BEAUFORT REGIONAL ENVIRONMENTAL ASSESSMENT

BREA Results Forum: First Two Years of Progress

February 19 to 21, 2013
Ingamo Hall Friendship Centre
Inuvik, NWT

Prepared by Gaea Consultants and DPRA Canada

Canada

March 20, 2013

TABLE OF CONTENTS

1 INTRODUCTION 1

2 BREA OVERVIEW AND BACKGROUND 2

3 OIL AND GAS EXPLORATION AND DEVELOPMENT FORECAST 2

4 BREA WORKING GROUPS 3

4.1 Climate Change Working Group 3
4.2 Cumulative Effects Working Group 3
4.3 Waste Management Working Group 4
4.4 Oil Spill Preparedness and Response Working Group 4
4.5 Social, Cultural and Economic Indicators Working Group 6
4.6 Information Management Working Group 7

5 GEOHAZARDS AND COASTAL PROCESSES 8

5.1 Regional Assessment of Deep Water Seabed Geohazards for Oil Spill Prevention 8
5.2 Regional Synthesis of Coastal Geoscience for the Beaufort Sea 9

6 COUPLED OCEAN ICE ATMOSPHERE MODELLING AND FORECASTING 9

6.1 Beaufort Sea Marine Observatories 9
6.2 Forecasting Weather, Ocean and Ice Conditions 10
6.3 Modelling Freshwater Flows from the Mackenzie Delta to the Beaufort Sea for Improved Offshore Prediction 10

7 WORST-CASE ENVIRONMENTAL CONDITIONS 11

7.1 Overwintering of Vessels in the Beaufort Sea and Assessing Damage Potential 11

8 SEA ICE AND EXTREME ICE FEATURES 13

8.1 Radarsat Mapping of Extreme Ice Integrated Sea Ice & Sachs Harbour Community Sea Ice Monitoring 13
8.2 Understanding Extreme Sea Ice Features & Quantifying Sea Ice Dynamics 13
8.3 Measuring the Thickness and Strength of Deformed Multi-year Ice 14
8.4 CanICE – A Sea Ice Information Database and Web-based Portal 14
8.5 Beaufort Sea Engineering Database 14

9 FISHERIES BASELINE INFORMATION 15

9.1 Offshore Fish Populations, Habitat and Ecosystems 15
9.2 Baselines and Potential Effects of Mercury and Hydrocarbons in Beaufort Sediments and Biota 16
9.3 Active Acoustics Mapping of Fish 17

10 GEOSPATIAL ANALYSIS FOR REGIONAL ASSESSMENT 18

10.1 Web-based Geospatial Analysis Tool for BREA 18

11 COMMUNITY PRIORITIES 18

11.1 Regional Coastal Monitoring in the Inuvialuit Settlement Region: Ecosystem Indicators 18
11.2 Polar Bears in Deep Offshore regions of the Beaufort Sea 19

12 BIRDS BASELINE INFORMATION 19

12.1 Coastal, Marine and Offshore Bird Usage of the Beaufort Sea Region 19

13 BIOLOGICAL INFORMATION TO INFORM OIL SPILL RESPONSE 20

13.1 Biological Data to Assess Net Environmental Benefits and Costs of Dispersants and In-Situ Burning in Oil Spills Response 20

14 WRAP-UP SESSION 21

14.1 Facilitator's Summary 21
14.2 Closing Remarks – Billy Storr 21
14.3 Moving Forward: Informing Outcomes and Next Steps – Ruth McKechnie 22
14.4 Participant Roundtable Remarks....23

APPENDIX A: FORUM AGENDA....A-1

APPENDIX B: LIST OF PARTICIPANTS....B-1

1 Introduction

The Beaufort Regional Environmental Assessment (BREA) Results Forum: First Two Years of Progress was held on February 19 to 21, 2013 at the Ingamo Hall Friendship Centre in Inuvik, NWT. The objectives of the Forum were:

- To share BREA research and working group results to date with Inuvialuit organizations and communities, industry, governments, regulators and academia.
- To provide participants with the opportunity to hear the results, pose questions, and engage in dialogue that will assist researchers in conducting any future work on their research projects and assist working group leads in planning their future activities.
- To hear from participants, how the information presented could help inform the final outcomes and contribution of BREA.
- To provide a venue to facilitate greater collaboration among the researchers and other partners as they share the research results to date.
- To enable working group leads to identify research directly relevant to their working group mandate and deliverables.

The Agenda for the Forum is provided in Appendix A. Approximately 70 participants representing Inuvialuit communities and organizations, co-management bodies, the federal and territorial government, industry, academia and consultants attended the Forum. The list of participants is provided in Appendix B.

This report describes the discussions and questions/answers during the Forum, according to the key themes on the agenda. The Forum presentations are available on the BREA website at: http://www.beaufortrea.ca/results-forum-2012-2013; their content is not summarized here. Participants also received a copy of the presentations on a memory stick or in a resource binder at the Forum.

2 BREA Overview and Background

Following an opening prayer by Billy Storr, Forum participants were welcomed by Nellie Cournoyea. She noted the importance of the research being conducted under BREA to the Inuvialuit. Although oil and gas exploration in the Beaufort is currently slowed down, it is expected that there will be proposals by industry to the National Energy Board in the next few months. Decision-makers need facts in order to effectively balance development and environmental protection. Nellie thanked the researchers for their work, and invited community members to learn about the results of their efforts.

Ruth McKechnie (Aboriginal Affairs and Northern Development Canada) set the context for the Forum with a presentation that provided an overview of the history of oil and gas development and research in the Beaufort region; the need for BREA; governance (the unique partnership of Inuvialuit, regulators, industry, government, academia); deliverables and research priorities; reporting/communications; and next steps.

3 Oil and Gas Exploration and Development Forecast

Lin Callow (Salmo Consulting) presented a forecast of oil and gas activity in the Beaufort Sea for the period 2012 to 2027. Participants had a number of questions and comments:

- Billy Storr: Although drilling began in 1972, and there have been significant discoveries, nothing has come out of the ground; not sure commercial production will occur during my lifetime. Lin responded that quality and quantity influence whether the resource will be developed. With the exception of Amauligak, the discovered reserves in the Beaufort Sea have been relatively small (when compared to Alaska).
- Lawrence Ruben:
  - This forecast is short-term, but is there any consideration of production timeframes? Lawrence stated that a ConocoPhillips engineer had said that the production life of the Amauligak would only be 6 years. Linda Graf (ConocoPhillips) clarified that maximum/peak production for the Amauligak field would last about 6 years, but the production would continue for another two decades or so with a long, slow decline in production.
  - How reliable is the forecast? For how long is the forecast reliable? Lin noted that a forecast can change overnight and about ½ of the predictions may be incorrect- due to the large number of variables that can affect the forecast. We can't forecast long term very accurately so we need current forecasts to ensure that planning is based on the most up to date estimate of what we expect will occur.
- Billie Archie: When will production of Alaska reserves start? The Molikpaq is now in Russia, operating as a production platform. The same companies are in both countries. Lin noted that in the US, they are looking at a pipeline that would go to Cook's inlet or Valdez to allow Liquefied Natural Gas shipments, but the larger proposed Alaska pipeline through the state is

not proceeding at this time. Petroleum Companies look at what their options are in Canada and other countries, and make their investments in the best prospects for economic production.

4 BREA Working Groups

4.1 Climate Change Working Group

Mike Fournier (Environment Canada) reported on the activities and outcomes of BREA's Climate Change Working Group. Billy Storr asked if any of the activities noted in the presentation coordinate with, or duplicate the western and Central ArcticNet Integrated Regional Impact Study (IRIS 1). Mike noted that BREA was not duplicating ArctiNet's IRIS and that to avoid duplication Gary Stern (Lead for IRIS) was a working group member. He indicated that BREA is focusing on areas related to oil and gas development that ArcticNet is not. Mike added that ultimately it would be nice to combine IRIS1 and BREA results, and perhaps identify future priority research gaps. While there were ArcticNet representatives at the Forum, they were reporting on BREA-related findings, rather than IRIS or other ArcticNet topics, which are presented in other fora Genevieve Carr (AANDC) added that individual BREA research projects that have linkages to climate change will be brought together, and a more complete picture will be available in two years.

