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Considerations in Developing Oil and Gas Industry Best Practices in the North

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Considerations in Developing Oil and Gas Industry Best Practices in the North

by

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EXECUTIVE SUMMARY

The oil and gas industry's best practices in the North are continually being developed in various ways in accordance with public response and regulator concerns, new standards and guidelines, changes in land use policy, environmental conditions and technological innovation. The primary focus of this report is industry activities associated with exploration and production. A wide variety of factors affect the adoption of these practices, including environmental, social and economic considerations. While government and industry generally oversee the implementation of these practices, the process by which they are developed, accepted and adopted has generally not been well understood by the parties affected. This document reports on the development of best practices in seismic operations, given that seismic operations are seen as a good example of how best practices develop over time.

RÉSUMÉ

Les Pratiques exemplaires de l'industrie pétrolière et gazière dans le Nord font l'objet de mises à jour constantes de diverses façons, par suite d'interventions de la part du public et de réponses aux préoccupations des organismes de réglementation, de l'adoption de nouvelles normes ou lignes directrices, de changements à la politique sur l'utilisation des terres, de l'évolution des conditions environnementales et de l'innovation technologique. Ce rapport vise principalement les activités d'exploration et de production de l'industrie. Il faut prendre en considération une foule de facteurs au moment d'adopter ces pratiques, notamment dans les domaines environnemental, social et économique. Bien que le gouvernement et l'industrie surveillent généralement le développement de ces pratiques, le processus de développement, d'acceptation et d'adoption n'est habituellement pas bien compris par les parties touchées. Le présent document rend compte de l'évolution des pratiques exemplaires en matière d'activités sismiques, étant donné que ces activités sont considérées comme un bon exemple du développement des pratiques exemplaires au fil du temps.

1. INTRODUCTION

The Oil and Gas industry is continually developing best practices in order to address environmental issues and reduce the footprint of development activity on the northern landscape. Such practices may be changed and adjusted in response to public or regulator concern, new standards and guidelines, changes in land use policy, environmental conditions or technological innovation. To date, the development of best practices has focused primarily on industry activities associated with exploration and production. Examples include construction methods and techniques for access roads, seismic lines, well spacing, facility sites and waste disposal options. Some examples of these best practices are available on the Canadian Association of Petroleum Producers (CAPP) website (www.capp.ca), the Canadian Association of Geophysical Contractors (CAGC) website (www.cagc.ca) and other sites.

The adoption of best practices in the North ("north" meaning primarily Canada north of the 60th parallel) needs to take into account a wide variety of factors, including environmental, social and economic considerations. While the development of best practices is generally seen by government and industry as beneficial to the overall management and operation of the industry and protection of the environment, the process by which they are developed, accepted and adopted has generally not been well understood by the parties affected. Also, the extent to which the socio-economic considerations of northern businesses and contractors are included in that process is an area of interest to the industry, regulators and contractors alike.

This document reports on what is taken into consideration in the development and implementation of best practices in this sector of northern Canada's economy. Because seismic operations were seen as a good example of how best practices develop over time, this report focuses on that activity within the oil and gas exploration and development sectors in order to provide an understanding of the process in which seismic exploration best practices are developed.

2. STUDY OBJECTIVES

The primary objective of the study is to produce a report that describes the process and methods by which the development of best practices are put forward for consideration, how they are reviewed and how they are adopted by industry, regulators and contractors in the North. More specifically, the objectives of the study are as follows:

- Review the current literature on oil and gas best practices in the North, including a review of seismic operations and a determination of how methods have changed over time and in response to what drivers. Seismic operations should cover the various operational requirements for 2-D and 3-D seismic and the best management practices associated with each.
- Describe current formal and informal procedures that have been used to develop best practices for the oil and gas industry in the North, including the role of industry, regulators and the public. The role of consultations (regulators, policy makers, industry, Aboriginal governments and organizations, and public) and education is to be outlined using examples where these are available.

- Identify barriers or challenges to the adoption of best practices, including technological, economic and educational constraints of the workforce. The potential impact on the industry is to be evaluated from several perspectives, including the following: the current financial capacity of local businesses and contractors to carry out changes; the extent of adoption by industry in different regions of the North and the reasons for the pattern of industry adoption; economic efficiencies created by adopting new best practices; and possible solutions for overcoming barriers to adoption.
- Recommend ways of introducing sustainable best practices successfully in the North, including raising awareness of issues that best practices seek to address, how best practices should be monitored, and how the monitoring results may, in turn, be used to inform all stakeholders of the effectiveness of new measures and practices.

3. STUDY METHODOLOGY

The study methodology involved a comprehensive review of the literature on oil and gas practices in the North, focusing on seismic operations. The literature review highlighted issues and challenges that best practices are designed to address, identified barriers that have to be overcome, and discovered how the various regulatory regimes and co-management entities are involved in putting forward both prescriptive and non-prescriptive solutions. Examples from other jurisdictions that share characteristics with the northern social, environmental and economic conditions were also reviewed, where available. A selected bibliography is included in Appendix A.

The study also involved a series of interviews with representatives of northern communities affected by seismic operations and representatives of industry and regulatory agencies. In these interviews, we attempted to identify key issues as well as any challenges or barriers to or incentives encouraging the adoption of best practices. The interviews also sought to identify the roles of industry, regulators and the public in initiating, developing and implementing existing and new best practices and how such new measures should be monitored to determine whether or not they were successful in meeting specific objectives. A list of the persons interviewed is included in Appendix B. A copy of the questionnaire used during the interviews is included in Appendix C.

Some of the interviewees preferred that specific comments not be attributed to them. Therefore, most of the comments and opinions expressed by interviewed individuals have not been specifically attributed to them. Some individuals who have already expressed their views publicly in presentations or in articles are cited, where this was deemed helpful.

4. BEST PRACTICES AND SEISMIC EXPLORATION

4.1 BEST PRACTICES

The terms "best practices" (BPs) and "best management practices" (BMPs) appear to be used interchangeably in the literature. Some of those interviewed questioned the use of the term "best practices": Were the standards applied in a given activity indeed the "best" practice? Who determined that a given approach was a "best practice"? Other questions from interviewees were the following: Is "best" the same in all circumstances? Are the criteria specific to the activity? And are the criteria specific to a geographic region? One person preferred to refer to activity standards as "application of the best available technology economically available" (BATEA). However, the best available technology—at least with respect to seismic exploration activity—is not always applied. This is because, although it might be economically available, it would not result in an accepted level of local economic benefits.

We did not provide a definition of the term "best practices". Instead, we let individual interviewees answer the questions according to their concept or understanding of the term. Nonetheless, a useful definition is the following: "… any kind of existing or new practices that will reduce the time, intensity or duration of the footprint or effect on the land base and/or users of that land base." (Simpson, K., 2005) Another definition is provided by the Canadian Association of Petroleum Producers (CAPP), which suggests that "best management practices" are "management practices or techniques recognized to be the most effective and practical means to develop the resource, while minimizing adverse environmental and other negative effects." (Peters, M., 2007) It has also been suggested that "best practices" should include efforts to minimize impact and provide benefits in terms of social and economic opportunities.

There are differing views as to whether the term "best practice" should be limited to a practice that goes beyond what is required of the industry in legislation. An important notion to keep in mind is that this definition is fluid over time. That is, as our knowledge and understanding of the relationship between social norms, activities and the environment change, so too will the dimensions of the ecological footprint, and complementary "Best Practices" change.

4.2 SURVEY OF BEST PRACTICES

Best practices (or best management practices) have been developed in a number of North American jurisdictions for various activities related to oil and gas exploration and development. In addition to best practices for seismic exploration, best practices have been developed for air quality, drilling waste management, drilling pad development, well spacing, road construction, water crossings, winter road construction, wildlife interaction, wetlands, health and safety and many other aspects of the upstream sector of the oil and gas industry. Much more development of best practices has taken place in Canada south of the 60th parallel than in the Canadian North. This is probably because most oil and gas exploration and development have taken place south of the northern Territories and proximity to more populated areas has forced greater attention to industry practices.

Focusing just on seismic exploration activity, one finds that best practices documents have been developed by various government agencies and industry associations for seismic exploration in the Yukon, British Columbia, Alberta, Saskatchewan and Manitoba, and that guidelines have been drafted in the Northwest Territories (see

bibliography). They range from being quite prescriptive in Alberta (Alberta Sustainable Resource Development, 2006) and British Columbia (Oil and Gas Commission, 2007) to being objectives-based in the Yukon (Energy, Mines and Resources, 2006). In Alaska, geophysical exploration permits incorporate seismic practices outlined by the proponent companies. Some of the United States federal agencies with land and resource management responsibilities in Alaska have developed and published documents on best management practices that apply to lands within their jurisdiction in Alaska, as well as elsewhere in the country (BLM, 2007).

In addition to those developed for regional jurisdictions, there are industry-wide best practices for some activities developed by bodies such as CAPP, the Canadian Association of Geophysical Contractors (CAGC) and the Petroleum Technology Alliance of Canada (PTAC). As well, industry groups in Alberta have developed their own best practices to comply with the Energy Utilities Board (EUB), now the Energy Resources Conservation Board (ERCB), as well as guides (Sundre Petroleum Operators Group, 2002). The ERCB is converting guides that contain requirements into directives. However, the literature survey focused mainly on best practices for seismic exploration activities.

