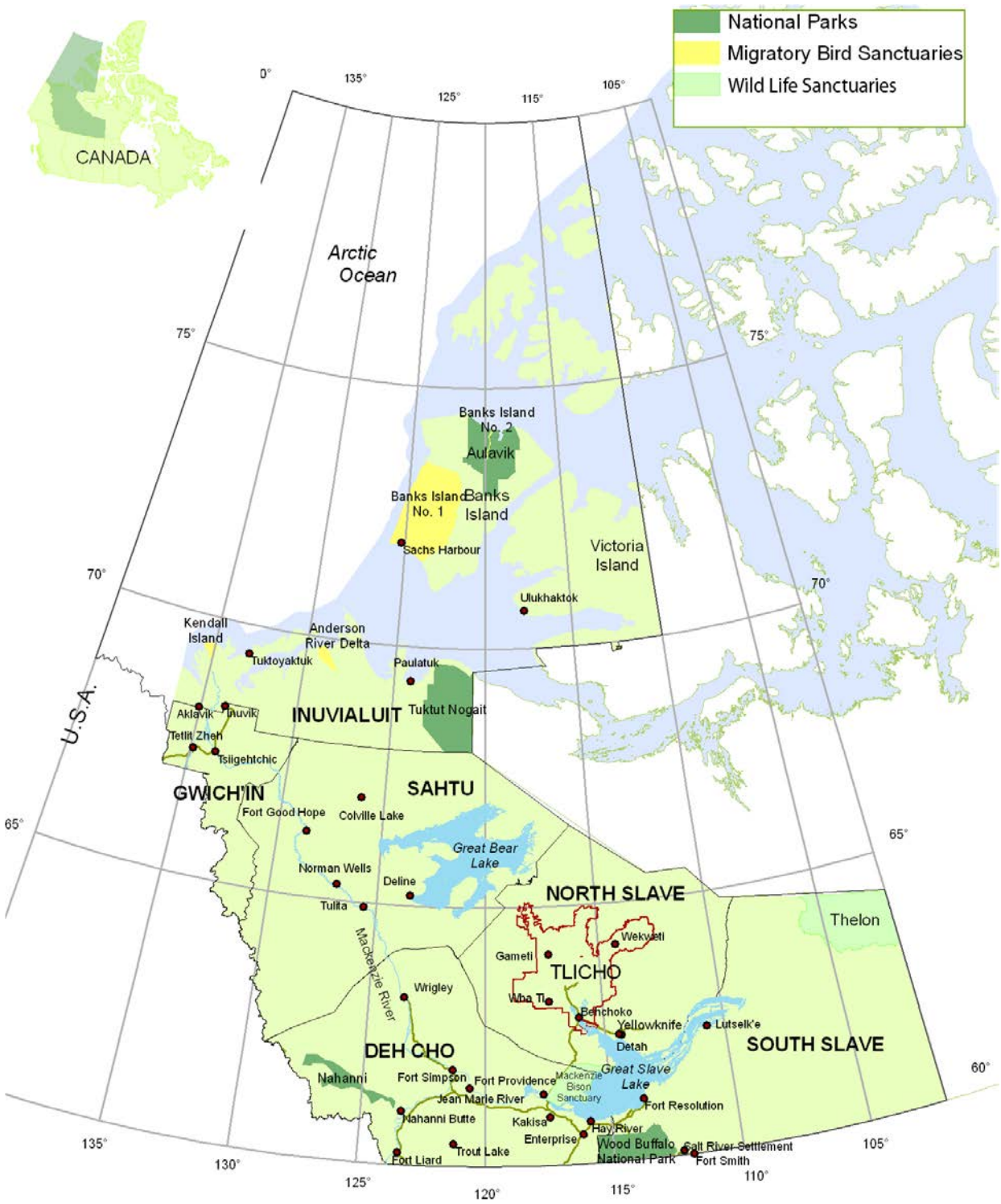

Figure 1. *Land claim regions in the Northwest Territories*

AURORA RESEARCH INSTITUTE

The Aurora Research Institute's mandate is to improve the quality of life for NWT residents by applying scientific, technological and indigenous knowledge to solve northern problems and advance social and economic goals.

ARI is responsible for:

- licencing and coordinating research in accordance with the NWT Scientists Act: this covers all disciplines including the physical, social, biological sciences and traditional knowledge;
- promoting communication between researchers and the people of the communities in which they work;
- promoting public awareness of the importance of science, technology and indigenous knowledge;
- fostering a scientific community within the NWT which recognizes and uses the traditional knowledge of northern aboriginal people;
- making scientific and indigenous knowledge available to the people of the NWT;
- supporting or conducting research and technological developments which contribute to the social, cultural and economic prosperity of the people of the NWT.

For more information, contact ARI at:

Aurora Research Institute
PO Box 1450
Inuvik, NT X0E 0T0
Tel: 867-777-3298
Fax: 867-777-4264
E-mail: licence@nwtresearch.com
Website:www.nwtresearch.com

THE DEPARTMENT OF ENVIRONMENT & NATURAL RESOURCES

The Government of the Northwest Territories' Department of Environment and Natural Resources (ENR) has a mandate to promote sustainable development through the management and protection of the quality, diversity and abundance of natural resources and the integrity of the environment.

With respect to permitting for research and monitoring, ENR is responsible for issuing Wildlife Research Permits under the Wildlife Act (Section 24) for all studies on wildlife or wildlife habitat in the Northwest Territories. Wildlife includes all vertebrates, except fish and marine mammals.

For more information, contact ENR at:

Wildlife Division
Environment and Natural Resources
Government of the Northwest Territories
PO Box 1320
Yellowknife, NT X1A 2L9
Fax: 867-873-0293
Email: wildliferesearch_permit@gov.nt.ca
Website: www.nwtwildlife.com/ResearchPermits/

Northwest Territories Environment and Natural Resources

DEPARTMENT OF FISHERIES AND OCEANS

The Department of Fisheries and Oceans Canada (DFO) is responsible for developing and implementing policies and programs in support of Canada's scientific, ecological, social and economic interests in oceans and fresh waters. Some Fisheries management responsibilities have been delegated or transferred to other federal agencies (e.g. Parks Canada), provinces/territories and co-management groups under Land Claim agreements.

DFO Fisheries Management is responsible for issuing Commercial, Domestic, Licence to Fish for Scientific Purposes (LFSP), Exploratory, Public Display and Educational licences in the NWT. Subject to Land Claim agreements, a Commercial licence is required to sell or barter fish

All individuals fishing for scientific purposes or participating in the acts described below are required to obtain a Licence to Fish for Scientific Purposes (LFSP):

- activities involving fishing, catching or attempting to catch fish;
- activities where the potential exists for the incidental capture of fish;
- sampling or possessing fish caught in a subsistence fishery.

For further information about licensing, contact DFO at:

Licensing Officer
Central & Arctic Region
Government of Canada
Fisheries and Oceans Canada
PO Box 1871
Inuvik, NT X0E 0T0
Tel: (867) 777-7500
Fax: (867) 777-7501
Email: xca-inuvikpermit@dfo-mpo.gc.ca
Website: http://www.dfo-mpo.gc.ca/index-eng.htm

Fisheries and Oceans Canada | Pêches et Océans Canada

PRINCE OF WALES NORTHERN HERITAGE CENTRE

The Prince of Wales Northern Heritage Centre (PWNHC), a division of the Department of Education, Culture and Employment, Government of the Northwest Territories, is responsible for managing and protecting the archaeological resources of the NWT. Representing a continuous human occupation stretching back over 7000 years, archaeological sites are fragile and non-renewable and are protected from disturbance by legislation, regulation and policy in the NWT. There are currently about 6000 archaeological sites recorded in the NWT, though this number represents only a fraction of the existing sites as large areas remain unexplored for archaeological resources. A large part of the work done at the PWNHC involves reviewing land use and development permit applications. On average, 300 permits are reviewed per year, with recommendations being proffered to nine land management authorities.

With respect to permitting for research and monitoring, PWNHC is responsible for issuing NWT Archaeology Research Permits.

For more information, contact the Prince of Wales Northern Heritage Centre at:

NWT Cultural Places Program
Prince of Wales Northern Heritage Centre
4750 48th Street
PO Box 1320
Yellowknife, NT X1A 2L9
Phone: (867) 873-7551
Fax: (867) 873-0205
Email: archaeology@gov.nt.ca
Website: www.pwnhc.ca

Northwest Territories Education, Culture and Employment

BIOLOGY 2011

Blaschuk, Katherine
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File No: 12 402 842 **Licence No:** 14847
Region: SA **Location:** Bosworth Creek; Norman Wells

Bosworth Creek aquatics and fisheries monitoring program Gahcho Kue
The objective of the Bosworth Creek aquatics and fisheries monitoring program was to determine current water and aquatic habitat quality, and to establish baseline conditions for evaluation of future monitoring data. In order to achieve the project objectives, sampling stations within and downstream of the active Imperial Oil Norman Wells lease area were compared to an upstream reference station, located beyond the possible influence of the development. Field monitoring was conducted on August 31 and September 1, 2011.The 2011 program included the following components: (1) collection and analysis of surface water quality samples from four upstream and three downstream locations; (2) Assessment of the benthic invertebrate community at six locations coincident with the surface water quality sampling; and (3) assessment of fish habitat quality at two upstream and two downstream locations. Please note that fish sampling was not conducted in 2011. Analysis of data collected in 2011, and preparation of a summary report, is currently underway.

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File No: 12 402 861 **Licence No:** 14914
Region: IN, SA, NS **Location:** Norman Wells; Yellowknife; Aulavik National Park on North East Banks Island

Ecological structure of northern arthropods: adaptation to a changing environment
Our research team visited three areas in the Northwest Territories: Yellowknife (June 6 to 21), Norman Wells (June 6 to 19), and Aulavik National Park on Banks Island (July 6 to 22). In all three locations we conducted our standardized sampling of insects and spiders at six sites, as well as some opportunistic collection in a variety of both terrestrial and aquatic habitats. Collections in all three locations were highly productive, especially for biting flies, higher flies, spiders, and parasitoid wasps. Team members are currently processing the samples in our labs at McGill University and the University of Toronto. Specimens in groups of interest are being sorted, dried, pinned, labeled, and identified. Data will be analyzed to test how, and to what

degree, the structure of arthropod communities change between boreal, subarctic and arctic ecoclimatic zones, and to assess how northern arthropod communities have adapted to recent (50-60 year) changes to their environment. Cutting-edge molecular genetic techniques will aid species identification and help elucidate longer-term (i.e., phylogeographical) patterns. In addition to our collection-based activities, the research team also participated in public education activities as bug experts at “Bugfest at the Museum” in Yellowknife.

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File No: 12 402 475 **Licence No:** 14890
Region: SA **Location:** Nota Creek C-17 well site

Phytoremediation study on the Candadian forest et al. Nota Creek C-17 wellsite

Phytoremediation is a remediation strategy involving the use of plants to remove contaminants. In theory, plants take up the contaminant from the soil, are harvested and then removed from the site. This process is repeated until the impacted soil is remediated to applicable guidelines. Phytoremediation activities on the Nota Creek C-17 well site progressed to full site planting in 2009 and 2010. Remediation results were encouraging enough to support excavating impacted soil still buried on the site and integrating it into the phytoremediation process. Personnel and equipment were mobilized to the site, approximately 43 km southeast of Norman Wells and 38 km northwest of Tulít’a, in February/March 2011 under frozen ground conditions. Some of the remaining impacted soil that was still buried was excavated and stockpiled. In early July 2011, a portion of the excavated impacted material was incorporated into the phytoremediation process. The soil was spread and conditioned, and the site fertilized and seeded. Plant health and vigor was assessed in mid-August during a monitoring trip. In late September personnel were mobilized to the site to collect plant and soil samples, to harvest the growth from the impacted areas and to remove that growth from the site. Initial laboratory results from the collected samples were encouraging and support continuation of the application of phytoremediation technology to the well site.

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File No: 12 402 858 **Licence No:** 14901
Region: IN **Location:** The Baillie Islands and northwestern portions of Cape Bathurst

Population inventory of hairy rockcress (*Braya pilosa*): NWT’s rarest species of global importance

Hairy rockcress, a plant first collected by Sir Richardson in the mid-1800s, is known from only one area in the world; Cape Bathurst on the Beaufort Sea coast. Specimens from that site were collected more than 200 years ago, and then thought to be lost until 2004 when the exact location was re-discovered. The objectives of the 2011 field trip were to determine how many populations of this rare plant grow on Cape Bathurst, and to describe and evaluate the threats to its survival. Part of the team arrived by airplane on July 25, set up camp and walked to and along the coast. New locations for this plant were found. The major threat to this rare plant is

shoreline erosion. For example, the 2004 site was re-examined and found to be almost all gone due to ground slumping into the sea and salt kills. On August 1, additional team members arrived with a helicopter and a large area of Cape Bathurst was searched for one day. The whole team left the Cape on August 2, 2011. In all, about 15,000-20,000 plants were observed in 10 locations, some of which are protected from coastal erosion for now. The results of this survey are being used to assess the biological status of the rare plant in reports for the Committee on Endangered Wildlife in Canada and for the NWT Species at Risk Committee.

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File No: 12 402 263 **Licence No:** 14975
Region: NS **Location:** The La Martre River, extending from the La Martre River Falls to the confluence with the Marian River

La Martre River fall fisheries program

In 2009, the Tłı̨chǫ Investment Corporation proceeded with a pre-feasibility investigation of the La Martre River Hydroelectric Project. The project is a 13.2 MW run-of-river power generation facility that proposes to divert 30 m^3/s, or approximately 89% of the mean annual discharge, from a headworks facility on the La Martre River. In order to understand the potential effects of a sudden increase/decrease in flow on fish and fish habitat within the river, Cambria Marshall Côté consultants completed a preliminary assessment in 2011. The results indicated that there is a risk of stranding fish and/or dewatering incubating eggs; however, the study was conducted at a desktop level and no fisheries information was available downstream of the proposed tailrace. It was recommended that a fish and fish habitat study be conducted downstream from the proposed tailrace. Fieldwork was completed in September 2011 by Cambria Marshall Côté and a local technician from the community of Whatì. The study area was broken into two distinct river reaches: upper (tailrace to 8 km downstream) and lower (8 km to 34 km downstream of tailrace). A total of 42 sample sites were visited within the two reaches, and four habitat types were identified in each. A total of 159 fish from 9 species -- stickleback, sculpin, arctic grayling, northern pike, sucker spp., lake chub, burbot, emerald shiner, and trout perch – were captured within the upper section. A braided side-channel habitat was found to provide high value habitat to a number of species and potentially critical habitat for arctic grayling. A total of 129 fish from 7 species - stickleback, sculpin, northern pike, sucker spp., lake chub, inconnu, and emerald shiner -- were captured within the lower section. Run/glide and deep pool habitats in this section were documented to provide excellent rearing potential, and based on the depth and velocity characteristics, likely provide excellent overwintering potential.

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File No: 12 402 780 **Licence No:** 14841
Region: SA **Location:** Bosworth Creek

Bosworth Creek monitoring project

This Bosworth Creek Monitoring Project (BCMP) is a high resolution, long-term study of a 125 square kilometer watershed at Norman Wells, NWT. The project was initiated after the Sahtu

Renewable Resources Board received a request from local residents for information on fish stocks in Bosworth Creek, following the removal of a weir in 2005 by Imperil Oil Resources. The project has focused on studying benthic insects and creating a chemical inventory over the past three years. The benthic work will be completed within one year and will compare Bosworth insects with three other nearby streams. The water quality analysis will be completed by September 2011. This information will be invaluable for local Renewable Resources Council stewardship. The project will continue to monitor potential or existing impacts by climate change and industry. The BCMP has become a permanent component of Mackenzie Mountain School's high school curriculum program through the NWT Experiential Science Program. The BCMP will continue to provide professional development for local youth through associations with academic and industrial institutions.

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File No: 12 402 780
Region: SA

Licence No: 14873
Location: Lac St. Therese; Kelly Lake; Lennie Lake; Stewart Lake; Tate Lake; Hodgson Lake

Baseline mercury levels in predatory fish in the Sahtu Settlement Area
No research was conducted under this licence in 2011.

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File No: 12 404 771
Region: SA

Licence No: 14938
Location: Along the proposed Highway Route within the K'ahsho Got'ine District from Gibson Gap to the Thunder River

Mackenzie Valley Highway project description report
Environmental fieldwork was conducted along the proposed K'ahsho Got'ine Highway (KGH). This fieldwork was undertaken by a fisheries biologist and ecologist with AMEC Environment and Infrastructure. The proposed highway would upgrade the winter road from Norman Wells to Fort Good Hope into a year round road and construct a new road northwards to the Gwich'in Settlement Area boundary. The goal of this fieldwork was to verify the environmental information that was available for potential fish and wildlife habitat, as well as plant communities along the proposed highway. The fieldwork was conducted from July 12th to 16th, 2011. The field work was planned to use a helicopter to assess watercourse crossings with potential fish habitat and portions of the route with limited environmental information. However, due to issues with the helicopter, part of the proposed highway near Fort Good Hope was accessed by hiking and by boat. Notes and photographs were taken on the presence or absence of fish habitat and plant communities at each watercourse crossing. In addition, notes were made on the suitability of wildlife habitat. The final project description report was delivered to the K'ahsho Development Foundation in January 2012.

Jones, Paul
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File No: 12 402 867
Region: SS
Licence No: 14970
Location: The mouth of the Slave River Delta near Fort Resolution; the Slave River within the municipal boundaries of Fort Smith

Fish health study in the Slave River and the Slave River Delta
The aim of this study is to investigate the contamination of the Athabasca/Slave river system with chemicals potentially derived from oilsands activities in northern Alberta. Contamination effects on fish health, and the quality of those fish as food, were examined. The potential for contaminants effects on the health of fishes in the Athabasca River was identified previously from measures of chemicals in water and snowmelt, and there have been reports in the press of the occurrence of fish with lesions. Furthermore, observations from local harvesters suggest that similar health impacts may be happening to fish from the Slave River system, which is immediately downstream of the Athabasca system. Potential impacts on fisheries were assessed by collecting four species of fishes from several locations in the Athabasca/Slave River system. Samples were collected at Ft. McMurray AB (upstream of oilsands activities), Ft. McKay AB (immediately downstream of oilsands activities), Ft. Chipewyan AB (where the Athabasca River enters Lake Athabasca), Ft. Smith NWT (on the Slave River downstream of Lake Athabasca) and Ft. Resolution NWT (where the Slave River empties into Great Slave Lake). Fish were collected in collaboration with local harvesters and other community members, aboriginal organizations, provincial or territorial authorities and Federal agencies as appropriate. The health assessment did not indicate any major observable differences in fish health between sites, however this data is still being compiled for statistical analysis, which cannot be conducted until all sampling is complete in the spring of 2012. Samples have been submitted to laboratories for analysis of metal and organic chemical content. While preliminary results for metals have been provided they have not yet been subjected to final quality assurance/quality control (QA/QC) assessment, and so cannot be released.

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File No: 12 402 664
Region: IN
Licence No: 14960
Location: Along the proposed Tuktoyaktuk to Inuvik highway

Archaeological and fish habitat assessment for the Tuktoyaktuk to Inuvik highway
IMG-Golder Corporation completed an archaeological and fish habitat assessment on behalf of the Government of the Northwest Territories Department of Transportation, as required for the proposed Inuvik to Tuktoyaktuk highway and two potential realignments (Alternative 1 and Alternative 3) in the Inuvialuit Settlement Region. The objectives of the archaeological assessment were to identify, record and assess cultural heritage resources that might be impacted by the proposed highway project, and to devise mitigation strategies should any be found in conflict with the proposed highway. A field investigation was completed in September 2011 over a six day period, along the planned highway right-of-way and at several proposed borrow source locations. No artifacts were found and no new sites were recorded. The objective

of the fish habitat assessment was to assess the 36 watercourse crossing locations of the proposed highway and potential realignments that remained following the 2009 and 2010 surveys. Site assessments on the proposed watercourse crossings were conducted in September 2011. A total of 11 watercourses were assessed as being ephemeral with no defined channel, 10 were classified as intermittent, and 15 were classified as perennial with a defined channel. One crossing could not be located.

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File No: 12 404 733
Region: NS

Licence No: 14962
Location: The Kennady Lake watershed and adjacent watershed areas

De Beers - Gahcho Kué ecological risk assessment program

Collections of soil, berries, and vegetation were completed in Sept 2011 at the Gahcho Kué project. Up to 10 samples each of lichen, berries (cranberries), leaves (dwarf birch), and grass were collected among the 23 soil sample sites. Samples were sent to a lab to measure metal and polycyclic aromatic hydrocarbon levels. Results will be used to refine the environmental assessment for the project.

Lantz, Trevor
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File No: 12 404 758
Region: IN

Licence No: 14929
Location: Peel Plateau; Aklavik Area; Delta Uplands; Outer Delta; Aklavik / Western Delta

Vegetation monitoring and science training in the Mackenzie Delta region

From 2010-2012, AANDC scientists have been working with researchers at the University of Victoria, and Hunters and Trappers Committees (HTCs) in the Mackenzie Delta, to develop a vegetation monitoring protocol that can be implemented by a range of users. The long-term goal of this program is to establish and maintain a network of sites to characterize regional environmental variability, and serve as a baseline against which to measure changes resulting from the cumulative impacts of multiple natural and anthropogenic disturbances. At all sites in the network, we measure vegetation structure, plant community composition, tree density, the productivity of edible berries, active layer depth, and near surface ground temperatures. At core sites we also maintain meteorological stations, frost tubes, and deep ground temperature cables. Since 2010, we have established 35 community-based monitoring sites in 6 terrain types. Statistical power simulations, using data from 2010-2012, also show that the protocol is capable of detecting small changes in vegetation structure. Through a partnership with Environment Canada and the Canadian Forest Service, we are working to identify areas of overlap among this and other programs and, where possible, develop common monitoring techniques. By selecting monitoring sites that are regionally representative, and including disturbances that communities have identified as priorities, this monitoring program also provides a platform for directed research and hypotheses-driven investigations, that will contribute to local decision making. We are in the final stages of production of a user-friendly

protocol guidebook. We anticipate completion and first printing in advance of the 2013 field season. Baseline data on vegetation, active layer, and snow is being added to the NWT Discovery Portal on an ongoing basis. In February 2012, a presentation describing project outcomes was given to our community partners in Inuvik, as well as several project presentations were also delivered in Yellowknife.

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File No: 12 402 685
Region: NS,SS
Licence No: 14945
Location: Within Avalon's Thor Lake Property; Redemption Lake, just northeast of Thor Lake

2011 baseline studies for Avalon Rare Metals Inc. proposed Thor Lake rare earth element project - aquatics and fisheries

In 2011, Deton'Cho Stantec conducted three field programs for the aquatics component of this project. This included: water and plankton (phytoplankton and zooplankton) sampling in June; water, sediment, plankton and benthic invertebrate sampling in September; and water sampling in October. Sampling was carried out at 8 lake stations. Results from the 2009-2011 field programs indicate neutral to basic water and very low nutrient levels at all stations. There were large fluctuations in some general and metal parameters, primarily during winter in small, shallow lakes that developed highly reducing, anoxic conditions under ice. Sediment characteristics varied, though generally lake sediment had high phosphorus, nitrogen and organic carbon content; metal levels in sediment ranged from less than detection to higher than the guidelines set by the Canadian Council of Ministers of the Environment. Chlorophyll levels varied among lakes and seasons, and most of the lakes were oligotrophic. From 2009-2011, phytoplankton and zooplankton abundance, richness and diversity varied between lakes and years. Predominant phytoplankton species included filamentous and coccoid blue-green algae, colonial yellow-brown algae and small cryptoflagellates. One rotifer species was the predominant zooplankton taxa in most lakes from 2009-2011. Similarly, benthic invertebrate abundance, richness, diversity and evenness varied between lakes and years. One dipteran family (Chironomidae), one crustacean order (Amphipoda) and one clam family (Sphaeriidae) were found in most lakes. The fisheries component of the 2011 Thor Lake baseline study included a fish sampling program at five lakes (Ring, Buck, Drizzle, Ball and Murky). A total of three juvenile northern pike were captured; two from Drizzle Lake and one from Murky Lake. No fish were caught in Ring, Ball or Buck Lakes. These results support the conclusions from field studies in 2009-2010: Drizzle and Murky Lakes are fish-bearing while Ring, Ball and Buck Lakes are non-fish bearing.

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File No: 12 402 856
Region: SA
Licence No: 14887
Location: The Great Bear River from Great Bear Lake to the Mackenzie River, near Délı̨nę and Tulít'a

Great Bear River environmental and traditional knowledge baseline program

A field program was conducted in August 2011 with participation from both Tulít'a and Délı̨nę. Five sites were identified on the Great Bear River, and data were collected on the channel structure, sediment, water chemistry, fish community and habitat, benthic invertebrates, and other environmental disciplines. Data is still being analyzed, but the following points provide a brief summary of field program results: Fourteen species of fish were identified; the average age of the fish caught using gillnets was 8 years; the oldest fish caught was a 15 year old walleye; the mercury level in the water at all sites was very low; the creeks flowing into the Great Bear River have different water chemistry. The traditional knowledge (TK) portion of this study is underway at this time, and residents of both Tulít'a and Délı̨nę are involved. The focus of the TK portion of the study is to better understand conditions of the river, including how the river is used, freeze/thaw patterns, locations of important cultural sites and key hunting and fishing areas. TK information will be documented by conducting workshops and interviews with elders, renewable resources councils, land users and residents from Tulít'a and Délı̨nę.

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File No: 12 402 859
Region: GW

Licence No: 14902
Location: Richardson Mountains near Husky Channel; area south of Inuvik to Fort McPherson

Reassessment of the *Polygonia faunus* complex

The primary objective of this project was to collect a species of butterfly (*Polygonia faunus arcticus*) from sites in the Yukon and Northwest Territories, with a particular emphasis placed on obtaining specimens from Black Mountain in the Richardson Mountains, the type locality of this subspecies. These specimens supported a taxonomic assessment of the *Polygonia faunus arcticus*. Genetic analysis indicates that subspecies *arcticus* is synonymous with subspecies *faunus*, while subspecies *hylas* contains two additional as yet undescribed subspecies, and at least two independent expansion phases of *Polygonia faunus* into eastern North America have occurred. The results of this research have been submitted to BMC Evolutionary Biology, a peer-reviewed scientific journal of entymology, and a trip report was published in the News of the Lepidopterist Society. A secondary objective of this study was to assess other butterfly species from this region. Initial evaluation of *Polygonia gracilis* from the Richardson Mountains demonstrates that the dorsal surface of these individuals resembles that of the western subspecies *Polygonia gracilis zephyrus*, whereas the ventral surface of these individuals resembles that of the eastern subspecies *Polygonia gracilis gracilis*. Thus, the Richardson Mountains are a blend area for *Polygonia gracilis*.

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File No: 12 402 857
Region: DC

Licence No: 14875
Location: Fort Simpson - Cli Lake, Little Doctor, Sibbeston Lake, Tsesto lake; Wrigley - Blackwater Lake, Fish Lake; Jean Marie River - McGill Lake, Deep Lake; Trout Lake - Trout Lake

Updating data on mercury levels in food fish species in lakes used by Deh Cho communities

In 2011, the Deh Cho Aboriginal Aquatic Resources and Ocean Management (AAROM) program carried out the first year of this multiyear project. Work was done on five lakes with the assistance of local community monitors, who were critical to completing work in the field. Fish were collected and sampled, and water quality samples were taken. In the Jean Marie River First Nation area, fish and data were collected from Deep, McGill and Ekali Lakes. In total 5 yellow walleye, 4 northern pike, 3 burbot and one lake whitefish were caught in 13 sets at Deep Lake; 33 yellow walleye, 19 northern pike, 12 white sucker and 3 lake whitefish in 5 sets at McGill Lake; and 18 yellow walleye, 16 northern pike and 35 lake whitefish in 6 sets at Ekali Lake. In the Pehdzeh Ki First Nation (Wrigley) area, fish and data were collected from Fish Lake. In total 5 yellow walleye, 20 northern pike, 10 lake trout, 7 burbot and 25 lake whitefish were caught in 20 sets. Twenty-five lake trout were also collected from Trout Lake by residents of Sambaa K'e, and fish were sampled in Hay River. All of the fish collected during this project were biologically sampled in the field for fork length, total length, round weight, ageing structures, stomach contents, sex/maturity and gonad weight. If it was possible, fish were distributed to each local community afterwards.

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File No: 12 402 851 **Licence No:** 14952
Region: GW **Location:** Stony Creek (NWT); Vittrekwa River (Yukon)

Dolly Varden char assessment in the Peel Plateau

This project had two parts. The first was to re-assess the population size of the Vittrekwa River Dolly Varden char stock. The second was to determine if Dolly Varden char exist in the Stony Creek watershed near Fort McPherson. The project was carried out in August 2011. A team of three flew to the upper Vittrekwa River by helicopter and installed a fish weir on the spawning creek used by Vittrekwa River char. The weir was in place for 19 days and a total of 44 mature adult char were captured. Another 19 mature adult char were captured by angling. All char were sampled for length and weight, while only 50 had a small piece of fin removed for genetic analysis. It is important to note that only adult, sexually mature char were sampled. The actual population size of this stock is larger than this number (63 char sampled) because immature char were not counted in this assessment, as they typically do not migrate to the spawning tributary. Also, during the early period after the weir was installed, it was not operating efficiently and missed capturing a large number of mature male char. Because of this, the number of char counted through the weir can only indicate an absolute minimum population size. Visual counts of the spawning area estimated approximately 140 mature adult char. In addition to fish sampling, 9 CABIN (Canadian Aquatic Biomonitoring Network) reference sites were established for comparison with streams affected by permafrost slumping in the lower Vittrekwa and Stony watersheds. Sampling in the Stony Creek watershed was not completed because of high water and unfavorable conditions. One burbot was accidentally captured in an invertebrate kick net and was released. Juvenile grayling were observed in off-channel habitat but were not sampled.

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File No: 12 402 848 **Licence No:** 14849
Region: NS **Location:** Yellowknife River between Prosperous Lake and Bluefish Lake

NTPC Bluefish Hydro repairs

The objective of this study was to describe the aquatic environment in the Yellowknife River between Prosperous Lake and Bluefish Lake. In particular, efforts were made to document current fish use of the existing dam. The results will be used to determine the most suitable means of fish habitat compensation, and to guide mitigation strategies during construction of the new dam for Bluefish Hydro. In October 2011, a four-day fisheries assessment was completed in Bluefish Lake. Gillnets and Gee minnow traps were deployed, both near the existing dam and at the inflow to Bluefish Lake. Most fish were released live, although some were sacrificed to document age, sex, and reproductive status. Additional bathymetry information was also collected in the vicinity of the existing dam, and lake shore substrate and water quality was documented in Bluefish Lake.

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File No: 12 402 492 **Licence No:** 14939
Region: GW, SS **Location:** Adjacent to and along Highway #5, between the boundary of Wood Buffalo National Park west of Fort Smith and Angus Tower; Along Highway #5, between the Park boundary west of Fort Smith and the intersection with the road leading to Thebacha Camp; near Inuvik

Structure, carbon dynamics, and silvichronology of boreal forests

Forest landscape may be going through changes in growth under a warming climate. We are trying to evaluate that thought (or hypothesis) by measuring forest growth at present, and by estimating its history during the past 100 years. Tree rings have been extensively used. We have also measured the movement of carbon in forest ecosystems, including growth of fine roots in the soil. Previous research we did in the Northwest Territories indicated that the proportion of growth in fine roots to the whole amount of forest growth is large, so root growth needs to be studied seriously. We continued to collect data in small (several square kilometers) forest plots near Inuvik and in about a dozen forests near Fort Smith this year to estimate forest growth. Remote sensing was also used. We have almost finished measuring tree rings from several hundred stem samples we collected last year. We will use this data to calculate forest growth history. We will continue to study the forest plots next year to improve the accuracy of our reconstructed forest history. Thanks to a new development this year, a research partnership between Japan and the USA for investigating arctic environments, we are now considering extending our experience in the Canadian north to a study of the entire arctic environment by starting similar projects in Scandinavia, and by integrating old and new results of our research activities.

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File No: 12 402 766
Region: NS
Licence No: 14850
Location: Waterbodies located within the EKATI claim block

EKATI aquatic monitoring program, 2009-2013

In 2011, seven monitoring projects were ongoing in the lakes and streams of the Koala, King-Cujo and Pigeon watersheds, where EKATI mine infrastructure are located. The objectives of the aquatic effects monitoring program (AEMP) and the Fay Lake monitoring program were to assess the current conditions in the lakes and streams of the Koala, King-Cujo and Pigeon watersheds, in order to determine whether there have been any mine effects. The objective of the surveillance network monitoring program was to confirm EKATI's compliance with its water licenses. The assessments incorporate some or all of the following: meteorology, hydrology, water quality and physical limnology, sediment quality, phytoplankton, zooplankton, benthos and fish data. Data analyses for 2011 are currently being completed. A detailed review of the AEMP plan for 2010-2012 was submitted to the Wek'eezhii Land and Water Board in 2011. Fish populations in the Panda diversion were monitored for the 13th consecutive year. A compilation and analysis of this work is also in progress. Assessment of fish habitat created in Nero-Nema Stream was ongoing in 2011. The nitrate in situ treatment study is a mitigation strategy developed and implemented in 2010 to reduce nitrate concentrations in the Long Lake containment facility (LLCF). In 2011, the study continued to closely monitor the physical, chemical and biological environment in Cell D and Cell E of the LLCF, with minor modifications to fertilizer timing additions. Air quality was monitored using high volume air sampling, continuous ambient monitors and dust fall measurements as a part of the air quality monitoring program.

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File No: 12 402 724
Region: NS
Licence No: 14891
Location: Seven lakes, and their six outlet streams, draining into Lac de Gras

Improving habitat connectivity to enhance productive capacity of arctic freshwater ecosystems

The Diavik Diamond Mine, located on Lac de Gras in the Northwest Territories, has proposed a habitat compensation project for nearby lake and stream systems. Headwater lake outlet streams at two sites will be modified to improve fish passage, and thus ecological "connectivity" among these headwater lakes and with Lac de Gras. One set of habitat manipulations occurred in fall 2011, while the second habitat project will occur during summer 2012. Sampling during the 2011 summer field season (Year 3 of the "before" period) was conducted according to plan. Combined with the two lake-stream ecosystems designated for habitat compensation, several other lake-stream reference systems were studied to provide information on the spatial variability of aquatic ecosystems in the barren lands, and to incorporate natural temporal patterns in these ecosystems. We sampled each lake and stream for hydrology, water quality, habitat characteristics, primary producers, invertebrates, and fish to establish pre-manipulation baseline conditions for these ecosystems. Electrofishing and hoop netting in streams revealed very low abundances of slimy sculpin and juvenile burbot. We collected Surber and drift samples of macroinvertebrates, in both riffle and pool habitats, from seven streams in the Lac de Gras watershed (4 slated for modification, 3 controls) during the ice-free season. Post-winter

recolonization of streams by macroinvertebrates was measured by placing different colonization boxes, open to only one type of colonization (upstream, downstream, aerial, and vertical), in each stream. Samples are currently being analyzed . Lake fish assemblages were surveyed by gill netting, angling, and electrofishing. Fish communities and species abundances vary among lakes, but consist mainly of arctic grayling, lake trout, round whitefish, burbot, longnose sucker, and slimy sculpin. During this “before” period, we are comparing the ecology (diet composition, condition, growth) of lake trout in lakes with other fishes, to that of lake trout in lakes without other fishes.

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Region: IN, GW **Location:** Inuvik

Northern native seed development field trials
The objective of this project is to continue assessing the performance of native plants which were seeded and transplanted into field plots in 2006 and 2007. Data regarding winter survival, seedling emergence, and overall plant vigor and productivity will be collected in order to assess each species' and collection's suitability for use in land reclamation in the NWT. The results of this study will help to determine which plant species are best suited for restoring disturbed sites to their natural condition in different habitats across the NWT. This year data was recorded at all three sites. As in previous years, plants which had been transplanted had higher survival than those that were direct seeded. Survival was also higher at the gravel and clay sites than at the peat site. Data analysis is ongoing, and results will be made available at www.nwtresearch.com.

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File No: 12 402 864 **Licence No:** 14958
Region: DC, SS **Location:** The sites of six recent fires that occured south of Yellowknife since 2004

Effects of wildfire on biomass combustion in boreal peatlands and forests
Study plots were established in several recent fire scars south of Yellowknife. Data were collected to estimate the depth of burning of fuels on the forest floor (moss and peat). These data will be used to explore ecosystem type and weather as controls on burn severity.

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File No: 12 402 860 **Licence No:** 14903
Region: NS, SS **Location:** Daring Lake; ponds, lakes, and creeks in the area of Fort Smith

A phylogenetic and phylogeographic study of predaceous diving beetles in the Nearctic with a focus on the tribe Agabini (Coleoptera, Dytiscidae, Colymbetinae)

The main purpose of this project is to look for information about how water beetles respond to a changing environment, including: how have they re-colonized northern Canada and Alaska after the retreat of glaciers at the end of the last ice age? Another goal is to examine where different types of beetles are found in the north, and to see if these beetles are expanding their ranges northward. During the summer of 2011 (from July to early August), beetles were collected within 5 km of Daring Lake. To date, the beetles have not been fully identified; however, so far there are between 5 and 7 species that, in comparison to where they were found 30-40 years ago, appear to have shifted their ranges to the north. This information may be important because it tells us how animals in the north may be responding to a changing environment. These, and future results, will be presented at scientific conferences and in scientific journals. They will also be provided to the GNWT, to be placed in the library so the public can access them.

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File No: 12 402 865 **Licence No:** 14961
Region: DC **Location:** Prairie Creek

Exfiltration fence habitat assessment

A fisheries field assessment was conducted on August 10 and 11, 2011. The objective of the study was to assess fish utilization of a section of Prairie Creek that will contain the proposed mine effluent exfiltration trench (diffuser) and effluent mixing (dilution) zone. The study area consisted of a 100 m long zone of the creek. Electrofishing was conducted along both banks of the 100 m zone. Caught fish were identified, weighed, and measured for length. Other habitat assessment work included an assessment of substrate, flow rate, and stream morphology along five transects distributed evenly within the 100 m assessment reach. Slimy sculpin (*Cottus cognatus*) were relatively abundant (23 were caught), and a variety of life stage and sizes/weights were noted, indicating that the proposed effluent mixing zone represents potential spawning and rearing habitat for slimy sculpin. A single bull trout (*Salvelinus confluentus*) was captured in the channel margin of the creek in shallow, slower moving water. Given the lack of instream cover or rearing habitat available at the point of capture, it is likely that this individual trout was utilizing these slower flows as an opportunity to rest during a migration past the effluent site.

CONTAMINANTS 2011

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File No: 12 402 843
Region: NS
Licence No: 14846
Location: Diavik Diamond Mines Inc. - Lac de Gras mine site

Waste rock studies at a diamond mine site

The objective of this research was to investigate the processes related to water quality and quantity draining from experimental waste rock piles that are located in areas of continuous permafrost. Waste rock piles are mounds of rock removed from open pit and underground mines. The quality of water draining from a waste rock pile is determined by the combined effects of oxygen transport in the air, biogeochemical processes that control mineral weathering rates, the release of heat and dissolved constituents due to sulfide mineral oxidation, and hydrologic processes that control unsaturated water flow. The transport of dissolved constituents is further affected by the formation and subsequent dissolution of secondary minerals. Three instrumented experimental waste rock piles were constructed from 2004 to early 2007 at the Diavik diamond mine. In 2010, three 40 m deep boreholes were drilled into the operational waste dump and a series of instruments similar to those in the test piles were installed. In 2011, two additional 40 m boreholes and one 80 m borehole were installed and instrumented with similar instruments. Data from these instruments will be compared to data from the test piles to evaluate differences in measurement scale. The study is undertaken entirely as a graduate research program through the University of Waterloo, University of British Columbia, and University of Alberta. At least one presentation on the Diavik test piles project will be presented at the Geoscience Forum in November, 2011 in Yellowknife.

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File No: 12 402 681
Region: SS
Licence No: 14950
Location: Great Slave Lake: West Basin- near Fort Resolution; and West Basin- near Hay River

Spatial and long-term trends in persistent organic contaminants and metals in lake trout and burbot from the Northwest Territories

This is an ongoing study under the Northern Contaminants Program (NCP); some support was provided by the Cumulative Impacts Monitoring Program. We are investigating whether contaminant levels are changing in Great Slave Lake fish, which we have been studying since the early 1990s. Twenty lake trout from Hay River, 20 pike and 20 burbot from Fort Resolution, and 20 lake trout and 20 burbot from Łutsel K'e were shipped, frozen and whole, by community members to a lab in Saskatoon. In the lab, length, weight, and age were determined and samples were submitted for metals (including mercury) and persistent organic contaminant analyses. Pike and Łutsel K'e burbot were analyzed only for mercury. Mercury has been showing an increasing trend, although levels remain below the 0.5 ppm guideline. Organic contaminant concentrations have not been increasing; some such as HCH and DDT have decreased in concentration due to their decreased usage. The results of our 2011 findings will be presented in a 2011 NCP report, with those findings shared with our community partners.

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File No: 12 402 868
Region: IN

Licence No: 14974
Location: Inuvik; Tuktoyaktuk; Yaya Lake; Noell Lake; Big Lake; Husky Lakes system; 16 lakes along the 177 road; 4 lakes along the Tuk-Inuvik road corridor

Evaluation of hydro-climatic drivers of contaminant transfer in aquatic food webs in the Husky Lakes Watershed (Inuvialuit Settlement Region, NWT)

This fall field campaign was a multi-purpose trip that included some helicopter-supported work, land-based work, and more outreach/consultation. The timing for the late fall/winter work was suggested to us by the Tuktoyaktuk Hunters' and Trappers' Committee (Tuk HTC) and during the review by the Regional Contaminants Committee in the proposal stage. We were asked to come conduct sampling of fish and other parameters when fishers set fishing nets under the ice, thereby limiting helicopter use and our scientific fishing efforts in this ecologically and culturally sensitive ecosystem. Prior to arranging flights to Inuvik, we communicated with the Aurora Research Institute (ARI) in Inuvik and the Tuk HTC to ensure the ice on the lakes was safe for travel. We spent 3 weeks in the Inuvialuit Settlement Region, split between Inuvik and Tuktoyaktuk; we met with local partners (ARI, Fisheries Joint Management Committee, Fisheries and Oceans Canada, Tuk HTC) and the public in Tuktoyaktuk to discuss project details and future directions. We went to all study lakes to develop the methods related to sample collection for two graduate projects (at U Victoria and U Manitoba). The field crew at all sites consisted of three people, with 2-4 local people helping in Tuktoyaktuk. We used Spot devices to map our field trips via GPS Satellite tracking.

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File No: 12 402 862
Region: SA

Licence No: 12940
Location: Along the south shore of the Great Bear River, from the source of the river on Great Bear Lake to Tulít'a

Great Bear River site assessments
No research was conducted under this licence in 2011.

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File No: 12 402 664
Region: IN
Licence No: 14953
Location: The abandoned Panarctic Satellite F-68 well site, located at Satellite Bay on the north-western coast of Prince Patrick Island

Detailed site description, remediation feasibility and risk assessment of the Panarctic Satellite F-68 Wellsite, Satellite Bay, Prince Patrick Island, NWT
Talisman Energy Inc. conducted a supplemental Phase II Environmental Site Assessment (ESA) program at the abandoned Panarctic Satellite F-68 wellsite area at Satellite Bay on Prince Patrick Island, Northwest Territories . Panarctic Satellite F-68 was a dry exploratory petroleum well drilled in the 1970s. In 2010, several Areas of Potential Environmental Concern were identified around the wellsite. These included the well site area itself, a small pond containing old steel fuel drums, a landfill area, surficial debris, surface stains, potential buried (likely detonated) explosives, and an area of suspected buried debris adjacent to the landfill. During the 2011 program, soil and water sampling was conducted to delineate contaminated areas that were identified during the 2010 program. The debris that had been consolidated in 2010 remained as it was left in 2010. The supplemental Phase II ESA included a geophysical survey covering areas not included in 2010, testing of surface water from the creeks/rivers near the Site, and collection of groundwater and soil samples. Samples were submitted to an accredited laboratory for analysis and compared to applicable territorial and federal guideline criteria. Exceedances for metals and petroleum hydrocarbons were identified in both 2010 and 2011. Delineation of known contamination was conducted in 2011. Information was collected to define the extents of contaminated soil and groundwater as well as waste materials. Some geotechnical data was collected to support the potential design and construction of a landfill on-site. An assessment of the airstrip was also conducted to determine what aircraft could safely land/take off, as well as what maintenance would be required to support larger aircraft.

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File No: 12 402 863
Region: SS
Licence No: 14954
Location: Nagel Channel Boat Landing, Fort Resolution; Fort Smith Boat Launch

Multi-scale environmental health implications of the Athabasca oil sands for Aboriginal communities in Alberta and Northwest Territories
From June 4-20 2012, three members of the University of Manitoba's Environmental Conservation Laboratory conducted field research contributing to this project. During this period we conducted video interviews with community members in Fort Chipewyan, Alberta and Fort Smith and Fort Resolution, Northwest Territories, about environmental change and community concerns about contamination arising from industrial activities affecting the Slave River and

Peace Athabasca river deltas. We shared community newsletters created to publicize the work we had completed between June 2011 and spring 2012 with community collaborators. These newsletters are an attempt to create a communication network for communities to share their knowledge and concerns with each other, and for the scientific community to communicate their research approaches and results. Two thousand copies of these newsletters have been printed for distribution to First Nation and Métis Nation research partners in Fort Chipewyan, Fort Smith and Fort Resolution. We anticipate return visits to Fort Chipewyan in fall 2012 and production of a second newsletter for distribution to all community partners in spring of 2013.

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File No: 12 402 778 **Licence No:** 14872
Region: NS, SS **Location:** Blanchet Island Mine; Outpost Island Mine; Copper Pass Mine; DeStaffany Mine

Great Slave Lake area mines: site assessment and remediation planning
No research was conducted under this licence in 2011.

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File No: 12 402 866 **Licence No:** 14966
Region: SS **Location:** Slave River Delta

Sediment core sampling to assess contaminant deposition to the Slave River Delta (NWT) over time
The perceived negative downstream effects of oil sands development is a major environmental issue of international concern. In the Slave River Delta, a key unknown is whether industrial activity is enhancing the delivery of natural sources of oil sands-derived contaminants. In this study, sediment cores were taken from a flood-dominated lake in the Slave River Delta. The historical record is necessary for determining baseline concentrations of polycyclic aromatic compounds (PACs). Using a gravity corer, lake sediment cores were collected in September 2011 from a small (~1.2 km^2), shallow (maximum depth ~1.5 m) flood-dominated lake in the active Slave River Delta . Sediments in this lake contain a record of spring break-up flooding for at least the past century . Sediment cores were sectioned into 1 -cm intervals, placed in sample bags and shipped to the University of Waterloo. Samples are currently being analyzed for 1) radiometric isotope (137Cs, 210Pb) concentration to develop the sediment core chronology, 2) loss-on-ignition to characterize physical properties of the sediment core, 3) organic carbon and nitrogen elemental and isotopic composition to reconstruct past hydrological conditions, and 4) PACs to examine their depositional patterns and trends over time. Research is being conducted as an initiative of the Slave River and Delta Partnership. Fieldwork in September 2011 was conducted with the assistance of a community member. Also, while conducting fieldwork, presentations were made to classes of school children at the Fort Resolution Deninu School and an open-house was held in Fort Resolution to inform the community of the project. Analyses are in progress but results are expected to contribute new knowledge of how and if PAC deposition in the Slave River Delta has changed over time. Research will contribute to

addressing concerns of local residents over the perceived impacts of upstream oil sands development, and will help prioritize future research and monitoring needs.

ENGINEERING 2011

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File No: 12 406 054
Region: NS
Licence No: 14949
Location: Along the length of the Tibbitt to Contwoyto Winter Road

Paleoclimatological assessment of the central Northwest Territories: implications for the long-term viability of the Tibbitt to Contwoyto winter ice road

In support of our three-year multi-disciplinary research project, 80 sediment/water interface samples from 43 lakes along the route of the Tibbitt to Contwoyto Winter Road have thus far been analyzed for water property data, substrate characteristics , nutrient loading, water geochemistry, isotopes and environmentally available metals. This data is being used to develop training sets and transfer functions based on micropaleontological proxies; the camoebians, diatoms and chironomids. Twenty-one Glew cores and 16 freeze cores have also been collected from these lakes. Use of a freeze core microtome has permitted subsampling of freeze cores to mm-resolution (2-5 years). Preliminary time series analyses results indicate that throughout the late Holocene there has been considerable climate variability, with winter and summer signals often becoming decoupled. The Pacific Decadal Oscillation and North Atlantic Oscillation have contributed to step-wise temperature changes as these phenomena vary between positive and negative phases. There is also a correspondence between solar cycles and seasonal climate variability, with solar cycle peaks corresponding to cooler summers and warmer winters, and troughs corresponding to warmer summers and colder winters.

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File No: 12 406 058
Region: NS
Licence No: 14910
Location: Thor Lake near the Avalon Rare Metals Inc. development

Wind energy monitoring at Thor Lake 2010-2011

In 2009/10, one year of wind data was analyzed from a 50 m meteorological station installed near Thor Lake on a ridge overlooking the Hearne Channel. The projected long-term average wind speed at 48 m above the ground is estimated to be 5.7 m/s. At 80 m above the ground, the long-term wind speed is estimated to be 6.5 m/s. Data collection continued through 2010/11

with similar results, though winter wind speed measurements were not recorded due to mechanical issues. This will be resolved by extending the monitoring stage of the project. All reports related to this project are available at www.nwtresearch.com

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File No: 12 406 058 **Licence No:** 14852
Region: NS **Location:** Wekweètì

Wind energy monitoring in Wekweètì: 2010-2012

Two wind monitoring towers were installed in Wekweètì in October, 2010, following a pre-feasibility study and community consultation. The first tower installed is 34 meters tall, and the second is 10 meters tall. Each tower is equipped with anemometers to measure wind speed, a wind vane for wind direction, a meteorological station to record weather, and a data logger to store the information. The 34 m tower is now monitoring wind speed and direction for potential wind energy to serve the entire community, and the 10 m tower collects data for potential wind energy to directly serve the new complex. After the towers were installed, a local resident was hired and trained to be the wind monitor. His duties include monthly site visits, the collection of data, and maintenance of the towers. These towers will collect data for up to two years, after which the data will be analyzed and a feasibility report written. Recommendations will be presented to the community for review and discussion. In 2011, data collection was ongoing. The project technician returned to Wekweètì to check the towers and provide additional training. For more information on wind energy project activities, please visit our website at www.nwtresearch.com

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File No: 12 404 720 **Licence No:** 14963
Region: DC **Location:** Jean Marie River; Fort Providence

Solar irradiance monitoring in Jean Marie River and Fort Providence

The majority of Canada's northern communities are dependent on fossil fuels for electricity generation. Due to their remoteness, the cost of transporting diesel fuel to these communities is a large financial burden on the territory's government and utility companies. Renewable energy, particularly in the north, offers many potential benefits to northern communities. Using wind or solar power in place of diesel can help to reduce particulate emissions and the greenhouse gas emissions which contribute to climate change. Solar energy is of particular interest in the southern parts of the NWT, though little irradiance data has been collected in the territory to date. The objective of this project, therefore, is to measure solar irradiance levels in Jean Marie River and Ft. Providence, in order to support pre-feasibility studies on the use of solar energy in those communities. In August, 2011, the project engineer traveled to Jean Marie River and Fort Providence to install solar irradiance monitoring equipment in the two communities. The sensors will collect solar irradiance data for at least one year, depending on the success of data capture and annual variation in weather (cloud cover, etc.). Once the study is complete, the sensors will be removed and pre-feasibility studies will be produced and distributed in both plain language and technical reports. These reports will be made available at www.nwtresearch.com.

HEALTH 2011

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Region: IN, NS, SS **Location:** Łutsel K'e; Behchokò; Ulukhaktok; Yellowknife

Brightening our home fires: Women and wellness project program report
Brightening Our Home Fires was a qualitative research project, which used Photovoice to explore women's perceptions, attitudes and experiences related to the prevention of Fetal Alcohol Spectrum Disorder (FASD) in the Northwest Territories (NT). Four communities participated: Behchokò, Ulukhaktok, Yellowknife and Łutsel K'e. Yellowknife was also included as women from remote northern communities often migrate to this urban location for reasons such as homelessness, domestic violence, substance abuse treatment, financial need, employment opportunities and a stronger resource network. Women participants were given digital cameras, some hands on training by research team members and an introduction to the research question: What does health and healing look like for you in your community? About 30 women participated from the NT. The women provided beautiful images and captions from their communities about their understanding of health and healing – a foundation to FASD prevention. The photos and words that were shared with the research team provided a deep understanding of the need for culturally based health support resources. Key findings relate to the importance of children, relationship to elders and participation in traditional activities as important parts of health and healing. Photovoice helps women voice life experiences. FASD prevention requires involvement of women, men and communities.

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Region: NS **Location:** Yellowknife

Formative evaluation study of the BSN program
The formative evaluation study of the Bachelor of Science in Nursing (BSN) Program has collected some data from student and faculty focus groups and student questionnaires over the past six months. Unfortunately, this collaborative study across sites has been stopped by the Collaboration for Academic Education in Nursing (CAEN) Steering Committee. Information can

still be retrieved specifically for Aurora College, until this point in the study. Therefore, there is no need to continue this research licence.

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File No: 12 408 149 **Licence No:** 14886
Region: IN, GW **Location:** Aklavik; Tuktoyaktuk

The Aklavik *H. pylori* project

In February 2011, the Inuvialuit Settlement Region (ISR) *H. pylori* pilot project was launched in Tuktoyaktuk, NWT. Of the 93 participants who enrolled in the pilot, 86 had a breath test for *H. pylori* infection, 35 provided health data, and 23 provided individual-level and household-level socio-environmental data. Using feedback from this pilot, planning is underway for the full ISR *H. pylori* project to launch in 2012. One component of our community *H. pylori* projects is the collection of interview data on health problems related to *H. pylori* infection, along with relevant data from participants' medical records. In May 2011, we completed a project to assess the completeness of information obtained from medical records in Aklavik, and to improve our chart review tool to collect more accurate information. In September 2011, a project examining ways to foster effective communication between researchers, knowledge users, and other community members involved in the Aklavik *H. pylori* project was initiated. This project aims to help promote the direct application of research knowledge to effective *H. pylori* screening practices, both in Aklavik and other remote northern communities throughout Canada.

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File No: 12 408 148 **Licence No:** 14885
Region: IN **Location:** Aklavik; Ulukhaktok

Changing the "culture of smoking": Community-based participatory research to empower Inuvialuit communities

This community-based participatory research (CBPR) project began in Aklavik and Ulukhaktok in 2007. CBPR team members completed baseline surveys in late 2008, and completed data entry in 2009. Data were checked and analyzed. A summary of findings was shared with communities in late December 2010. The response rate was 50% in Ulukhaktok and only 12% in Aklavik; in Ulukhaktok, 60% said they smoke every day and 25% are non-smokers, while in Aklavik these figures are 38% and 45% respectively. In both communities, peer pressure was the biggest reason to start smoking. Smokers in Aklavik expressed a much greater willingness to quit. In Aklavik, "health concerns" were mentioned by 56% of ex-smokers, but were mentioned by only 29% of ex-smokers in Ulukhaktok. A total of 52% of women in Ulukhaktok reported smoking during their most recent pregnancy, compared to only 30% in Aklavik. Aklavik smokers smoked more than Ulukhaktok smokers. The teams launched a second smoking cessation challenge, the Be Smoke-free Challenge, in November 2010. Community responses were excellent, with 33% of the total population of Aklavik signing up, and 24% in Ulukhaktok. More non-smokers than smokers entered, and slightly more women and girls than men and boys.

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File No: 12 408 142
Region: IN, GW, SA, DC, NS, SS
Licence No: 14982
Location: Community health centres; Hospitals; Clinic laboratories

RHD alleles in prenatal patients from northern Canada
No research was conducted under this license in 2011.

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File No: 12 408 184
Region: DC, NS
Licence No: 14981
Location: Yellowknife Primary Care Clinic and Stanton Territorial Hospital; Fort Simpson Clinic; Behchokò Clinic; Dettah Clinic

Evaluation of the electronic health record (EHR) system used in the Northwest Territories
No research was conducted under this licence in 2011.