4.2 Cumulative Effects Working Group

Genevieve Carr (AANDC) presented an update on the activities of BREA's Cumulative Effects Working Group (CE WG), including a planned pilot project to develop an assessment and monitoring framework with three to five Valued Components. Participants had a number of comments and questions:

- Billy Archie: we are working on community-based monitoring. What is in it for the communities, and how will our knowledge contribute to cumulative effects assessment? Local hunters / people see the changes. There are cuts in all government departments, while changes in the environment are increasing. We question the commitment to communities and capacity development. Genevieve responded that there are two members on the CE WG that are strong advocates of community-based monitoring. We are not yet at the stage of doing the monitoring, or testing the selection of Valued Components. This is on the horizon, we just have not gotten there yet.
- Billy Storr: do not see community members on the Working Group. Community members need to speak for themselves. Genevieve acknowledged that Working Group members do not speak for the communities.
- Julie Friddell: What is the chance for 'enforceable cut-offs' with respect to cumulative effects? Genevieve noted that that is more a questions for implementation; this will be addressed when work begins and the Working Group is re-engaged.
- Malcolm Lowings: Were other approaches and successes from other regions (e.g., Russian, Alaska, Greenland) considered? There are probably good lessons from Greenland. The regulatory regime is different but they have done some work on cumulative effects. Genevieve responded that this has not been explicitly done, although the expert engaged by the Working Group may have taken this information into account.

- Lawrence Ruben: Worried that the next Minister of AANDC won't support BREA (note: Minister John Duncan resigned just before the Forum). Community Conservations Plans were mentioned in the presentation, but not the Tarium Niryutait Marine Protected Area (TNMPA), or other proposed MPAs. How will these be built into BREA? Will they be discussed at this Forum? Genevieve stated that the MPA won't be a specific topic discussed at this Forum, although there is a linkage. In terms of 'lessons learned' from other areas, lots of information will be pulled in from the ISR. DFO has been very engaged on the Working Group and they will bring in their expertise. Lisa Loseto (DFO) added that there are cross-linkages across initiatives, for example, she is involved in both BREA and the TNMPA. Lawrence noted that there are many species in the MPA even though the beluga is the main species of concern for this area – e.g. whitefish, coney and others. Lisa responded that representative species will be discussed on Thursday, and agreed that the linkages must be made more explicit. Genevieve added that many of the individuals are also involved in the Beaufort Sea Partnership's (Integrated Ocean Management Plan) Regional Coordination Committee or Working Groups, and individuals talk to each other.
- Billy Storr: Next step to "identify Valued Components and VC objectives" – really need the right people at the table to identify these. Who better than the communities?
- Richard Gordon: This is my 2nd BREA meeting. The issue is 'Aboriginal/Inuvialuit representation and involvement of communities'. If the communities are left out, it is like our voices are not being heard.

4.3 Waste Management Working Group

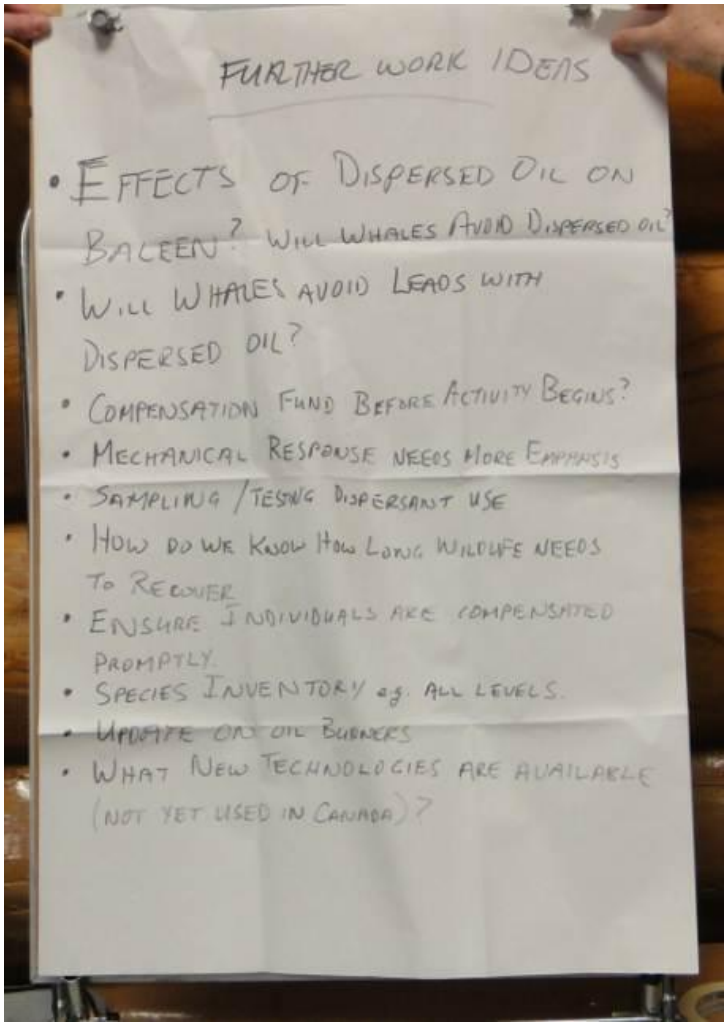
Mike Fournier (Environment Canada) reported on the activities of BREA's Waste Management Working Group, including work being done toward a *Regional Oil and Gas Waste Management Strategy for the ISR*. An ISR community member stated that in Tuk they have a solid waste site for the hamlet, but they receive waste materials from other locations far away. Monitoring what goes into this dump is hard, will that be part of the Strategy? What about large pieces of steel and metal from industry – will these be recycled? The current piece of work won't address issues such as infrastructure, is it appropriate and can it accommodate it? What about waste anticipated in the future? Mike responded that the Working Group is only setting the business case and developing a regional waste management framework for the ISR as a foundation for the Strategy right now, but these types of questions or issues could be dealt with were a waste management strategy to be developed in future. There may be economic development opportunities for communities or the region on the waste management front, if oil and gas activity ramps up again.

4.4 Oil Spill Preparedness and Response Working Group

George McCormick (AANDC) presented an update on the activities of BREA's Oil Spill Preparedness and Response Working Group, including:

- the 2011 Dispersant Use workshop
- the October 2012 Community Oil Spill Training Needs workshop and report (2013), and
- the recent survey of mandates and roles of Inuvialuit, Federal and Territorial governments for a Tier 3 Beaufort Sea Oil Spill Response.

George concluded by asking participants for their thoughts on what the Working Group should do next. Participants had a number of comments and questions:



- Malcolm Lowings: is the Beaufort Sea Oil Spill Response Atlas prepared by Environment Canada being updated? Genevieve Carr noted that it is being updated through a larger Environmental Studies Research Fund (ESRF) project led by Jason Duffe at Environment Canada, to be completed in 2013.
- Darrel Nasogaluak: Imperial Oil recently provided an update on their plans to communities. In the Macondo spill, large amounts of dispersants were injected at the blow-out site. What are the effects and impacts on belugas and their food source? Imperial Oil said that belugas were very intelligent and would sense the dispersants and leave the area. This is not a satisfactory answer. Timing and location of dispersant use is important, and dispersant use must not have negative impact on beluga and their feeding. How do we take this into account? What is the effect of dispersants/oil on bowhead baleen? George responded that the Net Environmental Benefit Analysis is an important part of the process when deciding on how to treat a spill the aggregation of belugas at various times should be included in that analysis to address these types of questions.
- Billy Archie: "Location, location, location" - the Beaufort Sea is our back yard. We need research on dispersant effects on whales, and how to get whales to avoid areas in case of a spill. There is capability in communities to respond to a spill, just need equipment. The Yukon North Slope is an important harvesting area for Inuvialuit, especially Aklavik. I've asked Imperial Oil about the spilled oils in leads and how that would affect belugas. Imperial had said that the whales would be smart enough to avoid those leads. Will they?
- Ernest Pokiak: If a spill did happen in the Beaufort Sea, there should be some sort of compensation fund created in advance to compensate those immediately affected and future generations impacted by a spill. George noted that Harvester Compensation Agreements must be negotiated with communities before drilling occurs; Devon has done that, for example.
- Billy Storr: There is a lot of emphasis on the use of dispersants, because it is relatively inexpensive way to do something; there is no talk of mechanical methods because of the equipment requirements. Need more emphasis on the mechanical methods because this is important for dealing with oil that comes near shore. The companies don't want to bring the equipment in to have on hand, although people who use the area want this.