4.2.1 SEISMIC EXPLORATION DEFINED

For the benefit of those who may not be familiar with this aspect of the oil and gas industry, seismic exploration is defined in Schlumberger's "Oilfield Glossary" (Schlumberger, undated) as follows:

"Pertaining to waves of elastic energy, such as that transmitted by P-waves and S-waves, in the frequency range of approximately 1 to 100 Hz. Seismic energy is studied by scientists to interpret the composition, fluid content, extent and geometry of rocks in the subsurface." More simply, "Seismic (or geophysical) exploration is used to identify and map oil and gas geological structures prior to drilling. The technique is based on analyzing how sound waves are reflected from subsurface structures." (EMR, 2006)

In the same Schlumberger source, two-dimensional or 2-D seismic exploration data acquisition is defined as follows:

"A group of 2D seismic lines acquired individually, as opposed to the multiple closely spaced lines acquired together that constitute 3D seismic data." Or, "2D seismic lines are single lines of regularly spaced geophone stations (e.g., every 20 metres). Energy source points are established along the line typically at every 3rd or 4th station. The same line contains recording cables and geophones as well as source points." This information is taken from the undated "Seismic Information Pamphlet (Saskatchewan)" and is endorsed by CAPP, CAGC and the Small Explorers and Producers Association of Canada (SEPAC).

Also in the Schlumberger "Oilfield Glossary", three-dimensional or 3-D seismic exploration is defined as from:

"A set of numerous closely-spaced seismic lines that provide a high spatially sampled measure of subsurface reflectivity. Typical receiver line spacing can range from 300 m [1,000 ft] to over 600 m [2,000 ft], and typical distances between shotpoints and receiver groups is 25 m [82 ft] (offshore and internationally) and 110 ft or 220 ft [34 to 67 m] (onshore USA, using values that are even factors of the 5,280 feet in a mile). Bin sizes are commonly 25 m, 110 ft or 220 ft. The resultant data set can be "cut" in any direction but still display a well sampled seismic section. The original seismic lines are called in-lines. Lines displayed perpendicular to in-lines are called crosslines.

In a properly migrated 3D seismic data set, events are placed in their proper vertical and horizontal positions, providing more accurate subsurface maps than can be constructed on the basis of more widely spaced 2D seismic lines, between which significant interpolation might be necessary. In particular, 3D seismic data provide detailed information about fault distribution and subsurface structures. Computer-based interpretation and display of 3D seismic data allow for more thorough analysis than 2D seismic data."

As the definitions above indicate, the operational requirements of 2D and 3D seismic are substantially different. While both operations will require the establishment of lines along which to conduct the seismic activity, the 2D process will require longer, often many kilometres long, lines. The 2D lines generally will also be straight and need not be a particular pattern; they may run in parallel or at varying angles from adjacent 2D lines. They will also generally have to be wider to accommodate both the geophones and establishment of energy source points.

Lines for a 3D seismic operation are generally laid out in a uniform and evenly spaced grid over a relatively small area. Receiver lines containing the geophones or recording devices usually, though not necessarily always, run at right angles to the source lines. While the spacing of receiver lines and source lines may vary, 400 m separations are common. However, for shallower targets, the line separation is reduced to as little as 40 to 60 metres (M. Doyle, 2007). Energy source points occur approximately every 40 to 50 m along the source lines. For both 2D and 3D operations the energy sources may be either a small dynamite charge in a shot hole, drilled to depths of up to 20 m, or vibrations generated from a series of "vibroseis" vehicles, or "mini-vibes". Vibroseis relies on several vibrator units mounted on tracked vehicles or trucks. When the seismic line is to be vibrated, these units lower their pads and simultaneously vibrate the ground for a few seconds at each source point location. (CAPP et al, undated brochure) Use of heli-portable drills in conjunction with quads or four-wheelers and snow machines that require narrower lines has resulted in a reduced footprint of seismic operations in some remote areas.

4.3 PROGRESSION OF SEISMIC EXPLORATION BEST PRACTICES

Much of the focus in the progression of seismic exploration best practices has been on the reduction of the footprint of the seismic lines themselves. Documentation used to demonstrate the reduction of line widths is often dramatic, showing aerial photographs of seismic lines in boreal forests or on arctic tundra of wide seismic lines from the 1970s, created with multiple passes of bulldozers with blades down (The Pembina Institute, 2006; Schmidt, D., 2004). Earlier practices resulted in both physical terrain and soil/vegetation disturbances that together have delayed the time period for recovery. In contrast, current practices are frequently represented with an image of an all-terrain vehicle parked sideways in a meandering seismic line in the boreal forest, demonstrating how relatively narrow the lines now are (Scott, I., 2005). There has been improvement in seismic practices and not just with respect to footprint.

4.3.1 SEISMIC LINE WIDTH

Focusing on seismic line width to begin with, the changes have been well-described in CAPP's (2004) comprehensive document entitled, "Evolving Approaches to Minimize the Footprint of the Canadian Oil and Natural Gas Industry", or Doug Schmidt's article "The Evolution of Seismic Line Clearing" in The Source (2004). In northern Alberta it was recognized that the cutting of seismic lines was having a significant impact on existing or potential timber resources. The Alberta government became involved, creating a financial structure that offered an incentive for the narrowing of seismic lines, that being reduction of the Timber Damage Assessment (TDA) of 50% as a rebate. This incentive was sufficient to lead to a reduction of seismic line widths from 7 or 8 metres to as little as 2.5 metres for source lines and 1.75 metres for receiver lines (M. Doyle, pers. comm. 2008). Further, this led to the development and use of mulchers with 2.5 and 1.75-metre cutting heads, mulchers being used for clearing vegetation on lines. (Schmidt, 2004)

4.3.2 2D VS 3D SEISMIC LINE WIDTH

The oil and gas industry, represented by CAPP, CAGC and SEPAC, worked with Alberta Sustainable Resource Development to develop an acceptable set of standardized widths of seismic lines reflecting both health and safety needs and environmental concerns, as well as the width/space requirements of the equipment used to conduct seismic activity. This has resulted in the "Geophysical Field Report" (GFR) (Alberta Sustainable Resources Development, 2006) objective of creating "a maximum LIS [Low Impact Seismic] width standard for 2D and 3D seismic programs within the province." For "2D Explosive (mulch)" the line would be equal to or less than 4.0 m in width; for "2D Non-Explosive" the line would be equal to or less than 4.5 m in width. For "3D Explosive Programs", the line widths vary, depending on the nature of the intensity of the program, from receiver lines of a maximum 2.0 m width for intensive LIS programs to lines of a maximum 3.5 m width for non-intensive LIS Programs. Source lines, respectively for similar programs, vary from a maximum of 3.0 m width to 4.5 m. For "3D Non-Explosive Programs" the receiver lines may not be wider than 2.0 m, while the source lines may range from no more than 3.0 m to no more than 4.5 m in width. In Saskatchewan, regulators typically limit industry to 2.2 m wide source lines in the southern part of the province. In northern Saskatchewan, greater line widths are allowed given remoteness, safety concerns and the lack of existing infrastructure. The NWT has considered 2.5 m maximum width; however, this has not always been practical (M. Doyle, 2007). In British Columbia, the Oil and Gas Commission's (OGC) "Geophysical Manual" suggests that for a "Minimum Impact Line" "very little vegetation is to be cut …", while for LIS lines the "widths typically range from 1.5 to 5.5" m. A conventional or straight seismic line that is mechanically cut may range up to 7.0 m in width (OGC, 2007).

4.3.3 NORTHERN SEISMIC LINE WIDTHS

The NWT is considering guidelines for seismic exploration. These proposed guidelines are causing concern in industry—for safety and other reasons—as to how narrow the maximum width may be (Doyle, M., 2007) and for at least one politician in the NWT Legislative Assembly as to how wide—double the 2.5 m figure—they may be (B. Bromley, Hansard, 2008). The NWT Department of Industry, Tourism and Investment (ITI) is closely monitoring "plans by government agencies to develop guidelines to reduce the width of seismic cut lines" (ITI, 2008). As presented at the Best Practices for Oil and Gas Development in the North Symposium in Inuvik, NT in October 2007, the Government of the Northwest Territories, together with Indian and Northern Affairs Canada

and Environment Canada, is preparing "NWT Guidelines for Seismic Operations" (Krizan, J. 2007). These guidelines are still in draft form and not available; so it is not yet possible to confirm, for example, how the width of seismic lines might be detemined, nor whether the guidleines will be goal driven rather than prescriptive.

In the Yukon, the Energy, Mines and Resources Department's document "Seismic Exploration" (EMR, 2006) does not specify what the maximum width shall be. These best management practices emphasize what the objectives of implementing best management practices for ground-based seismic exploration in the Yukon are. The document does go on to suggest that, while traditionally 2D lines were up to 6 m to 8 m wide, low impact seismic maximum widths are typically less than 5.5 m, with 3D receiver lines being 1.7 m wide and source lines between 2.5 m and 5.5 m wide. New technology for shot hole drilling may lead to 1.5 m wide source lines (Wortley, D. and Corbett, R. 2007).

In Alaska, Geophysical Exploration Permits are issued by the State for 2D seismic programs that have lines up to 14 feet (approximately 4 m) in width in forested areas (Rader, 2004). Little other information was available.