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File No: 12 408 143
Region: NS
Licence No: 14932
Location: Behchokò; Gamètì; Wekweètì; Whatì; Yellowknife

Tłı̨chǫ Natsedzi Nihtsi: Tłı̨chǫ healing wind project / promoting sexual health
Despite many well-intentioned programs and policies, the burden of illness among rural Aboriginal communities continues to grow, particularly in the North. In 2006, the rate of sexually transmitted infections (STIs) in the Northwest Territories was eight times the Canadian rate, at 20.4 per 1,000. In the same time frame, the rates in the Tłı̨chǫ Region were three times the NWT rate, at 67.5 per 1000. This summary describes how four rural and remote Aboriginal communities reduced their rates of syphilis and improved sexual health in the relevant age groups. The Tłı̨chǫ Community Services Agency (TCSA) Board and the Tłı̨chǫ Government strongly supported the development of community research skills to provide the base for programs and policies that fit with regional priorities, including sexual health. Traditional clinically based models were ineffective in reducing the STI rates in the region, so the TCSA designed a community-based strategy, which began with visits by community leaders to every household to provide information for families. Next, a region-wide survey conducted by trained community-based researchers showed how people learned about sexual health, and what their attitudes were towards related issues. The follow-up activities were hard to implement; people who were expected to do the knowledge translation were already busy in their full-time TCSA positions, and thus communication and program development were uneven. To fill this gap, a

team of young Tłı̨chǫ adults was recruited in May of 2009 to be trained as researchers and communicators. They worked with health professionals and others to develop, conduct and evaluate research to ensure that programming and policies continued to respond to community needs and priorities. The Community Action Research Team (CART) was trained by local people in cultural values, and by academics in research and communication skills. CART developed a series of programs and resources based on the survey findings. Examples include resource materials (e.g. pamphlets, booklets, manuals, posters, etc.), media (e.g. radio, DVD, web, blog, etc.), and community events (e.g. workshops in the community, youth conferences, puberty camps for boys and for girls, focus group discussions). Research and communications training and mentoring were provided by CIETcanada, an international non-government research organization. A second survey was conducted in 2010 to measure progress. That study revealed that condom use was making a difference, as was participation in CART-related activities. This was an integrated program; at the health centre, the public health nurse trained one of the community health representatives to trace and visit contacts in the communities and encourage people to come to the clinic for testing. The education system welcomed classroom presentations. The CART members created a DVD for YouTube featuring local actors and elders. The integration of community, public health, education and social programs and academic perspectives created a collaborative approach that led to a series of activities to sustain the low rates of infection, and to support behavior change regarding sexual health. This is an on-going program, and activities will continue, with collection of biomedical data, frequent focus groups with affected age groups, targeted activities and regular evaluations to monitor the effectiveness of programs.

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File No: 12 408 183 **Licence No:** 14899
Region: IN, GW, SA, DC, NS, SS **Location:** Health Authorities of the NWT

Achieving high performance in health care priority setting

Between January and April 2011, we conducted an on-line survey of senior executive team members at the Regional Health Authorities across Canada. We received 92 responses, with 4% of total respondents from the Northwest Territories, representing four Health and Social Services Authorities. The survey inquired about structures, process features and behaviors related to organization-wide resource allocation decisions in the health sector. Decision making rules and procedures, enabling and constraining factors, criteria, participation, and internal and external communications were among the topics addressed. Among key findings were the following: about one-half of respondents indicated that their organization used primarily a formal process for resource allocation, while the others reported that political or historical factors held sway. Seventy percent of respondents agreed or strongly agreed with the statement, “our resource allocation process is fair”. Just over one-half assessed their own process as ‘good’ or ‘very good’. Complete results are available upon request to the investigators.

PHYSICAL SCIENCES 2011

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File No: 12 404 750
Region: DC, SS
Licence No: 14964
Location: From the Mackenzie River to approximately Birch Lake

Landscape scale flooding in the Great Slave Lake Plain
A comparison of tree growth records from sampling in 2010 and temperature and precipitation records from Fort Providence and Hay River suggested growth of trees in this region was influenced by a combination of temperature and precipitation. The relationship is convoluted in recent decades as many of the sampled trees became submerged by rising water, which affected their growth. In 2011, 14 new sites and multiple species (white spruce, tamarack, jack pine) were sampled in areas thought to be unaffected by rising lake levels, which may provide a more dependable climatic relationship and strengthen confidence in results. In addition to the tree core samples, two lake-core samples from Caen Lake were obtained, which will aid in the understanding of past climates of the region. Tree- and lake-core samples are currently being analyzed. Aerial photographs and satellite imagery of 12 lakes in the study area showed that some had dramatic changes in size between the late 1940's and 2010, while others had changed little. Most of the study lakes had flooded large areas in the late 1940's, up to 1971, were smaller by 1984, and then increased. Some grew to 8 to 10 times their earlier size.

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File No: 12 404 768
Region: IN
Licence No: 14916
Location: Arctic Ocean

ICESCAPE - Impacts of climate on ecoSystems and chemistry of the arctic pacific environment
No research was conducted under this licence in 2011.

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File No: 12 404 756 **Licence No:** 14980
Region: GW, NS **Location:** Point Lake; Russell Lake; Damoti Lake; Bell Lake; Rapitan; Yellowknife

Precambrian banded iron-formations: palaeoceanographic, palaeoclimatic, and palaeobiologic implications

During 2011, we reviewed the sampling conducted in 2010 in collaboration with staff from the Northwest Territories Geoscience Office. Activities were partially funded through a grant from the Canadian Circumpolar Institute (CCI Research Grants Program), and the Natural Sciences and Engineering Research Council of Canada (NSERC). Traditionally, investigations about banded iron formations (BIF's) and associated sediments have focused on sequences from South Africa, Australia, India, and Brazil. Geochemical studies on BIF's from Canada, especially from the NWT, however, are still scarce. Geochemical characterization of BIF's from the Northwest Territories provides relevant information to our understanding of the atmospheric evolution of Earth, as well as the chemical composition of the oceans during the Archean-Paleoproterozoic (2500 my ago), which ultimately lead to the appearance of animal life on Earth (~750 my ago). As a result of this work, two communications will be presented at (1) the 22nd Goldschmidt Geochemistry Conference (Montreal, June 2012, see attach), and (2) the 39th Annual Yellowknife Geoscience Forum (November, 2012). In addition, one paper about the geochemistry and geochronology of BIF's from the Northwest Territories is under preparation.

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File No: 12 404 735 **Licence No:** 14924
Region: IN **Location:** Ulukhaktok base camp

Northern base and precious metal potential, Victoria Island (NWT) and Nunavut

Major discoveries and achievements in the field (so far) include: (1) completion of the planned mapping block in the Proterozoic rocks; (2) completion of the follow up to the stream sediment survey; (3) completion of the mapping and subdivision of the Paleozoic succession; (4) documentation of the chemical heterogeneity of the volcanic succession, which indicates the existence of a complex feeder system with multiple vents; (5) discovery of unconsolidated scoria, spatter and fumarolic deposits, and of pillow-hyaloclastite deposits, allowing us to localize vent complexes; (6) the association of native copper deposits with these fumarolic vent deposits. This provides, for the 1st time, a context for the occurrence of the native copper in the region; (7) lateral facies and thickness variations of lahar-like deposits implying infilling of pre-volcanic topography; (8) discovery of volcaniclastics and exhalites at the Killian-Kujjua transition, marking the awakening of the volcanic system at that time; (9) recognition of pepperitic deposits on the fluviatile sands of the Kujjua; (10) recognition of coarse volcanic deposits (possible agglutinate); (11) Discovery of two feeder complexes, that include sulphide-rich propagator tips. This suggests that wallrock assimilation did indeed trigger immiscibility in places; (12) discovery of a sub-sill gossan zone, including rheomorphic breccias, hybrid magma bodies, graphitized black shales, and extensive sulphide stringers in the footwall; (13) discovery of two more oxide-sulphide skarn systems associated with sills; (14) discovery of ankaramitic lavas, which implies that primitive magmas were capable of reaching the surface, and so increases the size of the exploration target. Community Engagement: Two graduating high-school students were involved as geological assistants for 2 weeks. Three Inuvialuit

archaeological sites were discovered and reported to the ILA.The two OHTC wildlife monitors were extremely helpful, and we provided wildlife sighting logs to them.

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File No: 12 404 679
Region: DC, GW, SA
Licence No: 14870
Location: Inuvik; Norman Wells; Fort Simpson; Nahanni Butte; Wrigley

Recent changes in carbon source-sink relationships and greenhouse gas emissions in forest and peatland ecosystems along the Mackenzie Valley region of Canada
Summary of research not provided for this 2011 licence.

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File No: 12 404 777
Region: IN
Licence No: 14957
Location: Esso Tuk Base 800 m east across Tuktoyaktuk Harbour from Tuktoyaktuk

Tuk Base demolition supplementary sampling
During the 1970's and 1980's Imperial Oil built a logistic base on the east side of Tuktoyaktuk Harbour called Esso Tuk Base. The land is Inuvialuit Private 1 (a) Land and is managed by the Inuvialuit Land Administration. Since about 2006, Imperial Oil has been cleaning up the site by removing old drilling supplies and equipment that is not required. Buildings and fuel tanks were demolished at the site during the summer of 2011. The debris from the demolition was sent to the south for disposal. During past clean-up activities at the site, soil and water samples were collected to look at areas that may be contaminated by substances such as hydrocarbons, metals and salt. The past results found soil contaminated by hydrocarbons. In 2011, soil samples were collected to better understand the size of contaminated soil areas. Groundwater samples were collected from monitoring wells to continue the existing ground water monitoring program. Soil and water samples were sent for analysis at a laboratory in Edmonton. The soil results have helped better determine where the boundary between contaminated soil and clean soil is located. The water results showed that contamination is not moving through the groundwater.

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File No: 12 404 729
Region: IN
Licence No: 14834
Location: Arctic Ocean

O-buoy measurements of ozone, carbon dioxide and bromine oxide over frozen surface of Hudson Bay and Arctic Ocean

O-buoy instrumentation package is capable of long term measurements of the concentrations of bromine monoxide and two important greenhouse gases (ozone and carbon dioxide), along with a full suite of meteorological parameters, ice drift, sky and ice conditions. One of the two units that belongs to Air Quality Research Division of Environment Canada was deployed with the help of the Canadian Extended Continental Shelf Program at latitude 88.15° N and longitude 157.49° W on September 5, 2011. Data collected are transmitted on daily schedule via satellite and displayed on the public web site. Seven weeks of data have been collected, since the deployment. Data are in the process of being integrated into the Marine Weather Forecasting and International Artic Buoy Programs. O-buoy measured carbon dioxide and ozone concentrations are within the concentration range recorded by an identical unit over the ice of Beaufort Gyre. The project results were reported at the NWT IPY conference held in Inuvik in January 2011. Data is currently being analyzed and the most interesting findings will be presented at IPY conference in Montreal in April 2012.

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File No: 12 404 707 **Licence No:** 14859
Region: IN **Location:** South Melville Ice Cap

Melville Island South Ice Cap mass balance and snow pollution

Measurements of snow accumulation and ice melt were performed at 21 pole locations on the Melville South Ice Cap by D. Burgess and J. Zheng on April 18 and 19, 2011. The Melville Island South Ice Cap is a small plateau ice cap (76 km2 in size) that is located on the western portion of Melville Island in the Canadian high Arctic, NWT. Pole measurements indicate that the ice cap, as a whole, has thinned by 94 cm, which equates to a loss of 0.072 km3 (or 1 km x 1 km x 0.072 Km) of water to the ocean over the past year, as a result of warm temperatures during the summer of 2010. These melt rates are second only to 2007, which was the year of greatest mass loss experienced by the ice cap, since the record began in 1963. Temperature data downloaded from the automatic weather station on the ice cap indicate that the 2010 summer melt season extended from early June to late August, with periods of sub-zero temperatures in early July and early August. Recent thinning has resulted in large areas of bedrock being exposed within the interior sections of the Melville South Ice Cap. These areas of bedrock have likely been covered by ice for several thousand years. Further investigation of these sites may offer insight into the age of the ice cap, and possibly the climatic conditions that prevailed at that time. Continued monitoring of the Melville South Ice Cap is important, as the rapid changes experienced by this ice cap are valuable for gaining insight into long-term climate change over the western Canadian Arctic region. Mass wastage of ice caps across the Canadian high Arctic is currently a significant contributor to global sea-level rise.

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File No: 12 404 325
Region: IN

Licence No: 14942
Location: Garry Island, Mackenzie delta area; Illisarvik, western Richards Island;Inuvik, near the Dempster highway; Paulatuk, near the Community Red Lake; Bar C; Seal Lake; Dennis Lagoon

Permafrost and climate change, western arctic Canada
In 2011, we visited three sites for our research activities. We made two separate visits of 10 days at the Illisarvik drained lake site on Richards Island. There, we began to measure the small earthquakes that happen when ice wedges crack. We installed little data loggers that are meant to record ground shocks. They have not been used in the western Arctic before, so their installation was an experiment. We went to Paulatuk, in July, with Dr. Ross Mackay. Our research there was concentrated on ground temperatures and abrasion of rocks, as before. We continued our studies of permafrost conditions near Inuvik. In 2012, we will write up data on tilting of trees above permafrost. We have published two papers this year, one on changes in vegetation at the pingo near Paulatuk, and one on the place names of Herschel Island. The paper on vegetation at Pinguksayuk is the first paper to report changes in the distribution of willows in the western Arctic. It compared photos taken in 1910 with present conditions. A large amount of our work in 2011 was focussed on preparing a book about Herschel Island for publication. This will be available in April 2012. It will be 252 pages long and have over 400 photos, both historical and taken in the last 10 years.

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File No: 12 404 534
Region: GW

Licence No: 14919
Location: Near Fort McPherson

Chronology of thaw flow and geochemistry of associated massive ground ice. Fort McPherson, Northwest Territory, Canada.
In May and June 2011 fieldwork was undertaken in the Stony Creek watershed (NWT), to study the impacts of retrogressive thaw slumps on the terrestrial and aquatic ecosystems. The work was performed by students and professors from the University of Ottawa, with valuable field assistance provided by Gwich'in monitors from Fort McPherson. Below we provide the tasks performed during our field season and anticipated outcomes.: (1) Data loggers that record water quality measurements, such as water level, conductivity and turbidity, were installed in streams above and below two thaw slumps, to monitor the quality of clear tundra streams and streams impacted by slump runoff. At these two sites, stream velocity measurements were taken to calculate ionic and sediment fluxes used to determine the contribution of slump runoff to the overall stream budget; (2) A survey of stream water quality in the Stony Creek watershed was performed, during both field campaigns. Here, stream water samples were collected at the mouth of Stony Creek, at several locations above, within and below the thaw slumps and from clear tundra streams. The samples were analyzed for major dissolved ions and suspended sediments. The data will allow us to assess the impacts of slumps on the water quality downstream; (3) Permafrost drilling was undertaken in a thaw slump, to obtain samples of ancient peat and soil, in August, 2011. The peat will be analyzed for iodine, iodine-129 and carbon-14 using facilities at the University of Ottawa. The permafrost was also analyzed for major ions and stable isotopes to characterize the sediment in the thaw slumps and permafrost

melting. The outcome of these analyses will allow us to investigate changes in the fallout of iodine-129 in the recent past, as well as hundreds of years in the past.

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File No: 12 404 716
Region: SA, NS
Licence No: 14844
Location: Grouard Lake; Lou Lake; Gamètì; Cole Lake

GEM Great Bear magmatic zone/iron oxide copper-gold deposit project
The Great Bear magmatic zone is a geological belt that extends from Great Bear Lake to Great Slave Lake. The belt hosts two iron oxide-copper-gold (IOCG) deposits and has a very high mineral potential for other undiscovered IOCG and affiliated deposits. It remains, however, significantly under explored. The current project, within the Geomapping for Energy and Minerals program, and its partners have now laid a solid geoscientific foundation for exploring IOCG in the region and for land use planning. In summer 2011, NRCan conducted fieldwork in partnership with the Community Government of Gamètì, academia, and Fortune Minerals. The project models, techniques and mapping protocols for IOCG systems were tested southwest of Lou Lake and east of Gamètì. While based in Gamètì, Tłı̨chǫ community members were employed and helped test the mapping protocols on an area centered on the historic Fab Lake showings. Field observations confirm the effectiveness of the protocols and highlight the ability of IOCG systems to create affiliated mineralization, such as albite-hosted uranium. Interim results were presented nationally and internationally, including at the Yellowknife Geoscience Forum, with formal publications to follow. Results are attracting attention of exploration companies and scientists worldwide and pave the way for a new cycle of mineral exploration in the region and new collaborations.

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File No: 12 404 763
Region: NS
Licence No: 14898
Location: Fortune Mineral's NICO property, along the route of a proposed all-weather access road from Highway 3

Environmental baseline surveys of the Fortune Minerals Ltd. NICO project
No research was conducted under this licence in 2011.

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File No: 12 404 359
Region: IN, GW
Licence No: 14836
Location: Mackenzie Delta; Richards Island

Mackenzie Delta shallow gas and permafrost studies

This multi-year project attempts to quantify geohazards and environmental considerations related to release of methane gas from aquatic and terrestrial areas in the outer Mackenzie Delta, with special emphasis on the controls of permafrost and gas hydrates. We conducted two field programs in 2011. In late-March, we deployed two aquatic moorings, to record the acoustics (sound characteristics) of gas discharge at two of our gas seep study sites. We were then able to convert the acoustic data in gas flux measurements, to investigate temporal variability in gas discharge. We also deployed two dissolved oxygen sensors, to investigate changes in dissolved oxygen concentration over time. In October, we deployed water column samplers for analysis of water properties at three sites. Our research results have been submitted to a journal for publication and have been presented at several national and international meetings. This work will ultimately assist in understanding if the warming permafrost and gas hydrate deposits found in outer the Mackenzie Delta pose a hazard to hydrocarbon development or surface activities and also assist to calibrate fluxes of greenhouse gases.

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File No: 12 404 743
Region: IN
Licence No: 14923
Location: The coastline of the Beaufort Sea, from the Alaska/Yukon border to the Northwest Territories/Nunavut border

Assessing the potential for environmental sensitivity index mapping in the Arctic using synthetic aperture radar

In late July-early August, we collected geo-tagged oblique video and audio commentary over almost 3000km of NWT coastline, from Alaska to Nunavut. RADARSAT-2 and TerraSAR-X satellite imagery were acquired at different periods of time and at different incidence angles over the study sites. All study sites are also covered with optical data (SPOT and LANDSAT). Radar and optical data analyses will be conducted independently, to determine the most suitable techniques and optimal datasets to differentiate the shoreline types (intertidal and supratidal zones). Textural analysis and polarimetric data will be generated and used with ancillary datasets, such as bathymetric data, surface deposits maps and wind data to classify shoreline type. Comparisons between the traditional approach (oblique video) and remote sensing techniques will be conducted to verify if the satellite products are as reliable as the traditional approach. A series of ground plots was also completed in Ivaavik National Park and in the Anderson River *Migratory Bird Sanctuary*. An intensive ground program was also completed on Herschel Island, where we also acquired 2 hyperspectral images from the European satellite CRIS. The shoreline video will be interpreted into a Beaufort Coastal Sensitivity Atlas and research results on satellite analysis will be completed through the winter and reported next year.

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File No: 12 404 752
Region: NS
Licence No: 14884
Location: Matthews Lake; Courageous Lake; Dumbell Lake; Jolly Lake; Sandy Lake

Courageous Lake project
The 2011 environmental baseline program collected data, to characterize the physical and biological setting of the proposed Courageous Lake project area. The following activities were carried out:

Meteorology: The meteorological station and wind tower were maintained. Ten snow course surveys were completed at representative locations across the project area.

Air Quality: Dust fall monitoring was undertaken at five stations, every 30 days over the summer. Noise: Six stations were monitored for 24 hours in spring.

Hydrology: Eight hydrological stations were established. Water current velocity and related flow discharge measurements were determined throughout the open-water season. Current meters were installed in Courageous Lake, during the open water season, to obtain data.

Bathymetry: Surveys were completed at Courageous Lake, Matthews Lake, and two unnamed lakes of interest.

Hydrogeology: Two groundwater wells were drilled and Westbays installed. Packer testing was undertaken, to determine hydraulic parameters of aquifers. Water samples were taken from aquifers below the permafrost. Data loggers were installed on existing thermistor strings. Measurements were collected from thermistor strings.

Aquatics: Water quality was sampled at 14 lakes and 9 streams three times over the summer. A subset of these lakes was sampled in March. Sediment quality and primary and secondary producer communities were sampled in mid-summer.

Fish and fish habitat surveys: 65 lakes and 43 streams were sampled. 15 lakes and 13 streams were identified as fish bearing. 2 lakes and 25 streams were found to be dry or not flowing during freshet. Sensitive Habitat Inventory and Mapping (SHIM) were undertaken for Matthews Creek. Ecosystems: Terrain mapping and soil samples were collected, in conjunction with vegetation surveys, in the project area. Field surveys were conducted to identify wetlands in the proposed project area. Baseline reports will on the above aspects will be available in March 2012, when data analysis and report writing has been completed.

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File No: 12 404 652
Region: IN
Licence No: 14917
Location: Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region

ArcticNet: an integrated regional impact study of the coastal western Canadian Arctic.
Since 2004, ArcticNet has been using the Canadian research icebreaker CCGS Amundsen to carry out sampling operations in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region, as part of its ongoing marine-based research program. The central aim of this research program is to study, on a long-term basis, how climate induced changes are impacting marine ecology, contaminant transport, biogeochemical fluxes, and exchange processes across the ocean-sea ice-atmosphere interface in the Canadian Arctic Ocean. In 2011, sampling operations in the

Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region were carried out from the CCGS Amundsen, from 11 August to 04 October. During these 55 days, researchers sampled at over 50 oceanographic stations. Sampling operations included deployments of a CTD-Rosette, box corer, Agassiz trawl, and plankton nets. A total of 4 sub-surface oceanographic moorings were deployed. In addition, a multitude of oceanic and atmospheric parameters were measured continuously, using the Amundsen's impressive array of continuous samplers (SM-ADCP, EK-60 scientific echosounder, water surface pCO2 and CTD on track system, foredeck and top bridge meteorological towers, ceilometers, radiometer and all-sky camera). The ship's EM302 multibeam sonar and Knudsen sub-bottom profiler collected over 15,000 km of high-resolution bathymetry and sub-bottom data. From the vessel's wheelhouse, hired Inuvialuit Marine Wildlife Observers sighted and identified marine mammals and seabirds. Data collected from this multi-year program will contribute to a better understanding of the impacts of climate variability and change on the physical, biological and geochemical processes in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region.

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File No: 12 404 687
Region: NS

Licence No: 14943
Location: Daring Lake Terrestrial Ecosystem Research Station

Controls on carbon and nutrient cycling in arctic tundra

This research looks at: What are the principal controls on the functioning of common tundra ecosystem types, and how are they likely to be affected directly and indirectly by climate change? In 2011, most of the summer was spent at Daring Lake collecting vegetation and soil samples from a greenhouse warming experiment. Samples are currently being processed, in order to determine the potential for warming to alter nitrogen and phosphorus availability, as well as vegetation change in response to rising air and soil temperatures. Other progress in 2011 includes: a manuscript is currently in review with *Global Change Biology*, demonstrating that birch shrub apical growth, at the Daring Lake research site, is limited as much by the availability of phosphorus as it is by nitrogen. This is a very surprising result. For many researchers across the Arctic, the focus has been on nitrogen. The biogeochemical cycling of phosphorus is fundamentally different. Based on this result, our understanding of how low arctic terrestrial ecosystems function, as well as how plant growth and vegetation change will be affected by climate warming, will be determined by the changes in both the availability of phosphorus and nitrogen.

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File No: 12 404 774
Region: DC

Licence No: 14946
Location: Ekali Lake (Ezáa Łue Túe); Sanguez Lake (Tł'onie Túé); Gargan Lake (Tłįtętįį); Deep Lake (Dechį Náʔa); McGill Lake (Tthets'éhk'e')

Ecological assessment fieldwork for Lue Túé Sulái (the Five Fish Lakes) candidate cultural conservation area

The survey was conducted in August 2011 and was supported by the Jean Marie River community and a larger DFN-AAROM collaborative management initiative. Three of the five lakes within the candidate area were sampled: Ekali, Sanguez, and Gargan Lakes. An inflow, centre and outflow site were established for each lake. Some measurements were taken at the sites and water samples from the surface were shipped to and analysed by Taiga Labs, Yellowknife. The water quality within all three lakes is generally good. Water temperature was uniformly warm, pH was slightly basic, major ion concentrations were moderate, and nutrient, chlorophyll and metal concentrations were low. However, dissolved oxygen was often reduced, mostly at depths below 5 meters in Ekali and Sanguez, but 50% saturation values were recorded for all depths within Lake Gargan. Shoreline observations were made for each station. Vegetation was similar and ranged from Black Spruce and Tamarack through Birch, Aspen & Willow to Alders, Dogwoods and Rosehips. Emergent vegetation generally occurred in the shallows and near shore sediment ranged from organic, woody debris to sandy and small rocks. Elders provided traditional knowledge, to identify spawning areas and good fishing sites for each lake and the creeks between them. General hydrological observations were also documented.

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File No: 12 404 769
Region: SA
Licence No: 14921
Location: The Northern Mackenzie Mountains, specifically in the Sheep Lake/Mountain River area

Late Proterozoic stratigraphy of northwestern Canada and its record of Earth system evolution

In July 2011, a research group consisting of geologists from Queen's University and Harvard University visited outcrops of the latest Precambrian sedimentary rocks in the Sekwi Brook region of NWT. The purpose of this research was to better understand the age and depositional setting of sedimentary rocks deposited during intervals of extreme glaciation and in which some of the earliest animal fossils in the world are found. Fieldwork consisted of mapping of these rocks and collecting rock samples for geochemical analysis. Early results include: (1) the most precise age estimate yet produced for one of these glacial events; (2)new data bearing on the water depth and oxygen content of the sedimentary basin in which these early animals resided. Importantly, the geological mapping has shown that some of the fossil occurrences, which based on prior mapping appeared to significantly pre-date other similar fossils globally, are in fact younger than thought and hence do not constitute an outlier that forces rethinking of earliest animal evolution. Nevertheless, the new work provides a valuable new geological framework for interpreting the environmental setting in which these early animals lived. This project ties in with an ongoing research program on similarly-aged rocks in Yukon.

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File No: 12 404 710
Region: IN
Licence No: 14895
Location: Sachs Harbour; A N/NW route approximately 200 Km from Sachs Harbour and then returning to Sachs Harbour along the same path

Polar airborne measurements and arctic regional climate model simulation project
The campaign polar airborne measurements and arctic regional climate model simulation project (PAMARCMIP) 2011 was performed from March 25, 2011 until May 06, 2011. The aircraft was operated by the Canadian Aviation partner Kenn Borek Air Ltd. Scientists from different research institutes, including Germany, Canada, and USA were involved in the project. We performed airborne measurements (127 flight hours) in the inner Arctic over six weeks and successfully completed a traverse from the North American Arctic (Barrow, Alaska) to the European Arctic (Longyearbyen, Svalbard). Northward flights were performed over the Arctic Ocean from Barrow, Inuvik, Eureka, Alert, Station Nord as well as Longyearbyen. We arrived in Inuvik on April 3, 2011 and left Inuvik on April 6, 2011. During this period we performed two research flights, measuring ice thickness, trace gases, aerosols and meteorological parameters over a key region of the Arctic. Unfortunately the planned landing in Sachs Harbour, with the aim to extend the endurance for the research flights, was cancelled, due to bad weather conditions. Measurements were also made during the ferry flights from Barrow to Inuvik on April 3, 2011 and from Inuvik to Resolute Bay on April 6, in the altitude range of 10 000 feet.

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File No: 12 404 493
Region: SS
Licence No: 14892
Location: Along the Hay River

Hay River ice jam study
The 2010 field research program brought members of the University of Alberta (U of A) team, and colleagues from the Department of Indian Affairs and Northern Development (DIAND) to the Town of Hay River, to observe, measure, and document river breakup ice conditions (April 19 to May 10). During breakup, U of A/DIAND field crews worked with the Town Flood Watch Committee, to measure ice jams and to document the river's breakup progression. Breakup was relatively uneventful that year, with low water/ice levels and no flood threat. Nevertheless, there were numerous ice jam formation and release events along the river, providing excellent scientific data to aid in the advancement of our flood forecasting models. Operational testing of these U of A ice jam flood forecasting models continued during breakup 2011. The timing of the onset of breakup, the expected peak snowmelt runoff stream flow and the time of arrival of the ice runs from were all predicted with reasonable accuracy. Further research is needed to identify when these incoming ice runs will actually stall upstream of the community, and breakup 2011 provided valuable data towards understanding this scenario. The U of A and DIAND researchers will be providing the Town of Hay River with an update on the flood forecasting model development project prior to breakup in 2012.

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File No: 12 404 717 **Licence No:** 14925
Region: GW, DC, SS **Location:** The Mackenzie River and its main tributaries

Geological carbon in the Mackenzie River Basin: sources and sinks of atmospheric carbon dioxide

In May and June 2011, the research team spent their third consecutive year sampling river sediments in the Mackenzie River Basin. Essential logistical support was provided by the Aurora Research Institute, Environment Canada, and the local communities. As in June 2009 river water and suspended sediment samples were collected from 'depth profiles' within river channels, using our custom-built, clean, depth sampler. At the same time, researchers used an 'Acoustic Doppler Current Profiler', to measure the speed of the water in detail. Analysis is ongoing. In 2011, we hoped to collect samples from the river as close to the freshet (ice break up) as possible, because this is when the rivers carry most of their sediment. The campaign was a success. The May 2011 samples are the most sediment-rich collected in the three years of work on the Mackenzie River. The increase in sediment concentration with water depth is also useful to us. It means each sample reflects different sizes and masses of particles, which can investigate. Researchers are currently analyzing the samples for their chemistry, to better understand the source of carbon contained in the water and sediments.

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File No: 12 404 713 **Licence No:** 14881
Region: GW **Location:** The Mackenzie River, near Inuvik; from shore, and near the ferry crossing, near Tsiigehtchic

Arctic great rivers observatory

This project studies the 6 largest rivers that flow into the Arctic Ocean: in North America, the Mackenzie and Yukon; and in Russia, the Ob', Yenisey, Lena, and Kolyma. We are measuring the concentration of naturally occurring chemicals, such as carbon, nitrogen, and phosphorus, in these rivers to obtain baseline information about the flow of these chemicals to the ocean, and to help us understand how climate change is impacting Arctic rivers. This is a 3 year project, and we are now nearing the end of the third year. Most of our samples have been collected, but laboratory analyses are still underway. All data from this project is posted on a public website (http://arcticgreatrivers.org) and is available for free download by the public. We took 2 sampling trips to the Mackenzie River in 2011. In late May and June, we took daily 1 liter samples of river water from the shore near Inuvik, as well as 3 samples by boat near the Tsiigehtchic ferry crossing. In September, we took one sample by boat near Tsiigehtchic. All boat samples were less than 15 liters of water. During our 2011 sampling year, we were fortunate to have Will Storr (of Fort McPherson / Tsiigehtchic) provide local field support.

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File No: 12 404 661
Region: DC
Licence No: 14937
Location: Historic seismic lines near the Mackenzie Highway, between 61-62°N and 120°30'-121°30'W; several sampling sites will be located in the Scotty Creek Research Basin

Investigating the effects of winter overland travel in sub-arctic boreal forest
The objective of this project is to investigate terrain conditions associated with transportation infrastructure, specifically seismic lines, in discontinuous permafrost. In July 2011, researchers met with staff from the Liidlii Kue and Jean Marie River First Nations, to discuss the project and opportunities for local involvement. Measurements were obtained at several road-accessible seismic lines. In areas underlain by permafrost, active layers were significantly thicker along seismic lines than in undisturbed areas. Subsidence in the order of centimeters was observed along the seismic lines, leading to wetter conditions and different vegetation. In August 2011, sites were established in 3 common terrain units adjacent to the Liard Highway: peat land, fen, and till. The sites were instrumented with shallow (1 m) ground temperature cables, soil moisture and air temperature sensors. Results from these sites will establish the natural variability of active layer freeze back between different terrain types. Deep (10 m) ground temperature cables were installed in the Scotty Creek basin at a channel fen, and at the center and edge of a degrading peat land. Shallow and deep ground temperature cables were also instrumented along a nearby winter road and seismic line. Results may indicate how line widths, line orientation, and ground-ice content relate to permafrost resilience along disturbance corridors.

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File No: 12 404 545
Region: IN, GW
Licence No: 14840
Location: Mackenzie Delta

Environmental studies across treeline
This study is a northern-based collaborative program initiated by the Renewable Resources Directorate, AANDC, in 2004. It is designed to enhance the understanding of environmental conditions in the region, through scientific studies and monitoring. In 2011, we continued to monitor permafrost and active layer temperatures in the Delta region, by visiting previously established sites by helicopter and boat. This was the third year of active-layer freeze back monitoring, and results indicate that different terrain types freeze back in the same order each year, but there is significant variation in the timing of freeze back between years. This information will be useful for decision makers for permitting winter overland travel. In 2010, we removed tall shrubs from an abandoned delta drilling mud sump in an attempt to promote freezing conditions. Lower ground temperatures were measured in 2011 in the sump cap at depths up to 3 m. Continued monitoring may indicate that vegetation removal is a valuable long term sump maintenance technique. Ground temperatures were measured near proposed Mackenzie Gas Pipeline stream crossings. The thermal regime of stream valleys is significantly different than adjacent uplands, and an understanding of these differences is important for pipeline construction in the region.

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File No: 12 404 545
Region: GW
Licence No: 14842
Location: Stoney Creek catchment, which runs parallel to the Dempster Highway and empties into the Peel River at Fort McPherson

Evaluating the environmental impacts of permafrost mega-disturbances along the Dempster Highway, NWT

This project studies the cumulative impacts of permafrost slumping on the land and water and addresses several landscape change, water and fisheries questions that have been determined through the regional Renewable Resource Council (RRC) gatherings, Gwich'in Renewable Resources Board meetings and the Gwich'in Water Strategy Workshop. This project studies the impacts of big slumps on streams and fish in the Peel Plateau. Mapping shows that there are hundreds of big slumps like those seen off of the Dempster Highway. The slumps are impacting the Rat, Willow, Vittrekwa, Trail, Road and Caribou Rivers, as well as Stony Creek. By looking at old air photographs we determined that the slumps are much bigger than in the 1970s. Studies tell us that the big slumps cause major changes to landscape and the streams and these changes impact what can live in the streams. The streams become choked with mud. Slumps are having impacts on water in the Peel River. The support of the Tetl'it RRC and the community of Fort McPherson have been a key to the success of this project. In 2011, the CIMP project funded about 100 days of employment to community members from Fort McPherson. Community members helped researchers decide where to sample water, to travel safely and respectfully on the land and they have made many observations of changes to the environment. Community monitors have collected information on plants, berries, permafrost, water and the health of the streams. The Tetl'it RRC played an important coordinating role and administered funds to community researchers. The study is providing information to support fish and wildlife management, and planning and maintenance of community and transportation infrastructure. The data users include the Department of Fisheries and Oceans, the Community of Fort McPherson, the Department of Transportation and the Gwich'in Land Use Planning Board.

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File No: 13 404 770
Region: IN,GW
Licence No: 14928
Location: Along about 5 km of traditional trail between about 2 km west of Aklavik and 7 km west of Aklavik, west of the junction with the Peel Channel

Proposed Aklavik west road and bridge - Hydrotechnical and geotechnical field investigations

In 2011, Nehtruh-EBA Consulting Ltd. did a research program at Bridge Creek, about 3.5 km west on the traditional trail from Aklavik, NT to the Richardson Mountains. The people in Aklavik have made some different bridges over the creek, but the bridges usually wash away in spring. So, in June 2011, Nehtruh-EBA sent a hydrotechnical engineer and a surveyor to look at the bridge site, and take some measurements of the stream bed and flood levels. They also took

measurements at the Water Survey of Canada gauge on the Peel Channel, so that they would have some flood history with which to compare. Two local environmental monitors helped with the work. Now the hydrotechnical engineer can design a bridge high enough not to wash away when there is a flood. The information from the surveyor helps him to do his calculations. In August 2011, Nehtruh-EBA asked an air photo company to fly over the first part of the traditional trail and take some photos looking straight down. The photos overlap, so if you look at them through special glasses, it is like a 3D picture. This 3D picture helps the engineers see problem areas along the trail, and helps them think of ways to keep the trail good for travelling. It also helps them find sand or gravel to improve the trail if needed.

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File No: 12 404 621 **Licence No:** 14851
Region: NS **Location:** Daring Lake

Exchange of carbon gas fluxes over low arctic tundra

We continued our research into carbon fluxes from arctic tundra, near Daring Lake, NWT, in 2011. Instruments were set up in early May and continued operating until late August. We made measurements at 4 different tundra types: fen, mixed heath, low shrub heath and tall shrubs. At each site, we measure carbon dioxide fluxes between the tundra and atmosphere. The overall objective is to see if the tundra is taking more carbon dioxide out of the atmosphere by plant photosynthesis than it is releasing by respiration. If more goes in than goes out, the tundra is a sink for carbon and if more goes out, it is a source. As carbon dioxide levels in the atmosphere build up from burning gas and oil, we hope the tundra is a sink, which indeed our 2012 results seem to show for all the sites. We measured important differences in how much carbon dioxide is taken out among the sites. For example, the tall shrubs are a larger sink than the heath and low shrubs, but about the same as the fen. This research helps us to understand how arctic tundra will influence the amount of carbon dioxide in the atmosphere and thus how it might influence the climate today and into the future.

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File No: 12 404 767 **Licence No:** 14913
Region: SS **Location:** Near the former Pine Point Mine

Pine Point project (N-204)

Seven dust fall monitoring stations were installed and over 90 samples collected, along with noise monitoring. Water bodies at all deposit areas, as well as Great Slave Lake, were surveyed to characterize water quality and measure baseline metals in sediment. Fish populations were surveyed at over 50 sites in the deposit areas and habitat assessed. A 170 meter deep borehole was drilled and tested at the R-190 deposit and hydraulic testing was done at the upper Pine Point Formation. Six monitoring wells were drilled and installed at the N-204 deposit, and hydraulic testing and sample collection was completed. Four site visits were completed for hydrologic flow characterization, and hydrometric monitoring stations were installed along the Buffalo River and Twin Creek, to record surface water elevations. Fifty-onesamples from deposit

areas were tested for metal leaching potential. Soils and vegetation field data were collected at 80 inspection sites within the six deposit areas, to classify terrain and ecosystems, and to characterize soils for soil salvage. Forty-five plant samples and 22 soil samples were collected from a subset of the inspection sites, to determine levels of baseline metals. The study area was surveyed for wetlands, which were then mapped. An archaeological assessment was conducted and four prehistoric sites were recorded. Potential land users and key socio-economic informants will be identified and interviewed in the fall and winter, to determine existing levels of land use near the project area and to characterize the social and economic environment. Traditional knowledge studies are planned to be conducted in 2012, in collaboration with aboriginal groups near the Pine Point project area (Akaitcho Territory Government, Deh Cho First Nations, Deninu Kue First Nation, Hay River Dene Band/Katlodeeche First Nation, Northwest Territory Métis Nation, and West Point First Nation).

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File No: 12 404 733 **Licence No:** 14894
Region: NS, SS **Location:** The Kennady Lake watershed

De Beers - Gahcho Kué environmental monitoring program
Baseline environmental studies were completed during the spring, summer and fall in the area surrounding the Gahcho Kué project in 2011. The surveys were conducted with the assistance of representatives of the Yellowknife Dene First Nation and Łutsel K'e Dene First Nation. The studies encompassed weather, air quality, fisheries, water quality, and hydrology. The hydrological regime was monitored through measurement of water levels and river flow between each water body. Meteorological data was recorded starting in August from the weather station at site. Noise monitoring was not required in 2011. Fish surveys were completed in small lakes and streams throughout the local study area and at Kennady Lake. The surveys included gill netting, electro-fishing and minnow trapping. Fish habitat was also mapped in the surrounding streams and small lakes. Water samples were collected to update water quality information for Kennady Lake, and surrounding and downstream lakes. Stream outlets and lakes were surveyed, along with the watershed adjacent to Kennady Lake. Benthic invertebrate sampling was also completed in the lakes.

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File No: 12 404 773 **Licence No:** 14944
Region: NS, SS **Location:** Within Avalon's Thor Lake Property, 100 km southeast of Yellowknife

2011 baseline studies for Avalon Rare Metals Inc. proposed Thor Lake rare earth element project - surface water hydrology and climate
The objective of the surface water hydrology field program was to characterize the surface water hydrology and meteorological conditions at the Thor Lake site. Surface water hydrology fieldwork, during 2011, included water level monitoring in the following lakes at the project site: Thor, Long and Cressy lakes. Water levels were recorded using a Hobo pressure transducer

and water level gauge secured to the lake or stream bed. Stream flow monitoring was completed at the outlets of Thor, Long, Fred and Murky lakes. Stream flow measurements were taken following standardized methods for stream flow in May and October. Meteorological conditions were monitored at the Thor Lake site, using an AXYS Watchman 500 weather station. Data were periodically downloaded and compiled; station maintenance was also completed. Lake water levels, stream flows, and meteorological data was compiled, analyzed, and compared to regional data. Deton'Cho Stantec produced an updated technical data report in December 2011.

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File No: 12 404 708
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Region: NS, SS
Location: Barnston River; Beaulieu River; Hoarfrost River; Waldron River

NT Hydro hydrology monitoring program
In May 2010, NT Hydro's contractor, Water Survey of Canada, installed water gauging stations on the Hoarfrost, Barnston, Beaulieu and Waldron Rivers. Gauging stations are remotely operated and collect hydrology data on a full time continuous basis. The goal of the program is to collect hydrology information, to better understand the hydrology and hydro potential of these rivers in this area of the NWT. The four stations continue to collect data to develop a complete hydrology record. Hydrology information collected includes: water level, water and air temperature, water volume and velocity. Data will continue to be collected for the next 2-3 years, to develop a hydrology record for the rivers. Once enough data has been compiled, NT, Hydro will be able to evaluate the hydro potential of these rivers.

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File No: 12 404 612
Licence No: 14935
Region: IN
Location: Mackenzie Delta

Coastal geoscience research in the Beaufort Sea and Mackenzie Delta
No research was conducted under this licence in 2011.

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File No: 12 404 529
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Region: SA
Location: Mackenzie Mountains near Norman Wells and Tulít'a

Geological fieldwork in Mackenzie Plain and adjacent mountains.
A team of eleven scientists from the Geological Survey of Canada (Calgary), University of Calgary, University of Ottawa, University of Saskatchewan, Texas A&M University, and James

Madison University did geological fieldwork based out of Norman Wells, for five weeks in July and August, 2011. Working with them was a Wildlife Monitor from Norman Wells. Two scientists also worked out of Tulít'a for one week in July, accompanied by a local Monitor. Helicopter, accommodation, and food services were provided by local businesses. Fieldwork involved helicopter visits or overland hiking to 458 rock outcrops on ridges and streams from the eastern Mackenzie Mountains to the Franklin Mountains. Locations and rock descriptions were recorded, and rock thicknesses and orientations were measured. Approximately 300 rock samples were collected, varying from fist size to slightly larger than a loaf of bread. Samples were shipped to labs at the Geological Survey of Canada in Calgary, or at the above mentioned universities, where they are undergoing paleontological, geochronological and organic chemistry analyses. Data are being used to produce new geological reports and maps of bedrock geology for the Norman Wells and Tulít'a region (NTS map areas 96C, 96D, 96E, and 96F).

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Region: IN, GW

Licence No: 14837
Location: Trail Valley Creek; Havikpak Creek; Denis Lagoon; Big Lake, 65 km W of Tuktoyaktuk, 130 km N of Inuvik; 75 km E of Tuktoyaktuk

Hydrological studies, Mackenzie Delta region

With a changing climate and increasing development, there is an urgent need for appropriate hydrological information (snow cover, soil moisture, soil temperature, and stream discharge) in the western Canadian Arctic. For example, the design of roads and pipelines requires estimates of maximum stream discharge, while rules controlling land access in the fall require estimates of snow cover and whether the soil is frozen. However, with a changing climate, the recent past may not be a reliable guide to the hydrological conditions in the near future. As a result, in order to limit the environmental impact of development, the research team needs better methods to predict future conditions. The research program is aimed at developing such improved methods, and over the last year has: (1) collected hydrologic data at two study sites, in order to extend the 20+ year data set; (2) extended the data collection by installing new state of the art equipment. This year, the research team installed a continuous GPS unit that will collect important snow and soil information; (3) continued to develop better methods to predict future changes in snow cover, soil moisture, ground thaw, and stream flow. Recent results consider the factors controlling the thaw of the upper layer of the ground over the summer period. This is an important step towards better predictions of the impact of a changing climate and developments on the hydrology of the region. Other results have considered the role of lakes on the hydrology and ecology of the Mackenzie Delta.

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File No: 12 404 728
Region: NS, SS

Licence No: 14880
Location: Snap Lake and the regional study area (33 km radius from camp)

De Beers Snap Lake Mine - 2011-2014 environmental monitoring program

Monitoring of water quality, sediment quality, zooplankton, phytoplankton, benthic communities, fish, fish habitat, and fish health was successfully carried out in the 2011 field season. The hydrology program monitored lake levels, stream-flow, and outflows; measured site runoff; and collected hydro-meteorological data. Additional water quality monitoring was conducted during construction and installation of the new diffuser. The 2011 aquatics program results have yet to be analyzed and reported. This information will be available in the 2011 Aquatic Effects Monitoring Program (AEMP) Annual Report for Snap Lake which will be submitted to the Mackenzie Valley Land and Water Board (MVLWB) by March 31st, 2012 and available on the MVLWB Public Registry online at (http://www.mvlwb.ca/mv/registry.aspx). Many parameters were measured as part of the 2011 geochemistry monitoring program. An annual site inspection to monitor site runoff/seepage, review the placement of materials, and identify any signs of acid generation was also carried out in September. The summary field report for this inspection is available on the Public Registry. The air quality monitoring program involved the collection and processing of meteorological data from the onsite weather station, as well as the measurement of particulate matter and dust-fall from sampling stations on site. No vegetation monitoring was carried out in 2011. As per the Vegetation Monitoring Plan, the next vegetation monitoring at Snap Lake will take place in 2013. The results of all these monitoring programs will be submitted in the 2011 Annual Report, which will be available on the MVLWB's Public Registry.

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File No: 12 404 727
Region: NS

Licence No: 14876
Location: The project area is on the Hearne Channel of the East Arm of Great Slave Lake, 90 km southeast of Yellowknife

Blatchford Lake, NT airborne gravity gradiometry survey

The objective of this research was to acquire high-resolution gravity gradiometer and aeromagnetic data, in the Blatchford Lake, NT area, centered on the Thor Lake rare earth element (REE) deposit. The gravitational field measured by this survey reflects lateral variations in the density of underlying rocks. The aeromagnetic survey measured magnetic properties of bedrock. Both data types are tools used in geological mapping. Understanding these gravity and magnetic data will help geologists map the area, assist mineral exploration activities, and provide information necessary for communities, aboriginal associations, and government to make land use decisions. The survey collected approximately 3,066 line km of data flown along parallel lines spaced 250 m apart. The flying height was at a nominal terrain clearance of 100 m. The horizontal gradient of gravity and the intensity of the total magnetic field were measured from the aircraft. The survey was flown between March 19, 2011 and March 23, 2011. Final data have been accepted for the survey. The data and maps were published on October 14, 2011. The data are available for free download from the Geoscience Data Repository for Aeromagnetic and Electromagnetic Data (http://gdr.nrcan.gc.ca/aeromag) and digital versions of the maps are similarly available from MIRAGE (http://gdr.nrcan.gc.ca/mirage). The survey results were presented at a poster session of the Yellowknife Geoscience Forum on November 15-17, 2011. The poster was entitled Geological significance of a new high resolution gravity gradiometric and magnetic survey over the Blatchford Lake Complex. The data acquired over the Blatchford Lake area are of high quality and will serve their intended purpose.

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File No: 12 404 718
Region: SS
Licence No: 14983
Location: The survey will be flown in an area 230 km from the Łutsel K'eDene First Nation, 305 km from the Deninu K'ue First Nation, and 215 km from the Smith's Landing and Salt River First Nation locations

South Rae, NWT aeromagnetic survey
No research was conducted under this licence in 2011.

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File No: 12 404 734
Region: SA, DC
Licence No: 14845
Location: Mackenzie Mountains - the Backbone Ranges and the Redstone Plateau, Coates Lake; Fortress Mountain; Ten Stone Range

Geology of the Redstone Copperbelt
Four weeks were spent in the field around Coates Lake in the Central Mackenzie Mountains. Detailed geological mapping was carried out, to support ongoing research and thesis work at the University of British Columbia (UBC), Vancouver, B.C. This was the final field season for the project and the fieldwork has provided a wealth of information, regarding copper mineralization in the Mackenzie Mountains. Further laboratory studies will continue at UBC and the results will be written up as a doctoral thesis. Initial results of the field studies have furthered scientific understanding of how copper is transported and concentrated in certain areas of the Earth. These results can be used to increase the efficiency of mineral exploration projects in the NWT and also in other parts of the world where similar geological environments can be found, for example: central Africa, Poland, eastern Russia and Afghanistan.

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Region: GW, NS
Licence No: 14979
Location: Point Lake; Russell Lake; Damoti Lake; Bell Lake; Rapitan; Yellowknife

Investigating the influence of Archean seawater composition on the evolution and diversity of microbial metallo-enzyme evolution, through the chemistry of Archean banded iron formation
The objective of this research project is to examine the chemistry of the oceans directly preceding the oxidation of our atmosphere at ca. 2.4 billion years ago (The Great Oxidation Event), by studying recently-discovered Neoarchean (2.8 to 2.6 GA) banded iron formation (BIF)

in the Northwest Territories. In August (2010), we explored these units for the first time and took transects of the sampling areas and a number of samples for petrographic and chemical analyses. In 2011, analyses determined the stratigraphic, initial petrographic and geochemical framework needed in order to conduct detailed geochemical analytical work that will be completed in 2012. Sampling sites included the ca. 2.62 billion year old BIF at Point Lake, which are interbedded with greywacke-mudstone turbidites, the ca. 2.85 billion year old BIF in the Central Slave Cover Group ~30 km north of Yellowknife, and detailed sampling of BIF belonging to the Central Slave Cover Group at the Northwest Territories Geoscience Office (NTGO) core lab. Thin sections for petrographic and chemical analyses have been made of these samples and chemical analyses are underway.

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File No: 12 404 766 **Licence No:** 14907
Region: NS **Location:** Lac de Gras

Diavik aquatic effects monitoring program 2011

Network program stations indicated an “early warning” or “low level” effect on water chemistry within Lac de Gras resulting from the mine. Analysis of benthic invertebrates indicated a range of effect designations. Effects on Procladius sp. density and percent Chironomidae were classified as “early warning” or “low level”; the effect on total benthic invertebrate density was classified as a “moderate”, and the effect on Heterotrissocladius sp. density was classified as a “high” level effect. Overall, benthic invertebrate monitoring results indicate mild nutrient enrichment. Results of a study to examine changes in the amount, number and types of tiny animals (zooplankton) and algae (phytoplankton) that live in the water of Lac de Gras indicate a pattern consistent with nutrient enrichment from the mine, similar to eutrophication indicators, measured as part of the aquatic effects monitoring program. Phytoplankton and total phosphorus measurements in the near-field area resulted in a “moderate” level effect designation while higher zooplankton biomass near the effluent resulted in a “high” level effect designation. Results of the lake trout study suggest that there has been an increase in mercury in the muscle tissue of lake trout, in both Lac de Gras and Lac du Sauvage, since 2005. The increase from baseline resulted in a “low” level effect designation. However, since the increase was observed in both lakes, it cannot be directly linked to the mine. The weight-of-evidence analysis confirmed the nutrient enrichment effect and concluded that there is strong evidence for a mild increase in lake productivity as a result of nutrient increases in Lac de Gras. There is some evidence suggesting potential low-level toxicological impairment of the benthic invertebrate community, although these findings have high uncertainty, because the link to contaminant exposure is not strong and the responses indicating possible impairment are not consistent with the multiple other responses indicating enrichment.

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File No: 12 404 736 **Licence No:** 14948
Region: SS **Location:** Blachford Lake Intrusive Suite of rocks, centered on Thor Lake, about 100 km southeast of Yellowknife

Petrogenesis of the Blachford Lake intrusive suite
Work completed during 2010-2011 involved processing samples collected during the 2010 field season. The samples were divided into two portions, one part was crushed and powdered for analysis to determine composition, and the other was used to determine mineralogy. A geochronological study was also initiated to determine the age of the Thor Lake syenite, a phase in the Blachford Lake intrusive suite, which has some historic controversy. The previous date of this unit was almost 100 million years (Ma) younger than the rest of the units of the Blachford Lake Intrusive Suite, far beyond what was expected and analytical error. Based on our study, we have shown the previous date to be incorrect. Fieldwork, during the summer of 2011, consisted of sampling carbonate bearing dykes along the shore of the Hearne Channel, Great Slave Lake. These dykes were sampled to determine if they had a relationship to the sedimentary rocks on the south-side of the channel, or to the Blachford Lake Complex; geochemical results which are currently pending will be used to distinguish. Rock sampling was also done on diamond drill holes provided by Avalon Rare Metals Inc. These drill holes intersected unusual rock types that were not encountered surface sampling, during the 2009 and 2010 field seasons. These new rock types are extremely rare and may have serious implications to how the Blatchford Lake intrusive suite formed.

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File No: 12 404 712 **Licence No:** 14936
Region: NS **Location:** Yellowknife, Aurora College

Sunphotometer measurements at Yellowknife
Measurements of aerosol optical depth (AOD), which is an indicator of the vertical concentration of aerosols, as well as their size, were acquired in Yellowknife, at the AEROCAN sunphotometry network, from January. 19 to September 13, 2011. We have not had time to analyze these data, in general, but we did look at some events in detail. The sunphotometer captured the extraordinarily intense smoke (sub-micron aerosol) event at Yellowknife on May 16, 2011, which could be attributed to the fires of northern Alberta. See the Rapidfire image at http://rapidfire.sci.gsfc.nasa.gov/cgi-bin/imagery/single.cgi?image=Canada.A2011136.1840.2km.jpg

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File No: 12 404 772 **Licence No:** 14941
Region: SA, DC **Location:** Howards Pass deposit; Prairie Creek deposit; Gayna River deposits; Various sites within the central Mackenzie Mountains

Hydrothermal event recognition and vectoring to SEDEX ore system in shale basins, Yukon and NWT
Rocks are made of various components and occasionally they have metals in them. We want to find a way to 1) identify some proximal (close) and distal (at a distance) mineralogical and chemical elements, that will indicate that rocks in a sedimentary basin are likely or not likely to

be rich in metals; and 2) understand how metals were emplaced in rocks, and how they disperse in the soils and water once the rocks are weathered. This has implications for the land, environment and mineral identification. To achieve the objectives mentioned above, preliminary fieldwork was done during 3 weeks in July and August 2011, and will continue during the summers of 2012 to 2014. The fieldwork consisted of familiarizing ourselves with the regional and basin-scale geology; and collecting representative small samples from drill holes stored at one exploration site (i.e., Howards Pass deposit). The samples will be subsequently analyzed in laboratories, using various techniques, to help define the mineral and chemical composition of the rocks. Analysis will start in the fall of 2011, and will continue over the next few years. Microanalytical methods for in-situ measurement of trace elements of mineral phases (apatite, pyrite, feldspar etc.) within host-, footwall, and hanging wall sedimentary rocks will be developed.

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File No: 12 404 742
Region: IN

Licence No: 14839
Location: The shelf edge, from the US/Canada border to the vicinity of Banks Island

Assessment of the western Arctic boundary current

Cruise HLY1103 of the US Coast Guard Cutter Healy took place from 2-27 October, 2011. The title of the field program is "Assessing the western Arctic boundary current and its role in the arctic ecosystem and climate change", funded by the US National Science Foundation as part of the Arctic Observing Network (AON). The project is a collaboration between US and Canadian scientists. We are using a combination of year-round subsurface moorings in the boundary current (deployed upstream in US waters), and seasonal (summertime) shipboard observations, including measurements downstream in Canadian waters. During cruise HLY1103, we successfully deployed all of the moorings, and carried out a hydrographic survey of the boundary current from Barrow Canyon, along the continental slope into Canadian waters to the mouth of M'Clure Strait. The survey consisted of 10 cross-slope transects, using a conductivity/temperature/depth (CTD) package equipped with a transmissometer, fluorometer, and oxygen sensor. Niskin bottles were used for water sample measurements of salinity, dissolved oxygen, nutrients, dissolved inorganic carbon, total alkalinity, oxygen isotopes, and chlorophyll. Velocity measurements were made using the hull-mounted acoustic Doppler current profiler (ADCP).

