PROPOSAL FOR

Don Pickle, Senior Administrative Officer
Hamlet of Grise Fiord

October 2004

P42-2655

PROPOSAL FOR

FISH HABITAT ASSESSMENT STUDY – MARINE RESUPPLY AND BREAKWATER FACILITIES IN ASSUITUQ/GRISE FIORD, NU

Submitted to:

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1. INTRODUCTION

The Hamlet of Grise Fiord has requested proposals from qualified environmental consulting firms for the preparation of a Fish Habitat Assessment Study related to the development of the Marine Resupply and Breakwater Facilities in Grise Fiord, Nunavut (NU).

The Federal Transport Minister announced the Strategic Highway Infrastructure Program (SHIP) in April of 2001. The SHIP agreement between Canada and Nunavut allows for the joint funding of various transportation infrastructures such as Air Terminal Buildings, Marine Facilities and Access Roads over the next 5 years. This agreement was signed in Coral Harbour on October 22, 2002. Since ratification, this agreement has contributed to fulfilling marine transportation requirements in several Nunavut communities.

1.1 Background

Grise Fiord, also known as Ausuittuq or “the island that never melts”, lies on the southern tip of Ellesmere Island. The community is surrounded by glaciers and fiords, is the northern most community in Canada and welcomes international cruise ships. Based on the 2001 census, the population of Grise Fiord is 145.

The proposed new Marine Resupply and Breakwater Facilities will be used for offloading and temporary storage of dry cargo, offloading fuel delivered for the yearly sealift and development of the commercial fishery. These facilities will also shelter marine re-supply vessels and community subsistence-fishing and recreational boats from inclement weather. The new facility will guarantee deeper water access close to shore for the re-supply vessels and provide a larger staging area and docking facilities for the offloaded material and fish products.

The proposed new Marine Resupply and Breakwater Facilities comprises a Breakwater, Causeway/Docking complex, Marshalling Area and possible Access Roads. The land portion of the work may include upgrading to the Marshalling Area and Access Road. Construction of the marine portion, including Breakwater, Causeway and Docking facilities are subject to approval of new capital funding with projections to commence in 2005-06 and will require approval from the Department of Fisheries and Oceans (DFO) and the Nunavut Impact Review Board (NIRB).

The DFO may request a comprehensive fish-habitat assessment, including an assessment of existing fish habitat and impacts to fish habitat posed by the proposed construction activities. The DFO may also request development and implementation of acceptable measures for fish habitat compensation.

1.2 Study Area

The proposed Marine Resupply and Breakwater Facilities will be located in direct proximity to the Hamlet of Grise Fiord (Labelled as 'B' in Figure 1), located at 76° 35' 00" N - 83° 14' 00" W, along the southern shore of Ellesmere Island. A small inland stream that is particularly active during the spring, runs through the community. There is discussion in the community as to whether it should be redirected to the original channel thereby requiring upgrades to local culverts and the peninsula.

Figure 1. Hamlet of Grise Fiord prior to spring break-up (A, airstrip; B, Hamlet; N = approximate geographic north; photo courtesy http://www.jovial.on.ca/vica/Welcome.html)

1.3 General Study Approach

For this project, IMG-Golder has brought together a unique team of scientists and local specialists who have significant experience in all required disciplines. We believe that combining internal corporate know-how together with strong community partnership is a key strength of Golder Associates which will provide a comprehensive and cost-effective assessment of the local fish habitat resources.

IMG-Golder Corporation is an Inuvialuit environmental consulting company with its office in Inuvik, NT, and supported by our company directors and Golder Associates personnel. The majority of IMG-Golder's full time staff is Inuvialuit. A brochure is provided in Appendix I reviews the development and some of the experience of IMG-Golder over the last three years. Included in this proposal is the corporate commitment of IMG-Golder and Golder Associates Ltd. to work with the community of Grise Fiord to develop professional products in a cost-effective and safe manner and to work closely with local Inuit to enhance capacity wherever possible.

We are confident that the prospective Grise Fiord Marine Resupply and Breakwater Facilities Project can be successfully completed by IMG-Golder for the following reasons:

- IMG-Golder has made a corporate commitment to the north with long-term strategies for the provision of consulting services from northern-based professionals, through training and capacity building, hiring local labour, and by developing strong working relationships with local communities across the Arctic.
- IMG-Golder has an office located in the Arctic and employs local specialists who will focus on developing a cost-effective program to address issues of concern.
- IMG-Golder has extensive relevant experience in fishery habitat assessment, baseline surveys, environmental assessment, and the regulatory process in the Northwest Territories and Nunavut.
- IMG-Golder has assembled a unique and experienced study team for this project, which benefits from significant northern and Nunavut experience, allowing us to implement a cost-effective program to address all fishery assessment issues and concerns.

- IMG-Golder has carried out a very similar project for Kugluktuk with great success, as indicated by the many support letters found in Appendix II. The fisheries assessment included the successful integration of both western scientific data and Inuit Qaujimajatuqangit (IQ).
- IMG-Golder will establish partnerships with the community of Grise Fiord to integrate and utilize local expertise, goods and services.
- IMG-Golder is a highly innovative and responsive firm, focused on placing client interests at the forefront of all projects.
- IMG-Golder conducts senior peer review on all reports to maintain and enhance technical quality control and assurance, and close management of project schedules and budgets to achieve time and cost control.
- IMG-Golder has the personnel available to commence the project immediately and complete it within the time frame proposed.

2. OBJECTIVES

The Fish Habitat Assessment Study has two main objectives:

1. To establish the long term impact, including damage and benefit to the fish habitat created by the construction, of the new Marine Resupply and Breakwater Facilities.

2. To produce and implement compensation measures in order to meet the DFO 'No-net-loss' policy guidelines', for the potential loss of habitat associated with this development.

In addition, we suggest:

3. The inclusion of Inuit Qaujimajatuqangit (IQ), wherever possible, as a third objective of the Study. In particular, IQ should be incorporated to better understand past and current conditions as well as to suggest future mitigation strategies.

Photo 1.

Example of Arctic fyke net in position.

3. SCOPE OF WORK

3.1 Principal Fisheries Issues and Concerns

Principal Fisheries Issues and Concerns to be addressed in relation to the proposed Marine Resupply and Breakwater Facilities include:

- Potential interference (delay, deflection) with seasonal fish migrations/movements through the near-shore zone; generally oriented to and from any of the communities river systems.
- Direct and permanent loss of near-shore habitat associated with the footprint of the breakwater and causeway structures.
- Habitat alteration for key marine species (including those presented in Table 1) within the perimeter of the breakwater and causeway resulting from changes to wave action, depth, substrate type, water quality, etc.

Table 1 Marine Species of Concern in the Project Area

Iqaluk Arctic charr (*Salvelinus alpinus*)	Abundant in Baffin Bay and Davis Strait. Does occur in lakes across Ellesmere Island. An important run is south of Ellesmere in Clyde River.
Nataarnaq Turbot, Greenland halibut (*Scophthalmus maximus*)	Abundant in Davis Strait / Baffin Bay. Important for fishery in Grise Fiord.
Uugaq Arctic cod (*Boreagadus saida*)	Fairly common in both Baffin Bay and Davis Strait. Very important prey for a healthy **Qilalugaq** / Beluga (*Delphinapterus leucas*) stock.
Ammumajuuq Clams (*Serripes groenlandicus)* and **Putjuuti** Shrimps (*Pandalus sp*)	Important economic species in the area.

3.2 Input Assessment Tasks

In order to define the nature, extent and significance of the Principal Fisheries Issues and Concerns, an Impact Assessment will be undertaken. This Assessment will include:

- A definition of the timing and extent of fish migrations and movements within, and adjacent to, the study area. This will include an assessment of essential fish species (amphidromous salmonids and estuarine/marine species) in the area and will address movements during the open water period (i.e., spawning and feeding).
- Measurement, description and suitability assessment of the habitat directly affected by the footprint of the project (breakwater and causeway/wharf complex), and associated habitat within the zone of influence of the structures (e.g., near-shore area contained within the breakwater).
  - Descriptions to focus on essential fish species that occur in the area
  - The assessment to include all critical life stages for essential fish species including spawning, rearing, overwintering and feeding habits in the affected area
- Assessment of the availability of alternate habitats similar to those potentially affected by the project, in the area surrounding the project. Level of salinity of both, affected and alternate habitats should be measured and compared. Effects of effluent from sewage outfall on the present fish habitat in the vicinity of proposed area should also be considered in the study.
- A review of the relevant literature (also see Section 8.0, Relevant Company Experience, for similar studies conducted by Golder Associates) assessing the impacts of marine development on aquatic resources in Alaska and Northern Canada.

Photo 2.

Releasing an Arctic charr captured in a fyke net. Note: the plastic tag inserted below the dorsal fin to track fish movements.

3.3 Compensation Requirements / Options

The Fish Habitat Assessment Study will identify, assess and recommend an appropriate mitigation and compensation strategy to meet or exceed the "No Net Loss" guiding principal of the DFO Habitat Management Policy. This shall be achieved through:

- Development of a "No Net Loss" plan that identifies acceptable compensation measures.
- Development of a systematic accounting of habitat losses and gains.

3.4 Consultations

Throughout the delivery of this project, consultations shall be maintained with all stakeholders directly affected by this project. These will include but will not necessarily be limited to:

- Hamlet of Grise Fiord

- Government of Nunavut, Department of Public Works & Services
- Government of Nunavut, Department of Community Government & Transportation
- Government of Nunavut, Department of Environment
- Nunavut Impact Review Board
- Nunavut Wildlife Management Board
- Qikiqtaaluk Wildlife Board
- Qikiqtani Inuit Association
- Iviq Hunters and Trappers Organization
- Department of Fisheries and Oceans; Fish Habitat Management Division
- Nunavut Eastern Arctic Shipping Inc.
- Nunavut Sealink Supply Inc.
- Woodwards Oil Ltd.

If appropriate, consultations will also be carried out with the local Elders Group or Women's Group. High school students will be encouraged to participate in meetings.

4. PHASE I METHODOLOGY

Given the restrictive open-water period at Grise Fiord (between late July/ mid August to mid/end October) and the merit of including IQ into the design of a successful field season, it will not be feasible to carry out the proposed field work during 2004. Instead, a phased approach is recommended, as described below:

Phase I: October 2004 – January 2005

- Carry out desktop literature review of scientific knowledge and IQ of local fisheries and fish habitat.
- Conduct a Preliminary Habitat Assessment.
- Initiate Community Consultation.
  - Open dialogue with relevant regulatory agencies (i.e., DFO) to initiate licensing and Fisheries Authorizations processes.
  - Host initial community consultation meeting.
  - Conduct, transcribe and verify Inuit Qaujimajatuqnagit interviews with local Elders and/or fisheries experts.
- Prepare a detailed workplan and budget for Phase II, based on community input and current construction and regulatory conditions.

Phase II: January - September 2005

- Continue Community Consultation.
  - Host open-house or meeting.
- Carry out impact assessment fieldwork (7 days).
- Prepare compensation requirements (e.g., develop and prepare for implementation of a “No Net Loss” plan).
- Present results back to Hamlet and community members.

4.1 Literature Review

A detailed literature review of relevant published and available non-published materials focused on the effects of related developments on northern fisheries will be carried out. This will include library and on-line database searches.

A search of published IQ sources and relevant web-sites will also be carried out.

4.2 Preliminary Habitat Assessment

Concurrent with this literature review, IMG-Golder biologists will initiate a Preliminary Habitat Assessment to:

- Quantify and designate habitat units associated with in-shore areas in proximity to the Hamlet of Grise Fiord.
- Collate available bathymetric, topographic and aerial photographs and maps.
- Integrate habitat assessment and map based information into Geographic Information System (GIS) software (ArcInfo©).

4.3 Consultation

The community consultation process will be ongoing throughout the study. It will primarily be comprised of two components. The first component will involve meeting with stakeholders (listed in Section 3.4) and making presentations to community members. This will allow for input into the study design and documentation of local concerns. The second component will involve meeting with focus groups comprised of Elders and fishers in order to document Inuit Qaujimajatuqnagit of the local fisheries and fish habitat. The guiding principle with respect to community consultation will be to ensure that contact is frequent, inclusive and meaningful. Once the contract is awarded, the team will consult with the HTO and Hamlet to hire a local co-ordinator to facilitate community relations, ensure the progress of the study, help with field work, and to carry out, transcribe and verify IQ interviews. This person will work closely with the Hamlet of Grise Fiord which will provide names and addresses of agencies and stakeholders and assist in organizing meetings and interviews.

Photo 3.

Baker Lake Elders share Inuit Qaujimajatuqangit about the local environment to be included in a wildlife assessment study.

4.3.1 Community Meetings

At the outset of the project, the project director, project manager, cultural resource specialist and local co-ordinator will meet with the Hamlet of Grise Fiord. Both the project director and manager will participate via conference call, unless budget allows for one to participate in person. The local co-ordinator and cultural resource specialist will meet in person with the Hamlet. Any revisions to the scope of work, budget, timeline and other issues will be discussed.

Next, an initial community meeting will be held. Representatives from key stakeholder groups (e.g., listed in Section 3.4) will be invited. Key agencies will be contacted in order to raise awareness of the Study and to initiate consultation.

A second set of community meetings will be held during the summer of 2005, during Phase II.

4.3.2 Inuit Qaujimajatuqangit Interviews and Training

IQ has much to contribute to an understanding of past, current and future conditions in the study area. A combination of group and individual interviews will be carried out with local Elders and other fisheries experts. The local co-ordinator will assist with setting up and carrying out interviews as well as transcribing interview results. The local co-ordinator will also read through (verify) the interview transcripts with the Elders and/or fisheries experts to make sure they are accurate. Start-up training on interview techniques and protocols will be provided to the local co-ordinator prior to any interviewing.

Possible topics of discussion may include quality of fish habitat, seasonal fish migrations and known overwintering habitat in the area. It is expected that this local knowledge will be able to assist the fisheries biologists in locating areas of fish concentration and domestic fishing activity as well as insight into short and long term changes in the marine environment and key periods of seasonal migrations.

Standard and accepted protocols for carrying out interviews will be implemented. Prior to commencing the interviews, the study background will be explained and consent forms will be reviewed. Next, the terms of the interview and how the interview results will be used will be discussed. It may be that interviewees decide that copies of their recordings can be donated to local school, Elders centre, HTO or QIA office. Ownership of the recordings and copyright will remain with the interviewees.

A semi-structured interview approach will be used so that the interviewees can share what they feel is most important. An interview guide will be prepared by the local co-ordinator and the cultural resource specialist for approval by the Hamlet of Grise Fiord. This guide will form the basis of the interviews.

Interview tapes (or disks) as well as maps will be transcribed and then verified. The local co-ordinator will read the transcripts aloud back to the interviewees to ensure that ‘the words are right.’

Photo 4.

Meeting with Kugluktuk Elders to document Inuit Qaujimajatuqangit on fisheries.

4.4 Prepare Phase II Workplan and Budget

Once information from the literature review, preliminary habitat assessment, meetings and interviews is collected, a detailed workplan and budget for Phase II will be prepared and submitted to the Hamlet of Grise Fiord for comment.

5. PHASE II PROPOSED METHODOLOGY

Once results from the literature review, preliminary desktop habitat assessment, interviews and meetings are assembled, a more detailed workplan and budget will be presented to the Hamlet for consideration. A preliminary workplan for Phase II, assuming field work is required (see Section 5.5), is presented below.

5.1 Fisheries Baseline Assessment

5.1.1 Physical Habitat

The area directly affected by the footprint of the project (i.e., the near shore habitat displaced by the breakwater, causeway, marshalling area and possible access roads) and the associated habitat within the zone of influence of the structures (within perimeter of breakwater and adjacent to the breakwater, causeway, marshalling area and possible access roads) will be described and quantified as follows:

- Calculation of potentially affected areas based on technical scale drawings; verification of area involved through field measurements (laser range finder).
- Characterization and differentiation of the potentially affected habitat through depth bathymetry, substrate assessment (line activated and pole mounted Ponar grab, recording underwater camera) and description of bottom and shoreline cover (recording underwater camera, snorkeling/SCUBA).

5.1.2 Water Quality

Water quality under baseline conditions will be assessed as follows:

- During the summer field survey, a range of parameters will be measured on a daily basis: water temperature, salinity, turbidity, pH, conductivity and transparency.
- A representative water sample will be collected at the proposed development site during the summer survey. It will be forwarded to a commercial laboratory for routine water analysis (including nutrients). Also included will be analysis for

oil/grease, BTEX (benzenes, toluenes, ethyl benzene, xylenes), TPH (total petroleum hydrocarbon), TEH (total extractable hydrocarbons, includes C5-C10/diesel (C11-C32)), phenols, PAH (polynucleic aromatic hydrocarbons), metals (ICP scan), TOC (total organic carbon), and total fecal coliform.

- Additionally, a second sample will be collected at a reference (control) location situated outside the affected zone. This sample will be submitted for similar analyses.
- A sample of the sediments from the proposed breakwater and reference sites will also be analysed; the parameters examined will be largely similar to those indicated above for the water column samples.

5.1.3 Plankton and Benthos

In order to provide a basic level of understanding of the food web at the lower taxonomic levels, we would carry out the following:

- Phytoplankton samples (composite of 5-10 samples/session) will be collected during both survey periods to determine composition and relative abundance. The samples will be collected with a weighted plastic tubing sampler fitted with a foot valve.
- Zooplankton samples (5-10 samples) will be collected to determine composition and relative abundance. The samples will be collected using a Wisconsin-style net constructed of Nitex® mesh (net mouth diameter 133.4 mm; mesh aperture 0.080 mm; bucket mesh aperture 0.604 x 0.064 mm).
- Benthic invertebrate populations inhabiting the site will be assessed through the use of a line activated or pole mounted Ponar Grab sampler. A representative number of samples will be taken (i.e., 3-10 samples depending on habitat variability).

The above methods were used successfully on projects with similar objectives in Arctic environments.

5.1.4 Fish Resources

Fish resources utilizing the area to be affected by the proposed development will be assessed during the 10-day summer survey period using the following techniques:

- A two-way Arctic fyke net similar to those used extensively along the Beaufort Sea coast by government researchers and by RL&L Environmental Services Ltd. (now Golder Associates Ltd.) in Coronation Gulf (19 km west of Kugluktuk) in 1993 and in at Kugluktuk in 2002 will be deployed. The fyke net consists of two traps, separated by a 30 m lead to shore. This directional set-up will allow separation of coastal migrations into eastward and westward components (i.e., to and from local fiords and more distant locations). The fyke net will be checked several times daily depending on catch and drifting ice conditions.
- Variable mesh test gill nets will be employed (3.8, 5.1, 6.4, 7.6, 8.9, 10.2, and 14.0 cm mesh, multifilament nylon) as required to supplement the results of the fyke net. The gill nets will allow capture of fish that reside in the area for rearing and feeding purposes, and are not actively migrating along the coast.
- A 9.1 m long beach seine (1.3 cm mesh size with 0-6 cm mesh collection bag) will be used to capture smaller varieties of fish or younger stages of large-sized fish occupying the shallow, near shore zone.
- All captured fish will be identified to species measured (length to nearest millimetre) and weighed (to nearest gram). If acceptable to regulatory agencies larger specimens (greater than 300 mm in length) of the key fish species will be tagged with uniquely numbered Floy Anchor tags or otherwise marked and released. Recapture of these tagged individuals by the survey team over the length of the field study, and opportunistically by residents of Assuituq over the longer term, will allow tracking of spawning and feeding related movements in the study area.
- Fish that succumb to the capture and sampling procedures will be examined internally to determine sex and maturity. Stomach contents from a selected sample will be examined to get a better understanding of feeding behaviour and relationships in the study area.

Photo 5.

A modern day version of a tool to catch fish (known as *kakivak* in the Kitikmeot).

5.2 Fisheries Impact Assessment

In order to define the type and significance of impacts on fish and aquatic habitat resources in the area of the proposed development we will undertake the following:

- Assessment of potential effects of interference (delaying, deflecting) with seasonal fish migrations/movement.
  - The Arctic fyke net installed at the proposed development site will allow us to determine the timing and extent of movements by major fish species through the near shore zone. We will schedule the field survey in order to cover the key movement period (which will be determined from interviews with local Elders during Phase 1).
- Measurement, description and suitability assessment of potentially affected habitat.
  - During the habitat assessment component of the investigation, habitat will be described and quantified. We will then rate the suitability of the habitat for the major fish species residing in the area and for the various life requisite functions (spawning, rearing, overwintering, feeding, etc.). If sufficient fish-habitat interaction is available, or can be generated on site, we will employ the industry standard Habitat Evaluation Procedure (HEP) developed by the United States Fish and Wildlife Service. This system utilizes a rating scheme ranging from 0.0 (nil suitability) to 1.0 (optimum suitability). In order to assign the suitability we will produce simple, narrative models based on species/life stage habitat requirements derived from the literature and from field data collected during the present study. In order to assess the impacts of the proposed development, we will re-assign habitat suitability indices based on predicted changes in physical conditions and water quality. If the level of data is insufficient to develop and run models, we will provide a narrative description (text-based) of habitat suitability for the key species.
- Assessment of the availability of alternate habitats.
  - The severity of impacts resulting from the proposed development can be lessened or heightened in significance depending on the availability of alternate habitat in the general area. This is particularly true if the proposed development area supports a critical habitat function (e.g.,, spawning). In order to assess this

possibility we will conduct survey level habitat assessment and fish sampling of near shore habitats within 2 km east and 3 km west of the proposed breakwater and docking facility. Salinity levels will be recorded in the alternate habitats for comparison to the data collected at the proposed development site.

- Effects of effluent from sewage outfall.
  - In order to assess the effects of the effluent on present fish habitat we have included a full range of water quality and sediment analysis in the project. Samples will be collected at the site of the proposed development and from a reference site located outside the zone of influence of the sewage outfall.
- Review of relevant literature on similar developments.
  - Relevant literature relating to similar developments (e.g.,, causeways and breakwaters) in northern Canada and Alaska will be reviewed and assessed. The information of interest would be summarized in an impact matrix for ease of interpretation and use for this and any future developments.

5.3 Compensation Requirements / Options

The proposed breakwater and docking facility will result in a direct loss of fish habitat associated with the footprints of the various structures. It is also likely that the structures will result in alteration of the habitat located inshore from the breakwater. The type and extent of these changes are presently unknown and will be assessed in the current investigation. Possible benefits to the local habitat scene may accrue from the increased diversity associated with the addition of coarse infill and rip rap material. Through our investigations we will produce a “No Net Loss” accounting scheme that clearly indicates the extent to which habitat compensation will be required. We envisage this to be a comprehensive matrix that summarizes pre and post development habitat availability and suitability and predicted effects (if any) on seasonal fish migrations. Having completed this we would identify and discuss appropriate options for compensation.

Photo 6.