4.3.4 OTHER SEISMIC ACTIVITY CONSIDERATIONS

Reduction of the footprint of the oil and gas industry's exploration and development activities through narrowing of seismic lines is but one aspect of best practices associated with this activity. In Alberta, the GFR also requires consideration of ownership of land, leases, registered traplines, timber allocations, cultural sites, areas of special concern, Caribou Protection Guidelines, Critical Wildlife Zones and key ungulate winter ranges as well as other ungulates such as sheep and goats. Seismic activity is also limited with respect to timing in Trumpeter Swan habitat. The activity is further constrained by aquatic buffers, riparian area buffers and wildlife and wildlife corridor buffers, all of which have to be observed. Since the overall objective is to reduce the footprint on the landscape, "[i]n site-specific instances, an existing straight line may be favourable for reuse and in other instances it may not be." The GFR then cites a list of criteria that have to be considered (Alberta Sustainable Resource Development, 2006).

4.3.5 OTHER SEISMIC TECHNIQUES

RIn addition to achieving a reduced footprint through line width reduction, the effects of low impact seismic may be further lessened through the use of the following:

- Low ground pressure vehicles, particularly on the tundra;
- Mushroom caps or blade covers on dozer blades;
- Washing of vehicles to prevent the introduction of invasive species;
- Meandering (3D) lines or doglegs in access roads;
- Plugging of shot holes; and
- The use of helicopters either to assist the seismic activity during the recording phase or to deploy equipment and personnel.

Further, hand-cutting of lines not only results in a narrower line, it can help reduce other impacts. These various types of practices reflect the fact that there is a need for adaptability in applying different techniques and methods in response to varying terrain conditions.

An extensive list of these and other best practices can be found in the Yukon's Seismic Exploration Best Management Practices document already mentioned (EMR, 2006). To the extent that interviewees were familiar with best practices in northern Canada, they were generally supported.

It is also acknowledged that there is still a legacy of disturbance in the northern tundra landscape from earlier seismic exploration practices. Their presence may have provided, at least in part, the incentive to improve practices, resulting in current best practices.

4.3.6 SEISMIC BEST PRACTICES DEVELOPMENT IN NORTHERN CANADA

The foregoing demonstrates that while the development of best practices with respect to seismic activity, as well as other aspects of oil and gas exploration and development, has advanced significantly in the northern portions of most of the western provinces and Alberta, in particular, this has not uniformly been the experience in Canada north of 60. The Yukon has made substantial progress in developing best management practices by publishing three guidance documents (Oil and Gas Best Management Practices – Seismic Exploration; Oil and Gas Best Management Practices – Winter Tourism; Oil and Gas Best Management Practices – Historic Resources) for the industry and as references for stakeholders, as well as brochures on each BMP for general information. As indicated, work is currently under way in the Northwest Territories to develop guidelines for seismic exploration. We were unable to determine whether any such best practices were being considered in Nunavut, but there is currently no oil and gas exploration occurring in that Territory, although exploratory permits issued under the Canada Oil and Gas Regulations exist onshore and offshore adjacent to Southampton Island. As well, Significant Discovery Licences exist for holdings on Melville, Parry and Sverdrup Islands (Indian and Northern Affairs Canada, 2008).

While no current best practices have been developed for seismic exploration in the NWT, an earlier 1988 INAC document entitled Environmental Guidelines, Northern Seismic Operations has been available for reference. Additionally, there is a draft Reference Bulletin entitled Preliminary Screening of Seismic Operations in the Mackenzie Valley prepared for the Mackenzie Valley Environmental Impact Review Board (MVEIRB, 2003). It contains a section on "Land Based Seismic Techniques" that "lists and briefly explains currently available best practices for seismic operations …" intended "to provide the screener with a quick overview of available techniques." Another section "provides a generic cost-benefit analysis of various seismic techniques, comparing cost, environmental impact, and benefits to local communities." As well, The Pembina Institute has produced an educational "Environment and Energy in the North Primer Series" that includes among its six volumes one entitled: Seismic Exploration. It contains a section with the heading "Using the Best Practices Available." (Severson-Baker, C., 2004) The Best Practices section is intended to acquaint northerners with various ways of reducing the impact of seismic activity.

Also, while some interviewees felt that they did not technically qualify as best practices—if one means by that term practices that go beyond what is required by regulatory permits—the conditions that Indian and Northern Affairs Canada's (INAC) land use officers attach to land use permits issued under the Territorial Lands Act in the Northwest Territories require a response that might elsewhere (Alaska, for instance) be equated with "best practices." These conditions have to do with stream crossings, depth of snow before travel is permitted on the tundra, and so on. With respect to stream crossings specifically, INAC staff conducted a study of these and presented the study results at the Best Practices for Oil and Gas Development in the North Symposium in Inuvik in 2007 (Jenkins, R.,

2007). INAC's Inuvik Region staff have also prepared presentations on best practices that, while not in the form of guidelines, are seen as having a positive influence.

Further, while not an example of seismic best practices development, another example of how best practices can develop was provided by the Environmental Studies Research Fund (ESRF). Its document "Drilling Waste Management Recommended Best Practices" was published in March 2004. The "Background" to this document states the following:

> "Representatives from the Inuvialuit Joint Secretariat, Inuvialuit Game Council, Inuvialuit Lands Administration, Department of Indian Affairs and Northern Development, Environment Canada, and the energy industry joined forces to develop and make available a set of 'best recommended practices' for the management and disposal of drilling waste."

As well, the Government of the Northwest Territories is considering producing best management practice guidance documents for management of camp waste and management of refined petroleum products (Paget, T. and S. Toogood, 2007; Toogood, S. and T. Paget, 2007).

5. PROCESSES FOR ESTABLISHING BEST PRACTICES

The literature search produced little in the way of documentation on the procedures followed for initiating, developing and implementing best practices in the North. However, some knowledge of the procedures came from the interviews.

5.1 PROCESSES AND ROLES

There was no consensus among those interviewed as to whether there were both formal and informal procedures for establishing best practices. Most of the interviewees felt that some aspects of the procedures were formal and some informal. A few felt that they were mainly informal, while another few felt they were formal procedures. The views seemed to depend on the level of experience with the development of best practices. None could identify any documentation on formal procedures for initiating, developing and implementing best practices. In the absence of formalized procedures, one interviewee suggested following the procedures established by the Canadian Standards Association for developing new standards (CSA, 2009). CAPP conducted a study of evolving practices that may be adopted by its members and which may develop into best practices (CAPP, 2004). The procedures followed by CAPP's consultants when they conducted this study may also serve as a procedural model.

Several interviewees suggested that the current environmental and socio-economic assessment process in place in two of the northern territories was a means of formalizing at least some aspects of the implementation of best practices. For example, the Environmental Impact Assessment Process, established under the Inuvialuit Final Agreement (IFA), requires that all development in the Inuvialuit Settlement Region (ISR) of the Northwest Territories and the Yukon North Slope be screened for potential environmental impacts. Development proponents submit project

descriptions to the Environmental Impact Screening Committee (EISC) for screening. In their project submissions, proponent oil and gas exploration companies outline the steps—which may be defined as best practices—that they will take to minimize potential environmental effects. The EISC has the authority to recommend the inclusion of these best practices or other actions by the exploration companies in the authorizations or permits necessary to allow the exploration program to proceed. When these recommendations are included in the authorizations, they become conditions that are enforceable. Thus there is in the EISC process a formalized means of acknowledging, implementing, monitoring and enforcing best practices. The Environmental Impact Review Board (EIRB), also established under the IFA, may also issue such recommendations.

There is a similar situation with the Mackenzie Valley Environmental Impact Review Board (MVEIRB) established under the Mackenzie Valley Resource Management Act, which applies in the Northwest Territories outside of the ISR. The MVEIRB conducts screenings or reviews of proposed oil and gas exploration projects. At the conclusion of a screening or review, the Board may make recommendations as to how the project is to be carried out to reduce potentially negative environmental effects. Some interviewees felt that such recommendations might be considered best practices which, if included as conditions of permits authorizing the exploration work to proceed, would be subject to implementation, monitoring and enforcement.

In the Yukon Territory, the Yukon Environmental and Socio-economic Act (YESAA) established the Yukon Environmental and Socio-economic Assessment Board (YESAB). The Board fulfils its responsibilities through designated offices in six Yukon communities, each with its own region, as well as through the YESAB Executive Committee. Evaluations of oil and gas exploration projects at the designated office level, or screenings and reviews at the Board level, may also result in recommendations being made to one or more decision body (an agency of government responsible for issuing the authorizations necessary for the proposed project to proceed or a First Nation where a project is located on settlement lands). In the case of YESAA considerations of projects, both environmental and socio economic impacts must be addressed and recommendations to a decision body may include both. In the Yukon then, it is possible that improved ways of carrying out an exploration project (best practices) may be recommended for both environmental and socio-economic aspects of a project. If accepted by the decision body, such recommendations could become enforceable conditions of permits.

In each of the three screening and review process examples given above, the decision bodies or resource management agencies responsible for issuing the authorizations that may allow the exploration project to proceed may only include as conditions those recommendations that lie within their legislated mandates. For example, Indian and Northern Affairs Canada cannot include socio-economic conditions in its land use permits since its legislation does not provide for this. However, the National Energy Board (NEB), if the proponent of an exploration project that requires an NEB authorization agrees to include recommendations from a screening and review process in its work plan, will include the work plan in its authorization and it then becomes subject to monitoring and enforcement by NEB inspectors. The NEB expects companies to be in compliance with the applicable conditions (Romanchuk, P., 2007).

Another aspect of the discussion on formal versus informal procedures for establishing best practices was that the interviewees also had varying views on whether or not best practices were voluntary or mandatory. As indicated,

if best practices are written into or included in a permit as a condition, while perhaps initially agreed to by the proponent on a voluntary basis, such best practices then become mandatory and enforceable.