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File No: 12 404 640
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Licence No: 14908
Location: Blueberry site, north of Inuvik from Noel Lake towards Swimming Point; the Dead Zone in the outer Mackenzie Delta; the Kendall Island Bird Sanctuary; Richards Island; lakes north of Fort McPherson, on the western edge of the Mackenzie Delta

Examining the impacts of climate change on aquatic and terrestrial ecosystems of the Mackenzie region, NWT

In 2011, we collected sediment from the bottom of lakes near Noel Lake, Husky Lake, north of Fort McPherson, and ~60 km west of Swimming Point. Our objectives are to document the impacts of changing climate on these lakes, especially the impact of thawing permafrost and storm surges. This summer we visited ~10 lakes, to study how algae and insects preserved in the sediment are being affected by these disturbances. Early results of the storm surge project indicate that larger storm surges occur during periods of warmer temperatures, suggesting climate warming may result in more and larger storm surges near the coast. Around Fort McPherson we sampled a lake near Husky Lake with a small stream flowing into it from the mountains. Up in the mountains the permafrost has melted and the ground is collapsing and is being carried by the stream into the lake. In April, we collected sediment from this lake and found that ~20 cm of sediment had been deposited in this lake during the last 10 years, which is a remarkable amount of sediment. In other lakes around Inuvik, it would usually take more than 100 years to accumulate this much sediment.

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File No: 12 404 570
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Licence No: 14874
Location: The Scotty Creek drainage area, approximately 62 km SSW of Fort Simpson

Understanding and prediction of permafrost thaw impacts on northern water resources

Research at Scotty Creek is focused on 1) understanding the rates and patterns of permafrost thaw, and the physical and biological processes that control it; 2) developing science-based tools to predict the rate and pattern of permafrost thaw over the next 50 years; 3) understanding and predicting the impact of permafrost thaw on ecosystems and water resources; and 4) developing appropriate mitigation strategies. Scotty Creek is typical of the southern margin of permafrost, where permafrost is relatively warm, thin and discontinuous. As a result, permafrost thaw often leads to permafrost disappearance. Over the last half century, permafrost has reduced from about 72% of Scotty Creek to about 40%, and the rate of permafrost disappearance is accelerating. Current research is focused on 1) developing new conceptual and mathematical models that simulate water flow and storage processes at the southern margin of permafrost, 2) developing a new permafrost thaw model that includes the effects of climate warming and human-induced disturbances, such as seismic lines, winter roads and pipelines; and 3) coupling the hydrological model with the permafrost model, to predict the spatial distribution of permafrost and river flow regimes under possible scenarios of climate change and human-induced disturbances. This project hosted a public workshop in Yellowknife (Oct., 2011), that focused on interactive training of new science-based predictive tools, needed to properly manage northern water resources in the wetland-dominated regions with thawing, discontinuous permafrost. This project is part of the new Laurier-GNWT Partnership, and as such collaborates closely with the GNWT and its federal partners, NGOs, First Nations communities and local stake-holders, for the purpose of strengthening the NWT Water Strategy.

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File No: 12 404 745 **Licence No:** 14857
Region: IN **Location:** Darnley Bay Resources land holdings near Paulatuk

Darnley Bay Resources Ltd. 2010 - 2012 field program
This summary covers the second year of a three-year program of exploration for metals and diamonds in the Paulatuk area. The following fieldwork took place in November 2010 and March-April 2011: (1) Geological Prospecting and Sampling was not carried out, due to snow cover; (2) Claim Staking and Bathymetric Survey was not carried out during the second year; (3) Ground Geophysical Surveys were not carried out during the second year; (4) Kimberlite/Metals Drilling was not carried out during the second year. Results of the drilling in 2010 were received in early 2011 and announced. Three new kimberlite pipes were intersected on the Parry Peninsula, one contained diamonds and numerous indicator minerals. The other two did not have enough kimberlite material for analysis. In addition, xenoliths were extracted from the kimberlite core, for a research project currently underway at the University of Alberta and the Northwest Territories Geoscience Office, focused on mantle studies. The third drillhole for metals was completed in 2010, south of Paulatuk. The hole on a gravity target was terminated after 158 m of overburden (glacial till and unconsolidated Cretaceous sediments) and 84 m of Devonian vuggy dolomite, due to technical difficulties. The same target was drilled again in 2011, but encountered the same difficulties and was terminated at a depth of 242 m, without reaching its target.

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File No: 12 404 775 **Licence No:** 14951
Region: SA **Location:** Powell Creek; Shortcut Creek; Little Chicago

Western Imperial formation
Plans were changed, due to circumstances in the field. Rather than multiple days and sites, we visited a single location on one day, July 27 2011. The location was Lac Charrue, approximately 50 km northeast of Little Chicago. Samples were collected for detrital zircon analysis. Detrital zircon analysis of other sandstones in the northern Mackenzie Valley had shown that the sandstone rocks contained sand grains that were initially from either northwestern Alaska or Siberia. Those sand grains were transported from those locations to the northern Mackenzie Valley area, approximately 360 million years ago, when those landmasses were located where the Arctic Ocean is presently located. We aim to improve our understanding of how NW Alaska and Siberia drifted away from northern Canada, during the formation of the Arctic Ocean. Sandstones collected under this research licence were crushed, to separate individual sand grains for analysis. We did identify Alaskan and Siberian sand grains and we will publish those results in a scientific journal.

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File No: 12 404 765 **Licence No:** 14906
Region: NS, SS **Location:** MacKay Lake; Beaverhill Lake

Heavy mineral indicator tracing in glacial-fluvial systems
No research was conducted under this licence in 2011.

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File No: 12 404 762
Region: SA, DC

Licence No: 14896
Location: Coates Lake deposit; Bear Twit deposit; Prairie Creek deposit; Howards Pass deposit; Mactung deposit

Geochemical and mineralogical controls on metal dispersal downstream of mineralization in the Mackenzie Mountains, Canada
In July and August of 2011, sampling was done in, and around, the Prairie Creek Mine site. Water and sediment (very fine grained, as well as larger grained) was sampled from the streams. Water and sediment (only fine grained) was also sampled from within the ore stock pile and waste rock pile on site. Over the past year, these samples have been analyzed, using a variety of different methods. Chemical analysis was done for total concentrations of major and trace elements in the water and sediments. The sediments have also been analyzed under a Scanning Electron Microscope and by synchrotron-based techniques, both of which allow the investigator to look at individual grains, to get chemical data for specific spots on those grains, and to figure out which minerals the grains contain. Results from all analyses are still being processed and interpreted. Preliminary results show that there is chemical weathering occurring and that dissolved trace metals are found in very small quantities in the streams. They are often adsorbed onto iron-containing grains and clays. In the ore stock pile and waste rock pile, metals are found in higher concentrations. Modeling software will be used to try to predict the movement of these metals.

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File No: 12 404 657
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Licence No: 14918
Location: Jean Marie River; Fort Simpson; Wrigley; Tulít'a; Norman Wells; Fort Good Hope; Tsiigehtchic; Tuktoyaktuk and locations surrounding these communities

Permafrost monitoring and collection of baseline terrain information in the Mackenzie Valley corridor, NWT
Permafrost monitoring sites throughout the Mackenzie corridor (Inuvialuit, Gwich'in, Sahtu, Deh Cho regions) were visited in August and September 2011, to acquire ground temperature and active layer data. Two students and an Inuvik resident were engaged through ARI, to assist with data collection in the Inuvialuit and Gwich'in regions. Data records for 40 monitoring sites established in 2007-2008 were extended, to better characterize the permafrost conditions. These records are helping us understand the natural variability in permafrost thermal and active layer conditions and ensure availability of adequate baseline permafrost information to support land management decisions in the region. Our results show that permafrost in the discontinuous permafrost zone, which covers a large portion of the corridor, is generally warmer than –2°C. Permafrost temperatures generally continue to increase and ongoing maintenance of monitoring

sites and data collection is planned to better characterize the impact of climate change on the permafrost environment. A detailed report, including graphical and tabular summaries of data, is currently being prepared and will be sent to relevant organizations in the region.

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Region: SA, NS, SS
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Location: Castor lake; Gamètì airport; Hepburn Lake; Sulky Lake; Lac des Bois; Simpson Lake; Colville Lake; Kugluktuk

Teleseismic studies in the Wopmay
During 2011, nine seismic stations were removed in the East Arm regions of Great Slave Lake; one remains. One new station was sited on Johnson Point, Banks Island. Seven stations were maintained in the northern Great Bear Lake region, as well as on southern Victoria Island. This project is attempting to define the northwest margin of the Achaean Slave block at great depth, in support of diamond exploration. All active stations successfully recorded more than 100 distant earthquakes, in 2011. Analysis of the final data from the East Arm suggests that mantle rocks, associated with the Slave block, to the northwest, form a wedge of mantle rock that continues as far south as Gardenia Lake at 170 km depth.

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Location: Inuvik

PolarDARN: The northern hemisphere polar portion of the international SuperDARN [Super Dual Auroral Radar Network] program
The most important achievement in the past year is the successful construction and installation of a new digital beam forming (DDS) system. The system was installed at Inuvik, on a site visit, from 29 November - 3 December 2010. The Inuvik radar is a world-class facility for ionospheric monitoring. When a DDS system is deployed at Rankin Inlet, as well as at the other two Canadian-operated auroral-zone SuperDARN radars near Prince George and Saskatoon, by the end of 2011, we will be able to perform more complicated/useful scanning programs than the other 23 radars in the network. The PolarDARN radars are positioned in the polar cap region, which is highly dynamical and is directly controlled by space weather conditions in near-Earth space. The polar caps are the regions that contain those magnetic field lines that are connected directly between the Earth and the interplanetary medium. It is by studying the direct interaction between the interplanetary medium and the Earth's upper atmosphere that we can begin to understand the influences that phenomena like solar storms have to communications, satellites, astronauts, large power grids at ground level, and the influence of space weather upon weather at the Earth's surface. The PolarDARN radars will be located and orientated so that they will provide the opportunity for research collaboration with the "incoherent scatter radar" (ISR) radar project happening in Nunavut. They will also enhance the ability to do HF radio wave propagation experiments in the polar cap region. For the times when HF radio wave

transmission is the only viable communication option for aircraft in the polar regions, understanding the propagation of these waves will be very important. It has clearly been a very busy and productive year for the Inuvik radar team, and the future promises to hold even greater research and collaboration opportunities.

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Region: NS **Location:** The Baker Creek basin

Investigations of the water cycle and hydrological processes of the subarctic Canadian Shield

Field activities in 2011 in the Baker Creek research catchment began with spring snow surveys and the activation of climate towers and water level stations in April. There were no people living and working in the research catchment in 2010. Along with the continued remote measurements of meteorological conditions, evaporation, soil moisture and stream flow, a hydrochemistry sampling program, began in 2010, continued through 2011. This program involved sampling stream flow in tributaries and at lake outlets along Baker Creek bi-weekly. Groundwater was also sampled. Samples were analyzed for ions, pH, metals, nutrients and carbon and nitrogen. This work is in support of determining how stream chemistry and frozen ground relate to wetter autumn conditions during freeze up. These research questions are in response to observations, which have shown that stream flow in small subarctic Canadian Shield catchments changed from a predominantly nival (snowmelt) to a combined nival/pluvial (snowmelt and rainfall) regime in the late 1990's. The autumn of 2011 was wet and the 2011 annual peak discharge was in October, rather than during spring snowmelt. Hydrochemistry and stream flow data during this freeze-up event were collected and are now being analyzed.

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File No: 12 404 757 **Licence No:** 14915
Region: IN **Location:** Southern Beaufort Sea

UpTempO: measuring the upper ocean temperature of the Arctic Ocean

One UpTempO buoy was deployed from the Canadian Coast Guard ship Amundsen, in August 2011. The ocean thermistors on the buoy failed immediately. A second buoy was deployed later that same month and this one worked successfully. As expected, it drifted with the prevailing currents westward through the southern Beaufort Sea, measuring the fall cooling of the upper ocean. The buoy failed in late October 2011, probably as a result of sea ice impact.

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File No: 12 404 776
Region: DC
Licence No: 14955
Location: Streams and rivers along the Mackenzie Highway from the Alberta border until it meets the Liard Highway near Fort Simpson

Composition of natural dissolved organic carbon in streams along latitudinal transect
In August 2011, we sampled 65 rivers in NWT and northern Alberta, during a 3 day road trip, taking 2x50 ml whole water samples at each river. The purpose was to assess the composition of dissolved organic carbon for rivers within and outside the permafrost region. Sampling was successful and analysis back in Guelph, Ontario, was also successful. We found that the aromaticity of dissolved organic carbon decreased with latitude of the sampling river, however, we are still looking into possible explanations for this pattern. Aromaticity of dissolved organic carbon regulates how well it supports microbial respiration, but also how well UV-light is attenuated. Possible explanation include the presence or absence of permafrost, extent of peat lands along the transect, differences in water temperature, or differences in how much groundwater that enters the rivers.

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Region: IN, GW, DC, NS
Licence No: 14856
Location: Inuvik; Paulatuk; Ulukhaktok; Tsiigehtchic; Fort Providence and Rae

Arctic wastewater research
From May to October of 2011, Environment Canada conducted sampling at wastewater systems in Canada's Arctic region for the third year. Extensive sampling was conducted at the lagoons in Paulatuk, Inuvik, Tsiigehtchic, and Rae. Environment Canada also visited Ulukhaktok, to remove thermistors that were placed in the wastewater lagoon the year prior. The sewage lagoons in Paulatuk, Inuvik and Tsiigehtchic discharge continuously, during the open-water season. Sampling was done in these communities in June. Paulatuk and Inuvik were also sampled in September. A controlled discharge of Rae's sewage lagoon began in August and samples were collected throughout the discharge. At each community, samples were taken of raw sewage (influent), lagoon effluent and sludge. Samples were also taken of the overland flow (wetland) prior to the receiving environment. Solids in the Paulatuk and Inuvik lagoon effluent were lower in June than in September. Higher solids are expected in the fall, because algae are discharged with the effluent. Solids concentrations were high in Rae (>50mg/L), due to sediment flowing through the discharge pipe. In most cases, solids concentrations were reduced by >90% through the lagoon. Removal of organics through the lagoon systems was similar. The results show that wetlands also contribute to the overall treatment of the wastewater. In most cases, wetland treatment reduced solids and organic concentrations by an additional 20% from the lagoon effluent. Community reports containing detailed data will be sent to the ARI and the communities by November 30, 2011. In 2012, Environment Canada plans to return to Paulatuk and Rae. New sites will likely include Edzo, Fort Providence and Tuktoyaktuk, funding permitting.

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File No: 12 404 764 **Licence No:** 14900
Region: IN, GW **Location:** Mackenzie River Delta

Deltaic lake sediments as recorders of past carbon export from arctic river drainage basins

The Mackenzie River is the largest source of river sediments and carbon to the Arctic Ocean. Its delta, the Mackenzie Delta, is the second largest river delta in the world, and is covered with thousands of small, shallow lakes. During the period of ice break-up in May-June, when water levels are high, these lakes receive and store a lot of river sediments.To determine the spatial spread of sediment delivery to the delta, samples were collected from six lakes and delta channels all across the Mackenzie Delta. In addition, sediments were collected from the Mackenzie main channel. Sampling was performed from helicopter floats, on June 3rd 2011. The sampling results are still being processed, but preliminary results show that lakes in the western part of the delta show a different sediment pattern than in the eastern and northern part of the delta. This can probably be explained by the inflow of the Peel River, draining into the Mackenzie Delta in the southeast. If river discharge and/or the timing of the ice break-up changes due to climate change, this will most likely also change the sediment distribution into the delta lakes.

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Region: IN **Location:** Mackenzie River, near Inuvik

Towards long-term monitoring of the CO_2 system in arctic rivers

This year, we have continued to collect monthly river samples from Mackenzie River, near Inuvik, NT, Canada. All sampling was very successful. We have collected a total of 18 water samples. All samples will be measured for total dissolved inorganic carbon (DIC) concentration and alkalinity. About half of the samples have been processed, and the results are promising. We will continue processing the samples, and maintain monthly sampling into 2012. The available data show significant seasonal changes in DIC concentrations and alkalinity in the east channel of Mackenzie River at the Inuvik dock. From DIC concentrations and alkalinity, we can calculate pH and partial pressure of carbon dioxide (pCO2) in water. The results also show large seasonal changes of pH and pCO2. We also found that there is a significant positive correlation between monthly DIC or alkalinity concentration and mean basin-wide temperature: higher temperature, higher DIC or alkalinity concentration in Mackenzie River water. We are in the process of data analysis and developing a manuscript that describes carbonate chemistry in the Mackenzie River basin.

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File No: 12 404 549
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Location: West of Yellowknife; along the Ingraham Trail, east of Yellowknife; the Baker Creek Watershed, north of Yellowknife; along the Tibbit to Contwoyto winter road, based out of the Lockhart and Lac de Gras facilities

North Slave permafrost study: Characterizing and predicting discontinuous permafrost for climate change adaptation

Fieldwork was conducted between June and September, 2011, in the Great Slave region, along Highways 3 and 4, and the Tibbitt to Contwoyto winter road. Permafrost cores, ranging from 1.2 to 7.3 meter depth, were obtained from six sites in peatland, spruce and birch forest settings. Thaw depths, soil types, visible ice moisture contents, and bulk densities were determined, with grain size, water geochemistry and geotechnical tests to be determined. These data will be used as part of a graduate thesis study and for understanding geotechnical conditions associated with permafrost soils in the area. Temperature data continue to be collected and monitored at a number of sites including: active layer temperatures from birch, spruce forest and peatland sites; ground temperatures from burn sites and peatland, birch and spruce forest sites; and air temperature sites; shallow-water; and lake-bottom sites. These data are used to understand potential climatic gradients and the effects of water on local permafrost conditions. PCSP-supported helicopter surveys were undertaken, to validate remote sensing interpretations of surficial geology and vegetation cover mapping in NTS map sheets 85I, J, O and P, 86A and 75M.

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File No: 12 404 760
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Licence No: 14871
Location: NWT Power Corporation's Frank Channel Substation, located near Behchokò

High-precision atmospheric carbon dioxide and methane measurements at Behchokò, NWT

Environment Canada conducts atmospheric measurements of carbon dioxide, methane and other GHGs, from coastal, interior and arctic regions in Canada. Our goal is to provide high quality data, to permit and improve our ability estimate sources, such as carbon dioxide, from the burning of oil and gas, as well as natural sources, such as methane emissions, from wetlands. Of particular interest, and thus the reason behind the measurement program at Behchokò, is in regards to the general concern that the Arctic may undergo drastic changes, if the arctic warming trend continues. This is especially true for methane, since arctic methane sources may be widespread. The climate feedbacks from such changes may potentially be very large. Because Behchokò is located in a discontinuous permafrost zone, and within the tree line transition zone, this site provides an excellent platform for observing potential emissions of carbon dioxide and methane from the high terrestrial and subarctic region. The data records are too short to make any conclusive statements at this time, but we are confident that these

records will be invaluable, if significant emissions of methane and carbon dioxide from the subarctic do start to occur.

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File No: 12 404 711 **Licence No:** 14947
Region: IN **Location:** Noell Lake

Noell Lake ice study - hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation

The objective of this research is to improve knowledge on lake ice and its effect on the food webs/productivity of small arctic lake systems, in order to better predict changes that could occur under changing climate. In late-September 2010, prior to freeze-up, an automated ice buoy and subsurface mooring system was deployed in Noell Lake, for continuous monitoring of weather conditions, lake ice cover (i.e., formation, growth over winter, breakup in spring), light penetration into the lake through ice in winter, and water quality. The installation was successful and data was collected by the system, throughout the 2010-11 winter. In late June/early July 2011, after the ice was gone, the buoy and mooring system was removed from the lake for servicing. Due to some logistical challenges, the monitoring system was not in place to capture the first part of the summer season. In September, the buoy system was redeployed and it is expected that the system will provide continuous data (winter, spring, summer and fall), in 2011-12, from Noell Lake. These data are allowing us to examine lake ice and its effects on the food web/productivity through the winter, as well as the character of food webs/productivity during the ice-free season.

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File No: 12 404 711 **Licence No:** 14832
Region: IN **Location:** Mackenzie Delta Lakes

Amendment - Hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation

Through our on-going investigations on small Arctic ponds/lakes, it became evident that some of the small pond/lake food-webs may include very small fish, such as stickleback and pond smelt, as top-down controls on the food-web. In 2009, this research component was added to our overall research program, to determine if any of the small ponds/lakes we study contain fish. It was found that 7 of the 11 lakes visited did indeed host fish. In 2010, we visited some of these lakes again, to collect additional samples of some species of fish and increase our overall sample size. We also visited 15 “new” ponds/lakes, not sampled in 2009, that drain into Noell Lake, to enhance our investigations. Although we were licensed to do so, it was decided that we did not need additional information on fish, and no fish collections were taken in 2011. All our information on fish, including which fish types were found in which lakes and which lakes did not host fish, are being made available as a DFO Data Report.

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File No: 12 404 711 **Licence No:** 14833
Region: IN **Location:** Mackenzie Delta Lakes

Hydro-ecological responses of arctic tundra Lakes to climate change and landscape perturbation

An overall goal of this work is to better understand the effects of changing climate, using permafrost degradation as an analogue for changes under a warming climate, on the supply of nutrients to tundra lakes, and in turn, its effect on lake geochemistry, as well as the biological communities within the lakes. Preliminary results indicate that the high inter-annual and seasonal variability in temperature controls key hydrological processes, such as ice-on and ice-off dates and the timing of the spring snow melt. Additionally, inter-annual variability in snowfall and rainfall has significant controlling effects on the magnitude of the spring snow melt and summer surface flow generation, respectively. This apparent variability in both climate and hydrology affects the geochemistry of both surface flow and lake water. Most noticeable, in spring, when snow melt water has relatively low ionic concentrations, there is a dilution effect on surface flows into the lakes, and in turn, the lake water. However, runoff from shoreline permafrost slumps exhibit relatively high concentrations of ions than from other catchment sources, and contributes to relatively higher concentrations in the lake water. Data analyses, interpretation of results, and assessment of potential effects on aquatic biology (food-webs) is ongoing.

SOCIAL SCIENCES 2011

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File No: 12 410 857 **Licence No:** 14879
Region: NS **Location:** Yellowknife; Behchokò

Housing and being homeless in Yellowknife
This research project began in 2009, and thus far has resulted in three publications. They are as follows: (1) A 2010 article, co-authored by Frances Abele, Nick Falvo and Arlene Hache: http://homelesshub.ca/%28S%2820gliz35wmmqflb1dxypfz45%29%29/Library/Homeless-in-the-Homeland--A-Growing-Problem-For-Indigenous-People-in-Canadas-North-49863.aspx; (2) A 2011 policy report on homelessness, written by Nick Falvo, in partnership with the Centre for Northern Families: www.homelesshub.ca/Yellowknife; (3) A 2011 peer-reviewed chapter on government-assisted housing in the NWT, which appeared in How Ottawa Spends (McGill-Queen's University Press): www.homelesshub.ca/NWT. Dr. Abele and Mr. Falvo still intend to collaborate on an historical article on government-assisted housing in the NWT. It would focus on the period from roughly 1945 to 2000.

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Region: IN, NS **Location:** Inuvik; Yellowknife; Tuktoyaktuk

The impact of the priest decline on the Canadian Roman Catholic Church
This doctoral dissertation examines the impact of the decline in the number of priests within the Canadian Roman Catholic Church. Part of this project examines the priest shortages that exist in remote areas in northern Canada. Interviews with Roman Catholic activists reveal that many Canadian parishes are experiencing a shortage of priests. There are reports that some Roman Catholic communities in the north may only see a priest once or twice per year and that Roman Catholic lay persons are attending to the spiritual needs of parishioners. As well, some northern priests must cover multiple parishes. These priests spend a great deal of time travelling between parishes to administer sacraments requested by northern Roman Catholics. The next phase of this project will take place at the Diocese of Mackenzie-Fort Smith. We will gather qualitative data on the lived experiences of northern Roman Catholics as they develop what they refer to as “a new way of being church” that no longer depends on priests from the south.

Data will be collected through interviews with the Diocese administrators, as well as people that are involved in Roman Catholic lay ministry. This research is a valuable addition to the sociological literature as it will improve our grasp of the constituency of the Canadian Roman Catholic Church. It is imperative to include the voices of northern Roman Catholics in any study of the Canadian Roman Catholic Church. Additionally, northern Roman Catholics have had an effect upon the Roman Catholic Church due to both their challenges and their innovations. This study will provide us with specific knowledge about the unique features of northern Roman Catholic practice, which is increasingly focused upon aboriginal leadership.

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Region: NS **Location:** Yellowknife

Quality workplace environment

Quality workplace environments are known to be a positive determinant in the recruitment and retention of nurse educators. This project is designed to survey nurse educators in all public post-secondary schools of nursing in British Columbia (BC) and the Northwest Territories (NT) to establish what nurse educators consider to be important elements in their work environment and to determine if these are experienced. This project builds on a pilot project (H08-0021), which involves the development of an instrument to measure quality workplace environments, as well as the pilot testing of that instrument. This instrument was used in all of the surveys. All nurse educators in public post-secondary schools of nursing in BC and NT were invited to participate in an online survey. Using a mixed methods approach, descriptive statistics will be used to examine the survey responses. Qualitative responses will be examined for themes and used to triangulate the statistical findings. This work is ongoing. Next Steps: We have proposed an amendment to collect data through focus groups with nurse educators in BC and NT. In the survey, subjects had time and space restrictions on their qualitative comments. Focus groups will help to further inform the themes emerging from the qualitative data. We are planning 4 to 8 focus groups that will involve all nurse educators currently employed in public post-secondary education institutions in BC and NT. This will include nurse educators teaching in programs ranging from Health Care Assistant Certificates to Doctoral Programs.

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File No: 12 410 889 **Licence No:** 14877
Region: SA **Location:** Tulít'a

Traditional and market food: focus on fish consumption in Tulít'a, NWT

In June 2010, the community of Tulít'a raised concerns about a public health advisory to eat less lake trout from Kelly Lake due to high levels of mercury measured in them. The community requested a study to learn if the fish they were eating could harm them, while also keeping in mind the nutritional and cultural benefits of fish. Sixty-seven community members took part in the study, twelve were children. Participants gave a hair sample for mercury testing and answered questions about their fish eating habits. Seven community knowledge holders and a

public health officer gave interviews on the cultural meaning of fish as a traditional food, as well as the effects of the advisory on how people view eating fish. Hair mercury tests showed that people were consuming very low amounts of mercury. Only two adult men required follow-up. Dietary results show that people eat more fish in summer than winter. Whitefish and lake trout are eaten most often, but grayling, loche, inconnu and cisco are eaten too. Fish provides important nutrients. Interviews noted that traditionally fish was a dependable food source, ensured the survival of the Dene & Métis peoples, and is also deeply culturally important. Fish is still preferred as a food today and traditional food harvesting needs to continue. Negative reaction to the public health advisory on mercury was largely due to the way information reached the community. This study has changed the way public health advisories are done in the Northwest Territories.

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File No: 12 410 896 **Licence No:** 14933
Region: NS **Location:** Yellowknife

Street outreach community consultation

The purpose of this study was to describe the health and addictions assets in the downtown core of Yellowknife, NT, in order to better address the high hepatitis C (HCV) and sexually transmitted infection (STI) rates observed there, especially infections transmitted through illicit drug use.Over the summer of 2011, data was collected through focus groups with nineteen street people, a Photovoice workshop with eight street people and seven one-on-one interviews with service providers in the downtown core. A number of themes emerged through the consultation process, including: needle exchange; non-beverage alcohol use; mixed messages to youth; sex trade; interagency coordination; and need for outreach services. The community consultation results indicate that the high HCV and STI rates are likely not related to illicit drug use, such as transmission by crack cocaine pipes. However, links may be found through further investigation into the following areas: (1) the development of harm reduction mechanisms that address the needs of the street population; (2) non-beverage alcohol use and how it impacts the HCV and/or STI rates in Yellowknife; (3) youth-based social marketing tools that use messaging consistent with local laws and/or policy; (4) how the sex trade in Yellowknife can be effectively addressed; (5) How communication, coordination and collaboration can be increased between service providers and service agencies in Yellowknife; and (6) Defining the appropriate outreach measures to reach Yellowknife's marginalized street population.

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Region: NS **Location:** Ndilo; Dettah

The effects of a changed climate and environment on the nutrition and health of Dene First Nations

No research was conducted under this licence in 2011.

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File No: 12 410 891 **Licence No:** 14912
Region: DC, NS, SS **Location:** Courageous Lake

Courageous Lake project - Social and economic sciences research
The objective of this study is to characterize the social and economic environment of the proposed Courageous Lake Project and land use in the area. The 2011 environmental baseline program collected data from various government, academic and other public sources to characterize the social and economic environment of the proposed Courageous Lake Project. Contact with various First Nations and the Métis was initiated to discuss research methodology, but due to various delays no survey work was completed. Meetings are anticipated to occur in November. A desk-based portion of the study compiled information from available sources, including government databases regarding existing land use activities to help identify land users and tenure holders, including commercial and recreational land users, as well as aboriginal groups. The land management context for the study area was investigated, including the identification of relevant land/resource management strategies and objectives.

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File No: 12 410 885 **Licence No:** 14869
Region: SS **Location:** Fort Resolution

Linking place identity, environmental change and adaptation in the context of changing water conditions in Fort Resolution, NT
Preliminary findings show that water in/around Fort Resolution is perceived by community residents to be changing dramatically. Water levels in Great Slave Lake, Slave River and Delta and other important waterways have declined by several inches in the last few years. Residents noted that water looks, tastes and smells different in many traditional areas. Many expressed mistrust of water quality, both on the land and in the community, and take alternate measures for drinking water consumption. People are connected to places in the South Slave Region because of heritage, what the land provides, a sense of identity, social connections, and for well-being. Many places are now inaccessible due to declining water levels, making it harder for trappers to engage in traditional subsistence activities. Many residents described feelings of loss because places important to them are changing. There is sadness and frustration that people can no longer use the land and water in the same way as before. People expressed frustration that many of the impacts on regional waters are coming from outside the community, and often beyond territorial borders. It is imperative that steps are taken to ensure community concerns about water are heard and addressed appropriately at multiple levels.

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File No: 12 410 890 **Licence No:** 14882
Region: IN, GW **Location:** Ulukhaktuk; Aklavik

Success factors for small sustainable drinking water systems
Water is used in the home for cooking, cleaning, bathing and drinking. Everyone needs to have access to safe water in order to be healthy. In most communities in Canada, water is treated and then delivered to homes by a pipe or by truck. Small communities (those with fewer than 5,000 people) often face a number of challenges when providing safe water. These include, but are not limited to, the cost of water treatment and delivery. The purpose of this study is to understand what these challenges are, and to understand how some small communities have overcome these challenges in order to provide safe water. To do this, interviews were conducted with decision-makers, water operators, and community members, in seven communities from across Canada, including one community in the Northwest Territories (Ulukhaktok). The research found that the community had improved their water treatment so they could meet new regulations set by the territory. Although people were happy with their water supply, most preferred to gather water from the land. This information will be used to better understand issues that small communities face with respect to water quality and health.

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Region: IN, GW, NS, SS, SA, DC **Location:** All communities

Rural and northern community response to intimate partner violence
For the year 2011, the Northwest Territories team of the Rural and Northern Community Response to Intimate Partner Violence (IPV) accomplished several goals. We successfully hired two undergraduate students from Aurora College as research assistants. One student is from the Nursing Program and the other student is currently enrolled in the Social Work Program. We are very satisfied with their work productivity, learning achievements, and contributions to our project. Furthermore, these students will be retained for the 2012/2013 academic year. One of our major accomplishments this year was the completion of an environmental scan of supports and resources located throughout the NT (e.g., shelters, victim services, treatment programs, justice system supports/courts, health program, etc.). This data was submitted to the project geographer who will integrate the data into the geographic information system (GIS) mapping. We were also able to establish a relationship with a G Division RCMP member, whose work focuses on domestic violence. He and the national office have helped us collect incidence data across the NT. This will also be integrated into the GIS mapping. For 2012, we will have a face-to-face project meeting with the entire planning team, representing all 4 jurisdictions (Alberta, Saskatchewan, Manitoba, and Northwest Territories). This will determine the steps for our second year including the completion of GIS mapping, a review of the results, and begin interviews with front-line service providers across the NT who have been identified by our aboriginal project sub-committee as having expertise in IPV (e.g., directors of shelters, justice workers, elders). We are in the process of seeking NT representation on the aboriginal project sub-committee.

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Region: IN, GW **Location:** Inuvik

Vocational education and training partnerships in northern Canada
In November, the researcher visited Inuvik for 10 days and interviewed students at Aurora Campus who were taking Aboriginal Skills & Employment Partnership (ASEP) funded trades programs. Stakeholders related to education, training, and employment were also interviewed. A total of 17 interviews occurred at this stage. Follow-up interviews will be carried out in the spring 2011.

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Region: NS **Location:** Yellowknife; N'Dilo; Dettah; Behchokò

The Canadian state's relation to Impact and Benefit Agreements in NWT
This research looked at the Canadian state's relation to Impact and Benefit Agreements (IBAs) signed over to the diamond mines in the NWT. Since these agreements are bilateral and take place outside of the regulatory regime within the NWT, it is important to understand better what interests the state has in these agreements. Interviews were conducted with federal and territorial government officials, leaders within the Akaitcho Treaty 8 First Nations and the Tłı̨chǫ First Nations, consultants, and lawyers. Many of the interviews were conducted in and around Yellowknife. The research concluded that the Canadian state has been downloading its responsibilities onto third parties through these agreements. Therefore, the state is being relieved of certain elements involved in the consultation and accommodation of potential infringements to aboriginal rights and title. Through abstaining from regulating these agreements, the state has largely given way to the forces of the market to dictate the negotiation, signing, and implementation of these agreements. It is through these agreements that indigenous communities in Canada can be further incorporated into the capitalist system, through increased participation in the labor market and the emergence and growth of aboriginal-owned and operated businesses. This suits the interests of the state by making these communities more self-reliant.

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Region: IN, GW, NS, SS, SA, DC **Location:** All communities

Evaluation of early childhood development training
The evaluation was intended to identify ways to improve the quality of training. Input was gathered from almost 120 early childhood students, practitioners, educators, and leaders in the field. It is clear that tinkering with the existing training program offered by Aurora College is not enough. The GNWT Department of Education, Culture and Employment and Aurora College need to work together to deal with the issues that impact on attracting, retaining, and training

northerners for early childhood work. These issues include: low wages and benefits, low value placed on this work, job insecurity, and inequities among early childhood workplaces. The evaluation calls for changes to: existing early childhood training, in terms of expanding delivery modalities; establishing partnerships to deliver accredited training; implementing prior learning assessment and recognition; and linking early childhood, aboriginal language, and teacher education training. The evaluation also recommends a professional early childhood association, occupational standards, credentialing and registering processes, standardized pay structure, and more focus on student supports, promotion, and performance monitoring.

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Region: GW **Location:** Fort McPherson; Inuvik

Tracing trails with Gwich'in: Poetics, well-being, memory, and land in circumpolar Canada

This Royal Anthropological Institute Urgent Anthropology Fellowship research has illustrated that there is an intimate relation between land, poetics, well-being, and memory. This research has shown that ‘language loss’ between and within different generations is complex and nuances need to be made. Language revitalization projects need to include such complex dynamics. The programs for language revitalization can be threefold: on the land, in the community with Tukudh Bible classes, and in the community at school and in homes. Taking ownership of the language, like Gwich’in language workers and elders emphasize, will play an integral role in this. With Gwich’in elders passing away, work on the Tsii Deii language remains pivotal. Recording elders singing Gwich’in hymns and reading the Tukudh Bible needs to be continued. Gwich’in people continue to live life out on the land – hunting, fishing, trapping, picking berries and travelling. Large-scale resource extraction developments in the Peel River Watershed have been a matter of great concern to the Gwich'in. These developments could jeopardize life out on the land, and subsequently, the language revitalization, well-being, and memory of the Teetl'it Gwich'in people.

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Region: GW **Location:** Fort McPherson

Collaborative research on community well-being

This research on the role of volunteering, sewing, and human-land relationships in community well-being is conducted in collaboration with the community of Fort McPherson and the Gwich’in Social and Cultural Institute. The methodology of this qualitative study involves apprenticing with elders and community members in the three focus areas, conducting life-story and semi-structured interviews, as well as documenting these activities on video. The theme emerging from the first five months of research concerns the balance of the capacity to care for others, either individually or collectively, as expressed in volunteering time and resources, and the

capacity to care for oneself as expressed in hunting, snaring, getting wood, sewing, cooking, being physically fit, and pursuing education. The importance of this balance for well-being is recognized more easily while staying on the land. A project collaboration with the youth council using photography for the creation of digital stories and posters to explore the topic of well-being is in the planning stages and will begin in January 2012. The second stage of the project will focus on the recording of life stories, the completion of the youth photo project, and the production of written and visual material for knowledge sharing in the community.

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Region: SS **Location:** Hay River

Tourism development plan for Hay River
This project involved working with members of the community of Hay River to update their tourism development plan. Our interviews and observations indicated that the community possesses many opportunities to become a go-to destination for travelers who are already in the north. A strategic plan and two presentations about the plan were made to the community about our findings, including recommendations for future development.

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Region: IN **Location:** Inuvik; Tuktoyaktuk

Strategic environmental assessment roles and stakes in arctic oil and gas exploration and development
Canada's Beaufort Sea is rich in oil and gas resources. Currently, 'environmental impact assessment' is the tool of choice for assessing and managing the impacts of development in the offshore. The problem is that this approach looks only at each project, one at a time, and does not address the total or cumulative impacts of offshore development on the ecosystem or on communities. Neither does it plan for development, explore different development options, or identify the potential impacts of each, in order to determine how best to move forward in the planning and development of the offshore. In 2004 the Inuvialuit Game Council wrote to the federal Minister of the Environment, requesting a more regional and 'strategic environment assessment' of future energy development in the region. Although the Beaufort Region Environmental Assessment (BREA) was recently launched, its focus remains, like previous efforts, on data collection, as opposed to regional planning for the future. Norway, the United Kingdom and Atlantic Canada all have formal systems for strategic environmental assessment offshore, but no such system exists in Canada's Arctic. This research examined government, industry, environmental, and Inuvialuit perspectives on the need for, benefits of, and risks associated with strategic environmental assessment in the Beaufort Sea. Results indicate a number of opportunities, including: improved regulatory efficiency for proponents; better regional science and planning practices; improved northern influence over future development; an opportunity to assess cumulative effects; more meaningful project-based assessment; and

greater certainty for industry. At the same time, there are a number of perceived risks, including: foregoing anticipated development opportunities; the loss of flexibility in decision making; adding another layer of bureaucracy; the uncertainty of a new approach.

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Region: IN **Location:** Inuvik

Inuvialuit language and identity: perspectives on the symbolic meaning of Inuvialuktun in the Canadian western Arctic

The purpose of this study was to examine how Inuvialuit beneficiaries in Inuvik felt about the importance of Inuvialuktun, especially in relation to their own cultural identity. This information was intended to help Inuvialuit language planners and instructors in promoting Inuvialuktun. The study consulted 45 Inuvialuit beneficiaries between the ages of 6 and 59. Data was gathered through interviews, group meetings, and questionnaires conducted with individuals who were part of the college, learning centre, secondary school, and the community at large. The study identified some separation in the beliefs held by individuals about their heritage language. While some saw Inuvialuktun as a pillar of their cultural identity, others saw it merely as a benefit, while favoring land-ties as a primary sign of their cultural identity. Moreover, learning desire fluctuated according to age, peaking in young adults who were building identities to pass on to younger generations. The data also confirmed that Inuvialuktun had to compete with English on unequal terms, and within a generally accepted hierarchy upheld by economic demands. Although Inuvialuktun was held in high esteem, most people were satisfied knowing only a few words, as this connected them to their heritage. Several recommendations for language revitalization were made, based on participants' insights.

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Region: IN, GW, SA, DC, NS, SS **Location:** South Slave; Deh Cho; Tłįchǫ; Sahtu; Beaufort-Delta; Yellowknife

Teacher performance appraisals: A tool for teacher growth and improvement

The objective of this qualitative research is to explore how current methods of teacher performance appraisals contribute to teacher growth and improvement over time in the Northwest Territories (NT). Teacher perceptions about the value, benefit, and purpose of teacher performance appraisals are being analyzed. This study attempts to generate data about the amount of time, energy, and effort that teachers put into annual performance appraisals and how teachers act upon the recommendations and feedback provided by the principal. Interviews were conducted with 24 teachers in the K-12 education system in the NT. The interviews consisted of several open-ended questions designed to have teachers share their perceptions about their own experiences with performance appraisals and the motivational value of these appraisals. The subjects were selected to include teachers with varying amounts of experience as teachers in the NT and to ensure that they have experience with teacher performance

appraisal practices in the NT. Teachers interviewed came from the South Slave, Deh Cho, Tłįchǫ, Sahtu, Beaufort-Delta and Yellowknife regions. The interviews have all been completed at this point in time. Data from these interviews is being compiled and analyzed currently. It is anticipated that data analysis will continue into early 2013 with research being completed by the end of 2013.

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Learning the language of the land: The representation of land in web-based indigenous language education

This research focused on connections between indigenous languages and land, incorporating a synthesis of current literature, interviews with indigenous language and culture experts, and a survey of indigenous language education websites. Essential ties between land and language were demonstrated to be integral parts of indigenous cultures. These ties were explored in the framework of an intimate relationship with the land that involves living on the land, learning from the land, belonging to the land, and respecting the land. The current situation of language, territory and culture loss that indigenous communities face has influenced that relationship in many ways, affecting all aspects of indigenous life and culture. These ties between language and land were then considered in an educational context through a survey of 14 indigenous language education websites from within Canada and the United States. The survey revealed that all aspects of the relationship to the land, as described above, appear in different ways on the websites, and that there are many opportunities for more fully representing land in online education. The research showed that indigenous languages have a complex and deep connection to the land that is essential to indigenous culture and that plays a significant role in online language education.

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Region: IN **Location:** Aklavik; Ulukhaktok; Paulatuk

Adaptation planning for climate change in Ulukhaktok, Paulatuk and Aklavik, NWT

This project worked with community members in Paulatuk, Ulukhaktok and Aklavik to continue adaptation planning for climate change. Workshops were held to identify how climate change is affecting the communities and adaptation options. Opportunities to include adaptation in community plans/decision making processes were identified and adaptation actions were prioritized. A landscape scientist worked with community public works and housing to address climate risks affecting community infrastructure. Community adaptation plans were produced for each community, as well as landscape hazard maps for Ulukhaktok and Paulatuk. In Ulukhaktok, a workshop on cruise-ship tourism was held to document community concerns and opportunities related to increasing cruise-ship tourism. An oral history project was developed in partnership with the Inuvialuit Cultural Resource Centre and Helen Kalvak School to help

preserve, organize and make oral history accessible within the community (www.nauvikhaq.com). In Paulatuk, where food insecurity was highlighted as a priority concern, a community kitchen series was piloted in collaboration with the community counselor and local volunteers. The series presented an opportunity for food-insecure families to learn and prepare new, nutritious recipes using affordable ingredients (ingredients were free for participants), as well as a space to discuss food security challenges and pose nutrition questions.

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Region: IN, GW **Location:** Aklavik

Intergenerational resilience in Aklavik, NWT

In February 2011, Andrea Rawluk returned the preliminary results from her Masters research to Aklavik. Interview transcripts were returned to everyone that participated in the project. As well, Rawluk presented the preliminary results to the Aklavik Renewable Resource Council (RRC) on March 10, 2011. The results were also shared with anyone who was interested at a combined community workshop and community feast held at the Moose Kerr School. The preliminary results suggest that Gwich'in and Inuvialuit elders define resilience similarly to other indigenous cultures, whilst offering additional perspectives. Fewer youth reported having traditional language, knowledge and spirituality than elders, but expressed a desire to learn them and described spiritual experiences. All generations had similar perspectives about what changes were negative and positive for the community and the land and how they would like to see the future of the community. At the workshop, Rawluk received feedback from some community members and decided to ask three community elders to participate in longer interviews during her stay. In these interviews, the elders described that love, spirituality, and patience were at the foundation of resilience for the people of their community. Since the sharing of the results with Aklavik, the thesis has been completed.

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Region: IN **Location:** Sachs Harbour

Arctic contaminants: Exploring effective and appropriate communication between Inuvialuit communities and researchers

In November 2010, collaborative surveys were created but responses were low. Compared to interviews, which offer richer descriptions and context, it was determined that the surveys were better suited for use as pilot studies and were discontinued. Interviews were completed in June 2011, representing 27% of the Sachs Harbour population. Focus groups were not to begin until the target range (25-30%) was met. Verification of transcripts with participants is in progress. In November 2011, focus groups were going to start, but funding issues prevented this. To finish the project and deliver on set objectives, arrangements are being made for January/February 2012. Themes identified in interviews include: relationships with researchers (positive/negative/neutral impressions of interactions, frequency/duration of time in community);

conceptions/perceptions of contaminants (yes/no concerns/risks, local knowledge of what contaminants are/look like, etc.); methods of communication (positive/negative impressions, recommendations). Some people found the information presented by researchers to be helpful, informative and easy to understand; however, some found it to be confusing and complicated. Most locals acknowledge the importance of learning about contaminants, especially for future generations. Meetings and presentations by researchers are viewed positively because researchers are visible in the community, but spending time one-on-one or in small groups using storytelling and pictures are potential ways to better communicate the importance of contaminants on a local level.

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Region: NS **Location:** Yellowknife

Alternatives north: A history
No research was conducted under this licence in 2011.

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Region: NS **Location:** Behchokò

Tłı̨chǫ on-line and print dictionary
This research has resulted in updating of the Tłı̨chǫ Yatiì Multimedia Dictionary (online at http://tlicho.ling.uvic.ca)) and the development of the iPhone/iPad/iPod application called "Yati", released in May 2012 (download it at http://itunes.apple.com/ca/app/yati/id525154015?mt=8). Researchers of the Tłı̨chǫ Community Services Agency and the Department of Linguistics, University of Victoria, worked together in increasing the number of words in these dictionary formats and recording sounds for these "talking dictionaries". The researchers produced a set of instructions on how to use the dictionary. A dictionary is an on-going project and the goal is to continue dictionary work into the future.

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Region: SA, NS **Location:** North Slave; Sahtu

The genographic project: Anthropological genetic analyses of indigenous human populations of North America - North Slave and Sahtu Dene field research
Results show that more than 94% of individuals from the Gwich'in and Inuvialuit communities have maternal DNA that is indigenous, with the remainder as non-native lineages. While they

did share some maternal DNA, the Inuvialuit are largely genetically distinct from the Gwich'in. This genetic difference is supported by a geographic gradient and suggests that two distinct prehistoric migrations may have contributed to the gene pool of the contemporary Inuvialuit. This sheds new light on the migrations by Inuit peoples across the Arctic over the past several thousand years. Some 65% of male individuals had Y-chromosomes with indigenous DNA markers, with the remainder from non-native lineages. The Y-chromosome data also suggests that Canadian Eskimoan- and Dene-speaking populations are genetically distinct from one another. We found one paternal lineage that is unique to the Inuvialuit and another unique to the Tłįchǫ. We also found that the Tłįchǫ are genetically distinct from other Athapaskan groups, including the Gwich'in. This high-resolution analysis shows that Y-chromosomal diversity among the first Native Americans is greater than previously recognized. Interestingly, the Y-chromosome DNA that is unique to the Inuvialuit is present in all Eskimoan speaking populations studied (Yupik, Inupiat, Inuvialuit), suggesting it represents a founding male lineage for all of these circumarctic populations. Researchers are in the process of writing and publishing our results, which will be co-authored with members of the aboriginal communities and other NWT researchers involved in this research. We have uploaded all of the results to the project database so that anyone who participated can see their own DNA test results online. We have mailed results for the maternal study to all participants, although a few were returned because of address changes. We will send reports for the paternal results by December 2012. These have been delayed due to turnover in laboratory personnel.

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File No: 12 410 845 **Licence No:** 14862
Region: IN, GW **Location:** Inuvialuit Settlement Region; Gwich'in Settlement Region

The genographic project: Anthropological genetic analyses of indigenous human populations of North America

Our results show that the vast majority of individuals from the Tłįchǫ communities have maternal DNA that is indigenous. While sharing some maternal DNA with the Gwich'in, the Tłįchǫ were genetically distinctive. Some 65% of Tłįchǫ male individuals had indigenous paternal DNA (Y-chromosome), with the remainder representing non-native lineages. Like the Gwich'in, the Tłįchǫ had genetic markers that also appear in Athapaskan speaking populations in Alaska. Interestingly, we also found one paternal lineage that was unique to the Tłįchǫ. The population history of Athapaskan speakers appears to be rather complex, with the Tłįchǫ being distinctive from other Athapaskan groups, including the Gwich'in. This high-resolution analysis further makes clear that paternal DNA diversity among the first Native Americans is greater than previously recognized. In addition to these questions, the data also provide new details about the phylogeography of Athapaskan (Dene) peoples, including their origins and pattern of dispersal across the circumarctic region. They also allow us to test theories about Dene prehistory based on linguistic evidence. Furthermore, by combining the genetic data with genealogical, ethnographic and historical information from the region, we will be able to expand our understanding of the recent history of aboriginal communities from the Mackenzie River valley and Great Slave Lake region. Based on these results, we are in the process of writing and publishing several papers describing our findings. We have uploaded all of the results to the project database so that anyone who participated can see their own DNA test results online. We

have also mailed results for the maternal study to all participants, although a few were returned to us because of address changes. We will send reports for the paternal results by December 2012. These have been delayed due to turnover in laboratory personnel.

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File No: 12 410 845 **Licence No:** 14863
Region: DC, SS **Location:** South Slave; Deh Cho

The genographic project: Anthropological genetic analyses of indigenous human populations of North America - South Slave and Deh Cho
No research was conducted under this licence in 2011.

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File No: 12 410 678 **Licence No:** 14909
Region: SA **Location:** Délı̨nę

Mapping, language and stories in Délı̨nę
The mapping, language and stories program is an outgrowth of research initiated in 2006. Funding was obtained to conduct research about land-based language, stories and spatial knowledge, focusing on the five themes of climate change, abandoned mines, health, the social economy, and governance, under the working title *Learning About Changes*. During the summer of 2011, doctoral research was conducted by Ingeborg Fink (Endangered Languages Documentation) and Sarah Gordon (Health, Healing, and the Stories of the Sahtú).This phase was also a period of analysis and synthesis of previous research, leading to collaborative development of a framework for future research under the working title *Stories and Songs as Policy*. Co-authored presentations were made at the results conference of the Social Economy Network of Northern Canada (SERNNoCa); Strategies for Moving Forward, the 2nd International Conference on Language Documentation and Conservation (ICLDC); the Pan-Arctic Results Workshop of the Climate Change and Health Adaptation Program for Northern First Nations and Inuit Communities; and People in Places: Engaging Together in Integrated Resource Management. Contributions were made to two forthcoming books, a special issue of Rangifer journal, *Sustaining Caribou and their Landscapes - Knowledge to Action*, as well as a Health Canada *Success Stories* booklet and website.

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File No: 12 410 800 **Licence No:** 14931
Region: IN, GW, SA, DC, NS, SS **Location:** All communities

Mapping the social economy in northern Canada - Northwest Territories project
No research was conducted under this licence in 2011.

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File No: 12 410 903 **Licence No:** 14976
Region: NS **Location:** Yellowknife

Taiga Adventure Camp feasibility study
The goal of the project was to examine the possibility of offering a new service in the Northwest Territories (NWT). To accomplish this, the market, stakeholders, company capability, and financial considerations were studied. A survey was given to men that live in the NWT. The survey was done in paper format and consisted of a series of closed and open-ended questions. The survey was used to determine if the people responding would like the suggested service, if they have had any previous experience with a similar service and if they would be interested in using that service again. The results of the survey helped determine the demand for the proposed service. A report was submitted to the client as part of an overall project to help the client figure out if it is worth offering the new service.

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File No: 12 410 875 **Licence No:** 14868
Region: IN, GW **Location:** Inuvik; Yellowknife; Aklavik; Tuktoyaktuk

Environment, commerce, and science in western Arctic history
Research was conducted while living in Inuvik between January 1, 2011 and June 7, 2011. Information was collected in the following ways: speaking with Inuvik residents, visiting certain places in the Beaufort-Delta, and spending considerable time in the town's libraries, especially the Inuvialuit Cultural Resource Centre and the Inuvik Centennial Library. Archives and other libraries that hold records pertaining to northern history still need to be visited. Consequently, final research results are not available. Some relevant results concerning the history of reindeer herding in the area were presented to Inuvik high school students. Additional information regarding the history of exploration in the area was shared during a five day field program in Ivvavik National Park. The central questions guiding the research include the following: (1) Since the late 1860s, how has scientific research shaped the land of the western Arctic, a region which includes the Arctic portions of the Northwest Territories, Yukon Territory, and Alaska? (2) What have been arctic science's relationships with federal governments, private industries, and native communities? (3) How has scientific knowledge about arctic environments changed over time?

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File No: 12 410 815 **Licence No:** 14978
Region: IN **Location:** Paulatuk; Yellowknife; Inuvik

Lands, lakes and livelihoods: women's subsistence fishing in Paulatuk, NT
This research will investigate the ways people talk about, and practice, fishing in Paulatuk, NT. The methods will include participant observation, apprenticeship, oral history and archival research. This work will inform anthropological understandings of women's harvesting activities in northern Canada, and will generate detailed, locally informed data on people's relationships with the environment in the past and the present in the community. I believe that research on women's subsistence practices can provide insight into contemporary relationships between people and the environment. In 2011, archival work was conducted at the Hudson's Bay Archives in Winnipeg. I am currently transcribing the notes that I took while working with the Hudson's Bay outpost journals from Letty Harbour between 1932 and 1934, as well as some notes from the Fort Anderson journal (1861). I am working closely with Anne Thrasher to share these notes. I plan to return to the Hudson's Bay archives in 2012 after fieldwork in Paulatuk, and will work closely with local residents to co-ordinate ways to obtain photos of the journals so that they may be shared with the community. This is in addition to the joint archival work that I will do with a community member at the Prince of Wales Northern Heritage Centre in Yellowknife in 2012. I plan to travel to Paulatuk in early January in order to begin consulting with local community members about how to proceed with the remainder of the project (ie: interviews, fishing, workshops).

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File No: 12 410 904 **Licence No:** 14987
Region: IN **Location:** Aklavik; Inuvik; Tuktoyaktuk

Dwelling off-grids
Our world is a watery world, but despite this fact geography has largely evolved as a landlocked discipline. If we are serious about reversing geography's land-centric bias, we should not erect boundaries amongst water worlds or between land and water. Fieldwork was conducted during the month of February 2012 to study off-grid living in Canada's Northwest Territories. Research included participant observation and 15 interviews conducted in the Mackenzie Delta region of Canada's Northwest Territories, and Inuvik in particular. Ice roads are an intricate assemblage of trails carved by human movement and by the movements of water across the seasons. The ice road meshwork is a mutating, temporary, ephemeral, landscape, embedded within its environment. Indeed its formation is an event - turning water into a land-like icescape. As river and ocean waters meet cold air, ice roads form and change. As sun rays shine on ice roads, their surfaces change. As water accumulated in the shape of snow meets winds, snowdrifts begin to form, confusing distinctions between road and snow banks. It is by recognizing the transformational flows of water and by working with the uniqueness of these changing materials that inhabitants of the Mackenzie Delta region (and us visitors) can use roads and thus access each other's communities and the rest of Canada. It is by taking part in the region's constant self-transformation that they create and follow their roads, routes, and trails, the territorialization of the ice road meshwork. Then liquefaction is an event leading to its deterritorialization and to the emergence of a delta that is no longer drivable but navigable. Whether congealed or liquefied, frozen solid, muddy, or in the midst of breaking up or thawing out, the water-land-air

meshwork reveals to us a domain of entanglement open to different relations with humans for different access assemblages.

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File No: 12 410 898 **Licence No:** 14959
Region: NS **Location:** Yellowknife

Collaboration: NWT sport and recreation sector

The sport and recreation sector in the Northwest Territories consists of many relationships and contractual agreements. Within the sector, many organizations are responsible for providing programming to improve the lives of NWT residents through physical activity, sport and recreation. This research project examined effective collaboration between one government division and one program delivery non-government organization within the NWT sport and recreation sector. Through a series of one on one interviews and a facilitated focus group, it was determined that effective collaboration is based on an evolution of relationship. Resulting recommendations provided to the government division propose that value be placed on development opportunities for staff while investing in a structure which will support staff in their collaborative activities. Specifically, recommendations included: building staff interpersonal skills; learning by engaging staff in internal collaborative projects and then shifting to a sector-wide focus; and declaring and aligning personal, divisional and organizational values to create and foster a shared vision.

TRADITIONAL KNOWLEDGE 2011

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File No: 12 410 873 **Licence No:** 14864
Region: SS **Location:** Fort Resolution

Human dimension of river resource development and transboundary water security in the Peace-Slave River Basin

In August 2011, I returned to Fort Resolution to continue my fieldwork. During this time, I followed up with the research participants I interviewed in 2010 and was able to participate in both Cultural Week and Deninoo Days. I was not able to meet with each person that I had previously interviewed, so I will be returning to Fort Resolution in 2012 in order to follow-up with the research participants I missed in August 2011. My research is progressing well and I am looking forward to returning to Fort Resolution, to not only complete my project but to re-connect with the community members who welcomed me warmly and gave me their encouragement.

