Description of document:	Department of the Interior (DOI) Bureau of Safety and Environmental Enforcement (BSEE) 2012-13 Freeze-Up Study of the Alaskan Beaufort and Chukchi Seas, including three progress reports, 2013
Request date:	29-November-2014
Released date:	16-March-2015
Posted date:	27-April-2015
Source of document:	Bureau of Safety and Environmental Enforcement Mail Stop: VAE-BSEE FOIA 45600 Woodland Road Sterling, VA 20166 Fax: 703-787-1207 Email: BSEEFOIA@bsee.gov

United States Department of the Interior

BUREAU OF SAFETY AND ENVIRONMENTAL ENFORCEMENT
WASHINGTON, DC 20240-0001

In Reply Refer To:
Mail Stop HE-2204

March 16, 2015

The Bureau of Safety and Environmental Enforcement (BSEE) FOIA office received your Freedom of Information Act (FOIA) request dated November 29, 2014 on December 1, 2014 and assigned it control number **BSEE-2015-00064.** Please cite this number in any future communications with our office regarding your request.

We are writing today to respond to your request on behalf of the BSEE. We have enclosed one CD containing four files consisting of 190 pages.

We are withholding 175 pages under FOIA Exemption 4. 5 U.S.C. § 552(b)(4). Exemption 4 protects "trade secrets and commercial or financial information obtained from a person [that is] privileged or confidential."

The withheld information is commercial or financial information. The company that supplied this information (the submitter) is considered a person, because the term "person," under the FOIA, includes a wide range of entities including corporations. We are withholding these pages in part under Exemption 4 because they are protected under the following rationale:

The information in question was required to be submitted and is confidential.

We have determined that the information at issue was required to be submitted to the government. Information that was required to be submitted is considered confidential if disclosure of it is likely to cause substantial harm to the competitive position of the person from whom the information was obtained, or harm the government's ability to obtain it in the future. National Parks & Conservation Ass'n v. Morton 498 F.2d 765, 770 (D.C. Cir. 1974).

We have examined the information and have concluded that the disclosure of the redacted information is likely to 1) cause substantial harm to the competitive position of the person from whom the information was obtained and/or 2) harm the government's ability to obtain it in the future. This study is protected under a contract with a strict confidentiality clause indicating that the study shall remain confidential until November 1, 2018. If BSEE were to release the information prior to that date, it would violate the terms of its contract with Coastal Frontiers

Corporation. The provision of the confidentiality clause was necessary to secure the participation of other partners that shared the information with the company. Public release of it in response to this FOIA request would cause potential harm to its competitive position in the marketplace and the company's ability to participate in other joint industry studies. Therefore this information is confidential for the purposes of Exemption 4 and we have withheld it.

Mr. Timothy Baker, Attorney, in the Office of the Solicitor was consulted.

In accordance with ***43 C.F.R. §§ 2.57, .58, .59***, you may appeal this response to the Department's FOIA/Privacy Act Appeals Officer. If you choose to appeal, the FOIA/Privacy Act Appeals Officer must receive your FOIA appeal **no later than 30 workdays** from the date of this letter. Appeals arriving or delivered after 5 p.m. Eastern Time, Monday through Friday, will be deemed received on the next workday.

Your appeal must be made in writing. You may submit your appeal and accompanying materials to the FOIA/Privacy Act Appeals Officer by mail, courier service, fax, or email. All communications concerning your appeal should be clearly marked with the words: "FREEDOM OF INFORMATION APPEAL." You must include an explanation of why you believe the BSEE's response is in error. You must also include with your appeal copies of all correspondence between you and BSEE concerning your FOIA request, including your original FOIA request and BSEE's response. Failure to include with your appeal all correspondence between you and BSEE will result in the Department's rejection of your appeal, unless the FOIA/Privacy Act Appeals Officer determines (in the FOIA/Privacy Act Appeals Officer's sole discretion) that good cause exists to accept the defective appeal.

Please include your name and daytime telephone number (or the name and telephone number of an appropriate contact), email address and fax number (if available) in case the FOIA/Privacy Act Appeals Officer needs additional information or clarification of your appeal.