Interviewees were also not in agreement on whether or not best practices were monitored. However, as indicated above, when couched within an authorization, the best practice is at least monitored to ensure compliance (Measor, S., 2007)

5.1.1 INITIATION OF BEST PRACTICES

The interviewees had various opinions in regard to initiating the process. Some were of the view that best practices were initiated mainly by the industry sector. They believed that larger companies operating in the North, and with the prospect of developing petroleum resources in the North over a long period of time, wanted to be well-received by northern residents. So it was seen as in those companies' best interest to initiate, develop and adopt better practices in all aspects of their activities. Another view was that when industry discovered a better (i.e., more efficient and cost effective) way of carrying out an activity, such as seismic exploration, then that better practice was initiated and developed. Once one company adopted a higher standard of performance or an improved practice, then other companies were "obliged" to come up to that level. This occurred either because of community pressure or because of cost effectiveness. Some interviewees suggested companies had to initiate and adopt best practices in order to obtain their "social licence to operate," i.e., community support for their program.

Others were of the opinion that when Aboriginal residents of an area where oil or gas exploration was taking place complained about a particular practice, or were opposed to the activity in the first place, that companies took pains to conduct the activity in such a way as to alleviate the concern and reduce opposition to the project. Still others thought that government, either on its own or because of concern expressed to it by the public or environmental organizations, encouraged industry to improve its practices. In these respondents' views, the initiation of the best practice was informal, resulting from objection to the way that the exploration activity was being carried out. In some instances, the way in which the change in practice was initiated was more formalized, perhaps with draft best practices being made available for comment or discussed in workshop settings before being adopted by industry. Few of those interviewed thought that environmental non-governmental organizations had had much influence in the initiation of changes to best practices.

An example of a more structured process for developing seismic guidelines, which presumably will ultimately meet the definition of best practices provided above, is the process used to develop the NWT Guidelines for Seismic Operations. This entails a seven step process, as shown in the following table:

TABLE 1. NWT SEISMIC OPERATIONS GUIDELINE DEVELOPMENT PROCESS

NWT Seismic Operations Guideline Development Process	
Step 1	Collect information on existing guidelines and best management practices from other jurisdictions.
Step 2	Establish list of valued ecosystem components (VECs) for regionally diverse ecosystems in the NWT.
Step 3	Determine potential impact of seismic activities on NWT VECs.
Step 4	Determine applicability of existing guidelines to diverse northern ecosystems.
Step 5	Identify and describe state of the art seismic technology.
Step 6	Consult regularly and efficiently with regulatory agencies and industry throughout the development process.
Step 7	Organize and facilitate workshops for regulatory agencies, industry and communities to provide input into guidelines.

The above process was presented at the Inuvik Symposium on Best Practices for Oil and Gas Development in the North (Krizan, J., 2007)

Another approach is outlined in CAPP's 2004 paper referred to above. It undertook "to identify new and evolving "innovative" practices and technologies that reduce the 'footprint' of oil and gas activities in forested regions of western Canada." The report outlines its objective and lays out the process for establishing "a set of tools that CAPP companies can apply to minimize both project-specific impacts and regional cumulative effects."

The methodology taken from the CAPP study is shown in the following table.

TABLE 2. CAPP STUDY METHODOLOGY

CAPP Study Methodology	
Literature Review	Identify relevant literature sources developed by international oil and gas enterprises, governments, regulators and international development agencies to identify practices relevant to Canada.
Initial Survey	An initial survey of 300 CAPP companies.
Follow-up Survey	A detailed structured survey of respondents identified in the initial survey.
Government and Regulatory Interviews	Telephone interviews with representatives of select government agencies and environmental groups in Western Canada to identify innovative operational and project planning practices, and evaluate them.
Assessment	Innovative practices identified in the survey and interviews were then catalogued and assessed.
Case Studies	A number of evolving techniques or approaches to minimizing footprint were identified and documented as case studies.
Publication Stage	CSA staff conduct a final edit to verify conformity with the applicable editorial and procedural requirements and then publishes and disseminates the standard.
Maintenance Stage	The standard is maintained with the objective of keeping it up to date and technically valid. This may include the publication of amendments, the interpretation of a standard or clause, and the systematic review of all standards.

This CAPP approach includes components of the NWT Seismic Guidelines process.

As indicated above, one interviewer who had experience with the process used by the Canadian Standards Association to develop new standards suggested that this process be followed. Its standards development process is well developed and formally documented and controlled. This process includes eight distinct stages as set out in the following table:

TABLE 3. CSA STANDARDS DEVELOPMENT PROCESS

CSA Standards Development Process	
Preliminary Stage	On receipt of a request for the development of a standard, an evaluation is conducted and the project is submitted for authorization.
Proposal Stage	Public notice of intent to proceed is published and a technical committee is set up or the project is assigned to an existing technical committee.
Preparatory Stage	A working draft is prepared and a project schedule is established.
Committee Stage	The technical committee or technical subcommittee—facilitated by CSA staff—develops the draft through an iterative process that typically involves a number of committee meetings.
Enquiry Stage	The draft is offered to the public for review and comment, the technical committee reaches a consensus, CSA staff conduct a quality review, and a pre-approval edit is completed.
Approval Stage	The technical committee approves the technical content by letter ballot or recorded vote. A second level review verifies that standards development procedures were followed.
Publication Stage	CSA staff conduct a final edit to verify conformity with the applicable editorial and procedural requirements and then publishes and disseminates the standard.
Maintenance Stage	The standard is maintained with the objective of keeping it up to date and technically valid. This may include the publication of amendments, the interpretation of a standard or clause, and the systematic review of all standards.

In this process, anyone can suggest the need for a new standard. The CSA process seeks to balance vested interests, with the technical committee functioning as a neutral third party providing form and structure for developing the standard.

The above process would address a suggestion put forward by a couple of interviewees that the process of going from initiation to implementation and monitoring of best practices should be removed from a process where the best practice may result from recommendations arising from an environmental screening or review of an individual oil or gas exploration project. The suggestion was that an identified need should be addressed in the independent and impartial manner that the CSA process appears on the surface to be.

Of these three approaches, only the first appears to involve consultations with the wider community.

5.1.2 IMPLEMENTATION OF BEST PRACTICES IN THE NORTH

The introduction of best practices to a region such as the North may also come about because of a company's experience in another region of the country or in another country. A company that has been operating in northern Alberta using a particular standard may well apply that standard of practice to its operation in northern Canada. The use of low ground pressure vehicles was tested on a seismic operation in the Mackenzie Delta region because these types of vehicles had been used on the Alaska North Slope to good effect, reducing potential impact on the tundra (Callow, L., 2004). Companies also learn from the experience of other companies operating in the same area. Within international companies, information is exchanged—formally and informally—in regard to the best practice for a particular activity in a similar, i.e., northern, region. Successful application of sound practice in one portion of the circumpolar north, Russia, for example, may end up being applied by that same company in northern Canada (L. Callow, pers. comm., 2008). However, it should be acknowledged that sound practices in one northern country or region may not be directly applicable to another, given differences in geology, permafrost, soil, vegetation, and local climate and weather conditions.

The rationale for adopting a new best practice will vary from practice to practice and from company to company. As indicated elsewhere in this report, a company may decide to use a less environmentally disturbing practice because of objections from local residents to the way things have been done in the past. A new best practice, such as using low ground pressure vehicles, may mean that work can begin sooner, before the usually required depth of snow cover has been attained, thus ensuring project completion. This may mean that efficient use of time has resulted in cost savings, as well as less impact on the tundra environment, a desirable outcome in its own right that results in positive public relations for that company. A best practice may be adopted by other companies in a given region because one company decides for its own reasons to move to a better operating practice, thus creating subtle pressure for other companies to do the same.

The process by which the Recommended Best Practices for Drilling Waste Management (ESRF, 2004) came about may serve as a useful example. When natural gas exploration resumed in the Mackenzie Delta in the late 1990s and early 2000, the Inuvialuit voiced their concern over the continued practice of using sumps for the disposal of drilling wastes. This concern was based on observations of sumps from the 1970s that had failed or appeared to have failed to contain the waste deposited in them. Dead vegetation was observed in the immediate vicinity of some sumps and in some instances water was ponding on the surfaces of collapsing sumps. When drilling projects were screened by the Environmental Impact Screening Committee (EISC), opposition to the use of sumps was voiced by community members. The EISC visited the Alaska North Slope and learned that sumps (called reserve pits in Alaska) were no longer being used there; rather, drilling waste was being disposed of by downhole injection. Also at about the same time, the Inuvialuit Game Council expressed its opposition to the continued use of sumps, following research projects that showed a large percentage of the old sumps in the Delta were experiencing some level of failure.

The ESRF initiated a review of drilling waste disposal options and set up a committee to oversee the review, as mentioned above. A workshop on drilling waste management was held in Inuvik, NWT with attendance by representatives from industry, the Inuvialuit and co-management bodies, First Nations, and government agencies. At the workshop, the various methods of dealing with drilling waste were discussed and examples from other jurisdictions were provided. Breakout groups discussed individual options and reported back to the larger session. Workshop participants were able to vote electronically on the issues related to drilling waste and on preferred options during the plenary session. Subsequently, the ESRF produced the report referred to in this study. Since

then, at the Joint Review Panel hearings into the Mackenzie Gas Project, several of the producers have stated that they intend to dispose of drilling wastes by means other than the use of sumps. Some pointed out that sumps are usually used during exploration. Once production begins and the field and its geology are better known, down-hole injection of drilling waste is more likely to be used.