- Marlene Wolki: Was disappointed with past oil spill response workshop. Would like to see more information on other methods and their differences, including in situ burning. George responded that there are test facilities elsewhere; there has been some discussion of taking Inuvialuit to tour them to see how various methods work.
- Charlton Haogak: I participated in the BREA dispersant workshop in 2011, and have an understanding of how dispersants work. But, how can they determine the recovery periods for beluga populations if anything goes wrong? There's little research to back up the estimated timelines. George agreed that there is a need for additional research.
- Lawrence Ruben: I attended a spill conference in New Orleans and took a tour of the Gulf coast; talked to people about compensation. Local individuals that depend on the area were not compensated properly, nor in a timely manner. Companies and organizations were compensated first. Compensation to individuals was very slow, and they were often hardest hit. The Working Group should emphasize compensation for individuals, not just organizations. With respect to identifying resources at risk, in the Gulf they worked on nearshore and onshore areas as well as offshore (fish and mammals), as the tides and oil went far in land. They did an inventory of species and found a cordgrass bug species that ate the oil from the grasses. If species are identified prior to a spill, can see which ones can digest/ingest the oil?
- Billy Archie: Was there any work done in the 1980s on the Saki in-situ burner? Is there newer technology for in situ burning? Joanne Munroe responded that Canadian Coast Guard has a couple of Saki burners in their inventory, modified for transport via Twin Otters.
- Darrel Nasogaluak: The oil industry has been away from Tuktoyaktuk for so long that all the equipment has either been shipped out or is too old. Some countries are more advanced in northern oil spill clean-up and are way ahead of Canada. We have much to learn from these countries. Industry needs to look into new technology and not just rely on dispersants. Are there some bacteria in the north that may help eat up the oil? George responded that there is research being done on other methods, e.g. SINTEF in Norway.

4.5 Social, Cultural and Economic Indicators Working Group

Bob Simpson (Inuvialuit Regional Corporation) reported on the activities of BREA's Social, Cultural and Economic Working Group, including work being done on the *Inuvialuit Indicators* and other projects, and coordination of efforts with the corresponding Working Group of the Beaufort Sea Integrated Oceans Management Plan. The work is assisting in the preparations for self-government and devolution, as well as oil and gas development.

- Richard Gordon: Is the information generated by the project useful to Inuvialuit for developing programs, planning? Bob confirmed that the information is and will be used by the Inuvialuit to make decisions of all kinds. Though the project is funded partly by BREA, there are partnerships with others, e.g. the Bureau of Statistics. Government of Northwest Territories is getting more resources to help this initiative.
- Andy Swiderski: Are there any initial findings that you found surprising? Bob responded that they are just beginning with the case study; starting to produce results that can be used to focus government services and programs on specific needs of Inuvialuit, making for constructive dialogue and working relationships. With self-government, Inuvialuit will be able to use the data to do their own planning and program development.

4.6 Information Management Working Group

Two presentations were made on behalf of BREA's Information Management Working Group:

- Tara Paull, Aboriginal Affairs and Northern Development Canada presented an overview of Working Group activities (e.g. BREA website , data and information management policy, linkages to Hydrocarbon Impact Database, Polar Data Catalogue and other initiatives)
- Julie Friddell, University of Waterloo presented on the Polar Data Catalogue *(Julie also demonstrated the PDC with participants during breaks/over lunch)*

Following the presentations, the following questions were asked:

- Richard Gordon: is the BREA website easy to use, in plain language so it is accessible to the average lay person? Tara responded that the website loads easily; the Working Group met with a communications person to ensure project summaries were understandable. There are some reports that are quite technical, but the annual results report is a plain language report.
- Michelle Johnston: After BREA is complete, are there plans to include future publications on the BREA website? Tara stated that in any event, the Hydrocarbon Impact Database (part of ASTIS) and the Polar Data Catalogue could continue after the BREA program is completed. The Hydrocarbon database is updated on an annual basis. Ruth added that the Joint Secretariat is hosting the BREA website and could continue to add materials to the website after BREA is finished.
- Andy Swiderski: What is the most common issue that people have in getting information? Julie responded that people are frustrated with getting the information 'out', often there is a lack of data. The Polar Data Catalogue is working with other groups (ArcticNet, BREA, International Polar Year (IPY)) to get more data. They are in a development stage.

5 Geohazards and Coastal Processes

5.1 Regional Assessment of Deep Water Seabed Geohazards for Oil Spill Prevention

Steve Blasco (Geological Survey of Canada/Natural Resources Canada) presented research on deepwater geoscience that can be used by communities and others to protect their resources from oil spills.

- Richard Gordon: If an underwater landslide happened during drilling, could it lead to a blow-out? Steve stated that there would likely be significant impact to the riser platform and not so much to the Blowout Preventer. Richard asked if there has been work done on the impact of climate change on the sea floor. Steve responded that two initiatives under BREA and ArcticNet are asking if the sea floor will warm up, if yes, how much, and will that result in reduced stability. Don't have the answers yet.
- Billy Archie: Is there any monitoring or a database of existing drilled wellheads in the Beaufort? Steve responded that studies on one historic well thought to be leaking concluded in the 1990s that it was water not gas; he is not aware of any monitoring of historic wells at this time.
- Hans Lennie: Do the oil companies know what is out there and do they have the same info as NRCan? Is there a way to force companies to share this data? Steve responded that in Canada, companies have shared their data for use in the assessment in the public domain – for example the NEB can use the data to assess an application. He has not encountered any resistance from companies in regards to sharing of data. Oil companies want transparency; they want to understand potential issues. Canada is unique, setting the standards globally, not only in collecting information but also in communicating information to communities.
- Billy Storr: Russian drilling in deep water in the Kara Sea is probably fairly similar to what we have in the Beaufort. Is there anything applicable to the Beaufort? Steve noted that Exxon Mobil had a huge program in the Kara Sea, more or less on the shelf. There is a lot of similarity between the Beaufort and Kara Sea. And as you get to deeper waters, we are dealing with many unknowns. With soft sediments, you need to know that they are there, and then design for the situation. Steve has recommended to the Arctic Council that oil spill prevention be examined as a large international effort where we could all learn from one another, rather than working in isolation. This had been proposed for IPY but was not funded.

5.2 Regional Synthesis of Coastal Geoscience for the Beaufort Sea

Dustin Whalen (Natural Resources Canada) provided a regional synthesis of coastal geoscience for the Beaufort Sea. Danny C Gordon noted that he lived on Herschel Island for a while, travelling there about 25 years ago. The Coastal Classification Database slide in the presentation - 25 years ago they could get into the bay, the harbour was on the east side, could go in with schooners, but a big storm closed it due to sediment build up. Ptarmigan Bay, 25 years ago, there has been much slumping there. There used to be four ice houses there but not anymore due to the slumping – 200 feet has been lost. The hunting camp had to be moved back away from the eroding cliff three times over the last 25 years. Gerald Inglangasuk asked if historic dredging has affected Tuk Harbour sediment. Dustin stated that there is little sedimentation in the dredge pits, which indicates that there is little effect; the sediment is likely coming from the outside.

6 Coupled Ocean Ice Atmosphere Modelling and Forecasting

6.1 Beaufort Sea Marine Observatories

Malcolm Lowings (IMG-Golder) presented findings from the first two years of data collected from ocean moorings in the Beaufort, describing why it is important to communities, agencies, companies and others. A number of questions were posed by Forum participants:

- Billy Archie: Seals washed up on shore a few years ago. Can science tell us what happened – a virus? Fukushima? Malcolm responded that this is outside of his area of expertise, but that ArcticNet has done quite a bit of work on biology, that work can help us to understand what the health of ecosystem as a whole is like. Lisa Loseto added that DFO thinks the cause was a virus, but are still working on determining what the virus might be. Links to Fukushima are weak.
- Lawrence Ruben: 1) Will students be brought on the Amundsen and trained this year? 2) Will students from this region e.g. Roger M, be going? 3) Mooring design improvements, are older designs being put out without waiting for new designs? Malcolm responded that any modifications to the moorings make it easier to deploy/recover the moorings. The equipment itself isn't being changed. With respect to hiring – for the mooring work, Roger is the person we are relying on. We do some work in Inuvik, calibration on shore is required. Roger is involved in this and we may be able to involve others. Keith Levesque (ArcticNet) added that the Amundsen will be out of dry dock May 31, leave Quebec mid-late July, and in the Beaufort Sea in mid to late September. Wildlife monitors will be hired to come on the ship. The Schools on Board program will be held aboard the Amundsen, and students from all over Canada, including northerners, are invited to participate.