DOI FOIA/Privacy Act Appeals Office Contact Information

Department of the Interior
Office of the Solicitor
1849 C Street, N.W.
MS-6556 MIB
Washington, DC 20240
Attn: FOIA/Privacy Act Appeals Office

Telephone: (202) 208-5339
Fax: (202) 208-6677
Email: FOIA.Appeals@sol.doi.gov

For your information, Congress excluded three discrete categories of law enforcement and national security records from the requirements of FOIA. *See* 5 U.S.C. 552(c). This response is limited to those records that are subject to the requirements of FOIA. This is a standard notification that is given to all our requesters and should not be taken as an indication that excluded records do, or do not, exist.

The 2007 FOIA amendments created the Office of Government Information Services (OGIS) to offer mediation services to resolve disputes between FOIA requesters and Federal agencies as a non-exclusive alternative to litigation. Using OGIS services does not affect your right to pursue litigation. You may contact OGIS in any of the following ways:

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Please note that using OGIS services does not affect the timing of filing an appeal with the Department's FOIA & Privacy Act Appeals Officer.

We do not bill requesters for FOIA processing fees when their fees are less than $50.00, because the cost of collection would be greater than the fee collected. *See* ***43 C.F.R. § 2.49(a)(1)***. Therefore, there is no billable fee for the processing of this request.

If you have any questions concerning your request, please contact me at BSEEFOIA@bsee.gov.

Sincerely,

Ashley Rychak
Government Information Specialist (FOIA)
BSEE FOIA Office

Enclosure

COASTAL
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2012-13 Freeze-Up Study of the Alaskan Beaufort and Chukchi Seas

Progress Report No. 1
October 1, 2012 – January 31, 2013

Activities Undertaken

Between October 2012 and January 2013, the following activities were conducted under the contractual Scope of Work:

- ***Task 1. Planning and Administration***: Input regarding specific topics of interest was solicited from the study participants; logistical arrangements were made for the aerial reconnaissance missions to be conducted in November 2012 and February 2013; meteorological data and ice charts were procured from publicly-available sources.
- ***Task 2. Satellite Imagery***: Fourteen RADARSAT-2 images of the Alaskan Beaufort Sea and 14 RADARSAT-2 images of the Chukchi Sea encompassing the period from October 3, 2012 through January 23, 2013, were provided by Shell. In addition, approximately 70 AVHRR images were downloaded from the National Weather Service website. The images were used both to track the progress of freeze-up, and to select specific features of interest to be investigated during the two sets of aerial reconnaissance missions.
- ***Task 3. Aerial Reconnaissance Missions***: The first aerial reconnaissance missions, consisting of one fixed-wing flight in each of the Beaufort and Chukchi Seas, were conducted on November 27th and 28th. The flights paths were similar to those followed in November 2011, but were altered to the extent necessary to investigate features of interest noted during the current study. Travel to the North Slope to conduct the second set of aerial reconnaissance missions was undertaken on January 31, 2013.
- ***Task 4. Data Processing and Analysis***: Processing and initial analysis of the data acquired under Tasks 1 through 3 has been on-going since November.

Key Findings

Key findings to date are summarized below:

- Continuing a pattern noted in recent years, the air temperatures at both Deadhorse and Barrow remained above normal during the early portion of freeze-up. Subsequently, from mid-November through the end of January, they tended to approach normal at Barrow and to fall somewhat below normal at Deadhorse. At the end of January, the total number of freezing degree days (FDDs) accumulated at Deadhorse was about 11% lower than a year earlier, while that at Barrow was nearly 18% lower.

Coastal Frontiers Corporation
882A Patriot Drive
Moorpark, CA 93021-3544
(818) 341-8133