Community members travel Bathurst Inlet to hunt caribou and go fishing.

5.4 On-the-Job Training

IMG-Golder has experience in offering continuing education units through Golder Institute, a division of Golder Associates Ltd. Field staff will use this experience to offer on-the-job training to the local co-ordinator (during Phase I and II) and local field assistants (during Phase II) before any field work begins. It is expected that these skills will be transferable to other fisheries, habitat and/or water quality work in the future.

5.5 Alternative Approach for Phase II

If DFO should issue an authorization for the proposed Resupply and Breakwater Facilities after completion of Phase 1, we will suggest an alternative approach for Phase II. In that case, we would shift directly to the preparation of the "No Net Loss" and compensation requirements. That would be reflected in the budget for Phase II. Without the field program and the associated high travel costs, the revised budget for Phase II would be $25,000 (±20%).

6. PROJECT SCHEDULE

Phase I

Project Component	Period / Deadline
Inuit Qaujimajatuqangit and Scientific Literature Review	October – December 2004
Preliminary Habitat Assessment	October – December 2004
Inuit Qaujimajatuqangit Interviews	16 – 22 November 2004
Community Meetings	16 - 22 November 2004
Preparation of Detailed Phase II Workplan and Budget	10 December 2004
Initiate Dialogue with Regulatory Agencies	15 January 2004
Submission of Draft Report to Hamlet	31 January 2004
Receipt of Comments from Hamlet	14 February 2004
Submission of Final Report to Hamlet	28 February 2004

Phase II (Proposed)

Project Component	Period / Deadline
Field Sampling and Training (7 days proposed)	July - August 2005
Community Meetings	July – August 2005
Data Analysis / Reporting	August – September 2005
Submission of Draft Report to Hamlet	16 September 2005
Receipt of Comments from Hamlet	23 September 2005
Submission of Final Report to Hamlet	30 September 2005
Submission of Application for Environmental Approval	7 October 2005
Receipt of Permit to Proceed	15 December 2005
Tendering of Contract	1 January 2006
Commencement of Construction	Late March 2006

7. PROJECT TEAM

Brief biosketches for the project team are provided below, with the exception of the local IQ co-ordinator as this person has not yet been identified. Detailed CVs are provided in Appendix III.

Jim O'Neil, B.Sc., P.Biol.
Project Director / Senior Fisheries Advisor / Reviewer

Mr. O'Neil has been involved in fisheries research and management in western Canada for 30 years. Since 1971 he has been employed in the environmental consulting field, the last 25 years as a principal in Golder Associates/RL & L Environmental Services Ltd. (recently merged with Golder Associates Ltd.). During this period he has participated in a wide variety of projects (forestry, mining, hydro developments, linear developments) in Alberta, British Columbia, and Northern Canada. He has developed specific expertise in the area of habitat assessment and mitigation/compensation planning on fluvial systems, with a particular focus on the fishery benefits of in-stream and riparian habitat structures. Jim served as Project Director and Senior Reviewer for the Fisheries Assessment of the Proposed Marine Docking Facility at Kugluktuk, NU in 2002. In 2004, he directed an Arctic charr recovery project on a small stream entering Dolphin and Union Strait west of Kugluktuk. This project was done as a joint venture with Angoniatit Niovikvia Ltd., the contracting arm of the hunters and trappers organization in Kugluktuk. He is also directing the fisheries assessment of the proposed Deh Cho Bridge on the Mackenzie River at Ft. Providence, NT. This project involved detailed habitat mapping, which formed the basis for the "No Net Loss" accounting, monitoring the seasonal fish migrations and a historical summary of domestic fish utilization. Also, Jim has been heavily involved in highway upgrades and twinning projects and pipelines, with particular reference to "No Net Loss" of habitat, fish passage, and compensation issues. Jim's primary role will be as project director, senior fisheries advisor and reviewer but he will also contribute to the development of the "No Net Loss" plan.

Julia Krizan, Ph.D.
Project Manager / Senior Biologist

Dr. Krizan is Senior Biologist and Office Manager in the IMG-Golder office and is a long time northern resident. Project work includes environmental impact assessments, cumulative effects assessments, conservation and reclamation plans, aerial and ground wildlife surveys, community consultation, literature reviews, habitat suitability index models and habitat evaluation procedures. Other duties include supervision of permanent and casual staff, project management, coordination and logistics support for projects.

She completed undergraduate and postgraduate (M.Sc. and Ph.D.) degrees in Biology, at the University of Munich, Germany. Her postgraduate studies concerned ecological interactions in aquatic systems. She then worked as an assistant professor of ecology and statistics also at Munich University. Since moving to Canada in 1996, Julia has worked in Ontario both as a college instructor in ecology and in wolf research. From 1998 – 2002 she was carnivore biologist with the Nunavut Government based in Iqaluit. Her duties included research on large carnivores, coordination of the Nunavut rabies program, project management, community consultation and conservation education. She was the lead scientist for a traditional knowledge study on the importance of wolf harvest in Nunavut. She has experience working with aboriginal people in both the eastern and the western Arctic, as well as coordinating logistics and personnel. During 2002-2003 she has been an instructor at Aurora College, Inuvik, for the Natural Resources Technology Program where she trained Gwich'in and Inuvialuit students in all aspects of wildlife biology and management, botany and forestry, fisheries biology, law enforcement, water resource management and marine biology with special emphasis on artic environments. Julia will act as project manager and contribute to senior review for the literature review and habitat assessment.

Natasha Thorpe, B.Sc., M.R.M.
Cultural Component Manager / Environmental Scientist

Ms. Thorpe is an environmental scientist with more than eight years of consulting experience in northern and western Canada. She holds a Masters degree in Resource Management. As a consultant, her focus has been on project management, traditional ecological knowledge, community consultation, capacity building, environmental impact assessment, environmental education, and climate change related projects. She has directed, managed and assisted in a broad range of cultural resource management projects in the Canadian Arctic that have required liaising

with a diversity of stakeholders and integrating both scientific and traditional knowledge data. She has authored over twenty publications and has been invited worldwide to lecture on conducting northern community-based research, and applying traditional knowledge in climate change research.

Natasha has worked in partnership with Inuit and other First Nations groups on numerous traditional ecological knowledge and Inuit Qaujimajatuqangit projects. She recently completed a project to integrate IQ collected through interviews and workshops into an environmental impact statement for an Arctic mining company. From 1996 through 2001, Ms. Thorpe served as principal researcher for the Tuktu and Nogak Project, a community-driven effort to document and communicate IQ of Bathurst caribou that resulted in the collaborative publication, Thunder on the Tundra. Ms. Thorpe has participated in several national and international projects on climate change, particularly those linking local observations of environmental change. Natasha led the IQ component of the Kugluktuk Fisheries Assessment study. Similarly, Natasha will act as project manager for the consultation and IQ components of the study.

Hilary Machtans, B.Sc., M.Sc.
Fisheries Biologist

Hilary Machtans is a Fisheries Biologist with over ten years of experience in fisheries research. Hilary joined Golder Associates in 1997 and is based in the Yellowknife office. Her experience includes fish habitat assessment in tundra, boreal, foothills and shield areas, fish tissue collection, fish population estimates and water quality in boreal, montane and alpine streams. Hilary worked on the Fish Habitat Compensation Plan(s) for the De Beers Snap Lake Project which involved fish habitat assessment, regulatory consultation for the plan. She led a fish-out of inland lakes at the Diavik Diamond Mine site which included assessment of fish habitat. She has recently been on secondment to De Beers Mining Inc. as a permitting and regulatory specialist. She participates in environmental assessment projects in the NT with emphasis on fisheries, fish habitat and water quality components, and assists clients with regulatory and permitting processes. For this project, Hilary will contribute to the desktop literature review and Phase II workplan development.

Benjamin Wheeler, B.Sc., M.Sc.
Marine Biologist

Mr. Wheeler, has gained valuable experience working as a biologist for five years in Nunavut. After completing his Master of Science degree at McGill University, Mr. Wheeler moved to Resolute Bay where he worked with the Department of Fisheries and Oceans (DFO) on a phytoplankton survey of Barrow Straits, and with the Hunters and Trappers for an Arctic charr tagging project on Prince of Wales Island. Working closely with the Iqaluit and Winnipeg DFO staff, Mr. Wheeler produced a comprehensive review and recommendations for the management of the well-known Sylvia Grinnell River Arctic charr fishery near Iqaluit. Most recently, as a member of the contract team chosen for the installation of the Clyde River breakwater, Mr. Wheeler has gained experience with DFO's "No Net Loss" policy and environmental assessment.

Mr. Wheeler recently concluded an extensive three-year bowhead whale ecological project at Isabella Bay, south of Clyde River. As project leader, and primary researcher, he worked closely with the community of Clyde River, the World Wildlife Fund of Canada, DFO, the Nunavut Wildlife Management Board, and the Department of Sustainable Development to document whale feeding patterns, oceanographic features, zooplankton densities, photo-identification, population estimates and habitat use. Mr. Wheeler recently moved from the north to Victoria, B.C. Ben will lead the literature review, preliminary habitat assessment and Phase II workplan development as well as taking the lead on consultations with key stakeholders.

Jim Campbell, B.Sc.
Fisheries Biologist

Mr. Campbell will function as a fisheries biologist and participate in all aspects of field data collections, data compilation, figure and table production, and reporting. Jim has over 10 years experience in environmental consulting throughout western Canada. Mr. Campbell has participated in a variety of projects for industry and government clients, and has broad experience in fisheries science. His experience includes fish movement studies using radio telemetry, baseline fisheries inventories, and linear development, including pipeline and road crossings. Mr. Campbell has been involved in projects throughout western Canada and the Arctic. Jim was involved in a baseline inventory of the marine aquatic system near Coppermine, NT, and was project biologist for a fisheries and fish habitat evaluation of the Meliadine Lake system, near Rankin Inlet, NU, as part of an environmental impact assessment for a proposed gold mining

operation. He has conducted fisheries and habitat inventories of the Athabasca and North Saskatchewan rivers. Mr. Campbell has been primarily involved with projects concerning the impacts of pipeline and bridge crossings on fish communities and habitats. Recently, Jim was involved with an assessment of fisheries resources (community and fish habitat) in the vicinity of proposed relocation of docking facilities at Kugluktuk (Coppermine), NU. Jim will help develop the Phase II workplan and budget, given his recent experience with the Fisheries Assessment Study in Kugluktuk.

Tanis Dirks, B.Sc. (Honors)
Environmental Scientist

Tanis Dirks is an environmental scientist with over 8 years experience in environmental consulting. She has been involved in a variety of aquatic research and analysis projects at Golder Associates. Her experience includes fisheries and fish habitat investigations, fish health assessments, water quality assessments, suspended sediment monitoring for pipeline water crossings and post-construction impact assessments of road and pipeline water crossings. Further responsibilities include technical support, field crew coordination, project coordination, quality assurance and quality control and report preparation for baseline studies, environmental impact assessments and monitoring projects in the forestry and mining industries. Upon transferring to Victoria, Tanis has become involved with the Cultural Resources Management Group in all aspects of Coastal First Nations work, including traditional knowledge studies, literature reviews and developing and reviewing capacity training manuals and programs. Tanis will assist with the consultation, community meetings, IQ interviews, literature review and workplan development.

Robin Carpenter - IMG-Golder
Project Co-ordinator

Robin is an Inuvialuit beneficiary from Inuvik working as the office coordinator for IMG-Golder. She graduated from the Natural Resources Technology Program with a Diploma in 2003. The courses of the program included environmental law, land claims, assessment of contaminants in soil and water, geology, water resource management, botany, forestry, wildlife, fisheries and marine biology.

Robin has worked for Parks Canada, where she assisted the Park wardens on regular patrols through Ivvavik National Park. She also worked for the Yukon Territory Government on

Herschel Island. She participated in wildlife surveys (e.g., muskox) and, most recently, she worked for the Geological Survey Canada on board of an icebreaker in the Beaufort Sea to study the effects of sonar and seismic equipment on marine mammals. For this project, Robin will contribute her good communication and computer skills, and assistance in literature reviews and report writing.

8. RELEVANT COMPANY EXPERIENCE

IMG-Golder and Golder Associates have over 25 years of experience covering all aspects of aquatic ecology and associated engineering and socio-economic disciplines. Our team of scientists includes fisheries biologists, limnologists, toxicologists, coastal engineers, benthos invertebrate and water quality specialists, traditional ecological knowledge (Inuit Qaujimajatuqangit) specialists and coastal engineers

IMG-Golder and Golder Associates scientists have extensive experience in developing solutions to complex problems, especially in the northern environment. Our experience extends to the permitting of large industrial, commercial and government projects. As well, we are often involved in monitoring and problem solving for projects in their operational, closure and reclamation phases.

The aquatic scientists work closely with in-house team of water resources and geotechnical engineers, social scientists and other environmental professionals. Our multi-disciplinary experience ensures that aquatic issues are considered within the framework of overall project goals. We pride ourselves in providing practical and cost-effective solutions to aquatic-related problems.

We offer the following specific services in aquatic ecology:

- Baseline Aquatic Inventories.
- Aquatic Impact Assessments.
- Monitoring.
- Environmental Effects Monitoring.
- Aquatic Toxicology.
- Fish Habitat.
- Fish Health.
- Ecological Risk Assessment.
- Water Quality.
- Consultation and Expert Testimony.

In addition, we have carried out numerous traditional knowledge, Inuit Qaujimajatuqangit and training projects throughout Nunavut as well as the Northwest Territories and Yukon.

IMG-Golder relies on its national and international network of offices and 2,400 employees as a vast talent pool to utilize if specific skill sets are not available locally. In 1996, Golder opened an office in Yellowknife as a component of its commitment to the mining industry in the Northwest Territories. In 2001 we entered into a joint venture partnership with IMG-Golder, a majority Inuvialuit owned company based in Inuvik; this group will focus on providing local environmental expertise to our clients. In July 2001, RL & L Environmental Services Ltd., a Canadian owned company with 25 years experience in fisheries and aquatic related expertise, joined Golder Associates, thereby expanding Golder's expertise and capabilities in these fields. In August 2004, EVS Environment Consultants Ltd. joined Golder. EVS brings to Golder a global reputation and 30 year track record for excellence in environmental toxicology, environmental effects monitoring, natural resources damage assessment, litigation support for civil and criminal environmental proceedings, capacity building, ecology and environmental impact assessment, including northern experience. The merger with EVS also expands Golder's capability and capacity for environmental laboratory services. EVS have done extensive work related to mining and the toxicology of metals in the environment. A few selected projects relevant to the present development are listed below.

8.1 Fisheries

Project: **Fisheries Assessment for the Proposed Marine Docking Facility at Kugluktuk, NU**
Client: **Department of Public Works and Services and Department of Community Government Transportation**
Contact: **Alex Buchan (867) 982-4471**

The Department of Public Works & Services for the Government of Nunavut commissioned a fisheries assessment for a marine supply facility (dock and breakwater) at the Hamlet of Kugluktuk, Nunavut. The development was determined by the Department of Fisheries and Oceans to result in harmful alteration, disruption or destruction (HADD) of fish habitat due to construction activities. Golder carried out two seasonal field sessions based on the movement patterns of Arctic charr and key marine estuarine fish species. The sessions included: community consultation and participation (public meeting, interviews and collection of IQ related to local

fisheries and habitats), an assessment of fish habitat and fish resources in the vicinity of the proposed causeway and breakwater. Eighteen species of fish were recorded and over 4000 fish were captured, measured and released during the fisheries component. Also collected were baseline data on phytoplankton, zooplankton, nearshore water quality and sediment characteristics. Physical habitat altered by the presence of the footprint of the causeway and the breakwater was quantified to form the basis for a "No Net Loss" plan. The losses and gains of habitat were assessed in relation to alternate habitats available in the area, in order to better define the significance of the changes. This project was carried out on time.

Project: Fishery Authorization and Breakwater Development Licensing for Iqaluit NU
Client: Ferguson, Simek & Clarke
Contact: Ron Kent (867) 920-2882

Ben Wheeler is currently assisting in the environmental assessment process for the development and construction of a breakwater in Arctic charr habitat (Clyde River, NU), application of relevant legislations (Fisheries Act, no-net-loss policy), liaising with DFO and private sector. Providing written and verbal advice and recommendations to client (FSC) on fish habitat enhancement protocols, protection and restoration. Presently, this project is on time and within budget.

Project: Arctic Charr Fishery Assessment
Client: Department of Fisheries and Oceans (Iqaluit)
Contact: Karen Ditz (867) 979-8004

While living in Iqaluit, Ben Wheeler carried out desktop review of history, potential environmental impacts and possible appropriate mitigation/ compensation; compiled and analyzed available data for Arctic charr (*Salvelinus alpinus*) fishery in the Sylvia Grinnell River, Nunavut. Interviewed stakeholders and user groups, delivered report containing three recommendations for management. Consulted with, and presented to, stakeholders (DFO, EC, NWMB) on report content to best combine scientific evidence with sociological need. Report outlining that the best course of action based on research was to temporarily close the river from future fishing. Stakeholders accepted and implemented recommendations. This project was carried out on time and within budget.

Project: Habitat Assessment in Clyde River, NU
Client: Environment Canada
Contact: Paul Latour (867) 669-4769

Carried out by Ben Wheeler, this three-year project was a multi-agency (DFO, EC, NWMB, WWF) initiative to monitor and assess critical bowhead whale habitat: Isabella Bay Critical Bowhead Habitat Project. Monitored whales, collected baseline data (CTD, plankton identification), determined species numbers, plotted habitat units, and submitted reports to federal government to promote species recovery. Developed and led the training of Inuit group on effective techniques of cetacean monitoring. Full accountability for project: research/survey design, project logistics and implementation, equipment, budget development and maintenance. This project was carried out on time and within budget.

Project: Habitat Assessment in Resolute Bay, NU
Client: Department of Fisheries and Oceans (Winnipeg)
Contact: Dr. Mike Papst (204) 983-5257

Developed a Fisheries and Oceans project to conduct baseline habitat assessment of the marine plankton (phyto- and zooplankton) community in the Barrow Strait, Nunavut. Sampling and survey protocol design, net and niskin bottle sampling, microscopic analyses, reporting and accounting. This project was carried out on time and within budget.

Project: Potential Impacts of Marine Dredging
Client: Department of Fisheries and Oceans
Contact: T.G. Meikle, DFO Burlington, ON (905) 336-4816

In 2004, IMG-Golder conducted a review of the existing literature to identify the potential physical and biological impacts that could result from dredging in the Mackenzie Delta/Beaufort Sea. As part of this study, IMG-Golder determined and reviewed the history of dredging operations within the Beaufort Sea and reviewed pertinent legislation, policy and guidelines, related to dredging in marine and freshwater in the NT and identified existing guidelines for dredging in marine and large silty rivers. This project was carried out on time and within budget.

Project: **Mackenzie Delta and Mackenzie River Seismic Surveys**
Client: **Western Geco**
Contact: **Keith Rosindell (403) 509-4660**

In 2002, IMG-Golder was contracted to complete EIAs for two proposed marine seismic surveys in the Mackenzie Delta, plus the Mackenzie and Liard rivers. The scope included assisting with public and regulatory consultation, collation of existing baseline data, impact analysis, mitigation planning and reporting. An extensive fish study also took place as part of a 2003 test program. This project was carried out on time and within budget.

Project: **Beaufort Sea Habitat Mapping**
Client: **Geological Survey Canada**
Contact: **Steve Blasco (902) 426-3932**

In 2003, staff members of IMG-Golder where involved in the Ocean Floor Mapping Program in the Beaufort Sea. Staff was on board the reconstructed Coast Guard vessel Nahidik to carry out acoustic measurements, bottom sampling, plankton collection and marine mammal observations. This project was carried out on time and within budget.

Project: **Marine Habitat Survey of Foreshore & Subtidal Areas in Support of Foreshore Permit with MELP for Existing Structures, Namu, BC**
Client: **Interpac Forest (Interpac Forest Products Ltd.)**
Contact: **David Milne (604) 857-5455**

Intertidal and subtidal surveys of the marine foreshore were conducted on a property in Namu, BC. Work was consistent with the FEAP prepared by DFO and consistent with provincial and federal laws and regulations that may apply (WCB, Fisheries Act, etc.). The information was used to assess the levels of impact that has occurred due to existing development and related activities. Foreshore areas where adverse impacts have occurred due to previous and/or ongoing operations were identified and the nature, cause and significance of the impacts described. Information was collected in suitable detail and format to provide the basis for development of compensation measures that may be deemed necessary as a result of any future development. This project was carried out on time and within budget.

Project: **Proposed Base Metals Mine at Izok Lake and Port Site at Coronation Gulf, Nunavut - Aquatic Studies**
Client: **Metall Mining Corporation**
Contact: **Hugh Wilson (780) 433-8336**

Fisheries and water quality investigations were undertaken as part of an initial environmental assessment for regulatory approval of a proposed base metals mine at Izok Lake and port site at Coronation Gulf, Nunavut. The baseline information was used to predict impacts of the project on the aquatic system. Sampling programs and habitat evaluations were undertaken at both Izok Lake and on the Arctic coast near Coppermine. Collections were made in the vicinity of the proposed mine site (freshwater) and at the proposed port site (marine).

Project: **Fish Populations, Aquatic Habitat And Water Quality Environmental Baseline Program: Izok Project**
Client: **INMET Mining Corporation**
Contact: **Ian Pirie (416) 860-3955**

Golder Associates is currently undertaking fisheries and water quality environmental baseline studies for the Izok project in Nunavut. Fish habitat studies include a characterization of the fish habitat that is proposed for alteration or contamination by the mining and an assessment of the effects. Fish population studies include a review of previously collected population and tissue data.

Project: **Conceptual Design and Compensation Workplan for the Fish Habitat Compensation Program, Diavik Diamond Mines Inc. Lac De Gras**
Client: **Diavik Diamond Mines Inc.**
Contact: **Scott Wytrychowski (867) 766-5407**

Detailed designs, specifications, and implementation plans were developed for fish habitat creation/modification. The project was required to meet the terms set out by the Department of Fisheries and Oceans (DFO) in the Authorization for Works or Undertakings Affecting Fish Habitat (Fisheries Authorization). This project was carried out on time and within budget.

Project: **Aquatic and Terrestrial Environmental Baseline Study**
Client: **Ranger Oil Ltd. (Ranger Oil was acquired by Canadian Natural Resources Limited on July 17, 2000)**
Contact: **Contact: Brent Harrison, Ranger Oil Ltd., Suite 1600, 321 6th Ave. S.W.,Calgary,AB T2P 3H3**
(403) 303-7300 main

Plans for drilling of three exploration wells in the Mackenzie River Plain near Tulita, NT, during the winter of 1997/98 demanded a field survey to obtain additional environmental baseline information. This information was used by Ranger Oil to ensure that potential environmental impacts were avoided or minimized to the greatest extent practicable. Golder Associates staff conducted the survey which covered fisheries, vegetation and wildlife studies. Also, at the suggestion of Golder, the Tulita Renewable Resource Council agreed to undertake a brief traditional knowledge survey to highlight any potential concerns in relation to fish and wildlife and their utilization. The environmental summary report was submitted on behalf of Ranger to the National Energy Board [NEB] to assist in that agency's assessment of the project. Potential impacts, proposed mitigation measures and residual negative impacts were addressed, as well as the issues of cleanup, reclamation, disposal and abandonment. This project was carried out on time and within budget.