6.2 Forecasting Weather, Ocean and Ice Conditions

Fraser Davidson (Department of Fisheries and Oceans) reported on a joint project related to the forecast of weather ocean and ice conditions in the Beaufort Sea.

- Lawrence Ruben: can real time weather/ocean/ice information be available to Inuvialuit? Fraser responded that the system produces daily ocean and ice forecasts through forecasters at Environment Canada, this is done in an operational manner so it is sustained. The first operational system is global and will be available in June (2013). The regional system will likely be up and running in January 2014.
- Fraser asked participants questions and received responses:
    - What is on your minds with respect to ocean/ice movement:
        - In case of an oil spill, where will it go and where will it end up?
        - Application to search and rescue
        - Movement and migration of fish
    - What types of ocean and ice information do you want access to?
    - What do you currently use for computers? Would you use a website?
        - It is hard to download information, cannot download MODIS satellite information
        - The outer communities do not have very fast Internet speed/low bandwidth.
    - Fraser noted that if there is a central computer in the community, information could be automatically delivered.

6.3 Modelling Freshwater Flows from the Mackenzie Delta to the Beaufort Sea for Improved Offshore Prediction

Evan Davies' (University of Alberta) presentation was on the modelling of freshwater flows to the Beaufort Sea for improved offshore prediction by the METAREA ocean forecast system. Questions and comments are summarized below:

- Hans Lennie: Much of this information can be gained through Traditional Knowledge (TK) (e.g., Spring break up information). More TK should be included in this sort of work. During spring, lots of people go out to hunt muskrat, going down a lot of frozen rivers and they see the break up.
- Billy Archie: While flying over to Aklavik, the lakes don't seem as clear as they used to. Are you monitoring water quality? Evan stated that he is not, but there is work being done by other researchers – can put you in touch with collaborator who is working on this.
- Richard Gordon: Transect slide re: the E/W flow differences and ice dams. Is this because of the mountain run-off? Evan responded that it's during break-up, so it's increased river water speed and volume, not mountain runoff.
- Richard Gordon: What's the timeframe that they were looking at for the ice dam? Evan noted that that the ice dams occur April to June during breakup. Some of the water enters lakes at different times depending on whether the lakes are connected to the river. Some lakes are higher than the river water level at some points.
- Are storm surges still being monitored? Evan noted that Faye Hicks (University of Alberta) may do work on storm surges, some work was done for IPY but may no longer be going on as it is very expensive.
- Darrel Nasogaluak shared his experience of finding freshwater quite far out - about 10 miles- when he was working on the ice island. Evan added that during breakup, the freshwater can go out 100 kms.

7 Worst-Case Environmental Conditions

7.1 Overwintering of Vessels in the Beaufort Sea and Assessing Damage Potential

A presentation on the overwintering of vessels in the Beaufort and assessing ice issues and potential damage was provided by Anne Barker (National Research Council). A number of questions were posed by Forum participants:

- Billy Storr: There doesn't seem to be anyone listed from NTCL on the list of contacts for this project. Anne responded that NTCL was not intentionally left out; Transport Canada had previously met with NTCL and that information was used for the project.
- Billy Archie: The new shipping regulations require double hull vessels in the shipping zone. The zone does not include Tuk Harbour or waterways into the Delta. Exemptions for McKinley Bay. This is a Transport Canada decision.
- Larry Ruben: If I wanted to find info from 70-80's about Wise Bay and Summers Harbour use by overwintering vessels, would you have it? Anne answered that industry has the information. Larry had further questions about the type of information available. Anne said that the information is specific to the circumstances and it would have to be an overwintering due to ice damage. No specific records of overwintering vessels appear to exist. Industry has some information, other information would only be found if there was a problem (i.e. a spill). If it was reported, and it was in the spills database, there should be information on that in the database. Sometimes the linkages aren't there as to why a spill occurred and whether it was due to overwintering practices or related to other issues.

- Michael Green: If vessels are overwintering in Beaufort Sea, are there wildlife monitors to make sure it doesn't negatively affect the wildlife? Anne responded that there have been cases in the past where there have been wildlife monitors. It depends on the vessel and what sort of monitoring is needed. Example was cited of a tanker in Wise Bay that was heated and staffed year-round. Some of the fuel barges are there, and they are monitored on how they are doing, but there isn't necessarily someone year-round. It depends on what type of vessel is there and what type of monitoring is required, on a case by case basis.
- Larry Ruben: recalled that there wasn't info provided that a vessel overwintered until after the fact. Anne agreed that there needs to be more timely communication with the communities and monitoring of the overwintering vessel. It is in the BREA project recommendations that local communities be made aware of the overwintering vessel. There aren't a lot of regulations now, but it is recommended that communities be notified.
- Dennis Arey: There was a case where they did not mark the vessel until after a skidoo accident.
- Hans Lennie: There are exemptions for double-hulled vessels in Tuk Harbour and the Delta – these need to be reviewed. Anne agreed that there needs to be more work and information shared about vessels overwintering in the Delta. It also depends on whether the issue is whether the vessel is strong enough to deal with the ice conditions or something else like mooring or if the vessel was compromised prior to the icing. Hans asked what the next step is to make sure that these vessels are dealt with. Anne responded that Transport Canada is working on guidelines to address these concerns.
- Richard Gordon echoed Hans' concerns that the exemptions be dealt with.
- Note that there was a leaking barge out on the ice. Anne asked if the vessel was cracked before it arrived, or if this was something that happened because of the ice? On the river, there are safe places but you need to know the river. In some cases, issues are due to mooring lines and not the vessels, the moorings fail.
- Transport Canada is taking on the regulatory authority, there will be guidelines developed, hopefully these will take into consideration information from ice experts and traditional knowledge.
- In the communities they tell everyone that they have to buy double-hulled fuel tanks… when bad things happen, it's too late to turn back time. This is an opportunity to get action on our concerns.

8 Sea Ice and Extreme Ice Features

8.1 Radarsat Mapping of Extreme Ice Integrated Sea Ice & Sachs Harbour Community Sea Ice Monitoring

Klaus Hocheim (University of Manitoba) and Charlie Haogak (Sachs Harbour) presented the findings of an integrated sea ice project for BREA – Detection, Motion and RADARSAT Mapping of Extreme Ice Features in the Southern Beaufort Sea, which includes a community based monitoring component. Questions and comments included:

- Michelle Johnson: Clarification on thickness of ice floe (10m?). Klaus confirmed that it was 10m. Were you surprised? Klaus responded that he was not.
- Darrel Nasogaluak: When you're out there studying multi-year ice, are you taking ice core samples? Klaus stated not for this year; they will be looking at surface snow properties in this coming season.
- Fraser Davidson: How far offshore can you go with the skidoo/sled? Klaus noted that there are safety limitations, but they didn't go very far this past season. Charlie added they only went 2-4kms out. They followed the Sachs River for 20km. Klaus noted they are looking to scale it up and go further in the next season.
- Larry Ruben: Are you expecting the ice modeling to show how much we're going to lose in 2014/2015? Klaus said that it depends on the summer season and what the winds do.
- Julie Friddell: How often did Charlie do monitoring? He responded that he went out a couple times over a month.

8.2 Understanding Extreme Sea Ice Features & Quantifying Sea Ice Dynamics

Christian Haas (York University) provided an update on a project that is taking airborne and satellite observations of the distribution, thickness and drift of sea ice types and extreme ice features in the Beaufort Sea. Christian noted that flights will be conducted out of Sachs Harbour April 10-17 for the project, noting that wildlife monitors would be used, and observations made of drifting pack ice. There is an opportunity to take other sensors on the flights. He invited community suggestions for locations of 'interesting ice', and traditional knowledge about multi-year ice thickness and drift.

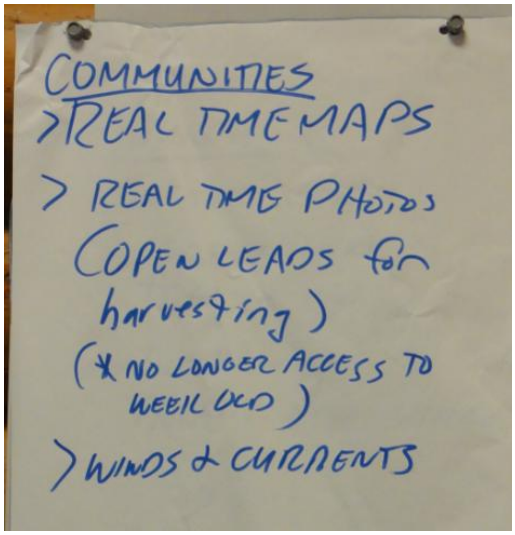
- Larry Ruben: Suggested that Christian contact the Sachs Harbour HTC to inform them of his flight schedule, and get local observers on the plane this April. He added that there is a polynya outside of Paulatuk moving about. Suggested that polynya movement be added to this research.
- Michelle Johnson: Do you know the accuracy of your methods? Christian said that over level ice, it's very accurate. However, there are various difficulties getting accurate readings for pressure ridges. Usually this leads to underestimates of this rough ice.