- Based on accumulated FDDs, the predicted thickness of undeformed first year ice at the end of January 2013 was 112 cm at Deadhorse and 100 cm at Barrow. The former is 8 cm less than that predicted at the end of January 2012; the latter is 12 cm less. This finding is not surprising, in that the 2011-12 freeze-up season was particularly cold by recent standards.
- From October 2012 through January 2013, storm activity in the Beaufort consisted of five easterly events and seven westerly events (with a storm defined as an event during which the daily average wind speed exceeded 15 kt or 7.7 m/s). Because easterly storms tend to promote the formation of a grounded shear zone in the Beaufort, it is noteworthy that the first such event did not occur until December 23rd.
- Of the nine storms that took place in the Chukchi from October 2012 through January 2013, seven were easterlies and only two were westerlies. The imbalance was even more pronounced in December and January, when the storm population consisted of five easterlies and no westerlies. As a result, the development of stable landfast ice was inhibited along the northeast-southwest trending coastline, and the coastal flaw lead opened repeatedly.
- When the November reconnaissance flight was undertaken in the Beaufort, freeze-up was found to be less advanced than in November 2011. Salient observations are summarized below:
    - The ice in protected waters such as Gwydyr Bay and Leffingwell Lagoon was flat and undeformed. In Stefansson Sound, however, the ice was flat near the mainland coast but deformed on the south side of the barrier islands in response to the southwesterly winds that prevailed during much of October and November. The rubble typically attained heights of 1 to 2 m in this region, but occasionally reached 5 m.
    - The shear zone to the north of the barrier islands was poorly-developed, reflecting the lack of easterly storms prior to the flight (Plate 1). The largest ridges and rubble piles, with heights to 6 m, were located off the barrier islands between Narwhal and Flaxman.
    - In Harrison Bay, broken ice was interspersed with refreezing leads. Rubble heights were modest, with typical heights of 1 to 2 m.
    - Numerous pile-ups were noted on the northeast, northwest, and southwest sides of the barrier islands, and on Northstar Production Island. The largest pile-up height, estimated at 8 m, was located on the southwest side of Northstar (Plate 2).
- As in the case of the Beaufort, freeze-up in the Chukchi was found to be less advanced at the time of the November 2012 reconnaissance flight than a year earlier. Noteworthy findings included the following:

Plate 1. Poorly-Developed Shear Zone off Cross Island (November 27, 2012)

Plate 2. 8-m Ice Pile-Up on Northstar Production Island (November 27, 2012)

- The landfast ice zone consisted of an extremely thin, poorly-grounded strip along the coast (Plate 3). In some areas, open water associated with the coastal flaw lead was present within 50 m of the shoreline. Ridges and rubble fields were intermittent, with typical heights of 1 to 2 m and occasional heights to 3 m.
- The nearshore ice seaward of the coastal flaw lead consisted primarily of First Year Ice (>30 cm thick) with ridge and rubble heights to 3 m.
- Farther offshore, from east of the Burger Prospect through the Crackerjack Prospect, First Year Ice was interspersed with Young Ice (10-30 cm thick) and Nilas (0-10 cm thick). Numerous leads, both open and refreezing, were present in this region (Plate 4).

Activities Planned

- Continue the analysis of weather data to with respect to air temperatures, wind conditions, and storm events.
- Continue the analysis of RADARSAT-2 imagery to correlate changes in the ice canopy with meteorological conditions.
- Process and analyze the data obtained during the February reconnaissance flights with respect to flight lines, features observed, and photographs.
- Commence preparing tables and drawings for inclusion in the project draft report.

Percent Completion

Contract Amount = $232,992.50

Invoice No.	Period Covered	Work Completed Each Period		Work Completed to Date	
		% of Total	$	% of Total	$
3519	10/1/12-1/31/13	20	$46,598.50	20	$46,598.50

Plate 3. Thin Strip of Landfast Ice Just North of Wainwright (November 28, 2012)

Plate 4. Mixture of Leads, Nilas, Young Ice, and First-Year Ice in Offshore Region of Chukchi (November 28, 2012)

2012-13 Freeze-Up Study of the Alaskan Beaufort and Chukchi Seas

Progress Report No. 2
February 1, 2013 – March 6, 2013

Activities Undertaken

During the past five weeks, the following activities have been undertaken under the contractual Scope of Work:

- ***Task 1. Planning and Administration***: Meteorological data, ice charts, and satellite imagery were procured from publicly-available sources.
- ***Task 2. Satellite Imagery***: Three RADARSAT-2 images of the Alaskan Beaufort Sea and three of the Chukchi Sea encompassing the period from February 4th through March 2nd were provided by Shell, while approximately 30 AVHRR images were downloaded from the National Weather Service website. The images obtained in late January and early February were used to identify features of potential interest to be investigated during the aerial reconnaissance missions conducted in early February.
- ***Task 3. Aerial Reconnaissance Missions***: Five aerial reconnaissance missions were conducted from February 1st through 6th, consisting of one fixed-wing and one helicopter flight in the central Beaufort, one fixed-wing flight in the western Beaufort, one fixed-wing flight in the offshore portion of the Chukchi, and one fixed-wing flight in the nearshore portion of the Chukchi.
- ***Task 4. Data Processing and Analysis***: The data acquired under Tasks 1 through 3 were used to compute freezing degree days and ice thickness through the end of February, to analyze wind and storm characteristics, and to assess ice pile-up characteristics.

Key Findings

Noteworthy findings are summarized below:

- The air temperatures at Deadhorse and Barrow were relatively low during the month of February, with values ranging from normal to well below normal. At the end of the month, 5,252 freezing degree days (FDDs) had accumulated at Deadhorse and 4,460 at Barrow.
- When the thickness of undeformed first-year ice in the Central Beaufort Sea was investigated during the helicopter mission on February 3rd, two independent measurements each yielded a value of 119 cm. This result is about 5% greater than the 113 cm predicted on the basis of accumulated FDDs at Deadhorse.

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882A Patriot Drive
Moorpark, CA 93021-3544
(818) 341-8133

- The predicted thickness of undeformed first-year ice at the end of February was 135 cm at Deadhorse and 123 cm at Barrow. The former is 4 cm less than that predicted at the end of February 2012, while the latter is 9 cm less.
- Easterly winds predominated in the Beaufort Sea during the month of February, occurring on 21 of 28 days. Furthermore, the three storm events recorded during the month were easterlies (with a storm defined as an event during which the daily average wind speed exceeded 15 kt or 7.7 m/s). The most severe of these extended for a full week, from the 20th through the 26th, and included average daily wind speeds as high as 23 kt (11.8 m/s).
- In the Chukchi, easterly winds were even more predominant than in the Beaufort during the month of February. Easterlies occurred on 25 days, and the storm population consisted of four easterly events. The most severe storm ran from the 20th through the 25th, with the daily average wind speed peaking at 27 kt (13.9 m/s) on the 23rd.
- The conditions observed in the Beaufort Sea during the reconnaissance flights conducted on February 1st, 3rd, and 4th are summarized below:

  Lagoon Ice: Most of the ice in the semi-protected lagoon areas was relatively flat. The primary exception occurred in the northern portion of Stefansson Sound between Narwhal Island and the Stockton Islands, where rubble fields and shoreline pile-ups had been created by southwesterly winds during the early stages of freeze-up.

  Ice Pile-Ups: Approximately 30 ice pile-ups were noted in the Central and Western Beaufort, including 3 on Northstar Production Island. The densest concentration extended from Cross Island through the Stockton Islands, where pile-ups were located on both the north and south sides of the barrier islands (Plate 1).

  Landfast Ice: The landfast ice in the central Beaufort appeared to be well-grounded on Stamukhi Shoal and Weller Bank. Ridge and rubble heights in the landfast ice zone were unexceptional relative to those noted in recent years (Plate 2).

  Offshore Ice: The offshore ice canopy was well-consolidated with relatively few leads and areas of broken ice – a circumstance that is consistent with the prevalence of easterly winds and absence of westerly storms during the month prior to the flights.

  Camden Bay: The ice was more consolidated than in any of the past three years, with fewer leads and areas of broken ice.

  Shell Sivulliq Pipeline Route: The nearshore portion of the pipeline route, from the mainland shore through Mary Sachs Entrance, was covered by relatively flat, undeformed first-year ice. An abrupt transition to 4-m high rubble occurred in the vicinity of the 6-m isobath, with extensive rubble persisting to about 5 nm (9 km) north of Mary Sachs Entrance. Farther offshore, the rubble became smaller and more widely dispersed, with a maximum height of 3 m. Although broken ice and

Plate 1. Ice Pile-Up on North Side of Jeanette Island (February 3, 2013).