In this example, what began as an informal process of local people objecting to a practice resulted in a formalized method of investigating the alternatives and developing a "recommended best practice." The public, industry, Inuvialuit and regulators all played a role.

5.1.3 ROLE OF RESEARCH

The implementation of a new best practice, however, appears to stem from the results of research having been conducted into an issue or problem of concern, whether of concern to industry representatives, government regulator or member of the public. In the case of the research into the use of Rollagons in the Mackenzie Delta, it was conducted because of concern for the impact of natural gas exploration activity on the tundra and vegetative cover and inadequate snowcover to permit the use of conventional tracked vehicles to carry out the exploration activity (Callow, L., 2004). The research into the status of drilling waste sumps was prompted by the concerns of Inuvialuit users of the land who noticed changes in the vegetation in the sumps' vicinity, and by the observations of land use inspectors. A variety of research has been conducted into how the impacts of seismic lines can be reduced, whether in terms of the use of such lines as travel corridors for predators of ungulates, or into how quickly such lines can return to their predisturbance vegetative state. Similar research has been conducted into wellsite construction to speed vegetative recovery once the site is no longer used.

The results of such research can provide the information needed to develop a best practice to address the identified issue or concern. One organization that fosters research and the implementation of positive results in the upstream hydrocarbon industry is the Petroleum Technology Alliance Canada (PTAC). It oversees the Environmental Research Advisory Council (ERAC) fund and in addition to reviewing and funding research proposals, it facilitates the dissemination of information resulting from such research (Gaudet, D., 2005).

The approach to research in support of best practice technologies in oil and gas exploration and development that PTAC recommends is the following:

- Identify an issue and potential innovative solution
- Research and develop the solution or best practice
- Demonstrate that the solution or best practice is indeed valid
- Deploy the best practice and enforce its use
- Communicate the success of the best practice to the public

As indicated in the example of the development and application of best practices with respect to drilling waste management, the value of traditional knowledge and local knowledge in identifying an issue of concern is not to be overlooked. Involving local people in the discussion of the issue and potential solutions, including field research, is important, both from the point of view of obtaining the benefit of their insight and that of educating them about the efforts made by the industry and regulatory bodies to address the concerns. This, in turn, supports other consultation efforts.

5.1.4 ROLE OF CONSULTATIONS

Most interviewees thought that consultations played an important role in the development of best practices. Some felt that because the oil and gas industry was still relatively new to the north, it was important for the industry to explain to local people how it operated. It was also seen to be important for industry representatives to understand the local people and their culture and relationship to the land. Both First Nations' and industry representatives with extensive experience in the North expressed the view that industry practices would benefit from incorporation of traditional knowledge. Incorporation of local knowledge helped the practice to work in a manner sensitive to unique characteristics of the natural environment.

The MVEIRB has published Guidelines for Incorporating Traditional Knowledge into the Environmental Impact Assessment Process (2005). This is obviously of concern to industry also, evidenced in part by CAPP having drafted a document entitled Developing Effective Working Relationships with Aboriginal Communities (CAPP, undated). In it CAPP outlines six steps for Aboriginal involvement and consultation. These are shown in the following table.

- address scientific and political uncertainty by providing progressive decision points;
- encourage innovation;
- provide clear 'rules of the road'; and
- maintain flexibility for all land users.

TABLE 4. SIX STEPS TO ABORIGINAL RELATIONSHIPS, INVOLVEMENT AND CONSULTATIONS

Corporate Planning Phase	
Step 1	Evaluate corporate approach to aboriginal affairs through policy and/or guidelines
Step 2	Develop and/or update Aboriginal Relations Plan
Project Specific Planning Phase	
Step 3	Research project-specific issues as required per Aboriginal Relations Plan
Relationship Building and Consultation Phase	
Step 4	Initiate and build relationships with Aboriginal community
Step 5	Consult with Aboriginal community
Step 6	Document meetings, issues and actions and honour commitments

CAPP has also developed a generic public involvement program, outlined in its Guide to Effective Public Involvement (CAPP, undated).

In terms of the role that consultation and education played in the drilling waste management example above, when drilling projects were being proposed, the proponent companies would conduct community consultation meetings to discuss their projects. They would present information about how drilling wastes would be handled, mainly by disposal in sumps. They explained the procedures for excavating the sumps using explosives and heavy equipment and how drilling waste would be frozen in the sump before the sump was refilled and capped. Company representatives also provided detailed explanations to Hunters and Trappers Committees as well as to the Inuvialuit Game Council and the Environmental Impact Screening Committee (EISC) about the drilling process and identification of the materials that were deposited in the sump in separate meetings with these various bodies. One of the companies gave the EISC a tour of its drilling operation and the accompanying sump. The company representatives emphasized how the application of the new Drilling Waste Management Best Practices was an improvement over the way in which drilling waste sumps were constructed and managed in the 1970s. Project proponents conduct similar consultation sessions in connection with their seismic exploration projects.

Another example of effective consultations were those conducted by ConocoPhillips in the Mackenzie Delta when it brought over the large low ground impact vehicles (Rollagons) from the Alaska North Slope. The company conducted trials with these vehicles at which observers from the community were present. The company then submitted the results of the tests and the winter's work done with the vehicles to each stakeholder group. These sessions were then followed up with community meetings. However, despite having gained, in the company's view, support for the use of these vehicles, there is currently no need for them and they have been shipped back to Alaska (L. Callow, pers. comm. 2008)

The prevailing view of those interviewed was that people living in the region should have a say in the way oil and gas exploration and development will be conducted. Where government has taken the lead in the north in developing best practices, as in the Yukon, public consultations influenced the outcome.

In an effort to acquaint the broader community—public, industry, policy makers and regulators—with its initiative to develop Oil and Gas Best Management Practices, the Yukon's Department of Energy, Mines and Resources convened the first Oil and Gas Best Practices Symposium in Whitehorse in April, 2005. A second biennial Best Practices for Oil and Gas Development in the North Symposium was held in Inuvik in October 2007. These conferences have been well attended, with the 2007 symposium attracting over 200 delegates. Speakers included 7 from land claims/co-management organizations, 10 non-government speakers, 12 from industry and 20 from governments. The attendees were similarly diverse. Tentative discussions are under way for a third such biennial symposium in Alaska. Such symposia play an important role in disseminating information within the industry about best practices development and application in the upstream oil and gas sector. They also demonstrate to government, co-management bodies and the public that efforts are being made to improve industry practices.

6. BARRIERS AND CHALLENGES

There is a significant number of barriers and challenges to the adoption of best practices in the North. These range from environmental, technological and economic to socio-cultural, educational and training constraints of the workforce.

From the point of view of CAPP (Scott, I., 2005), the "barriers to innovation" include the following:

- Legal due diligence
- Concerns with "raising the bar"
- Corporate inertia
- Time and resources
- Regulatory frameworks
- Costs—require a business case example
- Long standing practices—internal inertia in regard to change

From the PTAC perspective, the barriers to the deployment of "environmental technology" are (Gaudet, D., 2005) the following:

- Perception of environmental technology solutions as a cost rather than a cost savings
- Non-competitive returns on investment
- Small scale of many environmental technology solutions
- Short-term focus of the industry and financial markets
- Industry's reluctance to foot the up-front costs of environmental technology
- Time required to implement the technology
- Regulatory inconsistency and uncertainty
- Measurement challenges
- Insufficient enforcement
- Prevailing attitudes

6.1 ENVIRONMENT

The natural environment will always present a challenge, even though the best practices have been designed to reduce the environmental effects of projects. Very cold weather, deep snow, steep terrain, the unanticipated arrival of ungulates, e.g., caribou, in the work area—all these may present a challenge to the successful implementation of best practices and timely completion of projects.

Existing best practices are implemented in different ways partly because of differences in the natural environment from one location to another in northern Canada. While helicopter supported seismic activity may be desirable in Eagle Plains in late winter when the Porcupine Caribou Herd is no longer present in the area, heli-supported programs would not work in the Mackenzie Delta in mid-winter during short daylight hours.

6.2 TECHNOLOGICAL

There may be a technological lag in implementing a best practice. In northern Alberta when there was an incentive to move to the use of narrower seismic lines, it took a while for the equipment to be developed, i.e., mulchers with narrower cutting heads, and for them to be available in enough numbers to satisfy the need (M. Doyle, pers. comm. 2008).

Experience in northern Alberta also indicates that even though a new best practice has been developed, such as the use of mulchers to achieve a reduced width seismic line, that piece of technology may not be available in the community adjacent to the area where the program is to be carried out. While it might be possible to ship it in, a contracting company in the community owns bulldozers that it wants to hire out to the exploration company. Thus, in the interests of maintaining good will in the community, the project proponent may be forced to hire bulldozers that create a broader line. This is a concern of some in the NWT as well (Bromley, B., 2008).

The technological improvement may not always work in practice. Under certain deep snow conditions or in steep terrain, mulchers may not work effectively and will have to be replaced with bulldozers or chainsaw crews. In some respects mulchers are safer than hiring a large crew with chainsaws (small chainsaw crews do work together with mulchers), thus the incentive is there for the proponent to use this technology, thus reducing the risk to workers on the job. However, in some areas, e.g., riparian zones, only cutting by hand is permitted, so this technology cannot be applied (Alberta Sustainable Resource Development, 2006). This is another reason why best practices may not be applied in all areas.