8.3 Measuring the Thickness and Strength of Deformed Multi-year Ice

Michelle Johnston, with the National Research Council, reported on her project about measuring the thickness and strength of hummocked multi-year ice. Charlton Haogak asked how many people from Sachs are going to be trained for this coming season. Michelle said that they have one wildlife monitor so far; the weight restrictions for the aircraft are limiting who can be involved. Would like to add at least another wildlife monitor to the group if weight allows.

8.4 CanICE – A Sea Ice Information Database and Web-based Portal

Julie Friddell (University of Waterloo) presented the CanICE Project, which is making sea ice information from the Canadian Ice Service available through a web-based portal, and asked community participants what information would be the most useful to them:



- Billy Storr: Community people would like real-time maps for the Beaufort. It could be used for harvesting and to see if they can get out to where they are planning on going. Julie asked if they could work with the communities to target which areas would be the most beneficial.
- Larry Ruben: Agree with the need for real-time photos. It would be useful to get info about where the leads and open areas are for harvesting purposes, also ice thickness, currents and winds. There used to be week-old photos but it would be better to have real-time info. Julie asked if a camera could be set up in the community; Larry indicated yes.
- Marlene Wolki: Agree that real-time wind and current information would be useful.

8.5 Beaufort Sea Engineering Database

The Beaufort Sea Engineering Database, which brings together sea ice information with other key datasets in order to assist with engineering decisions, was presented by Ivana Kubat of the National Research Council.

- Andy Swiderski: How were the Community Conservation Plans accessed and included in the database? Ivana noted that colleagues worked with AANDC and NEB to obtain the maps and processes are included in the database. She suggested that the database could also add other sensitive areas, MPAs, ice edge areas, beluga zones.
- Michelle Johnston: Could ice thickness info (point data?) be included into the database? Ivana said that it depends - they could include point measurements, data sets, flow rates, polygons or other raw data. There is minimal or no analysis of data within the database.

- Hans Lennie: Would like to ensure that researchers go to the individual communities for their local info. Each community has specific and unique information. Ivana noted that she is open to working with the communities to ensure this.
- Julie Friddell: Will the database be available online? Ivana said that it is only available on hard drive; currently, online access is not feasible.
- Josh Oliktoak: Can you predict harmful ice for ships, to get to safe harbour? Ivana responded that the database is not predictive, but others could use the data it contains to model/forecast with other tools.
- Larry Ruben: informed the group that the Community Conservation Plans are to be updated this year and the database(s) should include the updated plans when they are complete.

9 Fisheries Baseline Information

9.1 Offshore Fish Populations, Habitat and Ecosystems

The findings of a marine fisheries program that integrates knowledge of the Canadian Beaufort Sea fishes and their ecosystems were provided by Andy Majewski (Department of Fisheries and Oceans). Questions and comments are summarized below:

- Chucky Gruben: Your studies are conducted in the ice-free season; right after ice freezes up in October, we fish for cod in shallow waters. They are so abundant that we used to use them for dog food. Traditional knowledge will provide info that the research ship is not able to. Andy responded that this study does indeed focus on the open-water season, this is mostly due to the difficulty of conducting a regional study on the ice. Distribution does change over the seasons; we know that most marine species are spawning under the ice, and that we know very little about this behavior. If there is information in the communities about these things, this may be the only information we have on this topic and it is certainly valuable.
- Maxime Geoffroy: ArcticNet acoustic monitoring overwintering project on the Amundsen in 2007-2008, scans in October; we saw cod in the deep layer (Atlantic origin) although it looked like there were dense coastal schools; maybe it's not a question of different distributions

throughout the year, perhaps there are several populations? Andy stated that they looked for cod in shallower water in the nearshore but didn't see any in this survey this summer – but that does not mean that they weren't there.

- Billy Storr: Mature cod are in the deeper warmer saltier layer, the younger in the higher pelagic layer. There is a big difference between the mature fish and younger. Andy agreed that mature cod were in the thermocline and top of Atlantic layer. We know that cod have a wide tolerance of environmental conditions; we can catch them almost anywhere. It may be food type or availability, but we don't know. But they are in highest concentrations at the Atlantic/thermohalocline area.
- Fraser Davidson: Who is looking at physical oceanographic data from the cruise? Where is the data located? Andy responded that the data resides with Bill Williams and Jane Eart, and will be made publicly accessible through the Polar Data Catalogue.
- Michelle Johnston: Is the vessel 'Frosti' ice strengthened? Concerns about going near Banks transect? Andy stated that it is, and agreed that the Banks Island transect may not get done if there is a concern with the ice in that region, but it is in the plan.
- Margaret Kanayok: A few years ago in Sachs, someone caught a salmon, it must have gotten lost! Don't know what it was doing there but it sure tasted good.

9.2 Baselines and Potential Effects of Mercury and Hydrocarbons in Beaufort Sediments and Biota

Jessie Carrie (University of Manitoba, Centre of Earth Observation Science) presented findings to date on a project looking at baselines and potential effects of mercury and hydrocarbons in Beaufort sediments and biota. Forum participants had a number of questions:

- John Korec: What is the fate of mercury when left in spilled oil? Jessie responded that there have not been many studies, most studies look at mercury in the atmosphere, and as such he could not speak to this with confidence at this time.
- Lin Callow: Any speculation on why mercury is higher in the east? Jessie noted there are a number of possible reasons, e.g. could be an anomaly year; could be the carbon cycle; the west may be a different system than the east.
- Richard Gordon: Asked for clarification on the mercury movement pattern diagram – what do the arrows mean 'east and up'? Is that the movement of zooplankton? Jessie stated that that diagram was to show the trends of concentration, rather than movement of mercury, as you go east and off-shore. Richard asked if the ice influences. Jessie responded that it may be ecological habitat factors at play rather than ice; need to study more and understand where feeding occurs.
- Hans Lennie: Liver sampling – Is there indication of concentrations of 'anti-freeze' in the cod in regards to where in the water depth they're found to help them deal with the colder temperatures? Do you know the spawning trends and area of the cod? Jessie responded that he could not speak to these questions, as he deals with the contaminants. Andy Majewski added that he has had some conversations with community members at this workshop regarding cod

spawning habitat changes, and agrees that traditional knowledge can provide some insights. As to the antifreeze aspect, he could not speak to it. The winter spawning information provided by communities needs to be followed up.

- Darrel Nasogaluak: Imperial Oil workshop – Is there a difference in the mercury levels in the cuttings from previous drilling fluids? Is there a reason for concern? Jessie said that there are regional variations. The concentrations in the west are relatively low. In regards to the drilling cuttings, they would have to be sampled and analyzed. John Korec added that the cuttings and cores are stored in Calgary at the Geological Survey of Canada. You can make an application to NEB to obtain a sample.
- Larry Ruben: Are the levels of contaminants safe for fish? Is 0.5 high? We have had 0.7 in char at Paulatuk. How are these levels set? Should they be lower? Jessie said that there used to be a lower safe level set for frequent eaters of fish, but this has changed recently to the current level. It's a trade-off between eating fish or less healthy processed foods. You want to minimize the consumption of contaminants but the fish also provides a high quality food. Lisa Loseto responded that there is a recent health assessment that recommends 0.5 to 1.0 for commercial fish in the south. Don't want to look at mercury in isolation; there are other diet factors such as omega fatty acids to consider. Using just the mercury concentration by itself is not as useful. Lisa will provide contact information for the local health authority.

9.3 Active Acoustics Mapping of Fish

A presentation on active acoustics mapping of fish, and the answer to the mystery of the missing Arctic Cod was provided by Maxime Geoffroy (ArcticNet).