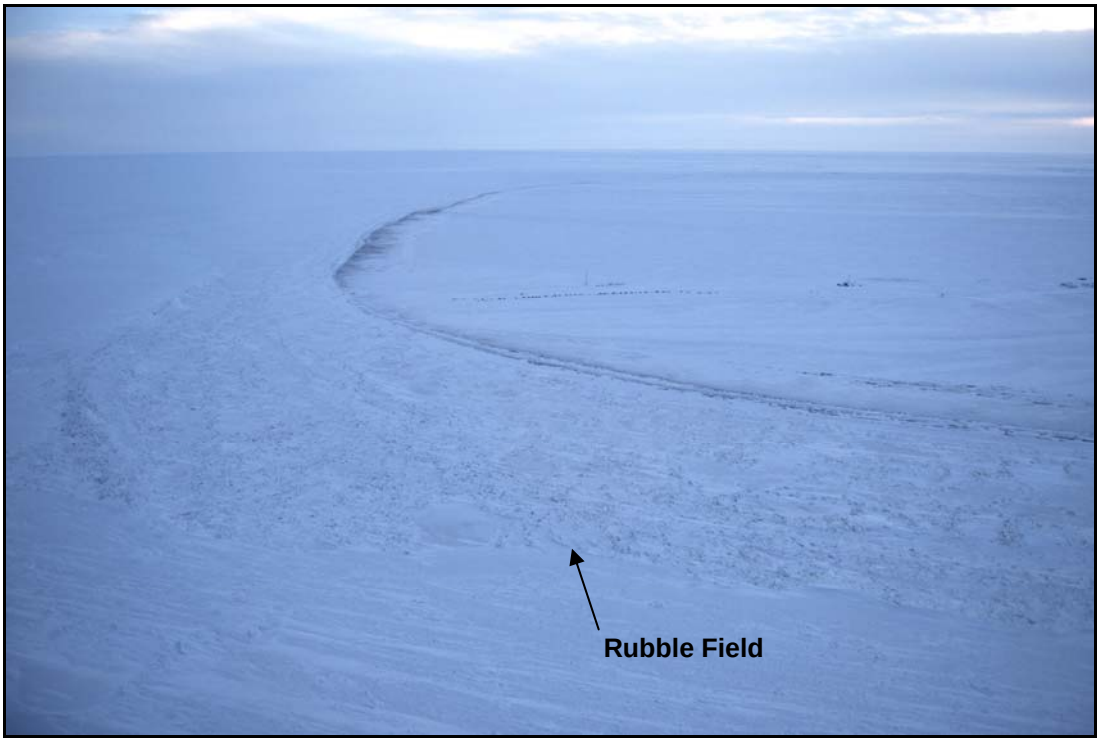

Plate 2. Modest Rubble Field on North Side of Cross Island (February 3, 2013).

refreezing leads were noted at several locations, open leads were conspicuously absent.

Shell Harrison Bay Prospects: The Harrison Bay Prospects were contained within the landfast ice zone. The ice canopy contained no open leads, major cracks, or other evidence of recent movement. An inactive shear line was observed in the southern portion, a mixture of flat ice and scattered rubble with heights to 4 m in the central portion, and more extensive rubble and ridges with heights to 7 m in the northern portion.

Multi-Year Ice: No multi-year ice was observed.

- The conditions observed in the Chukchi Sea during the reconnaissance flights conducted on February 5th and 6th are summarized below:

  Lagoon Ice: The ice covering the protected waters of Kasegaluk Lagoon and Peard Bay was primarily flat and undeformed.

  Pile-Ups: Approximately 30 ice pile-ups were noted on the Chukchi Sea coast between Barrow and Point Lay. More than half of these were located in the southern portion of the study area, on the barrier islands between Icy Cape and Point Lay.

  Coastal Flaw Lead: The coastal flaw lead was present on February 4th, 5th, and 6th, extending from north of Point Barrow to south of Icy Cape (Plate 3). The maximum observed width, approximately 60 nm (111 km), was found off Icy Cape.

  Landfast Ice: The landfast ice was continuous between Barrow and Point Franklin, but ranged from narrow to non-existent to the southwest of Point Franklin. In some areas, the flaw lead extended to the shoreline. From Wainwright to Point Lay, the landfast ice was anchored by sporadic ridges and rubble piles with heights to 8 m (Plate 4).