6.3 ECONOMIC

Economic barriers also exist. The use of tracked and low pressure vehicles minimizes duff layer disturbance, but costs are approximately 30% to 50% higher than those of using more conventional equipment, depending on line width and timber density (EMR, 2006). However, when the Alberta government offered a 50% rebate on the Timber Damage Assessment, it became economical for companies to move to narrower lines using other equipment. Once the narrower lines became the industry standard, the government's monetary incentive was removed. When helicopter-assisted seismic and heli-portable drills became available, there was resistance to using them because of the cost of helicopter use. The use of helicopters can be approximately 150% to 300% more expensive than using conventional equipment. Depending on the location in the north and the time of year, there may be limited daylight for flying, which will increase the cost of the program and increase the overall period of time required to carry it out. Despite this, in the Kotaneelee area of southeast Yukon heli-assist seismic is being carried out, resulting in a much reduced impact (EMR, 2006).

If there were significant work in the North, as would result if the Mackenzie Gas Project were to proceed, resulting in a significant increase in exploration work, that would provide the incentive to contractors in the region to acquire the more expensive but more efficient and environmentally more acceptable equipment. What always drives a decision for the companies is the business case. However, it must be said that in more remote areas of the North, sleigh camps will still be needed, which means wider lines and access roads (M. Doyle, pers. comm. 2008).

Unless the demand for the more specialized equipment, e.g., mulchers and hydro-axes, increases as a result of increased oil and gas exploration, it is unlikely that local businesses and contractors will make the investment in

such equipment that would enable them to be ready for that increased activity. Some have seen that this as a bit of a "catch-22". Some of the people interviewed felt that, while there was an expense up front to acquire the specialized equipment, it would pay off in the long run, as long as activity in the sector remained strong. When introducing new practices that require new equipment, sufficient time must be allowed to enable local companies to acquire such equipment. For large pieces of equipment, such as the low ground pressure vehicles (Rollagons), local businesses could perhaps joint venture with the large oil and gas company that want work done with low impact machines (L. Callow, pers. comm. 2008).

In the end, the use of best practices will have to be economically competitive and viable. It can perhaps be demonstrated that by applying best practices to proven new technology, the company that is prepared to do so will get through the screening and review process faster, thus saving money in that part of the process.

There is considerable debate about how "economic viability" does or should affect the application of best practices that are socially and environmentally desirable and acceptable given the evolving standards of today. This is an issue that, if left up to the various industry players (proponents, service companies, local businesses) to develop and implement in a self-regulated climate, will continue to see sporadic and uneven application of best practices. Several interviewees felt that the overall objective of environmental and social stewardship standards is primarily the responsibility of government to help achieve. However, it should be acknowledged that CAPP has a "Stewardship" program in which companies voluntarily participate. Some interviewees thought that government should establish the standard that everyone must meet as a minimum, in an effort to reduce the net impact on the environment. In an open competitive market, companies will find ways and technologies to meet those standards, and those that offer the lowest cost in doing so will reap the benefits, whether these are greater efficiency and lower costs, or by moving more quickly through the environmental and regulatory process. This tactic transfers the responsibility of environmental and social stewardship and the cost of meeting standards to industry. Industry has demonstrated that it can rise to these challenges in a cost-effective manner. As has been demonstrated, industry, government and other stakeholders all have a role to play in promoting best practices. Government is also seen to have the responsibility to ensure that an appropriate balance is achieved between economic development and environmental practices.

6.4 SOCIAL AND CULTURAL

The persons interviewed felt that generally little account was taken of social and cultural issues in adopting new best practices. As already mentioned, if there is social (political) pressure to hire locally, a project may be carried out using large chainsaw crews or older bulldozers that are owned locally rather than user the safer, more efficient machinery and having operators brought in from elsewhere.

Cultural issues arise in the form of cultural or heritage sites that need to be taken into account when carrying out the exploration and development program. Identifying such sites in ways that do not leave them vulnerable to future exploitation by unauthorized individuals can be a challenge. Incorporation of traditional and cultural knowledge can, on the other hand, result in projects being carried out in a more culturally and environmentally sensitive and acceptable manner, which, in turn, creates goodwill for the company when it wants to return to do further work. As indicated above, guidance documents for engaging Aboriginal communities have been developed by industry and government.

6.5 EDUCATION AND TRAINING

Education and training is an ongoing challenge, given the seasonal nature of oil and gas exploration and development work, and the existing levels of education and training of northern residents. In parts of the Canadian north, historically such exploration activities have come and gone, resulting in only seasonal employment for a few years. This kind of seasonal or cyclical employment does not engender loyalty to any particular company or the industry more generally, nor any desire to become more skilled, beyond being able to safely operate snow machines or ATVs and chainsaws. It is not reasonable for companies to come in to a region and expect there to be a capably trained workforce waiting to go to work on their projects, let alone be trained to operate the more sophisticated equipment that may be needed to conform to the best practices.

The economies of the Yukon and the Northwest Territories are doing fairly well at present and unemployment is relatively low, although in the winter of 2008/2009 there was a reduced level of oil and gas exploration activity in the Mackenzie Delta. Until the recent downturn in the global economy, which is resulting in job cuts at some mines in the NWT, the general perception when the interviews were conducted was that anyone with even minimal training who wanted employment could find a job and did not need to obtain training for employment in the oil and gas exploration sector. This particular challenge will likely not be overcome until there is enough growth in the oil and gas sector of the northern Canadian economy to develop the skilled workforce necessary. While formal training is one part of addressing this challenge, on the job training is the most important component of oilfield career development (Pahl, J., 2007).

An area of employment interest for some members of the Aboriginal communities, in part because it makes use of skills many of them already have as people who live on the land, is that of wildlife and environmental monitors. For projects in the ISR, the EISC will often recommend that proponents hire wildlife monitors or environmental monitors to accompany project crews into the field to minimize adverse effects of development on wildlife, wildlife habitats and Inuvialuit harvesting activities. Training programs for both wildlife monitors and environmental monitors have been offered for a number of years in the region through the auspices of the Inuvialuit Game Council and the Inuvialuit Land Administration, and a pool of qualified monitors has been established (Binder, R., 2007).

7. INTRODUCTION OF SUSTAINABLE BEST PRACTICES IN THE NORTH

7.1 RAISING AWARENESS OF BEST PRACTICES

One of the objectives of this study was to identify how one might go about increasing awareness of best practices, both on the part of industry and government agencies and of stakeholders and the general public. A couple of examples have been given above, one being the holding of issue specific workshops, such as the one conducted in connection with development of recommended best practices for dealing with drilling waste in the Mackenzie Delta. A second example is the biennial Symposium on Oil and Gas Best Management Practices, two of which have now been held. The former specifically targeted affected stakeholders, while the second example, though still focused on interested stakeholders, appeals to a broader audience. A third method is for government agencies and industry associations to make literature on best practices available. The Internet is another method of disseminating information and raising awareness of best practices and their application and positive effects.

7.2 MONITORING OF BEST PRACTICES

The interviews had diverging views on how best practices should be monitored. Some felt that this should be done by government land use inspectors who were already in the field inspecting land use permits. Others thought that companies should monitor their own implementation of best practices, as well as require that their subcontractors implement them, and then monitor them. Another suggested approach was to have Inuvialuit companies or Aboriginal governments have their employees carry out the monitoring. As already indicated, in the ISR there is a cadre of trained wildlife and environmental monitors who perform this role when the employment of such monitors is agreed to by the project proponent, often on the recommendation of the EISC and the Inuvialuit Land Administration. Monitors are required to submit weekly reports.

Where best practices are incorporated into work plans and thus become part of regulatory authorizations, or where best practices are conditions of land use permits, they are aspects of the projects that are checked by NEB and land use officials.

The means by which the results of monitoring can be used to inform all stakeholders of the effectiveness of new measures and practices also engendered considerable comment from interviewees. Some were of the view that semi-annual "post mortem" sessions, perhaps in the form of a workshop, should be held at the end of each winter and summer field season. At such sessions there should be a review of the application of best practices and an analysis submitted of what was effective and what was not, based on reports of environmental monitors and government agency inspectors. Apparently such workshops have been held in the past in the Mackenzie Delta in the spring once the drilling and other winter activities have shut down, according to some interviewees. These were considered beneficial for both disseminating information about best practices and encouraging their use.

8. CONCLUSIONS AND RECOMMENDATIONS

Interest in the oil and gas potential of northern Canada has generally increased over the past ten years or so, demonstrated by an increase in the level of exploration. This has taken the form of seismic exploration activity, both 2D and 3D, followed by drilling of exploratory wells. The Mackenzie Gas Project (MGP) prompted further exploration work in the Mackenzie Delta; however, the delay in the completion of the MGP review may now be dampening such interest. There has been similar interest and exploration in other areas with oil and gas potential further south along the Mackenzie Valley to the 60th parallel, and in the Yukon's southeastern and north-central regions.

This increased oil and gas exploration activity has also led to increased involvement by northerners in the way such activity is carried out. The settlement of Aboriginal land claims since the mid-1980s has resulted in the establishment of environmental and socio-economic review processes in all three northern territories. These processes, along with the Canadian Environmental Assessment Agency process, established in 1995, have made northerners more aware of their ability and responsibility to be involved in the review of exploration activity. The oil and gas exploration sector, returning to the north after an absence of a decade and a half, has responded to this increased awareness and involvement of northerners with improved practices, called best practices, to reduce the effects of their activities on the northern natural environment as well as to try to ensure that their activities have beneficial social and economic effects.