- Richard Gordon: Did you see any whales or seals in the areas you were monitoring? There is a relationship between beluga, seals, and cod. Maxime stated that the slope area has higher productivity for cod and that correlates with the whale migration and feeding areas. There needs to be further research on this.
- Richard asked if the fish would move away if there is prolonged noise pollution in the water. Maxime said that this research did not look at that, but others are looking at the effects of seismic activity on fish. There are also some ambient noise surveys (moorings with hydrophones) that are looking at that question. Richard added that it is important to understand the effects of shipping noise versus point sources from development.
- Chucky Gruben: Sixty percent of the ISR communities' diet is fish, we fish throughout the year. When it comes to research, many of your questions could be answered by the communities.

10 Geospatial Analysis for Regional Assessment

10.1 Web-based Geospatial Analysis Tool for BREA

Valerie Torontow (Environment Canada) spoke about the web-based geospatial analysis tool that is being prepared for BREA.

- Joanne Munroe: How do the suite of tools – this one, other EC mapping tools, and Arctic ERMA (Environmental Response Management Application) fit together? Valerie was not sure how they will fit together ultimately. The various tools have different applications. This specific product is a pilot project, and there are discussions to bring it into the Arctic ERMA platform.
- Billy Storr: Glad to see researchers talking to each other and sharing information. There seems to be projects that have overlap and potential duplication. Andy Swiderski noted the importance of bringing everybody together, to share information, and ensure that resources and capacity are put to good use.

11 Community Priorities

11.1 Regional Coastal Monitoring in the Inuvialuit Settlement Region: Ecosystem Indicators

Lisa Loseto (Department of Fisheries and Oceans) presented the results of a project examining ecosystem indicators for regional coastal monitoring in the ISR. Questions and comments are summarized below:

- Josh Oliktoak: Hope that funding can be found to do similar work in Ulukhaktok. There needs to be multi-year projects.
- Billy Storr: When you do your mercury studies on fish, is there any test comparing levels in liver vs. the meat? Lisa replied that they don't usually sample the liver. It is a storage site for mercury. The muscle tells more about the whole body and what the fish eat currently. When you look at liver, you'll see accumulation over time. Billy said that there are many who eat loche liver and eggs. Lisa noted that they could work with Health Canada to do some sampling.
- Larry Ruben: Many Paulatuk community members do eat liver from fish and birds - char, loche, whitefish, geese. They will be asking for some liver sampling work. Lisa stated that she is not sure about fish, but in belugas the mercury is bound to selenium, which is excreted; it is a different type of mercury that is not absorbed.
- Michael Greene: Paulatuk got their whale last year late in the season, late August. He noted to the HTC that when they had monitoring in the base camp, using generators and freezers, it really affected the animals, keeping them from coming into the bay. Lisa will follow up with the community about this concern.

11.2 Polar Bears in Deep Offshore regions of the Beaufort Sea

Norm Snow's (Joint Secretariat) presentation reviewed the results of a project studying the distribution and density of polar bears in previously un-surveyed areas of the off-shore Beaufort Sea. Richard Gordon's questions and comments are summarized below:

- *Study Area:* Was this the only survey of the area? It is a debatable zone for getting the needed information. Norm responded that it was the only survey.
- *Timing/Frequency:* Timing is important for studies like this; will the survey be done annually until we have better numbers? This was done in winter months, while offshore development will occur in summer months – how does it relate? Norm responded that the reason for doing the study is to get a better understanding of that population of bears. March was the only time available to do it. When it was suggested that it be done in August, there was not much interest due to safety concerns. The Joint Secretariat would like to see another effort to get a better estimate of polar bear and their prey distribution.
- Richard noted that in the fall a similar study was done in the Yukon, and they didn't see any bears. Need to be careful about conclusions.
- *Logistical constraints:* The other thing is the time constraints on the availability of the aircraft with the right equipment and experienced pilots. The planning came down to everything hinging on the availability of the pilot.
- *Clarification of estimate:* Richard asked for clarification on the estimated number of bears. Norm clarified that the number (N=4) was the number actually sighted on transect within the survey period. The other number is an estimate based on calculations.

12 Birds Baseline Information

12.1 Coastal, Marine and Offshore Bird Usage of the Beaufort Sea Region

Myra Robertson (Environment Canada) presented research on the usage of coastal, marine and offshore areas by birds in the Beaufort Sea. Forum participants had a number of questions and comments:

- Richard Gordon: Some of the datasets that are used are dated. Is there any funding to update the data? Myra responded that there is some work to update the data. The first step is to figure out what data does already exist, for example, industry had bird data that we did not have. Once we work through the process, it will help inform where future field surveys could be done. This will provide regional information for industry. However, industry is required to gather their own data for their lease areas.
- Hans Lennie: We are more interested in the birds that provide food to the Inuvialuit than non-food birds. Re: Spring geese studies - There are different populations of geese. Some of these populations are being overhunted.

- Darrel Nasogaluak: At the end of May/beginning of June, I have observed nesting birds right to the end of the Tuk Peninsula. Myra clarified that the map she used in the presentation shows nesting sites later in the year (fall). There is quite a bit of data from TK that is incorporated into the database.
- Josh Oliktoak: Is there work included from Ulukhaktok? Myra responded that for this step, they are concentrating on the Beaufort Sea. She agrees that there should be an expansion to include Victoria Island in the next round of work on this database.
- Larry Ruben: Had heard a presentation on shorebirds at a recent oil spill conference. Have you been in contact with US researchers to share information on migrating birds? There might have been birds affected down south during the Gulf of Mexico spill that migrated up here. Myra said that it is of interest to see if Canadian migratory birds were affected. The spill happened before the Canadian migratory birds were down south. Snow geese in the Western Arctic migrate to California, so they're unlikely to have been affected. Other geese tend to migrate inland so they would not be likely affected by the Gulf spill.
- Margaret Kanayok: Ulukhaktok uses the same ocean, and the birds that migrate there will be affected too. Myra agreed that Victoria Island should be included in the database.
- Lynda Graff: Was Lynn Dixon's (Canadian Wildlife Survey) telemetry project work on sea ducks included in the nearshore coastal program? Myra noted that some of that work will go into the offshore database, but the details of how it will be included have not been worked out. Telemetry data is about an individual bird's use of an area, but it does not provide population density.

13 Biological Information to Inform Oil Spill Response

13.1 Biological Data to Assess Net Environmental Benefits and Costs of Dispersants and In-Situ Burning in Oil Spills Response

Note – this presentation by Ken Trudel (SL Ross) was cancelled due to travel issues. Presentation is available on the website.

14 Wrap-Up Session

The workshop wrapped up with a summary of the three days by one of the facilitators, and closing remarks from Billy Storr (Vice Chair of the Inuvialuit Game Council), and Ruth McKechnie (BREA Project Manager, AANDC). Forum participants were then asked to share their thoughts on the BREA Forum in a roundtable.

14.1 Facilitator's Summary

The Forum has spent 2-1/2 days sharing the findings of the first two years of BREA. The Working Groups and the research projects will go far to serve the diverse needs of various organizations – communities, Inuvialuit organizations, co-management bodies, regulators, government, industry and academics. As Julie Friddell noted, "there are a lot of old and new data that are finding new uses". The objectives of the Forum have been achieved: results to date have been shared, questions have been asked, suggestions made for additional work, and opportunities for collaboration identified. There were many conversations, during the Forum itself and during the breaks and at lunch. From the outset of the Forum we used the theme of telling stories. This Forum provided a great opportunity to bring the individual stories from communities and researchers together and make linkages. Historical data and newer research findings are being considered, along with local/traditional knowledge, to more fully understand the bigger picture. There is better access to information through various databases and portals. The ongoing challenge is to create awareness of information, ensure it is accessible, to transfer it to those who can use it, and ultimately incorporate the best information into planning and decision-making.

14.2 Closing Remarks – Billy Storr

Billy Storr focused on the linkages between traditional/local knowledge and science. He noted that he went to college at 49 years of age. As a harvester, he kept going home to his wife and saying "I don't think I could sit there at a desk". While hunting, along the shore he could see distinct areas of grasses, willows, and trees. He knew that when you got to the trees, there aren't any more willows. But in school he learned that this is because the trees drop their needles and the ground is too acidic for the willows. So there is a way to mix TK and Science. He noted that we need to know what we have here, and understand why we have it. Inuvialuit haven't been far offshore much, we don't know specifically what's there, but we do know that the animals use this area. We are glad to have scientists bringing the information all together, that communities have come out and talked with the researchers, and that the researchers have seen what we have to contribute through traditional knowledge. We want to protect what we have, and support from research gives us the ability to do that.