  Nearshore Ice: Seaward of the landfast ice, the flaw lead contained a mixture of nilas, young ice, and first-year floes typically 500 m to 5 km in diameter. The ice evidenced considerable deformation, with ridges at the edges of the floes indicative of collisions. Ridge heights of 3 m were common, with occasional heights of 5 m.

  Offshore Ice: Leads became smaller and less frequent with increasing distance off the coast, while floe diameters tended to increase. To the west of Shell's Burger prospects, the ice canopy was well-consolidated with very few cracks and leads, and with only modest deformation.

  Shell Hanna Shoal Prospects: The ice consisted of flat, first-year pans with numerous refreezing leads. Scattered ridges were present with heights to 5 m.

  Shell Crackerjack Prospects: Large first-year pans with diameters of 5 to 10 km and perimeter ridges to 3 m were interspersed with areas of broken ice and refreezing leads. Deformation tended to be modest, although one ridge with an estimated height of 6 m high was noted in the southwest portion.

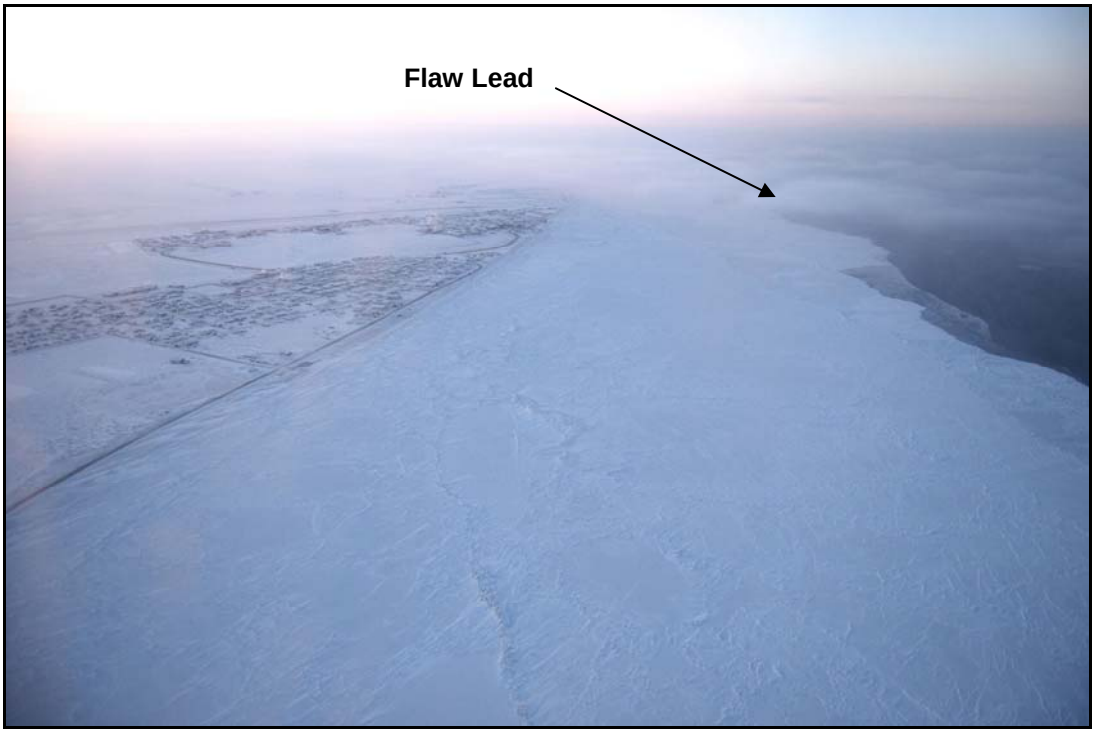

Plate 3. Coastal Flaw Lead off Barrow (February 5, 2013).