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File No: 12 410 894 **Licence No:** 14927
Region: SA **Location:** Délı̨nę; Great Bear Lake

The biology and ecology of sympatric polymorphic lake trout, *Salvelinus namaycush*, in Great Bear Lake, Northwest Territories

Stock assessment monitoring research has been conducted on the lake trout in Great Bear Lake since 2000. In order to investigate the occurrence of four forms of shallow-water lake trout, however, many questions remained regarding lake trout ecology. With the collaboration of the Délı̨nę Renewable Resources Council, a focus group was held with six participants from the community, followed by individual interviews. Both the focus group and individual interviews involved a mixed method of semi-directed and structured exchanges on lake trout distribution, movement, habitat, diet and morphology. A slide presentation about the scientific research on this subject was offered to participants at the beginning of the traditional knowledge study. Documentation tools, such as Google Earth, photos, audio recordings, projectors and

transcription, were used to facilitate the study. A post-study validation process asked the people from the community to verify all material produced to date (i.e. the poster, presentation and report).

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File No: 12 410 899 **Licence No:** 14967
Region: IN **Location:** Ulukhaktok

Peary caribou and Dolphin Union caribou traditional knowledge in the ISR
Interviews were conducted in Ulukhaktok in September 2011 and January 2012. A total of 11 traditional knowledge holders were identified by the Olokhaktomiut Hunters and Trappers Committee and interviewed. A total of 8 interviews were done in September; a community assistant was hired to assist with the interviews, and a translator was hired for interviewees who wanted to be interviewed in their traditional language. A total of 3 interviews were done in January; a community assistant/translator was hired to assist with these interviews. All interviews were audio recorded and later transcribed. There was also a mapping component to the interviews. Maps were scanned and digitized after the interviews. There are currently no results available, as the information needs to be complied and then verified by the interviewees.

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File No: 12 410 906 **Licence No:** 14992
Region: IN,GW **Location:** Husky Lakes; Hendrickson Island; Peel Plateau/Dempster Highway; Aklavik; Inuvik; Tuktoyaktuk; Tsiigehtchic; Fort McPherson

Using Inuvialuit and Gwich'in observations to monitor environmental change in the Mackenzie Delta region
No research was conducted under this licence in 2011.

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File No: 12 410 865 **Licence No:** 14867
Region: IN **Location:** Aklavik; Inuvik; Ulukhaktok; Sachs Harbour; Tuktoyaktuk; Paulatuk

Polar bear traditional knowledge for the Beaufort Sea
No research was conducted under this licence in 2011.

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File No: 12 410 821 **Licence No:** 14897
Region: SA **Location:** Délı̨nę

Planning for climate change impacts on the aquatic ecosystems of Great Bear Lake and its watershed

The Déline Renewable Resources Council, with the support of the Déline Land Corporation and Indian and Northern Affairs Canada, completed a project in 2011 to investigate the impacts of climate change and commercial development on Great Bear Lake using a combination of scientific and traditional knowledge. We conducted a review of the relevant scientific literature, completed a climate change model for Great Bear Lake, and discussed traditional ecological knowledge of Great Bear Lake and climate change impacts during a series of workshops with Déline elders and hunters. The information collected was integrated in our evaluation of the vulnerability of Great Bear Lake to climate change impacts and commercial development, and informed the design of a community-based water monitoring program. The vulnerability assessment and other project materials are available on the project website at www.greatbearlake.org.

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File No: 12 410 522 **Licence No:** 14984
Region: SA **Location:** Fort Good Hope

Community perspectives on the health of caribou, moose, and deer populations around Fort Good Hope

No research was conducted under this licence in 2011.

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File No: 12 410 847 **Licence No:** 14866
Region: SA, NS, SS **Location:** Former Pine Point mine/townsite; Fort Resolution; Hay River; Giant and Con mine sites; Yellowknife; Dettah; Délı̨nę; Port Radium mine/townsite

Abandoned mines in northern Canada: historical consequences and mitigation of current impacts

In May 2011, the research team conducted extensive archival research on the history of Giant Mine, as well as the aboriginal employment policy in the mineral industry. Some members of the research team also worked in partnership with the Goyatiko Language Society to begin oral history interviews in Dettah and Ndilo about the historical impacts of Giant Mine. To date, Goyatiko researchers have conducted, transcribed, and translated eleven oral history

interviews. A workshop will be held in Dettah in November 2011 to discuss the results of this research. In the Pine Point area, workshops were conducted in Fort Resolution and Katlodeeche First Nation to communicate research results. During these workshops, options for community use of the research results were discussed with attendees. Options included using the results as an educational resource and as part of a community history, amongst others. A paper on the history of Pine Point has been accepted for publication in the journal "Environment and History", and will appear in early 2012. In Délı̨nę, a graduate student spent the summer months conducting fieldwork with the goal of developing community contacts and partnerships for her research on how local people interpret artistic and media representations of uranium mining in the Sahtu region. The abandoned mines project has developed a new website, with a blog documenting our activities. You can find the blog, and post comments, at http://www.abandonedminesnc.com/.

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File No: 12 410 678 **Licence No:** 14904
Region: SA **Location:** Délı̨nę

Caribou and communities in the Sahtu region
This program was initiated in response to announcements of declining barren-ground caribou herds. Activities took place in each of the five Sahtu communities in 2007-2010, along with two regional harvester workshops and an international conference (the North American Caribou Workshop, or NACW). During 2011, core activities related to this program included the following: the development of a proposal for a Sahtu regional validation workshop; a knowledge exchange including youth, harvesters and leaders through the Indigenous Talking Circle at the international Arctic Ungulate Conference; and preparation, editing and publication of the NACW proceedings in special issue #20 of the journal "Rangifer". This journal submission was titled "Sustaining Caribou and their Landscapes — Knowledge to Action", and included submissions from aboriginal authors speaking to key issues in caribou research and management.

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File No: 12 410 636 **Licence No:** 14965
Region: NS **Location:** Slemon Lake

Ihda k'ètì aquatic ecosystem monitoring project
The main goals of this project were to share and document Tłı̨chǫ knowledge and western scientific knowledge on the aquatic environment in Russell Lake. The project engaged local community members in sampling and recording a standard set of observations, using both Tłı̨chǫ and western scientific knowledge. It involved community members in a meaningful manner in all aspects of conducting contaminants related research, including the actual pursuit of monitoring and research objectives. A monitoring camp was held on Russell Lake, a location that supports a strong aboriginal subsistence fishery. Water, sediment and fish were sampled by elders, youth and fisheries scientists. Elders provided assessments of fish health, and described the indicators they use to identify fish health. Scientists sampled fish tissues and demonstrated

to elders and youth the methods for collecting fish tissues for analysis. A results workshop was held in Behchokö to present the results of the fish tissue analysis, water and sediment quality sampling. Community members were informed and educated on the status of contaminants in the fish they may be eating and that these foods remain healthy choices, perhaps within certain limits. Annual implementation of the program and consistent use of the monitoring protocols developed this year will be the key to achieving the main goals of long-term monitoring: detecting change over time and space.

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File No: 12 410 811 **Licence No:** 14989
Region: IN, GW **Location:** Fort McPherson; Tsiigehtchic; Aklavik; Inuvik; Tuktoyaktuk

Arctic Borderlands Ecological Knowledge Coop: Community based ecological monitoring program

The Coop uses both local and scientific knowledge to monitor and assess environmental changes in the range of the Porcupine caribou herd, and nearby coastal and marine areas. Interviews with local experts are conducted every year by community researchers. People share what they see and hear about fish, berries, caribou, unusual animal sightings, weather conditions, and other things while they are out on the land. This year was the first year that we used the reviewed and updated community questionnaire. Community interviews were completed for Tsiigehtchic, Fort McPherson, Aklavik, Inuvik, Old Crow, and Arctic Village. Also, community reports were completed and mailed to program partners and community participants at the end of 2011. The Coop website is an important communication tool, and contains proceedings from past meetings as well as the results from the community monitoring program. Lastly, two videos were published on our website main page; the videos, along with all other documents, can be viewed at www.taiga.net/coop.

ARCHAEOLOGY 2011

Andrews, Tom
Prince of Wales Northern Heritage Centre (GNWT)

Permit No: 2011-004 **Class:** 2
Region: SA **Location:** Tulít'a District, Sahtu Settlement Area

NWT ice patch monitoring project Tłı̨chǫ
Bad weather—rain, fog, and low clouds—plagued our fieldwork this year, significantly restricting our ability to reach the ice patches by helicopter. Though we were camped in the mountains from August 15th to 18th, the weather permitted only a few hours of flying each day. Usually, this was later in the afternoon. This year, our Tulít'a partner was unable to join us due to other commitments, but his seat in the helicopter was filled by a PhD student from the University of Alberta. The student will focus his PhD thesis on the broader cultural and ecological context of ice patch use in the NWT. As with the 2010 field season, we were shocked at the amount of melting at several sites. It seems that as the ice patches melt, they reach a critical tipping point where enough dung is exposed to dramatically change the albedo of the patch, leading to rapid melting. We have seen this in recent years, most dramatically at the KhTe-2 site. Despite poor weather, we discovered a new archaeological ice patch site, KhTf-3, at an elevation of just over 2000 metres. We recovered approximately ¾ of the proximal end of a wooden arrow from this site. the nock end was recovered, the distal end with the projectile point was not.

Bussey, Jean
Tibbitt to Contwoyto Winter Road Joint Venture

Permit No: 2011-002 **Class:** 2
Region: NS **Location:** North Slave, Tłı̨chǫ Settlement Area

Tibbitt to Contwoyto winter road project
In 2011, an archaeological investigation was conducted for the Joint Venture that operates the Tibbitt to Contwoyto winter road. This road runs from the south end of Tibbitt Lake near Yellowknife to almost the north end of Contwoyto Lake in Nunavut. This ice road was used every winter for over 25 years, but since the winter of 2008 to 2009 it has not been constructed north of Lac de Gras due a lack of mining activity. In previous years, a number of archaeological sites located near the winter road or its associated developments were marked by stakes to ensure avoidance during winter activities. Monitoring of the protected archaeological sites was a major component of the 2011 investigation. In addition, ground reconnaissance was done at two potential gravel sources located near Lockhart Lake camp. In total, there are seven sites that are protected from accidental impact by the installation of markers. Whenever possible, these markers are 30 m from archaeological sites, but in most instances this is not possible because the development occurred prior to archaeological investigations. Damaged stakes were

replaced when necessary and the top of all markers were sprayed with fluorescent paint to make them more visible in winter. In the process of visiting the protected archaeological sites, other portages were examined from the air to confirm their status and ensure no new disturbances have occurred in areas with archaeological potential. During the ground reconnaissance, an archaeological site with multiple localities was discovered at each of the proposed gravel source near Lockhart Lake. At the preferred source, there were four localities with primarily sparse archaeological material. A few flakes of non-quartz material were collected and the small sample of quartz flakes present was left in situ. There is little potential for significant archaeological material at this site. At the other proposed gravel source, three localities with intact archaeological material were located and all specimens were left in situ. The second gravel source has greater potential to yield intact and significant archaeological material. If this potential source is selected, more extensive testing, and possibly excavation, will be required in addition to more ground reconnaissance.

Cary, Henry
Parks Canada

Permit No: 2011-016 **Class:** 2
Region: SA **Location:** Sahtu Settlement Area, Délı̨nę District

Parks Canada investigations at Cloud Bay, Great Bear Lake

On 11 August 2011, two people travelled from Inuvik to Saoyú-?ehdacho National Historic Site to assess the location for a new cabin in Cloud Bay, a small inlet on the Saoyú Peninsula in Keith Arm, Great Bear Lake. The 9.8 × 6.1 m traditionally-built cabin will be used as a teaching and healing camp for elders and youth, and accessed by boat or float plane from Délı̨nę. Parks Canada had conducted an assessment for this project in 2010 on an adjacent beach, but this location was rejected in favour of building the cabin further north. Archaeological sites have been found near the study area, most notably an early occupation found on Dog Point in 1951 , so further assessment was necessary to ensure that remains would not be disturbed during the cabin's construction. After landing on the beach in Cloud Bay and a brief search of the surrounding area, an elder from Délı̨nę selected a cobble bench approximately 160 m inland as the building site. A surface survey was conducted and the depth of the cobble was assessed. After digging below 30 cm, no archaeological deposits or artefacts were found, and the excavation was abandoned. The proposed foundation area, a section from the beach to the study area, and the high water mark nearest the proposed cabin location were mapped using GPS. On the return trip to Délı̨nę a series of oblique aerial views of the Délı̨nę Fisheries and Fort Franklin National Historic Site Designated Place were takenThe Cloud Bay cabin will be constructed in Spring 2012, and will not require further archaeological assessment.

Cary, Henry
Parks Canada

Permit No: 2011-019 **Class:** 1
Region: GW **Location:** Gwich'in Settlement Area

Hannah's Field archaeological assessment

In 2011, the Teetl'it Gwich'in Council wished to move two large log cabins from the Tl'oondih Healing Camp to 'Hannah's Field,' a partially vacant lot due east of the Fort McPherson Anglican Church and cemetery. There was some concern that this new construction would impact archaeological remains at the site. Although unexplored, the property was thought to have a number of features given its proximity to Fort McPherson National Historic Site, and

becauseseveral finds had been made while excavating a children's playground within a hundred metres of Hannah's Field. Two Parks Canada employees travelled to Fort McPherson on 6 October 2011 to visit the proposed construction area and determine whether archaeological excavation was necessary before the cabins were moved to the site. Despite the light snow cover, we could readily see the foundations of structures built on the proposed site in the past 100 years. We determined that the option with least impact to the archaeological remains was an on-grade pillar structure. This would involve laying a series of gravel beds on grade, which would provide a base for the horizontal wood pillars supporting the cabin structure at its corner and mid-points. We also recommended that the gravel beds be separated from the ground surface using geotextile. Since this option does not require excavation, we did not recommend that the construction be monitored by an archaeologist. We also assessed the Historic Sites and Monuments Board plaque at Fort McPherson National Historic Site. We found the two posts holding the plaque to be rotted, and one had snapped. Additionally, the plaque's location behind the Anglican Church is not easily found by visitors approaching from the road. Since the plaque will be replaced, the community has requested that it be moved to a new location on the road-side of the church. We agree with this proposal, but suggest that any new plaque location be tested by archaeological excavation in advance.

Clarke, Grant
Aurora Geosciences Ltd. and TNR Gold Corp.

Permit No: 2011-011 **Class:** 2
Region: NS **Location:** Akaitcho Territory, North Slave Region

Moose property archaeological investigation
A Heritage Resources Impact Assessment was completed at Moose property, located on the north shore of Great Slave Lake, in advance of mineral exploration. The purpose of the investigation was to identify, record, and evaluate previously unrecorded archaeological sites and to provide recommendations to mitigate potential impacts if development sites were identified within the study area. These investigations focused on the proposed drilling locations and were carried out over two days. The first day of fieldwork was completed in August 2011. The second day of fieldwork took place in September and provided an opportunity for a site visit with elders and youth representing the Łutsel K'e First Nation, the Yellowknives Dené First Nation, the Deninu Kue First Nation and the Fort Resolution Métis Council. The visit allowed the representatives an opportunity to visit the site and provide advice regarding the nature and significance of the area, and to comment on the potential of the area for archaeological resources. No previously recorded sites were identified within the study area during our pre-field studies. Field investigations focused on areas exhibiting moderate to high potential for archaeological materials that may be impacted by the proposed development. Field methods consisted of pedestrian transects with the intent to identify and assess any archaeological sites that may be present. This included the excavation of limited shovel tests to investigate for buried archaeological materials. Much of the area investigated, however, was bedrock with little to no sediment. No precontact archaeological sites were identified and it was generally believed that the area has moderate archaeological potential at best. The abandoned workings and some machinery are still evident from the abandoned De Staffany mine and previous camp area. An area that is currently used as a camp by local people and exploration crews was also noted. A total of 11 shovel tests were excavated in these two areas, but no archaeological materials were recorded.

Clarke, Grant
The Department of Transportation, GNWT

Permit No: 2011-014 **Class:** 2
Region: IN **Location:** Inuvialuit Settlement Area

Tuktoyaktuk to Inuvik Highway archaeological investigation
The proposed Highway runs north from Inuvik to Tuktoyaktuk on Inuvialuit-owned landsas well as Crown Land. The proposed Highway measures 138 km in length in its current alignment, starting at the end of Navy Road in Inuvik (km 0) and ending in Tuktoyaktuk (km 138). The objectives of the Heritage Resources Impact Assessment (HRIA) were to identify, record and assess heritage resources that might be impacted by the proposed Highway project, and to devise appropriate mitigation strategies should any be found in conflict with the proposed Highway. The field investigations of the HRIA were completed in September 2011 over a six day period. The field crew consisted of two IMG Golder employees and four Inuvik community members who assisted during the field program and provided advice on the cultural significance of the landscape. Prefield research noted that there were no previously recorded sites within the proposed right-of-way routes. Five archaeological sites were previously recorded in areas that are potential borrow sites for gravel. The assessment was conducted along the planned Highway right-of-way and at several proposed borrow source locations. Aerial helicopter surveys were used to conduct preliminary reconnaissance to confirm areas with moderate to high potential for the presence of cultural materials. Areas deemed to have potential were ground truthed using pedestrian surveys and shovel tests. In total approximately 189 shovel tests were excavated in the study area, and one previously recorded site was revisited to identify any possible conflict with the proposed program. No artefacts were recovered from the test sites.

Clarke, Grant
Aurora Geosciences Ltd. and Boxxer Gold Corp.

Permit No: 2011-017 **Class:** 2
Region: NS **Location:** Akaitcho Territory, North Slave Region

Ven Lake property archaeological investigation
In October of 2011, Golder Associates Ltd. conducted a Heritage Resources Impact Assessment at a series of potential diamond drill locations near Ven Lake, Northwest Territories. The work was conducted on behalf of Aurora Geosciences Ltd. and Boxxer Gold Corporation. No archaeological sites have been previously recorded in the local study area, although sites are known to be present in the region. The investigations were conducted to identify, record, and evaluate the proposed location for the presence of previously unrecorded archaeological sites, and to provide recommendations to mitigate potential impacts if sites were identified. The field crew consisted of an employee of Golder Associates Ltd. (Yellowknife) and a member of the Yellowknives Dené First Nation. Procedures used for this project were standard for projects of this nature in the region, and included pre-field studies, helicopter overflights, on-ground reconnaissance, reporting and formulation of recommendations. Project planning also included provisions for a representative of the local community to accompany the field crew during the field inspection and to provide advice regarding the nature and significance of the sites in the area. Field investigations began at an existing, and currently unoccupied, camp located on the west shore of Ven Lake. An existing series of cut lines connected the areas of investigation. Evidence of previous exploration, including bulk trenches and cleared outcrops, were noted during the assessment. The fieldwork focused on areas exhibiting moderate to high

potential for archaeological materials that may be impacted by the proposed development. These areas were shovel tested in an effort to identify any buried cultural materials or palaeosols. Because much of the area was exposed bedrock outcrops, limited shovel testing was conducted, but all completed tests were negative. No archaeological sites were recorded as a result of the investigation.

Harris, Ryan
Parks Canada

Permit No: 2011-005 **Class:** 2
Region: IN **Location:** Inuvialuit Settlement Area

H.M.S. Investigator underwater archaeological survey
No summary was provided for this 2011 permit.

Lobb, Wayne Murray
Mackenzie Valley Highway Project

Permit No: 2011-013 **Class:** 2
Region: SA **Location:** Sahtu Settlement Area, K'ahsho Got'ine District

Mackenzie Valley Highway project - Gibson Gap to Thunder River
An Archaeological Impact Assessment (AIA) was conducted near Fort Good Hope, Northwest Territories for the proposed K'asho Got'ine Highway (KGH). The proposed highway would convert the winter road from Norman Wells to Fort Good Hope into a year round road, which would then be extended northward toward Little Chicago. The goal of this project was to relocate and re-examine 13 known archaeological sites that are on or near the proposed KGH route. In addition, six other archaeological sites were to be examined at borrow sources if time was available. These 19 sites consisted of paleontological sites, historic structures, historic trails, and pre-historic archaeological sites. The fieldwork was conducted from July 12th to 16th. The field program was carried out by hiking, boat, and helicopter at various points during the survey. Twelve sites on the main KGH route were revisited. Four of the sites were determined to be outside of the KGH right-of-way. A new paleontological site was recorded during a survey of the Jackfish Summer Trail (MbTb-12). Unfortunately, due to helicopter issues, the rest of the archaeological sites, including one on the proposed KGH right-of-way and six in borrow source locations, could not be revisited. Approximately 80 artifacts were recovered, consisting of fossils and stone tool debitage (debitage is the by-product from stone tool manufacturing). The new artifacts are from four of the archaeological sites surveyed in 2011. In addition, one of the sites on the Jackfish Summer Trail (MbTb-11) featured the remnants of at least two hearths. It is hoped that this past year's fieldwork will lay the groundwork for any future development of the KGH and borrow sources.

MacKay, Glen
Prince of Wales Northern Heritage Centre (GNWT)

Permit No: 2011-010 **Class:** 2
Region: DC **Location:** Deh Cho Region

Kakisa archaeology project
The Prince of Wales Northern Heritage Centre (PWNHC) conducted a community archaeology project in partnership with the Ka'a'gee Tu First Nation in 2011. The goal was to help the community document cultural values in the Ka'a'gee Tu Candidate Area, which is being

considered for protection as a National Wildlife Area through the NWT Protected Areas Strategy. Over three days in July, archaeologists from the PWNHC worked with an elder from the Ka'a'gee Tu First Nation to document important cultural places around Kakisa Lake. A previous archaeological survey was conducted around Kakisa Lake in the late 1970s. We relocated several of the archaeological sites recorded during that survey in order to evaluate their conditions and determine more precise locations for these sites using GPS. The sites included two log cabin villages that were occupied in the 40s and 50s, and a lithic scatter located on the Muskeg River (which flows into the east side of Kakisa Lake). A small test excavation at the latter site indicates that it contains at least two precontact components. We also recorded two new sites: a precontact lithic scatter, and an historic fish camp. We hope to conduct more extensive surveys of Kakisa and Tathlina Lakes in future seasons.

MacKay, Glen
Prince of Wales Northern Heritage Centre (GNWT)

Permit No: 2011-012 **Class:** 2
Region: DC **Location:** Deh Cho Region

Deh Cho highways archaeology project
The Prince of Wales Northern Heritage Centre (PWNHC) conducted a community archaeology project in partnership with the Jean Marie River First Nation in 2011. The goal of the project was to document cultural values in the Łue Túé Sųlái Candidate Cultural Conservation Area, which is being considered for protection through the NWT Protected Areas Strategy. During one week in July and another week in September, archaeologists from the PWNHC worked with elders from the Jean Marie River First Nation to survey portions of two small lakes in the Łue Túé Sųlái area: Ekali and Sanguez Lakes. We recorded eight new archaeological sites, including five precontact lithic scatters, a cabin, a cache, and a trail. According to the oral traditions of the people of Jean Marie River, these small inland fish lakes were important winter harvesting areas, where fish caught through the ice and small game provided important staples for the winter months. We expect the density of archaeological sites in the Łue Túé Sųlái area to be high, and are planning more extensive surveys and test excavations for 2012.

Prager, Gabriella
EBA Engineering Consultants Ltd.

Permit No: 2011-007 **Class:** 2
Region: NS **Location:** Akaitcho Region, North Slave Region

Nechalacho rare earth element project
The Nechalacho Rare Earth Metals Project is located on the north side of the east arm of Great Slave Lake, approximately 95 km southeast of Yellowknife, with mine development focused around Thor Lake, about 4 km due north of Great Slave Lake. The archaeological team for this project consisted of two archaeologists and a local person from each of the three closest communities (Dettah, Lutselke and Fort Resolution. Archaeological investigations were conducted in August 2011, and consisted of pedestrian surveys of the proposed mine site and associated developments. During this field project, six archaeological sites were found, all along the north sides of two small lakes associated with proposed tailings containment locations. These sites are small, comprising one or two stone circles that were probably tent rings, hearths and a rock structure identified by our local crew members as a marten trap. The small sizes of the circles suggest that they probably represent one night stops by a lone traveller. These sites provide information about past people's travel routes and regional use

patterns. Their presence suggests that interior parts of the study area were used more than expected. Further detailed recording and investigations will be completed at all newly recorded sites. Three sites found during the original 1988 archaeological survey of the Thor Lake project were revisited. One is the existing exploration camp, one was a small quartz scatter and the third contained three quartz tool fragments found on different beach ridges on Great Slave Lake. Although no additional artifacts were found this year at the latter site, it is the only one that may require further work. Since it is close to the proposed dock and associated laydown areas, the site boundaries need to be defined so that impacts can be avoided if possible.

Seip, Lisa
Seabridge Gold Inc.

Permit No: 2011-006 **Class:** 2
Region: NS **Location:** Tłı̨chǫ Settlement Area and Akaitcho Region

Courageous Lake
This work was conducted by two archaeologists and two community members, and was a continuation of a baseline study that was conducted in 2010. Work was focused around the southern end of Courageous Lake and the areas surrounding Matthews Lake. Community meetings were conducted with the Lustel K'e Dene, the Tłı̨chǫ, the North Slave Métis Alliance, and the Yellowknife Dene between March 15th and 20th. Topics discussed included archaeological baseline studies conducted in 2010 and archaeological studies proposed for the current year. Community site visits were held between August 22nd and August 25th and included members of the North Slave Métis Alliance, the Northwest Territory Métis Nation, the Tłı̨chǫ, and the Lustel K'e Dene. The meetings and site visits allowed community members to learn about and provide feedback regarding the baseline programs to date. The fieldwork resulted in the recording of 55 new archaeological sites, including 32 lithic sites, 13 rock cairns, one rock feature site, eight multi-component sites (containing a combination of lithics, rock cairns, other rock alignments, and/or historic features), and one site containing a modified piece of caribou antler. Additionally, one previously recorded site (LbNw- 3) containing two grave sites was revisited and found to be in good condition. Additional archaeological studies are planned for 2012. Avoidance is the preferred management recommendation for all sites, and if avoidance is not possible then systematic data recovery is recommended. As the project is currently in the design phase no impacts are anticipated in 2011.

Walker, Daniel
Tamerlane Ventures Inc.

Permit No: 2011-009 **Class:** 2
Region: SS **Location:** Akaitcho Region, South Slave

Pine Point project
In 2011, archaeological investigations of the proposed Pine Point project were conducted. This project is located between Hay River and Fort Resolution, south of Great Slave Lake. Fieldwork was conducted from August 22 to September 3 under snow free conditions. The field investigations were conducted by three archaeologists and three local community members from the Deninu Kue First Nation, the Fort Resolution Métis Council, and the Hay River Métis Council. The main objective of this investigation was to identify, evaluate, and record any archaeological sites located within seven proposed deposit areas. During pedestrian surveys of the project area subsurface testing was conducted on terrain features determined to have the potential to contain cultural materials, as well as a sampling of areas determine to have low

potential to contain cultural material in order to confirm that assessment. As a result of this investigation, four new prehistoric archaeological sites containing lithic material created during stone tool production were recorded.

Wickham, Michelle
Bison Historical Services Ltd.

Permit No: 2011-015 **Class:** 2
Region: SA **Location:** Tulít'a District, Sahtu Settlement Area

Slater River exploration program

In September of 2011, Bison Historical Services Ltd. carried out a survey for heritage sites southeast of Norman Wells in the Sahtu Region. The goals of this investigation were to conduct a pre-impact examination of all areas that may be impacted by 2011/2012 development activities to ensure any unrecorded heritage resource locations will be avoided, and to relocate a known archaeological site (LgRs-2). Fieldwork was based out of Norman Wells and was carried out by helicopter and on foot. Investigations focused on high potential areas within the 3-D seismic area, as well as locations where construction activities will take place (e.g. winter access road, base camp, construction camp, two helipads, security shack, staging area, two well leases, and the shoreline of fourteen water sources). The 3-D seismic area was repeatedly overflown in systematic grids at low elevation and slow speed to identify any possible heritage concerns. A low elevation, slow spiraling over-flight was conducted at each location noted above. The majority of these locations were identified as having low heritage resource potential given some combination of low topographic relief, muskeg ground cover, black spruce vegetation, standing water and existing disturbances along the access road or existing seismic lines. The over-flights and photo documentation were deemed an appropriate level of assessment for these sites. Ten areas with high heritage resource potential (as identified during over-flights and pre-field map analysis) were further assessed through pedestrian and subsurface testing. All 180 shovel tests that were excavated yielded negative results. Only one known site (LgRs-2) occurs close to any of the currently proposed development activities. LgRs-2 is located approximately 1.4 km north of the access road and will not be impacted by the currently proposed construction activities. LgRs-2 was recorded in 2003 as a collapsed tripod with insulators and wire, part of the CN communications line installed around 1960. During this investigation, the tripod was relocated. The insulator and wires are still in good condition; however, the wooden poles are starting to decompose. No previously unidentified heritage sites were found within the Slater River Exploration Program, so it will not impact any known heritage sites.

WILDLIFE 2011

Abernathy, David
BHP Billiton Diamond Inc.
Yellowknife, NT

Permit No: 5693
Region: NS
Species Studied: Caribou, Grizzly Bear, Wolves, Falcons and birds
Location: BHP Billiton property, approximately 300km northeast of Yellowknife

Wildlife effects monitoring program
The requirement for the wildlife effects monitoring at the Ekati Diamond Mine is described in the Environmental Agreement between Canada (DIAND), the GNWT (ENR) and BHP (January 1997).

Bidwell, Mark
Canadian Wildlife Service
Saskatoon, SK

Permit No: 4821
Region: SS
Species Studied: Whooping Crane
Location: South Slave Region

Whooping Crane ecology and rehabilitation
The goal of the whooping crane recovery strategy is to protect, restore and manage whooping cranes to be self-sustaining in the wild and to downlist the species from endangered to threatened.

Carriere, Suzanne
ENR Wildlife
Yellowknife, NT

Permit No: 5764
Region: IN, GW, NS, SS, DC, SA
Species Studied: Mice, voles, lemmings, shrews
Location: All regions in the NWT

NWT small mammel and hare transect survey
Establish the abilty to predict small mammal cycles throughout the NWT.

Cluff, Dean
ENR North Slave
Yellowknife, NT

Permit No: 6883
Region: NS
Species Studied: Black Bears
Location: North Slave Region

Black bear movement and ecology in the North Slave Region
No studies of black bears in the North Slave Region have been done, therefore very little information is known about these bears in the northernmost part of their range.

Cluff, Dean
ENR North Slave
Yellowknife, NT

Permit No: 5690
Region: NS
Species Studied: Tundra Wolves
Location: Central tundra region of the NT

Index abundance for tundra-denning wolves
Management plans prepared for barren-ground caribou herds recommend monitoring for trends in predator abundance.

Coulton, Dan
Golder Associates Limited
Yellowknife, NT

Permit No: 6877
Region: NS
Species Studied: Raptors and water birds
Location: 15 km radius from Nico Project base camp

Baseline wildlife studies for Fortune Minerals NICO Project at Lou Lake study area
Wildlife surveys were completed, to augment existing information on wildlife species, the habitat surrounding the proposed mine site, and all-weather access road route.

Croft, Bruno
ENR North Slave
Yellowknife, NT

Permit No: 6878
Region: NS
Species Studied: Caribou
Location: North Slave Region

Continue monitoring the health, condition and contaminants of the Bathurst and Bluenose East caribou in the North Slave Region
Health, body condition, disease, and parasites of barren-ground caribou provide important information on the status of the herds and on the potential for population growth.

Croft, Bruno
ENR North Slave
Yellowknife, NT

Permit No: 6879
Region: NS, SS
Species Studied: Caribou
Location: Behchokò; Whatì; Gamètì; Wekweètì; Dettah; and Łutsel K'e

Continue monitoring the Bathurst and Bluenose East caribou herds
In order to insure that barren-ground caribou and caribou herds remain healthy, a number of monitioring actions must be undertaken on an annual basis, to provide decision makers with the information required to address management objectives.

Davidson, Tracy
ENR - Inuvik region
Inuvik, NT

Permit No: 7410
Region: IN

Species Studied: Barren-ground Caribou
Location: Range of the Tuktoyaktuk Peninsula; Cape Bathurst; Bluenose-West barren ground caribou herds

Late winter recruitment, and fall composition surveys of the Tuktoyaktuk Peninsula, Cape Bathurst, and Bluenose-West barren-ground caribou herds
Late winter recruitment survey, fall composition, and collar monitoring.

Davidson, Tracy
Gwich'in Renewable Resource Board
Inuvik, NT

Permit No: 7420
Region: GW

Species Studied: Moose
Location: Various locations throughout the Richardson Mountains, Mackenzie Delta, Eagle Plains

Moose abundance and composition survey
This survey will provide moose population density, composition and recruitment rates and will also give important insights into the influence of habitat characteristics and human-related disturbances on moose.

Decker, Robert
ENR South Slave
Hay River, NT

Permit No: 5404
Region: IN

Species Studied: no specific wildlife species
Location: Sachs Harbour; Ulukhaktok

Ecological regions (ecosystem classification) of the Northwest Territories arctic islands
All provinces and territories have some form of hierarchical ecological land classification that integrates climate, physiography, and biotic factors in some fashion. These classifications can be a useful tool / framework for ecosystem based resource management and land use planning, as well as for understanding the effects of climate change, cumulative effects and natural disturbances on the landscape.

Derocher, Andrew
University of Alberta
Edmonton, AB

Permit No: 7425
Region: IN, GW

Species Studied: Female Polar Bears
Location: Inuvik Region

Movement and habitat use by adult female polar bears
Adult female polar bears with cubs will be caught in the southern Beaufort Sea (From Herschel Island to Baillie Islands, NT) and instrumented with GPS satellite transmitters. The study will monitor the movements and habitat use of adult females.

Elkin, Brett
ENR Wildlife
Yellowknife, NT

Permit No: 5761
Region: IN, GW, NS, SS, DC, SA
Species Studied: All wildlife species
Location: NWT wide

Wildlife health, condition, and genetic monitoring
Although most wild animals are healthy, diseases and parasites can occassionally occur in any wildlife population. Some diseases and parasites are naturally occurring and appear to cause little problem in their host species, while others have the potential to impact wildlife, at both the individual animal and population level.

Enbridge Pipelines
Enbridge Pipelines (NW) Inc.
Norman Wells,

Permit No: 5760
Region: DC, SA
Species Studied: Various wildlife species
Location: Selected areas of the Enbridge Pipeline, right - of - way in the vicinity of various Deh Cho and Sahtu communities

Monitoring wildlife along Enbridge ROW
A community based wildlife monitoring program was established when pipeline operations began in the mid-1980s and ran for several years before being terminated.

English, Colleen
Rio Tinto, Diabik Diamond Mines Inc.
Yellowknife, NT

Permit No: 5696
Region: NS
Species Studied: Caribou, Grizzly Bear, Wolverine, waterfowl and other aquatic birds, raptors
Location: Diavik wildlife study area

2010 wildlife monitoring program for the Diavik diamond mine
To monitor wildlife within the vicinity of the mine.

Fast, Marie
Canadian Wildlife Service
Yellowknife, NT

Permit No: 6888
Region: NS
Species Studied: Marsh birds and species at risk
Location: Kwets'ootł'àà candidate protected area

Marsh bird surveys in Kwets'ootł'àà candidate protected area
Kwets'ootł'àà is a candidate National Wildlife Area being proposed through the NWT Protected Areas Strategy (Mackenzie Valley 5-Year Action Plan). As part of Step 5 of the NWT Protected Areas Strategy, an ecological assessment must be conducted, to identify the key ecological components in the candidate area, before a final decision can be made to proceed with legally designating the site.

Fronczak, David
United States Fish and Wildlife Service
Division of Migratory Bird Management
Bloomington, MN
United States

Permit No: 4824
Region: NS
Species Studied: Ducks
Location: Mills Lake Marsh

Western Canada cooperative preseason waterfowl banding prgram - Mills Lake Station, NT
Preseason banding of 2,000 mallards, 1,500 northern pintails, and 1,000 of all other waterfowl species.

Green, David
CWE
Burnaby, BC

Permit No: 5401
Region: IN, GW
Species Studied: Yellow Warblers
Location: Inuvik Region

Latitudinal variation in life history traits and carry-over effects of Yellow Warblers
Species with wide breeding distributions, such as Yellow Warblers, provide an excellent opportunity to study potential trade-offs among vital rates at different latitudes.

Groves, Debbie
US Fish and Wildlife Service
Migratory Bird Management
Juneau, Alaska
United States

Permit No: 5403
Region: IN
Species Studied: Geese, swans, ducks, loons, gulls, terns and owls
Location: Banks Island; Tuktoyaktuk Peninsula; Western Victoria Island

Aerial waterfowl surveys on Banks Island, Tuktoyaktuk Peninsula, and Western Victoria Island
Information on waterfowl abundance, distribution, and population trends in the NWT is needed to ensure that populations are conserved for the long-term use, as well as that appreciation by northern residents and all people residing within the species' migratory range is maintained.

Harpley, David
Canadian Zinc
Vancouver, BC

Permit No: 5033
Region: DC
Species Studied: Woodland Caribou
Location: Prairie Creek Mine

Aeiral surveys of the Prairie Creek mine access road for caribou

Canadian Zinc's's access road links the Prairie Creek mine to the Liard Highway, near Nahanni Butte, and crosses terrain that is not belived to be home range for significant caribou populations.

Hegel, Troy
Environment Yukon (V5-A)
Whitehorse, YT

Permit No: 5765
Region: DC, SA
Species Studied: Nahanni and Coal River caribou herds
Location: Sahtu; Deh Cho

Population monitoring of the Nahanni and Coal River caribou herds
Recent fall composition surveys, increasing hunter traffic on the Nahanni Range Road, increasing industrial development, and reports of low numbers of large bulls are all contributing factors heightening the level of concern regarding the South Nahanni and Coal River caribou herds.

Kardynal, Kevin
Canadian Wildlife Service
Yellowknife, NT

Permit No: 4822
Region: DC
Species Studied: Canada Warbler, Olive-sided Flycatcher, Rusty Blackbird
Location: Protected area in the Deh Cho region, surrounding Kakisa

Nest searching in Ka'a'gee Tu candidate protected area
As part of Step 5 of the NWT Protected Areas Strategy, an ecological assessment must be conducted to identify the key ecological components in the candidate area before a final decision can be made to proceed with legally designating the site.

Kelly, Allicia
ENR South Slave
Fort Smith, NT

Permit No: 4826
Region: SS
Species Studied: Moose population
Location: Slave River Lowlands

Moose population survey - Slave River Lowlands
Moose surveys were completed when moose are found in more open habitats and snow cover is complete. Survey to collect data on age and sex composition, as well as population abundance.

Kelly, Allicia
ENR South Slave
Fort Smith, NT

Permit No: 4813
Region: SS
Species Studied: Moose
Location: South Slave Region

Moose - Baseline health survey
In the South Slave region, moose are one of the most important food animals to the communities. Understanding what types and levels of parasites and disease moose currently carry and the occurrence of new or emerging pathogens is an important first step in determining population health.

Kelly, Allicia
ENR South Slave
Fort Smith, NT

Permit No: 5757
Region: SS

Species Studied: Barren-ground Caribou
Location: communities of Lutselk'e; Fort Resolution; Fort Smith

Barren-ground caribou monitoring: population parameters, movements, distribution, health, and habitat use of the Beverly and Ahiak herds
Monitoring of the Beverly and Ahiak caribou herds is imporant to determine the status of these herds and to understand factors driving changes in herd status. This work is a part of strategy 5 of the barren-ground caribou management strategy for the northwest territories 2006-2010.

Kutz, Susan
University of Calgary
Calgary, AB

Permit No: 5158
Region: SA

Species Studied: Caribou
Location: Sahtu Region

Community-based monitoring of wildlife health
Climate and other landscape changes may impact the health of wild animals. This research establishes ongoing wildlife health monitoring programs, in collaboration with local hunters and trappers.

Larter, Nic
ENR Deh Cho
Fort Simpson, NT

Permit No: 5036
Region: NS

Species Studied: Moose
Location: Deh Cho Region, includes areas north of and along the Mackenzie River

Geospatial moose survey in the Deh Cho
Concerns have been voiced over depressed moose abundance, along high use areas in the Deh Cho Region. There was unanimous agreement by all first nation representatives at the Regional Wildlife Workshop, in Fort Simpson, in September 2002, that there was a need for moose surveys, to establish some baseline information on moose densities in the region.

Larter, Nic
ENR Deh Cho
Fort Simpson, NT

Permit No: 5032
Region: DC

Species Studied: Wood Bison
Location: Fort Liard; Nahanni Butte

Nahanni wood bison population survey
The first and only survey to estimate population number of the Nahanni wood bison population was conducted in March 2004. At the time the population was estimated at about 400 adults and it was acknowledged that future population surveys would be required every 5-6 years.

Larter, Nic
ENR Deh Cho
Fort Simpson, NT

Permit No: 5031
Region: DC
Species Studied: Boreal Caribou
Location: Deh Cho Region

Deh Cho boreal caribou population monitoring
A substantial portion of boreal caribou range falls within the boundaries of the Deh Cho Region. Boreal caribou have recently been designated as threatened by COSEWIC.

Larter, Nic
ENR Deh Cho
Fort Simpson, NT

Permit No: 5030
Region: DC
Species Studied: Moose
Location: Deh Cho Region

Moose population monitoring
There were concerns voiced over moose abundance along high use areas in the Deh Cho Region by all Deh Cho communities during a wildlife workshop conducted by ENR in September 2002.

Larter, Nic
ENR Deh Cho
Fort Simpson, NT

Permit No: 5028
Region: DC
Species Studied: Wood Bison
Location: Fort Liard; Nahanni Butte area, in the vicinity of Liard and South Nahanni River Valleys

Monitoring of the Liard wood bison population

The Nahanni wood bison population is currently afforded a measure of protection against infection with *Brucella abortus* (causes brucellosis) and *Mycobacterium bovis* (causes tuberculosis), by maintaining a bison free zone, to prevent contact with infected bison from Wood Buffalo National Park.

Lausen, Cori
Birchdale Ecological
Kaslo, BC

Permit No: 4812
Region: SS
Species Studied: Bats
Location: Near Fort Smith

Swarming survey of bats near Wood Buffalo Nationsl Park

Bat biodiversity has not been surveyed in the South Slave Region. A hibernaculum for bats is known in Wood Buffalo National Park, suggesting bats may be overwintering in the southern part of the NWT.

Machtans, Craig
Canadian Wildlife Service, Environment Canada
Yellowknife, NT

Permit No: 5034
Region: DC
Species Studied: Forest songbirds
Location: Fort Liard

Long-term population monitoring of songbirds at Fort Liard, NT
Data collected regarding song bird population is used for conservation management and policy decisions at Environment Canada.

Madsen, Erik
Tibbit to Contwoyto Winter Road Joint Venture
C/O Diavik Diamond Mines Inc.
Yellowknife, NT

Permit No: 5699
Region: NS
Species Studied: Caribou
Location: Lockart Lake Camp

Aerial and ground-based caribou surveys of the winter road
In response to concern from community members, the Joint Venture is interested in monitoring caribou movements along and near the Tibbit to Contwoyto winter road, to obtain a better understanding of caribou presence in the area.

McCallum, Dee
Snap Lake Mine
Yellowknife, NT

Permit No: 6881
Region: SS
Species Studied: Caribou, Grizzly Bear, Wolverines, Wolves and Falcons
Location: Snap Lake

Wildlife effects monitoring program
This program is designed to detect, monitor and measure environmental effects that may impact wildlife habitat, changes to wildlife behaviour and distribution, and wildlife mortalities associated with the mine activities.

Mulders, Robert
ENR North Slave
Yellowknife, NT

Permit No: 6880
Region: SS
Species Studied: Wolverine
Location: NE of Wekweètì (Daring Lake, BHP and Diavik study areas)

Wolverine DNA sampling
A DNA sampling protocol has been developed, that can estimate relative wolverine abundance across large landscapes. This technique enhances the ability to quantify relative wolverine

abundance, provide trend information for wildlife monitoring programs, and is anticipated to permit the modelling and assessment for cumulative impacts of anthropogenic activity on a regional scale.

Panayi, Damian
Golder Associates
Yellowknife, NT

Permit No: 5700
Region: SS
Species Studied: Wolverine, Wolf, Grizzly and Black Bear, water birds, and raptor
Location: Kennady lake area

Gahcho Kué environmental monitoring
The purpose of these studies is to gather additional baseline information on wildlife in relation to the proposed Gahcho Kué project.

Popko, Richard
ENR Sahtu Region
Norman Wells, NT

Permit No: 5159
Region: SA
Species Studied: Mallards and Northern Pintail ducks
Location: Willow Lake

Western Canada cooperative duck banding program at Willow Lake
Dabbling ducks are migratory waterfowl that are hunted throughout their range. Banding large numbers of ducks across their summer range before the start of the hunting season and then documenting band returns from successful hunters allows us to plot the harvest distribution.

Rausch, Jennie
Canadian Wildlife Service
Yellowknife, NT

Permit No: 5402
Region: IN
Species Studied: All shorebirds
Location: Kendall Island Migratory Bird Sanctuary

Arctic shorebird monitoring program
The arctic shorebird monitoring program was initiated in response to widespread shorebird population declines noted on migration routes through southern Canada and the United States.

Reford, Stephen
Darnely Bay Resources Ltd.
Toronto, ON

Permit No: 7419
Region: IN
Species Studied: Birds
Location: Near Paulatuk

Darnely Bay Resources Ltd. 2010-2012 field program - pre-activity nest surveys
Identify if birds are nesting in or near the identified drill and camp sites; identify which bird species are nesting in or near identified drill and camp sites.

Robertson, Myra
Canadian Wildlife Service
Yellowknife, NT

Permit No: 5405
Region: IN
Species Studied: All goose species
Location: Bird sanctuary

Population management of geese and swans in the Inuvialuit Settlement Region, using aerial surveys and banding studies
Information on bird numbers, distribution, survival and productivity is needed to determine if current local and international harvest levels are sustainable and to ensure that populations are conserved for the long-term use of the Inuvialuit and other people residing or hunting within the migratory range of these species.

Sharam, Greg
Rescan Environmental Services
Yellowknife, NT

Permit No: 5697
Region: NS
Species Studied: Caribou, Wolverine, Arctic Fox, Red Fox, Grizzly Bear, voles, lemming, hares, ground squirrels
Location: Couageous Lake

Courageous Lake project wildlife baseline program
Seabridge Gold is conducting mineral exploration near Courageous Lake, NT. Baseline wildlife studies were conducted in the area in 1982-1983 and 2004-2005, but this is the first year that Rescan will be conducting this work.

Wood, Cindy
Canadian Wildlife Service, Environment Canada
Yellowknife, NT

Permit No: 6887
Region: NS
Species Studied: Herring Gulls
Location: North shores of North Arm of Great Slave Lake from Boundary Creek west to Frank Channel

Chemical management plan wildlife national monitoring program
Herring Gulls and other gull species have been used as the typical sentinel species for contaiminants in aquatic environments for over 30 years. They are used because they are known to accumulate organic contaminants, nest in colonies, making egg collection relatively simple, and lay three eggs, but seldom rear more than 2 chicks, thus the removal of a single egg from a nest does not typically reduce breeding success.

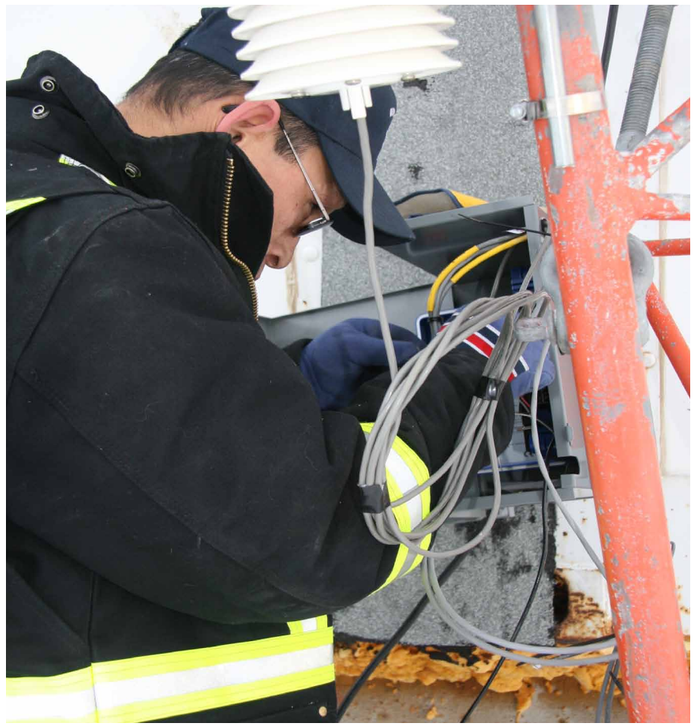
Wortham, Jim
US Fish and Wildlife Service
c/o Canadian Wildlife Service
Yellowknife, NT

Permit No: 5762
Region: IN, GW, NS, SS, DC, SA
Species Studied: Swans and ducks
Location: From southern border of the NWT to Mackenzie Delta region

Cooperative waterfowl population surveys in the Northwest Territories
Information on bird numbers, distribution, and population trends is needed to determine if current local and international harvest levels are sustainable and to ensure that populations are conserved for the long-term use and appreciation by northern residents.

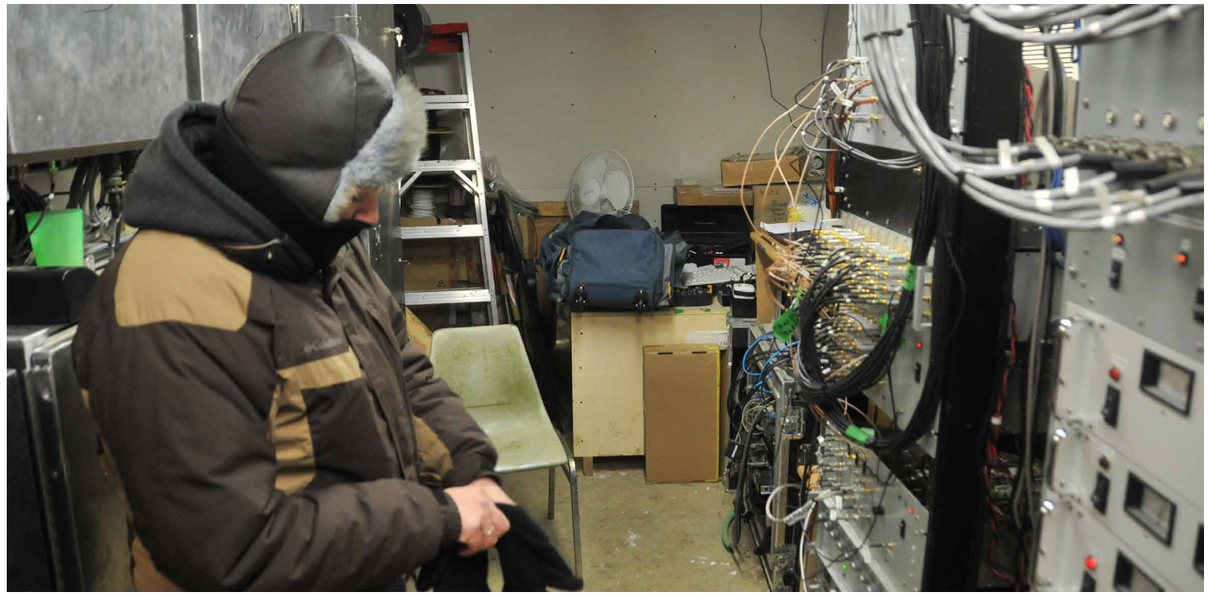
FISHERIES PERMITS 2011

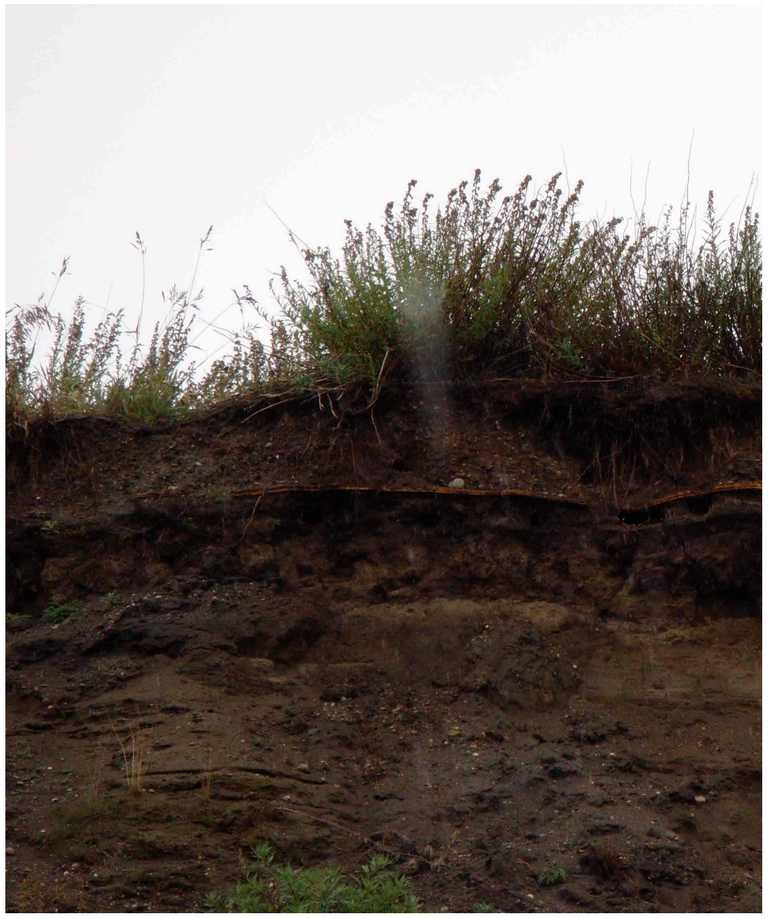
At the time of publication, the Department of Fisheries and Oceans have not submitted their 2011 permitting information. Updates will be published when information is made available.

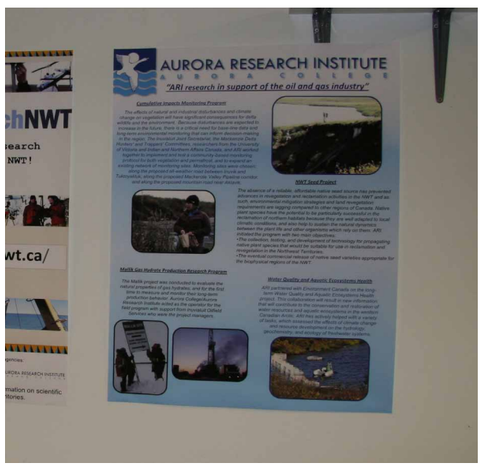


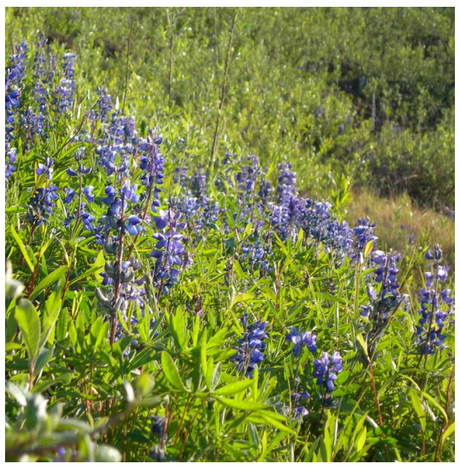
Research in Action

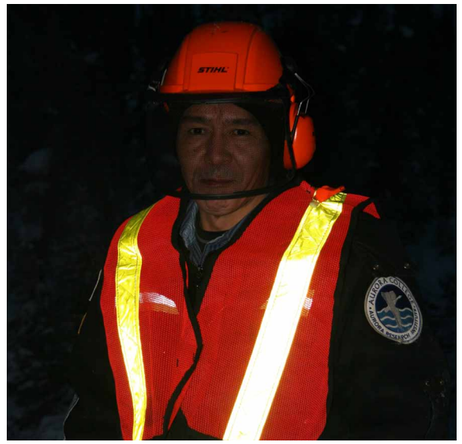
Photo Credits: ARI staff






AURORA RESEARCH INSTITUTE
AURORA COLLEGE
"ARI research in support of the oil and gas industry"
Cumulative Impacts Monitoring Program
NWT Seed Project
Mackenzie Gas Hydrate Production Research Program
Water Quality and Aquatic Ecosystems Health

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ARCTIC ICE
A GLOBAL THERMOSTAT
Science rarely speaks with a single voice, especially about something as complex as our global climate and ecosystem.