The focus of this study has been the mechanisms used to identify, consider, review and adopt best practices in this sector. The following are the study's conclusions and recommendations based on a review of the relevant literature and information obtained in interviews with knowledgeable individuals in the industry, government and the private sector.

8.1 CONCLUSIONS

The oil and gas exploration sector has improved its various practices in the Canadian north since its return to the region approximately ten years ago. Company representatives and project proponents have made improvements in how they present their proposed projects to the communities that may be affected by them. They employ people in the region to assist with consultations and communications, including having interpreters available at community meetings where projects are presented, and they try to hold these meetings when they will not conflict with other regularly scheduled community events. They arrange meetings with organizations such as the Hunters and Trappers Committees to inform them of their projects, since these organizations provide advice for the screening and review processes now operating in the northern territories. Industry representatives provide information in ways and in language that are more easily understood. The industry, and screening and review organizations, has published guides for such community engagement.

The oil and gas companies are supporting or undertaking necessary field research that results in or supports the best practices that are subsequently developed. One example is the development of best practices for the management of drilling waste, based on university, government and industry research.

The exploration sector has also improved its other practices in the field. Technology has made it possible, for example, to reduce the footprint of seismic activities and implement practices that enable disturbed areas to return to natural vegetative cover more quickly. A variety of seismic best practices have been adopted by the industry, for the most part voluntarily.

The processes used to develop best practices in the north are not well understood, nor is there only one process. Better identification of the need for improved practices is needed, as are improved ways of developing, adopting, implementing and monitoring them.

There continues to be a significant number of barriers and challenges to the development and adoption of best practices in this industry sector in the North. However, these barriers have been identified and at least in some aspects of the exploration activity spectrum, companies and industry associations are striving to overcome them.

8.2 RECOMMENDATIONS

Based on the information gathered in the interview process and the literature search, some recommendations can be made in regard to the following:

- How to raise awareness of issues that best practices seek to address;
- How to introduce sustainable best practices successfully in Canada's north;
- How best practices should be monitored, including the need to train monitors; and
- How the results of monitoring may be used to inform all stakeholders of the effectiveness of these new measures and practices.

8.2.1 HOW TO RAISE AWARENESS OF ISSUES

There are any number of issues that best practices seek to address. Most of these are known to greater or lesser degrees to local northerners, northern natural resource managers, scientists, northern economic development officers and social workers, oil and gas exploration program managers, environmental screening and review practitioners, and regulatory agency representatives. Most of them are also documented in the literature. The issues range from the direct impacts on the natural environment, wildlife and wildlife habitats, to the indirect impacts on the level of services available in northern communities for exploration and development activities. Very recently, the potential effects of natural gas exploration and development have been and are still being examined at some length by the Mackenzie Gas Project Joint Review Panel. The Panel's report will no doubt provide a comprehensive list of these issues and, hopefully, also suggest ways to address them.

At a local level, the way to increase awareness of issues and the best practices that are intended to address them is to meet with and talk to residents of local communities when a project is proposed. In this way the issues of local concern that may be addressed by a best practice for that particular project will be identified and brought to the attention of the project proponent. Such local issues could then be fed into a database of issues, and corresponding best practices, which would be maintained by an independent organization. This database could perhaps be housed in a northern research institute, for example, but be overseen by a committee with representatives from the communities, industry and government. All stakeholders would have access to the database so that the same questions would not need to be repeated every time an exploration project was proposed, since the issues and the best practice to address them would have already been identified.

One forum for addressing issues and associated best practices more broadly has already been established. Twice, in 2005 and 2007, a Symposium on Best Practices for Oil and Gas Development in the North was held, first in Whitehorse, YT and then in Inuvik, NT. A third one is tentatively planned for Fairbanks, AK in 2009. This type of symposium brings together a range of stakeholders who present information and learn (or do not learn) from one another's' success stories in attempting to develop best practices to address various issues. It is a useful platform for sharing information. It is recommended that this type of symposium continue to be held on a biennial basis.

It would be useful to develop another forum, perhaps a conference, under the auspices of ESRF or PTAC together with the MVEIRB or YESAB, to address some the key issues in a given northern region, without these issues being reviewed and discussed only in the light of a particular currently proposed project. The objective of such a "detached" discussion would be to provide an opportunity to identify issues and discuss them with a view to identifying possible best practices to address them. Such a conference could be held as needed, with the decision to convene such a conference taken by the joint body suggested.

8.2.2 HOW TO INTRODUCE SUSTAINABLE BEST PRACTICES

To introduce sustainable best practices, it is necessary to identify the issues to be addressed. Once the issue is identified, the process outlined by PTAC could be followed. That is, first research the issue and the potential best practice (or "environmental technology" in PTAC language). Then the PTAC research sequence of "develop, demonstrate, deploy and defend" mentioned in section 5.1.3 could be employed.

A process model that could be used with a few modifications is the one used by the CSA to develop new standards. As outlined in Table 3, section 5.1.1, the CSA process begins with a request for the development of a standard. In the case of oil and gas best practices, it should begin with taking an identified issue and researching it as suggested above, with a view to winnowing out the best practice(s) that would address the issue. Then the subsequent steps in the CSA process could be followed, perhaps under the guidance of a committee established under ESRF. An entity such as an ESRF committee is preferred because it would be viewed as more neutral than if the process were led by a government agency. In addition to the steps set out in the CSA process, provision would have to be made for consultations with communities and the industry, perhaps in the form of the workshop convened to discuss drilling waste management in Inuvik a few years ago. The results of such a workshop would be taken into account by the technical committee. The CSA process has a systematic five year review built into it. Given how rapidly changes can occur in the oil and gas sector, a more flexible review process, based on monitoring, should be adopted.

Given some of the challenges to initiating best practices, governments should consider providing incentives to promote the implementation of best practices, possibly along the lines of the reduction of Timber Damage Assessments in Alberta, mentioned in section 4.3.1. The determination of which best practices to promote through incentives would have to be done after the range of best practices for addressing various issues had been identified, following which an assessment of which best practices would be most onerous, economically, to implement would have to be made.

Given that the implementation of best practices contributes to social good, i.e., a sustainable natural environment, the adoption of best practices in other industries has also been encouraged through incentives. For example, in Canadian agriculture, new technologies and practices are a continually evolving process. For those technologies

and practices, such as reduced-tillage to limit soil erosion into waterways, that generate a social good, the adoption process has been encouraged with the assistance of price and cost incentives to the point where the cost-benefit equation between "traditional" tillage and reduced tillage practices are the same. The cost of these incentives is generally borne by the taxpayer through federal and provincial agencies. Some of these incentive programs in the past included the following, for example:

- Equipment buy-back programs
- Debt retirement assistance
- Interest free loans

8.2.3 HOW BEST PRACTICES SHOULD BE MONITORED

It is necessary to monitor best practices in the upstream oil and gas sector if they are to be sustainable over time. Whether voluntary or mandatory, best practices should be monitored to ensure their appropriate implementation. They should also be monitored to ensure that they are having the intended positive effect. If the intended effect is not occurring, then there should be provision in the project's environmental management plan to modify the best practice so as to achieve the desired result. However, this may become complicated if altering the practice requires a change to a regulatory permit.

As mentioned in section 7.2 and elsewhere, some monitoring of best practices is already occurring. However, a process for consistently monitoring all best practices needs to be established. This will have to be discussed by the various stakeholders: project proponents who will want to participate in the monitoring; agencies with legislated responsibility to monitor best practices that they have written into the authorizations they have issued; and organizations such as Hunters and Trappers Committees and the Inuvialuit Land Administration that have an interest in the positive outcome of best practice implementation. While there is no need for all stakeholders to be directly involved in the monitoring, there has to be overall trust in whoever is conducting the monitoring.

An aspect of successful monitoring is ensuring a supply of well-qualified monitors. This suggests that practical monitoring training should be made available to qualified northerners who already have a base of traditional or local knowledge. The training should be provided in the home communities of the would be monitors by northern educational institutions supported by government and industry representatives.

Interviewees also pointed out that in order to tell from a monitoring program whether or not beneficial effects were being achieved from best practices, an environmental baseline for the project area is needed in order to judge the usefulness of the best practices. It was also suggested that disturbance thresholds be established, at least for critical wildlife habitat, beyond which disturbance-causing activities should not be permitted. Establishing such an environmental baseline and disturbance thresholds would be the responsibility of the resource management agencies and co-management bodies. Once established, this information would have to be updated on a regular basis. The information could also be housed in the database already suggested.

8.2.4 HOW THE RESULTS OF MONITORING MAY BE USED

In order to use the monitoring results to inform all stakeholders of the effectiveness of these new measures and practices, the results need to be readily available. It is not satisfactory for the results of land use inspections to be available on request or to have to wait until an end-of-season workshop (though this would still be useful). The way to accomplish this may be to establish an electronic "registry" where monitoring reports are filed and can be accessed by bona fide stakeholders, perhaps using a password. Given the value of such a database in assessing the effectiveness of best practices, perhaps it should be linked to the issues database suggested in 8.2.1.

While the role of screening and assessment organizations is completed once they have made a determination about a project and issued their recommendations, it would be helpful for them to know whether or not the recommendations they made had any beneficial effect. These screening and review organizations could also be given access to the monitoring database to learn whether or the decision bodies to which they had made the recommendations had, in fact, incorporated them and, based on the monitoring results, whether or not the recommended best practices achieved the desired outcomes with respect to the particular project.

APPENDIX A

BIBLIOGRAPHY

Alberta Sustainable Resource Development. 2006. Policy and Procedures for Submitting the Geophysical Field Report Form. Edmonton, AB.
Binder, Richard 2007. Training and Use of Wildlife Monitors. Inuvik, NT.