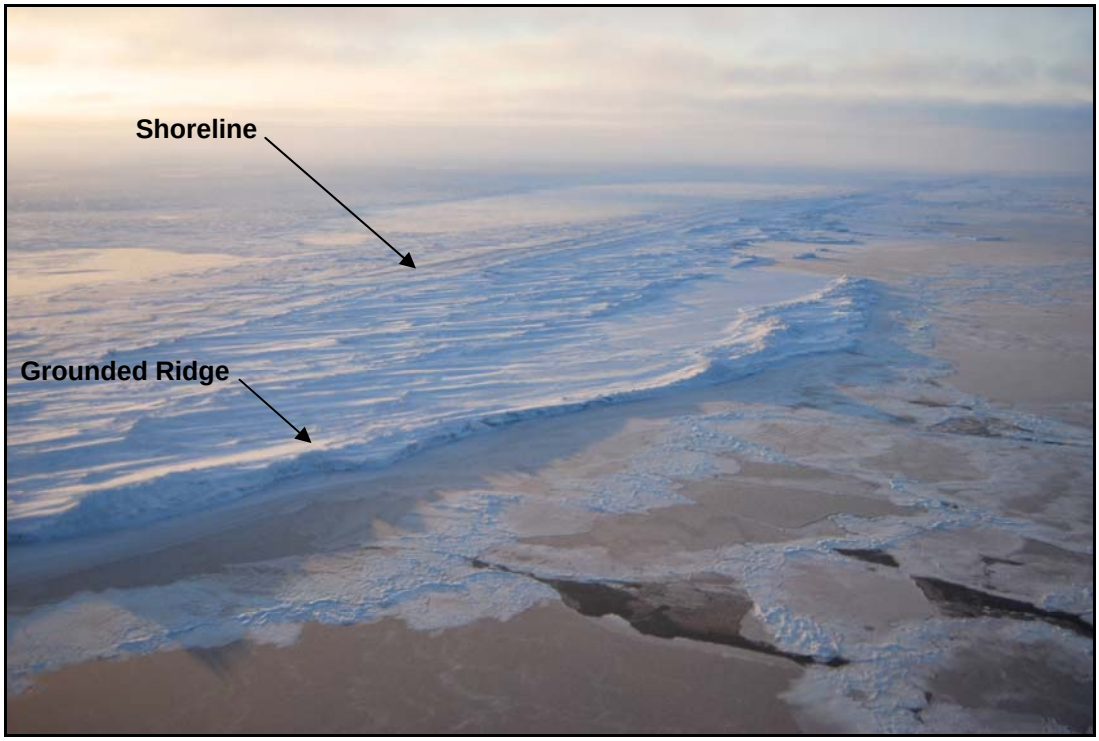

Plate 4. Narrow Strip of Landfase Ice Anchored by Grounded Ridge to the South of Wainwright (February 6, 2013).

Shell Burger Prospects: The ice was less consolidated and more deformed than in the Crackerjack Prospects, with ridge heights to 5 m. Several prominent leads were observed with widths greater than or equal to 500 m.

Multi-Year Ice: No multi-year ice was observed.

Katie's Floeberg: Katie's Floeberg was not evident at the time of the flight on February 5th, reflecting the absence of multi-year ice coupled with only modest ridge and rubble formation in the first-year ice canopy.

Activities Planned

- Continue the analysis of weather data with respect to air temperatures, wind conditions, and storm events.
- Continue the analysis of satellite imagery to correlate changes in the ice canopy with the corresponding meteorological conditions.
- Analyze the data obtained during the February reconnaissance flights, including correlating the photos and videos with the flight paths.
- Commence preparation of the draft report.

Percent Completion

Contract Amount = $232,992.50

Invoice No.	Period Covered	Work Completed Each Period		Work Completed to Date	
		% of Total	$	% of Total	$
3519	10/1/12-1/31/13	20	$46,598.50	20	$46,598.50
3529	2/1-3/6/13	50	$116,496.25	70	$163,094.75

2012-13 Freeze-Up Study of the Alaskan Beaufort and Chukchi Seas

Progress Report No. 3
March 7 – July 12, 2013

Activities Undertaken

During the past four months, the following activities have been undertaken under the contractual Scope of Work:

- ***Task 1. Planning and Administration***: Statoil AG was enrolled as a participant in the study, thereby reducing the cost attributable to each of the two original participants (BSEE and Shell) by one third. Contract terms were modified to reflect this cost reduction.