SKI-DOO


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BIOLOGY 2012

Buddle, Chris
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Ste-Anne-de-Bellevue, QB
chris.buddle@mcgill.ca

File Number: 12 402 861
Region: GW
Licence No: 15091 (Multi-year licence)
Location: Dempster Highway, between kilometers 0 and 540 including Rock River; Mackenzie lowlands; Engineer Creek

Ecological structure of northern arthropods: Assessing community structure and biodiversity across an environmental gradient

Northern parts of Canada are home to many different species of insects, spiders and other arthropods. Researchers from McGill University have been working to document the species of insects and arachnids living in the North, in an effort to benchmark northern biodiversity so that climate change and other environmental effects can be better understood. In 2012, a field team from McGill University travelled into the Northwest Territories, between the Yukon-NWT border, but not further than the Peel River. The field team spent less than one day in the NWT. The objective was to collect some insects and arachnids, and the bulk of the collections were done in the Yukon. However, about 50 pseudoscorpions (small arachnids, related to spiders), several dozen caterpillars, some wolf spiders and beetles were collected in the NWT. These arthropods were collected by hand, and by searching in the tundra. Determining exactly what species were collected is a time-consuming task and the data are not yet fully processed. Preliminary observations, however, suggest the species are similar to what field teams collected along the Dempster Highway in past years.

Hansen, Ken
Husky Oil Operations Limited
Calgary, AB
ken.hansen@huskyenergy.com

File Number: 12 402 880
Region: SA
Licence No: 15160 (Multi-year licence)
Location: Within the boundaries of EL 462/EL 463 in the Central

Husky EL462/463 fisheries baseline study

Travel to the study area (near Norman Wells) occurred in September 2012. Baseline fish studies involving the electrofishing of several streams and the netting of several lakes were attempted (as outlined in the proposed scope of work). The studies were not completed due to increased water levels and flow rates in the streams from higher-than-normal snow fall in the area in mid-September. Several of the proposed study sites were inspected, however, no

activities associated with electrofishing or netting were performed. As such, no fish were removed from the streams or lakes of interest.

Harris, Allan
Northern Bioscience
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aharris@tbaytel.net

File Number: 12 402 876
Region: DC

Licence No: 15137 (Multi-year licence)
Location: Hotsprings (approximately 60) in and around Nahanni National Park

Nahanni Aster status report

A survey for Nahanni Aster (*Symphyotrichum nahanniense*) was conducted in 2012 in and around Nahanni National Park Reserve. Fifty springs were surveyed, including the four previously documented sites for this species, an undocumented site reported by Parks Canada staff, and 44 sites that had not previously been surveyed for this species. The species was rediscovered at all five known sites and newly discovered at a sixth site. The number of stems (mature individuals) ranged from 200 to over 1500 per site, with an overall total of more than 5000 stems.

Jones, Paul
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Saskatoon, SK
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File Number: 12 402 867
Region: SS

Licence No: 15014 (Multi-year licence)
Location: The mouth of the Slave River Delta at Fort Resolution; Slave River within the municipal boundaries of Fort Smith

Fish health study in the Slave River and the Slave River Delta

In 2012, researchers continued fish sampling on the Slave River in collaboration with the Government of the Northwest Territories. These collections were carried out in conjunction with sampling on the Athabasca River. Fish were collected by gillnetting with the assistance of community members. A total of 185 fish were collected, including: 7 burbot, 57 goldeye, 49 jackfish, 45 walleye and 27 whitefish. After collection, the fish were subject to a detailed external and internal health examination and samples were collected for contaminant analysis. Samples are currently being analyzed for chemicals associated with oil sands activities in Alberta. These tested chemicals include: PAHs (polycyclic aromatic hydrocarbons), naphthenic acids and metals.

Krizan, Julia
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jkrizan@golder.com

File Number: 12 402 664
Region: IN

Licence No: 15097
Location: From the Ikhil Production Facility to the proposed South Parsons Lake well

Fish habitat survey and bathymetry survey for the South Parsons Lake gas supply project, NWT
The proposed work was not completed, and is not anticipated to be completed in the future.

Marken, Sandra
ConocoPhillips Canada
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sandra.l.marken@conocophillips.com

File Number: 12 404 792 **Licence No:** 15100
Region: SA **Location:** Central Mackenzie Valley

Environmental assessment for ConocoPhillips EL470
Assessments of the EL470 study area were conducted to gather baseline information for the environmental assessment process, in support of the ConocoPhillips' 2012-2013 winter drilling program and future exploration activities. Biophysical components studied included: soils, vegetation, wildlife, species at risk and plants and animals of traditional interest. Bathymetric surveys, volumetric calculations and surface water sampling were conducted on 14 water bodies within the study area; however, only eight of these water bodies and the Mackenzie River were found to be suitable for potential project use. Four groundwater monitoring wells were installed, with groundwater sampling planned for 2013. The geotechnical activities originally planned for 2012 have been deferred to 2013. Community meetings were held in Tulít'a and Norman Wells during the week of May 22, 2012.

Muir, Andrew
Great Lakes Fishery Commission.
Ann Arbor, MI
United States
amuir@glfc.org

File Number: 12 402 849 **Licence No:** 15078
Region: SA **Location:** Narakay Islands; Dease Arm; the eastern side of McTavish Arm extending from the Doghead Peninsula in the north to the Superstition Islands in the south; Great Bear Lake

Lake trout diversity in Great Bear Lake: Do deep-water forms exist?
A type of lake trout lives in the deep waters of several big lakes in Canada, including Great Slave Lake and the Great Lakes. The objective of this research was to determine if this deep-water lake trout also existed in Great Bear Lake. Fourteen gillnets in deep-water regions (> 50 m) southwest of the Narakay Islands and McTavish Arm were set, resulting in only 132 lake trout caught. This low number of caught fish suggests that very few fish live in the deep-water parts of the lake. No other kinds of fish were caught in the nets. Each fish was sampled to determine their age, growth, reproductive condition, body shape, and diet. These samples are still being processed. Preliminary information suggests that deep-water lake trout - similar to the ones in Great Slave Lake - do not occur in the areas of the McTavish Arm. Two fish that were caught near the Narakay Islands in the Dease Arm did resemble the deep-water lake trout form, but further analysis is ongoing.

Renaud, Claude
The Canadian Museum of Nature -- Research and Collections Division
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crenaud@mus-nature.ca

File Number: 12 402 873
Region: DC, SS

Licence No: 15057 (Multi-year licence)
Location: Lower Martin River; Mackenzie River Basin; Harris River mouth opposite and north of Fort Simpson; Mackenzie River near Fort Providence about 75 km downstream from the outlet of Great Slave Lake; Mackenzie River at the outlet of Great Slave Lake near Big Island; Lower Hay River in approximately the 16 km before it enters Great Slave Lake; upper Slave River at the water intake reservoir of the water treatment plant in Fort Smith

Evolution of arctic lampreys

The purpose of this research was to study the two lamprey species found in NWT. To date, there is very little information about both the arctic lamprey (*Lethenteron camtschaticum*, formerly known under the scientific name *Lampetra japonica*) and the Alaskan brook lamprey or darktail lamprey (*Lethenteron alaskense*). This study is part of a larger scale research initiative about lampreys of the genus *Lethenteron* across the northern hemisphere (Eurasia and North America). For the NWT study, the objectives of this ongoing project are: (1) To collect a total of about 30 larvae (at least 60 mm in total length) for each of the two species: (2) To collect adults of each species, describe their gross morphology and pigmentation and produce an identification key. A total of about 10 adults of each species would desirable to corroborate the identity of the larvael; (3) Compare the DNA sequences between the two lamprey species; (4) Perform a histological examination of lamprey larvae of different sizes (5 larvae per 10 mm increments from 30 mm up to 120 mm total length) for the two species to follow the development of their ovaries and determine if they contain one or two generations of eggs. This gives a combined total for the two species of 90 larvae. To date, researchers have done preliminary work based on a single mitochondrial gene on samples from Japan (*L. camtschaticum*) and Alaska (*L. alaskense*) and found no differences. Work is ongoing.

Robb, Tonia
Rescan Environmental Services
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File Number: 12 402 766
Region: NS

Licence No: 14996
Location: Waterbodies located within the EKATI claim block

EKATI aquatic monitoring program, 2009-2013

In 2012, five monitoring projects were ongoing in the lakes and streams of the Koala, King-Cujo, and Pigeon watersheds, where EKATI mine infrastructure are located. The monitoring programs are: (1) Aquatic Effects Monitoring Program (AEMP); (2) Surveillance Network Monitoring Program (SNP); (3) Panda Diversion Monitoring (PDC) Program; (4) seepage monitoring program; and (5) Air Quality Monitoring Program (AQMP). The objective of the AEMP was to assess the current conditions in the lakes and streams of the Koala and King-Cujo watersheds to determine whether there have been any mine effects. The assessment incorporated meteorology, hydrology, water quality and physical limnology, phytoplankton, zooplankton, benthos and fish data. Data analyses for the 2012 are currently being completed and will be submitted in April 2013 to the Wek'èezhìi Land and Water Board (WLWB). The main objective of the SNP was to confirm EKATI's compliance with effluent quality criteria in its water license. The data are reported monthly to Aboriginal Affairs and Northern Development Canada and are

available on the WLWB online registry. Results from the past 13 years have shown that the PDC is successfully providing fish habitat and that vegetation is establishing itself along its banks. A full habitat assessment of the PDC was conducted during July 2012 to provide information for the design and installation of the habitat enhancements that were proposed prior to the completion of the program. Although many plants have successfully re-colonized riparian and bank slope areas, results indicate that the establishment of in-stream vegetation was occurring at a slower rate. In response, in-stream vegetation mats were transplanted to the PDC during the summer. Further analysis of this work is in progress. Monitoring of seepage from the waste rock storage areas (WRSAs) at Misery, Fox and Panda-Koala continued in 2012. Seepage samples were collected in June to correspond with snow melt, and again in September prior to freeze up. The data will indicate the extent of metal leaching from the WRSA. Results are reported to the WLWB. Air quality was monitored using high volume air sampling (HVAS), partisols, continuous ambient monitors (CAM) and dustfall measurements as a part of the AQMP.

Sibbald, Carey
Deton' Cho Stantec
Yellowknife, NT
carey.sibbald@stantec.com

File Number: 12 402 879 **Licence No:** 15155
Region: NS, SS **Location:** Within Avalon's Thor Lake Property; two reference lakes

2012 baseline aquatic program for Avalon Rare Metals Inc. proposed Thor Lake rare earth element project

In 2012, Deton'Cho Stantec conducted two field programs for aquatics baseline studies of Avalon Rare Metals' proposed Thor Lake Rare Earth Metals Project. In September 2012, water, plankton (phytoplankton and zooplankton), sediment, and benthos sampling was undertaken. In October 2012, the fieldwork consisted of water sampling. Sampling was carried out at nine lake stations. Results of the 2009-2012 field programs indicate neutral to basic water and very low nutrient levels at all stations. There were large fluctuations in some general and metal parameters (primarily during winter in small, shallow lakes that developed low oxygen conditions under the ice). Sediment characteristics varied, though generally lake sediment had: (1) high phosphorus, nitrogen and organic carbon content; and (2) ranging metal levels (below the ability to detect higher than Canadian guidelines). Chlorophyll a levels varied among lakes and seasons, but in general, most of the lakes are considered oligotrophic (poor in nutrients and plant life and rich in oxygen). Biota data from 2012 is still under analysis.

Tonn, William
University of Alberta
Edmonton, AB
bill.tonn@ualberta.ca

File Number: 12 402 724 **Licence No:** 15051
Region: NS **Location:** Small headwater lakes and their outlet streams into Lac de Gras

Improving habitat connectivity to enhance productive capacity of arctic freshwater ecosystems

Diavik Diamond Mines, Inc., located on Lac de Gras, has undertaken two habitat compensation projects on headwater lake and stream systems near the mine site. Lake outlet streams at two sites were modified to improve fish passage and thus the ecological “connectivity” among these headwater lakes and with Lac de Gras. One habitat manipulation - called M-lakes - occurred in the fall of 2011, while the second habitat project - called West Island - occurred the year following. In 2012, ongoing sampling continued at all reference sites and the West Island site for hydrology, water quality, habitat characteristics, primary producers, invertebrates, and fish. Results from the habitat assessments are similar to previous years. Stream riparian zones are dominated by shrubs, forbs, grasses, mosses, and boulders, while streambeds are sparsely vegetated and composed predominantly of inorganic fines, boulders, and pebbles. Water quality is similar among all streams, but does show seasonal variation. Streams feature low, diffuse flows and cascades that obstruct fish movement from Lac de Gras. Stream electrofishing and hoop netting continues to document low abundances of slimy sculpin, juvenile burbot, and arctic grayling. All lakes are oligotrophic. Riparian zones of lakes are similar to those of streams. Littoral zones are dominated by boulders and inorganic fines. Lake fish communities and species abundances vary among lakes, but are made up mainly of arctic grayling, lake trout, round whitefish, burbot, longnose sucker, and slimy sculpin. Macroinverebrates samples from the streams are still being analyzed. Further research examined the post-winter recolonization of streams by macroinvertebrates and lake trout feeding ecology. For macroinvertebrates, larger, more mobile taxa tended to colonize from downstream areas, while smaller, less mobile taxa drifted in from upstream or colonized from the zone below the stream bed. Few specimens colonized the streams from the air. Diets of lake trout were more specialized in lakes with fewer potential fish competitors, with lake trout mainly feeding on zooplankton. This is compared to the broader, more littoral-oriented diets of trout co-occurring with multiple competitor species. Growth rates did not differ between the lake types, but trout were in better body condition in lakes with fewer potential competitors. The preliminary evaluation of the M-Lake habitat manipulation indicated that two of three streams at the M-lakes site were ineffective at increasing fish passage and would likely need modifications. A third stream at M-lakes did improve fish passage and required no further work.

Trimble, Annika
Aurora Research Institute
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atrimble@auroracollege.nt.ca

File Number: 12 402 842 **Licence No:** 15021
Region: IN, GW **Location:** In and around Inuvik

Northern native seed development field trials

In 2005, three field trial sites were established in partnership with the Inuvik Community Greenhouse to assess NWT seed collections under natural conditions on disturbed sites. Each field site was established in a different type of habitat (i.e. gravel pit, clay slope, peat firebreak). Beyond the initial site clearing, seeding, and transplanting, these plots received no additional care. Each year the field sites are surveyed to assess the survival of transplants, germination of seeded plots, as well as the vigour and flower production of both. In 2012, the field plots continued to demonstrate the following trends: (1) higher survival and vigour in plots with transplants, as opposed to low germination in plots which were seeded; (2) increasing ground cover and recovery at clay and gravel pit sites, and low survival and vigour at the peat site; and (3) notable vigour in the legume species at the clay and gravel sites. These field plots will

continue to be monitored for several more years to assess site recovery and long-term survival of the transplants.

CONTAMINANTS 2012

Blais, Jules
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File Number: 12 404 800
Region: DC
Licence No: 15128 (Multi-year licence)
Location: Tathlina Lake/Cameron River Delta; Lakes in and around Yellowknife

The Arctic in flux: How has recent climate change affected contaminant transport and uptake in aquatic arctic systems?

The Cameron Hills, located along the Alberta/NWT border, are the largest actively producing oil and gas fields in the NWT, and yet the impacts of these activities, in particular the release of polycyclic aromatic hydrocarbons (PAHs) downstream, has not been investigated. Lake sediments are natural archives of physical, biological, and chemical information that can track environmental change in lakes, including contaminant histories. In September 2012, in collaboration with the Ka'a'gee Tu First Nation in Kakisa, sediment cores were obtained from four lakes in the Cameron Hills that are adjacent to oil and gas wells. Two sites were located downstream of the development in the Cameron River Delta (at Tathlina Lake), and three reference lakes. These cores were used to help determine whether oil and gas production in this region is releasing PAHs and other contaminants into the ecosystem, and whether contaminants are being transported downstream to Tathlina Lake. Samples of benthic invertebrates from streams in the Cameron Hills that are upstream and downstream of development are still being analyzed for PAH and metal contamination to assess whether contaminants are bioaccumulating in the food web.

Blowes, David
University of Waterloo
Waterloo, ON
blowes@uwaterloo.ca

File Number: 12 402 843
Region: NS
Licence No: 14993 (Multi-year licence)
Location: Lac de Gras mine site at Diavik Diamond Mines

Waste rock studies at a diamond mine site

The objective of this ongoing research is to investigate the processes related to water quality and quantity draining from experimental waste rock piles that are located in areas of continuous permafrost. Waste rock piles are mounds of rock removed from open-pit and underground mines. The quality of water draining from a waste rock pile is determined by: (1) the combined

effects of oxygen transport in the air phase; (2) biogeochemical processes that control mineral weathering rates; (3) the release of heat and dissolved constituents due to sulfide mineral oxidation; and (4) hydrologic processes that control unsaturated water flow. The transport of dissolved constituents is further affected by the formation and subsequent dissolution of secondary minerals. Three instrumented experimental waste rock piles were constructed from 2004 to early 2007 at the Diavik Diamond Mine. Instruments in the pile include: basal lysimeters; basal drain; thermistors; time domain reflectometry probes and moisture sensors; tensiometers to measure near-surface infiltration; soil water solution samplers; air permeability probes; air pressure sensors; thermal conductivity access ports; gas sampling ports for oxygen and carbon dioxide; and microbiology access conduit and pyrite growth medium. In 2010, three 40 m deep boreholes were drilled into the operational waste dump and a series of instruments similar to those in the test piles were installed. In 2011, two additional 40 m boreholes and one 80 m borehole were installed and instrumented. Data from these instruments will be compared to data from the test piles to evaluate differences in measurement scale. Data collection and analysis, including modeling that incorporates climate change, continued in 2012.

Dewar, David
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ddewar@ntpc.com

File Number: 12 402 878 **Licence No:** 15153 (Multi-year licence)
Region: NS **Location:** Bluefish Lake

Bluefish Lake mercury monitoring
No research was conducted under this research licence in 2012.

Evans, Marlene
Environment Canada
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File Number: 12 402 681 **Licence No:** 15129
Region: SS **Location:** Around Great Slave Lake (the East Arm near Łutsel K'e; the West Basin near Fort Resolution; the West Basin near Hay River)

Spatial and long-term trends in persistent organic contaminants and metals in lake trout and burbot from the Northwest Territories
This ongoing research project has been investigating the changing contaminant levels in Great Slave Lake fish since the early 1990s. In 2012, 20 lake trout from Hay River, 20 pike and 20 burbot from Fort Resolution, and 20 lake trout and 20 burbot from Łutsel K'e were shipped (frozen) whole by community members to Saskatoon where length, weight, and age were determined and samples submitted for metals (including mercury) and persistent organic contaminant analyzes; pike and Łutsel K'e burbot were analyzed for mercury only. Mercury concentration has been increasing, although levels remain below the 0.5 ppm guideline. Organic contaminant concentrations have not been increasing and some such as: HCH and DDT, have decreased in concentration due to their decreased usage. The results of 2012 findings will be presented in a 2012 Northern Contaminants Program (NCP) report. This is an ongoing study under the NCP.

Farrell, Rory
EBA, A Tetra Tech Company
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rfarrell@eba.ca

File Number: 12 402 686 **Licence No:** 15144
Region: NS, SS **Location:** Approximately 70 km east of Yellowknife

EBA, Five Mine Sites ESA update and remedial action plan
No summary was submitted for this licence. This project is not in compliance with licencing requirements.

Gantner, Nikolaus (Klaus)
University of Victoria
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File Number: 12 402 868 **Licence No:** 15046 (Multi-year licence)
Region: IN **Location:** In and around Inuvik and Tuktoyaktuk; Yaya Lake; Noell Lake; Big Lake; Husky Lakes; 16 lakes along the 177 road; 4 lakes in the Tuktoyaktuk-Inuvik road corridor

Evaluation of hydro-climatic drivers of contaminant transfer in aquatic food webs in the Husky Lakes Watershed (Inuvialuit Settlement Region, NWT)
The goal of this ongoing research is to identify and quantify the physical, chemical and ecological processes that effect contaminant transfer in Arctic aquatic food webs in response to observed and predicted climate variability and changes in the Husky Lakes watershed. In May and August 2012, the research team completed two successful sampling trips to Husky Lakes, both based out of Inuvik and Tuktoyaktuk. During May, the research crew accessed the southern Husky Lakes to collect samples before continuing on to Tuktoyaktuk for further sampling. All fish samples were collected from fish caught at Husky Lakes by local fisherman. Less that 50 fishes were donated for sampling from 26 families in Tuktoyaktuk. In August, researchers returned to Inuvik to conduct open water sampling at all study lakes. The fieldwork was very successful, with collections of multiple fish species and near-shore invertebrate communities at all study sites. Fifteen traditional knowledge interviews were conducted in February through August 2012 in the region. All TK interviews are currently being translated and transcribed and verification through participants is planned for early 2013.

Geddes, Robert
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File Number: 12 404 862 **Licence No:** 15125
Region: SA **Location:** The south shore of the Great Bear River between Bear River Landing and Lower Shipyard

Great Bear River summer of 2012 site assessments
No research was conducted under this licence in 2012.

Livingstone, Steve
Franz Environmental Inc. and SENES Consultants Ltd.
Ottawa, ON
slivingstone@franzenvironmental.com

File Number: 12 402 811 **Licence No:** 15150
Region: SA **Location:** Along the Canol Trail

Environmental site assessments, Canol Trail, NT

SENES Consultants Ltd. and Franz Environmental Inc. were retained by Public Works and Government Services Canada – Northern Contaminated Sites Program to complete a case study for petroleum hydrocarbon stability and ecological integrity at discrete oil spill sites along the Canol Trail, in 2012. The purpose of the 2012 case study program was to characterize possible oil (petroleum hydrocarbon) related impacts to soil, groundwater and/or surface water at 11 selected spill sites identified during the Phase II Environmental Site Assessments. Each spill site was selected based on its suitability to characterize potential historical oil impacts within the surrounding geological and environmental area. The methods utilized to implement the field program included drilling boreholes and/or test pits (as soil conditions allowed), taking near surface and at-depth soil samples, and installing groundwater/active layer monitoring wells. A number of overall site characteristics including: oil spill morphology and mobility, petroleum hydrocarbon observations, site impacts and recovery were summarized in the report titled “Case Study Program for Petroleum Hydrocarbon Stability and Ecological Integrity” prepared by SENES/Franz and dated July 2, 2013.

Low, George
Deh Cho First Nations
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geobarbgeo@hotmail.com

File Number: 12 402 857 **Licence No:** 14999 (Multi-year licence)
Region: DC **Location:** Cli Lake; Little Doctor Lake; Sibbeston Lake; Tsesto Lake; Blackwater Lake; Fish Lake; Jean Marie River-McGill Lake; Deep Lake; Trout Lake

Updating data on mercury levels in food fish species in lakes used by Deh Cho communities

During 2012, collection of fish was carried out in the following locations: Sanguez Lake, Willow Lake, Trout Lake, Tathlina Lake and Big Island Lake. 20 fish were collected from each lake and biologically sampled. Muscle samples were taken and analyzed for mercury. The work and results have been presented to the community and community workshops have been set up to explain the research and encourage eating fish.

Macdonald, Colin
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File Number: 12 402 333 **Licence No:** 15172
Region: SA **Location:** Keith Arm of Great Bear Lake offshore from Déline

The continuation of a community-led fish monitoring study in Déline, NT 2012

This study was designed to test for metals and radionuclides in fish species around Déline and to provide the people of Déline with advice on whether the fish are safe to eat. Major concerns are: (1) radionuclides (found at Port Radium and other mines in the eastern Sahtú); and (2) mercury (found in fish throughout the NWT). The high levels of mercury in some fish species can lead to health advisories, where Health Canada recommends that pregnant women and children eat less of the fish to avoid possible effects from mercury exposure. During November and December 2012, community members collected lake whitefish, lake trout and herring using gill nets in the waters off the eastern end of Déline. A total of nine lake whitefish, 17 lake trout and 10 herring were measured and aged, and muscle and liver tested for a wide range of chemicals. Data were combined with results from 2009 and 2010 to provide a comprehensive set of data to test differences between species and to determine if there were any causes for concern. In total, 39 trout, 26 whitefish and 26 herring were analyzed from 2009 to 2012, giving a solid basis to provide conclusions. The average concentration of mercury in all three fish species was well below Health Canada's guideline of 0.5 mg/kg for commercial sale. Only one lake trout sample (0.72 mg/kg ww), caught in 2010 was above the guideline. The mercury concentration in all whitefish and herring were far below the guideline. Mercury increased with the size of the fish in all three species tested in this study, but only larger lake trout approached the Health Canada guideline. Organochlorine pesticides, which move into the NWT from southern North America and Asia, were tested in 2010 and were found to be present in the fish of Great Bear Lake, but the concentrations are very low and are not a health concern.

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File Number: 12 402 863 **Licence No:** 15036
Region: SS **Location:** Fort Resolution; Fort Smith

Multi-scale environmental health implications of the Athabasca oil sands for aboriginal communities in Alberta and Northwest Territories

The overall goal of this project was to better understand and communicate how the environmental and human health of downstream aboriginal communities are affected by industrial activity associated with the Athabasca tar sands and large-scale hydro developments. In June 2012, researchers conducted video interviews with community members in Fort Chipewyan (Alberta), Fort Smith and Fort Resolution about environmental changes and community concerns arising from industrial activities impacting the Slave River and Peace Athabasca River deltas. The research was shared with community collaborators through community newsletters. These newsletters were an attempt to create a communication network for communities to share their knowledge and concerns with each other and for the scientific community to communicate their research approaches and results. Two thousand copies of these newsletters have been printed for distribution to First Nation and Métis Nation research partners.

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File Number: 12 402 872 **Licence No:** 15055
Region: NS **Location:** Along Baker Creek near Giant Mine; Outside of Yellowknife

An investigation of arsenic speciation and toxicity in Baker Creek sediments from Giant Mine in the Northwest Territories, Canada

The objective of this research project was to assess the sediment quality of Baker Creek. Researchers sampled arsenic contaminated dirt and water from the Giant Mine. Sampling was conducted in locations believed to be both highly and lightly contaminated. Sediments were dug up using a trowel. Water was filtered and colletected into large jars. The research revealed that arsenic exists as highly toxic arsenic trioxide in some heavily contaminated areas. Many other forms of arsenic were also discovered, as the arsenic at Giant Mine is very complex. Live-organism toxicity tests were conducted on all of the collected dirt and it was discovered that some of the dirt samples are very toxic to fish.

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File Number: 12 402 492
Region: GW, SS

Licence No: 15013 (Multi-year licence)
Location: Forest stands adjacent to and along Highway #5; around Wood Buffalo National Park; the Dempster Highway between the north shore of Canpbell Lake and Rengleng River

Structure, carbon dynamics, and silvichronology of boreal forests

The main objective of this ongoing fieldwork was to collect data in jack pine and black spruce forests on annual movement of organic matter and carbon. During the 2012 field season, a total of ten scientists participated in the study of carbon dynamics in the forests of black spruce, jack pine, or dwarf birch in the Inuvik and Fort Smith area. Soil and plant samples were collected allowing the researchers to examine: soils; fine roots; mycorrhizal hyphae (thin, white, thread-like things related to mushrooms); aboveground litter (amount of falling leaves and branches); tree growth and mortality; and growth history. Changing trends in the amounts of forest materials and forest ecosystems are crucial to understanding carbon dynamics of these forests. This in turn relates to the effect of forest vegetation on climate change (what scientists call feed-back). New efforts this year included: (1) collection of stem core or stem disc samples from two stands in Inuvik and two stands in Fort Smith areas for estimation of stands' growth history; (2) collection of soil samples for examining processes of phosphorous dynamics in permafrost soils; and (3) initiation of growth measurement in mycorrhizal hyphae (that may grow to mushrooms) in jack pine and black spruce stands near Fort Smith. Efforts remain ongoing to quantify the movement of these materials in northern forests.

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File Number: 12 402 871
Region: NS

Licence No: 15054 (Multi-year licence)
Location: Thor Lake

Geochemical and mineralogical controls on the low-temperature aqueous mobility of rare earth elements (REE) in mine waste from the Nechalacho deposit, NWT

No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 402 528 **Licence No:** 15095
Region: NS **Location:** In and around Yellowknife, with a focus on mine properties

Non-toxic arsenic in mushrooms and plants from Yellowknife

The purpose of this research was to determine and compare total arsenic and arsenic species in edible and non-edible fauna and soil from contaminated and uncontaminated locations (mine properties and roadsides/parks). In 2012, a total of 16 different mushroom species were collected from contaminated and uncontaminated locations. Mushrooms were analyzed for total arsenic and arsenic species to determine if the forms of arsenic are toxic or non-toxic. Puffballs, shaggy manes and meadow mushrooms from contaminated areas had total arsenic concentrations ranging from 2.8 to 36 mg/kg dry weight, mainly in the non-toxic form of arsenic, arsenobetaine. Associated soils were also collected and their microbial communities were characterized by DNA analysis, and are currently being compared. The arsenic distribution in a negus tailings mushroom was mapped and showed arsenobetaine is mainly found in the cap and the gills of the mushroom. A field bioaccessibility test was developed and performed on three species of plants collected from five locations. Results were lower than lab methods (research beginning in Fall 2013 to seek to explain this). Total arsenic has not yet been analyzed in all the sampled plants but of those analyzed so far (from Ndilo), the concentrations ranged from 0.04 to 70 mg/kg dry weight. Arsenic compounds present in the plants have not yet been determined, but future work will address this.

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File Number: 12 402 870 **Licence No:** 15042
Region: IN **Location:** Sachs Harbour

Arctic contaminants: Exploring effective and appropriate communication between Inuvialuit communities and researchers

The purpose of this research was to understand indigenous perspectives on contaminants, contaminant research, and how research is communicated and made accessible within communities. From February to March 2012, four focus groups occurred with 12 individuals (six males and six females). Overall, 41% of the Sachs Harbour population contributed to this project since 2009. Early analysis suggests, a person's perceptions of communications processes about environmental hazards may influence their perceptions about the hazard itself. Examples of these processes are: communication methods (how) and communicators/sources (who). Perceptions affect an individual's reception, comprehension and compliance with messages about contaminants. Continuing analysis is investigating the emerging connections and importance between how risk communication is approached and carried out and how

contaminants are perceived. In addition, the roles that trust and relationships play in message development, reliability and retention are also being studied. Focus group discussions highlighted the importance of researchers spending time in the community to explain their research and connect with locals. This research identified a gap in community members' understanding as to why researchers are interested in studying contaminants. Participants identified an absence of basic background knowledge about mercury (the contaminant being discussed), which prevented them from engaging with research updates. Criteria were established for creating a community-based pamphlet about mercury, which is in progress. Fieldwork is complete, and interview participants continue to verify their transcripts.

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File Number: 12 402 869 **Licence No:** 15041
Region: SA, DC **Location:** In and around Trout Lake; Kelly Lake

Impact of climate change on freshwater fish mercury levels

The purpose of the research was to collect fish from lakes and tributary rivers under consumption advisories due to mercury and compare results with historical record. This research also collected and analyzed sediment cores from these lakes to see how lake ecosystem changes relate to fish mercury levels. In 2012, researchers analyzed sediment cores from Trout Lake and Kelly Lake to see how mercury was deposited over time, and how this compares with mercury in lake trout that were collected and analyzed over the past three or four years. Fish from both lakes showed marked increases from earlier collections (1970s and 1980s). Increases over time were also observed in the sediment cores, suggesting that fish mercury levels were linked in some manner to in-lake processes. There was a link between algae-derived organic matter and mercury. This implies that a longer ice-free period (due to climate change) is leading to more mercury entering the lake, which in turn can enter fish. More fish collections are needed to improve the statistical power of these trends, which are currently weak.

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File Number: 12 404 778 **Licence No:** 15146
Region: NS, SS **Location:** The former Copper Pass Mine located on Sachowia Lake

Copper Pass Mine: Environmental site assessment and remediation planning

The Copper Pass Mine is a former small-scale mine on Sachowia Lake, within the East Arm of Great Slave Lake. The nickel mine operated for only a few years and has since been abandoned for approximately 40 years. The objective of this research was to assist Aboriginal Affairs and Northern Development Canada (AANDC) with its ongoing work to clean up abandoned mines across the Northwest Territories. The site investigation (conducted August 1-3, 2012) involved the collection of soil, vegetation and waste rock. A detailed topographic survey was conducted using GPS equipment, as well as site reconnaissance to find roadways, hazards, borrow materials, etc. No mechanical equipment was used, excluding a float plane for site access. Results of the site investigation were incorporated with previous site assessment

findings and confirmed there are aspects of the site that will require remediation. The finalized document is still being prepared, and will be provided to AANDC for ownership and distribution.

ENGINEERING 2012

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File Number: 12 406 054
Region: NS
Licence No: 15106 (Multi-year licence)
Location: Along the length of the Tibbitt to Contwoyto Winter Road

Paleoclimatological assessment of the central Northwest Territories: Implications for the long-term viability of the Tibbitt to Contwoyto winter ice road

The purpose of this research was to develop a comprehensive sub-decadal to centennial-scale late Holocene climatic history along a 2° latitudinal gradient in the central NWT. Over 100 lakes along the route of the Tibbitt to Contwoyto Winter Road were analyzed for water property data (e.g. pH, conductivity), substrate characteristics (e.g. LOI, grain-size, BSi), nutrient loading, water geochemistry (e.g. F/U, Fe/Mn, DIC/DOC) isotopes (C/N) and environmentally available metals. This dataset was used to develop training sets and transfer functions based on micropaleontological proxies (thecamoebians, diatoms and chironomids). A large number of freeze cores were also collected from these lakes. Use of a freeze core microtome has permitted subsampling of freeze cores to mm-resolution (2-5 years). Time series analysis results indicate that throughout the late Holocene there was been considerable climate variability with winter and summer signals often becoming decoupled. The Pacific Decadal Oscillation and North Atlantic Oscillation have contributed to step-wise temperature changes, as these phenomena vary between positive and negative phases. The computer model results indicate that the Tibbitt to Contwoyto Winter Road should remain viable for the coming decades as winter temperatures will only rise slightly. Precautions should be taken during El Niño years though. 2012 was the final year of this research project.

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File Number: 12 406 058
Region: IN
Licence No: 15151 (Multi-year licence)
Location: Storm Hills (68°53'1.14"N, 133°56'55.65"W)

Wind energy monitoring at Storm Hills: 2012-2014

In October 2012, wind monitoring equipment was installed on an existing 150 foot communications tower in the Storm Hills area. The datalogger is being powered by solar panels,

and data are being transmitted by satellite. Wind speed data will be collected for two years and then used to verify the feasibility of developing a wind energy project in the area.

HEALTH 2012

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File Number: 12 408 149
Licence No: 15009 (Multi-year licence)
Region: GW
Location: Aklavik; Tuktoyaktuk; Sachs Harbour; Fort McPherson

The Aklavik *H. pylori* project

The objective of the ongoing Aklavik *H. pylori* project is to develop a comprehensive approach to investigating community health problems related to *Helicobacter pylori* infection (a bacteria that can be found in the gastrointestinal tract) in NWT communities. The purpose of this research project is to identify public health solutions aimed at reducing related health risks, and to obtain representative data from diverse settings in northern Canada for informing regional public health strategies for reducing health risks from *H. pylori* infection. From fall 2011 to summer 2012, research team members followed up with the Aklavik *H. pylori* project participants to assess the onset of new infections and re-infections. Additionally, microbiology results were shared with Aklavik community members. Since April 2012, 16 new participants joined the Inuvialuit Settlement Region (ISR) *H. pylori* Project in Tuktoyaktuk. Project team members and the team's lead gastroenterologist have made two additional trips to offer medical consultations to project participants and initiate the treatment component of the project. Planning for expansion to other communities in the ISR is underway. In addition, the Fort McPherson *H. pylori* project was launched in June 2012. As of September 2012, 179 residents of Fort McPherson have joined the project and completed a urea breath test. Recruitment is still ongoing, and the endoscopy and treatment components of the project are being planned. These are expected to be held in March 2013.

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File Number: 12 408 148
Licence No: 14997 (Multi-year licence)
Region: IN
Location: Aklavik; Ulukhaktok

Changing the "culture of smoking": Community-based participatory research to empower Inuvialuit communities

The purpose of this research was to empower local Inuvialuit community members to better understand tobacco and its health and other effects and to motivate them to consider quitting or

reducing their use of tobacco. This community-based participatory research project began in Aklavik and Ulukhaktok in 2007. 2012 was the final year of the project. At the beginning of the projects, participants completed baseline surveys that were analyzed and presented to communities in 2010. The first smoking cessation challenge, called the *Quit to Win Challenge* (open to smokers and non-smokers aged 8 and up) took place in January 2009. It was very successful with a total of 34% of eligible community members signing up. The second challenge, the *Be Smoke-free Challenge* took place in November 2010. Community responses were excellent, again with 34% of the eligible population of the two communities signing up. The third challenge, the *No Tobacco Week Challenge* was held in June 2011 in Aklavik and November 2011 in Ulukhaktok. This time, participation rates went up to 43% for both communities. More non-smokers than smokers entered (an equal number of girls and boys, and more women than men). In 2012, the final year of the project, participants completed an exit survey.

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File Number: 12 408 142 **Licence No:** 15029 (Multi-year licence)
Region: IN, GW, DC, SA, NS, SS **Location:** At health centres, hospital and clinic laboratories throughout the Northwest Territories

RHD alleles in prenatal patients from northern Canada

The objective of this research is to ensure that current prenatal testing methods are appropriate for prenatal patients in the northern regions of Canada, and to learn more about the RHD genotype in northern populations. This project was initiated in 2006, but getting participants has been slow despite repeated recruitment efforts. Much is known about the RHD genetic make-up of ethnic groups world-wide but this information has never been compiled for the indigenous populations of northern Canada. The information is important because the test reagents - used for prenatal testing - are largely developed based on a Caucasian population. To date 72 maternal blood samples have been collected, DNA extracted and frozen in a molecular laboratory. A minimum of 80 samples are required to make the results statistically significant. This study is likely to continue at least until the minimum 80 samples are collected.

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File Number: 12 408 187 **Licence No:** 15162
Region: SS **Location:** Fort Smith

Outcomes of primary maternity care in Fort Smith, NWT

The purpose of this research was to look at outcome data that is available from a perinatal database developed during the last two years in Fort Smith and to describe the experiences of women who have given birth using the community-based midwifery service. Data were collected from medical charts at the Fort Smith Midwifery Program to evaluate the birth outcomes of moms and babies in Fort Smith from 2005-2011. Researchers collected information including: who the birth attendant was; if the woman transferred out of Fort Smith for the labour/delivery; if it was a preterm birth; if the woman had a Cesarean section; if the woman had any tearing from

delivery; and gestational age and weight of the baby. The dataset is now being analyzed and compared to outcomes from the midwifery-led maternity centres in Nunavik, Quebec. Focus groups were also held with several women who had used the Fort Smith Midwifery Program to discuss their experiences and the impacts that the program has had on their own and their family's lives.

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File Number: 12 408 184 **Licence No:** 15058
Region: DC, NS **Location:** Yellowknife Primary Care Clinic and Stanton Territorial Hospital; Fort Simpson Clinic; Behchokǫ̀ Clinic; Dettah Clinic

Evaluation of the electronic health record (EHR) system used in the Northwest Territories
No research was conducted under this licence in 2012.

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File Number: 12 408 188 **Licence No:** 15168
Region: IN, GW, SA, DC, NS, SS **Location:** Registered Nurses, Nurse Practitioners, Licensed Practical Nurses and Registered Psychiatric Nurses across the NWT

Nursing practice in rural and remote Canada II
The survey instrument was developed and revised during this year. It was tested outside of the Northwest Territories. No data were collected in the NWT in 2012.

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File Number: 12 408 183 **Licence No:** 15010 (Multi-year licence)
Region: NS **Location:** Within the Stanton Territorial Health Authority

Achieving high performance in health care priority setting
The intent of this project was to develop an evaluative framework that identifies how health care organizations can be transformed to achieve excellence in priority setting and resource management. As part of this project, the researchers interviewed five members of the management team in Stanton Territorial Health Authority. This was one of six case studies conducted across Canada, in a range of large and small, urban and rural sites. Managers were asked to define the concept of 'high performance' in a priority setting and what resource allocation looked like to them. Then they were asked to assess their own organization's performance in relation to those ideas. Gathering these results, the researchers developed a framework for high performance, including 19 elements, within four broad domains. They represented areas that organizational managers should address in order to improve priority

setting and resource allocation practice in the health care sector. None of the case study sites were identified by name in public presentations of the findings.

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File Number: 12 408 186 **Licence No:** 15099
Region: NS **Location:** Stanton Territorial Hospital

TRanslating Emergency Knowledge for Kids (TREKK)
In Canada, the majority of children requiring emergency care are treated in general emergency departments. Evidence shows however that as many as 40% of children cared for in general emergency departments do not receive treatments for which clear evidence exists, and up to 20% of these children receive a treatment which has been shown to provide no benefit or in some cases even harm. This study, Translating Emergency Knowledge for Kids (TREKK), is a Pan-Canadian initiative aimed at ensuring that the latest research in pediatric emergency medicine is applied within general emergency departments. TREKK's long-term vision is to efficiently and effectively improve the outcomes of acutely ill and injured children cared for in all Canadian emergency departments. During this phase, TREKK will determine the knowledge needs of health care providers working in general emergency departments, and the families seeking care within these facilities. Through an established partnership with 32 general emergency departments across Canada (including at the Stanton Territorial Hospital), TREKK will work with staff, administrators and consumers to understand the existing knowledge gaps, needs and priorities in pediatric emergency medicine. Understanding the needs and preferences for knowledge mobilization among receptor communities is central to the mandate of TREKK. Phase one work is ongoing.

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File Number: 12 408 185 **Licence No:** 15074
Region: IN, GW, SA, DC, NS, SS **Location:** Database study using the Non-Insured Health Benefits prescription drug database

Anticoagulation in Canada's north: A cost-effectiveness analysis of point-of-care INR testing at remote sites in the Northwest Territories and Western Nunavut.
No research was conducted under this licence in 2012.

PHYSICAL SCIENCES 2012

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File Number: 12 404 789
Region: DC, SS
Licence No: 15093 (Multi-year licence)
Location: Along the Mackenzie drainage basin at the Slave River Rapids

Big river wood dynamics in the Canadian subarctic

The primary objectives of this ongoing research are to: (1) evaluate fundamental controls on wood dynamics within the Mackenzie; and (2) develop an empirical predictive model to estimate future wood dynamics. In the summer of 2012, preliminary research was conducted on the Slave River near Fort Smith, Great Slave Lake, and Fort Simpson. This work mainly focused on networking, reconnaissance and gaining familiarity with the region. Data on log jam structure and size were collected from islands in Mountain and Cassette Rapids (on the Slave River), Paulette Island (near the Slave Delta) and along the shores of the Mackenzie and Liard (near their confluence). Time-lapse photography was taken at the Slave R. Fitzgerald gage to capture wood moving downstream during high flows. Repeat analog aerial photographs of the Pelican Islands (data usage allowed from the Department of Environment and Natural Resources and the Pelican Advisory Circle) from 1978 to 2004 were scanned and digital photographs from 2004 to present were acquired. Work will continue in 2013.

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File Number: 12 404 750
Region: DC, NS
Licence No: 15059 (Multi-year licence)
Location: The Mackenzie Bison Sanctuary and areas to the west to Mills Lake; Birch Lake; Fawn Lake; Sharun Lake and Second Lake. Tree core sampling took place south of Behchokǫ̀, primarily along Highway 3

Landscape scale flooding in the Great Slave Lake Plain

This ongoing research project is designed to study the Great Slave Lake Plains. In 2012, researchers collected nine sediment cores from the bottom of eight lakes within the Mackenzie Bison Sanctuary. In addition, water samples were collected from those eight lakes plus three others in the area. Water samples were analyzed for a variety of water chemistry parameters,

including major ions, mercury and dissolved carbon. Analysis of the water chemistry was undertaken at Taiga Laboratory in Yellowknife. Sediment cores are now being analyzed to determine the algae (diatoms) living in lakes and how their populations may have changed as the lakes have expanded. Sediment analysis is being done to determine if mercury is becoming more abundant in the lake systems as the lakes have grown in size and flooded the forests and shrubs surrounding the lakes. In addition, the research team also traveled to Fort Smith where they gave presentations and took students from Aurora College out into the field to explain the research in Fort Providence.

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File Number: 12 404 371 **Licence No:** 15044 (Multi-year licence)
Region: IN **Location:** In and around Sachs Harbour

An integrated sea ice project for BREA: Detection, motion, and RADARSAT mapping of extreme ice features in the Southern Beaufort Sea

Three groups are represented in the integrated sea ice project for BREA. The University of Manitoba contributions to the integrated sea ice BREA project focuses on: (1) the identification of hazardous ice features using remote sensing techniques; (2) understanding the ice motion relative to winds and ocean currents; and (3) obtaining seasonal temperature profiles of extreme ice features (>4m thick). In April 2012, the research group deployed 13 GPS beacons, 11 on multi-year ice floes located 80-100 nautical miles (NM) west of Banks Island and two GPS beacons on an ice island (glacial ice) located 48 NM west of Sachs Harbour. These provided hourly position data from April 9 onward through the summer period. To help understand the nature of ice movement, instruments were deployed on and through the ice to measure surface winds and ocean currents. The ocean current profiler measured speed and direction of currents at 2 metre (m) intervals to 60 m depth. Two ice mass balance (IMB) buoys measured ice temperature profiles from April 10 to July 31. Ice temperature has a direct bearing on ice strength and will be used in modeling studies. All instruments deployed transmitted data back to the University of Manitoba at 0.5-1 hour intervals. This dataset is currently being analyzed. EM Induction surveys were conducted on multi-year ice to obtain local ice thickness data. Average ice thickness measured on the multi-year floes ranged between 4 to 7 m. The ice island measured 33 m thick.

The second research group was focused on characterizing the thickness and strength of hummocked multi-year ice. In May 2012, researchers used new equipment to measure the temperature, salinity and strength of a 12 m thick multi-year ice hummock. A total of 10.8 m of ice core was removed to provide information about the temperature and salinity of the ice. The ice was coldest near the top layer of ice (-15.1°C) and increased towards the bottom of the ice (to -1.5°C). The ice salinity ranged from 0.1 to 3.7%. Strength tests were performed with an instrument that is lowered into the borehole in ice. A series of strength tests were conducted in each borehole until the bottom of the ice has been reached. For the first time, researchers provided data about strengths in the bottom portion of a thick, multi-year ice hummock. The measurements confirmed that not all hummocks are the same. Some hummocks are old and fully consolidated, with high strengths throughout their full thickness. Other hummocks may have formed recently, and because they still have seawater-filled cavities, they will be weaker overall. Researchers did not encounter any cavities in the hummock that were sampled in May 2012. Tests showed several weak layers within the ice but, overall, the hummock was strong.

Researchers intend to use this equipment to sample several more hummocks in the Beaufort Sea in March and April 2013.

The third research group focused on airborne observations of the distribution, thickness, and drift of different sea ice types and extreme ice features in the Canadian Beaufort Sea. Extensive airborne electromagnetic (EM) ice thickness surveys have been performed in April 2009, 2011, and 2012 over the Canadian Beaufort Sea with a long-range airplane. Results show that the location of the multi-year ice edge can be very variable from year to year. Multi-year ice modal thicknesses ranged between 3.0 and 3.7 m. The seasonal ice zone had very variable ice thicknesses depending on the amount and age of ice formed in coastal polynyas and leads throughout the winter. However, researchers gathered enough data to show that modal first-year ice thicknesses of 2.0 to 2.2 m emerge if profiles are long enough. This can be considered the most representative first-year ice thickness estimate in the Canadian Beaufort Sea in April. However, in the seasonal ice zone also regions with heavily deformed ice thicker than 10 m, and occasional multi-year hummock fields of similar thicknesses occur. Results suggest that multi-year hummock fields may not comprise the thickest ice as they are affected by melt during the summer. Two ice islands had thicknesses between 20 and 30 m. Ice thickness surveys were complemented by the analysis of satellite radar data and tracking of ice features by means of GPS beacons.

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File Number: 12 404 793 **Licence No:** 15101
Region: SA **Location:** Bosworth Creek

Bosworth Creek surface water monitoring program
No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 404 780 **Licence No:** 15045
Region: IN **Location:** Canadian Beaufort Sea

Study on the vertical distribution of ice in arctic clouds (VERDI)
The purpose of this research was to improve the understanding of the cloud-related processes in the Arctic atmosphere and to use these measurements to improve the performance of regional and global climate models of the arctic. This research was designed to obtain a snapshot of ice thickness in this region of the arctic and create an inventory of arctic sea ice volume. Fieldwork was successfully conducted out of Inuvik between 20 April and 20 May, 2012. A total of 13 research flights were undertaken. Most of the flights targeted clouds over the sea ice of the southern Beaufort Sea. No wildlife was seen on the ice. Researchers observed low, stratiform clouds. Diameters of sampled cloud droplets were typically 20 micrometre at cloud top and 10 micrometre at cloud bottom. Ice crystals were also observed in the clouds in

low concentration. A cloud with snowfall was sampled at multiple altitudes and is a useful example to validate modelling of arctic precipitation. The cloud reflectivity was measured to support algorithms for arctic cloud detection from satellites. Several scientific publications are currently in preparation to shed more light of the role of clouds in the energy budget of the arctic atmosphere.

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File Number: 12 404 752 **Licence No:** 15071 (Multi-year licence)
Region: DC, NS, SS **Location:** Within the Seabridge Gold Inc. Courageous Lake lease area

Courageous Lake Project

Data collection at Courageous Lake took place for several technical disciplines between May and September 2012. Water quality was sampled at 27 lakes and 12 streams up to three times over the field season. Some of these lakes were also sampled in March for water quality and in August, for sediment quality, primary and secondary producer communities. Soil and vegetation surveys were completed to verify and confirm existing vegetation and terrain mapping based on imagery. Vegetation and soil sampling was also done to collect baseline metal concentration distribution and patterns. Soil surveys were completed to assess the salvage suitability of the soil. Fish communities and fish habitat were sampled within the regional study area of the Courageous Lake Project. Sampling methods to assess community composition included: minnow trapping, gillnetting, and electrofishing. Sensitive habitat inventory mapping and littoral zone habitat mapping were used to assess fish habitat. Two fish fences were installed on Matthews Creek to assess arctic grayling and longnose sucker use of the creek for spawning. Most water bodies sampled were classified as non-fish bearing, and those water bodies that contained fish had communities comprised of arctic grayling, longnose sucker, lake trout and northern pike. During the 2012 open water field season, the hydrology group monitored eight stream discharge locations in order to develop stage-discharge relationships. Five lakes were monitored for stage height changes across the same time period. Bathymetric mapping surveys were conducted in five small lakes in the local study area as well. In June 2012, the meteorological station had the winter precipitation adapter removed and a diagnostic test performed on the current set of sensors on the station tower. In anticipation of the winter period, the power system for the station was updated and the winter precipitation adapter was reinstalled in September 2012.

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File Number: 12 404 729 **Licence No:** 15111 (Multi-year licence)
Region: IN **Location:** Arctic Ocean

O-buoy measurements of ozone, carbon dioxide and bromine oxide over frozen surface of Hudson Bay and Arctic Ocean

The purpose of this research was to take part in the establishment of long-term observation network to measure concentrations of ozone, carbon dioxide and bromine oxide. An

autonomous ice tethered platform known as “O-buoy 4” started measuring the concentrations of ozone, carbon dioxide and bromine monoxide in the air over the ice of the Arctic Ocean (88.15°N and 157.49°W) on September 5, 2011.The deployment of the instrumentation package was conducted by the CCGS Louis S. St-Laurent Icebreaker. O-buoy 4 drifted with the ice in the wind driven-ice circulation known as Transpolar Drift Stream. This circulation moves ice from the Siberian Coast of Russia across the arctic and exits predominantly into the North Atlantic through the Fram Strait on the east coast of Greenland. The O-buoy 4 was successfully recovered on August 25, 2012. It collected data on air composition, meteorological variables, the ice drift and the ice conditions through its 355-day journey across the High Arctic. It was the first O-buoy that recorded ozone and carbon dioxide concentrations over the ice of the Arctic Ocean with the first parallel measurements of bromine monoxide. It was also collected a complete suite of the surrounding environmental parameters throughout all four seasons in the High Arctic, providing details on regional and seasonal variability. It recorded carbon dioxide variations through the ocean freezing and the ice melt periods and reported data for the Marine Weather forecasting. Collected data are to be used for wind direction and wind speed validation of the forecast models, as well as by scientists to better understand the atmospheric processes in the Arctic. This will help develop advance forecasting capacity for the future developments and scientific understanding of the climate. Daily updated information was posted on open to the public web site: http://obuoy.datatransport.org/monitor.

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File Number: 12 402 475 **Licence No:** 15002 (Multi-year licence)
Region: SA **Location:** The Nota Creek C-17 wellsite

Phytoremediation study on the CDN Forest et al Nota Creek C-17 Wellsite

Phytoremediation is a remediation strategy involving the use of plants to remove contaminants. In theory, plants uptake the contaminant from the soil, are harvested and then removed from the site. This process is repeated until the impacted soil is remediated to applicable guidelines. Phytoremediation activities on the Nota Creek C-17 wellsite progressed to full site planting in 2009 and 2010. Remediation results were encouraging enough to support excavating impacted soil still buried on the site and integrating it into the phytoremediation process. Soil laboratory results from fall 2011 indicated that the impacted soil still required further phytoremediation. Over the course of the 2012 summer, a full phytoremediation cycle of planting, growth and harvesting was undertaken. Laboratory results from the collected samples indicate further soil remediation progress and support continuing with the application of phytoremediation technology to the wellsite.

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File Number: 12 404 707 **Licence No:** 15008 (Multi-year licence)
Region: IN **Location:** South Melville Ice Cap

Melville Island South Ice Cap mass balance and snow pollution

The objective of the multi-year project is to measure the changing volume of the South Melville Ice Cap using an automatic weather station and sampling techniques. Measurements of snow accumulation and ice melt were performed at 21 pole locations on the ice cap by researchers on April 16 and 17, 2012. The South Melville Ice Cap is a small plateau ice cap (76 km^2 in size) that is located on the western portion of Melville Island. Over half of the mass balance poles planted in the Melville ice cap were bent in a southwesterly direction. Bending of these poles was most likely caused by heavy loading of rime (frozen mist) and subsequent strong wind events that occurred in the late fall of 2011. Pole measurements indicate that the ice cap has thinned by ~134 cm as a result of warm temperatures during the summer of 2011 (this equates to a loss of 0.1 km^3 [or 100,000 metric tonnes] of water to the ocean over the past year). These melt rates are the highest since records began in 1963, surpassing the previous record in 2007 by ~15 cm water equivalent mass loss. Temperature data downloaded from the automatic weather station on the ice cap indicate that the 2011 summer melt season extended from early June to early September with an average summer temperature of +3.5^oC. Continued monitoring of the Melville South Ice Cap is important as its rapid changes are providing valuable insight into long-term climate change over the western Canadian arctic region. The accelerating melt trends observed from this ice cap are consistent with those from the other glacier monitoring sites located across the Canadian high arctic. Ongoing measurements are essential for improved estimates to global sea-level rise and documenting climate change across this region. The only wildlife sightings included an Arctic fox that came within 20 meters of the Melville Hut.

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File Number: 12 404 325
Region: IN
Licence No: 15040 (Multi-year licence)
Location: Garry Island; Illisarvik, Inuvik, near the Dempster highway; Paulatuk; Red Lake; Bar C; Seal Lake; Dennis Lagoon

Permafrost and climate change, western arctic Canada

The objective of this ongoing project is to understand how climate change is affecting permafrost in the western arctic, particularly in the outer Mackenzie Delta. In 2012, investigations continued on ground ice and near-surface permafrost at Herschel Island. Samples were collected for analysis from the alluvial fan at Pauline Cove and the surrounding hills. Researchers continued to collect ground temperatures near Inuvik and at both Garry Island and Illisarvik on Richards Island. A new investigation of the carbon content of permafrost at Illisarvik began this year. Overall, researchers continued to monitor ground temperatures in the region to see how they are warming up as the climate changes. Last May, a multi-disciplinary book on Herschel Island based this long-term research project was published by the Wildlife Management Advisory Committee (North Slope). The publication was sponsored by several Inuvialuit agencies, the Aurora Research Institute and several Yukon agencies. Copies of the book are available from the researchers.

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File Number: 12 404 763
Region: NS
Licence No: 15027 (Multi-year licence)
Location: Fortune Mineral's NICO property; along the route of a proposed all-weather access road from the proposed Tłı̨chǫ Road

Environmental baseline surveys of the Fortune Minerals Ltd. NICO Project
A plankton baseline field program was completed during the 2012 open water season (July to September) at the Fortune Minerals Limited – NICO project. The program was designed to collect additional plankton data in response to a request made during the February 2012 technical meetings. Phytoplankton, chlorophyll a and zooplankton samples were collected at five stations within Nico Lake, Peanut Lake, Burke Lake and Reference Lake, as well as from three stations within Little Grid Pond. Due to logistical issues, Reference Lake was only sampled in August and September. Samples have been submitted for analysis and results are pending. The plankton dataset will be summarized in a baseline report, which will be submitted to the Wek'èezhìi Land and Water Board. This report will be available on the Public Registry. Additional water quality sampling was completed at eight stations in the ephemeral stream between Little Grid Pond and Nico Lake. Samples were submitted for analysis and results are pending. Leachate samples from the on-site waste rock and/or tailings field cells were collected on a monthly basis between May and October, 2012. These samples were submitted for chemical analysis and will be used as additional information in the project design.