British Columbia Oil and Gas Commission. 2007. Geophysical Manual. Victoria, BC.

British Columbia Ministry of Forests and Range. Undated. Oil and Gas Best Management Practices for Mountain Pine Beetle (MPB) in the Peace Forest District. Victoria, BC.

Bromley, B., 2008. Cited in Northwest Territories Legislative Assembly Hansard, p. 903, Thursday, June 5, 2008. Yellowknife, NT.

Callow, L. 2004. Winter low ground pressure vehicle trials. Listed in "Hydrocarbon Impacts – Key Publications"

http://www.aina.ucalgary.ca/scripts/minisa.dll/144/hiproe/hiproeaa/bi+hi+and+dt+r+and+yr+2004?COMMANDSEARCH (accessed on January 10, 2009).

Canadian Standards Assocation. Undated. Standards Development – Development Process. http://www.csa.ca/standards/default.asp?load=development&language=english (accessed on January 10, 2009)

Canadian Association of Petroleum Producers (CAPP). 2004. Guide: Evolving Approaches to Minimize the Footprint of the Canadian Oil and Natural Gas Industry. Calgary, AB.

Canadian Association of Petroleum Producers (CAPP). Undated. Guide to Effective Public Involvement Calgary, AB.

Canadian Association of Petroleum Producers (CAPP). Undated. Industry Practices: Developing Effective Working Relationships with Aboriginal Communities. Calgary, AB.

Yukon Energy Mines and Resources. 2006. Oil and Gas Best Management Practices – Historic Resources. Whitehorse, YT.

Yukon Energy Mines and Resources. 2006. Oil and Gas Best Management Practices – Seismic Exploration. Whitehorse, YT.

Yukon Energy Mines and Resources. 2006. Oil and Gas Best Management Practices – Wilderness Tourism. Whitehorse, YT.

Environmental Studies Research Funds. 2004. Drilling Waste Management Recommended Best Practices. Calgary, AB.

Gaudet, Denis. 2005. Facilitating innovation, collaborative research and technology for the upstream hydrocarbon industry. Calgary, AB.

Indian and Northern Affairs Canada. 1988. Environmental Operating Guidelines: Seismic Operations. Ottawa, ON.

Indian and Northern Affairs Canada. 2008. Oil and Gas Dispositions Eastern Arctic Offshore (a map). Ottawa, ON, 2008. http://www.ainc-inac.gc.ca/nth/og/le/mp/ain/earct.pdf (accessed on January 10, 2009).

Indian and Northern Affairs Canada. 2008. Oil and Gas Dispositions Sverdrup Basin (a map). Ottawa, ON, 2008. http://www.ainc-inac.gc.ca/nth/og/le/mp/ain/Sverd.pdf (accessed on January 10, 2009).

Jenkins, Robert. Environmental Studies Research Funds Regional Sump Study Project. 2004 Listed in "Hydrocarbon Impacts – Key Publications"
http://www.aina.ucalgary.ca/scripts/minisa.dll/144/hiproe/hiproeaa/bi+hi+and+dt+r+and+yr+2004?COMMANDSEARCH (accessed on January 10, 2009).

Jenkins, Robert. 2007. INAC Steam Crossings Study – Collection, Compilation and Application to Best Management Practices. Yellowknife, NT.

Kokelj, S. 2004. Permafrost and Sump Investigations in the Mackenzie Delta. Listed in "Hydrocarbon Impacts – Key Publications"
http://www.aina.ucalgary.ca/scripts/minisa.dll/144/hiproe/hiproeaa/bi+hi+and+dt+r+and+yr+2004?COMMANDSEARCH (accessed on January 10, 2009).

Krizan, Julia. 2007. NWT Guidelines for Seismic Operations. IMG-Golder Corporation, Inuvik, NT.

Measor, Susan. 2007. Management Systems as Best Practices. Calgary, AB.

Mackenzie Valley Environmental Impact Review Board (MVEIRB). 2003. Draft Reference Bulletin: Preliminary Screening of Seismic Operations in the Mackenzie Valley. Yellowknife, NT.

Mackenzie Valley Environmental Impact Review Board (MVEIRB). 2005. Guidelines for Incorporating Traditional Knowledge into the Environmental Impact Assessment Process. Yellowknife, NT.

Paget, Todd and Simon Toogood. 2007. Guidance to the Best Management for Camp Waste. Yellowknife, NT.

Pahl, John. 2007. Best Practices for Local Training and Employment in the North, the Akita Equtak Perspective. Calgary, AB.

The Pembina Institute. 2006. Wildlife and Oil and Gas. Drayton Valley, AB.

Rader, Matt. 2004. Correspondence re Geophysical Exploration Permit Nenana Basin. Anchorage, AK.

Romanchuk, Pamela. 2007. How the NEB Uses Best Practices. Calgary, AB.

Severson-Baker, Chris. 2004. Seismic Exploration – A Primer. Drayton Valley, AB.

Scott, Ian. 2005. Evolving Approaches to Minimize the Footprint of the Canadian Oil and Gas Industry. Calgary, AB.

Schlumberger Ltd. Undated. The Oilfield Glossary: Where the Oilfield Meets the Dictionary. Online glossary available at http://www.glossary.oilfield.slb.com/ (accessed on January 10, 2009).

Schmidt, Doug. 2004. The Evolution of Seismic Line Clearing (in The Source). Calgary, AB.

Sundre Petroleum Operators Group (SPOG). 2002. Best Practice Guide 55: Testing and Releasing Water from Secondary Containment Systems. Sundre, AB.

Toogood, Simon and Todd Paget. 2007. Guidance to the Best Management for Refined Petroleum Products. Yellowknife, NT.

APPENDIX B

A LIST OF INTERVIEWEES

Andrew Applejohn, Director, Aurora Research Institute, Inuvik, NWT

Lin Callow, retired, formerly with ConocoPhillips, principle investigator in the use of low pressure ground vehicles in the Mackenzie Delta in winter.

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Norman Snowshoe, Director, Lands, Resources and Implementation, Gwich'in Tribal Council, Chief Jim Koe Zheh, 1–3 Council Crescent, Box 1509, Inuvik, NT X0E 0T0

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APPENDIX C

QUESTIONNAIRE

ESRF-08-110
Considerations in Developing Oil and Gas Industry Best Practices in the North

INTERVIEW QUESTIONNAIRE

INTRODUCTION:

"Best practices" are continually being developed by the Oil and Gas industry to address environmental issues and to reduce the footprint of development activity on the northern landscape. Such practices may evolve and adapt in response to new standards/guidelines, land use policy, environmental conditions or technological innovation. The focus to date has been primarily on best practices associated with exploration and production. Examples include construction methods and techniques for seismic lines, waste disposal options, well spacing, facility sites and access roads.

1. The adoption of best practices in the North needs to consider a wide variety of factors, including both environmental and socio-economic considerations.

1A. What prompts the industry to consider changing exploration and production practices, generally, and specifically through reducing the environmental footprint (i.e., narrower seismic lines)? Seismic operations provide an example of the development of best practices over time; what caused industry to consider developing best practices?

1B. To what extent are socio-economic considerations of northern businesses and contractors taken into account in this process?

1C. How have concerns of public stakeholders influenced the adoption of best practices? What other actions might be required to account for and address public issues and concerns?

2. Adoption of best practices related to narrow width seismic methods may require specialized equipment, education and training, and seasonal construction, and have implications for the labour force employed to cut narrower lines.

2A. Were these aspects considered in the development of such best practices?

2B. What were the implications of these aspects to the adoption and implementation of such best practices?

2C. How did the adoption and implementation of the best practices affect northern businesses and contractors and their employees?

2D. Was the process different for the different operational requirements for 2-D and 3-D seismic operations?

3. What do you know about the process and methods used to put the best practices forward for consideration? Are they developed and adopted in response to industry and regulator/resource management agency needs, as well as those of the local community?

3A. What is the primary and secondary rationale for developing the best practices? (Or are they equally important?)

4. Is there a formal as well as an informal process used to develop best practices for the oil and gas industry in the north? What is the role of industry, regulators and the public in both processes?

4A. Are best practices mandatory or voluntary considerations?

4B. Who, if anyone, monitors compliance with best practices? How does one know if stated best practices are, in fact, followed on the ground?

4C. How should best practices be monitored and how can the monitoring results be used to inform all stakeholders of the effectiveness of these practices?

5. What is the role of consultations and education with regulators, policy makers, industry and the public in developing, adopting and implementing best practices?

5A. Do you have any examples of how such consultations were conducted? Which, if any, were the most successful methods of consultation?

6. What are the barriers and challenges to determining and adopting best practices, including technological, legislative, economic and the educational or training constraints of the workforce?

6A. What are the possible solutions to these barriers and challenges? Could incentives be a solution?

7. What is the financial capacity of local businesses and contractors to adapt to the requirements of best practices? Can you cite an example of how best practices have benefited the industry? Please be specific in terms of the nature and scope of the benefits.

8. Are best practices such as those developed for seismic activity adopted to different degrees in different parts of the North? If so, are there reasons for this pattern of adoption?

9. Are economic efficiencies created by the adoption of new best practices?

10. What do you think public stakeholders would say about your industry best practices and why? Who would you suggest we speak with to gain further insight and knowledge about how the best practices have affected stakeholder concerns?

11. What would determine the sustainability of a best practice? Under what circumstances should it be reviewed?