Project: **Screening Level Environmental Impact Assessment For The Construction of A Protective Toe Berm At The Canadian Coast Guard Marine Radio Facility Cape Lazo, B.C.**
Client: **Public Works and Government Services Canada, Pacific Region**
Contact: **David Moore (604) 623-6233**

A screening level environmental impact assessment (EIA) was undertaken for the proposed construction of a protective rock berm at the toe of the bluff beneath the CCG Marine Radio Facility at Cape Lazo, B.C. The protective berm is being proposed as a strategy to control, or minimize the continued erosion of the sand bluffs and property loss next to the CCG Marine Radio Facility. Three options were considered in the study: Land-based access via a road through a residential area; marine-based access via barge; and land-based access via a boat launch. This project was carried out on time and within budget.

Project: Arctic Charr Restoration Project on Nulahugyuk Creek, NU.
Client: Department of Fisheries and Oceans (Yellowknife, NT)
Contact: Julie Dahl (867) 669-4911

Golder Associates Ltd., in a joint venture with Angoniatit Niovikvia Ltd. of Kugluktuk, has embarked on a phased, possible multi-year fisheries investigation aimed at restoring a formerly productive Artic charr spawning population. Based on IQ, which indicated that the fishery had declined (due likely to physical changes in stream morphology which prevented or delayed spawning migrations), the Golder/ANL field crew carried out a fisheries/hydrological investigation in August 2004. Subsequent phases will include stream repairs (if needed or practical) and post-restoration monitoring.

Project: Fisheries Assessment of the Proposed Deh Cho Bridge on the Mackenzie River, at Ft. Providence NT.
Client: Deh Cho Bridge Corporation/Jivko Engineering Ltd.
Contact: Jivko Jivkov (867) 920-4455

Golder Associates Ltd., along with aboriginal assistants from Ft. Providence NT characterized the fish and habitat resources in the Mackenzie River at and near the site of the proposed Deh Cho Bridge. The investigation included a two season field program (summer, fall) in 2002; it focused on fish movements in the nearshore zone using and Arctic fyke net, with supplemental data from boat electrofishing and gillnetting. Detailed habitat mapping of the nearshore habitat was undertaken in order to establish a basis for "No Net Loss" accounting. The instream foot print of the bridge structure was superimposed on the nearshore habitat mapping to determine, in conjunction with suspending the ferry and winter road, the net benefit of the project. Past and present use of the fish resources by residents of Ft. Providence was also considered.

Project: Fisheries Assessment of Habitat Structures at Three Watercourse Crossings near Kugaaruk, Nunavut
Client: Hamlet of Kugaaruk and Jivko Engineering Ltd
Contact: Jivko Jivkov (867) 920-4455

Golder Associates was retained by the Hamlet of Kugaaruk and Jivko Engineering Ltd. to provide an assessment of fish habitat conditions at three watercourse crossings near Kugaaruk, Nunavut. As part of the project authorization under the Fisheries Act, a "No Net Loss" plan was submitted to the Department of Fisheries and Oceans outlining the results of the baseline study and mitigation and compensation options. Compensation measures included the installation of fish

habitat enhancement structures. Following the construction of these structures, Golder conducted an assessment to determine the effectiveness of these structures.

Project: Doris North Gold Project, Nunavut
Client: Miramar Mining Corporation
Contact: David Long (604) 985-2572

The Doris North Project is a proposed underground gold mine near Bathurst Inlet in Nunavut. Golder Associates has been conducting baseline aquatic studies for the Doris North Project since 2002. Aquatic studies have included fish and fish habitat, fish tissues, limnology, water and sediment quality, in both freshwater and the ocean environment. To meet the requirements of Fisheries and Oceans Canada (DFO) for authorization for the project to proceed, Golder developed a comprehensive "No Net Loss" Plan. Golder also completed the Aquatic Resources component of the Environmental Impact Statement as part of the Nunavut Impact Review Board hearings process.

8.2 Inuit Qaujimajatuqangit Projects

Project: Inuit Qaujimajatuqangit in Environmental Assessment, Hope Bay, Nunavut
Client: Miramar Hope Bay Limited
Contact: Mr. David Long (604) 985-2572 or Kitikmeot Heritage Society, Emily Angulalik, (867) 983-4108

Golder Associates' Victoria and Burnaby offices conducted a three-day workshop and a one-day interview session in Cambridge Bay, Nunavut to record Inuit Qaujimajatuqangit (traditional knowledge) from Inuit Elders. The workshop and interviews served to collect valuable information on a variety of topics including hydrology, marine and freshwater biota and habitat, vegetation, terrestrial wildlife and habitat, cumulative effects, and both valued ecosystem components and valued socio-economic components. Results from this work were integrated into a final Environmental Impact Statement for a proposed gold mine called the Doris North Project, located on Inuit owned land in the West Kitikmeot Region of Nunavut, and operated by Miramar Hope Bay Ltd. This project was carried out on time and within budget.

Project: **Review of State of Knowledge of Inuit Qaujimajatuqangit, Kitikmeot Region, Nunavut**
Client: **Miramar Hope Bay Limited**
Contact: **Mr. David Long (604) 985-2572 or Kitikmeot Heritage Society, Emily Angulalik, 867) 983-4108**

Golder Associates' Victoria and Burnaby offices conducted a review of Inuit Qaujimajatuqangit (traditional knowledge) available in both published and grey literature relevant to the proposed gold development in Hope Bay, Nunavut. This work included a gap analysis and recommendations on how future work could best serve to address Inuit Qaujimajatuqangit in the context of mineral exploration and development. This project was carried out on time and within budget.

Project: **Inuit Qaujimajatuqangit of Climate Change Literature Analysis, Kitikmeot Region, Nunavut**
Client: **Government of Nunavut, Department of Sustainable Development (now Department of Environment)**
Contact: **Earle Baddaloo/Elizabeth Sherlock (or replacements) (867) 975-5912**

For the Government of Nunavut, Golder Associates carried out a literature review and gap analysis of traditional knowledge resources pertaining to climate change in the Kitikmeot region of Nunavut. Reporting included developing a matrix of resources and ranking them according to their relevancy. Recommendations were made as to where future research should take place. This project was carried out on time and within budget.

Project: **Tuktu and Nogak Project, West Kitikmeot Region, Nunavut**
Client: **Kitikmeot Elders.**
Contact: **Sandra Eyegetok (867) 983-4028**

Prior to joining Golder, Natasha Thorpe worked extensively throughout the Kitikmeot on numerous environmental projects with significant community consultation and planning components. In particular, her work with over 40 Elders, youth and researchers for the Tuktu (Caribou) and Nogak (Calves) Project, based in the Kitikmeot. Together, they published Thunder on the Tundra: Inuit Qaujimajatuqangit of the Bathurst Caribou and contributed to Teacher on the Tundra, an accompanying curriculum guide. This work relates to the current proposal in that it demonstrates strong continued working relationships with community members and an expertise in carrying out Inuit Qaujimajatuqangit projects.

9. HEALTH AND SAFETY

The management of IMG-Golder. is committed to maintaining the health and safety of its employees. Protection of employees from injury or occupational disease is a major continuing objective and, for its part, the company will make every effort to provide a safe, healthy working environment. Employees at all levels are responsible and accountable for the company's health and safety performance. Active participation by every person, every day, in every job, is necessary for the safety excellence this company expects.

To this end, key components of our health and safety policy and procedures are included in the planning and execution of all projects undertaken by IMG-Golder. Prior to the initiation of fieldwork, a hazard assessment and project specific health and safety plan will be prepared. All project personnel will be screened to ensure they have any training they require to complete the tasks assigned to them in a safe manner. In addition, a manual of safe work practices relevant to the project will be supplied to all employees (e.g.,, remote surveys, fire prevention and protection, wildlife safety, helicopter safety, boat safety, emergency communication procedures).

During the execution of the field components of the project, safety awareness will be stressed during the daily Pre-planning Meetings and crew meetings. Field crew leaders will be responsible for coordinating daily health and safety requirements with the local staff. They will also be responsible for communicating any safety concerns and incident or accident reports to the project manager as well as discussing safety issues with crew members on a daily basis. Points of discussion will include equipment maintenance, personal protective equipment, emergency preparedness, incidents or accidents, and safe work practices. The Field Crew Leader or a designated Project Health and Safety Coordinator will be responsible for any investigations of incidents or accidents, and recommendations on the prevention of similar occurrences. Records of all health and safety meetings and reports will be maintained by the field staff and submitted to the Project Manager on a weekly basis.

All IMG-Golder employees and subcontracts to Golder are expected to follow project specific requirements and to actively participate in ensuring a safe working environment.

10. COST ESTIMATE

Golder's charges will be on an actual time and expenses basis in accordance with the terms, conditions and hourly rates described in the attached Schedule of Fees (see Appendix IV). Based on the scope of work outlined above, this proposal is presented as a lump sum fixed fee of $52,518 (plus GST) consisting of $41,458 in fees, $11,060 in estimated disbursements. In lieu of billing for administrative costs, our preferred approach is to add an additional charge of 5% to the total fees and 10% to the total disbursements. This charge will cover all incidental office disbursements including fax transmissions, mobile and long distance phone calls and reproduction of documents.

This cost estimate includes and assumes:

- IQ and Scientific literature review.
- Preliminary habitat assessment.
- Fees for community meeting.
- Senior review of all reports and plans.
- Elders' / experts' honoraria (up to $3,200).
- Hours for Local Co-ordinator (up to 78 hours).
- Production and delivery of electronic copy of propose Phase II workplan and budget.
- Production and delivery of 1 electronic copy of the draft report.
- Production and delivery of 5 hard copies and 1 electronic copy by regular delivery of the final report.
- There will be one edit cycle between the draft and final reports.
- Travel costs (up to $5,500 per airfare and $240/da per meals and accommodation).
- Project management.
- Administration costs.

This cost estimate does not include:

- Expenses incurred owing to weather or travel delays.
- Community meeting costs such as hall rental, refreshments, etc.

- Expenses incurred by the Hamlet or other community agencies to participate in this study (excluding $3,200 in honoraria and 78 hours for Local Co-ordinator).
- Additional time incurred by Local Co-ordinator (over 78 hours).

Note that any out of scope work would be identified to the Hamlet in advance, and your approval would be obtained prior to commencement of such work. A summary cost estimate is presented below and a detailed cost estimate is presented in Appendix IV.

Task	Description	Fees	Disbursements	Subtotal
1000	Project Management	$4,446	$0	$4,446
2000	Literature Review	$5,500	$0	$5,500
3000	Preliminary Habitat Assessment	$3,388	$0	$3,388
4000	Consultation (including Community meetings and IQ interviews)	$16,778	$10,860	$21,562
5000	Phase II Workplan and Budget Development	$1,864	$0	$1,864
6000	Reporting	$9,482	$200	$9,682
	Subtotal			***$52,518***
	Mark-Up[1]	***$2,073***	***$1,106***	***$3,950***
	Total			***$55,697***

The following payment schedule is proposed although alternate schedules can easily be considered:

Date	Amount
Upon signing of Contract	$20,000
December 15, 2004	$15,000
January 15, 2004	$15,000
Upon completion of Contract	$2,518 plus outstanding mark-ups and GST

[1] Does not include GST (7%).

11. USE OF LOCAL AND NUNAVUT RESOURCES / SERVICES

A) Fees

Personnel	Residence / Home Office	Amount Allocated	Amount to Grise Fiord	% in Grise Fiord	Amount in NT and NU	% in NT and NU
J. O'Neil	Edmonton	$1,860	0	0	0	0
J. Krizan	Inuvik	$6,032	0	0	$6,032	100
N. Thorpe	Victoria	$12,610	0	0	0	0
B. Wheeler/J. Campbell	Victoria	$4,576	0	0	0	0
H. Machtans	Yellowknife	$2,760	0	0	$2,760	100
T. Dirks	Victoria	$7,482	0	0	0	0
R. Carpenter	Inuvik	$1,770	0	0	$1,770	100
Local Assistants	Grise Fiord	$3,120	$3,120	100	$3,120	100
Technical Work	Edmonton	$1,248	0	0	0	0
Total Personnel Fees		***$41,***458	***$3,120***		***$10,562***	

B) Estimated Disbursements

Total Expenses (Disbursements and Rentals)	Amount of Expenses to Grise Fiord	% of Expenses to Grise Fiord	Amount in NT and NU	% in NT and NU
$11,060	$9,760	88	$9,960	90

C) Fees / Estimated Disbursements Combined

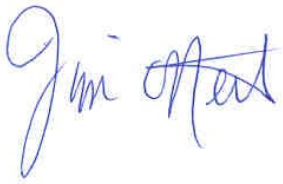
Total Study Cost	Amount of Fees / Expenses to Grise Fiord	% of Expenses to Grise Fiord	Amount in NT and NU	% in NT and NU
$52,518	$12,880	24.5	$23,642	45.02

12. CLOSURE

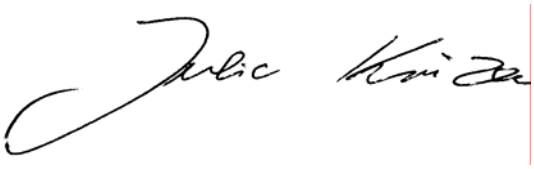
Koana for the opportunity to present this proposal. We hope this proposal meets your present requirements. Should you have any questions, please contact us at your convenience.

Yours truly,

GOLDER ASSOCIATES LTD.



Jim O'Neil, P.Biol.
Senior Biologist and Principal



Julia Krizan, Ph.D.
Senior Biologist

Natasha Thorpe, M.R.M.
Cultural Resource Specialist

JPO/JD/arw

APPENDIX I

IMG-GOLDER CORPORATE BROCHURE

About IMG - Golder Corporation

IMG-Golder is an Inuvialuit environmental consulting company, jointly owned by Inuvialuit business partners and Golder Associates Ltd. IMG-Golder was formed in

2001 and is based in Inuvik. Golder is an employee-owned Canadian company which has been involved in Arctic projects since the 1970s and includes an office in Yellowknife NT. The Yellowknife Office opened in 1996 and offers a full range of environmental and engineering services.

The Inuvialuit owners of IMG-Golder are the majority shareholders, with Golder holding the remaining shares. IMG-Golder has permanent and temporary staff based in Inuvik to execute projects. In addition, through a shareholder agreement, Golder Associates Ltd.is committed to supplying additional professional support to IMG-Golder, so that clients' needs are efficiently met. IMG-Golder is well positioned to offer a broad range of environmental and engineering services to its private and public sector clients in the western Arctic.

One of the primary corporate objectives of IMG-Golder is the employment, training, and participation of Aboriginal peoples in environmental studies programs. We believe that as an Aboriginal-owned company, supported by the technical skills of Golder Associates, IMG-Golder is ideally suited to provide environmental services to its clients in the North.

The partners are committed to developing a company which northern people, and all clients, view as meeting a wide range of their needs. Therefore, we place a priority on training and employment of Inuit and First Nations People. As much as possible, local people are hired to fill positions where hands-on training, as well as off-site training, can provide sustainable employment. IMG-Golder also encourages the pursuit of technical and degree course training related to environmental sciences.

For more information about IMG - Golder Corporation,
Please contact:

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Office Manager

Ernest Pokiak
General Manager

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IMG-Golder Corporation
Environmental Consulting Inuvik, NT

05/2004

Environmental Consulting Services

IMG-Golder Corporation
Environmental Consulting Inuvik, NT

IMG-Golder Consulting Services

Environmental / Engineering Surveys and Project Permitting Services:

- Carry out environmental surveys in support of seismic, well-site, flow line and pipeline projects, and for other non oil and gas market sector developments
- Complete land use and water use permit applications and associated environmental impact assessments.
- Conduct hydrological, geotechnical and air quality investigations
- Plan for and implement environmental monitoring during oil and gas and other project construction
- Advise and assist with community consultation for proposed developments.
- Field sampling of potentially impacted sites.
- Plan reclamation activities after project completion, including monitoring.

Closure Planning and Reclamation

- Site audits
- Closure and decommissioning planning
- Site remediation / reclamation planning
- Public consultation
- Regulatory process facilitation
- Monitoring / performance assessment

Environmental Impact Assessment

- ”Fatal flaw” analysis
- Regulatory consultation and permitting
- Facilitation of stakeholder involvement
- Environmental impact analysis
- Evaluation of potential mitigation measures
- Monitoring plans
- Performance assessment

Operations

- Environmental management systems
- Training courses for operating and technical staff

Project Experience

Project: **Aklavik Oil Spill Remediation**
Clients: ***NWT Housing Corporation***

Starting in 2003, IMG-Golder provided Environmental Engineering Services for an oil spill clean-up at the Joe Greenland building in Aklavik, NT. The objective of the project was to ensure that the residual contaminated soil beneath and adjacent to the building is removed and disposed off in a safe and effective manner, consistent with the environment, health and safety regulations of the Northwest Territories. This project is still ongoing.

Project: **Potential impacts of marine dredging**
Client: ***Department of Fisheries and Oceans***

In 2004, IMG-Golder conducted a review of the existing literature to identify the potential physical and biological impacts that could result from dredging in the Mackenzie Delta/Beaufort Sea. As part of this study, IMG-Golder determined and reviewed the history of dredging operations within the Beaufort Sea and reviewed pertinent legislation, policy and guidelines, related to dredging in marine and freshwater in the NWT and identified existing guidelines for dredging in marine and large silty river.

Project: **Taktuk 3D Seismic Monitoring**
Client: ***Chevrontexaco***

During the winter of 2003 / 2004, IMG-Golder conducted an Instantaneous Pressure Change Monitoring on seismic test lines on Ellice Island, NT. This IPC monitoring was carried out in 2 phases: Phase 1 was the pre-operation testing and Phase 2 consisted of mitigation measures during seismic operation.

Project: **Low Ground Pressure Vehicle trials**
Client: ***Conoco Phillips***

During winter 2004, IMG-Golder conducted a monitoring program on the potential impact of Low Ground Pressure Vehicles that were driven over the frozen tundra close to Parsons Lake, NT. The effects of the LGPV trials on permafrost, soil and vegetation were documented. This project is still ongoing.

Project: **Mackenzie Delta and Mackenzie River Seismic Surveys t**
Client: ***WesternGeco***

In 2002, IMG-Golder was hired to complete EIAs for two proposed marine seismic surveys from along stretches of the Mackenzie Delta, plus the Mackenzie and Liard Rivers. Scope included helping with public and regulatory consultation, collation of existing baseline data, impact analysis, mitigation planning and reporting. An extensive fish study, plus wildlife monitoring, also took place as part of a 2003 test program.

Project: **Geotechnical Investigations**
Client: ***Colt / KBR***

IMG-Golder was contracted in 2003 to conduct geotechnical investigations in support of the Mackenzie Gas Project in the ISR. Scope included professional services during geotechnical drilling, plus setting up and operating a materials testing facility in Inuvik.

APPENDIX II

LETTERS OF RECOMMENDATION

October 12, 2004

Mr. Don Pickle
Senior Administration Officer
Hamlet of Grise Fiord
P.O. Box 77
Grise Fiord, NU
X0A 0J0
FAX: (867) 980-9052

Dear Mr. Pickle,

RE: Recommendation for Golder for Fisheries Assessment Study for Grise Fiord

I am pleased to provide the following letter of recommendation for Golder in regards of work related to fisheries and fish habitat assessments that they carried out on the following projects designed and managed by our firm:

- 2000: Kugaaruk, NU, Fish Habitat Assessment Study related to the construction of two bridges on Aliarusik River. Owner: GN; Responsible Officer: Mr. Dave Crockatt, Community Services & Transportation, Cambridge Bay, NU. Total construction cost $1.8M
- 2002 Kugluktuk NU, Fish Habitat Assessment Study related to New Marine Resupply Facility including breakwater and dock. Owner: GN, Responsible Officer: Mr. David Allen, P.Eng., Public Works, Cambridge Bay, NU. Total construction cost $1,5M
- 2003 Ft. Providence NT, Fish Habitat Assessment Study related to the construction of Mackenzie River Bridge. Owner Deh Cho Bridge Corporation (DCBC), Ft. Providence, NT. Responsible Officer Mr. Andrew Gamble, P. Eng., DCBC. Estimated construction cost $60M.

I found Golder staff to be competent, hard-working and thorough. Their technical skill and diligence, particularly related to the North, was commendable. The project management was excellent, resulting in a projects that were both within the budget and schedule. I strongly recommend them to carry out a fisheries study for the Marine Resupply and Breakwater in Grise Fiord, NU.

It was a pleasure to work with Golder and I am confident they will carry out a high quality study for the Hamlet of Grise Fiord. Please call me if you have any questions at Tel: 867 920-4455

Sincerely,

Jivko I. Jivkov, P.Eng.
Principal,
Jivko Engineering

Kugluktuk Angoniatit Association
PO. Box 309
Kugluktuk, NU. X0B 0E0
Ph. (867) 982-4908 Fx. (867) 982-5912

October 12, 2004

Don Pickle
Senior Administration Office
Hamlet of Grise Fiord
P.O. Box 77
Grise Fiord, NU
X0A 0J0
FAX: 867.980.9052

RE: Fisheries Assessment Study for Grise Fiord

Dear Mr. Pickle,

It is with pleasure that I provide the following letter of recommendation for Golder Associates Ltd. who carried out a fisheries assessment of the marine docking facility in Kugluktuk in 2002. This work was carried out for the Department of Public Works and Services and the Department of Community Government Transportation with assistance from the Kugluktuk Angoniatit Niovikvia Ltd. which is the business subsidiary of Kugluktuk Angoniatit Association

We were impressed with Golder's unique approach and high quality assessment. Natasha Thorpe, Jim O'Neil and Jim Campbell worked closely with community members and carried out valuable *Inuit Qaujimajatuqangit* interviews in order to integrated local expertise with scientific data in the assessment. This helped us understand potential impacts to local fish and fish habitat. We found their final report to be well written and thorough.

We were happy to work with Golder Associates Ltd. We highly recommend them to carry out the proposed fisheries assessment study in Grise Fiord. If you need more information, please do not hesitate to contact me for more information at: 867.982.4908.