  Meteorological data, ice charts, and satellite imagery were procured from publicly-available sources.

- ***Task 2. Satellite Imagery***: One additional RADARSAT-2 image of the Alaskan Beaufort Sea and one of the Chukchi Sea encompassing the period from March 12th through 14th were provided by Shell, while 20 AVHRR images were downloaded from the National Weather Service website. The 18 RADARSAT-2 images of the Beaufort and 18 of the Chukchi obtained over the course of the six-month study period (October 2012-March 2013) were analyzed to track the progress of freeze-up and to quantify the extent of the landfast ice, the absence of multi-year ice, and the motion of selected first-year ice features.

- ***Task 3. Aerial Reconnaissance Missions***: The digital photographs and videos acquired during the five aerial reconnaissance missions conducted in February 2013 were correlated with the flight paths, and the locations were plotted on a series of drawings that display the flight paths as well as observations of the ice characteristics made during the flights.

- ***Task 4. Data Processing and Analysis***: The data acquired under Tasks 1 through 3 were used to compute freezing degree days and ice thickness, and to assess wind and storm characteristics, variations in the extent of the landfast ice zone, ice drift velocities, and ice pile-up characteristics.

- ***Task 5. Reporting***: Preparation of the draft report is underway. Draft chapters pertaining to prior studies, study methods, and freeze-up in the Alaskan Beaufort Sea have been completed. Chapters yet to be completed pertain to freeze-up in the Chukchi Sea, a comparison of freeze-up in recent years with that in the 1980s, and conclusions drawn from this year's study.

Coastal Frontiers Corporation
882A Patriot Drive
Moorpark, CA 93021-3544
(818) 341-8133

Key Findings

Noteworthy findings are summarized below:

- Air temperatures during the 2012-13 winter season (September 2012 through May 2013) were lower than those recorded during two of the three prior years (2009-10 and 2010-11) but substantially higher than in 2011-12. A total of 6,676 freezing days (FDDs) was recorded at Barrow Airport, versus 7,556 a year earlier.
- In the Beaufort, westerly winds predominated in October and November, a transition from westerlies to easterlies occurred in mid-December, and easterlies predominated thereafter. Over the entire six-month period, westerlies prevailed 54% of the time and easterlies 46%. The storm population, consisting of 20 events, was divided equally between easterlies and westerlies (ten of each).
- In the Chukchi, the transition from westerly to easterly wind predominance occurred in mid-November. As a result, easterlies outpaced westerlies by a margin of 69% to 31% from October 2012 through March 2013. Twelve of the sixteen storms during this period were easterlies, including all of the storm events after mid-November.
- The landfast ice zone in the Beaufort remained narrow and poorly-developed through mid-December due to the predominance of westerly winds and absence of easterly storms. The situation changed dramatically between late December and late January, however, when the resurgence of easterly winds coupled with five easterly storms produced a wide, well-grounded shear zone. In the Chukchi, where the coast trends northeast-southwest, the landfast ice zone remained narrow and unstable throughout the study period due to the paucity of westerly winds and absence of westerly storms after mid-November.
- Multi-year ice remained absent from the nearshore regions of the Alaskan Beaufort and Chukchi Seas throughout the study period.

Activities Planned

- Continue the analysis of weather and ice movement data.
- Continue preparation of the draft report.

Percent Completion

Modified Contract Amount = $155,328.31

Invoice No.	Period Covered	Work Completed Each Period		Work Completed to Date	
		% of Total	$	% of Total	$
3519	10/1/12-1/31/13	30	$46,598.50	20	$46,598.50
3529	2/1-3/6/13	40	$62,131.34	70	$108,729.84
3577	3/7-7/12/13	20	$31,065.67	90	$139,795.51

COASTAL
FRONTIERS

10-m Ice Pile-Up on Northstar Island (November 27, 2012)

2012-13 FREEZE-UP STUDY
OF THE
ALASKAN BEAUFORT AND CHUKCHI SEAS

Coastal Frontiers Corporation
882A Patriot Drive
Moorpark, CA 93021-3544
(818) 341-8133

Vaudrey & Associates, Inc.
1685 El Caserio Court
San Luis Obispo, CA 93401
(805) 544-9399

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