14.3 Moving Forward: Informing Outcomes and Next Steps – Ruth McKechnie

From Ruth's perspective the Forum was very exciting, providing a great opportunity to learn from each other's experiences and to consider new approaches for working together as we move forward. We learned that oil and gas activity forecasts can change, while at the same time they can provide a useful snapshot of what the potential levels of activity could be over the next fifteen years. This information when examined with new baseline information will help to identify where there may be sensitivities for certain species. This allows early actions to be taken to avoid potential impacts. Ruth made a number of observations:

- We heard that gaps in baseline information are being filled on physical and chemical oceanography, sea ice conditions, extreme ice features, coastal and marine birds, fish and polar bears to name a few. We have learned about ocean, ice and atmosphere models that will better predict sea ice forecasts in the Beaufort Sea – this is essential for exploration drilling in the deeper waters offshore.
- New information is being gathered that will assist in preparation of design criteria and regulations to enable safe drilling in the offshore.
- We heard about an assessment of capacity and training needs at the community level for oil spill response that is important for Inuvialuit communities as part of preparedness for oil and gas activity in the Beaufort Sea.
- We noted the importance of community-based monitoring. We also learned about a number of environmental indicators as well as the importance of social, cultural and economic indicators to assess the impacts of oil and gas activity. These are important components of BREA.
- The need for BREA metadata to be publicly accessible through the Polar Data Catalogue, other databases, and a web portal was a consistent message throughout the Forum.
- The importance of the involvement of Inuvialuit communities and the contribution of traditional knowledge was clearly communicated. Several times during the Forum we heard about changes that were observed by Inuvialuit in the environment, for which there were no previous scientific records or understanding.

All of these BREA results will build a strong knowledge base that will inform decisions by regulators, governments, Inuvialuit and industry on oil and gas exploration and development. The BREA research and working group results are like pieces of a puzzle, or parts of a story, that will fit together to create a regional picture of the current state of knowledge of the Beaufort Sea. At the end of the four years, the final results of BREA will inform the regional synthesis. They will provide information for environmental assessments and in support of efficient and effective regulatory decisions. All of the partners will be better prepared for oil and gas activity in the offshore as a result of BREA.

In conclusion, Ruth thanked:

- The Inuvialuit Game Council for hosting the Forum and for their leadership, with special thanks to Billy Storr for stepping in on Frank Pokiak's behalf over the past few days.
- The Joint Secretariat for organizing and planning this event, acknowledging Norm Snow, Jennifer Lam and Steve Baryluk for all their hard work.
- All the researchers and working group leads for coming to Inuvik and presenting your findings.

- The community representatives and IGC directors for providing such excellent feedback following the presentations.
- Tara Paull – she works day after day on BREA, and has made a significant contribution to the planning of the Forum.
- Special thanks to Andy Swiderski and Vicki McCullogh for their contribution to the organizing and management of the Forum.

14.4 Participant Roundtable Remarks

Each participant was asked to briefly share their thoughts on the Forum. The response was overwhelmingly positive, and the key themes are summarized below:

- The Forum provided an opportunity for mutual learning, to ask questions of each other, to see new perspectives. The learning process and communication are important, and must be continuous.
- A very diverse group of participants have shared interests and goals.
- Modern science and TK – two different but related forms of expertise - should work together. TK can inform researchers on how to better develop their projects. Science can help communities with their activities and decision-making.
- Thanks were extended to participants for asking tough questions and good questions. Researchers really valued local interest and involvement.
- Participants appreciated the longer discussion period after each presentation.
- Inuvialuit are the land owners, we will be here long after the oil is gone. This is our land, water, our main source of food. We have to protect it.
- There is so much research activity on the complex Beaufort Sea – we maybe need to integrate our work more, to collaborate fully – there is an opportunity to do this in the next year or so to bring together a unified story for BREA.
- How well was the BREA money spent? It seems like there was some duplication of research. There are a number of oil and gas representatives sitting on research teams. Industry funds research in Alaska. Maybe they should be helping with the funding here.
- It is good to see Inuvialuit working with highly educated people - the researchers. We are envious as they see the beautiful land around us. Hope to find some interested students out there to become involved.
- It was great to see Charles Haogak make a presentation on the work he has been doing as part of a research team.
- BREA is collecting the needed information at a regional level and with a longer-term time scale – the types of data being collected are just what are needed.
- These type of events help us all work together, to move forward more effectively. There is nothing like being in a room with like-minded individuals; this can't be done on a videoconference or a telephone call, or by reading a report or email. Can put faces to names, make personal connections.
- The collaborative model of BREA is great, it may not always be easy, but it is important.
- Information can be used for a number of purposes; for example, much of the information will contribute to spill preparedness and response, Net Environmental Benefits Analysis, trajectory models. As we move forward we should consider the multiple uses of our data.

- Need to ensure that the BREA report and findings are regularly reviewed, e.g., every five years, rather than waiting for a longer time period or in response to something happening – we need to be prepared for future development.
- There is a need to take information back to the communities, and to ensure communities can easily access the data presented at the workshop.
- We really need to start training our people so that they will have jobs in the future. Working together is vital to projects in the North; I hope we continue to do that.
- We need to ensure that we are able to respond to any oil spills.
- Back in Ulukhaktok, there have been issues with the clean-up of an old exploration site, and Inuvialuit Land Administration has to find funds to complete it. Hopefully industry can work with us on that, and it can be prevented from happening again.
- Archeology tells us that at one point things did not change for 500 years – there was no lack of food, no war. It must have been an incredible time. I hope that in the future an archeologist comes to the region and concludes there wasn't too much change in that period when we had oil, there is no layer of oil in the ground that we can trace back, like they could with Valdez or the Gulf.

APPENDIX A: FORUM AGENDA

BREA Results Forum: First Two Years of Progress

February 19 to 21, 2013

Ingamo Hall Friendship Centre,

20 Mackenzie Road, Inuvik, NWT

Objectives and Agenda

Objectives

- To share BREA research and working group results to date with Inuvialuit organizations and communities, industry, governments, regulators and academia.
- To provide participants with the opportunity to hear the results, pose questions, and engage in dialogue that will assist researchers in conducting any future work on their research projects and assist working group leads in planning their future activities.
- To hear from participants, how the information presented could help inform the final outcomes and contribution of BREA.
- To provide a venue to facilitate greater collaboration among the researchers and other partners as they share the research results to date.
- To enable working group leads to identify research directly relevant to their working group mandate and deliverables.

DRAFT Agenda

MEETING FORMAT
Most presentations are 20 minutes, with 10 minutes for questions after each presentation; Presentation lengths are in parentheses after the presentation title

Tuesday February 19, 2013	
2:30 – 2:50	Opening, elder prayer, words of welcome from Frank Pokiak, Inuvialuit Game Council and Nellie Cournoyea, Inuvialuit Regional Corporation (TBC)
2:50 – 3:10	Purpose and what to expect for next few days Andy Swiderski, Gaea Consulting and Vicki McCulloch, DPRA
3:10 – 3:25	1. BREA overview and background Ruth McKechnie, Aboriginal Affairs and Northern Development Canada
3:25 – 3:45	BREAK

3:45 – 4:15	2. Oil and gas exploration and development forecast 2012-2027 (20) Lin Callow, Salmo Consulting
4:15 – 4:45	**3. BREA Working Groups** 3.1 Climate change working group (20) Mike Fournier, Environment Canada
4:45 – 5:10	3.2 Cumulative effects (20) Genevieve Carr, Aboriginal Affairs and Northern Development Canada
5:10 – 5:30	3.3 Waste Management (15) Mike Fournier, Environment Canada
5:30 – 5:40	Day one wrap up Andy Swiderski
Wednesday February 20, 2013	
8:15 – 8:30	Refreshments
8:30 – 8:45	Introduction to day Andy Swiderski
8:45 – 9:15	**3. BREA Working Groups** (continued) 3.4 Oil Spill Preparedness and Response (20) George McCormick, Aboriginal Affairs and Northern Development Canada and Joanne Monroe, Canadian Coast Guard, on behalf of John Korec, National Energy Board
9:15 – 9:45	3.5 Social, Cultural and Economic Indicators (20) Bob Simpson, Inuvialuit Regional Corporation
9:45 – 10:25	3.6 Information Management (10) Tara Paull, Aboriginal Affairs and Northern Development Canada // Polar Data Catalogue (20) Julie Friddell, University of Waterloo
10:25 – 10:45	BREAK Opportunity to demo Polar Data Catalogue
10:45 – 11:15	**4. Geohazards and Coastal Processes** 4.1 Deep Water Seabed Geohazards (20) Steve Blasco, Natural Resources Canada
11:15 – 11:45	4.2 Regional Synthesis of Coastal Geoscience (20) Dustin Whalen, Natural Resources Canada
11:45 – 12:15	**5. Coupled Ocean-Ice-Atmosphere Modelling and Forecasting** 5.1 Beaufort Sea Marine Observatories (20) Malcolm Lowings, IMG-Golder and Keith Levesque, ArcticNet
12:15 – 1:30	LUNCH – Hosted by Inuvialuit Game Council Additional opportunity to demo PDC