Sincerely,

Peter Taptuna, Manager

APPENDIX III

PROJECT TEAM CVS

Jim P. O'Neil

Education B.Sc., Zoology, University of Alberta, Canada, 1970

Affiliations
Alberta Society of Professional Biologists
American Fisheries Society
Canadian Society of Environmental Biologists
Canadian Society of Zoologists

Experience

2001 **Golder Associates Ltd.** **Edmonton, Alberta**

Principal and Senior Fisheries Biologist

Aquatic resources specialist involved with research and environmental assessment of fish and habitat resources, and impact assessment with a focus on linear development projects. Services provided include study design and management, collection and reporting of field investigations, input to multidisciplinary environmental impact assessments, preparation of environmental monitoring plans, development of mitigation and fish habitat compensation programs to meet client and regulatory needs.

1977-2001 **R.L.&L. Environmental Services Ltd.**

Principal and Co-founder-Edmonton, Alberta

Conducted fisheries and aquatic environmental investigations throughout western and northern Canada for 30 years. Managed a variety of fishery-related investigations to determine potential impacts of proposed hydroelectric and flow-augmentation developments in western Canada; conducted investigations in the Oil Sands region of Alberta including post-diversion fisheries monitoring and expansion studies; undertook monitoring and compliance studies related to existing surface coal mining developments. Combines a practical working knowledge of aquatic ecology and a thorough understanding of the environmental effects of land use practices and water development projects. Skills and expertise in fisheries habitat evaluation and assessment procedures, including input to and implementation of a "no net loss" mitigation strategy to meet provincial and federal regulatory requirements related to the Oldman River Dam Project. In recent years, has focused efforts towards the impact assessment and monitoring of linear developments (pipelines, bridges, culverts), particularly sediment monitoring during pipeline construction/maintenance related to "no net loss" of habitat, fish passage, and compensation issues.

1971-1977 **Renewable Resources Consulting Services Ltd.**

Fisheries Biologist – Edmonton, AB

Undertook numerous aquatic research programs entailing environmental evaluations of proposed energy developments such as hydroelectric dams (McGregor River diversion, British Columbia); oil and gas pipelines (Mackenzie Valley gas pipeline, Alberta Natural Gas pipeline, Alberta Oil Sands pipeline); and oil sands developments (Syncrude Canada and Shell Canada). Participated in evaluations of highway routings (Mackenzie Highway, Yellowhead Highway), flood control programs, and timber harvest practices.

Jim P. O'Neil

PROJECT RELATED EXPERIENCE – LINEAR DEVELOPMENTS: OIL & GAS

Pipeline Crossings on McLeod and Pembina Rivers **Alberta, Canada**
Assessment of fish community and fish habitat in the vicinity of a proposed pipeline crossing. Preparation of contingency plan for open cut crossing at McLeod River site to meet DFO requirements.

Pipeline Replacement / Construction: Rocky & Athabasca Rivers **Jasper, Alberta**
Assessment of fish community and fish habitat suitability in the vicinity of a replacement pipeline crossing. Identification of fisheries issues and concerns, sediment monitoring during construction, provision of mitigation and compensation alternatives.

Monitoring at the Smoky River Pipeline Crossing **Grande Prairie, Alberta**
Monitoring at Kakwa River Pipeline Crossing **Grande Prairie, Alberta**
Monitoring at the Tanghe Creek Pipeline Crossing **High Level, Alberta**
Monitoring at Rocky River Pipeline Crossing **Jasper, Alberta**
Evaluation of suspended sediment levels recorded during open cut/isolated pipeline installations. Description of potential effects on fisheries resources, monitoring and advising during construction activities. Assisted client with acquiring/meeting federal and provincial authorizations to conduct the installations.

Sediment Feedback Monitoring at Sundance Creek **Edson, Alberta**
Monitoring of suspended sediment levels during a frac-out at a horizontal directional drill method pipeline crossing. Client was advised/assisted in meeting CCME water quality guidelines during construction.

Monitoring & Contingency Plan - ATCO **Drayton Valley, Alberta**
Preparation of an aquatic environmental monitoring and construction contingency plan for a directionally drilled pipeline crossing of the North Saskatchewan River.

South Saskatchewan River Pipeline Contingency Plan **Saskatchewan, Canada**
Preparation of sediment monitoring plans and compensation options to address the federal "no net loss" policy and provincial needs in the case of a possible failure of Horizontal Directional Drill crossing.

Mountain Whitefish Spawning Survey at Pipeline Crossing **Smoky River, Alberta**
Determined the extent and distribution of mountain whitefish spawning downstream of a scheduled pipeline crossing on the Smoky River south of Grande Praire, Alberta and assessed the potential impacts of the crossing on spawning success.

Post Construction Fisheries Assessment at Smoky River **Grande Cache, AB**
Conducted a post-construction fisheries and habitat assessment at and near a replacement pipeline crossing. Habitat suitability and fish use upstream and downstream of the crossing was assessed to ensure that mitigation efforts had successfully achieved regulatory requirements.

Removal of Deactivated Pipeline **Drayton Valley, Alberta**
Fisheries issues related to the removal of a deactivated pipeline on the North Saskatchewan River were assessed and a mitigation plan was developed.

Jim P. O'Neil

PROJECT RELATED EXPERIENCE – LINEAR DEVELOPMENTS: OIL & GAS (continued)

Fisheries Assessment at Scheduled Pipeline Crossing Contributions to Shiningbank Lake **Edson, Alberta**

Assessed fish and habitat resources at and downstream of the crossing, and developed appropriate mitigation and/or compensation measures to meet federal "no net loss" requirements.

Bow River Pipeline Break **Canmore, Alberta**

Erosion at a crossing had removed cover from over a gas pipeline, exposing it and creating a significant risk to the integrity of the pipeline during high flows (scouring away of underlying bed material). Fish habitat type and quality at and in the vicinity of the crossing was assessed and possible impacts to fish habitat identified related to the work required to re-establish cover over the pipeline.

Sandstone Creek Fisheries Assessment **Hinton, Alberta**

Assessed aquatic habitat and fish resources in the vicinity of a replacement pipeline crossing in support of crossing requirements under the provincial "*Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body*" and Section 35(2) of the federal "*Fisheries Act*".

Preliminary Fisheries Review Of Cabre Winter Road Crossings **Alberta**

Fisheries-related implications of six winter road crossings on tributaries to the Mackay River, north and west of Ft. McMurray Alberta were assessed. The crossings, located along the Cabre Winter Road right-of-way, were installed to provide construction access for the Muskeg River Pipeline.

Fisheries Assessment Of Streams Along the Muskeg River Pipeline **Alberta**

Fisheries resources and aquatic habitat were assessed in all watercourses located along a proposed pipeline alignment.

Jim P. O'Neil

PROJECT RELATED EXPERIENCE – LINEAR FACILITIES: TRANSPORTATION

Bridge Development on Athabasca and Smoky Rivers **Alberta, Canada**
Review of information on fish and habitat resources at proposed bridge sites in relation to highway twinning project. Assessment of habitat suitability for key fish species; options to mitigate or improve site habitat conditions to meet federal "no net loss" requirements were developed.

Fisheries and Habitat Assessment of Stream Crossings - Highway 43 Twinning **Whitecourt, Alberta**
Aquatic habitat and fish resources were assessed in the vicinity of the existing and the proposed Highway 43 culvert crossings on several streams northwest of Whitecourt, Alberta. The major focus of the investigation included defining direct habitat losses and fish passage concerns leading to receipt of an authorization from the Department of Fisheries and Oceans, Canada.

Fisheries Assessment: Proposed Highway 43 Bridge Crossing **Whitecourt, Alberta**
Assessed aquatic habitat and fish utilization patterns in the vicinity of the proposed Highway 43 bridge crossing on the McLeod River; of particular concern was the need to determine the extent of mountain whitefish spawning at and downstream of the crossing.

Fisheries Inspection Report: Wapiti River Bridge **Grande Prairie, Alberta**
An aquatic habitat and fish resources assessment was conducted in the vicinity of a temporary bridge. Environmental inspection duties were performed relative to instream activities which might adversely affect habitat and fish populations (sediment issues) within the zone of influence of the bridge works.

Wabasca River Bridge Replacement **Red Earth Creek, Alberta**
Discussed and dealt with fisheries issues related to the replacement of a bridge structure. This involved a fisheries field investigation leading to recommendations for effective mitigation.

Winter Road Stream Crossings Assessments: **Ulu, N.W.T.**
Assessed fish use and habitat conditions in streams along four proposed winter road routes between the new Ulu gold mine and existing infrastructure at Lupin, N.W.T.

Fish and Habitat Assessment of Three Watercourses **Kugaaruk, Nunavut**
Assessed fish habitat conditions at three watercourse crossings along a proposed road connecting the Hamlet of Kugaaruk, Nunavut to an existing Forward Operating Location (FOL) owned by the Department of National Defence (DND) and provided recommendations on potential mitigation and compensation options.

Preliminary Fisheries Review Of Cabre Winter Road Crossings **Alberta**
Fisheries-related implications of six winter road crossings on tributaries to the Mackay River, north and west of Ft. McMurray Alberta were assessed. The crossings, located along the Cabre Winter Road right-of-way, were installed to provide construction access for the Muskeg River Pipeline.

Jim P. O'Neil

PROJECT RELATED EXPERIENCE – OIL & GAS

Effects Of Under-Ice Air Gun Seismic Activity On Fish **Sturgeon Lake, Alberta**
Fisheries investigations were carried out to determine the effects of under-ice seismic activity on fish stocks and fish habitat in Sturgeon Lake, Alberta. The investigation involved enclosure-holding of a range of species to determine immediate and delayed effects.

Effects of Air Gun Seismic Activity On Lake Whitefish **Winefred Lake, Alberta**
Monitored the effects of a seismic exploration program, assessed the spawning effects of air gun activity on lake whitefish spawning population in order to meet provincial regulatory requirements.

Risk of fish entrainment at temporary water intakes **Fort McMurray, AB**
The likelihood of impingement/entrainment of fish larvae was reviewed and assessed for three temporary water intakes in the Athabasca River. Recommendations to mitigate adverse effects of the intakes were also developed.

Oil Sands Surface Mine and SAGD/CSS **Fort McMurray, AB**
Senior editorial review provided for an environmental assessment of an oil sands surface mine and SAGD/CSS.

Pre-Development Baseline Investigations: **Fort McMurray, AB**
Hartley Creek Oil Sands Development
Physical and biological contributions of Hartley Creek to the Muskeg River drainages were assessed in terms of physical habitat, limnological resources, and fish populations, and to assess the impact of a proposed Hartley Creek diversion on these resource parameters in Hartley Creek proper and in the Muskeg River mainstem resources in the Syncrude development area.

Jim P. O'Neil

PROJECT RELATED EXPERIENCE – WATER MANAGEMENT

Risk of fish entrainment at temporary water intakes **Fort McMurray, AB**
The likelihood of impingement/entrainment of fish larvae was reviewed and assessed for three temporary water intakes in the Athabasca River. Recommendations to mitigate adverse effects of the intakes were also developed.

Oldman River Dam Fisheries Mitigation Program **AB, Canada**
To mitigate the detrimental effects of habitat losses associated with the Oldman Dam on resident salmonid populations, a major habitat enhancement initiative was undertaken. A long-term fisheries research program was conducted to assess pre- and post-mitigation fish population densities and to evaluate the habitat gains to satisfy the "no net loss" requirements.

Sediment Monitoring Related to installation of a Water Outlet **Valleyview, AB**
Potential mitigation / compensation strategies were identified to avoid or minimize adverse impacts associated with instream construction activity related to construction of a discharge pipe and outlet structure.

Impact Assessment: Liard River Hydroelectric Development **Fort Liard, NWT**
Collection of baseline data for assessment of the potential impacts on aquatic biota of a proposed hydroelectric development on the Liard River, BC.

Slave River Hydroelectric Feasibility Studies –Aquatic Component **Fort Smith, NWT**
Several projects were undertaken to provide impact assessments related to potential hydroelectric development of the Slave River. Initially, baseline fisheries inventories and limnological characteristics of the study area were conducted. More detailed studies assessing the migration patterns and spawning use of the lower Slave River by fall spawning species of fish were also conducted. Other studies included an assessment of fishery resource use through monitoring catch and effort of the native domestic fishery in the area and studies were conducted to assess Arctic lamprey distribution, biology, and abundance in the study area. The information collected during this study was used for the assessment of downstream impacts of the proposed Slave River hydroelectric development near Fort Smith, N.W.T.

Fisheries Assessment of Construction Activities **AB, Canada**
Senior editorial review provided for a habitat and fisheries survey below the Oldman River Dam. Potential impacts of the proposed construction activities on aquatic habitat at and near the outlet of the diversion tunnels were discussed, and mitigation opportunities identified, which may be applied to minimize construction-related impacts.

Jim P. O'Neil

PROJECT RELATED EXPERIENCE – MINING

Oil Sands Surface Mine and SAGD/CSS **Fort McMurray, AB**

Senior editorial review provided for an environmental assessment of an oil sands surface mine and SAGD/CSS.

Pre-Development Baseline Investigations: **Fort McMurray, AB**
Hartley Creek Oil Sands Development

Physical and biological contributions of Hartley Creek to the Muskeg River drainages were assessed in terms of physical habitat, limnological resources, and fish populations, and to assess the impact of a proposed Hartley Creek diversion on these resource parameters in Hartley Creek proper and in the Muskeg River mainstem resources in the Syncrude development area.

Jim P. O'Neil

PROJECT RELATED EXPERIENCE – IMPACT ASSESSMENT/MITIGATION AND COMPENSATION

Fisheries and Habitat Assessment
of the Proposed Marine Resupply Relocation **Kugluktuk, NU**
Directed a fisheries and habitat study in Coronation Gulf on the Arctic Ocean coastline. The objective was to assess the quantity and quality of fish habitat created for fish utilizing the Coppermine River estuary, leading to development of a "NO Net Loss" plan.

Risk of fish entrainment at temporary water intakes **Fort McMurray, AB**
The likelihood of impingement/entrainment of fish larvae was reviewed and assessed for three temporary water intakes in the Athabasca River. Recommendations to mitigate adverse effects of the intakes were also developed.

Oil Sands Surface Mine and SAGD/CSS **Fort McMurray, AB**
Senior editorial review provided for an environmental assessment of an oil sands surface mine and SAGD/CSS.

Oldman River Dam Fisheries Mitigation Program **AB, Canada**
To mitigate the detrimental effects of habitat losses associated with the Oldman Dam on resident salmonid populations, a major habitat enhancement initiative was undertaken. A long-term fisheries research program was conducted to assess pre- and post-mitigation fish population densities and to evaluate the habitat gains to satisfy the "no net loss" requirements.

Pre-Development Baseline Investigations: **Fort McMurray, AB**
Hartley Creek Oil Sands Development
Physical and biological contributions of Hartley Creek to the Muskeg River drainages were assessed in terms of physical habitat, limnological resources, and fish populations, and to assess the impact of diverting Hartley Creek on the aquatic resources downstream in the mainstem of Hartley Creek and the Muskeg River.

Integrated Review Of EIA – Muskeg River Watershed **Fort McMurray, AB**
Senior editorial review provided for an overview of the aquatic resource components of recent environmental impact assessments submitted by oil sands developers with current or near-future projects in the Muskeg River watershed, located northeast of Fort McMurray, Alberta.

Fish Overwintering Use in the Lower Athabasca River **Fort McMurray, AB**
A preliminary review of existing data was prepared and recommendations for the main tasks and approaches to carrying out a comprehensive study of fish habitats and overwintering use in the lower Athabasca River provided.

Jim P. O'Neil

PROJECT RELATED EXPERIENCE – FISHERIES INVESTIGATIONS

Aquatic Habitats and Fish Resources of the Milk River **Milk River, Alberta**
Assessed the aquatic habitats and fish resources of the Milk River for potential impacts related to the proposed Milk River Site 2 Dam in 1986. The fish of main concern were sport species (northern pike, sauger, and mountain whitefish) and species that are rare or non-existent elsewhere in Alberta (e.g., stonecats) due to the Milk River basin's unique status in Alberta as the only river in the province which is part of the Missouri River drainage.

Fish Species at Risk in the Milk River **Milk River, Alberta**
The distribution and relative abundance was assessed of fish species potentially at risk in the St. Mary and Milk river drainages during 2000 and 2001. The extent of winter-kill in the lower Milk River and its potential effects on the short and long-term status of the various fish species at risk was also assessed in March 2002.

Post Construction Fisheries Assessment at Smoky River **Grande Cache, AB**
Conducted a post-construction fisheries and habitat assessment at and near a replacement pipeline crossing. Habitat suitability and fish use upstream and downstream of the crossing was assessed to ensure that mitigation efforts had successfully achieved regulatory requirements.

Sandstone Creek Fisheries Assessment **Hinton, Alberta**
Assessed aquatic habitat and fish resources in the vicinity of a replacement pipeline crossing in support of crossing requirements under the provincial "*Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body*" and Section 35(2) of the federal "*Fisheries Act*".

Habitat requirements of four native fish species **Alberta**
A database of existing information on the habitat requirements of four native sportfish species in west-central Alberta was developed. A summary report identifying the habitat requirements and other relevant information for the target species was also prepared.

Upstream fish movements and population densities **Edson, Alberta**
Fish spawning movements were assessed in Sundance Creek (Athabasca River drainage) during spring in relation to potential barriers to fish passage caused by beaverdams and road culvert installations. In addition, estimates of fish population densities were obtained at representative index sites to establish a baseline for future monitoring of sportfish abundance.

Arctic Grayling Habitat Utilization **Fort McMurray, AB**
Spring spawning studies were conducted in the House River and its major tributaries (Bear and Caribou creeks) during 1994 and 1995 to provide baseline habitat and fisheries information and to allow development of appropriate guidelines for watershed planning in northeastern Alberta.

Fisheries investigation of Rat Creek **Alberta**
The status of fish populations in the Rat Creek system and the major limiting factors were assessed through systematic fish and habitat surveys.

Jim P. O'Neil

PROJECT RELATED EXPERIENCE – FISHERIES INVESTIGATIONS

Fisheries investigation of Sundance and Little Sundance creeks **Edson, Alberta**
The status of fish populations in the Sundance Creek system was assessed to determine major factors limiting the sportfishery, and to develop a planning and implementation framework for further habitat enhancement in the system.

Walleye mortality at four live-release tournaments **Alberta**
The effectiveness of tournament format changes in reducing walleye mortality was assessed at four live-release tournaments.

County of Parkland Fisheries Inventory **County of Parkland, Alberta**
A fisheries inventory was conducted on 14 named lakes and 22 small "pothole" lakes within the County of Parkland. Maps and reports were produced for each waterbody detailing the presence and distribution of fish species, and their physical and chemical characteristics. The effectiveness of existing fisheries management strategies was assessed and recommendations for increased fishing opportunities were provided.

Fisheries Assessments Near The Proposed Valleyview Power Plant **Valleyview, Alberta**
A fish and habitat assessment was conducted of the Little Smoky River near the proposed Valleyview Power Plant to address fish habitat concerns associated with the installation of a wastewater pipeline. Recommendations were also provided for mitigation and compensation measures in relation to potential construction activities.

Jim P. O'Neil

PUBLICATIONS AND REPORTS

O'Neil, J. (consulting author). 2004. Fisheries assessment of the Mackenzie River at Ft. Providence, NT – proposed Deh Cho bridge. Prepared for Jivko Engineering. Golder Report No. 03-1370-021. 93 p + 6 apps.

O'Neil, J. (contributing author). 2003. Fish habitat assessment at the site of proposed bank protection on the Smoky River, near Grande Cache, Alberta. Prepared for Terrace Engineering Ltd. Golder Report No. 03-1370-001. 10 p + 2 apps.

O'Neil, J. (consulting author). 2002. Fisheries assessment of the proposed marine docking facility at Kugluktuk, Nunavut 2002. Prepared for Department of Public Works and Services and Department of Community Government Transportation. Golder Report No. 022-7022. 73 p + 5 apps.

O'Neil, J. (consulting author). 1999. Grande Prairie Mainline Fish and Fish Habitat Re-Assessment - Athabasca River. Prepared for NOVA Gas Transmission Ltd. R.L.& L. Report No. 759D: 16 p. + 3 apps.

O'Neil, J. (consulting author). 1999. Fisheries and habitat assessment of an unnamed stream (NW 14-61-15-W5M) related to the twinning of Highway 43. Prepared for Stantec Consulting Ltd. RL&L Report No. 749CD-UC: 14 p. + 2 app.

O'Neil, J. (consulting author). 1999. Fisheries and habitat assessment of Rainbow Creek related to the twinning of Highway 43. Prepared for Stantec Consulting Ltd. RL&L Report No. 749BD-RC: 14 p. + 2 app.

O'Neil, J., (consulting author). 1999. Fisheries and habitat assessment of Two Creek related to the twinning of Highway 43. Prepared for Stantec Consulting Ltd. RL&L Report No. 749AD-TC: 24 p. + 2 app

O'Neil, J. (consulting author). 1999. Fisheries and habitat assessment of Chickadee Creek related to the twinning of Highway 43. Prepared for Stantec Consulting Ltd. R.L. & L. Report No. 748F: 24 p. + 1 app.

O'Neil, J. (consulting author). 1999 South Saskatchewan River Habitat Enhancement Options (Enbridge). Prepared for Enbridge Pipelines Inc. RL&L Report No. 709 10 p

O'Neil, J. (consulting author). 1999 South Saskatchewan river Pipeline sediment Monitoring (Enbridge). Prepared for Enbridge Pipelines Inc. RL&L Report No. 708. 11 p.

O'Neil, J. (contributing author). 1999. Sediment Monitoring at the Smoky River Pipeline Crossing (Grande Prairie Mainline Loop). Prepared for NOVA Gas Transmission Ltd. RL&L Report No. 690: 33 p + 4 apps.

Campbell, J. and J. O'Neil. 1998. Mountain whitefish spawning survey at the NOVA pipeline crossing on the Smoky River. Prepared for NOVA Gas Transmission Ltd. RL&L Report No. 685F: 9 p. + 1 app.

O'Neil J. (contributing author) 1998. Proposed Highway 43 bridge crossing on the McLeod River - fisheries assessment. Prepared for Terrace Engineering Ltd. RL&L Report No. 674F: 9 p. + 2 app.

O'Neil, J. (contributing author) 1998. Post construction fisheries assessment at the Northwestern Utilities Ltd. pipeline crossing on the Smoky River. Prepared for Northwestern Utilities Ltd. R.L.& L. Report No. 661F: 12 p. + 2 app.

O'Neil, J. 1998. Aquatic Habitat Assessment of the Whitemud River (Highway 35 Bridge Crossing). Prepared for Terrace Engineering Ltd. R.L. & L. Report No. 658F

O'Neil, J. (contributing author). 1998. Environmental monitoring at the pipeline crossing on Sundance Creek, Alberta. Prepared for Alberta Natural Gas. R.L.& L. Report No. 652F: 22 p. + 2 app.