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File Number: 12 404 788
Region: IN
Licence No: 15088
Location: Within a 5 km radius of Sachs Harbour

Sachs Harbour disposal at sea follow-up study
No research was conducted under this licence in 2012. The project cancelled due to inclement weather and unsuitable ice conditions.

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File Number: 12 404 359
Region: IN, GW
Licence No: 15004 (Multi-year licence)
Location: Outer Mackenzie Delta in Camp Farewell and Mallik areas; Richards Island, Tuktoyaktuk Peninsula

Mackenzie Delta shallow gas and permafrost studies
No research was conducted under this licence in 2012.

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File Number: 12 404 641
Region: IN
Licence No: 15169 (Multi-year licence)
Location: Trail Valley Creek (40km north of Inuvik)

Airborne SAR and passive microwave measurements over snow covered tundra for CoReH20 retrieval validation and land surface model testing

The objective of this ongoing research project is to describe the distribution and physical properties of snow cover in the Trail Valley Creek watershed. This will be used to assess estimates of snow cover properties obtained from a distributed hydrological model, and airborne radar remote sensing. The proposed European Space Agency Earth Explorer 7 CoReH20 satellite mission has the primary objective of retrieving snow water equivalent (SWE) over land at a high spatial resolution (200-500 metres). This would make high resolution, satellite SWE measurement available for monitoring and modeling applications. The Trail Valley Creek project is a test project for: (1) the CoReH20 satellite SWE retrieval approach; (2) the potential use of CoReH20 SWE retrievals as observational inputs to various environmental prediction models (e.g. land surface data assimilation systems and distributed hydrological models used at Environment Canada). During December 2012, the airborne radar instrument did not function properly, and so usable measurements were not collected. Regardless of these issues, a comprehensive dataset of snow properties was collected during a time period when field observations are typically not made in the subarctic or arctic due to the limited light and cold conditions. Long transects (~15 km total ground distance covered) of snow depth, bulk density, and SWE were collected along pre-determined sampling lines. Detailed observations of snowpack stratigraphy (layering, grain type and size, density) were collected at twelve sites (selected to include the variability in snow properties). Snow grain specific surface area measurements were also acquired at these sites. Ground based LiDAR surveys of three snow drift sites were performed in order to estimate the volume and mass of snow storage in these features. Collectively, these measurements represent an important baseline from which the snow measurements in March and April will be compared. There are three phases for the data collection, further measurements are planned for March and April 2013.

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File Number: 12 404 794 **Licence No:** 15113 (Multi-year licence)
Region: NS **Location:** Daring Lake

Impacts from climate change on berry productivity in the Canadian Arctic: Integrating community participation with science

The objective of this research was to establish a long-term community-based monitoring program in arctic communities using culturally important berry species as indicators of climate change. Sample were collected from the berry-monitoring site (established in 2008) from July 23 to August 5, 2012 in Daring Lake. Changes in berry productivity (weight, abundance and ripeness levels) were record and compared with past data. The influence of environmental change on berry productivity may have serious implications for wildlife that depend on berry crops for survival and for humans who view berries as culturally important. Data collected from this site will also be compared with berry data collected from sites located around Kugluktuk, Nunavut. Cranberries and blueberries were also harvested from around the experimental research valley to analyze berry productivity under certain environmental conditions. Samples are still being analyzed.

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File Number: 12 404 743
Region: IN
Licence No: 15081 (Multi-year licence)
Location: The coastline of the Beaufort Sea, from the Alaska/Yukon border to the Northwest Territories/Nunavut border. Ground-based measurements using remote sensing were collected at: eastern Ivvavik National Park; Herschel Island; Northern Richards Island; north of Tuktoyaktuk; Anderson River Delta

Assessing the potential for Environmental Sensitivity Index mapping in the arctic using Synthetic Aperture Radar

The objective of this project was to create an Environmental Sensitivity Index map using helicopter videography. In late July 2012, researchers collected geo-tagged video and audio commentary of approximately 2500 km of NWT coastline around Banks Island and the east and middle channels of the Mackenzie River Delta (north of Inuvik). Radar (RADARSAT-2 and TerraSAR-X) and optical (SPOT) data are being analyzed to determine the most suitable techniques and optimal datasets to differentiate shoreline types (e.g. intertidal and supratidal zones). Textural measures and polarimetric parameters will also be generated and used with supporting datasets (e.g. bathymetric/elevation data and slope grids) to extract the shoreline types. In addition, satellite imagery and ground measurements (GPS points, ground photos, spectrometer and chlorophyll measurements) were acquired over and in the Aulavik National Park, Mackenzie Delta and Herschel Island study sites. Comparisons between traditional mapping approaches (manual interpretation of shoreline videos) and remote sensing techniques are being performed to verify if the satellite products are as reliable as traditional approaches. Data from the ground campaign are currently being analyzed and will be supplemented by further measurements and image acquisitions next summer. The shoreline videos are currently being interpreted and input into a Beaufort Coastal Sensitivity Atlas.

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File Number: 12 404 141
Region: IN
Licence No: 15082
Location: Duck Hawk Bluffs, southwest Banks Island; Bernard Island

Environmental change at Duck Hawk Bluffs, SW Banks Island: From a forested to glaciated arctic

The purpose of this research was to re-log the stratigraphic units that comprise the length of Duck Hawk Bluffs, southwest Banks Island. Research was conducted at the bluffs from June 20 to July 30, 2012. The site includes 12 kilometers of coastal cliffs reaching 50 meters in height and extending 12 km from Mary Sachs Creek to Kellett Point, at the southwest tip of the island. The bluffs provide an important source of sand and gravel for the airstrip and local roads around Sachs Harbour and are well known for their fossil tree stumps. The most important new conclusion from this research is that the lowermost unit of sand and gravel (called the Mary Sachs gravel) were not deposited by rivers before the first arrival of glaciers, but rather came

from the glacier that advanced from the mainland, that also picked up the tree fragments along its way there. Above the sand and gravel, two-thirds the way up to the top of the bluffs, is a beautiful, buried tundra surface from an ancient time that was similar to today. The buried tundra has fossil tundra polygons and well-preserved mosses that grew around ponds, more than 800,000 years ago. Above the buried tundra are later deposits from at least two younger glaciations that extend to the top of the bluffs. The last glaciation dates from about 25,000 to 14,000 years ago when Banks Island became ice-free like today. These studies show the importance of Banks Island is to understanding how the Arctic has changed.

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File Number: 12 404 555 **Licence No:** 15016
Region: NS **Location:** Around Wekweètì in the boreal forest and east-north-east into the tundra towards the Coppermine River

Evolution of the snowpack and snowmelt chemistry in the boreal forest and tundra ecosystem

The objective of the snow survey portion of this research has been accomplished within the constraints of a one year field study. With the existing field data it is possible to compare the pattern of snow accumulation over the snowyear between the data generated by the Environment Canada algorithm using the special sensor microwave/imager satellite data and the field data. From these data it has been demonstrated that within the constraints of this one field season, that utilizing the algorithm approach solely would lead to overestimations of Snow Water Equivalent (SWE) on the Earth surface in this subarctic region by approximately 24%. Our data indicate that this error decreases as the snowpack increases in SWE. The water chemistry portion of the research has yet to be achieved. The sampling procedures are in place for extracting surface water samples from the large catchment draining into Snare Lake once snowmelt starts. This data will be added to the report once the sample collection and chemical analysis is complete. The data recorded in a single year of this studyprovides us with an indication of the relationship between the algorithm produced SWE values those determined by fieldwork during the snowyear. However, given snowpack variability from year to year , this relationship may change from low to high snowfall years. Adding to this data base by continuing this type of study would provide that level of understanding. Competence in using satellite data to accurately discern patterns of SWE would help biologists interested in understanding the role of the snowpack in the biology and ecology of ungulates and small mammals. As gathering snowpack data is very expensive having a remote sensing tool to do this over large areas with confidence would benefit not only biologists but those government officials charged with determining the probability of forest fires (areas with lower winter snowfall) and those managing hydroelectric reservoirs who are very interested in annual recharge to those reservoirs from the snowpack.

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File Number: 12 404 652 **Licence No:** 15070 (Multi-year licence)
Region: IN **Location:** The Beaufort Sea; Mackenzie Shelf; Amundsen Gulf region

ArcticNet: an integrated regional impact study of the Coastal Western Canadian Arctic.
In 2011, the ArcticNet Network of Centres of Excellence of Canada and IMG-Golder Corporation established two Marine Observatories under the Beaufort Regional Environmental Assessment (BREA) framework. The first observatory consists of one oceanographic mooring located north of the Mackenzie Trough, at the western limit of the Canadian Beaufort Sea and the second observatory consists of three moorings located roughly 100 nautical miles northwest of Tuktoyaktuk. The purpose of the observatories is to obtain continuous sea ice, ocean circulation and biogeochemical flux data in the Beaufort Sea over a four-year period. This results are likely to contribute to a better understanding of the different ecosystem processes operating in this region of primary importance for potential future oil and gas exploration. In 2012, mooring operations in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region were carried out from the Canadian Coast Guard icebreaker CCGS Sir Wilfrid Laurier from September 18 to October 5. During the 17 days at sea, the four moorings deployed in 2011 were serviced and redeployed. A new mooring was also deployed further north of the Mackenzie Trough, in deeper water. Operations at sea also included CTD-Rosette deployments to obtain the physical-chemical profile of the water column at each of the mooring sites. The two Marine Observatories address monitoring needs for oceanic and sea-ice conditions in the Beaufort Sea, providing essential information for the corroboration of ocean circulation models, oil spill trajectory models and for future environmental (biophysical) assessments at local and regional scales.

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File Number: 12 404 687
Region: GW, NS
Licence No: 15073 (Multi-year licence)
Location: Daring Lake Terrestrial Ecosystem Research Station

Controls on carbon and nutrient cycling in arctic tundra
The objective of this ongoing research is to substantially advance the understanding of how Canadian arctic tundra ecosystems function, and therefore how it are likely to be affected by perturbations such as climate change, resource development and extraction, and atmospheric pollution. In 2012, researchers worked at Daring Lake with collecting soil and gas flux samples from the snow fence experiment. The samples are currently being analyzed to determine the potential for legacy effects of deeper snow on carbon release and soil nutrient mobilization. In 2012, results were published that demonstrate birch shrub apical growth at the Daring Lake research site is limited as much by the availability of phosphorus as it is by nitrogen.

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File Number: 12 404 790
Region: IN, GW
Licence No: 15094
Location: Areas north and south of the town of Inuvik including the Caribou Creek quarry

Thermochronologic approaches for fundamental energy exploration (TAFFEE)
No research was conducted under this licence in 2012.

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File Number: 12 404 774
Region: DC
Licence No: 15000 (Multi-year licence)
Location: Ekali Lake (Ezáa Łue Túe); Sanguez Lake (Tł'onie Túé); Gargan Lake (Tłįtętįį); Deep Lake (Dechį Náʔa); McGill Lake (Tthets'éhk'e')

Ecological assessment fieldwork for Łue Túé Sųlái (the Five Fish Lakes) Candidate Cultural Conservation Area

The final phase of the candidate area ecological assessment was conducted in August 2012. McGill and Deep Lakes were sampled and inflow, centre and outflow sites were established for each lake. Field measurements (temperature, pH, DO, conductivity) and water samples were collected and analyzed by Taiga Labs, Yellowknife. The water quality was good with temperature uniformly warm, pH slightly basic, major ion concentrations moderate, with nutrient and metal concentrations low. Dissolved oxygen was uniformly high even in the hypolimnion (bottom layer at the lake below the thermocline) of Deep Lake. Sonar measurements were taken across the Deep Lake basin and a maximum depth of 37 meters was recorded. Shoreline observations were made next to each lake station and vegetation included: black spruce, tamarack, birch, aspen, willow, alders, dogwoods and rosehips. Emergent vegetation was more common in epilimnetic (above the thermocline) areas of McGill Lake because Deep Lake contours were very steep. Sediment ranged from organic, woody debris to sandy and small rocks in both lakes but limestone cobble was very common along the Deep Lake shoreline. The survey was conducted as part of a community Youth, Culture and Archaeology initiative.

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File Number: 12 404 797
Region: SA
Licence No: 15118 (Multi-year licence)
Location: 39 surface water bodies within (and near) the EL462 and EL463 parcels; Bog Creek; Slater River; Little Bear River

EL462 and EL463 - Regional hydrology and surface water quality sampling

The objectives of this project were to establish baseline water quality, water levels and flow conditions and to evaluate potential changes in water quality and quantity before and after the start of site operations. The regional hydrology survey of EL 462 & EL 463 was conducted between June and October 2012 and included: (1) installing 3 hydrometric stations on Little Bear River, Bogg Creek and Slater River; (2) stream flow measurements on Little Bear River, Bogg Creek and Slater River; and, (3) one surface water quality sampling program of 39 locations across EL 462 and EL 463. The results of the hydrometric stations and stream flow measurements were used to calculate seasonal changes of water flow during the open water season. The surface water quality program provided baseline water quality data prior to additional exploration activities. The hydrology and surface water quality study will continue throughout the open water season of 2013.

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File Number: 12 404 797
Region: SA
Licence No: 15121
Location: The west side of the Mackenzie River southeast of Norman Wells 40 km along the proposed year-round access route

EL462 and EL463 aggregate and permafrost mapping - geophysical survey and confirmatory drilling

The geophysical survey was conducted in July and August, 2012 and employed ground penetrating radar and ohm mapper surveys. The combination of these two survey methods were successful in identifying areas of permafrost, ice lenses and bedrock that will assist in the location of road construction materials. Hand augering in areas of interest provided supporting information to validate the interpretation of the geophysical survey responses.

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File Number: 12 404 796
Region: NS
Licence No: 15117
Location: Mouth of Baker Creek; Yellowknife Bay; Yellowknife River upstream of bridge; Yellowknife River in the Tartan rapids area; Horseshoe Island Bay

Giant Mine phase 4 environmental effects monitoring

Two fish surveys were conducted for the Giant Mine Phase 4 Environmental Effects Monitoring Program to examine the health of two small-bodied fish species exposed to treated effluent from Giant Mine. Fish were captured from two exposure areas (Baker Creek and Yellowknife Bay) and two reference areas (Yellowknife River and Horseshoe Island Bay). A non-lethal survey focused on ninespine stickleback was conducted in July 2012. Fish were captured using seine nets, assessed for non-lethal health endpoints and released live. A sub-set of ninespine stickleback were lethally sampled for age verification. A lethal survey focused on slimy sculpin was conducted in September 2012. Fish were captured using a backpack electrofisher and assessed for lethal health endpoints. Additional supporting water quality and sediment quality information was collected during both fish surveys. During both fish surveys, any young-of-year and bi-catch captured were measured for length and weight prior to release, with the exception of nine burbot and 54 slimy sculpin. These additional fish were sacrificed and archived for potential tissue analysis. All samples have been submitted and results are pending. A final report will be submitted to Environment Canada and will be available through the Giant Mine Remediation Project Public Registry.

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File Number: 12 404 787
Region: NS
Licence No: 15087
Location: Russell Lake; Labrish; Point Lake

Petrology and geochemistry of the late Archaean banded iron formation and associated turbidites, western Slave Craton: constraints on palaeoenvironment

The recent discovery of new occurrences of 2.9 - 2.6 billion years old banded iron formations in the NWT have opened an exceptional opportunity to study ancient ocean chemistry. These banded iron formations (BIF) provide important environmental information regarding these ancient (late Achaean) oceans including: sea-level fluctuations, volcanism, biology, oxygen level and climate. From July 1–14, 2012, fieldwork was conducted at various locations throughout the central Slave Craton, which is north of Yellowknife. Two different field relations were found for the BIF within the Slave Craton: a 2.6 billion year old BIF associated with shales and turbidites, and a 2.85 billion year old BIF associated with chromium rich quartzites. Both types were documented and samples were obtained. These two different setting may indicate that these rock formations were deposited in two different types of ocean waters. Furthermore, a three-day visit to a drill camp in the eastern Slave Craton were carried out and very pristine core samples were selected and shipped home. Analysis of the samples is ongoing. Few preliminary geochemical results from Dwyer and Bell Lake show very interesting chromium signatures. Chromium is very important in the enzymes of oceanic microorganism. A high content of graphite were also found within some of the BIF sequences, which could indicate organic production within the water column.

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File Number: 12 404 493
Region: SS
Licence No: 15023 (Multi-year licence)
Location: Along the Hay River from the NWT/Alberta Border to Great Slave Lake

Hay River ice jam study

Because of limited research funding, only a modest field campaign was conducted in 2012. The University of Alberta field team came to the Town of Hay River just prior to breakup (April 14 to 18, 2012) and placed time-lapse cameras and water level data-loggers along the river upstream of Alexandra Falls. These instruments supplemented those already deployed by the Town of Hay River Flood Watch Committee. Several ice jam release waves were documented with the remote instruments. Operational testing of the ice jam flood forecasting models continued during breakup 2012. The timing of the onset of breakup, the expected peak snowmelt runoff streamflow and the time of arrival of the ice runs from were all predicted with reasonable accuracy. Photos documenting the 2012 breakup are posted on this public web site: http://www.riverice.ualberta.ca/breakup/hayriver/pub/HR%20photos%202012.html Additional information about Hay River breakup and our research can be viewed at this site: http://www.riverice.ualberta.ca/breakup/hayriver/pub/Hay_River_Breakup_Study.htm

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File Number: 12 404 713
Region: IN, GW
Licence No: 15032 (Multi-year licence)
Location: The Mackenzie River near the Tsiigehtchic ferry crossing

The arctic great rivers observatory
This five-year project studies the six largest rivers that flow into the Arctic Ocean (in North America the Mackenzie and Yukon Rivers, and in Russia the Ob', Yenisey, Lena, and Kolyma Rivers). In the first year (2012), researchers measured the concentration of naturally occurring chemicals (e.g. carbon, nitrogen, and phosphorus) in these rivers, to obtain baseline information about the flow of these chemicals to the ocean. Sampling began in May of 2012 and was conducted every second month. Sampling was conducted from a motorized boat, just upstream of the Tsiigehtchic ferry crossing. For each sampling trip, 8 litres of water were collected, and processed in the Inuvik labs. Researchers also used a hand-held water meter to measure water temperature, pH, conductivity, and dissolved oxygen concentration. Laboratory analysis is underway. These measurement will help show how climate change is impacting Arctic rivers. All data from this project are posted on a public website (http://arcticgreatrivers.org) and are available for free download by the public.

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File Number: 12 404 728 **Licence No:** 15025 (Multi-year licence)
Region: NS, SS **Location:** Snap Lake

De Beers Snap Lake Mine - 2011-2014 environmental monitoring program
In 2012, De Beers undertook a number of studies to meet requirements from the Environmental Agreement, Water License and Land Use permit, including studies on aquatics (specifically, water, benthos, plankton, sediment and fish sampling), air (specifically dioxins and furans, NO_2, SO_2 and dust sampling), vegetation, and Wildlife (caribou, grizzly and black bears, wolverine and raptors observation). These studies were carried out as per all license and permit requirements and all reports were submitted to the appropriate parties for review and comment.

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File Number: 12 404 677 **Licence No:** 15090
Region: DC **Location:** 5 locations along the Flat River at Tungsten

Aquatic environmental effects monitoring - Flat River at Cantung Mine
EBA conducted aquatic sampling on the Flat River from August 30 to September 4, 2012. A total of 512 slimy sculpin, 8 bull trout and 4 Arctic grayling were captured and all but 25 sculpin (sacrificed for tissue metals analysis) and two bull trout (mortalities) were released alive. The Third Interpretive Report for EEM Studies will be submitted to Environment Canada in early March 2013.

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File Number: 12 404 661
Region: DC
Licence No: 15015 (Multi-year licence)
Location: Sampling sites will be located on historic seismic lines near the Mackenzie Highway (between 61-62°N and 120°30'-121°30'W); Scotty Creek Research Basin

Investigating the effects of winter overland travel in sub-Arctic Boreal Forest
No research was conducted under this research licence in 2012.

Kerr, Jeremy
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File Number: 12 404 804
Region: IN, GW
Licence No: 15143
Location: Roadsides along portions of the Dempster Highway just outside the road bounds of Inuvik and Tuktoyaktuk

Canadian global change transect: Northern transect
No research was conducted under this licence in 2012.

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File Number: 12 404 116
Region: SA
Licence No: 15089 (Multi-year licence)
Location: Along the Canol Heritage Trail between mile post 55 and Macmillan Pass on the Yukon border

Long-term ecological and geomorphological investigations in the alpine tundra of the Mackenzie Mountains, NWT
This ongoing research aims to: (1) determine the status of permafrost landforms; (2) determine long-term recovery after abandonment of the Canol No. 1 project; and (3) determine the status of treeline. In August 2012, four automated microclimate stations were serviced and data retrieved. The station damaged by bears in 2010 was returned and reinstalled after repairs. Thaw depth measurements were completed on the nine features at the eight monitoring sites. Permafrost warming is in the order of 0.75 to 1.25°C despite atmospheric cooling in the past few years. Permafrost landforms continue to shrink in area at a rate of ~1% each year. Lack of change in thaw depth on the top of permafrost features confirms they are shrinking from their edges. A survey was conducted on disturbances originating from the CANOL Project (mainly the road right-of-way) to locate colonizing coniferous trees (spruce and subalpine fir). Over 100 were found and most appear to have started growth within the past 30 years (30.78 SD±11.93). A resurvey of CANOL crude-oil spills in tundra environments was also completed. Previous botanical surveys were conducted in 1977-9 and 1997-8. Comparisons of species composition, cover and frequency of occurrence will be included in the analysis.

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File Number: 12 404 455
Region: SS
Licence No: 15061
Location: The area from 62º 30' to 63º 30'N 106º 15' to 104º 30'W (approximately 270 km northeast of Łutsel K'e)

Heavy mineral indicator tracing in glaciated terrains
The objective of this study was to improve understanding of transportation and deposition of heavy minerals in surficial materials (till and esker systems). 181 samples surficial sediment samples were collected in 2012, of which 76 were from eskers and 105 were from tills (diamicton). A till sample was taken approximately every 100 square km, based on a 10 km x 10 km grid. An esker sample was taken approximately every 10 km along selected/major esker ridge crests. Geochemical results are published in the Geological Survey of Canada (GSC) Open File 7351 with additional portable x-ray flourescence spectromerty results published in GSC Open File 7408.

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File Number: 12 404 545
Region: IN, GW
Licence No: 15052 (Multi-year licence)
Location: *Permafrost Monitoring*: Mackenzie Delta
Active layer freezeback: Harry Channel; Fish Island
Shrub removal: Taglu Island
Contaminant movement: Navy Road Quarry; Tundra Lakes
Stream crossings: Ya Ya Crk, Holmes Creek; Jimmy Creek; Cabin Creek

Environmental studies across treeline
This research investigated permafrost conditions across treeline between Inuvik and the Beaufort Sea coast. The most recent activities included evaluation of ground temperature and environmental conditions at several stream crossings from Inuvik to the coast. Preliminary results show that valley bottoms with tall-shrub riparian vegetation have much higher ground temperatures than those measured on the adjacent tundra hill tops due to wet soils and thick snow cover in the valley-bottoms. Tall shrubs were also removed from a drilling-mud sump near Taglu Island in the outer Mackenzie Delta to study the impacts of shrub removal on ground temperatures. Winter ground temperatures in the top 2 meters of the sump cover decreased by several degrees because shrub removal led to a reduction in winter snow cover. The thinner snow promoted ground cooling in winter. The results suggest that shrub removal may be a useful management technique to maintain permafrost in the sump cap.

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File Number: 12 404 545
Region: GW
Licence No: 15072 (Multi-year licence)
Location: Dempster Highway corridor

Evaluating the environmental impacts of permafrost mega-disturbances along the Dempster Highway, NWT

In 2012, the field team collected water, permafrost and benthic samples from streams impacted by thaw slumps. The field team also collected ground temperature data to determine permafrost conditions and downloaded cameras that were tracking the growth of large thaw slumps along the Dempster Highway corridor. Lake sediment cores were also collected from Husky Lake. The analysis indicates that large thaw slumps have a major impact on both the water quality and ecology of streams draining the Peel Plateau. In summer 2012, a high intensity rainfall event of 95 mm was recorded at a remote weather station on the Peel Plateau. This extreme event accelerated the movement of debris flows downslope of thaw slumps and caused significant erosion along stream channels. The impacts of extreme events continue to be investigated. Mapping of thaw slumps also continues and air photo and remote sensing techniques are being used to map the extent of disturbances and to identify impacted watersheds across the Peel Plateau.

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File Number: 12 404 803
Region: IN
Licence No: 15136
Location: In the corridor for the proposed Inuvik to Tuktoyaktuk Highway between kilometre 105 and kilometre 120

Lake bathymetry survey for the Inuvik to Tuktoyaktuk Highway, NWT

On behalf of the Government of the Northwest Territories Department of Transportation, IMG-Golder completed a lake bathymetry survey for lakes suitable to be used as water sources for winter access road construction between km 105 and km 120 of the proposed Inuvik to Tuktoyaktuk Highway. The objectives of the fieldwork were to identify potentially suitable lakes, collect bathymetry data, estimate water volumes and allowable water extraction volumes for each lake. A field investigation was completed in August 2012 over a three-day period. A crew of two specialists and one Inuvialuit Wildlife Monitor accessed the lakes daily from Inuvik via helicopter and a 14-foot aluminum boat to survey the lakes. Four potentially suitable lakes were identified in proximity to the proposed highway and subsequently surveyed using continuous depth recordings, which were geo-referenced with a Global Positioning System (GPS) inside the bathymetry recorder. The bathymetry data from these lakes were analyzed to estimate the lake profiles, and from that total lake water volumes were calculated. In a final step, a two metre thick ice cover was subtracted from the total water volume to allow for winter conditions. From the remaining available winter water volume, the allowable 10% water withdrawal amount was calculated as per DFO Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut.

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File Number: 12 404 782
Region: GW
Licence No: 15060 (Multi-year licence)
Location: Watersheds of Stony Creek; Vittrekwa Creek

The cumulative impacts of rapid environmental change in the northwestern NWT: Investigating the impacts of mega-slump disturbances on terrestrial and aquatic ecosystems in the lower Peel watershed, NWT

From May 28 to June 18 and August 2 to 17, 2012, fieldwork was undertaken in the Stony Creek watershed to study the impacts of landscape disturbances (specifically retrogressive thaw slumps) on the terrestrial and aquatic ecosystems. Eight shallow permafrost cores (50 to 100 cm depth) were collected above the headwall of the slumps. The cores were divided into 1-2 cm vertical sections and will be used to determine the ice content (volumetric ice content and excess ice), as well as the isotope geochemical composition of shallow permafrost. Four hydrological sondes were installed in streams above and below two thaw slumps to monitor and quantify the water quality (water-level, conductivity and turbidity) of clear tundra streams and streams impacted by slump runoff. At these two sites, researchers performed in-situ measurements of stream velocity, to calculate ionic and sediment fluxes and the contribution of slump runoff to the overall stream flow. A survey of stream water quality in the Stony Creek watershed was performed during both field campaigns. Here, stream water samples were collected at the mouth of Stony Creek, above and below thaw slumps, and from clear tundra streams. The samples will be analyzed for major dissolved ions and trace metals and suspended sediments. The data will allow assessing the impacts of slumps on streams water quality at various sub-catchment scales and will be reported on a GIS platform.

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File Number: 12 404 621
Region: NS
Licence No: 15001 (Multi-year licence)
Location: Near Daring Lake Terrestrial Ecosystem Research Station (within 2 km)

Exchange of carbon gas fluxes over low arctic tundra

Carbon flux measurements at four arctic tundra sites near Daring Lake, continued in 2012. Instruments were set up in early May and continued operating until late August. The overall objective is to see if the tundra is taking more carbon dioxide out of the atmosphere by plant photosynthesis than it is releasing by respiration. If more is taken up by the tundra than released, the tundra is called a sink for carbon and if the opposite is true, it is a source. Researchers hypothesized that the tundra is a sink, which indeed what the 2012 results seem confirm. In the summer of 2012, researchers focused on tundra vegetation growth and measured the amount of leave on the surface and how the amount of leaves changes over the growing season. Results show that in years when more leaves are present, the tundra is a larger carbon dioxide sink. This research helps to show how arctic tundra will influences the amount of carbon dioxide in the atmosphere and thus how it might influence the climate today and into the future.

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File Number: 12 404 795
Region: SS
Licence No: 15115 (Multi-year licence)
Location: Tathlina Watershed near Kakisa

Investigating the cumulative effects of environmental change and human activity in the Tathlina watershed

Fieldwork has been completed in the Tathlina watershed as part of the Ka'a'gee Tu First Nation (KTFN)-led Cumulative Impact Monitoring Program project in the region. In March, Carleton University researchers and KTFN personnel traveled to Tathlina Lake to collect core sediment samples to determine historical biotic and abiotic conditions at the lake. The cores were collected successfully and are pending analysis in the laboratory. In March, hydrological sondes were retrieved and water grab samples were collected as part of an ongoing regional water quality monitoring program. Further water samples were collected in late May and hydrological sondes were redeployed. In September, Canadian Aquatic Biomonitoring Network (CABiN) protocol work and invertebrate contaminant testing was completed and additional core sediment samples were collected at Tathlina Lake and throughout the watershed. These sediment samples are aimed to test for signs of historical contaminants in the area and to determine baseline conditions.

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File Number: 12 404 567 **Licence No:** 15067 (Multi-year licence)
Region: IN **Location:** Unnamed lake, near Chevalier Bay, Melville Island

Long term river flow and climate conditions reconstructed from lake sediments

No research was conducted under this licence in 2012 due to logistical constraints (lack of aircraft flight time).

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File Number: 12 404 767 **Licence No:** 15019 (Multi-year licence)
Region: SS **Location:** In and around the former Pine Point Mine

Pine Point project (N-204)

The main objective of this study was to continue to collect baseline data to characterize the environmental setting (physical and biological) for the proposed Pine Point Project. Much of the originally proposed work was not completed in 2012. Surface water quality samples were collected from the Buffalo River, Paulette Creek, Twin Creek and Birch Creek. Water quality samples were analyzed for standard parameters including total and dissolved metals. Hydrometric monitoring stations were installed along the Buffalo River, Twin Creek and Paulette Creek to record surface water elevations and discharge measurements over high and low flow periods. Wildlife call surveys were completed for amphibians, owls and waterbirds at the project sites. Several incidental wildlife observations were also noted for raptors, landbirds and mammals (moose, deer and bat). Remote cameras were also installed at several locations to collect data on wildlife habitat use.

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File Number: 12 404 733
Region: SS
Licence No: 15024 (Multi-year licence)
Location: Kennedy Lake watershed and surrounding watersheds

De Beers - Gahcho Kué environmental monitoring program
The purpose of this ongoing research is to build upon current knowledge of the existing environment around the Gahcho Kué Project site including aerial, aquatic and terrestrial baseline conditions. Studies at the project site in 2012 included collection of baseline meteorological data, hydrology, soil, water/sediment quality, and fish and aquatic resources data. Air temperature, rainfall, wind speed/direction and relative humidity data were collected from the site weather station. Fifteen streams were surveyed for navigability in September, with supplemental assessment to characterize the hydrological regime of the surrounding watershed and quantify annual/seasonal water yields and lake water levels. The water/sediment quality component included collecting physico-chemical profile data and water/sediment samples in five potential reference lakes during winter and summer and in five small lakes adjacent to Kennedy Lake during summer. Water quality parameters sampled included major ions, nutrients, chlorophyll a, trace metals, and sediment quality parameters (i.e. trace organics and trace metals). Two continuous data logging multi-parameter sondes were used to collect physico-chemical water quality in two lakes during the freshet period. Fisheries work included downstream flow monitoring, fish/plankton sampling and fish tissue collection at two new potential reference lakes, and spring sampling in small lakes in the surrounding watershed. Sampling methods included small-mesh gill netting, angling, baited minnow traps and shoreline electrofishing. Physico-chemical water quality, stream discharge/flow measurements and fish habitat assessments were recorded during sampling.

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File Number: 12 402 712
Region: IN, GW
Licence No: 15123 (Multi-year licence)
Location: Throughout the Mackenzie Delta; Peel Plateau; 16 sites along the Dempster Highway; 5 Aklavik area sites

A multi-scale assessment of cumulative impacts in the Northern Mackenzie Basin
Since 2010, Aboriginal Affairs and Northern Development Canada scientists have been working with researchers at the University of Victoria, and Hunters and Trappers Committees (HTCs) in the Mackenzie Delta to develop a vegetation and permafrost monitoring protocol that can be implemented by a range of users. The long-term goal of this program is to establish and maintain a network of sites to characterize regional environmental variability, and serve as a baseline against which to measure changes resulting from the cumulative impacts of multiple natural and human-caused disturbances. In 2012, measurements of vegetation structure, plant community composition, tree density, the productivity of edible berries, active layer depth, and near surface ground temperatures were made at all 60 sites across 9 terrain types. At a set of core sites, measurements from meteorological stations, frost tubes, and deep ground temperature cables were also recorded. Over the course of this project, we have worked with a range of participants including: local youth, HTC wildlife monitors, graduate and undergraduate research assistants, and government scientists. Based on simulations of statistical power and preliminary comparisons of disturbed and undisturbed sites we are confident that our protocol

can be used to detect temporal changes in variables of ecological relevance. Data on vegetation, active layer, and snow are added to the NWT Discovery Portal on an ongoing basis.

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File Number: 12 404 799 **Licence No:** 15127
Region: NS **Location:** Great Slave Lake at: Yellowknife Bay; Jackfish Bay; Kam Bay; Horseshoe Island Bay

Con Mine Phase 4 EEM - periodic monitoring

Golder Associates Ltd. was contracted by Miramar Northern Mining Ltd. to collect field environmental, fish, and invertebrate data for the Phase 4 Environmental Effects Monitoring (EEM) program for Con Mine as required under federal Metal Mining Effluent Regulations. The field program was conducted in and around Yellowknife Bay of Great Slave Lake, between July and September 2012. Sampling areas included an exposure area (Jackfish Bay) located downstream of the Con Mine outfall. Two reference areas in Great Slave Lake were also sampled: Horseshoe Island Bay was sampled for fish and Kam Bay was sampled for invertebrates. Ninespine stickleback were captured using seine nets and were processed for lethal health endpoints, as such gonad, liver, and stomach samples were collected. Bi-catch were measured for length and weight prior to release. Invertebrates were sampled in Jackfish Bay and Kam Bay using Hester-Dendy Artificial Substrates and an Ekman Dredge. Additional supporting water quality and sediment quality information was also collected. All samples have been submitted and results are pending. A final interpretative report will be submitted to Environment Canada by June 6, 2013.

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File Number: 12 404 529 **Licence No:** 15105 (Multi-year licence)
Region: SA **Location:** Mackenzie Mountains near Norman Wells and Tulít'a

Geological Fieldwork in Mackenzie Plain and adjacent mountains

A team of three scientists from the Geological Survey of Canada undertook geological fieldwork based out of Norman Wells for two weeks in July 2012. The work involved helicopter visits or overland hiking to 170 rock outcrops on ridges and streams from the eastern Mackenzie Mountains to the Franklin Mountains. Locations and rock descriptions were recorded, photographs taken, and rock thicknesses and orientations were measured. Approximately 30 rock samples were collected, varying in size from a fist to slightly larger than a loaf of bread. Samples were shipped to labs at the Geological Survey of Canada in Calgary where they are undergoing paleontological and organic chemistry analyzes. Data are being used to produce new geological reports and maps of bedrock geology for the Norman Wells and Tulít'a region.

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File Number: 12 404 378 **Licence No:** 15007 (Multi-year licence)
Region: IN, GW **Location:** Trail Valley Creek; Havikpak Creek

Hydrological studies, Mackenzie Delta Region

With a changing climate and increasing development there is an urgent need for appropriate hydrological information (e.g. snow cover, soil moisture, soil temperature, stream discharge) in the western Canadian arctic. For example, the design of roads and pipelines requires estimates of maximum stream discharge, while rules controlling land access in the fall require estimates of snow cover and whether the soil is frozen. However, with a changing climate, the recent past may not be a reliable guide to the hydrological conditions in the near future. As a result, in order to limit the environmental impact of development, better methods to predict future conditions are needed. This research program aimed at developing such improved methods. In 2012, researchers: (1) collected hydrologic data at two study sites in order to extend a 20+ year data set; (2) began enhanced studies of snow accumulation in Trail Valley Creek (50 km north of Inuvik) which included extensive and frequent snow surveys, use of a laser terrain scanner to determine volume of snow held in large valley-side drifts, the addition of a new snowfall precipitation gauge in a forested site, added infrastructure at several instrument sites to allow the upcoming installation of new sensors for measuring the amount of water held in snow (not just snow depth), and the continuation of an experiment monitoring multiple snow depths at shrub and tundra locations; (3) continued development of better methods to predict future changes in snowcover, soil moisture, ground thaw, and streamflow; (4) rejuvenation of main meteorological measurement location in anticipation of the addition of new instrumentation to be installed in April 2013 to monitor fluxes of carbon dioxide and energy in the basin. Recent results consider the factors controlling the thaw of the upper layer of the ground over the summer period. This is an important step towards better predictions of the impact of a changing climate and developments on the hydrology of the region. Other results have considered the role of lakes on the hydrology and ecology of the Mackenzie Delta, combined with the continued analysis of highly detailed maps showing land and water elevations at four large transects across the Mackenzie Delta, with the intent of improving the understanding of arctic river delta water level regimes.

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File Number: 12 402 874 **Licence No:** 15066 (Multi-year licence)
Region: GW, NS **Location:** The wetlands along the current and old Yellowknife Highway between the communities of Yellowknife and Rae; the wetlands along the Dempster highway between Inuvik and the ferry crossing north of Tsiigehtchic

Effect of spring and summer temperatures on amphipod reproduction (*Gammarus lacustris*)

No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 404 718 **Licence No:** 15026 (Multi-year licence)
Region: SS **Location:** South Rae

South Rae, NWT aeromagnetic survey
The objective of this research was to acquire high-resolution aeromagnetic data in an area centred of the South Slave region of NWT. Aeromagnetic surveys measure magnetic properties of bedrock and are one of the tools used in geological mapping. Understanding these magnetic properties will help geologists map the area, assist mineral exploration activities, and provide useful information necessary for communities, aboriginal associations, and government to make land use decisions. The survey was flown between January 4, 2012 and March 23, 2012. It collected approximately 108,000 line km of data flown along parallel lines spaced 400 m apart. The flying height was at a terrain clearance of about 150 m. The intensity of the total magnetic field was measured from the aircraft. The contractor monitored interactions with large mammal species concentration. Final data were accepted for the survey and preparation of maps for publication is complete. The data and maps were published on September 7, 2012. Copies of all maps were sent to the NWT Métis Nation, the Athabasca Denesuliné, and the Aurora Research Institute. The data are available for free download from the Geoscience Data Repository for Aeromagnetic and Electromagnetic Data (http://gdr.nrcan.gc.ca/aeromag) and digital versions of the maps are similarly available from MIRAGE (http://gdr.nrcan.gc.ca/mirage). The Open File numbers are: 7120 7121 7122 7123 7124 7125 7126 7127 7128 7129 7130 7131 7132 7133 7134 7135 7136 7137 .

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File Number: 12 404 766 **Licence No:** 15048
Region: NS **Location:** Lac de Gras

Diavik aquatic effects monitoring program 2012
Diavik Diamond Mines Inc. conducts environmental monitoring programs under the terms and conditions of the Territorial Water Licence (W2007L2-0003) issued for the Diavik Diamond Mine and the Fisheries Authorization (SC98001) issued by Fisheries and Oceans Canada. The principal objective of the Aquatic Effects Monitoring Program is to monitor the Mine's water discharge and other potential stressors. Specifically, this ongoing program's goals are: (1) to determine the short and long-term effects in the aquatic environment resulting from the Diavik Diamond Mines; (2) test impact predictions; (3) measure the performance of operations; and (4) evaluate the effectiveness of impact mitigation. In 2012, samples of water chemistry, sediment quality, lake productivity, planktonic and benthic invertebrate communities, dust deposition; fish, fish habitat, and the use of fisheries resources in Lac de Gras were collected. Overall, samples show that nutrients (nitrogen and phosphorus) released from the treated mine water discharge are causing low to moderate enrichment-effect in Lac de Gras. Dust deposition rates in 2012 were consistent with previous years (whereby deposition rates were highest immediately adjacent to the project infrastructure and decreased with distance from the Mine). The analysis of effluent and water chemistry data collected during the field program and from relevant sites from the Water Licence SNP program stations indicated similar trends as observed in 2011, including an increase in arsenic and iron concentrations. Effect levels will be determined during 2013. Results, to date, of the plankton monitoring program - which examines changes in the amount, number and types of tiny animals (zooplankton) and algae (phytoplankton) that live in

the water of Lac de Gras - indicate a pattern consistent with weak nutrient enrichment from Mine effluent. Higher amounts of phytoplankton (chlorophyll a) and total phosphorus were measured. The observed enrichment effect has been given a “moderate” effect level designation. Zooplankton biomass resulted in a “low” effect level designation.

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File Number: 12 404 783
Region: SA
Licence No: 15062
Location: Mackenzie Mountains; June Lake (63°31'10"N, 128°38'00"W); 63°20'04"N, 128°19'16"W); 63°15'56"N, 128° 37'19"W)

Behavioural analysis of trace fossils at the Ediacaran-Cambrian boundary

Soft worm-like animals capable of movement appeared suddenly worldwide 555 million years ago. The purpose of this research was to examine fossils of these early animals to study the evolution of their muscles and brains, as well as their communities. Researchers spent one-month taking pictures and collecting samples of fossilized burrows in Sekwi Brook North, Sekwi Brook South, and Ingta Ridge. The formations that were studied were chosen because they represent the transition from Ediacaran to Cambrian assemblages. It was observed that burrows collected in the Blueflower formation showed simpler and more random horizontal movement patterns, while burrows of organisms collected in the Ingta and Backbone Ranges formations were more diverse, with many burrows displaying more organised search behaviour and/or a vertical component. Some of the younger burrows demonstrate the ability to sense and avoid previous burrows, creating crude spiral and meandering patterns. These patterns become more refined over geological time. Other younger burrowers probed the sediment, either horizontally or vertically. The abilities to backfill ones burrow and to leave scratch marks on the sediment surface were also observed. These observations and the data collected are being used to categorize behavioural changes and correlate them with stratigraphy in order to learn more about the development of brains and muscles across the Ediacaran-Cambrian boundary.

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File Number: 12 404 738
Region: IN, GW
Licence No: 15114 (Multi-year licence)
Location: Peel Plateau - along the Dempster Highway between 67°27'11”N, 134°47'43"W and the Yukon Border

Permafrost conditions and terrain stability considerations along the Dempster Highway, NWT

The Dempster Highway from the Yukon to the Mackenzie Delta area is the only road to the western arctic. The highway crosses several distinct landscapes from the mountains at the Yukon border to the Peel Plain lowlands at Fort McPherson. The objectives of this study were: (1) to examine the influence of drainage hydrology and snow cover on permafrost temperatures in the area, and hence vulnerability to future warming, (2) to assess the geomorphic, climatic and permafrost conditions in the study region and their influence on hillslope stability; and (3) to determine the ground temperature changes next to the highway in order to assess its impacts

on permafrost from the roadway. This study is ongoing and will enable an assessment of the controls on permafrost conditions and slope stability in the Peel Plateau region. Though this research is physical in nature, the results will be important to many northerners as they may facilitate management strategies to cope with potential impacts of climate change on this critical transportation route.

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File Number: 12 404 701
Region: IN
Licence No: 15083 (Multi-year licence)
Location: The Collinson structure (72°30' N, 114°0'W), a suspected meteorite impact crater located on the northwest portion of Victoria Island

Investigation of a possible impact structure on Victoria Island, NWT

Meteorite impact structures represent sites where asteroids or comets have struck the surface of the Earth in the past. They are one of the most common geological landforms in the Solar System. On Earth, approximately 180 impact craters have been documented to date, of which around 30 are in Canada. The goal of this project was to confirm the impact origin of an unusual structure near Collinson Inlet in northwestern Victoria Island. This site was visited for a two-week period in July 2012.This expedition was successful in confirming the impact origin of this structure through the discovery of shatter cones – distinctive fracture surfaces with a conical shape. While in the field, this team carried out mapping of the structure and collected samples for follow-up laboratory work. This mapping showed that the original impact structure was about 28 km across, making it the largest impact crater to be discovered in recent years. Other findings included evidence for hydrothermal activity – this occurs when ground waters are heated by the impact event and then flow through the fractured rocks, potentially forming hot springs, the likes of which can be found in places like Iceland and Yellowstone National Park in the U.S.A.

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File Number: 12 404 779
Region: NS
Licence No: 15034 (Multi-year licence)
Location: Bluefish Lake; Prosperous Lake; Yellowknife River between Prosperous Lake and Bluefish Lake

NTPC Bluefish Hydro repairs

The objective of this study was to describe and monitor the aquatic environment in the Yellowknife River between Prosperous Lake and Bluefish Lake during the construction of a new dam and spillway for the Bluefish Hydro Plant. In 2012, there was regular monitoring of water quality near construction areas to confirm the efficacy of mitigation. Efforts were made to document current fish use of the existing dam, to guide monitoring of fish use of a new spawning shoal to be built as fish habitat compensation. Samples were collected from large and small-bodied fish to assess current methyl-mercury levels. Finally, monitoring was undertaken to document water flows in the Yellowknife River and fish migration up from Prosperous Lake.

Results from all monitoring will be presented in annual reports to the Mackenzie Valley Land and Water Board.

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File Number: 12 404 772 **Licence No:** 15006 (Multi-year licence)
Region: SA, DC **Location:** Howards Pass deposit; Prairie Creek deposit; Gayna River deposit

Hydrothermal event recognition and vectoring to SEDEX ore system in shale basins, Yukon and NWT
No research was conducted under this licence in 2012.

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File Number: 12 404 504 **Licence No:** 15084
Region: SS **Location:** Parts of NTS Map sheets 65E, 65L, 75B, G, H, I, J

Reconnaissance geology of the South Rae region
The Geological Survey of Canada (GSC) is upgrading geoscience knowledge of the north through its Geo-mapping for Energy and Minerals Program, with the aim of understanding the geologically least known parts of NWT in the Akaitcho region (parts of NTS 75A, 75B, 75H, 75G, 75J). Fieldwork was conducted July 22 to August 7, 2012. Work included an airborne geophysical survey in the Abitau-Rennie Lake area, used to identify bedrock features beneath glacial deposits. Researchers also reanalyzed rock and sediment samples from previous mapping campaigns. Helicopters were used to access remote regions. Fuel caches were established at Manchester and Labyrinth Lakes and empty drums were removed. Rock and soil samples (< 10 kg), have been sent for laboratory analysis to aid preparation of new geological maps. Once produced, these maps will be archived at the GSC in Ottawa. The data, maps and reports will be used in the longer term for land-use decision-making. Initial results show potential for mineralization, particularly nickel and palladium, not recognized previously. Research results will become available via the internet through publications of the GSC.

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File Number: 12 404 742 **Licence No:** 15110 (Multi-year licence)
Region: IN **Location:** The shelf edge, in the region from the US/Canada border to the entrance of Amundsen Gulf

Assessment of the western Arctic Boundary current
The purpose of this research is to characterize the western Arctic Boundary current (which flows at the edge of the shelf), in order to understand its role in dictating shelf-basin exchange of

water and materials, as well as how it impacts the ecosystem of the region, including the occurrence of marine mammals. Cruise HLY1203 of the US Coast Guard Cutter Healy took place from October 5 to 25, 2012. Researchers used a combination of year-round subsurface moorings in the boundary current (deployed in US and Canadian waters), and seasonal (summertime) shipboard observations, including measurements downstream in Canadian waters. During the fieldwork, all of the moorings were successfully deployed. Researchers carried out a hydrographic survey of the boundary current from Barrow Canyon along the continental slope into Canadian waters to the mouth of Amundsen Gulf. The survey consisted of six cross-slope transects measuring the ocean's conductivity, temperature, and depth. This instrumentation used was equipped with a transmissometer, fluorometer, and oxygen sensor. Niskin bottles were used for taking water samples to measure salinity, dissolved oxygen, nutrients, dissolved inorganic carbon, total alkalinity, oxygen isotopes, and chlorophyll. Velocity measurements were made using the hull-mounted acoustic Doppler current profiler (ADCP). This project is an ongoing collaboration between American and Canadian scientists.

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File Number: 12 404 640
Region: IN, GW

Licence No: 14995 (Multi-year licence)
Location: Blueberry site (68°27'95" N 133°50'47" W); lakes north of Fort McPherson on the western edge of the Mackenzie Delta

Examining the impacts of climate change on aquatic and terrestrial ecosystems of the Mackenzie region, NWT

The objective of this ongoing research is to document the impacts of changing climate on Husky Lakes, especially the impact of thawing permafrost. Up in the mountains the permafrost is melting and the ground is collapsing. Streams flowing into Husky Lake are carrying sediment from these slumps. In 2012, researchers collected lake sediment cores from the bottom of Husky Lake, as well as deployed sediment traps in Husky Lake to record how much sediment was entering the lake from mountain streams. These sediment traps consisted of a plastic tube (about 20 cm in length) attached to the top of a pop bottle. The bottom of the pop bottle was cut off, creating a large funnel to collect sediment. Several of these traps were left floating beneath the water surface in Husky Lake from June until August. Amazingly, the sediment traps collected much more sediment than anticipated. Sediment filled the entire plastic tubes and in some cases filled part of the pop bottles as well. It is hypothesized that the large amounts of sediment entering Husky Lake this summer can be attributed to one particular rain event this summer. Colleagues who have positioned weather stations, with rain gauges, nearby in the Mackenzie Mountains recorded a single rain event this summer approaching 100 mm. It is likely that much of the sediment that made it into the traps arrived during this rain event.

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File Number: 12 404 167
Region: SA

Licence No: 15145
Location: Headwaters of Ravens Throat River, near Redstone and Natla rivers

Cambrian stratigraphy
The purpose of this research was to study a unique fossil deposit of the ancient sea floor at the headwaters of Ravens Throat River, north of the South Nahanni River. This fossil deposit has exposed deeper water sedimentary rocks belonging to the Rockslide Formation, which are over 500 million years old. It exhibits elements of soft-bodied invertebrate fauna, plus a form interpreted to be a type of seaweed. Most sedimentary rocks preserve only shells and skeletons, the hard parts that escaped rotting on the sea floor. Over three weeks of fieldwork in July and August, researchers documented the geological setting, measured the stratigraphic section, and made collections of rocks and fossils, mainly specimens from the scree slope below the mountainside exposure. During the fall, the researchers organized and curated the entire collection of fossils, and made the necessary preparations for assigning each specimen a unique number provided by the Royal Tyrrell Museum of Paleontology (where the material will be archived). Specimens were prepared and photographed in the standard ways, that is, under air, under alcohol, and after dusting with ammonium chloride to bring out certain details. The fossilized species were measured and counted to provide population statistics. The rock samples were also sent to the in-house X-ray diffraction laboratory and the Saskatchewan Research Council microprobe laboratory for mineral and chemical analysis. Samples were sent to the in-house petrology laboratory for the preparation of transparent thin sections for optical analysis.

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File Number: 12 404 778 **Licence No:** 14985 (Multi-year licence)
Region: IN **Location:** Canadian Beaufort Sea

Response of coastal sea ice properties of the Mackenzie Delta to climate change
No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 404 570 **Licence No:** 15005 (Multi-year licence)
Region: DC **Location:** Within the Scotty Creek drainage area

Understanding and prediction of permafrost thaw impacts on northern water resources
In 2012, research at Scotty Creek has focussed on 1) understanding the rates and patterns of permafrost thaw, and the physical and biological processes that control it; 2) developing science-based tools to predict the rate and pattern of permafrost thaw; 3) understanding and predicting the impact of permafrost thaw on ecosystems and water resources; and 4) developing appropriate mitigation strategies. Significant progress was made in all four areas. For example, it was shown that over the last half century, the permafrost cover at Scotty Creek has declined from about 72% to about 40%, and that the rate of permafrost disappearance is accelerating. It was also shown that permafrost thaw results in conversion of forests to tree-less wetlands. Although these changes are driven by a warming climate, it was found that permafrost thaw is also initiated where trees are removed by fire, disease or human disturbance. Another

study examined the impacts of seismic lines on permafrost thaw, and the associated publication recommended appropriate mitigation strategies. Current research is focussed on understanding the integrated eco-hydrological behaviour of ecosystems in the context of thawing permafrost so that predictions of the rate and pattern of thaw and associated land-cover change (e.g. loss of forest) can be predicted with confidence. The ongoing research objectives are to: (1) develop fundamental knowledge of the major ecosystems and estimate the amount of water present. The watershed responses to changes in permafrost regime and the rate and trajectory of such changes will also be examined; (2) develop and test a new suite of eco-hydrological predictive tools for simulating the responses of ecosystems to permafrost thaw; and (3) apply the new integrated eco-hydrological models to predict terrestrial and aquatic ecosystem responses to permafrost thaw extending to the year 2062. Implications of permafrost thaw on water quality are also being examined, including the impact on methyl mercury concentrations in wetlands, lakes and streams.

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File Number: 12 404 761 **Licence No:** 15116 (Multi-year licence)
Region: NS **Location:** Acasta River Region

Petrogenesis of the Acasta Gneiss Complex: Ancient rocks revisited

The purpose of this research was to further study a set of ancient rocks called the Acasta Gneiss Complex. Fieldwork during the 2012 field season took place from July 14 to 29. During this time researchers used previously published geologic maps and samples collected during the 2011 field season to locate and document further samples of interest. A small (1 km x 1 km) area - containing units of lower strain gradient than many areas with the Acasta Gneiss Complex - was identified and subsequently mapped in detail. Rock units of various ages (3.96-3.5 billion years) are suspected to occur within this area. Geochemical analysis is ongoing but preliminary results suggest multiple age components of sufficient quality as to be beneficial for the study of the rock's formational environments. Geochemical analysis will continue in the following months.

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File Number: 12 404 784 **Licence No:** 15063 (Multi-year licence)
Region: IN **Location:** Mackenzie Delta - Along coastline between Demarcation Point and Inuvik

Airborne measurements of methane (AIRMETH)

The objectives of this ongoing study are to quantify the surface-atmosphere methane emissions over large areas, and analyze the influence of different surface and vegetation characteristics on these emissions. Quantifying present methane emissions from the vast arctic permafrost wetlands and shelf areas is an essential prerequisite for identifying possible warming-induced future changes to the arctic carbon cycle, as well as for accurate model representation of regional to global methane contributions from the arctic. Current estimates are highly uncertain -

as measurements are sparse and very localized. Methane emissions are known to be extremely variable over space and time. Researchers use the research aircraft Polar 5 for measurements across the entire North Slope of Alaska and the Mackenzie Delta. These measurements were made between July 4 to 10, 2012. Researchers observed clearly increased methane concentrations throughout the entire atmospheric boundary layer with a sharp drop to background levels above. Despite not having seen the peak of the growing season in 2012, strong regional differences were visible both on the North Slope and in the Mackenzie Delta. In the Mackenzie Delta, a generally higher level of methane concentrations was observed in the boundary layer, as well as clear signs of night time built-up of methane close to the surface. Methane fluxes were about three times higher in the Mackenzie Delta than on the North Slope and higher in the outer Delta than in the southern parts.

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File Number: 12 404 786
Region: IN

Licence No: 15085
Location: Horton River; Smoking Hills Formation (70^{o}02' 06.62"N, 126^{o}56' 26.3" W); Boundary Creek; tributary to Big Fish River (68^{o}30' 30" N, 136^{o}23' 50" W)

Upper Cretaceous paleoenvironmental reconstruction of the gateway between the Boreal and Western Interior Seas: The Boundary Creek and Smoking Hills Formations, NWT

The purpose of this research was to gain a better understanding of the paleoenvironmental setting of a Cretaceous-aged ocean gateway between the Boreal Sea and the Western Interior Sea that flooded large parts of North America. In July of 2012 a successful field season was conducted addressing Cretaceous-aged sediments at Horton River and along Boundary Creek and Big Fish River, east and west of the Mackenzie Delta, respectively. A total of 117 sediment samples were collected and several sedimentary sections were measured. Samples for micropaleontological analysis were processed in order to extract marine microorganisms that provide information about the age of the sediments and the paleoenvironment of these ancient marine basins that occupied these regions between 70 to 100 million years ago. This was a time of frequent volcanism witnessed by ancient ash layers within the sediments. Analysis of these ancient ash beds revealed that their sources are volcanic arc systems; these were located along the tectonically active western margin of North America. In contrast, similar aged ashes from the Queen Elizabeth Islands have a different volcanic source. Samples are also being processed for carbon isotope stratigraphy - a method that detects times of major carbon burial and phases throughout earth's history when the seafloor had no oxygen and large amounts of organic matter gets buried in the sediments. These phases were relatively common during the Cretaceous Period, when the earth was considerably warmer than today. Micropaleontological and carbon isotope analyzes are ongoing.