1:30 – 2:10	5.2 Forecasting Weather, Ocean and Ice Conditions (30) Fraser Davidson, Fisheries and Oceans (also presenting on behalf of Greg Flato, Environment Canada)
2:10 – 2:35	5.3 Modelling Freshwater Flows from the Mackenzie Delta to the Beaufort Sea for Improved Offshore Prediction (20) Evan Davies, University of Alberta (on behalf of P. Marsh)
2:35 – 3:05	**6. Worst-Case Environmental Conditions** 6.1 Overwintering of Vessels in the Beaufort Sea and Assessing Damage Potential (20) Anne Barker, National Research Council
3:05 – 3:40	**7. Sea Ice and Extreme Ice Features** 7.1 Radarsat Mapping of Extreme Ice Integrated Sea Ice & Sachs Harbour Community Sea Ice Monitoring (25) Klaus Hocheim, University of Manitoba and Charlie Haogak (Sachs Harbour)
3:40 – 4:00	BREAK
4:00 – 4:40	7.2 Understanding Extreme Sea Ice Features & Quantifying Sea Ice Dynamics (on behalf of Chris Derksen, Environment Canada) Christian Haas, York University (30)
4:40 – 5:10	7.3 Measuring the Thickness and Strength of Deformed Multi-year Ice (20) Michelle Johnston, National Research Council
5:10 – 5:30	Wrap up
Thursday Feb 21	
8:15 – 8:30	Refreshments
8:30 – 8:40	Introduction to Final Day
8:40 – 9:10	**7. Sea Ice and Extreme Ice Features (continued)** 7.4 CanICE- A Sea Ice Information Database and Web-based Portal (20) Julie Friddell, University of Waterloo (on behalf of Leah Braithwaite, Environment Canada)
9:10 – 9:40	7.5. Beaufort Sea Engineering Database (20) Ivana Kubat, National Research Council
9:40 – 10:10	**8. Fisheries Baseline Information** 8.1 Offshore fish populations, habitat and ecosystems (20) Andy Majewski on behalf of Jim Reist, Fisheries and Oceans Canada
10:10 – 10:30	BREAK Opportunity to Demo CanICE and BSED databases
10:30 – 11:00	8.2 Baselines and Potential Effects of Mercury and Hydrocarbons in Beaufort Sediments and Biota (20) Jesse Carrie, University of Manitoba, Centre of Earth Observation Science

11:00 – 11:30	8.3 Active Acoustic Mapping of Fish (20) Maxime Geoffroy, ArcticNet
11:30 – 12:00	**9. Geospatial Analysis for Regional Assessment** 9.1 Web based Geospatial Analysis Tool For BREA (20) Valerie Torontow, Environment Canada
12:00 – 1:30	LUNCH Additional opportunity to demo CanICE and BSED databases
1:30 – 2:00	**10. Community Priorities** 10.1 Regional Coastal Monitoring in the Inuvialuit Settlement Region: Ecosystem Indicators (20) Frank Pokiak, Inuvialuit Game Council and Lisa Loseto, Fisheries and Oceans
2:00 – 2:30	10.2 Polar Bears in Deep Offshore Regions of the Beaufort Sea (20) Norm Snow, Joint Secretariat
2:30 – 3:00	**11. Birds baseline information** 11.1 Coastal, Marine and Offshore Bird Usage of the Beaufort Sea Region (35) Myra Robertson, Environment Canada (also presenting on behalf of R. Harris, Upun-LGL)
3:00 – 3:20	BREAK
3:20 – 3:50	**12. Biological Information to inform oil spill response** 12.1 Biological Data to Assess Net Environmental Benefits and Costs of Dispersants and In-Situ Burning in Oil Spill Response (20) Ken Trudel, SL Ross *(note – this presentation cancelled due to travel issues)*
3:50 – 4:45	Moving Forward: Informing outcomes and next steps
4:45 – 6:00	Additional opportunities to demo databases

APPENDIX B: LIST OF PARTICIPANTS

BREA Results Forum Participants List	
Name	**Affiliation**
Applejohn, Andrew	GNWT, Office of the Executive
Archie, Billy	Fisheries Joint Management Committee (FJMC)
Arey, Dennis	Aklavik
Barker, Anne	National Research Council
Baryluk, Steve	Joint Secretariat
Blasco, Steve	Natural Resources Canada
Callow, Lin	Salmo Consulting
Carpenter, Margaret	Sachs Harbour
Carr, Genevieve	Aboriginal Affairs and Northern Development Canada
Carrie, Jesse	University of Manitoba
Cockney, Richard	Tuktoyaktuk
Cournoyea, Nellie	Inuvialuit Regional Corporation
Darlow , Neil	Imperial Oil
Davidson, Fraser	Fisheries and Oceans Canada
Davies, Evan	University of Alberta
Emaghok, Lennie	Tuktoyaktuk
Fabijan, Michael	Kavik-Stantec
Fournier, Mike	Environment Canada
French, Chris	University of Alberta
Friddell, Julie	University of Waterloo
Geoffroy, Maxime	ArcticNet
Gordon, Danny C	Wildlife Management Advisory Council (WMAC) North Slope
Graf, Linda	ConocoPhillips
Green, Michael	Paulatuk
Gruben, Charles	Tuktoyaktuk
Gruben, Michelle	Aklavik
Haas, Christian	York University
Haogak, Charles	Sachs Harbour
Haogak, Charlton	Sachs Harbour
Hochheim, Klaus	University of Manitoba
Hynes, Kristin	FJMC
Inglangasuk, Gerald	Environmental Impact Screening Committee
Johnston, Michelle	National Research Council
Kanayok, Margaret	Inuvialuit Game Council (Ulukhaktok)
Kidd, Tyler	Environment Canada
Knopp, Jenny	Joint Secretariat
Korec, John	National Energy Board
Kubat, Ivana	National Research Council

BREA Results Forum Participants List	
Name	**Affiliation**
Lam, Jennifer	Joint Secretariat
Lennie, Hans	Inuvialuit Game Council (Inuvik)
Levesque, Keith	ArcticNet
Loseto, Lisa	Fisheries and Oceans Canada
Lowings, Malcolm	IMG-Golder
Majewski, Andy	Fisheries and Oceans Canada
Malone, James W.	Fisheries Joint Management Committee
McCormick, George	Aboriginal Affairs and Northern Development Canada
McCulloch, Vicki	DPRA (Facilitator)
McKechnie, Ruth	Aboriginal Affairs and Northern Development Canada
McLeod, Jordan	Aklavik
Monroe, Joanne	Coast Guard
Nasogaluak, Darrel	Inuvialuit Game Council (Tuktoyaktuk)
Newton, Steve	Fisheries and Oceans Canada
Oliktoak, Josh	Ulukhaktok
Oliver, James	Canadian Environmental Assessment Agency
Olyslager, John	Environment Canada
Paull, Tara	Aboriginal Affairs and Northern Development Canada
Pokiak, Ernest	WMAC North Slope
Pokiak, Frank	Inuvialuit Game Council
Robertson, Myra	Environment Canada
Ruben, Lawrence	Inuvialuit Game Council (Paulatuk)
Ruben, Nelson	Paulatuk
Salisbury, Ian	Transport Canada
Simpson, Bob	Inuvialuit Regional Corporation
Smith, Duane	Inuvialuit Regional Corporation
Smith, Jennifer	WMAC North Slope
Snow, Norm	Joint Secretariat
Sonnichsen, Gary	Natural Resources Canada
Storr, Billy	Inuvialuit Game Council (Aklavik)
Swiderski, Andy	Gaea Consulting (Facilitator)
Torontow, Valerie	Environment Canada
Whalen, Dustin	Natural Resources Canada
Wolki, Marlene	Paulatuk