O'Neil, J. (contributing author). 1998. Proposed Highway 43 bridge crossing on the Athabasca River - fisheries assessment. Prepared for Associated Engineering Ltd. RL&L Report No. 621D: 8 p. + 1 app.

O'Neil, J. (contributing author) 1998. Proposed Highway 43 bridge crossing on the Smoky River - fisheries assessment. Prepared for Associated Engineering Ltd. RL&L Report No. 619D: 7 p. + 1 app.

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Jim P. O'Neil

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Jim P. O'Neil

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Jim P. O'Neil

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McLeod, C., J. O'Neil, and M. Psutka. 1977. Environmental impact of stormwater drainage and retention ponds on water quality and fisheries of McMillan Creek, Prince George, B.C. Prep. for Stanley Associates Engineering Ltd. by R.L. & L. Environmental Services Ltd. and Renewable Resources Consulting Services Ltd.

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O'Neil, J.P. 1974. Fisheries resources, Northeast Alberta Regional Plan project. Vol. 1, Regional assessment, Vol. 2, Technical appendices. Prep. for Ekistic Design Consultants Ltd. by Renewable Resources Consulting Services Ltd.

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O'Neil, J.P. 1972. (contributing author). Overview study on the impact of the proposed Mackenzie Highway on aquatic resources. Prep. for Department of Indian Affairs and Northern Development by Renewable Resources Consulting Services Ltd.

O'Neil, J.P. 1972. (contributing author). Inventory of fish populations in the Mackenzie Valley, N.W.T. and Yukon related to the potential development of the Mackenzie Valley Pipeline. Prep. for Canadian Arctic Gas Ltd. under subcontract to Aquatic Environments Limited by Renewable Resources Consulting Services Ltd.

McCourt, K.H., and J.P. O'Neil. 1971. An ecological study of wildlife and fisheries in the Pembina and Sturgeon River basins. Vol. 1, Results of ecological studies, Vol. 2, An evaluation of the impact of proposed water resource developments. Prep. for Water Resources Division, Alberta Department of Environment by Renewable Resources Consulting Services Ltd.

Julia Krizan, M.R.M., B.Sc., Ph.D.

Education

B.Sc., (Biology) Ludwig Maximilians University, Munich, Germany, 1990
M.Sc., (Biology) University of Munich, Germany, 1991
Ph.D., (Degree as Dr. rer.nat.) University of Munich, Department of Ecology and Evolutionary Biology, 1995

Experience

2004 to date **IMG – Golder Corporation (IMGG)** **Inuvik, NT**
Senior Biologist/Office Manager
Project work includes environmental impact assessments, cumulative effects assessments, conservation and reclamation plans, aerial and ground wildlife surveys, community consultation, literature reviews and habitat suitability index models and habitat evaluation procedures. Other duties include supervision of permanent and casual staff, coordination and logistics support for projects.

2003 to 2004 **Gwich'in Renewable Resource Board** **Inuvik, NT**
Contract Biologist
Developing and instructing a comprehensive course on project design and advanced statistical procedures in wildlife research.

2003 **Aurora College** **Inuvik, NT**
Instructor, Licensed Practical Nurse Program
Participating in the design and development of the first Licensed Practical Nurse Program to be offered in Inuvik in a team of four instructors. Developing and teaching the course 'Anatomy and Physiology 1'.

2002 to date **Geological Survey Canada** **Dartmouth, NS**
Marine Environmental Geoscience Division
Associate Researcher, Beaufort Sea Habitat Mapping Project
Designing and conducting a literature survey and guiding students through interviews in communities of the Beaufort Delta about possible impacts of sonar and seismic activity in the Beaufort Sea with emphasis on marine mammals.

2002 to date **Gwich'in Renewable Resource Board** **Inuvik, NT**
Supervisor, Masters Thesis (GRRB Biologist)
Advice and design of Wolf Predation Study in the Richardson Mountains, NT . (Now designed as multi-year project of the GRRB) Advice on study about Habitat Use and Movement of Dall's sheep in the Richardson Mountains, NT.

2002 to 2003 **Aurora College** **Inuvik, NT**
Instructor, Natural Resources Technology Program
Developing and teaching the following courses: 'Wildlife Techniques', 'Wildlife Management', 'Range Botany and Forestry', 'Freshwater Fisheries', 'Marine Biology', 'Law Enforcement'. Designing and supervising 'Technical Report' studies. Designing and supervising fieldtrips and camps with emphasis on the following areas: Water quality testing, stream and lake ecology, collection and identification of aquatic invertebrates, vegetation / habitat assessment, wildlife observation & identification , fish habitat assessment.

Julia Krizan

Experience (continued)

1998 to 2002 **Government of Nunavut** **Iqaluit, Nunavut**

Carnivore Biologist, Department of Sustainable Development

Coordinating and organizing community consultations, meetings and workshops for research projects, training and discussion of wildlife management issues. Initiating agreements between governmental and nongovernmental agencies and the Government of Nunavut for the purpose of scientific support and training of local hunters.

Designing, conducting and presenting research on wolves, wolverines and foxes in very close cooperation with local hunters and trappers and participating Universities. Collecting harvest information on wolves, wolverines and grizzly bears from local hunters and wildlife organizations. Initiating and coordinating rabies and distemper vaccination programs for all sled dogs in Nunavut and training lay vaccinators in the communities.

Overseeing and coordinating all rabies related issues of wildlife in the Territory in cooperation with the local Hunters and Trappers Organizations, the wildlife officers, veterinarians, the Department of Health and Social Services and the Federal Government (Canadian Food Inspection Agency).

Writing briefing notes, budget proposals, quarterly variance reports, and technical file reports.

Hiring and supervising technical support staff and summer students.

Member of the 'Nunavut Wildlife Research Group' (tasks included reviewing Wildlife Research Permits and Development Permits and assessing possible impacts on wildlife and wildlife habitat within the guidelines of the Nunavut Land claims agreement).

Alternate COSEWIC representative for Nunavut (1999-2001).

1998 **Cambrian College** **Sudbury, Ontario**

Instructor, Freshwater Ecology

Teaching of the course 'Freshwater Ecology' and designing and supervising field trips with emphasis on the following areas: Water quality testing, stream and lake ecology, aquatic invertebrate collection and identification, fish habitat assessment.

1997 **Ministry of Natural Resources** **Thunder Bay, Ontario**

Coordinator and Speaker, Carnivore Education Program

Designing and presenting talks to the interested public about wolf ecology and behaviour.

1997 **Superior Wolf Research Project** **Marathon, Ontario**

Co-director

Organization and management of field research on timber Wolves on the north shore of Lake Superior.

Julia Krizan

Experience (continued)

1996 **Tierpark Herberstein** **Austria**
Wolf Enclosure and Visitor Information
Consultant
Providing information and advice on issues regarding wolves in captivity and in the wild, developing informative signs and creating possibilities for close observation of wolf behaviour. Supervising Masters students.

1995 to 2000 **Society for the Protection of Wolves** **Germany**
Scientific Advisor
Providing scientific information and advice on issues regarding conservation of wolves in captivity and in the wild.

1995 **Tatra National Park** **Slovak Republic**
Wolf Ecology Project
Contract Field Biologist
Live capture and telemetry of gray wolves in the Tatra Mountains of the Slovak Republic.

1991 to 1995 **University of Munich** **Munich, Germany**
Limnology, Ecology and Statistics
Assistant Professor
Teaching of courses 'Introductory Freshwater Ecology', 'Advanced Freshwater Ecology' (including lab at the limnological station of the University), 'Theoretical Ecology', 'Field Ecology' (including design and supervision of field experiments), 'Statistics for Biologists'. Supervising of Masters students with limnological and ecological topics.

1990 **Senckenberg Institute** **Frankfurt, Germany**
Field Assistant
Excavation and identification of fauna and flora of the Eocene period in Central Europe.

1988 to 1990 **University of Munich** **Munich, Germany**
Instructor
Teaching of the course "Anatomy of Vertebrates" and supervising the lab in which students learn to dissect different species of vertebrates.

1989 **MPI for Ethology** **Seewiesen, Germany**
Field Biologist
Contract field biologist on the project "Population Ecology of Toads (Bufo bufo) in Alpine Environments". Mark-recapture study and estimation of population parameters such as population size, male-female ratio, birth rate, death rate, age distribution.

1987 **University of Munich** **Sylt, Germany**
Research Assistant
Collection and identification of marine invertebrates of the North Sea.

Julia Krizan

Skills and Knowledge

Design and conduct scientific research
Renewable Resource Management
Administrative skills
Community networking and consultations
Collection and implementation of traditional and local knowledge
Computer skills
Knowledge of Land claim Agreements (Nunavut)
Cross-cultural background
Classroom instruction on various biological and statistical topics
Facilitation of meetings and workshops

Publications & Presentations

Lüning J. 1991. Predator-prey interactions in aquatic systems. Masters thesis, Department of Ecology and Evolutionary Biology, University of Munich, Germany.

Lüning J. 1992. Phenotypic plasticity of *Daphnia pulex* in the presence of invertebrate predators: morphological and life history responses.Oecologia 92: 383-390.

Stibor H. and Lüning. J 1994. Predator induced phenotypic variation in the pattern of growth and reproduction in *Daphnia hyalina* (Crustacea:Cladocera). Functional Ecology 8:97-101.

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Lüning J. and Stibor H. 1994. Indirect effects of size-selective predation on the life history of *Daphnia* hyalina. Verh. Internat. Verein. Limnol. 25: 2395.

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Lüning J. 1995. Life-history responses to *Chaoborus* of spined and unspined *Daphnia pulex*. Journal of Plankton Research17: 71-84.

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Lüning J. 1995. Invertebrate predators preying on *Daphnia* - prey vulnerability, selective feeding, and interactions in the field. Ph.D. thesis, University of Munich. ISBN 3-8265-0940-4.

Lüning-Krizan J. 1997. Selective feeding of third- and fourth-instar larvae of *Chaoborus flavicans* in the field. Arch. Hydrobiol. 140: 347-365.

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Krizan J. 1997. Ethophysiological aspects in the communication of wolves (*Canis lupus occidentalis* and *Canis lupus arctos*). Summary report prepared for the University of Graz, Austria.

Julia Krizan

Publications & Presentations (continued)

Krizan J. 1997. Testosterone levels and aggressive behaviour in two captive wolf packs. Report prepared for the University of Stuttgart, Germany.

Krizan P. and Krizan J. 1997. Longterm monitoring and management implications of the wolf (*Canis lupus*) on the north shore of Lake Superior. Research proposal for the Ministry of Natural Resources, Thunder Bay, Ontario.

Krizan J. 1999. Wolf harvest in the Baffin region of Nunavut. Unpublished internal report.

Krizan P. and Krizan J. Population trends and dispersal of wolves (*Canis lupus*) on the north shore of Lake Superior. in prep.

Krizan J. and Krizan P. Pack structure and parental investment in a newly formed wolf pack. in prep.

Chappell, D.E., Krizan J., Patterson B.R. and Van den Bussche R.A. 2002. Conservation Genetics of North American Wolverine (gulo gulo) Populations: Management Implications. Submitted to Molecular Ecology.

Natasha Thorpe, M.R.M., B.Sc.

Education: Master of Natural Resource Management (M.R.M.), Simon Fraser University, 2000
B.Sc. Honours (Environmental Science and Geography), University of Toronto, 1994
General Arts and Science (Economics and Business) Certificate, Simon Fraser University, 1991

Affiliations: Member, Arctic Institute of North America, University of Calgary, AB

Experience:

July 2002 - date **Golder Associates Ltd.** **Victoria, BC**
Environmental Scientist

Jan. – Mar. 2002 **Self-Employed** **Victoria, BC**
Environmental Scientist
Designed and carried out a strategic plan for conducting elder-youth camps in the Clayoquot Biosphere Reserve for the University of Victoria. Worked with the Nuu-chah-nulth Languages Group to develop educational and outreach materials. Prepared a draft code of practice and best management practices for the analytical laboratory sector for the Capital Regional District (CRD). Freelance author for several national magazines.

1996 - 2002 **Tuktu (Caribou) and Nogak (Calves) Project** **Ikaluktuuttiak, NU**
Environmental Scientist
Co-designed, wrote and conducted a participatory action research project with four Inuit settlements to document traditional Inuit knowledge of climate change and caribou in the Kitikmeot region. Co-authored and published two books entitled, *Thunder on the Tundra: Inuit Qaujimajatuqangit of the Bathurst Caribou* and *The Elder's Palace.*

1996 - 2002 **GeoNorth Northern Environmental Consulting** **Yellowknife, NWT**
Senior Partner and Environmental Scientist
Managed multiple projects and oversaw office operations for this small consulting firm. Conducted environmental site assessments, environmental impact assessments, organized and facilitated numerous national and international workshops relating to research design, northern climate change, sustainable development and globalization, and managed several community consultation and outreach projects. Major clients included aboriginal, territorial and federal governments, BHP Billiton, Canadian Polar Commission, Diavik Diamonds, Leadership for Environment and Development International, Nunavut Co-Management Boards and the West Kitikmeot/Slave Study Society.

1996 **BHP Billiton Ekati Diamond Mine** **Lac de Gras, NWT**
On-Site Environmental Officer
Implemented on-site environmental monitoring and compliance with land use permits and water licenses for a 400-person camp. Trained summer students to conduct local knowledge, wildlife and archaeological surveys (baseline data) in collaboration with industry and western scientists. Initiated a program to preserve organic soil for future vegetative reclamation.

Natasha Thorpe

PROJECT RELATED EXPERIENCE – TRADITIONAL KNOWLEDGE AND COMMUNITY OUTREACH

Anonymous Mining Company **Vancouver, BC**
Retained to design and deliver a cross-cultural training program for southern based employees working in Nunavut. The goal of the training course was to enhance awareness of Inuit culture and ways of living to foster communication and strong working relationships between Inuit and non-Inuit employees.

University of Northern British Columbia **Prince George, BC**
Managed and carried out training and capacity building with the Haida, Nisga'a, Tsimpshian, Heiltsuk and Kwakuitl to conduct traditional knowledge interviews pertaining to the state of the marine and estuarine ecosystems in the Queen Charlotte Basin. Subsequently integrated results from these interviews with results from a scientific literature review within an ecological risk assessment framework.

Sliammon First Nation **Lund, BC**
Teamed with local researchers to document traditional use of sites related to aggregate potential. Integrated results from reviewing traditional use studies and interviews with scientific findings.

Toquaht Marine Stewardship Training Program **Ucluelet, BC**
Working with the Toquaht First Nation, Golder and Golder Institute designed and delivered a 5-day marine stewardship training program that was jointly taught by Nuu-chah-nulth Elders and Golder biologists and cultural resource specialists. Members of the Nuu-chah-nulth Tribal Council Fisheries and Toquaht First Nation also delivered some lessons. The course curriculum was an equal balance of traditional teachings and western scientific teachings. Several Nuu-chah-nulth youth graduated from the program and were certified with continuing education units. A CD-ROM and VHS documentary was produced about this initiative.

Nuu-chah-nulth Languages Project **Ucluelet, BC**
Worked with Elders and Band offices on several initiatives aimed at revitalizing the Nuu-chah-nulth languages across the Central Region. Supervising a graduate student who is developing an interactive languages software program. Facilitated numerous meetings and raised funds for an elders advisory committee to guide the project.

Haida Environmental Company **Haida Gwaii, BC**
Helped to establish a Teaming Services Agreement with Haida Environmental to work together on training, capacity building and consulting projects within Haida Gwaii. Currently continuing to develop and carry out programs related to parks and tourism and environmental assessment.

Baker Lake Hunters and Trappers Organization **Baker Lake, NU**
Currently managing a collaborative Inuit Qaujimajatuqangit Study of grizzly bears in the Central Kivalliq region. Over twelve interviews with elders will be conducted using various traditional knowledge interviewing techniques. Community consultation forms a large component of the study.

Bathurst Caribou Management Planning Committee **Kugluktuk, NU**
Managed, wrote and designed a series of community outreach posters to inform and encourage feedback to the development of the BCMPC. This required close collaboration with all members of the BCMPC including representatives from federal and territorial governments and aboriginal agencies. These posters were distributed to every community across the range of the Bathurst herd.

Natasha Thorpe

PROJECT RELATED EXPERIENCE – TRADITIONAL KNOWLEDGE AND COMMUNITY OUTREACH (continued)

Government of Nunavut, Human Resources **Cambridge Bay, NU**
Prepared and presented a seminar series to the IQ Committee on how to integrate IQ into the workplace and how to conduct IQ research. The presentation was circulated to IQ committees across the Government of Nunavut.

Tuktu (Caribou) and Nogak (Calves) Project **Ikaluktuuttiak, NU**
Managed a team comprised of over 40 Inuit community researchers, elders and youth on a seven year project to document Inuit Qaujimajatuqangit of caribou and climate change for written papers, conference presentations, radio shows, press releases and community meetings across the circumpolar north (Canada, Norway, Sweden). Wrote proposals, briefing notes, public announcements and annual reports.

Indian and Northern Affairs Canada **Yellowknife, NWT**
Researched, wrote and designed a public "plain-language" newsletter on water quality and quantity in the NWT that was distributed across the north. Interviewed aboriginal people and community members involved in the federal water sampling program with a view to integrate traditional knowledge and scientific data.

Natasha Thorpe

PROJECT RELATED EXPERIENCE – ENVIRONMENTAL ASSESSMENT

Tlielang Tribal Park and Campground **Haida Gwaii, BC**

Working with Haida Environmental, we are currently carrying out a screening level environmental assessment for the Tlielang tribal park and campground. This site was formerly an important Haida village and remains an important Haida site for ceremonial, cultural, subsistence and recreational purposes. Accordingly, the EA requires us to document and integrate a substantial amount of TEK to complement the western scientific data. As part of the environmental assessment, we are providing on-the-job training for six Haida.

Miramar Hope Bay Ltd. **Hope Bay, NU**

Golder Associates' Victoria and Burnaby offices conducted a three-day workshop and a one-day interview session in Cambridge Bay, Nunavut to record *Inuit Qaujimajatuqangit* (traditional knowledge) from Inuit elders. The workshop and interviews served to collect valuable information on a variety of topics including climate change, hydrology, marine and freshwater biota and habitat, vegetation, terrestrial wildlife and habitat, cumulative effects, and both valued ecosystem components and valued socio-economic components. Results from this work were integrated into a final Environmental Impact Statement for a proposed gold mine called the Doris North Project, located on Inuit owned land in the West Kitikmeot Region of Nunavut, and operated by Miramar Hope Bay Ltd.

Miramar Hope Bay Ltd. **Hope Bay, NU**

Golder Associates' Victoria and Burnaby offices conducted a review of Inuit Qaujimajatuqangit (traditional knowledge) available in both published and grey literature relevant to the proposed gold development in Hope Bay, Nunavut. This work included a gap analysis and recommendations on how future work could best serve to address Inuit Qaujimajatuqangit in the context of mineral exploration and development.

Indian and Northern Affairs Canada (INAC) **Yellowknife, NWT**

Reviewed land and water regulations related to mineral development with Water Resources, Land Administration and District offices. Interacted with mining industry on numerous water and wildlife related topics.

Natasha Thorpe

PROJECT RELATED EXPERIENCE – CLIMATE CHANGE, HYDROLOGY AND WILDLIFE BIOLOGY

Government of Nunavut **Kitikmeot Region, Nunavut**
Golder Associates carried out a literature review and gap analysis of traditional knowledge resources pertaining to climate change in the Kitikmeot region of Nunavut. Reporting included developing a matrix of resources and ranking them according to their relevancy. Recommendations were made as to where future research should take place.

Government of the NWT, Department of Transportation **Yellowknife, NWT**
Coordinated the scientific and traditional knowledge components of an environmental impact assessment of the ferry landings in the Mackenzie Delta. Liaised with community members and partnered with the Gwich'in Social and Cultural Institute to conduct an elder-youth science camp. Managed the traditional knowledge components of the study.

Indian and Northern Affairs Canada (INAC) **Yellowknife, NWT**
Coordinated knowledge engineering between southern consultants and northern environmental experts to customize a northern-specific environmental assessment and screening database for INAC and the Nunavut Impact Review Board.

Indian and Northern Affairs Canada (INAC) **Yellowknife, NWT**
Collaborated with community members in Nunavut and the NWT involved in the federal water sampling program with a view to integrate traditional and scientific knowledge. Trained Inuit, Dene and Dogrib community members who were hired as local water samplers for a federal water quality and quantity monitoring program.

Natasha Thorpe

PROJECT RELATED EXPERIENCE – ENVIRONMENTAL EDUCATION

Tlielang (Hiellen) EA and PT Training Program **Haida Gwaii, BC**
Currently preparing a ten day course combining Elders and biologists' teachings with young adults in the context of an environmental assessment in a tribal park and campground. Students will learn about environmental assessment while carrying out a Phase I screening environmental assessment under CEAA. In addition, students will develop the beginnings of a trail and interpretive sign program. Students will receive continuing education units for participating in the coursework and on-the-job training to carry out field work for the site.

Marine Ecosystem Health Training Program **New Aiyansh, BC**
Designed and carried out a three day training program, accredited through the International Association for Continuing Education and Training, with a focus on marine and estuarine health in the Queen Charlotte Basin. My role was to integrate local TEK into the curriculum and to ground truth it with local Elders. Haida and Nisga'a students participated in the course.

University of Colorado at Boulder **Hiukkittaak River, NU**
As part of a team of academics and Inuit elders, lectured and supervised Inuit and non-Inuit students during a month-long ecology course held while kayaking an Arctic river. Formed partnerships with Inuit communities and fostered meaningful input from locals on course direction, outcome and reporting of research results to communities.

Suksasawnkrou School and Larnsang National Park **Thailand**
Taught English and environmental education to indigenous hill-tribe children at a rural residential school located adjacent to a national park. Collaborated with park rangers to implement erosion abatement strategies and sustainable tourism initiatives in a national park.

Natasha Thorpe

LIST OF PUBLICATIONS FOR NATASHA THORPE

Thorpe, N., Lemieux, G., Behr, T. and A. Morgan. (2004) Toquaht Marine Stewardship Program training manual and DVD. Toquaht First Nation, Golder Institute and Golder Associates Ltd. Victoria, BC. 84 pps.

Thorpe, N. (2004). *Factors affecting change in* Inuit Qaujimajatuqangit *and traditional caribou hunting practices in the Kitikmeot region of Nunavut.* In Cultivating Northern Landscapes. Edited by D. Anderson and M. Nuttall. Berghahn Publishing. Oxford, U.K.: 57-78.

Jolly, D., Fox, S. and N. Thorpe. (2003). Inuit and Inuvialuit knowledge of climate change. In Native Voices in Research. Edited by J. Oakes, R. Riewe, K. Wilde, A. Edmunds and A. Dubois. Aboriginal Issues Press, University of Manitoba. 280-290.