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File Number: 12 404 657
Region: IN, GW, SA, DC

Licence No: 15053 (Multi-year licence)
Location: In and around Jean Marie River; Fort Simpson; Wrigley; Tulít'a; Norman Wells; Fort Good Hope; Tsiigehtchic; Tuktoyaktuk

Permafrost monitoring and collection of baseline terrain information in the Mackenzie Valley Corridor, NWT

Permafrost monitoring sites throughout the Mackenzie corridor (Inuvialuit, Gwich'in, Sahtú, Deh Cho regions) were visited in August and September 2012 to acquire ground temperature and active layer data. Data records for 40 monitoring sites were extended to: better characterize of the permafrost conditions; facilitate an understanding of the natural variability in permafrost thermal and active layer conditions; ensure availability of adequate baseline permafrost information to support land management decisions in the region. Permafrost in the discontinuous permafrost zone, which covers a large portion of the corridor, is generally warmer than –2°C. Permafrost temperatures generally continue to increase in the region and the overall range in temperature is decreasing. Analysis is in progress to characterize the variability of the onset of seasonal ground freezing and thawing. Ongoing collection of data from monitoring sites is planned to better assess the impact of climate change on the permafrost environment. A detailed report, including graphical and tabular summaries of data, is in preparation and will be sent to relevant organizations in the region.

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File Number: 12 404 548
Region: SA, NS, SS

Licence No: 15050 (Multi-year licence)
Location: Maintained stations at: Hepburn Lake: Sulky Lake; Lac des Bois; Simpson Lake; Colville; Kugluktuk; near Ulukhatok. New stations: Johnson Point on Banks Island; near Thor Lake

Teleseismic studies in the Wopmay

This ongoing study investigates the structure and composition of the Earth's crust and mantle. The researchers are seeking better methods to characterize diamond reservoirs, in order to make exploration more efficient and low impact. Three seismic stations were removed and one new one established in the quarry at Norman Wells in August. Eight stations remain in the field recording earthquakes. Recorded earthquakes have continued to be analyzed and used to map three major seismic boundaries at 40, 100 & 150-km depths beneath central NWT. The middle boundary is related to eruption of the kimberlite field at Lac de Gras and its diamond mines and helps to locate the diamond source region.

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File Number: 12 404 636
Region: IN, GW

Licence No: 14994 (Multi-year licence)
Location: LOT 2, Block 107 PLAN 4166, Inuvik

PolarDARN (The northern hemisphere polar portion of the international SuperDARN (Super Dual Auroral Radar Network)

The goal of this long-term and ongoing project is to measure voltage patterns several hundred kilometers above the ground and out into space along the Earth's magnetic field lines. In 2012, the Clyde River radar (on Baffin Island) was added to the existing Inuvik and Rankin Inlet

radars. This provides a unique opportunity for Inuvik and Clyde River to work together, as signals can be transmitted from Clyde River and received at Inuvik, or vice versa. This kind of signal geometry is used to measure signals called “forward scatter” and is expected to be quite strong. The data would provide new opportunities to study up-and-down motions near the midpoint between Inuvik and Clyde River. This unique combination of the PolarDARN radars provides an opportunity for space science projects at high latitudes that has never before been possible. For example, the Earth’s magnetic field changes from being attached strictly to the Earth (closed magnetic field) to being partly attached to the solar wind and partly to the Earth (open magnetic field). The transition lies in the region examined by the three PolarDARN radars. Although there are now 29 radars in the international SuperDARN project, the three Canadian PolarDARN radars offer many new opportunities not possible with the other 26 radars. The year ahead should see some exciting new results from the PolarDARN radars at Inuvik, Rankin Inlet and Clyde River.

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File Number: 12 404 535 **Licence No:** 15107 (Multi-year licence)
Region: NS **Location:** The Baker Creek Basin

Investigations of the water cycle and hydrological processes of the subarctic Canadian Shield

The objective of this ongoing project is to determine the relationships between the climate, streamflow, water chemistry and permafrost in the subarctic Canadian Shield. Field activities in 2011 in the Baker Creek research catchment began with spring snow surveys and the activation of climate towers and water level stations in April. There were no people living in the research catchment in 2012. Remote measurements of meteorological conditions, evaporation, soil moisture, hydrochemistry and streamflow continued through 2012. This program involved sampling streamflow in tributaries and at lake outlets along Baker Creek bi-weekly. Groundwater was also sampled. Samples were analyzed for ions, pH, metals, nutrients and carbon and nitrogen. This work is in support of determining how stream chemistry and frozen ground react to wetter autumn conditions during freeze up. These research questions are in response to observations that have shown streamflow in small subarctic Canadian Shield catchments changed from a predominantly nival (snowmelt) to a combined nival/pluvial (snowmelt and rainfall) regime in the late 1990s. The autumn of 2012 was dry and Baker Creek remained in a near zero flow condition, which is more typical of the pre-1995 period. Hydrochemistry and streamflow data during this type of freeze-up event were collected and are now being analyzed.

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File Number: 12 404 785 **Licence No:** 15069 (Multi-year licence)
Region: IN, GW **Location:** Point Separation; East Channel, Inuvik; Middle Channel, mid-Delta; East Channel at mouth; Reindeer Channel; Napoiak Channel

Solar degradation of dissolved organic carbon in Mackenzie Delta lakes and river channels

This study examined the solar degradation of riverine dissolved organic carbon to carbon dioxide throughout the Mackenzie River Delta. The preliminary fieldwork involved 10 days of field sampling during early June 2012. Water was collected from river channel locations throughout the Mackenzie Delta and from a select series of lakes that are accessible by boat from Inuvik. Water samples have been analyzed for dissolved organic carbon concentration and composition, and some early analysis has been done to assess the photodegradation of the collected dissolved organic carbon samples.

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File Number: 12 404 720 **Licence No:** 15020 (Multi-year licence)
Region: DC **Location:** Jean Marie River; Fort Providence

Solar irradiance monitoring in Jean Marie River and Fort Providence

The objective of this ongoing research project is to measure solar irradiance levels (the strength of sunlight over a certain area) in Jean Marie River and Fort Providence, in order to support pre-feasibility studies on the use of solar energy in those communities. Data collected were used to support the pre-feasibility study completed in 2012 for Jean Marie River (available at www.nwtresearch.com). Should the community be interested in developing renewable energy projects, preliminary results indicate that solar would be a better option than wind energy. Analysis for Fort Providence has not yet been completed. However, due to the proximity of the two communities, it is probable that solar readings will be similar those of Jean Marie River.

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File Number: 12 404 720 **Licence No:** 15022 (Multi-year licence)
Region: NS **Location:** Wekweètì

Wind energy monitoring in Wekweètì: 2010 - 2012

The objective of this wind monitoring project was to quantify Wekweètì's wind energy resources. The project technician travelled to Wekweètì in July, 2011 to hire and train a new wind monitor and to perform maintenance on the two wind monitoring towers there. Data collection has been a challenge during this project, but wind speeds continue to be measured. Analysis of Wekweètì's wind resource is ongoing, and will be shared in a report in 2012/13.

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File Number: 12 404 720 **Licence No:** 15033
Region: NS **Location:** 62°4' 11.95"N, 112°37'10.7"W

Wind energy monitoring at Thor Lake 2012
The objective of this wind monitoring project was to quantify Thor Lakes's wind energy resources. Due to data loss at the Thor Lake site over two winters (2009/10 and 2010/11), it was decided that the wind monitoring tower should be left up another year instead of being taken down in the fall. To prevent further data loss, equipment upgrades were made to the wind monitoring tower. Analysis of Thor Lake's wind resource is ongoing, and will be shared in a final update in 2012/13.

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File Number: 12 404 781 **Licence No:** 15056 (Multi-year licence)
Region: NS **Location:** South of the proposed Izok project along and in the vicinity of the Coppermine River

Biophysical baseline studies in support of the Izok Project
The purpose of this project was: (1) to refine understanding of baseline conditions in the vicinity of the Izok Project; (2) to provide input to design mitigation; and (3) to evaluate potential changes in the environment in relation to the Izok Project. Surface water and sediment quality surveys, vegetation and soil sampling, and hydrological surveys took place in the vicinity of the Coppermine River in 2012.

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File Number: 12 404 585 **Licence No:** 15068
Region: GW, SA **Location:** West side of the Arctic River

Stratigraphy of the Misty Creek Embayment
The purpose of this research is to understand the geological evolution of a deep-marine environment that existed in the northern Mackenzie Mountains between 500 and 450 million years ago. Fieldwork for this project took place from July 29 to August 20, 2012 at one of the planned sites: 404000E/7155500N (west side Arctic Red River). A two-person camp was established by helicopter and moved to another part of the same slope (about 2 km away) halfway through the work. Work took place on foot along the nose of one slope and up a creek in another. The work was predominantly measuring and describing rocks in stratigraphic succession. A small number of rock samples were also collected (using a rock hammer) for later analysis in the lab. Since completion of this year's fieldwork, the data collected in the field is being anaylzed. The collected material will be prepared for geochemical analysis starting in December, 2012. Similar work is likely to be completed in 2013 at other sites.

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File Number: 12 404 741 **Licence No:** 15049 (Multi-year licence)
Region: IN, SA, DC, SS **Location:** Rae; Paulatuk; Fort Providence; Edzo; Tuktoyaktuk

Arctic Wastewater Research
No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 404 709 **Licence No:** 15018
Region: IN, GW **Location:** Mackenzie River Delta Middle Channel (from Point Separation to just North of Oniak Island); selected locations in the outer Delta

RADARSAT observations of river ice and flood patterns in the Mackenzie River Delta
The principal objective of the research carried out during 2012 was to assess and develop the utility of radar satellite images for the mapping of characteristics of winter ice cover and lakes and rivers, such as: ice type, ice thickness, and bottom fast vs. afloat. Fieldwork facilitates the correct interpretation of available radar images and the generation of reliable information products. In 2012, fieldwork was carried out at selected locations in the Mackenzie Delta from February 22, 2012 to March 9, 2012. The data collected capture properties of the ice cover (e.g. ice type, layering, thickness, roughness, air inclusions), as well as the overlying snow cover (e.g. snow type, layering, thickness). During the winter of 2011/2012 radar images were acquired by the Canadian RADARSAT-2 (R2) and the Italian Cosmo-Skymed (CS) satellites. R2 images were acquired every 24-days from freeze-up to breakup; a series of three CS images was acquired on March 8, 9, and 12, 2012. Analysis of the R2 and CS images focus on their potential for the mapping of ice types and ice thickness, respectively. The analysis of these data is ongoing. A report summarising our R&D to date can be found at:

http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/downloade.web&search1=R=291867

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File Number: 12 404 801 **Licence No:** 15132
Region: SA **Location:** Headwaters of the East Little Bear River

Palaeontology of the Summit Creek Formation, western Northwest Territories, Canada
From August 20 to September 1, 2012, the Royal Ontario Museum conducted a palaeontological survey of the Summit Creek Formation, a rock unit that is exposed approximately 100 km south of Norman Wells. This work was done to search for any fossils, in particular those of dinosaurs. The field crew flew in to Tulít'a, via Yellowknife and Déline. From Tulít'a, the crew was taken by helicopter to the first campsite along the East Little Bear River for five days. During the time there, the field crew searched any exposed rock face for fossils, and found a number of fossils at several different sites. The fossils that were recovered were from

both hadrosaur (duckbill) and ceratopsian (horned) dinosaurs, as well as a large carnivorous dinosaur. Because all of the fossils were fragmented, it is not possible to know exactly what types of dinosaurs were found. The second field site was approximately 10 km to the north. After two days of searching this area, no fossils were found. After this, the helicopter was used on a final day to search several additional spots that were inaccessible by foot, however no more fossils were found.

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File Number: 12 404 740 **Licence No:** 15098 (Multi-year licence)
Region: IN **Location:** Mackenzie River near Inuvik

Towards long-term monitoring of the CO_2 system in arctic rivers

The short-term goal of this research was to initiate time-series measurements of the carbon dioxide (CO_2) system in the Mackenzie River. This work will serve as the initial step towards long-term measurements and studies of the impacts of global warming on the CO_2 systems in Mackenzie River, its estuary, and adjacent coastal waters. This year's monthly sampling from the river continued near Inuvik. All sampling was very successful, with a total of 18 water samples collected. All samples will be measured for total dissolved inorganic carbon (DIC) concentration and alkalinity. About two thirds of the samples have been processed and is ongoing. Seasonal changes of DIC and alkalinity are different this year, as compared to the last two years. Future efforts will be made to investigate the mechanisms that caused these changes. From DIC concentrations and alkalinity, pH and partial pressure of carbon dioxide (pCO_2) in water can be calculated. The results also show large seasonal changes of pH and pCO_2. Monthly sampling will continue into 2013.

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File Number: 12 404 798 **Licence No:** 15119
Region: IN **Location:** Mackenzie Delta

Beaufort Sea coastal geoscience research

The goal of this research was to improve the understanding of physical conditions in the coastal zone in order to monitor, manage and respond to changes in the coastline. A total of twelve coastal monitoring sites were visited between the Alaska/Yukon border and McKinley Bay in August 2012. Some coastal monitoring sites along the Yukon Coast and Tuktoyaktuk Peninsula were visited for the first time in twenty years. Preliminary analysis show the Alaska border continues to erode with rates exceeding one metre per year. Parts of the coastline have receded 25 m since 1991. In comparison, Tuktoyaktuk Island continues to erode at alarming rates with no signs of slowing down receding 140 m since 1950. The fieldwork also provided the first look at a number of coastal and near shore issues with Tuktoyaktuk Harbour. Preliminary analysis of the sub-bottom stratigraphy in and around the harbour give indication that the approaches to Tuktoyaktuk Harbour are in-filling with sediment. This new information provided critical present day observations of extreme coastal change that affect a number of key sites.

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File Number: 12 404 791 **Licence No:** 15096
Region: DC **Location:** Small lakes along a proposed winter road Prairie Creek mine towards Nahanni Butte

Fish presence and lake bathymetry
Bathymetry data were collected at nine lakes located along the proposed winter road from the Prairie Creek mine towards Nahanni Butte. This dataset will be use to determine the suitability of each lake for water withdrawal for strengthening the road base of the winter road (following the Department of Fisheries and Ocean's guidance document for winter water withdrawal). At one lake, located at kilometre 95 from the mine, attempts were made to catch fish (lake was located at UTM 10V0465089 6812893). Fishing approaches attempted included: gillnet (soaking time 3hours, checked regularly), electrofishing (239 seconds), minnow traps (soak time 4hours) and angling (just under one hour). No fish were caught and no fish were seen.

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File Number: 12 404 802 **Licence No:** 15133 (Multi-year licence)
Region: NS **Location:** The Ingraham Trail

Carbon cycling linkages of permafrost systems [CYCLOPS]
No research was conducted under this licence in 2012**.**

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File Number: 12 404 549 **Licence No:** 15003 (Multi-year licence)
Region: NS **Location:** Along the highway route west of Yellowknife and along the Ingraham Trail east of Yellowknife; the Baker Creek Watershed north of Yellowknife; along the Tibbit to Contwoyto Winter Road based out of the Lockhart and Lac de Gras facilities

North Slave permafrost study: Characterizing and predicting discontinuous permafrost for climate change adaptation
Fieldwork was conducted between June and November, 2012 in the Great Slave region along Highways 3 and 4, and the Tibbitt to Contwoyto Winter Road. Permafrost cores ranging from 1.0 to 8.2 metre depth were obtained from one study sites in peatland and birch forest settings. Thaw depths, soil types, visible ice moisture contents, and bulk densities were determined, with grain size, water geochemistry and geotechnical tests still to be determined. These data study geotechnical conditions associated with permafrost soils in the area. Temperature data

continues to be collected and monitored at a number of sites including: active layer temperatures from birch, spruce forest and four peatland sites; ground temperatures from three burn sites, and eight peatland, birch and spruce forest sites; and ten air, ten active-layer, seven shallow-water, and four lake-bottom temperature monitoring sites. These data are used to understand potential climatic gradients and the effects of water on local permafrost conditions. Four new thermal monitoring sites were installed on the Tibbitt to Conwoyto Winter Road. Helicopter surveys were undertaken to validate remote sensing interpretations of surficial geology and vegetation cover mapping in NTS map sheets 85J, and P. Samples were collected for dating.

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File Number: 12 404 711 **Licence No:** 15108 (Multi-year licence)
Region: IN **Location:** Noell Lake

Noell Lake ice study - Hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation

The objective of this research is to improve knowledge on lake ice and its effect on food webs and productivity in arctic tundra upland lake systems. A better understanding of this, will help produce better predictions about the changes that could occur under changing climate. In late-September 2011, prior to freeze-up, an automated ice buoy and subsurface mooring system was re-deployed successfully (after removal for servicing of the instruments) in Noell Lake for continuous monitoring of weather conditions, lake ice cover (e.g. formation, growth over winter, breakup in spring), light penetration into the lake (through ice in winter), and water quality. The monitoring system collected data over the 2011-2012 winter period. After spring breakup in 2012, the buoy was removed from the lake for servicing and replaced with another instrumented buoy. The buoy and mooring system then continued to collect water quality information through the open-water season. In addition, manual grab samples for standard water quality and aquatic biological parameters were taken seasonally during 2012 to compare with and validate measurements made by the instrumented buoy/mooring system. These data are allowing researchers to examine lake ice and its effects on the food web/productivity through the winter, and the character of food webs/productivity during the ice-free season.

SOCIAL SCIENCES 2012

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File Number: 12 410 931
Region: SS
Licence No: 15154 (Multi-year licence)
Location: Schools in the South Slave Divisional Education District, specifically, elementary and high schools and teachers who have been involved with the SmartLearning approach prior to the commencement of the 2012-2013 school year

Assessing the SmartLearning Project
The purpose of this ongoing study is to identify the impact of the SmartLearning Project on student outcomes. The SmartLearning Project gathers quantitative and qualitative data at classroom, school, and school district levels annually as a part of regular instructional and assessment practice. Its assessment involves action research conducted by classroom teachers and inquiry leaders in schools in British Columbia, Alberta, and the Northwest Territories. The South Slave Divisional Education Council authorized consent for their staff to participate in the study on September 15, 2012. Three staff members at Princess Alexandra School, Hay River have indicated interest in participating in the Assessing the SmartLearning Project during the 2012-2013 school year. No other data have been collected by the research time at this time.

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File Number: 12 410 915
Region: DC
Licence No: 15075
Location: Within Wrigley townsite; Wrigley Property

Devonian Metals Wrigley Property TEK assessment
Located in the traditional territory of Pehdzeh Ki First Nation (PKFN) near the community of Wrigley, Devonian Metals Inc. is currently exploring their Wrigley Property for zinc, lead, and silver. This study described the pattern of land use created by the PKFN and the environmental knowledge that they have developed over the centuries in this region. Specifically, the intent of the study was to document the historic, present, and traditional use of the land, water, and wildlife in the Wrigley River, Moose Pasture Creek, and Fish Trap Creek watersheds by PKFN. This study was designed collaboratively with the participants and PKFN. Interviews of seven

participants took place from May 22 to 27, 2012. The interviewees included a cross section of knowledgeable elders and harvesters. Several types of data were collected during the study. The primary sources of data included the audio recordings and the maps from the interviews with the study participants. In addition to the audio recordings, notes were taken to facilitate the conversion of interview map data into a GIS. During this type of study, two classes of information are generally produced. The first class of information is typically more spatial in nature and oriented towards the traditional use and occupancy of the land. Some examples of this would be the description for the location of a cabin or a good lake for duck hunting. Additionally, in many cases traditional ecological knowledge is also mapped spatially (e.g., seasonal caribou habitat). The other class of information collected during the interviews can be categorized as traditional knowledge and is often (although not always) disassociated from specific locations and is not spatial in nature. Ethics surrounding respect for the land would be an example of traditional knowledge collected that could not be mapped. Initial interviews were verified and clarified by participants. The information from this study will be used by PKFN and Blyth & Bathe Inc. to inform Devonian Metals about potential impacts to environmental and cultural resources by the development activities.

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File Number: 12 410 895 **Licence No:** 14998 (Multi-year licence)
Region: IN, NS **Location:** Inuvik; Yellowknife; Tuktoyaktuk

The Impact of the Priest Decline on the Canadian Roman Catholic Church
No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 410 891 **Licence No:** 15080 (Multi-year licence)
Region: DC, NS, SS **Location:** Communities associated with the Courageous Lake Project

Courageous Lake Project - Social and economic sciences research
Socio-economic and land use work in 2012 entailed updating community profiles through desk-based research. Data sources included recent documents released on the Mackenzie Valley Environmental Impact Review Board's website, as well as results from the 2011 Census (including population and demographics, age, gender, households and dwellings). Site visits to the Courageous Lake exploration site were held the week of August 27, 2012 with participants from the Yellowknives Dene First Nation, Łutsel K'e First Nation, North Slave Métis Alliance and Northwest Territories Métis Nation. Site visits provided a detailed overview of current activities and plans based on current project design, with representatives from each Aboriginal group providing feedback. A meeting was held in September 2012 with members of the Tłı̨chǫ Government and the Kwe Beh Working Group to provide scope and direction on the socio-economic research activities to be carried out within the Tłı̨chǫ communities in the near future.

Preliminary contact information was exchanged in order to identify potential dates for data gathering.

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File Number: 12 410 873 **Licence No:** 15012 (Multi-year licence)
Region: SS **Location:** Fort Resolution

Human dimension of river resource development and transboundary water security in the Peace-Slave River Basin

The goal of this research was to document how issues and practices of trans-boundary water security and river resource developments affect local aboriginal communities in the South Slave region and the Peace Region. As part of the ongoing project, the researcher returned to Fort Resolution between May 28 and June 15, 2012. During this time they followed up with research participants who were interviewed in 2011. In addition, interviews were complete with those individuals originally missed in August 2011. The fieldwork is not complete, as such there are no results yet to report. Research will be ongoing on 2013.

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File Number: 12 410 935 **Licence No:** 15159
Region: IN, NS **Location:** Phone interview with individuals who are from Paulatuk (currently living in Alberta) and Whatì (currently living in Yellowknife)

Aboriginal youth involvement in a youth-driven program: A narrative exploration of the process and impact of engagement

The question guiding this research was: What narratives emerge, and are co-constructed, when exploring the experience of Aboriginal youth who engage in youth development programs aimed at fostering youth engagement? Two individuals from NWT were approached to participate in the study. One person participated in an interview about their experience of youth engagement through the ACTIVATE program. Results suggest the ACTIVATE was a positive experience that helped build confidence and contributed to goal building.

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File Number: 12 410 886 **Licence No:** 15028 (Multi-year licence)
Region: NS **Location:** Yellowknife

Quality Workplace Environment

No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 410 926 **Licence No:** 15141 (Multi-year licence)
Region: GW, DC **Location:** Fort Liard; Fort Providence; Fort McPherson

Assessing Process and Outcomes of Government Funded Projects in Northern Canada Aboriginal Communities
No research was conducted under this licence in 2012.

Daitch, Sarah
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File Number: 12 410 937 **Licence No:** 15164
Region: IN, GW, SA, DC, NS, SS **Location:** Katlodeeche First Nation; Hay River; Ndilo Yellowknife; Dél̨ne; Aklavik; Fort McPherson; Tuktoyaktuk, Inuvik; Behchokǫ̀; Fort Simpson; Fort Providence; Fort Smith; Fort Resolution

An ethical space for dialogue about difficult history: Program evaluation of a residential school education module in Canada's Northwest Territories and Nunavut Territory
The guiding question for this research was: How can Northern Canadian youth connect difficult history with their identity, and become capable and committed to their communities? This study was conducted in collaboration with the Territorial Departments of Education in the Northwest Territories and Nunavut. The territorial education departments developed a mandatory curriculum module regarding the history and impacts of residential schools, piloted in high schools during the 2012-2013 academic year. The curriculum aimed to teach difficult history of the attempted assimilation of Indigenous students through residential schools. This research explored how the new education module influenced student thinking and behaviour, including the development of critical thinking skills and sense of community involvement and leadership. Because it is a region undergoing rapid development, fostering critical citizenship amongst students is vital not just to the North, but to all of Canada. Findings indicate that students are developing empathy, understandings of history, critical thinking, ethical decision making strategies, and hope for the future through the new course. After teaching the course, teachers had greater awareness of intergenerational effects of the schools. They also felt more confident in supporting students towards learning objectives. However, the new course appears to have had limited effectiveness on empowering students to take active roles in shaping their communities and connect history to their identities. These, and other findings were used by the respective Territorial curriculum teams as they created a second version of the new course for 2013-2014. Changes made as a result of this study include: reduction of materials and adjustment of time spent on each activity to enable completion of all activities; addition of a new section to the module on students' final project options, with examples provided; and the development of a video of the Health Canada Support session, to assist teachers in managing emotions in the classroom and to provide guidance for self-care for teachers and students. The results of this study will better position the Departments of Education to optimize student learning.

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File Number: 12 410 869 **Licence No:** 15134
Region: IN **Location:** Aklavik; Ulukhaktok; Paulatuk; Tuktoyaktuk

Climate change impacts on Inuit food security in Canada's western arctic: Constructing a comparative anthropological model to guide adaptation planning
This project examined the critical impacts of environmental, economic and social change on traditional food availability to help determine the range of socially, culturally and physically acceptable adaptations. Researchers conducted a workshop in Inuvik on July 11 to 12, 2012. Results of contaminants research, food security research and Inuit Health Survey research were presented to participants from each of the participating communities. Participants provided feedback on fieldwork conducted in 2011 and suggested directions for future research and action in the light of results obtained from field research. Results of the workshop were collated, analyzed and incorporated into the final reports submitted to each community.

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File Number: 12 410 913 **Licence No:** 15064
Region: IN, NS **Location:** Yellowknife; Inuvik

The environmental assessment process of Canadian 'frontier' oil and gas
No research had been conducted under this licence in 2012.

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File Number: 12 410 920 **Licence No:** 15092
Region: DC, NS, SS **Location:** Outside Behchokǫ̀; Yellowknife

Ethical value and market value in a Canadian Wild Food Network
Research was conducted from June 2 to July 1, 2012. The main research method was participating in and observing the life and work of a camp of mushroom buyers and pickers from British Columbia. They were picking wild mushrooms (called morels) in an area burned by a forest fire the year before. It was located about 100 km south of Behchokǫ̀ on the highway. Interviews were also conducted with business people in Yellowknife who had experience harvesting, purchasing and selling wild food products from the NWT. Analysis of the results are now taking place.

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File Number: 12 410 916 **Licence No:** 15086
Region: NS **Location:** Yellowknife; Behchokǫ̀

Jane Glassco Arctic Fellows
No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 410 906 **Licence No:** 15103 (Multi-year licence)
Region: IN, GW, SS, NS **Location:** 2009 - 2012 Statistical data from the RCMP on all NWT communities based on GIS mapping results of incidents and services for women who experience intimate partner violence

Rural and northern community response to intimate partner violence
The goals of this ongoing research is to: (1) integrate several sources of data to create an action plan that maps the problem of intimate partner violence; (2) create narratives describing community response in to this violence; and (3) to generate a grounded theory as a practical tool to create and sustain non-violent communities. In 2012, researchers collaborated to complete an environmental scan and resource document at all project sites across Canada. In addition, they worked with the RCMP national office in Ottawa to collect information on incidents of intimate partner violence in the rural and northern regions. The resources from the environmental scan and the incidents of intimate partner violence are being uploaded into GIS maps that will allow further analysis of collected data. Team members from all regions were involved in an additional interviewing to capture qualitative information and stories that will contribute to the research questions. Researchers have continued to work with the Coalition against Family Violence, local RCMP, the Department of Justice and Health and Social Services.

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File Number: 12 410 932 **Licence No:** 15156
Region: SS **Location:** Princess Alexandra Middle School, Hay River

Incentive-based home reading challenges
By exploring the experiences of three participants of incentive-based home reading challenges three themes emerged: motivation, self-esteem, and social interactions. These themes developed through the interconnections between categories: incentives, home involvement, and academic achievement. By using incentives in the reading challenges, the participants were motivated to read at home. Home reading occurred on a daily basis and the participants identified academic benefits from their daily reading efforts. Improved reading ability, writing skills, increased vocabulary and improved comprehension were identified as some of the academic benefits realized by the participants. The participants' self-esteem increased as their reading improved and academic performance increased, which further motivated their continued

participation in the reading challenges. All three participants indicated they preferred reading challenges that allowed for classroom discussions and involvement with other students. The participants frequently earned the final reading challenge incentive, which provided further opportunities to interact with other students. The final incentive included pizza luncheons and school-outings, which further provided opportunity for social interactions with other students. Through their increased motivation to read, increased self-esteem and opportunities for interactions with others, the participants indicated their desire to reading increased significantly. After leaving the middle school, students were intrinsically motivated to read often, preferring reading over other activities.

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File Number: 12 410 911
Licence No: 15043
Region: IN, GW
Location: Kindergarten classroom in the following communities: Fort McPherson; Tsiigehtchic; Aklavik; Tuktoyaktuk

How standard is standard? Comparing culturally sensitive language norms versus CELF P2 in NWT

The aim of the project was to determine how to average kindergarten student in four selected communities of the Beaufort-Delta region score on our most frequently used 3-6 year test of language development. The purpose was to help the Speech-Language Pathologists gain more understanding of the scores that we are achieving during testing (e.g., "Johnny has scored this on the test but how is Johnny scoring against his peers?").

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File Number: 12 410 916
Licence No: 15076 (Multi-year licence)
Region: DC
Location: Fort Simpson; Fort Liard; Fort Providence

Enhancing youth-focused, evidence-informed treatment practices through cross-sectorial collaboration

The overall objectives of this ongoing national project are: (1) to provide training in the use of a youth screening tool for mental health and substance use concerns to service providers from agencies who have agreed to all use the same screening tool; (2) to understand the impact of training and project participation on service providers; and (3) to better understand youth mental health and substance use needs through their responses on the screening tool. This project is being implemented in 7 – 10 communities across Canada. To date, the following aspects of the project have been completed in the NWT: community visits; service provider training and data collection completed; and the youth data collection initiated. This research will continue in 2013 and include: completing the youth data collection; data analysis with community; and the report preparation.

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File Number: 12 410 649 **Licence No:** 15120
Region: IN, GW **Location:** Inuvik

A comparative analysis of vocational education and training programs in Northern Canada
No research was conducted under this licence in 2012.

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File Number: 12 410 903 **Licence No:** 14986
Region: IN, GW **Location:** In and around Inuvik; Tuktoyaktuk

Constellations and astral Lore: Far north and near east
In February 2012, the researcher conducted a sequence of astronomical observations, both in Inuvik (within the town site and in rural areas beyond the light pollution), and Tutoyaktuk. The research observed the apparent behaviour of stars and constellations, in particular the fact that the northern stars appear to rotate around the sky rather than to move in an east-west direction as observed from more southern latitudes, planetary and lunar phenomena, as well as the *aurora borealis* (the northern lights). These observations provide context for materials found in the written sources, which include materials ranging from modern ethnographic research to the diaries of early European explorers in the arctic in the 19th century. This methodology will now be applied to study both the modern Arctic sky and the Ancient Mesopotamian sky, correlating a database of written sources, astronomical cuneiform texts in the case of Ancient Mesopotamia, with observations of astronomical phenomena in the sky for the Ancient near east and the sky over Israel.

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File Number: 12 410 648 **Licence No:** 15122 (Multi-year licence)
Region: NS, SS **Location:** Dettah; Ndilo; Yellowknife; Łutsel K'e

Teaching our Yellowknives Dene languages
The ultimate goal of this research is to produce an intermediate-level reader, and a verb dictionary in Dogrib and Chipewyan that teachers can use in the classroom to teach Dene culture and languages. In 2012, researchers made very good progress towards the verb dictionary and reader in both Yellowknives Dene languages: Weledeh (Dogrib) and Chipewyan. Researchers collected approximately 100 verbs in Chipewyan and 200 in Weledeh. In Chipewyan, they recorded and transcribed two stories about fish, while in Weledeh they finished

several stories about muskrat, arctic hare, and arctic fox. The researchers have shared some the current drafts of the Chipewyan materials with the language programs in Deninu Kue and Łutsel K'e, who were very interested. The final version is not yet ready to publish and work will continue in 2013 and 2014. The end of 2014 is the current goal for final publication (most likely through Alaska Native Language Center publications).

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File Number: 12 410 882 **Licence No:** 15163 (Multi-year licence)
Region: SS **Location:** Ndilo

Engaging aboriginal youth in tobacco prevention using social media
This ongoing research explores if a social media intervention developed by Aboriginal youth (specifically videos to be available through YouTube) using a participatory approach can be an effective means for encouraging smoking prevention and/or cessation amongst youth and others in Aboriginal communities. To date, three teams involving a total of twelve high school students from the K'alemi Dene School in Ndilo, have completed their social media videos aimed at tobacco prevention and cessation. The youth worked with a local filmmaker to create story boards that represented their health messages. Each team produced, directed filmed and edited their own videos. Group interviews were conducted with the youth at the start of the project and after the videos were completed to determine their expectations and experiences. One-on-one interviews were also conducted with the K'alemi Dene School administrative staff participating in the project. The researchers are in the initial stages of interview analysis and will be able to provide preliminary results by the end of the year. The youth showcased their videos to other students, parents, elders and community members at their monthly circle ceremony at the K'alemi Dene School and during the schools' year-end celebration. They also came to Edmonton, Alberta to meet the Aboriginal students from the Queen Elizabeth School working on the same project, where they had an opportunity to learn about each other's cultures and view each other's videos. Together, the K'alemi Dene and Edmonton youth attended the Youth Day of the Dreamspeaker's Aboriginal film festival to learn more about film production.

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File Number: 12 410 921 **Licence No:** 15112
Region: IN, NS, SS **Location:** Yellowknife; Inuvik; Hay River

Backyard gardening - a viable food production solution for Yellowknife?
This community-based research project interviewed a cross section of local food growers to understand opportunities and challenges with producing local food, and also facilitated an online survey to assess food preference. This research was guided by the question: What would people buy if it were made available? Issues of agricultural management, sustainable development and food systems, and social strategies were examined to promote a slower, locally grown food system in Yellowknife. Data were also collected on economic profitability and the logistics of an urban farm business in Yellowknife. This research indicates Yellowknifers are ready for local food production. Over 99% said they would buy locally grown food if it was

available, 88% would pay a premium for the food, and 96% said they would attend a weekly market. Salad mixes, and other high profit greens such as herbs, as well as vegetables like carrots, radishes and beans were identified in the top 60% of participant's responses. This data supports the feasibility of a small- scale garden business in Yellowknife. Also based on survey results, a sixth of an acre is currently available for commercial gardening in backyard spaces. However, over 7000 acres are potentially available under the municipality. Yellowknife is ready and willing to facilitate growth of an urban farming business - the city is just waiting for a creative entrepreneur to pave the way.

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File Number: 12 410 892 **Licence No:** 15037
Region: GW **Location:** Fort McPherson

Collaborative research on community well-being
This project explores the role of volunteering, sewing, and human-land relationships in individual and community well-being. This project is in collaboration with the community of Fort McPherson. The researcher learned from Elders and others who are known for conducting positive lives and are respected as volunteers and seamstresses. In nineteen life-stories, twenty stories about strong Teetl'it Gwich'in of the past, and many informal interviews, people described what helped them through difficult times. Guided by Elders, the project is mainly concerned with documenting the history of the Peel River Alcohol Society, and the experiences of Elders who have volunteered in helping others by drawing on their own knowledge and experience. In many peoples' stories volunteering, sewing, and being out on the land are important to well-being. The stories relate what it is to experience oneself as a powerful and skillful person who is involved and needed in the community or on the land, and the importance of working for their own and others' well-being in the face of political and economic inequalities. All recordings were transcribed and transcripts verified by participants. Videos have been edited roughly and then approved by the storytellers.

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File Number: 12 410 902 **Licence No:** 14971
Region: DC **Location:** Fort Simpson; Hay River

Exploring social support, sport participation, and rural women's health using Photovoice
This project sought to determine the nature of rural women's involvement in organized sport and recreation and to assess their perceptions of the influence of these activities on their individual and social health. In particular, the study: (1) examined the social lives and health of rural women within the contexts of curling and curling clubs; (2) explored the roles that these clubs play as community places for rural women; (3) utilized *photovoice* to help women photograph, document, and express their perspectives; (4) documented how these activities held different meanings for women across Canada; and (5) determined how health, sport, and recreation can be understood within the broader contexts of gender and rural community change. Specifically, researchers worked with members of the Hay River community in the Spring of 2012. Four

women curlers were given cameras to take pictures to convey what the club meant to them. Follow-up interviews were conducted with the women (by phone) to gather deeper insight into the meaning of the club in their health and well-being. Research findings were shared with participants. The conclusions of the study suggest, curling clubs are significant community places that are deeply valued by women and girls. Specifically, clubs help women and girls: (1) establish new (and maintain) longstanding friendships; (2) increase physical exercise; (3) develop and improve curling expertise; (4) access opportunities for volunteering, mentoring, leadership and community engagement; and (5) share practical, emotional, and affirmational support (e.g. team members were frequently referred to as a "curling family"). The study demonstrates that curling clubs serve to enhance and sustain the physical, mental, and social wellbeing of rural women and girls.

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File Number: 12 410 917 **Licence No:** 15077
Region: IN, GW, SA, DC **Location:** Communities within each of the settlement regions and areas affected by the Mackenzie Gas Project

Addressing stakeholder interests through public consultation: A focus on natural resource exploration in the Canadian arctic

This research assessed the effectiveness of the public consultation processes utilized by the Mackenzie Gas Project's proponents in addressing and meeting stakeholder interests. Additionally, it examined how the requirements mandated by the National Energy Board affected the design of the proponents' public consultation processes and whether the use of mediation in public consultation could foster greater stakeholder outcome satisfaction. Understanding the gaps between the initial process design or intent of the proponent versus and the actual outcome satisfaction as experienced by the stakeholder is critical for determining the types of interests that proponents should focus on and emphasize during public consultation.

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File Number: 12 410 650 **Licence No:** 15139 (Multi-year licence)
Region: IN **Location:** Ulukhaktok

Inuit traditional knowledge for adapting to the health effects of climate change (IK-ADAPT)

This research is part of the Inuit Traditional Knowledge for Adapting to the Health Effects of Climate Change (IK-ADAPT). IK-ADAPT is a 3-year project that works closely with 6 communities across the Canadian Arctic (Ulukhaktok, Inuvik, Igloolik, Iqaluit, Rigolet, Nain) to identify how Inuit traditional knowledge can help enhance health in light of a rapidly changing climate. The first stage of this project was to learn from community members what ethical considerations must be taken when documenting and disseminating Inuit knowledge. In July 2012, researchers worked with a noted elder in Ulukhaktok to collect data for this first stage. Similar work will be conducted with community members in the other five communities. Taken together, this information will be used to develop protocol for documenting and disseminating

Inuit traditional knowledge in the project. The project will continue for another two years and will focus on initiatives, decided in partnership with the community, to identify how Inuit traditional knowledge can help enhance health given a changing climate.

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File Number: 12 410 909 **Licence No:** 15038
Region: NS **Location:** Yellowknife

Repairing the holes in the net: Responding to the mental health needs of northern homeless women

This research sought to involve decision makers in the mental health, housing and social sectors in improving the systemic response to northern women with mental health concerns who have unstable housing/are homeless, informed by research with women and service providers. The objectives were: (1) to gather the perspectives of northern women regarding the trajectory of their unstable housing/homelessness; mental health challenges and access to services; and ideas for what might make/have made a difference to prevent homelessness, mental health concerns and related issues like violence and substance use problems; (2) to involve service providers in identifying specific service improvements, including First Nations perspectives on mental health, that could remove barriers and enhance support for services for northern women with mental health and related health, housing and social concerns, contribute to improvement in women's health, and prevent homelessness; (3) to summarize academic literature, web-based reports and existing circumpolar policy reviews which describe effective approaches to prevention and alleviation of homelessness among women with mental health, substance use and violence-related concerns, and consider their relevance to guide approaches that would be effective in specific, northern, cultural contexts; (4) to utilize a community of practice (CoP) model to support health system decision makers in each of the three territories to collectively discuss: evidence arising from the literature search, ideas for expanding and improving policy and practice, factors affecting the implementation of such policy and knowledge translation strategies.

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File Number: 12 410 847 **Licence No:** 15035 (Multi-year licence)
Region: SA, NS, SS **Location:** Former Pine Point mine/townsite; Fort Resolution and Hay River; Giant and Con mine sites; Yellowknife and Dettah; Déline; Port Radium mine/townsite

Abandoned mines in northern Canada: Historical consequences and mitigation of current impacts

The ongoing Abandoned Mines Project looks at how mineral development impacted the social life, economic prospects and local environments of Northern communities throughout the twentieth century, considering carefully the connections between social justice and environmental change that were engendered by historical mining practices in the region. This project is transitioning from fieldwork and data collection to the writing and production of results.

The major fieldwork activity this year was conducted in the Pine Point area in July and August. Researchers conducted a mapping survey of the Pine Point area, ground truthing data from aerial photos and historical maps, while assessing current land cover in the area. A researcher also spent six weeks living in Fort Resolution, conducting interviews with elders to produce map biographies of former land use practices in the Pine Point area. Continued archival research on the history of Giant Mine at the NWT Archives at the Prince of Wales Northern Heritage Center was ongoing.

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File Number: 12 410 678 **Licence No:** 15104 (Multi-year licence)
Region: SA **Location:** Community of Déline

Caribou and communities in the Sahtú Region
No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 410 936 **Licence No:** 15161
Region: SA **Location:** Norman Wells and Norman Wells Land Corporation (NWLC); Yellowknife - Prince of Wales Northern Heritage Centre

Implementing the future: Ethnography of a land corp
This research project was an anthropological analysis of the Sahtú Dene and Métis Land Claim focused on the community of Norman Wells and the Norman Wells Land Corporation. The central research themes were the negotiation and implementation of the land claim, related political changes, and resource development in the Sahtú. A focus was put on including the views and words of involved community members. The fieldwork was done over five weeks in November and December of 2012. The main fieldwork site was Norman Wells with a smaller amount done in Yellowknife. Research was based mainly on one-on-one interviews. Some further interviews have been held over the phone since the fieldwork period ended. Additionally, archival research was done relating to the research topic including publicly accessible documents, media, academic literature and a small amount of available Norman Wells Land Corporation archives. Interviewees have had the opportunity to review their responses to ensure they approve. The project is now in the writing stage with an anticipated completion of late 2013.

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File Number: 12 410 811 **Licence No:** 15030 (Multi-year licence)
Region: IN, GW **Location:** Fort McPherson; Tsiigehtchic; Aklavik; Inuvik; Tuktoyaktuk

Arctic borderlands ecological knowledge coop: Community-based ecological monitoring program

The Coop uses both local and scientific knowledge to monitor and assess environmental changes in the range of the Porcupine Caribou Herd and nearby coastal and marine areas. Interviews are conducted every year by community researchers. People share what they see and hear about fish, berries, caribou, unusual animal sightings, weather conditions, and other things while they are out on the land. In 2012, monitors conducted interviews with selected community members and entered data directly online. This improved the reporting time and data validation 'step,' which occurred at the March 2012. A Youth Gathering was also held at the same time in Inuvik, which focused on leadership, facilitation, and environmental project/ monitoring. The Coop website (www.taiga.net/coop) remains an important communication tool and contains past Gathering Proceedings, as well as the results from the community monitoring program.

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Region: IN

Licence No: 15011 (Multi-year licence)
Location: Paulatuk; Yellowknife - Prince of Wales Northern Heritage Centre; Inuvik - Inuvialuit Cultural Resource Centre

Lands, lakes and livelihoods: women's subsistence fishing in Paulatuk, NT

From January to October 2012, the researcher lived and worked in Paulatuuq in order to conduct research on people's relationships to fish, fishing and water. Throughout the spring, she conducted a series of interviews on fishing in Paulatuuq, and also participated in a series of fishing trips with community members. Throughout June, July, August and September, the researcher was on the land fishing with community members in order to better understand the who, what, when, where, why and how of people's fishing activities. She travelled to lake, river and coastal areas with families in order to verify and contextualize the interview, oral history and archival data that were collected earlier in the year. Extensive archival research was undertaken at the Hudson's Bay Archives in Winnipeg in November 2011 and May 2012. At the current stage of analysis, this work indicates that fishing has played an important role in Paulatuuq life in the past, and continues to be an important activity that supports food security, intergenerational learning and is a crucial way in which many Paulatuuqmiut participate in land-based activities. Fish, fishing and water – particularly sensitive sites like the Hornaday River watershed – will be potentially heavily impacted by future resource development. For these reasons, it will be important for mining proponents to consider the impacts of their activities on fishing within the community.

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File Number: 12 410 933
Region: DC, NS

Licence No: 15157
Location: 3 Groups in Yellowknife - one with Dechinta students that are attending a conference in Yellowknife, and 2 other possible groups with high school students from high schools in Yellowknife and Fort Smith

Democracy talks
During the fall of last year researchers conducted 22 focus group conversations with young people across the country, to understand what things they were concerned about and how they felt about politics and political leaders in Canada. Four groups took place in Yellowknife and Fort Smith. Young people shared a negative view of politics; felt left out and felt that politicians didn't care about them. The level of knowledge about politics varied within each group – some understood a lot, where others knew almost nothing. The issues that concerned the participants were often local and personal, and they expressed a desire for a leader that cares about what they do.

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File Number: 12 410 905 **Licence No:** 14990
Region: NS, SS **Location:** Avalon Rare Metal's NECHALACHO Mine project Thor Lake Property

Community engagement in the Canadian mining sector: Identifying best practice and testing stakeholder theory
The field research was undertaken August, 2012 to identify, explore, and examine the community engagement approach of Avalon Rare Metals, Inc. as part of the company's corporate social responsibility strategy, at their Thor Lake Nechalacho Mine project. The field research consisted of semi-structured interviews in an effort to elicit responses concerning the community engagement practices of Avalon. Work is now underway to prepare a report of this field research. When completed, the report will be provided to the community members.

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File Number: 12 410 916 **Licence No:** 15079
Region: SS **Location:** Fort Smith

Integrating human dimensions research in Wood Buffalo National Park: Understanding attitudes, beliefs and values toward wood bison and bison management
The goal of this project was to gain an understanding of the perspectives of local people regarding bison disease and management in Wood Buffalo National Park (WBNP). With a social science approach, the theme of this research surrounds the human dimensions of conservation and the role that local attitudes play in the conservation of wood bison (*Bison athabascae*). Support and opposition for management decisions were explored using a quantitative survey conducted door-to-door. In addition, qualitative research in the form of focus groups was used to gain a deeper understanding of the various perspectives about this issue. Fieldwork was conducted in Fort Chipewyan, Fort Fitzgerald, and Fort Smith in 2012 over the course of seven weeks in June and July. The most evident conclusion from this study was that Aboriginal peoples not only wish to be seen as partners on paper, but wish to have an ongoing dialogue with WBNP resulting in a genuine sense of inclusiveness. The majority of participants held positive attitudes toward bison, despite the presence of disease. There were some differences

between Aboriginal and non-Aboriginal residents, however, on average, there was agreement on how bison in the park should be managed. This study emphasizes the need for public participation beyond traditional public meetings and consultation sessions in the wildlife decision-making process in Canadian national parks. The hope of this research is to contribute knowledge that furthers work between park managers, local Aboriginal governments, and local people, while aiding in informed decision-making regarding the future of this threatened species. This research is the result of a collaborative effort between Memorial University, Wood Buffalo National Park, and the Aboriginal and non-Aboriginal people of Fort Chipewyan, Fort Fitzgerald, and Fort Smith.

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File Number: 12 410 922 **Licence No:** 15126
Region: IN, GW **Location:** Inuvik and outlying communities in the Beaufort Delta

Rural migration and homelessness in the north

The goal of this research is to assess the role that the gaps in mental health and addictions services in Inuvik and the surrounding region play in the production of homelessness. The majority of time spent on this project in 2012 involved the establishment of networks working with homeless persons with co-morbid disorders (addictions and mental health). Focus groups were held with service providers in Inuvik, Sachs Harbour, Tuktoyaktuk, Fort McPherson and Aklavik. The information collected in these focus groups was used to develop a questionnaire to be administered to homeless persons with addictions and mental health disorders at a later in the project. The "Quality of Life for Hard to House Individuals" (QoLHHI) was selected at this time to replace the SF36 as an instrument to measure quality of life for homeless participants. The QoLHHI will be administered following the focus groups with homeless persons. Next steps involve the development of the focus group questionnaire, the identification of potential homeless participants and the scheduling of interviews.

TRADITIONAL KNOWLEDGE 2012

Alexie, Elaine
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File Number: 12 410 928 **Licence No:** 15148
Region: GW **Location:** Fort McPherson

The limits of sovereignty: Practices of indigeneity among the Teetl'it Gwich'in
The research was conducted in September to October in Fort McPherson. Nine Teetl'it Gwich'in elders were interviewed as part of the project. Community members and elders interested in participating were recruited through local posters and radio announcements. Some interviews were took place at participant's bush camp and others were completed in the homes in the community. The location of the interview was based on the preference of each participant. On some occasions, with proper consent, interviews were conducted over multiple sessions. The interviews were very open ended and allowing the elders to talk freely as long as they wished. Close to 600 minutes of interview was collected. Analysis of the material is ongoing and expected to be completed in the Fall of 2013.

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File Number: 12 410 617 **Licence No:** 15102
Region: IN **Location:** Ulukhaktok

***Pitquhiraluavut Puiglimiatavut* (We will not forget our ways): Bringing home photographs of the Inuinnait Collection at the British Museum**
The trip to the British Museum in London, England took place in April 2012 (the previously planned trip was postponed because of elder illness). Three Ulukhaktummiut, selected by the community, travelled with two elders and a researcher from Cambridge Bay, as well as the academic researcher, a museum curator and the principal investigator. The group spent four days in the British Museum stores examining the objects they had requested through the photographs. The discussions about the artifacts included: the skills involved, how they were made, and related language. The sessions were filmed and photographed. On returning to the communities, community members were invited to view the video footage and photographs and

to provide further input into the stories that were attached to the objects. As well, community members were asked which objects they would like to recreate in workshops, using the information derived from the visit. Two workshops were then held - one on making crimped drum dance slippers and the other on bow making. The bows were then used to hunt muskox. The materials (photos, film shorts, narratives) are now being uploaded on to a new website. The film footage is currently being edited (by community members) for a one hour TV documentary.

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File Number: 12 410 697 **Licence No:** 15165 (Multi-year licence)
Region: GW **Location:** Aklavik; Fort McPherson; Tsiigehtchic; Inuvik

Building capacity and documenting traditional knowledge on species at risk in the Gwich'in Settlement Area 2012- 2014

The purpose of this ongoing research is to gather Gwich'in traditional knowledge of three species of special concern- wolverine, grizzly bear, and woodland caribou. The project team, made up by staff and contractors from the Gwich'in Social and Cultural Institute and Gwich'in Renewable Resources Board (GRRB), completed several important tasks in 2012-2013. First, a community steering committee meeting was held (November 2012). The committee was made up of a member from the Renewable Resource Council in each of Aklavik, Inuvik, Tsiigehtchic, and Fort McPherson. They reviewed the questions and other documents for the project team, and selected possible interviewees. Interviews about grizzly bears were held in December, with knowledgeable Gwich'in hunters, trappers, and elders. The interviews focussed on grizzly bears as a species-at-risk – even though grizzlies are not declining in the Gwich'in Settlement Area, they are considered at risk across Canada so having region-specific information is important for wildlife management. A report on grizzlies was prepared and community review sessions were held in Fort McPherson and Tsiigehtchic. The report had information from all the interviews, plus other information from previous studies as well. A draft final report was produced after the community review sessions. Upon review by the community steering committee in early 2014, the report will be available on the GRRB's website.

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File Number: 12 410 938 **Licence No:** 15171
Region: NS **Location:** Yellowknife

Perseverance in/through the arts: Life histories of northern indigenous artists

No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 410 908 **Licence No:** 15031
Region: IN **Location:** BAR-C Tununuk Point, Richards Island

Traditional oral history of land use at Tununuk Point
The Department of Aboriginal Affairs and Northern Development Canada and Imperial Oil have undertaken a number of environmental assessments at Tununuk/BAR C as part of their clean up plan for the site. These studies have identified knowledge gaps in the history of human land use in the area that AANDC hopes to fill through oral history interviews. This project summarizes existing evidence from historic accounts and prior oral history interviews, and poses questions in order to learn more about how Inuvialuit used the area in the vicinity of Tununuk. Two groups of ancestral Inuvialuit hunted, fished and travelled in the Tununuk region. The territory of the Kuukpangmiut included Richards Island and the area east of the Mackenzie River further upstream into the northern part of the Mackenzie River Delta. The Kitigaaryungmiut lived directly to the east of the Kuukpangmiut. They spent most of the year hunting and fishing at the mouth of the East Channel of the Mackenzie River and along the shores of Qangmaliq Bay. Artifacts found in Qangmaliq Bay archaeological sites show fishing using nets in open water and ice fishing in winter were important activities. Foreigners, mainly from Europe, began coming into the Inuvialuit area in the 1800s. Few Inuvialuit oral histories survive that tell of the coming of Europeans to this area. The collection of drawings on small pieces of wood produced by Inuvialuit who traded at Fort Anderson between 1861-1866 may be the earliest surviving record by Inuvialuit of Europeans. Several burials are present at Tununuk. Judging from appearances, the burials at Tununuk are quite old, and most likely from the pre-Christian period.

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File Number: 12 410 907 **Licence No:** 15017
Region: IN **Location:** Inuvik; Tuktoyaktuk

GNWT Inuvik to Tuktoyaktuk traditional knowledge / traditional land use study
No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 410 930 **Licence No:** 15152
Region: DC, SS **Location:** Fort Providence

A narrative of women's crafts, learning and cultural identity
No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 410 925 **Licence No:** 15135 (Multi-year licence)
Region: NS **Location:** Yellowknife; Ndilo; Dettah; Cultural camp on Mackenzie Island just past Akaitcho Bay on Great Slave Lake

Climate change and emergency measures
Adaptation to climate change is critical for Northern peoples because it is affecting health and safety during northern travel. Unprecedented weather patterns now butt up against traditional knowledge (TK) about how to live and travel safely on the land. In this way it threatens the safety of First Nations and Inuit peoples of the Northwest Territories engaged in hunting, fishing and other land-based travel and activities informed by TK. Extreme weather variability is also proving to be a threat to those reliant on air travel. Air travel is the backbone of the emergency healthcare in the NWT as well as the only way to access some NWT communities. Preventing of death and injury as a result of weather-related travel accidents is an important priority for First Nation and Inuit communities in the NWT and a critical part of addressing the health impact's of climate change in Canada's north. The proposed project engaged northern youth to look at the intersection of climate change and health from the vantage point of its impact on TK and travel safety. It also promoted discussion between youth and their communities on the issues of emergency preparedness and injury prevention. Using community-based research methods and digital film as data collection tools, students discussed the themes of climate change with elders, climate change experts, and their community members to identify key lessons about the impacts of climate change on traditional lifestyles and travel in the north. As part of their investigations, students looked what the dangers/risks to health are and how they have impacted the community. Through reflection on guest lectures and class discussion, and personal interviews, students identified recommended actions to prevent and/or effectively respond to safety concerns that arise from unpredictable weather patterns caused by climate change. Key themes and lessons emerging from interviews form the basis of a short documentation film, created by the students with mentorship from local northern filmmakers.

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File Number: 12 410 910 **Licence No:** 15039
Region: IN **Location:** Husky Lakes - all cabin owners

Husky Lakes cabin owner information survey
No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 410 883 **Licence No:** 15138
Region: DC **Location:** In and around Jean Marie River

Permafrost vulnerability assessment and landscape changes related to climate change in the Jean Marie River First Nation
No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 410 923 **Licence No:** 15130 (Multi-year licence)
Region: SS **Location:** Łutsel K'e; Artillery Lake

Denesoline traditional knowledge of landscape-caribou movement interactions with Łutsel K'e Dene First Nation
The purpose of this ongoing project is: (1) to collect and analyze traditional knowledge and ecological data of landscape-caribou interactions; and (2) to develop a set of community-based indicators to assist the community of Łutsel K'e in the monitoring of barren-ground caribou movements within their traditional territory. The work completed as of October 31, 2012 includes scoping and preliminary interviews in Łutsel K'e and at field sites at Artillery Lake conducted between July and September 2012. Only preliminary analysis has been conducted with no formal writing undertaken thus far. An informal update has been provided to the community in the form of a pamphlet summarizing the 2012 research season and training activities undertaken with Łutsel K'e youth at our research camp at Artillery Lake between September 5-11, 2012. This pamphlet is currently under review by the Łutsel K'e Dene Band and Wildlife Office, once approved copies will be disseminated within the community. The researchers planned to return to Łutsel K'e in 2013 to conduct some secondary and verification interviews and to present preliminary findings to Chief and Council and community members.