Thorpe, N., S. Eyegetok, N. Hakongak and the Kitikmeot Elders (2002). *Nowadays it is not the same: Inuit qaujimajatuqangit, climate and caribou in the Kitikmeot Region of Nunavut, Canada.* In The Earth is Faster Now: Indigenous Observations of Environmental Change. Edited by I. Krupnik and D. Riedlinger. Arctic Research Consortium of the United States. 198-239.

Thorpe, N. (2001). Climate and caribou: Inuit knowledge of the impacts of climate change on the Bathurst Caribou Herd in the Kitikmeot Region, Nunavut. In Arctic Flora and Fauna: Status and Conservation. Edited by H. Huntington. CAFF (Conservation of Arctic Flora and Fauna). Helsinki: Edita. 272 pps.

Thorpe, N., S. Eyegetok and N. Hakongak. 2001. *Thunder on the tundra: Inuit ecological knowledge of caribou.* Tuktu and Nogak Project. Vancouver, BC. 240 pps.

Thorpe, N. and S. Eyegetok. 2000. *The Tuktu and Nogak Project brings elders and youth together.* Native Journal 9 (7): 9.

Thorpe, N. and S. Eyegetok. 2000. *Lessons on the land: The Tuktu and Nogak Project elder-youth camp.* Nunavut Tunngavik Incorporated Press. Ittuaqtuut 2 (2): 32-43.

Thorpe, N. 1998. The Hiukitak School of Tuktu: Collecting Inuit ecological knowledge of caribou and calving areas through an elder youth camp. Arctic 51(4): 403-408.

Thorpe, N. 1997. The Tuktu and Nogak Project: Inuit knowledge about caribou and calving areas in the Bathurst Inlet Region. Arctic 50 (4): 381-4.

NWT Water Today. 1995. Indian and Northern Affairs Canada. Yellowknife, NWT. 8 pps.

Natasha Thorpe

CONFERENCE AND WORKSHOP PRESENTATIONS

Thorpe, N. and E. Angulalik. Incorporating Inuit Qaujimajatuqangit into Environmental Assessment of a Proposed Gold Mine. 14th Inuit Studies Conference. Calgary, AB. (invited delegate August 2004).

Thorpe, N., Eyegetok, S. and M. Willett. International Forum for Indigenous Mapping. Vancouver, BC. May, 2004.

Mason, A. and N. Thorpe. Environmental Assessments and Consultation Processes for Landand Resource Development Projects. Aboriginal Land and Resource Management Conference. Vancouver, BC. November, 2002.

Thorpe, N. Moving Forward: Contributions of Inuit knowledge to understanding the impacts of climate on caribou. 51st Arctic Science Conference. Whitehorse, YT. September, 2000.

Thorpe, N., D. Riedlinger, S. Fox and GeoNorth Consultants. A preliminary assessment of the state of documented traditional and local knowledge research of climate change. Northern Climate ExChange Workshop. Whitehorse, YT. September, 2000.

Thorpe, N. Starting points for research: Contributions of Inuit knowledge to understanding climate change. 12th Inuit Studies Conference. Aberdeen, Scotland. August, 2000.

Thorpe, N. Finding balance in times of transition: Inuit recommendations on sustainability in the mineral-rich caribou calving grounds of Nunavut. 12th Inuit Studies Conference. Aberdeen, Scotland. August, 2000.

Thorpe, N. and S. Eyegetok. Inuit ecological knowledge of climatic influences on caribou. Workshop on Climate Change Impacts and Adaptation Strategies for Canada's Northern Territories. Yellowknife, NWT. February, 2000.

Thorpe, N., S. Eyegetok, and Elder L. Kamoayok. Inuit ecological knowledge of climatic influences on caribou and calving areas in the Kitikmeot region of Nunavut, Canada. 10th Annual Arctic Ungulate Conference. University of Tromso, Norway. August, 1999.

Thorpe, N. S. Eyegetok and Elder P. Omilgoitok. *The* Tuktu *and* Nogak *Project: Participatory action research in the Kitikmeot region of Nunavut.* Arctic Institute of North America. University of Calgary, AB. August 1998.

Thorpe, N. *Inuit knowledge of caribou and calving areas in the Bathurst Inlet region.* 5th National Students' Conference on Northern Studies. Association of Canadian Universities for Northern Studies. Simon Fraser University. Vancouver, BC. November 1997.

Natasha Thorpe

GUEST LECTURES

Thorpe, N. Research in Inuit knowledge of climate change impacts on caribou in the Kitikmeot region of Nunavut. University of Victoria. Victoria, BC. March 2001.

Thorpe, N., S. Eyegetok and N. Hakongak. Thoughtful Reflections on Inuit Qaujimajatuqangit (IQ) research. Government of Nunavut. Iqaluktuuttiaq, NU. November 2000.

Thorpe, N. Lessons learned: Reflections on conducting cross-cultural and community-based research in the Arctic. Presentation to REM 601. School of Resource and Environmental Management. Simon Fraser University. Burnaby, BC. October 1998.

Thorpe, N., N. Hakongak and Elder M. Koihok. Youth are the future: Elders and youth for the Tuktu and Nogak Project. Kiiliinik High School. Iqaluktuuttiaq, NU. June 1998.

Thorpe, N. and S. Eyegetok. Participatory action research in the Arctic: An Inuit and non-Inuit perspective. Simon Fraser University Co-Management Research Group. Vancouver, BC. March 1998.

Thorpe, N. The importance of youth in the Tuktu and Nogak Project. Umingmaktuuq Elementary School. Umingmaktuuq, NU. July 1997.

Hillary Machtans, B.Sc., M.Sc.

Education

B.Sc. in Biology (1992) from University of Regina in Saskatchewan
M.Sc. in Zoology (1995) from University of Alberta in Edmonton

Awards

Graduate Teaching Award for Outstanding Teaching, 1994
Mary Louise Imrie Award, 1994
University of Regina Award, 1991
Canada Scholars Award, 1988/89

Experience

1997 to date — **Golder Associates Ltd** — **Yellowknife, NWT**

Fisheries Biologist

Participates in environmental assessment projects in the NWT with emphasis on fisheries, fish habitat and water quality components. Conducts field programs at remote locations. Assists clients with regulatory and permitting processes for mining, forestry, transportation and oil and gas projects in the NWT.

1996 -1997 — **Foothills Model Forest** — **Hinton, AB**

Fisheries Technician

Fish and Stream Inventory in Weldwood of Canada's Forest Management Area and the Foothills Model Forest. Responsibilities included backpack electrofishing, fish population estimates, habitat inventory, data entry and data analysis (Microsoft Excel/Access, SAS/SPSS/CANOCO), Extensive data analysis of habitat and fisheries information and summary report on habitat and fisheries in the Foothills Model Forest.

1995 — **National Center for Excellence, Sustainable Forestry Management** — **Edmonton, AB**

Aquatic Research Technician

Research on aquatic birds and fisheries in association with the Center for Excellence (NCE) on sustainable forestry management at the University of Alberta.

1995 — **Saskatchewan Environment and Resource Management** — **Regina, SK**

Engineer One

Air and Land Protection Branch
Chemical and Hazardous Waste Division.

Engineers surveyed the province to inspect and register above and below ground chemical and hazardous waste storage tanks and storage facilities.

1991,1992 — **Saskatchewan Health** — **Regina, SK**

Special Chemistry Laboratory for Disease Control Services

Laboratory Technologist

Collation and analysis of clinical specimens. Worked in Special Chemistry, Chemistry, Endocrinology, and Electrophoresis. Involved analysis of blood serum electrolytes, lithium, acid phosphotase, copper and gold. Preparation of blood lead analysis. Analysis of spinal fluid and urine for signs of diseases. Analysis of urine for metabolites. Work included use of electrophoresis equipment and flame and atomic absorption spectrophotometers (FAA) and (AA).

Hillary Machtans

PROJECT RELATED EXPERIENCE

DeBeers Canada Mining Inc. **Snap Lake, NT**

One-and one half year secondment (2001-2002) to De Beers Canada Mining as Environmental Specialist on the Snap Lake Diamond Project. Involved in Fisheries Authorization and Compensation Plan for the mine as well as aquatics data management (2001-2004). In 1999 and 2000, implementation of the on-going fish, habitat, water and sediment survey of lakes and streams in the Snap Lake Diamond Project area. Prepare water license and land use permit applications for submission to territorial regulators. Assist with technical report writing and environmental impact assessment of proposed diamond mine project in Northwest Territories. Involves liaison with local government, community and regulatory agencies.

Diavik Diamond Mines Inc. **Yellowknife, NT**

Design and conduct a Fish-out Study of four lakes that were de-watered near the proposed diamond mine. Involves population estimate of multiple species from four lakes and post-de-watering habitat surveys.

Department of Transportation, Gov't of the NWT **Yellowknife, NT**

Field assessment of selected stream crossings along the existing winter road from Wrigley to Fort Good Hope, NT. Field work involved fish, fish habitat, and water quality survey of rivers and stream crossings and writing technical report on fish habitat assessment and recommendations and mitigation strategies for crossings potentially undergoing construction.

Chevron Canada Resources **Fort Liard, NT**

Design and collection of fish habitat data on streams and lakes as part of an environmental assessment at existing well site and proposed pipeline. Assist with preparation of technical and environmental assessment report for gas wells. Conduct field study and prepare technical report on algal blooms in local area.

Northrock Resources **Tulita, NT**

Collection of fish habitat data on streams and lakes as part of an environmental assessment at proposed well sites. Assist with preparation of environmental assessment report for gas wells.

Alberta Energy Corporation (West) Ltd. **Tulita, NT**

Collection of fish habitat data on streams and lakes as part of an environmental assessment at proposed well sites. Assist with preparation of environmental assessment report for gas wells.

Parks Canada, Ecosystem Secretariat **Fort Smith, NWT**

Aid in facilitation of Ecosystem Integrity Workshop for the Wood Buffalo National Park. Workshop involved multiple stakeholder input to create a ecological integrity statement for the park.

PROJECT RELATED EXPERIENCE (continued)

Enbridge Pipelines **Northwest Territories**
Winter fish habitat assessment at four creeks along the existing Norman Wells to Zama pipeline.

Mackenzie Valley Environmental Impact Assessment Board **Northwest Territories**
Assist with data collection and issue scoping of environmental issues related to developments in the Mackenzie Valley.

Suncor Energy **Fort Liard, Nahanni Butte, NWT**
Literature review of Fort Liard area and collection of fish habitat data on streams and lakes as part of an environmental assessment at proposed well sites. Write environmental assessment report on field data collection.

Paramount Resources **Fort Liard, NWT**
Literature review of Fort Liard area and collection of fish habitat data on streams and lakes as part of an environmental assessment at proposed well sites, winter roads, all-weather roads, and pipeline. Write technical and environmental assessment report on field data collection.

Canadian Forest Oil **Fort Liard, NWT**
Literature review of Fort Liard area and collection of fish habitat information part of the baseline survey and environmental assessment at a proposed well site. Assist in writing an environmental assessment report on field data collection.

Grey Wolf Exploration **Northwest Territories**
Literature review of Norman Wells area and collection of fish, habitat, and water data on 4 remote waterbodies as part of the baseline survey and environmental assessment at proposed well sites. Assist client in obtaining water license and land use permit. Write environmental assessment report on field data collection.

Highwood Resources **Northwest Territories**
Literature review of Thor Lake area and mining in the NT and collection of fish, habitat, water and sediment data on 8 remote waterbodies as part of the baseline survey and environmental assessment at proposed Thor Lake Beryllium demonstration site. Write technical report on field data collection.

Ranger Oil Ltd. **Fort Liard, Northwest Territories**
Design and implementation of the fish and habitat survey of 13 creeks in the Fort Liard area. Extensive literature review on industrial activities in the Liard Valley. Obtained permits for the work by extensive liaison with local government and regulatory agencies. Write fisheries sections of multi-disciplinary technical report and environmental assessment reports.

PROJECT RELATED EXPERIENCE (continued)

Diavik Diamond Mines Inc. **Northwest Territories**
Assisted in writing Fish and Water Environmental Effects Report being prepared for the Diavik mine project.

Alberta Environment, Fish and Wildlife **Sundance Creek, Alberta**
Assisted with fisheries and habitat assessment of Sundance Creek for the inclusion of the creek in the Canada 2000 Protected Areas.

Foothills Model Forest **Hinton, Alberta**
Fisheries and habitat assessment, fisheries population estimates and culvert remediation work on over 200 stream sites in the foothills.

BENJAMIN A. WHEELER, M.Sc.

1165A Hadfield Ave, V9A 5N8 Tel: (250) 386-9652
Languages: English and French E: wheelerben@shaw.ca

EDUCATION

1999 McGill University **M.Sc**. Biology (with focus on Marine organisms and systems)
Thesis: Systematics of the Euretidae (Porifera: Hexactinellida); pp.145.

1994 Brock University **B.Sc. Hons** Combined Chemistry/Biology
Thesis: Ultrastructure and function of gorgonian coral axes (Gorgonacea, Octocorallia); pp. 98.

EMPLOYMENT

2003/4 **Northern Environmental Marine Organization** (President)

Contracted by government agencies (Environment Canada, DFO, Inuit organizations) and private corporations (WWF Canada) to provide monitoring and assessment of endangered species, with a specific focus on marine systems and wildlife. Used solid understanding of government legislation, and industry knowledge to successfully negotiate partnerships and contracts; managed 9 separate contracts with private and public sector. Submitted proposals for three year research project on endangered species and created reports and recommendations for conservation action plans: the Isabella Bay Critical Bowhead Habitat Stewardship Project. As the primary funding recipient I led the final year of this three year multi-funded project aimed at researching the endangered Davis Strait bowhead whale population and its habitat – monitored whales, collected baseline data, determined species numbers, and submitted reports to federal government to promote species recovery. Developed and led the training of Inuit group on effective techniques of cetacean monitoring. Full accountability for project: research/survey design, project logistics and implementation, equipment, budget development and maintenance. As site manager for 6 field employees, provided training on field standards, and equipment usage and coaching.

2002 - present **Ferguson Simek & Clark**

Assisting in the environmental assessment process for the development and construction of a breakwater in Arctic charr habitat, application of relevant legislations (Fisheries Act, no-net-loss policy), liaising with DFO and private sector. Provided written and verbal advice and recommendations to the client on fish habitat enhancement protocols, protection and restoration.

2003/4 **Indian & Northern Affairs Canada, Iqaluit Nunavut**

Contracted by the Indian & Northern Affairs Canada, Iqaluit Nunavut to assist in the Environmental Impact Review process of several development projects (i.e. the Jericho Diamond Mine).
- Represented INAC at public hearings to gather information and provide details to stakeholders/decision makers.
- Reviewed the EIS, and created a socio-economic model assessment report, developed recommendations and generated final assessment reports for agency review.
- Reviewed technical literature and proposal documents for deficiencies and impact issues and provided technical support in interpreting technical data.

2003 **Department of Fisheries & Oceans, Iqaluit Nunavut**

Two month casual position with Fisheries Management to assist in aerial surveys, facilitate community-based monitoring/management programs, shrimp and Arctic charr management plans. Maintained fish sampling gear, coordinated otolith analyses and assisted in field project logistics and surveys.

2001-3 **World Wildlife Fund of Canada/NEMO Biological Consultants**

Submitted proposals and reports for a three year wildlife conservation project on endangered species and provided reports and recommendations for conservation action plans: the Isabella Bay Critical Bowhead Whale Habitat Stewardship Project. Consulting to WWF Canada I initiated and led the first two years of this three year multi-funder project aimed at researching the endangered Davis Strait bowhead whale population and its habitat – monitored whales, determined species numbers, and submitted reports to federal government to promote endangered species recovery. Developed and led the training of Inuit group on effective techniques of cetacean monitoring. Full accountability for project: research, project management team, project logistics and implementation, equipment, budget development and maintenance. As site manager for 6 field employees, provides training on field standards, and equipment usage and coaching.

2001 **Department of Fisheries & Oceans, Iqaluit Nunavut./NEMO Biological Consultants**

Hired to review history, compile and analyze available data, potential environmental impacts and possible appropriate mitigation and compensation on the Arctic charr (*Salvelinus alpinus*) fishery in the Sylvia Grinnell River, Nunavut. Interviewed stakeholders and user groups; compiled and delivered a 50 page report containing three recommendations for management. Consulted with, and presented to, stakeholders (DFO, EC, NWMB) on report content to best combine scientific evidence with sociological need. Report outlining that the best course of action based on research was to close the river from future fishing. Stakeholders accepted and implemented recommendations.

2000 **Department of Fisheries & Oceans, Iqaluit Nunavut/NEMO Biological Consultants**

Contracted by DFO to conduct a baseline habitat assessment of the plankton community in the Barrow Strait, Nunavut. Duties included sampling/survey protocol design, net and niskin bottle sampling, microscopic analyses, reporting and accounting.

1995/6 **Tree Planter/Foreman, Brinkman Ass.**

Duties commensurate with the operation of a team of 20 treeplanters under extreme environmental conditions.

1994 **Researcher, BC Wetlands Ntwk.**

Contractual appointment for the writing of a wetlands “Tool Kit” book focused on the ecology and science of wetlands as well as the policies and legislation affecting wetland protection.

1993 **Fossil Collector, National Geographic**

Member of Royal Ontario Museum expedition to the Burgess Shale, Yoho Park, B.C. - located and extracted rare and new fossils such as Anomalocaris and Hallucagenia (see National Geographic October, 1993)

RELATED PROJECT EXPERIENCE

Fishery authorization and breakwater development licensing; Iqaluit NU (2003-present)

Assisting in the environmental assessment process for the development and construction of a breakwater in Arctic charr habitat (Clyde River, NU), application of relevant legislations (Fisheries Act, no-net-loss policy), liaising with DFO and private sector. Providing written and verbal advice and recommendations to client (FSC) on fish habitat enhancement protocols, protection and restoration.

Arctic charr fishery assessment; Iqaluit NU (2001)

Desktop review of history, potential environmental impacts and possible appropriate mitigation/ compensation; compiled and analyzed available data for Arctic charr (Salvelinus alpinus) fishery in the Sylvia Grinnell River, Nunavut. Interviewed stakeholders and user groups, delivered report containing three recommendations for management. Consulted with, and presented to, stakeholders (DFO, EC, NWMB) on report content to best combine scientific evidence with sociological need. Report outlining that the best course of action based on research was to temporarily close the river from future fishing. Stakeholders accepted and implemented recommendations.

Habitat Assessment; Clyde River NU (2001-2004)

Multi-agency (DFO, EC, NWMB, WWF) project to monitor and assess critical bowhead whale habitat: Isabella Bay Critical Bowhead Habitat Project. Monitored whales, collected baseline data (CTD, plankton identification), determined species numbers, plotted habitat units, and submitted reports to federal government to promote species recovery. Developed and led the training of Inuit group on effective techniques of cetacean monitoring. Full accountability for project: research/survey design, project logistics and implementation, equipment, budget development and maintenance.

Habitat Assessment; Resolute Bay, NU (2000)

Developed a Fisheries and Oceans project to conduct baseline habitat assessment of the marine plankton (phyto- and zooplankton) community in the Barrow Strait, Nunavut. Sampling and survey protocol design, net and niskin bottle sampling, microscopic analyses, reporting and accounting.

OTHER EDUCATION

2004	Marine Mammals, an undergraduate course; Dalhousie University. Instructor: Hal Whitehead
2000	Inter-tidal biodiversity of the Pacific west coast; Bamfield Marine Station.

PUBLICATIONS

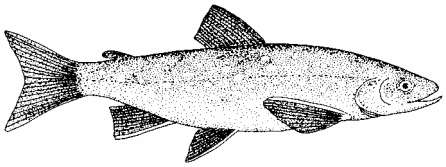
1. Wheeler, B. (in submission) An Entangled Bowhead Whale (*Balaena mysticetus*) in the Eastern Canadian Arctic. Arctic
2. Wheeler, B. (in submission) A Distinguished Bowhead Whale (*Balaena mysticetus*). Arctic
3. Wheeler, B. (in preparation). Isabella Bay Bowhead Critical Habitat Stewardship Program: three year summary. Environment Canada.
4. Wheeler, B. 2003. Isabella Bay Bowhead Critical Habitat Stewardship Program: Final Report 2002-2003. Environment Canada. pp 48.
5. Wheeler, B. 2003. Final Assessment of the Socio-Economic & Land Use Component, of the Final Environmental Impact Statement for the Jericho Diamond Project. Indian and Northern Affairs Canada. pp 44.
6. Reiswig, H., B. Wheeler. (2002). Family Euretidae (Porifera: Hexactinellida: Hexactinosa). In: Systema Porifera: Taxonomy of the phylum Porifera, Vol.II, The Hexactinellida. Eds. J.A. Hooper, R.W.M. Van Soest. pp. 1301-1332.
7. Wheeler, B. 2002. Isabella Bay Bowhead Critical Habitat Stewardship Program: Final Report 2001-2002. Environment Canada. pp15.
8. Wheeler, B. 2001. A Review of the History and Biology of Arctic charr (*Salvelinus alpinus*) from the Sylvia Grinnell River, Nunavut. Recommendations for the Department of Fisheries and Oceans. pp 58.

MEETINGS ATTENDED

1. Society of Conservation Biologists. July 2003. Duluth, Minnesota, USA.
2. Society of Marine Mammology 14th Biennial. December 2001. Vancouver, B.C.
3. International Symposium on Porifera. July 1998. Brisbane, Australia
4. World Congress, IUCN. 1998. Montreal, Canada
5. Evolutionary Biology and Systematics. June 1997. Boulder Colorado

MEMBERSHIP IN SOCIETIES

Society for Integrative and Comparative Biology
Canadian Zoological Association
Society for Conservation Biology



TEACHING

Supervision, presentation and evaluation of laboratory and lecture components of five 1st, 2nd and 3rd year university biology courses (Organismal Biology, Diversity of Life, Invert. Zoology, etc.). Adult Education courses such as computers, english, math, science. On-site field training in cetacean survey procedure, habitat stewardship and boating safety.