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File Number: 12 410 906 **Licence No:** 15109 (Multi-year licence)
Region: IN **Location:** Husky Lakes; Hendrickson Island: Areas East and West of Tuktoyaktuk; The Mackenzie Pipeline Corridor (ISR); The Inuvik – Tuktoyaktuk road corridor (proposed); Aklavik Mountain Road (proposed); The Peel Plateau / Dempster Highway; in and around the communities of Aklavik, Inuvik, and Tuktoyaktuk, Tsiigehtchic and Fort McPherson

Using Inuvialuit and Gwich'in observations to monitor environmental change in the Mackenzie Delta Region
The Mackenzie Delta Region (MDR) is a dynamic environment that is ecologically and culturally significant. This area is experiencing environmental changes that are expected to increase in magnitude with continued climate warming and additional anthropogenic stressors. In some areas, changes in land cover are occurring so rapidly that maintaining an accurate inventory is problematic. In this context of environmental change and uncertainty, there is critical need to draw on local knowledge and observations to inform decision-making. In the MDR, Inuvialuit hunters and trappers are in a unique position to assess ongoing changes in the regional

environment and to inventory cumulative impacts. Over the last three years, researchers at the University of Victoria and Aboriginal Affairs and Northern Development Canada (AANDC) have worked with the Hunter and Trapper Committees of Inuvik, Aklavik, and Tuktoyaktuk on several community-based monitoring initiatives. Since 2010, the research group has been developing and field testing a participatory monitoring protocol that uses participatory photography, video, and semi-structured interviews to record Inuvialuit observations. Observations of environmental conditions made during field outings with Inuvialuit experts and local youth are recorded using digital cameras, and handheld GPS units. Subsequently, digital photographs and video became the focus of photo elicitation interviews. The detailed narratives recorded in these interviews, along with geo-referenced photos, and video are entered into a web-based map (mapping.uvic.ca/mackenziedelta). During the winter of 2012, 12 Inuvialuit participants made observations using the participatory multimedia mapping (PMM) protocol. Monitoring activities took place on the land using snow machines and trucks. One multi-day monitoring and knowledge exchange camp was held in the Eastern Mackenzie Delta near Reindeer Station. To date, participants have focused their monitoring on environmental changes, including: shifts in wildlife and vegetation (range and distribution), drained lakes, thaw slumping, landslides, river bank erosion, increased run-off, increased overflows, changes in permafrost, and increasingly hazardous travel conditions. Observations also focused on damage to infrastructure (e.g. roads, cabins, camps, buildings), important sacred sites (e.g. traditionally used camps, travel routes, grave sites), and areas important for food harvesting. Expected impacts from proposed development (all season road to Tuktoyaktuk and the pipeline) were also discussed. This pilot project suggests that using PPM and web-based mapping to record local observations can make a contribution to local planning that will increase community resilience. Interviews with monitors and a range of potential map users suggest that our protocol and web map is an effective way to record and share observations of the regional environment. Elements of the protocol that contributed to its success include: the use of photography (the visual medium); the photo-interviews (story-telling); time spent on the land traveling and observing; and the paring of local youth and local experts. A monitoring program organized around continuous local observations that are linked to geo-referenced images (and other media) will significantly improve the capacity quickly detect environmental changes that impact northern communities. While web-based PPM should never replace direct community consultation, the research suggests that it can provide a resource that communities can use to share knowledge among themselves, across northern networks, and in meetings with researchers, regulators and decision-makers.

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File Number: 12 410 924 **Licence No:** 15131
Region: NS **Location:** Lac de Gras

Diavik palatability and tissue chemistry

This summary brings together results from traditional knowledge (TK) and scientific knowledge shared during a camp held near the Diavik Diamond Mine at Lac de Gras during the summer of 2012. These efforts were part of the Aquatic Effects Monitoring Program (AEMP) established by Diavik Diamond Mines Inc. with five Aboriginal parties to their Environmental Agreement: Kitikmeot Inuit Association; Łutsel K'e Dene First Nation; North Slave Métis Alliance; Tłı̨chǫ Government; and Yellowknives Dene First Nation. The primary objective of the 2012 program was to facilitate a two-way flow of information, resources, and knowledge between TK holders

and scientists regarding the health of fish and water in Lac de Gras. Four key elements were the focus of the AEMP: communications and engagement; fish palatability and texture studies; water quality and quantity studies; and video documentaries. Elders, youth and scientists collaborated to set nets and inspect overall fish health. Elders tasted a total of four fish that they baked, boiled, fried, and grilled. There were mostly positive descriptions based on the taste test of each fish. From this holistic, interconnected perspective, camp participants deduced that water quality was good by virtue of observing the health of surrounding or submerged vegetation, birds, wildlife, and fish; the shoreline; the presence/absence of surface foam and/or vegetation; clarity; movement; temperature; and taste. A 'tea test' was carried out whereby water samples were taken from Lac de Gras, boiled and then made into tea to evaluate the taste. In all cases, the taste of the water was said to be good. Water quality results from scientific results and TK support the same general conclusion that the water is still good in Lac de Gras. A video-documentary entitled "Five Ways, Two Days, One Camp" which was filmed and produced through a partnership of participating youth and a production crew.

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File Number: 12 402 872 **Licence No:** 15055
Region: NS **Location:** Along Baker Creek near Giant Mine

An investigation of arsenic speciation and toxicity in Baker Creek sediments from Giant Mine in the Northwest Territories, Canada

No summary was submitted for this licence. This project is not in compliance with licencing requirements.

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File Number: 12 410 678 **Licence No:** 15124 (Multi-year licence)
Region: SA **Location:** In and around Déline

Mapping, language and stories in Déline

This three year collaborative program develops an interdisciplinary approach to language documentation. As the community of Déline makes a transition to self-government, there has been increased interest in stories, song, and concepts of place in order to better understand what government means. Governance thus is one focal point of this research. Complementing this, the project involves development of an indigenous research methodology with respect to language research. The research explores variation, change and continuity in language, stories, song, and concepts of place as they relate to governance and land stewardship. The approach involves documentation with three groups of families from distinct traditional land use areas across generations, including archival and new materials, as well as dialogue with relatives from neighbouring communities with distinct dialects in order to understand the role of place of origin in variability. 2012 has been a time for transcription of existing narratives and development of the archiving system. Work will continue in 2013, with researchers staying in Déline for an extended period with community researchers and Dene language speakers.

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File Number: 12 410 912 **Licence No:** 15047
Region: SS **Location:** Hay River; Fort Resolution

Pine Point Socioeconomics and Traditional Use/Knowledge Study
No research was conducted under this licence in 2012.

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File Number: 12 410 939 **Licence No:** 15173 (Multi-year licence)
Region: IN, GW **Location:** Inuvik

Shifting stories, changing places: Transformational narratives of climate change in northwestern Canada and Alaska
Gwich'in and Inuvialuit roles in caribou stewardship go back thousands of years, and traditional values and laws shape how Gwich'in and Inuvialuit work to protect the caribou. At the same time, especially in Canada, gains made through land claims negotiations have helped Gwich'in and Inuvialuit have more say not just in managing the herd, but in educating the public and moving the indigenous perspective into more prominence in official channels, such as into the agenda of the Government of Canada. To keep the calving grounds campaign strong, it is important to celebrate victories, to maintain strong personal connections between people working on the campaign, and to renew involvement from new generations of people. Films, slideshows and other arts-based outreach projects have an important role to play in engaging people and giving a public face to the campaign. Arts-outreach projects on the calving grounds and other northern issues are more effective campaigning tools when they are made while consulting with northern partners from the ground up. New communications tools, such as social media, can be very helpful in increasing campaign outreach - but they are only effective if combined with a "human touch" where people are drawn into actively taking part in campaigns and having personal connections to them. “Journey North” is an educational website used in the Being Caribou project. School children can follow animal migrations in real time as information is posted to the web.

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File Number: 12 410 929 **Licence No:** 15149
Region: SA, DC **Location:** Norman Wells; Tulít’a, Wrigley; Fort Simpson; Jean Marie River; Trout Lake

Enbridge Pipelines (NW) Inc. Traditional Knowledge Study
No research was conducted under this licence in 2012. The research was transferred to ARI Licence 15243 for continuation into 2013.

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File Number: 12 410 934 **Licence No:** 15158
Region: DC **Location:** Fort Providence

Landscape scale flooding in the Great Slave Lake Plain: Expansion of lakes, flooding of wetlands and implications for bison habitat and local land users (Traditional knowledge study component)

This project is a partnership with the community of Fort Providence. Twelve interviews and a community workshop were carried out with local residents this past year. Local land users perceive a combination of different causes to be impacting water levels in the Great Slave Lake Plain, including climate change, increased beaver activity (due to reduced trapping), and the disruption of natural drainage patterns due to the Mackenzie Highway infrastructure. Impacts of changing water levels were noted in relation to vegetation and wildlife habitat, with knock-on effects for bison and moose. Snow and ice conditions are changing with warmer winters. These environmental impacts have implications for local residents, particularly in relation to traditional land use. Bison movement out of the sanctuary are impacting the big game bison hunt, which locals rely on for employment, and also highway safety (e.g. increased numbers of vehicle-bison collisions). Residents also experience significant limitations in terms of travel on the land (e.g. by snowmobile), where they must often delay or change the routing of harvesting trips due to unfavourable conditions. Various community-based adaptations are under discussion.

ARCHAEOLOGY 2012

Andrews, Tom
Prince of Wales Northern Heritage Centre

Permit No: 2012-011 **Class:** 2
Region: SA **Location:** Tulít'a District

NWT ice patch monitoring project (2012)
Research in the high alpine was severely restricted this summer due to a record snowfall the previous winter. Even by mid-August, all locations the researchers regularly inspect were still deeply buried under a thick bed of winter snow. As a result, the regular survey was abandoned and the focus shift to helping Todd Kristensen with his excavations at nearby O'Grady Lake. The abundance of snow provided a new source of possible site locations. Specifically, a central ice patch site (KhTe-2) - that has produced a complete arrow dating to 400 ± 90 cal. Yr BP (see Andrews *et al.* 2012) - had completely melted out by 2011. Researchers removed an ice core from the site in 2007 that exhibited several stratified layers of caribou dung, the earliest dating to 3500 ± 110 cal. Yr BP, suggesting that it had been relatively stable for nearly four millennia (see Meulendyk *et al.* 2012). In August 2012, not only was it completely covered in snow again, two other patches, not visible at this time of year in previous years, were noted on lower slopes north and south of it, suggesting that these might be fossil patches exploited sometime in the ancient past. Researchers hope to explore these locations in a future year.

References: Andrews TD, MacKay G, and Andrew L. 2012. Archaeological Investigations of Alpine Ice Patches in the Selwyn Mountains, Northwest Territories. *Arctic* 65(5):1-21.

Meulendyk T, Moorman BJ, Andrews TD, and MacKay G. 2012. Morphology and Development of Ice Patches in Northwest Territories, Canada. *Arctic* 65(5):43-58.

Bussey, Jean
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Permit No: 2012-004 **Class:** 2
Region: NS **Location:** Akaitcho Region

Tibbitt to Contwoyto winter road project
In 2011, Jean Bussey of Points West Heritage Consulting Ltd. conducted archaeological investigations for the Joint Venture that operates the Tibbitt to Contwoyto Winter Road. This work was conducted through EBA Engineering Consultants Ltd. under Northwest Territories Archaeological Permit 2012-004. The Tibbitt to Contwoyto winter road runs from the south end of Tibbitt Lake near Yellowknife to almost the north end of Contwoyto Lake in Nunavut. Until about six years ago, the full length of this ice road was utilized every winter, but most years it now only extends as far as Lac de Gras due a lack of mining activity further north. In previous

years, a number of archaeological sites located near the winter road or its associated developments (e.g. gravel pits and camps) were marked by stakes to ensure avoidance during winter activities. Monitoring of the protected archaeological sites is undertaken every year or two. No monitoring was conducted in 2012. Instead an archaeological site discovered within a proposed gravel source in 2011 was tested and collected. Investigations in 2012 indicated that KkNx-16 consisted of three small localities containing relatively sparse archaeological material. The site is located on esker deposits on the north side of a lake locally known as Sandridge Lake. This lake is part of the winter road route and there are numerous sites recorded on this well-defined esker. KkNx-16 is on south facing slope on the north side of Sandridge Lake. It consists of three localities with quartz flakes visible on the surface. Locality 1 was characterized by a surface scattering of approximately 40 specimens of quartz including white, grey and clear. They extended over an area about 10 m by 10 m; the specimens were sparsely scattered, likely as a result of slope wash. No artifacts were recovered during subsurface testing at Locality 1. All surface specimens were collected using a 2 m by 2 m grid. Locality 2 at KkNx-16 was also characterized by a surface scattering of about 40 specimen of quartz, but the artifacts were limited to white and grey coloured materials. The majority of the artifacts were scattered across an area approximately 6 m by 8 m and were collected using a 2 m by 2 m grid consisting of 12 units. These artifacts are more likely in their original provenience since they are on level terrain characterized by exposed rock. No artifacts were recovered during subsurface testing. Locality 3, situated between the other two localities, contained fewer than 20 specimens of white quartz, most of which are chunky. The white quartz specimens were found on gentle slope in an area about 3 m by 3 m and were collected by measuring from a central datum. No artifacts were encountered during subsurface testing at Locality 3. The lack of artifacts beneath the surface suggests that KkNx-16 consists of three small surface scatters. White quartz is the dominant material, but grey and clear quartz are also present. In addition, in 2011, three specimens of a dark grey siltstone were collected downslope from localities 1 and 2.

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Permit No: 2012-003 **Class:** 2
Region: NS **Location:** Akaitcho Region

Gahcho Kué project
Points West Heritage Consulting Ltd. (Points West) conducted archaeological investigations for De Beers Canada Inc. (De Beers) at Kennady Lake, the location of the proposed Gahcho Kué Project. Kennady Lake is situated approximately 280 km northeast of Yellowknife and 140 km north of Łutsel K'e. Jean Bussey directed the investigations under Class 2 Northwest Territories Archaeological Permit 2012-003. She was assisted by Brenda Michel of the Lutselk'e Dene First Nation. Points West previously conducted work at Kennady Lake for De Beers in 2004, 2005, 2006, 2007 and 2010. The objectives of the 2012 field investigation included archaeological potential assessment and limited ground reconnaissance. These investigations were prompted by minor revisions to the original Project footprint – the identification of a pipeline that would divert water from Kennady Lake to a small lake to the east and the identification of possible dykes. No new archaeological sites were discovered and low archaeological potential is identified in association with the pipeline and the small eastern lake. No new archaeological sites were found near the proposed dykes, but previously recorded sites are located nearby. In addition, there is archaeological potential at landforms near some of the potential dyke locations. If construction is proposed, locations with archaeological sites or with archaeological potential will require additional investigation – either site survey or site protection/mitigation. Using techniques employed along the Tibbitt to Contwoyto Winter Road, three sites along the

winter access between Mackay and Kennady lakes were marked to assist in protecting them during winter use. Wooden survey markers were installed at KkNq-6, KkNq-10 and KkNq-28. The markers were sprayed with fluorescent orange paint to make them more visible when there is snow cover. These locations will be monitored in the summer after each winter of use. De Beers sponsored workshops that were held at Kennady Lake during the summer and early fall of 2012; one was an archaeological workshop. Representatives of six First Nations groups attended: Deninu Kue First Nation, Łutsel K'e Dene First Nation, North Slave Métis Alliance, Northwest Territories Métis Nation, Tłı̨chǫ Government and Yellowknives Dene First Nation. The archaeology workshop included a demonstration of how a lithic scatter is created, as well as a display of some of the artifacts collected from the Project area. Other workshops included tours of the project footprint via boat, a wildlife monitoring station, and aerial reconnaissance of the Kennady Lake watershed and specific proposed developments. An archaeological management plan was prepared, reviewed by the Prince of Wales Northern Heritage Centre, revised, and submitted in October 2012. The plan includes archaeological measures that will be undertaken if the Gahcho Kué Project is approved. These measures include surface collection, subsurface excavation, monitoring, and site protection and will be updated whenever there are changes in the development plans.

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de Guzman, Margarita
Altamira Consulting Ltd.

Permit No: 2012-017 **Class:** 2
Region: NS **Location:** Akaitcho Region

Archaeological overview Giant Mine remediation
In October of 2012, Altamira Consulting Ltd. conducted an initial archaeological field survey of the Giant Mine Remediation Project area. The survey is part of an Archaeological overview of the Giant Mine area and was conducted in advance of the Giant Mine Remediation Project. Giant Mine is an abandoned gold mine located within the City of Yellowknife. The lease boundary covers 872 hectares and encompasses a number of ponds and small lakes, including Baker Creek, Pocket Lake, Trapper Lake and a portion of Yellowknife Bay (Great Slave Lake). Close to 60 years of gold mining has resulted in a massive environmental liability. The proposed remediation plan involves reclamation of the abandoned gold mine and the containment and immobilization of 237,000 tonnes of arsenic trioxide, a by-product of the gold production process. Included in the contamination is an estimated 325,000 m^3 of soils, as well as various buildings and mine facilities. The property is now Commissioner's Land and is administered by the Department of Municipal & Community Affairs. The archaeological overview assessment, which consisted solely of pedestrian reconnaissance, was directed at assessing lands within the Giant Mine Lease Boundary for archaeological potential. This included identifying areas of disturbance and determining areas of potential use for remediation, as well as determining if any previously recorded sites remained in the area. During the overview, three previously recorded heritage sites were revisited and eight areas were identified as having heritage potential; several new sites were also recorded. The results of these investigations underline the need, and provide justification, for a full Heritage Resource Impact Assessment of the project area prior to the initiation of field remediation operations.

Jankuta, Kimberly
Altamira Consulting Ltd.

Permit No: 2012-013 **Class:** 2
Region: NS **Location:** Akaitcho Region

Ingraham Trail realignment
In July of 2012, Altamira Consulting Ltd. conducted an archaeological field survey of the Ingraham Trail located near Yellowknife, NWT. The survey is part of an Archaeological Impact Assessment for the Ingraham Trial Realignment Project. The project personnel included Kimberly Jankuta and Jode MacKay. Originally constructed in the mid-1960s the Ingraham Road is part of Highway 4 that extends from Yellowknife approximately 70 km east to Tibbit Lake. The proposed realignment moves the southernmost leg of the road to the west to detour around the Giant Mine area. The proposed realignment will move the southern access point to the west from 48th street onto Highway 3. The realignment will connect with the existing road several kilometers to the north, near the turn off towards Vee Lake. The realignment will detour traffic around the Giant Mine area in anticipation of the remediation of the abandoned gold mine. The archaeological survey, which consisted of pedestrian reconnaissance and sub-surface shovel tests, was directed at assessing archaeological potential within the proposed Ingraham Trail Realignment right-of-way. This included shovel testing in areas thought to have potential and identifying areas of disturbance, both modern and historic. No archaeological sites were found during the survey. Two rectangular shaped rock features were noted, which may represent the use of rocks to hold down a tent on the rocky landscape. However, no hearths or cultural materials were found in association. A known historic site was revisited during the survey; the historic site is located adjacent to the project area. It represents the location of a 1935 Geological Survey of Canada field crew's discovery of gold. The team led by Norman Jennejohn discovered a quartz vein with visible gold. The site itself consists of a large trench cut through the bedrock.

Kristensen, Todd
University of Alberta

Permit No: 2012-007
Region: SA
Class: 2
Location: Tulít'a District

O'Grady Lake archaeology and ice patch monitoring project
A collaborative team from the University of Alberta, the Prince of Wales Northern Heritage Centre, and the Tulít'a Dene Band, visited O'Grady Lake and several ice patches in the Selwyn Mountains of the Northwest Territories from late July to mid-August. Crew members included Glen MacKay, Leon Andrew, Mike Donnelly, Tom Andrews, and Todd Kristensen. The goals were to monitor ice patches where ancient artifacts have been found and to find new archaeological sites around O'Grady Lake. In past years, ice patches have yielded well-preserved weapons and technologies left behind by people hunting caribou in high alpine areas. It is hoped that archaeological excavations around neighbouring O'Grady Lake will reveal more about the relationship between this alpine caribou hunting and lowland camps. Eight new archaeological sites were discovered around O'Grady Lake during 2012 fieldwork. Most of these sites consist of stone tools and debris from tool production. No new artifacts were discovered during ice patch monitoring due to heavy winter snows that expanded the extent of many patches. Small scale excavation units were dug at two of the O'Grady Lake archaeology sites in order to learn about possible dwellings and activity areas. One site produced fire cracked rock from boiling food while another yielded a deep cultural occupation below a layer of volcanic ash deposited 1250 years ago. Radiocarbon collected from this deep deposit will be tested to determine when O'Grady Lake was first used by pre-contact people. Both sites will be returned to in 2013 for more excavations.

MacKay, Glen
Prince of Wales Northern Heritage Centre

Permit No: 2012-009 **Class:** 2
Region: NS **Location:** Akaitcho Region

Yellowknife Bay archaeology project
In 2012, archaeologists from the Prince of Wales Northern Heritage Centre began an archaeological survey of the Yellowknife Bay area in collaboration with the Yellowknives Dene First Nation. The goal of the project is to record archaeological sites in and around Yellowknife Bay, which will facilitate their protection when land use activities are proposed in the area. This summer researchers focused our survey efforts between the mouth of the Yellowknife River and Tartan Rapids. They recorded archaeological evidence of past land uses in this area ranging from precontact stone tool scatters to campsites associated with historic mineral exploration activities. The continued survey of the Yellowknife area is planned for future summers.

MacKay, Glen
Prince of Wales Northern Heritage Centre

Permit No: 2012-008 **Class:** 2
Region: DC **Location:** Deh Cho Region

Five Lakes archaeology project
The Prince of Wales Northern Heritage Centre (PWNHC) continued a community archaeology project in partnership with the Jean Marie River First Nation in 2012. The goal of the project was to document cultural values in the Łue Túé Sųlái Candidate Cultural Conservation Area, which is being considered for protection through the NWT Protected Areas Strategy. According to the oral traditions of the people of Jean Marie River, these small fish lakes were important winter harvesting areas, where fish caught through the ice and small game provided important staples for the winter months. In 2012, archaeologists from the PWNHC visited all five lakes in the Łue Túé Sųlái Candidate Cultural Conservation Area with elders from Jean Marie River, and recorded 14 new archaeological sites. In September, archaeologists participated in the community culture camp at Tthets'éhk'e (McGill Lake), and were able to involve students from Henry Ekali school in the work. Most of the archaeological sites recorded this summer consist of precontact lithic scatters. The most significant sites were found at the outlet of Tthets'éhk'e, where archaeologists found evidence of multiple precontact occupations. They hope to return to these sites and others in the Łue Túé Sųlái Candidate Cultural Conservation Area in future years to conduct more detailed excavations.

Murphy, Brent
Prince of Wales Northern Heritage Centre

Permit No: 2012-016 **Class:** 2
Region: DC **Location:** Deh Cho Settlement Area

Archaeological impact assessment - Canada Zinc Corporation proposed access road alignment changes, Nahanni Butte, NT
During September of 2012, Golder Associates Ltd. conducted an Archaeological Impact Assessment under NWT Permit 2012-016 on behalf of Canadian Zinc Corporation of changes to their Prairie Creek Mine Access Road Alignment near Nahanni Butte, NWT. The study included the assessment of the proposed Nahanni Range Alternative (56.2 km) winter road. The

alternative road travels from just northeast of the community of Nahanni Butte north along the Nahanni Front Range to Grainger Gap where it meets up with the existing winter road. The current winter road was used by the past owner of the mine in the 1980s and was subject to an archaeological assessment in 2009. The objectives of the Archaeological Impact Assessment were to identify, record and assess heritage resources that might be impacted by the proposed winter road and to devise appropriate mitigation strategies should any be found in conflict with the proposed winter road alignment. The archaeological sites may include previously unrecorded sites within or adjacent to the proposed right of way, temporary workspace and/or borrow areas, if relevant. The field assessment was planned in conjunction with Elders and community members in Nahanni Butte prior to the field studies. Although the meetings were informal, advice and information from several community members and Elders was obtained that aided in the design of the archaeological field program. The field studies included the participation of Wilbert Antoine from Canadian Zinc Corporation and Peter Marcellais and Elder Leon Konisenta from the community of Nahanni Butte who assisted during the field program and provided advice on the cultural significance of the landscape traversed during the investigation. The field studies also included low and slow helicopter overflight and some pedestrian survey. The entire project right-of-way was examined from the air and pedestrian survey was focused on the proposed crossing of the Liard River. The results of the assessment were that no new archaeological sites were recorded or revisited; however, two traditional land use locations, both trails, were noted but not officially recorded as they do not meet some or all of the criteria required to be designated as an archaeological site under the Northwest Territories Archaeological Sites Regulations.

Ng, Tommy
Bison Historical Services Ltd.

Permit No: 2012-018 **Class:** 2
Region: SA **Location:** Tulít'a District

Slater River winter 2012-2013

On behalf of MWH Canada, Inc., acting as agent for Husky Energy, Bison Historical Services Ltd. conducted a heritage resource survey for the proposed Slater River Winter 2012 - 2013 Program within the exploration licence area EL462 and 463 within the Tulít'a District of the Sahtú Region. The exploration licence area is located within the Mackenzie Plain, which is southeast of the Town of Norman Wells and on the south side of the Mackenzie River. The proposed Slater River Winter 2012 - 2013 Program includes an upgrade to an existing eight metre wide winter road and a four metre wide source 126 seismic line into 20 m wide all-weather road. This includes four areas of new road cut along the source 126 seismic line. Associated with the road construction are a base camp/storage area, an airstrip and 13 quarry sites. Additionally, the proponent requested a heritage assessment of 32 future developments, which included eight petroleum wellsites (four horizontal and four vertical) and 24 groundwater monitoring pads. Most of these developments will be located along the all-weather road. This heritage resource survey is an assessment of 49 petroleum associated developments and includes eight petroleum well sites, 24 monitoring water wellsites, 13 quarries, an airstrip, a base camp and two all-weather roads (19 specific landforms along the two roads were assess for heritage resource potential). A total of 66 locales were assessed for heritage resources. Personnel of Bison Historical Services Ltd., based in Calgary, Alberta, assisted by a wildlife monitor and local advisor from the Tulít'a Renewable Resources Council, conducted the heritage resources survey from September 5 to 16, 2012. The survey was based out of Norman Wells and included helicopter overflight and pedestrian reconnaissance accompanied by the excavation of shovel tests within the proposed project area. Pedestrian investigations focused

on areas that were assessed to have high to moderate potential for new heritage resources within the confines of the proposed project area. A total of 432 shovel tests were conducted and all yielded negative results. It is recommended that the proposed Slater River Winter 2012 – 2013 Program be granted approval to proceed with development. This recommendation is subject to the approval from the Government of Northwest Territories through the Prince of Wales Northern Heritage Centre.

Ng, Tommy
Bison Historical Services Ltd.

Permit No: 2012-015 **Class:** 2
Region: SA **Location:** Tulít'a District

Chinook project
On behalf of MWH Canada, Inc., acting as agent for ConocoPhillips Canada (CPC) Resources Corporation, Bison Historical Services Ltd. conducted a heritage resource survey for the proposed ConocoPhillips Chinook Drilling Program within the exploration licence area of EL470 within the Tulít'a District of the Sahtú Region. The exploration licence area is located within the Mackenzie Plain, which is southeast of the Town of Norman Wells and on the south side of the Mackenzie River. During the 2012/2013 winter season, CPC plans to use an ice bridge access owned by Husky Energy in early winter, drill two vertical petroleum wells, develop access to a storage and staging area on the shores of the Mackenzie River, and construct an ice bridge across to Norman Wells for light truck traffic. The Norman Wells ice bridge access would be CPC's main access for subsequent years. Additionally, CPC wants to assess two petroleum well locations planned for the 2014 winter season. The heritage resource survey for ConocoPhillips was conducted at 14 locales, which included two 2012/2013 vertical petroleum wells, the two 2014 petroleum wells, base camp, construction camp, staging area, storage area and five ground water wells. All of these developments are located next to an existing access route. Also included is a heritage resource survey of the proposed new cut (D – E) that will be connecting two segments of the existing access route. Personnel of Bison Historical Services Ltd., Calgary, Alberta, assisted by a wildlife monitor and local advisor from the Tulít'a Renewable Resources Council. The heritage resource survey was conducted from August 8 to 11, 2012 and included a helicopter overflight to assess the archaeological potential of the entire proposed project area. Additionally, pedestrian reconnaissance accompanied by shovel tests were conducted in areas deemed to have moderate to high archaeological potential within the proposed project area. A total of 159 shovel tests were conducted and no artifacts were found. No new heritage resource sites were identify and there are no previously documented heritage resource sites within the general vicinity of the proposed project area. It is recommended that the proposed ConocoPhillips Chinook Drilling Program be granted approval to proceed with development. This recommendation is subject to the approval of the Government of Northwest Territories through the Prince of Wales Northern Heritage Centre.

Ng, Tommy
Bison Historical Services Ltd.

Permit No: 2012-014 **Class:** 2
Region: SA **Location:** Tulít'a District

MGM East Mackay project
On behalf of MGM Energy Corp., Bison Historical Services Ltd. conducted a heritage resource survey for the proposed MGM East Mackay Two Well Horizontal Project within the exploration

licence area of EL466 within the Tulít'a District of the Sahtú Region. The exploration licence area is located within the Mackenzie Plain, which is south of the Hamlet of Tulít'a and on the south side of the Mackenzie River. During the 2012/2013 winter season, MGM Energy Corp. plans to drill one vertical wellsite and one horizontal wellsite, both of which are 300 m apart from each other. Additionally, MGM plan to construct two future petroleum horizontal wellsites in the general area. Despite what is shown in Figure 1, the proposed project does not include the staging area and construction campsite; they will be constructed on the north side of the Mackenzie River. The heritage resource survey for the MGM East Mackay Two Well Horizontal Project was conducted at eight locales, which included the two 2012/2013 petroleum (vertical and horizontal) wellsites and the general locales for two additional future (2014) horizontal well sites. Also included is a heritage resource survey of four new access cuts crossing bodies of water and connecting separate segments of the existing access route. All of these developments are located along an existing access route. Personnel of Bison Historical Services Ltd., based in Calgary, Alberta, assisted by a wildlife monitor and local advisor from the Tulít'a Renewable Resources Council, conducted the heritage resources survey from August 20 to 22, 2012. The heritage resource survey was based out of Norman Wells and included a helicopter overflight and a pedestrian reconnaissance accompanied by the excavation of shovel tests within the proposed project area. Pedestrian investigations focused on areas that were appraised to have high to moderate potential for new heritage resources within the confines of the proposed project area. A total of 105 shovel tests were conducted and all were negative of artifacts. No new heritage resource sites were identify and there are no previously documented heritage resource sites within the general vicinity of the proposed project area. It is recommended that the proposed MGM East Mackay Two Well Horizontal Project be granted approval to proceed with development. Regarding the North and South Areas of Interest, the proponent assured the permit holder that the two future horizontal petroleum wellsites will be placed 200 m away from the drainages and lakes. Landforms that are considered to be locales of high heritage resource potential within these areas of interest. This recommendation is subject to the approval from the Government of Northwest Territories through the Prince of Wales Northern Heritage Centre.

Prager, Gabriella
Points West Heritage Consulting Ltd.

Permit No: 2012-005 **Class:** 2
Region: NS **Location:** Akaitcho Region

Nechalacho Rare Earth Element project
The Nechalacho Rare Earth Metals project is located on the north side of the east arm of Great Slave Lake, approximately 95 km southeast of Yellowknife. The mine development is focused around Thor Lake, about 4 km due north of Great Slave Lake, with a dock on the GSL shore; a marshalling yard is proposed at Pine Point on the south side of Great Slave Lake. The 2012 Points West Heritage Consulting Ltd. archaeological team consisted of Gabriella Prager (Project Director), Carol Rushworth of Points West, and a local person from each of the three closest communities: they were Fred Sangris from Dettah, Gabriel Enzoe from Łutsel K'e and Victor Mandeville from Deninu Kue (Fort Resolution). For the Pine Point work, Wilfred Beaulieu represented the Fort Resolution Metis Council. The 2012 archaeological inventory survey of the mine area covered gaps that remained after the initial 2011 surveys, that is, where project components were revised or boundaries were not accurately identifiable. All mine related facilities proposed on the north side of Great Slave Lake, as well as the proposed marshalling yard at Pine Point were examined by pedestrian transects sufficient to provide good visual coverage and subsurface testing in selected areas. No archaeological remains was found in the

Pine Point marshalling area due to extensive past disturbance and ongoing use, but an interesting structure of driftwood logs was found on the shore just outside the identified yard that could have been a hunting blind. Seven previously recorded sites (KaPb-4, KaPb-6 to KaPb-11, inclusive) in the north project area were subjected to systematic data recovery comprising detailed plan mapping, careful surface inspection of surrounding area, extensive photography, and subsurface testing of at least two tests units at each site where there was soil. No artifacts or additional features were uncovered during these mitigation actions. Because several finished tools had been found at KaPb-4 in 1988, this year archaeologists conducted a very careful surface inspection of the beach and all surface exposures, and extensive shovel testing. Although no additional artifacts were found, this is a very large site area and the vegetation is thick; therefore, artifacts could still be present. Two new sites were recorded at the Great Slave Lake north shore. One is a historic tipi style camp site that contains several prepared poles, a concentration of cut spruce boughs, and a hearth. It is adjacent to a fairly fresh looking skid trail that extends from the lakeshore to the road. This site was thoroughly recorded and three units were excavated. Nothing was found in the units except a metal snap which may be intrusive because it looks quite new. The second site contains stone features situated on the southwest end of the lake point a short distance south of the existing road. These features consist of a rock pile that may have been used as a cache, a propped large, flat rock that could represent a possible trap or a platform for some purpose such as a table, and a hearth, all on bare bedrock. The site terrain and features were mapped to scale and extensively photographed. All known sites are now considered fully recorded.

Ross, Julie
Prince of Wales Northern Heritage Centre

Permit No: 2012-010 **Class:** 2
Region: SA **Location:** Tłı̨chǫ Settlement Area

Archaeological survey - Indore, Hottah Mines and surrounding areas

In June of 2012, Julie Ross of Golder Associates Ltd. and Dolphous Apples from Gamètì, conducted an Archaeological Impact Assessment (AIA) in the vicinity of the Indore and Hottah mine sites along the shores of Beaverlodge and Hottah Lake north of Gamètì for Aboriginal Affairs Northern Development Canada (AANDC). The Euro-Canadian sites consist of uranium exploration camps and the two mine sites. Both site types have resulted in contaminated waste being distributed along the landscape and AANDC's intention is to remediate these sites. Eleven previously unrecorded archaeological sites were recorded and six previously recorded sites were revisited. Many of the Euro-Canadian sites were used by Tłı̨chǫ after their abandonment. The Euro-Canadian sites were mapped and photographic documentation was conducted. The Tłı̨chǫ sites that were recorded include 3 fish caches, 2 hunting blinds and 2 camp sites.

Seip, Lisa
Rescan Environmental Services Ltd.

Permit No: 2012-002 **Class:** 2
Region: NS **Location:** Akaitcho Region, North Slave

Courageous Lake

In June and September of 2012, Rescan Environmental Services Ltd. conducted archaeological baseline studies for Seabridge Gold Inc.'s Courageous Lake Project under Northwest Territories Class #2 Archaeologist's Permit 2012-002. These investigations were a continuation of baseline

studies conducted in 2010 and 2011, under Northwest Territories Class #2 Archaeologist's Permits 2010-015 and 2011-006, respectively. Lisa Seip directed the fieldwork and was assisted by archaeologists Daniel Walker, Vanessa Neuman, and Michael Campbell, also of Rescan Environmental Services Ltd., and by First Nations assistants Ernie Sangris of the Yellowknives Dene, and Darcy Zoe and Charlie Tatzia of the Tłı̨chǫ First Nation. Investigations included the assessment of proposed drill pad locations to the north of Courageous Lake, and surrounding Walsh and Saucer Lakes, and proposed project infrastructure to the south of Courageous Lake. The objective of the investigation was to identify sites that would potentially be impacted by newly proposed infrastructure and drill pad locations. Pedestrian surveys were conducted, focusing on areas considered to have high archaeological potential; subsurface testing was conducted in areas with adequate soil deposition. Examinations resulted in the identification of 54 archaeological sites, including 44 lithic sites, 6 rock feature sites, and 4 historical sites. Twelve archaeological sites with diagnostic artifacts were identified, including two Shield Archaic tradition sites, five Arctic Small Tool tradition sites, and five Taltheilei tradition sites; all of the attributed cultural affiliations are tentative. One previously recorded site, LaNv-20, was revisited. Avoidance is the preferred management recommendation for all sites. If avoidance is not possible, then systematic data recovery is recommended. As the project is currently in the design phase, no impacts are anticipated this year. Additional archaeological studies are planned for 2013.

Thomson, J. Callum
Thompson Heritage Consultants

Permit No: 2012-001 **Class:** 2
Region: NS **Location:** North Slave Region

Preliminary archaeological inventory and assessment of Peregrine Diamonds Lac de Gras West and East Claim Blocks
No summary was submitted for this permit.

Walker, Daniel
Rescan Environmental Services Ltd.

Permit No: 2012-006 **Class:** 2
Region: SS **Location:** Akaitcho Region

Pine Point Project
No summary was submitted for this permit.

Youell, Alan
Stantec Consulting Ltd.

Permit No: 2012-012 **Class:** 2
Region: IN **Location:** Inuvialuit Settlement Area

Inuvik to Tuktoyaktuk Highway borrow source investigations program
On behalf of the Department of Transport, Government of the Northwest Territories, Kavik-Stantec Inc. conducted an archaeological impact assessment of the Inuvik to Tuktoyaktuk Highway Borrow Source. The specific purpose of the archaeological component of the Inuvik to Tuktoyaktuk Highway Borrow Source Investigations Program was to identify archaeological, historical, palaeontological and traditional land use sites at the proposed gravel borrow source locations. These borrow source locations are situated within the Inuvialuit Settlement Region

east of the east channel of the Mackenzie River and west of Eskimo (Husky) Lakes. Investigation of the developments was conducted under Northwest Territories Class 2 Archaeologists Permit #2012-012. To conduct the assessment, archaeologist Alan Youell and wildlife monitor Tommy Chicksi of Inuvik conducted a field reconnaissance of the proposed development areas. The field reconnaissance consisted of a pedestrian traverse and intensive surface examination to determine the presence of unrecorded archaeological or cultural sites. Shovel tests were excavated in areas with the potential for buried cultural materials. The areas investigated during the archaeological assessment of Tuktoyaktuk Highway Borrow Source Investigations Program included the assessment of borrow sources 2.45, 170, 172, 173/305, 307, 314/325 and 312, no archaeological, historical or palaeontological sites were located and no previously recorded sites were revisited. However, two land use sites (modern campsites) and a section of the Jimmy Lake to Eskimo (Husky) Lakes trail were recorded. Based on the results of this assessment, there are no outstanding conflicts between archaeological, historical or palaeontological sites and the potential gravel borrow sources 2.45, 170, 172, 173/305, 307, 314/325 and 312. It is recommended that any impact to the land use sites should be mitigated through consultation with the communities involved.

WILDLIFE 2012

At the time of publication, the Department of Environment and Natural Resources have not submitted their 2012 permitting information. Updates will be published when information is made available.

FISHERIES PERMITS 2012

At the time of publication, the Department of Fisheries and Oceans have not submitted their 2012 permitting information. Updates will be published when information is made available.

GLOSSARY

Abiotic – Not living

Active layer -The area where the soil continually freezes and thaws above the permafrost

Adaptation - A process by which a living organism (human, animal or plant) changes to become better suited to a new environment. This generally on an evolutionary timescale however, in the human context, it may be over a short period.

Adipose - Of, relating to, or composed of animal fat; fatty

Aerial - In the air

Aeromagnetic survey - Surveys from aircraft that make use of the magnetic field caused by magnetized rocks in the Earth's crust to make estimates about underlying geology of a given area such as distribution of potential resources

Algae - Simple living aquatic single or multi celled plant organisms that contains chlorophyll

Algorithm - A procedure or formula for solving a problem

Alkali - A basic substance that can range in strength

Analytical - A detailed examination of the structure or some other parameter of a substance or thing

Anoxic - A situation where oxygen is present in very low amounts or not at all, common in water

Annual - Occurs every year

Anthropogenic - Caused by a human action

Anthropology - The study of the human beings including their origins, cultures, evolution

Aquatic - Of water

Aquatic Biota - All living organisms in the aquatic environment

Arable - Land fit to be cultivated

Archaeology - The study of past human life and culture by looking at remains and artifacts like tools

Archean - A period of geologic time from about 3.9 billion years to 2.5 billion years ago

Archival - Pertaining to a collection of documents, normal over long periods of time

Arsenic - A chemical element that is gray in color and that is highly poisonous with no taste

Artifact - A historical tool, weapon or other human-made object that can be studied

Asexual - An organism that reproduces without the aid of a partner and who passes on all of its genetic information

Atmosphere - The layers of gases that surround and protect the Earth

Attributed - To explain by indicating a cause

Avifauna - the birds of a particular region or period

Bacteria - A large and varied group of single-celled microorganisms

Baseline - A set of information and data serving as a basis for comparison into the future

Bathymetry - Underwater topography. Mapping the underwater contours of the bottoms of water bodies

Beaufort Gyre - The major ice and ocean current circulation of the Arctic Ocean

Benthos - The bottom of the ocean or body of water

Biochemistry - The study of chemical processes in living organisms

Biodiversity - Pertaining to the variety of species in an area

Biogenic - Produced by living organisms or biological processes

Biogeography – The study of the geographical distribution of organisms

Biomass - The total amount of all living material within a specific volume of the environment

Biomes - Distinct areas of the Earth that are common in climate conditions, life forms and physical features like the tundra or woodland

Biostratigraphy - Identification and differentiation of rocks based on the types of fossils they contain

Biotic - Having to do with living organisms

Boreal - Relating to the forest areas of the Northern Temperate Zone that are dominated by coniferous trees such as spruce, fir and pine

Brachiopods - Any of various marine invertebrates of the phylum Brachiopoda, having bivalve dorsal and ventral shells enclosing a pair of tentacled, armlike structures that are used to sweep minute food particles into the mouth. Also called *lampshell*.

Breccia - Rock composed of sharp-angled fragments embedded in a fine-grained matrix

Brunisol Soil - soil type that is associated with forest vegetation. It is usually poorly developed and immature

Carbon^{14} – A radioactive isotope of carbon used to date ancient rocks and artifacts

Carnivore - A flesh/meat eating animal

Characterized - To describe an object or idea

Chlorophyll A - A pigment in plants that give them their green color and which absorb energy from the sun. Plants use Chlorophyll to change carbon dioxide and water into food and oxygen

Classification - Organize into groups or categories

Climate – Typical weather patterns of a region over long time periods

Community - All organisms in a particular environment

Comprehend - Being able to understand

Comprehensive - Conveying or including everything or almost everything

Coniferous woodland - A wooded area that is dominated by evergreen trees

Conifers - A group of woody plant commonly known as evergreen trees such as pine, spruce or fir that bears cones

Connectivity - As something is able to connect or relate with another thing

Core - A part removed from the interior of a mass especially to determine the interior composition

Correlated - A mutual relation between two comparable things

Cretaceous - Of or belonging to the geologic time, system of rocks and sedimentary deposits of the third and last period of the Mesozoic Era, characterized by the development of flowering plants and ending with the sudden extinction of the dinosaurs and many other forms of life

Crustacean - any mainly aquatic arthropod usually having a segmented body and chitinous exoskeleton

Cryosols - Cryosols are characterized by frozen soil within 1 metre (39 inches) of the land surface and by waterlogging during periods of thaw. They often show disrupted soil layers, cracks, or patterned surface features such as frost mounds, caused by the physical actions of ice formation and melting. Cryosols may be either mineral soils or humus-rich materials

Cryosphere - frozen water in the form of snow, permanently frozen ground (permafrost), floating ice and glaciers

Cumulative - Objects or ideas that add together

Cyanobacteria - predominantly photosynthetic prokaryotic organisms containing a blue pigment in addition to chlorophyll; occur singly or in colonies in diverse habitats; important as phytoplankton

Deciduous – A plant that lose their leaves during one season, usually winter

Deducing – To draw a conclusion

Deformation - A measurable change in structure, normally for the worse

Degradation - To reduce something or to place something at a lower level

Delta – The land formed where a river deposited silt as it enters into a larger water body, classic example, the Mackenzie Delta

Dendrochronology - A system of dating wooden objects by studying the tree growth rings

Density - A quantity of mass per unit volume

Devonian - Of or belonging to the geologic time, system of rocks, or sedimentary deposits of the fourth period of the Paleozoic Era, characterized by the development of lobe-finned fishes, the appearance of amphibians and insects and the first forests

Discontinuous – Not continuing or linked

Diurnal - Relating to or occurring in a 24-hour period; daily. Occurring or active during the daytime rather than at night

Diversion - A changing of the direction an object is going

Ecology - The science that deals with how living organisms live in relation to each other and their environment

Ecological integrity - Ensuring the relationship in plant and animal communities remains healthy

Ecosystem – The organisms present in a defined area and how they interact with the non-living surrounding (the biotic and the abiotic)

Effluent - A pollutant that flows out from a main source, such as sewage or waste matter

Ekman Grab - A box core type of sediment sampling device.

ELC data - Ecological Land Classification data

Electrofishing - Using electricity to stun and kill fish, usually used during scientific scenarios

Electromagnetic - Magnetism that is caused by electricity

Emissions - A water product that is radiated outward or discharged from a source

Endocrine – 1) designating or of any gland producing one or more hormones 2) designating or of such a hormone

Endophyte - An organism, especially a fungus or microorganism, that lives inside a plant, in a parasitic or mutualistic relationship

Environment – An organism's physical surroundings

Epoch - A period of time during which something important developed or happened

Erosion - Group of natural processes (weathering, disintegration, abrasion, corrosion, transportation) where the Earth's surface is worn away and removed

Eskers - A long, narrow ridge of coarse gravel deposited by a stream flowing under a decaying glacial sheet of ice

Estuary - A place where coastal seawater comes into contact with the current of a freshwater stream

Eukaryote - any member of the *Eukarya*, a domain of organisms having cells each with a distinct nucleus within which the genetic material is contained. Eukaryotes include protoctists, fungi, plants and animals

Eutrophication – The enrichment of aquatic systems, promoting dense algal and plant growth in a body of water, depriving the water of oxygen and forcing change in species composition

Evaporites A sedimentary deposit that results from the evaporation of seawater

Evolution - A process where different species come into existence by differentiation and genetic mutations from common ancestors over a long period of time.

Excavated - Extracting or revealing something by removal of the surrounding earth

Fauna - Animal life of a particular region, environment, or geological period

Fault - A fracture in a rock along which the rocks move; the place of origination of seismic activity; types include: strike-slip and thrust

Fecundity - Ability to reproduce

Fen - Low, flat, swampy land; a bog or marsh

Flora - The plants of a particular region, environment or geological region

Fluvial - Pertaining to something's existence or growth around a stream or river

Fossil -Trace of an organism of a past age, embedded and preserved in the Earth's crust

Fry – Infant fish

Fungi - A kingdom of heterotrophic organisms that produce spores

Fyke - A long, bag-shaped fishing net held open by hoops

Gas hydrates (clathrates) – Crystalline water based solids physically resembling ice, in which small non polar molecules (typically gases) are trapped inside "cages" of hydrogen bonded water molecules

Gender - One's characteristics or traits determined socially as a result of one's sex

Genetic - Pertaining to an organism's traits or characters being linked to genes

Genera - A group of organisms that share common characteristics

Geochemistry - The science that deals with the chemical composition of and chemical changes in the solid matter of the Earth

Geochronological - The chronology of the earth's history as determined by geologic events and not by human history

Geomorphologic - Pertaining to the physical features of the Earth's surface

Glauconite - A greenish mineral of the mica group, a hydrous silicate of potassium, iron, aluminum, or magnesium

Gonad - a gland in which gametes (sex cells) are produced

Grams (g) - A unit of measurement for mass

Habitat - A place where organisms live

Hepatic – (Anatomy) of or relating to the liver; (Botany) *botany* of or relating to the liverworts

Heterogeneous - A situation where something is in a mixed composition

Holocene - The most recent 11,000 years of the Earth's history starting at the end of the last major iceage, which has been relatively warm

Hydraulic - Pertaining to movement caused by water

Hydroacoustic survey - An echo-sounding (SONAR) survey used for measuring such things as fish stocks, water velocity, etc.

Hydrocarbon – A molecule containing hydrogen and carbon, often petroleum, natural gas and coal

Hydrograph - A graph showing the water level, discharge, or other property of river volume with respect to time

Hydrology - Science dealing with the properties, distribution and circulation of water

Isotope - Atoms that have nuclei with the same number of protons (as the atomic number) but different numbers of neutrons

Igneous - A rock or mineral that solidified from molten or partly molten material, i.e. from magma; one of three rock types with metamorphic and sedimentary

Implement - To put into effect

Iron - A metallic element used for making tools and essential for all living organisms' survival

Jarosite - a yellow to brown secondary mineral consisting of basic hydrated sulphate of iron and potassium in masses or hexagonal crystals

Kimberlite – An igneous that forms in volcanic pipe, an indicator of diamond deposits

Larvae - A premature stage for an insect where it feeds before becoming a pupa

Latitude - A measurement of the from the equator to a given point on the Earth's surface in the north and south direction

Laurentide Ice Sheet - Principal glacial cover of North America during the Pleistocene Epoch (2.6 million – 11,700 years ago). At its maximum extent it spread as far south as latitude 37° N and covered an area of more than 5 million sq mi (13 million sq km). In some areas its thickness reached 8,000 – 10,000 ft (2,400 – 3,000 m) or more

Ligotrophic (oligotrophic) - The opposite of eutrophic. Waters having very low levels of primary productivity and (usually) low concentrations of nutrients; good, clear water quality

Limestone - A sedimentary rock that contains mostly calcium carbonate and can be formed by either inorganic or organic processes

Limnology - The scientific study of the life and phenomena of fresh water, especially lakes and ponds

Lithic - Of, like, or made of stone. Archaeological artifacts made of stone

Meristic - Having or composed of segments; segmented

Mesic - Of, characterized by, or adapted to a moderately moist habitat

Metabolism - The chemical processes occurring within a living cell or organism that are necessary for the maintenance of life. In metabolism some substances are broken down to yield energy for vital processes while other substances, necessary for life, are synthesized

Metamorphic rock - Any rock derived from pre-existing rocks by changes in response to environmental factors such as temperature and pressure over a long period of time; one of three types of rocks with igneous and sedimentary

Methane - The simplest hydrocarbon that is the main ingredient in natural gas (CH_4)

Microclimate - The climate of a small area that is different due to changes in geography

Microorganisms - Organisms that must be viewed under a microscope, such as bacteria or a virus

Migration - The long range movement of a group of animals based on the seasons

Molecular analysis - A detailed look at the chemical structure and properties of a molecule

Moraine - A mound of rock debris carried and deposited by a glacier

Multicellular – Composed of more than one cell

Nutrient – Any chemical that an organism removes from the environment to aid with growth and development; common nutrients include nitrogen and phosphorus

Otolith – A part of a fish's inner ear, often used to determine the age fish

Organic - Material pertaining to plants or animals

Outcrop - A portion of bedrock or other stratum protruding through the soil level

Overlie - Sedimentary or volcanic rock that lies on top of older rock

Paleoecological - A relationship or study of ancient organisms and how they related to their ancient environment

Paleoenvironmental - An environment that existed in the past

Parr - a juvenile fish

Parameter - One set of measurable factors, such as the temperature and pressure that define a system and determine its behavior and are varied in an experiment

Pelagic - Relating to or living in or on oceanic waters. The pelagic zone of the ocean begins at the low tide mark and includes the entire oceanic water column

Permafrost – The permanently frozen layer of soil that characterizes the Arctic's ground; there are two various types: continuous and discontinuous

Pertinent – An object, idea or concept that is relevant to the topic

Phylogeography - the study of the historical processes that may be responsible for the contemporary geographic distributions of individuals

Phylum – (Biology) a major taxonomic division of living organisms that contain one or more classes. An example is the phylum *Arthropoda* (insects, crustaceans, arachnids, etc., and myriapods)

Physiological - Pertaining to the physical structures and functions of living organisms

Phytoplankton - A group of plant-like plankton that all sea animals depend on either directly or indirectly

Pingo – A large frozen mound covered with vegetation in permafrost areas

Pleistocene - An age of notable ice ages and development of humans between 2,000,000 and 10,000 years ago

Postglacial - Relating to or occurring during the time following a glacial period

ppm – An abbreviation of parts per million

Precipitation – Water (in the form of rain, snow hail, etc.) falling from the atmosphere

Prokaryote - An organism of the kingdom Monera (or Prokaryotae), comprising the bacteria and cyanobacteria, characterized by the absence of a distinct, membrane-bound nucleus or membrane-bound organelles, and by DNA that is not organized into chromosomes. Also called *moneran*

Qualitative – A complete detailed descriptions usually taken from a small sample that allows for distinctions to be drawn from the data

Quantitative - Use of large amounts of data where statistics can be applied to interpret the data

Quaternary - Of or belonging to the geologic time, system of rocks, or sedimentary deposits of the second period of the Cenozoic Era, from the end of the Tertiary Period through the present, characterized by the appearance and development of humans and including the Pleistocene and Holocene epochs

Qiviuq - The soft downy undercoat of muskoxen

Radiocarbon dating - The determination of the approximate age of an ancient object, such as an archaeological specimen, by measuring the amount of carbon^{14} it contains

Raptor - A bird of prey such as an eagle, falcon or osprey

Regolith - The layer of loose rock resting on bedrock, constituting the surface of most land. Also called *mantle rock*

Regosol - a type of azonal soil consisting of unconsolidated material derived from freshly deposited alluvium or sands

Remote Sensing – A technique used to study locations using technology that does not require the researcher to be in the field

Revitalization - To give new life or vitality to something

Riffle – a) A rocky shoal or sandbar lying just below the surface of a waterway b) A stretch of choppy water caused by such a shoal or sandbar; a rapid

Satellite imagery - Computer images generated by a satellite which allow researchers to look at a specific area and monitor surface features such as vegetation

Sediment - Solid fragment material that occurs from the weathering of rocks. In water it is material that has settled from a state of suspension

Sedimentary rock - Rock derived from loose particles that have accumulated over time

Sedimentation - The process where small particles are moved and deposited to accumulate into layers

Seine - A large fishing net made to hang vertically in the water by weights at the lower edge and floats at the top

Seismic - Pertaining to vibrations in the Earth, both natural and induced

Shovel testing - A simple test where a sample of ground is taken by use of a shovel and examined

Species - A group of organisms that share common characteristics that group them together and also distinguish them from others

Stone flakes/chards - debris left over from a rock while making tools

Stratified - A system that is set up in layers or strata

Stratigraphic - Formation of rock where different layers can be picked out based on type and age of the rock

Subsidence - The shifting of the Earth's surface downwards (compared normally to sea-level)

Succession - A progressive change in the biological community as a result of a response from species to the changing environment

Surficial - Pertaining to something that is on the surface

Suspension - A situation where the medium is able to support the weight of the particles trapped inside it, example: silt in a river.

Symbioses – An interaction between two or more organisms that usually benefits both

Sympatric - Occupying the same or overlapping geographic areas without interbreeding. Used of populations of closely related species

Systematic - Done according to a plan

Taxonomy - The classification of organisms in an ordered system that indicates natural relationships

Thermokarst - Sinking holes, caves and underground drainage that are produced in regions with permafrost from melting of ground ice and settling of the remaining ground

Theodolite - a surveying instrument for measuring vertical and horizontal angles. Also called (in the US and Canada) ***transit***

Thermocline - Layer in a large body of water that sharply separates regions differing in temperature. An abrupt temperature gradient in a lake

Topography - A description of the surface of a given area

Trace metals - A metal that is not essential in the sample but is found in small quantities

Transect - An imaginary line across a surface where observations are made

Tributary - A stream or river which feeds into a larger body of water

Turbid - Stirred up material suspended in a medium leaving it unclear and opaque

Ungulate - Hoofed animals

Velocity - Rate of change of position; quickness of motion

Volatile - Unstable; a substance that easily vapourizes

Watershed - A region draining into a river, river system, or other body of water

Weather – Daily variable changes in temperature, precipitation, wind and other atmospheric conditions

Zooplankton - Microscopic animal organisms floating in water

210-Pb Method - is used to determine the accumulation rate of sediments in lakes, oceans and other water bodies. It is used for over a period of 100 - 200 years

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