AWARDS

1. Alma Mater Grant, McGill University, 1998
2. Principal's Honour Roll, McGill University, 1998-9
3. Recipient: Deputy Ministers' Pride & Recognition Award (2004)

VOLUNTEER EXPERIENCE

2004	Marine Mammal Monitoring	~ Database development, volunteer spotter, recorder
2003-4	Arctic Marine Mammal Research Institute	~ Society President
2000	DFO	~Biological research of local marine plankton
2000	DFO	~Organisation, arrangement and inventory of scientific equipment in "moth-balled" research facility
2000	Local Hunters & Trappers Organisation	~Worked closely with Wildlife Officer and DFO fisheries technician in logistics of a charr tagging project
1999	Local Hunters & Trappers Organisation	~Aided in logistics and labour in organising extensive Caribou and Muskox survey of Bathurst Is., NU
1998	IUCN Canada	~Assisted with the operation of the World Congress
1996	IUCN Pakistan	~Three months at the 'Mangrove Reforestation' project in Karachi, Pakistan – trained in community development skills, mangrove biology etc…

CERTIFICATES

St.John's CPR & First Aid (April, 2002)
PADI open water SCUBA diving/ PADI Dry-suit diving certificate
FAC – Firearms Acquisition Certificate

PRESENTATIONS

1. February, 2004. Isabella Bay Bowhead Whale Critical Habitat Stewardship Project. WWF Canada, Atlantic office.
2. February, 2004. Isabella Bay Bowhead Whale Conservation Project. Dalhousie marine mammal group.
3. July, 2003. Presentation to Society of Conservation Biologists, Duluth Minnesota, USA: Bowhead whale conservation challenges and opportunities in the Eastern Canadian Arctic.
4. June, 2002. Igaliqtuuq: Past, Present and Future. Fisheries and Oceans, Freshwater Institute, Winnipeg Manitoba.
5. September, 2001. Isabella Bay bowhead whales. WWF Canada, Toronto Office.
6. July, 1998. The Euretidae: a cladistic taxonomic review of a family of deep water sponges. Brisbane, Australia.

MEDIA

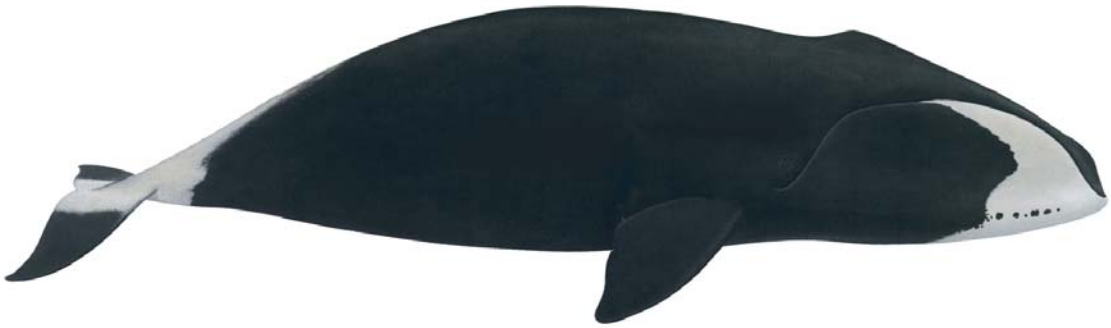
1. Documentary: Isabella Bay; Climate Change. Nature of Things. To be aired sometime 2004.
2. Discovery Channel. "White Frontiers" (1 hour video series). Aired December 2002.
3. CBC North: news interview: Record number of bowhead whales surveyed at Isabella Bay. October 2002.
4. Nunatsiaq news, October 25th, 2002. Igaliqtuuq crew spots record number of bowhead whales.
5. June, 2002. Presentation to DFO; Freshwater Institute, Winnipeg Manitoba: Igaliqtuuq, Past, Present & Future. One hour powerpoint.
6. World Wide Web: http://www.wwf.ca/en/whats_new/02_02_Bowhead.asp
   http://www.wwf.ca/en/whats_new/02_02_BowheadPhoto.asp
7. Nunatsiaq news, September 14th, 2001. No. 33.p. 5. "Igaliqtuuq whale sanctuary at least a year away".
8. National Geographic. October, 1993. Burgess Shale fossils.

BUSINESS

Sole proprietorship: N.E.M.O. (Northern Environmental Marine Organization). Registered 2000.

HOBBIES AND INTERESTS

Computers:	~Extensive experience with Microsoft Word, Excel, Systat, Statsview, SigmaPlot, Adobe (Illustrator/Photoshop) for Macintosh and IBM ~Familiar with digitising tablets and computerised graphical imaging techniques, DOS, Windows and MacIntosh platforms. ~Use of Internet for research and networking purposes.
Travelling:	~One year living and travelling in Penang,, Malaysia; visited India, Pakistan, Tanzania, Kenya, Thailand, Hong Kong and Singapore by backpack and/or bicycle.
Sports:	~Camping, hiking, mountain-biking, rock-climbing, skiing, SCUBA diving and canoeing.
Others:	~Literature, guitar, photography and mechanics.



Jim Campbell, B.Sc.

Education B.Sc. - Marine Biology, University of British Columbia, Canada, 1990

Affiliations Professional Association of Diving Instructors (PADI)

Experience

1996-Present **Golder Associates Ltd. /RL&L Environmental** **Edmonton, Alberta**

Fisheries Biologist

Aquatic resources biologist with experience in aquatic environmental assessments, fisheries research, oil and gas, mining, and linear development projects. Services provided include study design and management, collection and reporting of field investigations, and permit applications to regulatory authorities.

1992-1995 **RL&L Environmental Services Ltd.** **Edmonton, Alberta**

Biological Technician

Involved in field work, reporting, and data analysis for several biological studies, including fish and fish habitat inventories, radio telemetry movement studies, and baseline environmental assessment studies.

Jim Campbell

PROJECT RELATED EXPERIENCE – FISHERIES INVESTIGATIONS

Fisheries and Fish Habitat Inventories of the South Saskatchewan River Basin — **Alberta, Canada**

Participated in study to determine the status of fish populations in the lower Bow, lower Oldman, and South Saskatchewan rivers and identify factors that may limit fish production. Fish species composition and relative abundance were determined through an intensive sampling program that utilized electrofishing, seining, and set lines. Meso-habitat characteristics were recorded, mapped and correlated with fish capture data to provide an index of relative use by fish species. Radio transmitters were implanted in selected sportfish species (walleye, sauger, goldeye) to determine the extent of overwintering and spawning migrations.

Study of Lake Sturgeon Movements — **Alberta & Saskatchewan, Canada**

Lake sturgeon distribution in Alberta is confined to the North and South Saskatchewan River drainages. This study was initiated in 1996 to provide further information to aid in management of the species in the South Saskatchewan River. Critical habitats (spawning and overwintering) were identified as a result of the telemetry program.

Fisheries Inventory of Swan Hills – Whitecourt Integrated Resource Plan Area — **Alberta, Canada**

This study was undertaken to collect detailed fisheries inventory information to assist resource managers in formulating an integrated resource management plan for the Swan Hills – Whitecourt region.

Seasonal Movements of Bull Trout – Berland River — **Alberta, Canada**

Seasonal movement patterns of bull trout in the Berland River system were determined using radio telemetry. Sampling was conducted in the mainstem to capture and implant bull trout with radio transmitters. Seasonal tracking was conducted using a fixed-wing aircraft. Potentially important areas for spawning and overwintering were identified.

Oldman River Dam Fisheries Mitigation Program — **Alberta, Canada**

To mitigate the detrimental effects of habitat losses associated with the Oldman Dam on resident salmonid populations, a major habitat enhancement initiative was undertaken. A long-term fisheries research program was conducted to assess pre- and post-mitigation fish population densities and to evaluate the habitat gains to satisfy the "no net loss" requirements.

Investigation of the Walleye Spawning Population — **Sylvan Lake, Alberta**

An investigation of the walleye spawning population of Sylvan Lake was conducted during 1993 and 1994. Field programs during the project included (1) a fish capture program, employing boat electrofishing and gillnetting to capture spawning walleye, (2) a tracking program designed to identify movement patterns of spawning walleye implanted with sonic transmitters, and (3) an egg collection and habitat sampling program designed to verify use of potential spawning areas by walleye and quantify the physical characteristics of these areas.

Jim Campbell

PROJECT RELATED EXPERIENCE – FISHERIES INVESTIGATIONS

Fisheries Assessment of the Mackenzie River
-Proposed Deh Cho Bridge- Ft. Providence, NT

A Fisheries Assessment Study for the proposed Deh Cho Bridge was conducted in 2003 to determine the long-term impact of the construction of the proposed bridge on the existing fish habitat; and, prepare acceptable mitigation and compensation measures to ensure the construction of the bridge adheres to the Department of Fisheries and Oceans (DFO) policy for "No Net Loss" of fish habitat.

Fish Contaminant Study for Treaty 8
First Nation Communities in Northern Alberta Alberta, Canada

Alberta Treaty 8 Health Authority retained Golder Associates Ltd. (Golder) to coordinate a fish sampling program in lakes within the Northern River Basins (NRB) and to report the results of chemical analyses conducted on fish tissues.

Fisheries Assessment of the Proposed
Marine Docking Facility Kugluktuk, Nunavut

A Fisheries Assessment Study for the proposed Marine Docking Facility was conducted in 2002 to determine the long-term impact of the construction of the Marine Docking Facility on the existing and proposed fish habitat; and, prepare acceptable mitigation and compensation measures to ensure the construction of the Marine Docking Facility adheres to the Department of Fisheries and Oceans (DFO) policy for "No Net Loss" of fish habitat.

Wabamun Lake Whitefish Spawning Study Alberta, Canada

Study to evaluate the effects of the increased thermal regime caused by the Wabamun Lake Power Plant facility on lake whitefish spawning.

Fish Overwintering Use of the lower Athabasca River Fort McMurray, Alberta

To address the concerns of winter water withdrawals from the lower Athabasca River and their potential impacts on fish populations, a long-term study was initiated in 2001 to determine the use of the mainstem for overwintering by key fish species. Through the use of aerial and ground based telemetry, the study was designed to identify overwintering habitats for walleye, lake whitefish, northern pike and goldeye. Habitat preferences of these species during winter were assessed by depth, velocity, substrate and water quality measurements at overwintering locations confirmed through on-ice tracking of radio tagged fish. Additional information on overwintering use was provided through extensive gill net and set line program.

Fish Species at Risk in the Milk River, Alberta
-Late Winter 2002 Survey- Milk River, Alberta

Assessment to the extent of winter-kill in the lower Milk River, due to extreme drought conditions for the last several years and its potential effects on the short and long-term status of the various fish species at risk.

Mountain Whitefish Spawning Survey at the
New Highway 43 Crossing on the Smoky River Grande Prairie, Alberta

Study to document the extent of mountain whitefish spawning use at and near the bridge crossing.

Jim Campbell

PROJECT RELATED EXPERIENCE – LINEAR DEVELOPMENT

Pipeline Crossings on McLeod and Pembina Rivers **Alberta, Canada**
Assessment of fish community and fish habitat in the vicinity of a proposed pipeline crossing. Preparation of contingency plan for open cut crossing at McLeod River site to meet Fisheries and Oceans Canada requirements.

Jasper Transmission Relocation – Rocky River **Jasper, Alberta**
Assessment of fish community and fish habitat suitability in the vicinity of a proposed pipeline crossing. Identification of fisheries issues and concerns, provision of mitigation alternatives.

Sediment Monitoring at Rocky River Pipeline Crossing **Jasper, Alberta**
Evaluation of suspended sediment levels recorded during open cut pipeline installation. Description of potential effects on fisheries resources and evaluation of mitigation and construction activities.

Sediment Monitoring at Smoky River Pipeline Crossing **Grande Prairie, Alberta**
Evaluation of suspended sediment levels recorded during open cut pipeline installation. Description of potential effects on fisheries resources and evaluation of mitigation and construction activities.

Sediment Monitoring at Kakwa River Pipeline Crossing Grande **Prairie, Alberta**
Evaluation of suspended sediment levels recorded during a super-flume pipeline installation. Description of potential effects on fisheries resources and evaluation of mitigation and construction activities.

Highway 43 Bridge Twinning on the McLeod River **Whitecourt, Alberta**
Review of fish community information and collection of fish habitat data at proposed bridge twinning sites. Assessment of habitat suitability for key fish species, potential impacts and options to mitigate or improve site habitat conditions.

IPL Terrace Phase I Expansion. **Saskatchewan & Manitoba, Canada**
Fisheries and habitat assessments were conducted on 66 watercourses along the IPL right-of-way using DFO's habitat conservation and protection guidelines.

Mackenzie Pipeline **Inuvik, N.W.T.**
The collection of baseline fisheries information and preliminary impact assessment on streams that may be impacted by the proposed development of the natural gas pipeline.

Smoky River Bank Erosion Protection – Highway 40 **Alberta, Canada**
The study included a review of existing fisheries information on the Smoky River near Grand Cache, Alberta, and identification of potential mitigation strategies to avoid or minimize adverse impacts of bank protection works on fish habitat.

Chalmers Creek Habitat Assessment **Swan Hills, Alberta**
As part of compensation for fish habitat losses related to the Suncor Millenium Oilsands Project development activities, a detailed habitat assessment of a five kilometer section of Chalmers Creek upstream of the Highway 33 culvert crossing was undertaken to evaluate the potential for reclaimed habitat in relation to repair works to the suspended culvert.

Jim Campbell

PROJECT RELATED EXPERIENCE – OIL AND GAS

Pipeline Crossings on McLeod and Pembina Rivers **Alberta, Canada**
Assessment of fish community and fish habitat in the vicinity of a proposed pipeline crossing. Preparation of contingency plan for open cut crossing at McLeod River site to meet Fisheries and Oceans Canada requirements.

Sediment Monitoring at Smoky River Pipeline Crossing **Grande Prairie, Alberta**
Evaluation of suspended sediment levels recorded during open cut pipeline installation. Description of potential effects on fisheries resources and evaluation of mitigation and construction activities.

Sediment Monitoring at Kakwa River Pipeline Crossing Grande **Prairie, Alberta**
Evaluation of suspended sediment levels recorded during a super-flume pipeline installation. Description of potential effects on fisheries resources and evaluation of mitigation and construction activities.

Imperial Oil Cold Lake Expansion Project **Cold Lake, Alberta**
Aquatic studies of the fish community, fish habitat, lower trophic levels, and water quality for completion of the environmental impact assessment for Imperial Oil Resource Ltd.'s Mahihkan North and Nabiye developments near Cold Lake, Alberta. The development used Cyclic Steam Stimulation (CSS) technology to recover bitumen from deep formations.

JACOS West Hangingstone Project **Fort McMurray, Alberta**
Aquatic studies of the fish community, fish habitat, and lower trophic levels for completion of the environmental impact assessment for Japan Alberta Oil Sands Ltd. (JACOS) West Hangingstone SAGD project.

Grizzly Valley Pipeline Extension – Fisheries Assessment **Tumbler Ridge, BC**
Conducted an inventory and assessment of fisheries resources at watercourse crossings located along a proposed natural gas pipeline alignment.

Mackay River Pipeline Crossing Request
For DFO Authorization **Fort McMurray, Alberta**
Assessment of fisheries potential, to address aquatic habitat concerns in the vicinity of the Mackay River crossing, to recommend appropriate mitigation and/or compensation measures, and to prepare the a report in support of their *Application for Authorization of Works or Undertakings Affecting Fish Habitat* pursuant to Section 35(2) of the *Fisheries Act.*

Tributaries to Redrock Creek Pipeline Crossing Request
For DFO Authorization **Grande Prairie, Alberta**
Assessment of fisheries potential, to address aquatic habitat concerns on crossings of tributaries of Redrock Creek, to recommend appropriate mitigation and/or compensation measures, and to prepare the a report in support of their *Application for Authorization of Works or Undertakings Affecting Fish Habitat* pursuant to Section 35(2) of the *Fisheries Act.*

Sediment Monitoring in an Unnamed Tributary

Jim Campbell

to Redrock Creek **Grande Prairie, Alberta**

Evaluation of suspended sediment levels recorded during the isolated pipeline installation. Description of potential effects on fisheries resources and evaluation of mitigation and construction activities.

Jim Campbell

PROJECT RELATED EXPERIENCE – OIL AND GAS

Boulder Creek Pipeline Crossing Request For DFO Authorization — Grande Prairie, Alberta

Assessment of fisheries potential, to address aquatic habitat concerns in the vicinity of the Boulder Creek crossing, to recommend appropriate mitigation and/or compensation measures, and to prepare the a report in support of their *Application for Authorization of Works or Undertakings Affecting Fish Habitat* pursuant to Section 35(2) of the *Fisheries Act.*

Boulder and Redrock Creeks Drilling Mud Investigation — Grande Prairie, Alberta

During the directional drilling activities, approximately 4500 barrels (1 barrel equals 160L) of bentonite drilling mud were lost in Boulder and Redrock creeks, this study was to determine the distribution and extent of drilling mud in the riparian and instream areas of Boulder and Redrock creeks.

Jim Campbell

PROJECT RELATED EXPERIENCE – IMPACT ASSESSMENT

No. 7 and 8 Mines – Proposed Coal Mine Development **Grande Cache, Alberta**
Studies of the fish community, fish habitat, and lower trophic levels to support applications for the development of an underground and surface mine near Grande Cache. An Environmental Impact Assessment of the proposed development on aquatic resources was prepared.

Dunvegan Hydroelectric Project **Alberta, Canada**
Baseline aquatic studies in the vicinity of a proposed hydroelectric facility on the Peace River. Sampling of the fish community, fish habitat, river depth and velocity conditions, were conducted in the proposed headpond, as well as in a downstream zone and an upstream reference area. Sampling of potentially affected tributaries was also conducted.

Imperial Oil Cold Lake Expansion Project **Cold Lake, Alberta**
Aquatic studies of the fish community, fish habitat, lower trophic levels, and water quality for completion of the environmental impact assessment for Imperial Oil Resource Ltd.'s Mahihkan North and Nabiye developments near Cold Lake, Alberta. The development used Cyclic Steam Stimulation (CSS) technology to recover bitumen from deep formations.

Pre-Development Aquatic Studies: Meliadine West Project **Nunavut, Canada**
Participated in the collection of baseline information of fish populations and aquatic nonvertebrate communities in the area of Rankin Inlet, Nunavut. In addition, fish tissues and water quality samples were collected from selected waterbodies in the study area. An assessment was conducted of waterbodies and fish populations that may be impacted by the development. Radio transmitters were implanted in selected sportfish species (Arctic charr, Arctic grayling and lake trout) to determine the extent of overwintering and spawning migrations.

Pre-Development Aquatic Studies: Izok Mining Project (Port Site) **Nunavut, Canada**
Aquatic sampling programs were conducted to collect baseline information fro an initial Environmental Impact Assessment. Fisheries programs, habitat evaluations, water and sediment quality sampling, and bathymetry were undertaken at Izok Lake and on the Arctic coast (port site). Fish tissues and sediment samples were analysed to determine background levels if heavy metals.

Jim Campbell

PROJECT RELATED EXPERIENCE – MINING

No. 7 and 8 Mines – Proposed Coal Mine Development **Grande Cache, Alberta**
Studies of the fish community, fish habitat, and lower trophic levels to support applications for the development of an underground and surface mine near Grande Cache. An Environmental Impact Assessment of the proposed development on aquatic resources was prepared.

Aquatic Monitoring Program - No. 12 Mine South **Grande Cache, Alberta**
Long-term monitoring program to evaluate the effects of an open pit coal mining operation on the aquatic environment. Included repetitive sampling for fish, fish habitat, lower trophic levels, and water quality at sites within the mining area, as well as at reference sites.

Aquatic Studies of Laforce Creek - No. 9D Mine **Grande Cache, Alberta**
Preliminary investigation of fish community, fish habitat and water quality conditions at a proposed underground mine. Population estimates of bull trout were conducted at several locations.

Pre-Development Aquatic Studies: Meliadine West Project **Nunavut, Canada**
Participated in the collection of baseline information of fish populations and aquatic nonvertebrate communities in the area of Rankin Inlet, Nunavut. In addition, fish tissues and water quality samples were collected from selected waterbodies in the study area. An assessment was conducted of waterbodies and fish populations that may be impacted by the development. Radio transmitters were implanted in selected sportfish species (Arctic charr, Arctic grayling and lake trout) to determine the extent of overwintering and spawning migrations.

Pre-Development Aquatic Studies: Izok Mining Project (Port Site) **Nunavut, Canada**
Aquatic sampling programs were conducted to collect baseline information fro an initial Environmental Impact Assessment. Fisheries programs, habitat evaluations, water and sediment quality sampling, and bathymetry were undertaken at Izok Lake and on the Arctic coast (port site). Fish tissues and sediment samples were analysed to determine background levels if heavy metals.

Kennedy Lake Aquatic Studies Program **NWT, Canada**
Participated in the collection of baseline information of fish populations and aquatic nonvertebrate communities in the area of Kennedy Lake of the Northwest Territories. An assessment was conducted of waterbodies and fish populations that may be impacted by the development.

Jim Campbell

PROJECT RELATED EXPERIENCE – FORESTRY

Reconnaissance (1:20 000) Fish and Fish Habitat Inventories **Fort Nelson, BC**

A multi-year study, commencing in 1996, to provide fisheries and habitat data to support forest development planning in the Fort Nelson Forest District for Slocan Forest Products (Fort Nelson Division). Standard methodologies development by the Resource Inventory Committee was used for the habitat and fisheries assessments. Information summaries, photographic documentation, and classification and distribution maps were developed for the study areas.

Jim Campbell

PUBLICATIONS AND REPORTS

2004. Aquatic Environmental Contingency / Response Plan -Two Creek Project- Prepared for Paramount Resources Ltd. Golder Associates Ltd. Report No. 04-1373-003: 11p.

2004. Fisheries Assessment of the Mackenzie River at Ft. Providence, NT – Proposed Deh Cho Bridge- Prepared for Jivko Engineering. Golder Associates Ltd. Report No. 03-1370-021: 89p. + 5 app.

2003. Fish Habitat Assessment at the Site of Proposed Bank Protection on the Smoky River, near Grande Cache, Alberta, Terrace Engineering Ltd. Golder Associates Ltd. Report No. 031-370001: 13p. + 1 app.

2003. Fisheries Assessment of the Proposed Marine Docking Facility at Kugluktuk, Nunavut, Public Works and Services and Community Government Transportation. Golder Associates Ltd. Report No. 022-7022: 71p. + 5 app.

2002. Sediment Monitoring in an Unnamed Tributary to Redrock Creek, TransCanada PipeLines Ltd. Golder Associates Ltd. Report No. 012-2366/3000: 11p. + 3 app.

2002. Boulder and Redrock Creeks Drilling Mud Investigation, TransCanada PipeLines Ltd. Cutbank Extension. Golder Associates Ltd. Report No. 012-2366/3000: 4p. + 1 app.

2002. Mackay River Pipeline Crossing Request for DFO Authorization, TransCanada PipeLines Ltd. Moosa Pipeline Project. Golder Associates Ltd. Report No. 022-7001: 21p. + 3 app.

2002. Boulder Creek Pipeline Crossing Request for DFO Authorization, TransCanada PipeLines Ltd. Cutbank Extension. Golder Associates Ltd. Report No. 012-2366/1000: 22p. + 4 app.

2001. Jasper transmission relocation – sediment monitoring at a pipeline crossing on a side channel of the Rocky River. Prepared for ATCO Pipelines. RL&L Report No. 877C-D: 17p. + 2 app.

2000. Fisheries assessment at a proposed pipeline crossing on the Pembina River. Prepared for ATCO Pipelines. RL&L Report No. 896D: 14 p. + 2 app.

2000. Fisheries assessment at proposed pipeline crossing on the McLeod River. Prepared for ATCO Pipelines. RL&L Report No. 896D: 14 p. + 2 app.

2000. Mountain whitefish spawning survey at the new Highway 43 crossing on the Smoky River. Prepared for Associated Engineering Ltd. RL&L Report No. 904F: 4 p. + 1 app.

2000. Bourque Lake aquatic resources. Draft Report Prepared for Imperial Oil Resources Ltd. RL& L Report No. 764D: 54 p. + 4 App.

1999. Sediment Monitoring at the Smoky River Crossing on the Grande Prairie Mainline Loop. Prepared for NOVA Gas Transmission Ltd. R.L. & L. Report No. 690D:

Patalas, J.W., M. Dunnigan, J. Campbell, J. Earle, and R. Pattenden. 1999. Meliadine West baseline aquatic studies - 1998 data report. Prepared for WMC International Ltd. R.L. & L. Report No. 558-98F: 177 p. + 4 apps.

Campbell, J., J. O'Neil. 1998. Mountain whitefish spawning survey at the NOVA pipeline crossing on the Smoky River. Prepared for NOVA Gas Transmission Ltd. R.L. & L. Report No. 685F: 9 p. + 1 app.

Patalas, J.W., M. Dunnigan, J. Campbell, J. Earle, and A. Andreychuk. 1997. Meliadine West baseline aquatic studies - 1997 data report. Prepared for WMC International Ltd. R.L. & L. Report No. 558: 251 p. + 4 apps.

O'Neil, J., J. Campbell. 1997. The effects of under-ice air gun seismic activity on fish in Sturgeon Lake, Alberta. Prepared for Boyd PetroSearch. R.L. & L. Report No. 618: 23 p. + 1 app.

Campbell, J., C. Mcleod. 1997. Inconnu Survey of the B.C. Liard River Watershed. Prepared for B.C. Ministry of Environment, Lands and Parks, Fisheries Branch, Peace Region. R.L. & L. Report No. 594: 20 p. + 1 app.

Patalas, J.W., J. Campbell, and C. McLeod. 1997. Fisheries inventories of the lower Bow, lower Oldman, and South Saskatchewan rivers, 1995_1996. Prepared for Alberta Environmental Protection, Natural Resources Service, and Fisheries Management Division. R.L. & L. Report No. 516: 90 p. + 3 app.

Jim Campbell

PUBLICATIONS AND REPORTS (continued)

Pattenden, R., J. Campbell. 1994. Bodie Creek Mine Extension Project. Preliminary fisheries assessment, fall 1994. Prep. For Elkview Coal Corporation by R.L. & L. Environmental Services Ltd. No. 414F: 21 p + 1 app.

Campbell, J. 1993. Bodie Creek Mine Extension Project. Preliminary fisheries assessment, fall 1993. Prep. For Elkview Coal Corporation by R.L. & L. Environmental Services Ltd. No. 402F: 23 p + 1 app.

TECHNICAL CONTRIBUTIONS

2004. Fish contaminant study for Treaty 8 First Nation communities in northern Alberta -Data Report-. Prepared for Alberta Treaty 8 Health Authority. Golder Report No. 03-1370-016: 38 p. + 3 app.

2003. Fish overwintering use of the lower Athabasca River 2001 to 2003. Prepared for CEMA Water Working Group. RL&L/Golder Report No. 012-7014: 113 p. + 5 app.

2003. Doris North Project Aquatic Studies 2003. Prepared for Miramar Hope Bay Ltd. RL&L/Golder Report No. 03-1370-007: 72 p. + 4 app.

2003. Winter Zoobenthic Surveys at Grand Rapids, Athabasca River: Assessment of the Effects of Ambient Dissolved Oxygen Conditions. Prepared for Government of Alberta, Environment. Golder Associates Ltd. Report No. 03-1370-006: 46 p. + 4 app.

2002. Effects of Wabamun Plant Cooling Water Discharge on Spawning of Lake Whitefish in Lake Wabamun. Prepared for TransAlta Utilities. Golder Associates Ltd. Report No. 012-7019: 27 p. + 2 app.

2001. Meliadine West baseline aquatic studies: 2000 data report. Prepared for WMC International Ltd. RL&L Report No. 558_00: 65 p. + 4 app.

2000. Grizzly Valley Pipeline Extension Project – Fisheries assessment of proposed stream crossing sites. Prepared for Axys Environmental Consulting Ltd, Calgary, AB. RL&L Report No. 875: 91 p. + 3 app.

2000. Resident fish entrainment information review and analysis. Prepared for the Canadian Columbia River Inter-tribal Fisheries Commission. RL& L Report No. 872D: 52 p.

2000. Fisheries investigation of Two Creek at Highway 43 crossing near Whitecourt - 2000 Data Report. Draft Report Prepared for Elenor Enterprises Ltd. RL&L Report No. 849D 29 p. + 2 app.

2000. Dunvegan Hydroelectric Project- Fish and Habitat Inventory Comprehensive Report (Draft). Prepared for Glacier Power Ltd. RL& L Report No. 809D (2): 123 p + 4 Appendices and Plates.

1998. Post construction fisheries assessment at the Northwestern Utilities Ltd. pipeline crossing on the Smoky River. Prepared for Northwestern Utilities Ltd. R.L. & L. Report No. 661F: 12 p. + 2 app.

1998. Proposed Highway 43 Bridge crossing on the McLeod River-fisheries assessment. Prepared for Terrace Engineering Ltd. R.L. & L. Report No. 674F: 9 p. + 2 app.

1998. Fisheries assessment for the IPL Terrace Phase I Expansion Program. Prepared for TERA Environmental Consultants (Alta.) Ltd. R.L. & L. Report No. 624F: 164 p. + 4 app.

1997. Fisheries Inspection Report for the Canfor Temporary Bridge on the Wapiti River. Prepared for Associated Engineering Ltd. by R. L. & L. Environmental Services Ltd.

1997. Number 12 Mine South - Aquatic Studies, 1996. Prepared for Smoky River Coal Limited, Grande Cache, Alberta by R.L. & L. Environmental Services Ltd.

1996. Fish and Fish Habitat Inventory of the Beaver and La Biche Rivers and Selected Tributaries of the Liard River, B.C. Prepared for Slocan Forest Products, Fort Nelson Division, and Fort Nelson, BC by R.L. & L. Environmental Services Ltd.

1996. Fraser River White Sturgeon Monitoring Program. 1995 Data Report. Prepared for B.C. Ministry of Environment, Lands, and Parks,

Fisheries Branch, Victoria, B.C. by R.L. & L. Environmental Services Ltd.

1996. Berland River Fisheries Assessment. Prepared for Trout Unlimited Canada and Fish and Wildlife Services by R. L. & L. Environmental Services Ltd.

TECHNICAL CONTRIBUTIONS (continued)

1996. Fisheries and fish habitat inventories of the lower Bow lower Oldman, and South Saskatchewan rivers, fall 1995. Prepared for Alberta Environmental Protection, Natural Resources Service, and Fisheries Management Division. R.L. & L. Report No. 478: 71 p. + 3 app. 1995. Carrot Lake Project Aquatic Studies 1995. Prep. For Canamera Geological Ltd., by R. L. & L. Environmental Services Ltd.

1995. Berland River Fisheries Assessment. Prep. For Trout Unlimited Canada and Fish and Wildlife Services by R. L. & L. Environmental Services Ltd.

1995. Columbia Basin Development. Fisheries Inventory Program 1990 to 1994. Prep. For B.C. Hydro, Environmental Affairs, Vancouver, BC by R.L. & L. Environmental Services Ltd.

1994. Status of white sturgeon in the Columbia River, B.C. Prep. For B.C. Hydro, Environmental Affairs, Vancouver, BC by R.L. & L. Environmental Services Ltd.

1994. Rainbow trout spawning in Columbia River, B.C. with emphasis on the Norns Creek area 1990 to 1993. Prep. For B.C. Hydro, Environmental Affairs, Vancouver, BC by R.L. & L. Environmental Services Ltd.

1994. Fisheries Inventory for Swan Hills Whitecourt Integrated Resource Plan Area. Prep. For Alberta Environmental Protection, Resources Information Division.

1994. Investigation of the Walleye Spawning Population in Sylvan Lake, Alberta, 1994. Prep. For Western Walleye Council by R.L. & L. Environmental Services Ltd.

1994. Oldman River Dam Project. Fisheries Evaluation Program, 1994. Annual Report. Prep. For Alberta Public Works, Supply and Services by R.L. & L. Environmental Services Ltd.

1994. High Level Bridge substructure rehabilitation project. Fisheries Impact Assessment. Prep. For Kippen-Gibbs Landscape Architects Ltd. by R.L. & L. Environmental Services Ltd.

1994. Review of fisheries and habitat investigations on Thompson Creek. Prep. For Fording Coal Ltd. by R.L. & L. Environmental Services Ltd.

1994. Athabasca River Fisheries Inventory. Spring 1994. Prep. For Northern River Basins Study by R.L. & L. Environmental Services Ltd.

1994. Bodie Creek Mine Extension Preliminary Fisheries Assessment, spring 1994. Prep. For Elkview Coal Corporation by R.L. & L. Environmental Services Ltd.

1993. Izok Project Aquatic Studies, 1993. Prep. For Metall Mining Corporation by R.L. & L. Environmental Services Ltd.1993. Oldman River Dam Project. Fisheries evaluation Program, 1993. Castle River Annual Report. Prep. For Alberta Public Works, Supply and Services by R.L. & L. Environmental Services Ltd.

1993. Athabasca River Fish and Fish Habitat Inventory. Fall 1993. Prep. For Northern River Basin Study by R.L. & L. Environmental Services Ltd.

1993. An investigation of the walleye population in Sylvan Lake, Alberta (1993). Prep. For Western Walleye Council by R.L. & L. Environmental Services Ltd.

1992. Oldman River Dam Project. Fisheries Evaluation Program, 1992. Crowsnest River. Annual Report. Prep. For Alberta Public

Works, Supply and Services by R.L. & L. Environmental Services Ltd.

1992. Biophysical inventory of critical overwintering areas - Peace River. Prep. For Northern River Basins Study by R.L. & L. Environmental Services Ltd.

1992. Oldman River Dam Project. Fisheries Evaluation Program, 1992. Castle River. Annual Report. Prep. For Alberta Public Works, Supply and Services by R.L. & L. Environmental Services Ltd.

1992. Wildhay River sportfishery improvement study. Prep. For Alberta Fish and Wildlife Division by R.L. & L. Environmental Services Ltd.

Tanis Lynne Dirks, B.Sc.

Education B.Sc. (Honours), Biology, University of Saskatchewan, 1993.

Experience

2004 **Golder Associates Ltd.** **Victoria, British Columbia**
Environmental Scientist
Responsibilities comprise working with the Cultural Resources Group in all aspects of Coastal First Nations work, including incorporating traditional ecological knowledge into environmental assessments and ecological risk assessments and developing and reviewing capacity building training manuals and programs. Providing support to First Nations interested in developing 100% aboriginal owned consulting companies.

1995 to 2003 *Aquatic Biologist/Project Coordinator/Assistant Project Manager* **Calgary, Alberta**
Responsibilities include fisheries and fish habitat investigations, suspended sediment monitoring for pipeline water crossings and post-construction impact assessments of road and pipeline water crossings. Further responsibilities include technical support, field crew coordination, overall project coordination and report preparation for baseline studies, environmental impact assessments and monitoring projects in the forestry and oil sands industries. Assistant project manager for follow-up work associated with oil sands environment impact assessments.

1995 **University of Calgary** **Calgary, Alberta**
Research Assistant
Conducted bird surveys, wildlife observations and terrestrial habitat assessments.

1994 **Canadian Wildlife Service** **Saskatoon, Saskatchewan**
Wildlife Technician
Provided support with waterfowl inventory data entry and analysis.

1992-1993 **University of Saskatchewan** **Saskatoon, Saskatchewan**
Research Assistant
Responsibilities included intensive waterfowl nest surveys, waterfowl capture, banding and population censuses.

Tanis Lynne Dirks

PROJECT EXPERIENCE

Tlielang Tribal Park and Campground **Haida Gwaii, BC**

Currently assisting Haida Environmental Ltd. in preparing a screening level environmental assessment for the Tlielang tribal park and campground. This site was formerly an important Haida village and remains an important Haida site for ceremonial, cultural, subsistence and recreational purposes. Accordingly, the EA requires us to document and integrate a substantial amount of TEK to complement the western scientific data.

Tlielang (Hiellen) EA and PT Training Program **Haida Gwaii, BC**

Currently helping to prepare a ten day training course combining Elders and biologists' teachings with young adults in the context of an environmental assessment in a tribal park and campground. There is a parks and tourism component as part of the training program where students will develop the beginnings of a interpretive trail. Currently assisting in writing and editing several chapters of both the EA and parks and tourism training program.

University of Northern British Columbia **Prince George, BC**

Assisted in data analysis and writing of the traditional ecological knowledge sections that were incorporated into the draft ecological risk assessment framework report.

Aquatic Techniques Workshops **Kananaskis, Alberta**

Developed and delivered two training modules with manuals ("Introduction to GPS" and "Good Field Record Keeping Practices") to aquatic field personnel during internal training workshops in Kananaskis, Alberta.

OPTI Canada Inc. **Anzac, Alberta**

Worked with several environmental discipline experts and GIS analysts within Golder to coordinate and develop an environmental constraint map for the OPTI Long Lake steam assisted gravity drainage oil sands project. Constraint mapping relates areas of environmental and cultural sensitivity and constraints to surface development, which can be displayed on a digital map using GIS software. A constraints map is a tool used to find the best areas for development so that areas with high environmental importance can be avoided if possible.

Assisted with the development and coordination of a Constraint Mapping Process Workshop for regulators and stakeholders in the oil sands industry. Helped to facilitate the workshop.

Petro-Canada Oil and Gas **Fort McMurray, Alberta**

Project Coordinator for the Meadow Creek Environmental Impact Assessment. The Meadow Creek project was a multi-environmental assessment for a steam assisted gravity drainage oil sands project, done in support of an application to the Alberta Energy and Utilities Board and Alberta Environment. Responsibilities included invoicing, budget tracking and compiling progress reports. Assisted with project management including client communication and interaction with project team leaders. Coordinated the document completion process for the seven volume report. Participated in editing and managed aspects of the final printing of the document. The EIA was submitted to regulators in late 2001.

Assistant project manager/coordinator for the completion of supplemental responses to the Meadow Creek Project and other additional follow-up work.

Environmental hearing coordinator for the public hearing of the Meadow Creek application scheduled by the Alberta Energy and Utilities Board.

PROJECT EXPERIENCE (continued)

Shell Canada Limited **Caroline, Alberta**
Project manager for a small, yearly water quality monitoring program that involves six lakes in the vicinity of the Shell Caroline Gas Plant. Duties include: client communication, managing and conducting field work, data analysis and report writing.

OPTI Canada Inc. **Anzac, Alberta**
Quality Assurance/Quality Control component leader. Assisted with project coordination and report preparation for the Long Lake Environmental Impact Assessment. Assistant project manager for the completion of supplemental responses to the Long Lake Project and other additional ongoing follow-up work.

Oil Sands Regional Aquatics Monitoring Program (RAMP) **Alberta, Canada**
Assisted in water quality and fish habitat assessments and field crew coordination for RAMP. Compiled water quality and fisheries data, and provided support for the water quality and fisheries section for the RAMP report. Completed the Quality Assurance/Quality Control chapter for the 1999, 2000 and 2001 reports.

Suncor Inc., Oil Sands Group **Fort McMurray, Alberta**
Assisted in preparation of the fish impact assessment for the Project Millennium Environmental Impact Assessment.

Suncor Inc., Oil Sands Group **Fort McMurray, Alberta**
Participated in preparation of the Steepbank Mine environmental impact assessment. Specific responsibilities included biomarking, fisheries inventory, data entry and analysis.

Syncrude Canada Ltd. **Fort McMurray, Alberta**
Conducted benthic invertebrate collections, fisheries surveys, water quality assessments, and fisheries data entry and analysis for the Aurora Mine environmental impact assessment.

Shell Canada Limited **Fort McMurray, Alberta**
Prepared sections of the aquatic resources No Net Loss report for the Muskeg River Mine environmental impact assessment. Conducted fisheries surveys, fish habitat mapping and water quality assessments for the Muskeg River Mine Project aquatic baseline. Coordinated and participated in preparation of the aquatic baseline report.

Alliance Pipeline Ltd. **Saskatchewan, Canada**
Perform fisheries and habitat assessments on approximately 140 watercourses for a large scale international pipeline project.

TransCanada Pipelines Ltd. **Calgary, Alberta**
Prepared environmental impact assessments for a 1997-98 Ontario facilities expansion using existing and supplemental information acquired through field reconnaissance and contact through resource managers.

Foothills Pipelines Ltd. **Bone Creek, Saskatchewan**
Conducted redd surveys and suspended sediment monitoring during the pipeline crossing of Bone Creek. Performed reclamation assessment of Bone Creek after installation was complete.

Tanis Lynne Dirks

PROJECT EXPERIENCE (continued)

Weyerhaeuser Canada **Saskatchewan, Canada**
Crew leader responsible for watercourse surveys at road crossing locations and intensive watershed habitat assessments within the Weyerhaeuser Forestry Management Lease Area in northern Saskatchewan.

Diavik Diamond Mines Inc. **NWT, Canada**
Preparation of the terrain and soils, hydrology, wildlife and vegetation chapters of the Diavik Diamond Mines Inc. integrated baseline report.

TransAlta Utilities **Calgary, Alberta**
Assisted in compiling data and report preparation for a risk based assessment of the impact of power plants on Wabamun Lake, Alberta.

Athabasca River Basin Study EEM
Fish Consumption Advisory/Human Health Risk Study **Northern Alberta**
Technical supervisor responsible for co-ordinating field crews and equipment for these large-scale studies which were running concurrently in northern Alberta.

Weyerhaeuser Canada EEM **Grande Prairie, Alberta**
Co-ordinated field crews and equipment for the Weyerhaeuser EEM Cycle II study. Compiled sediment and water quality data and prepared the water and sediment quality section of this report.

Robin Carpenter

Education

1995	Suicide Prevention Workshop, H&SS, Kugluktuk
2000-2001	Natural Resources Technology Program Access Certificate, Aurora College, Inuvik
2001-2003	Natural Resources Technology Program – Diploma, Aurora College, Inuvik

Experience

2004 – present	Office Coordinator, IMG Golder, Inuvik
2003 – 2004	Administrative Assistant, Health and Social Services, Inuvik
2003	Assistant for the Geological Survey Canada on board of an icebreaker in the Beaufort Sea to study the effects of sonar and seismic equipment on marine mammals, Geological Survey Canada, Dartmouth, NS
2003	Herschel Island Territorial Park Ranger, Yukon Territories Government, Herschel Island
2002	Ivvavik National Park Patrol Person, Parks Canada, Inuvik
2001	Assisted with Muskox Surveys, Parks Canada, Inuvik
2000-2001	Receptionist / Finance Assistant, Bob's Welding Ltd., Inuvik
2000	Conducted one on one surveys in peoples homes, Statistics Canada, Inuvik
1999-2000	Waitress, Mackenzie Delta Hotel Group, Inuvik
1998-1999	Post Mistress, Canada Post , Sachs Harbour
1996-1997	Recreation Assistant, Hamlet of Sachs Harbour

Robin Carpenter

Courses

- First Aid/ CPR
- Canadian Firearm Safety Course
- Suicide Prevention Workshop

APPENDIX IV

DETAILED COST ESTIMATE

	Phase I Grise Fiord Fish Assessment Study	Project Director / Sr. Technical Review	Project Manager / Senior Biologist	Fisheries Biologist	Snr. Marine Biologist	IQ Project Manager / Cultural Resource Specialist	Fisheries Biologist / Marine Biologist	Local Co-ordinator (Recommended through HTO, Hamlet)	Drafting / GIS	Report Production/Office Co-ordinator	Total Labour Hours	Total Labour Cost	Disbursements							Total Disbursements	Task Total
		Jim O'Neil	Julia Krizan	Hillary Machtans	Benjamin Wheeler	Natasha Thorpe	Tanis Dirks/Gina Lemieux	TBA - Grise Fiord Resident	TBA	Robin Carpenter			Elders Honoraria (5 Elders @ $40/hr @ 16 hrs)	Local Taxi	Accommodation and Meals ($240/nght per person)	Travel (airfare approximately $5500 rtn.)	Maps, Charts, Air Photos, Mylar, Video Tapes, Film	Gear Rentals (Camera, GIS, etc.)	Report Production (5 copies)		
Task	Task Description	$ 155	$ 116	$ 115	$ 88	$ 97	$ 87	$ 40	$ 78	$ 59											
1000	Project Management	2	16		2	16		2		8	46	$ 4,446								$ -	$ 4,446
2000	Lit Review	2	6	6	4	16	20	4			58	$ 5,500								$ -	$ 5,500
3000	Preliminary Habitat Assessment	2	6	10	14						32	$ 3,388								$ -	$ 3,388
4000	Consultation		4		16	16	2	20	4	10	72	$ 5,300								$ -	$ 5,300
4100	Community Meetings					8					8	$ 776								$ -	$ 776
4200	IQ Interviews and Travel					48	48	36	4	2	138	$ 10,702	3200	100	960	5500	1000	100		$ 10,860	$ 21,562
5000	Phase II WorkPlan Development	2	4		6	4	2				18	$ 1,864								$ -	$ 1,864
6000	Reporting	4	16	8	10	22	14	16	8	10	108	$ 9,482							200	$ 200	$ 9,682
	TOTAL ESTIMATE	12	52	24	52	130	86	78	16	30	480	$ 41,458	$ 3,200	$ 100	$ 960	$ 5,500	$ 1,000	$ 100	$ 200	$ 11,060	$ 52,518

IMG - GOLDER

2003 CHARGEOUT RATES – BY LEVEL			
Class Code	**Category**	**Level**	**Rate**
921	Professional	8	210
922	Professional	7	170
923	Professional	6	149
924	Professional	5	132
925	Professional	4	116
926	Professional	3	100
927	Professional	2	88
928	Professional	1	77
929	Technical	E	99
930	Technical	D	84
931	Technical	C	68
932	Technical	B	59
933	Technical	A	50
934	Drafting		75
940	Secretarial		55
942	Report Reproduction		46
Incidental Expenses	3% of Fees		
Subcontractor / Subconsultant	Cost + 10%		
Disbursements	Cost + 10%		

Staff:

Julia Krizan, Senior Biologist / Office Manager– Level 4 - $116

Peter Krizan, Wildlife Biologist – Level 2 - $88

Shane Goesen, Environmental Technologist – Level C - $68

Robin Carpenter, Office Coordinator – Level B - $59

Mark Robertson, Field Technician – Level B - $59