

## Environmental Studies Program: Ongoing Study

Field	Study Information
Title	Update of River Overflow on Sea Ice and Strudel Scour Database (AK-20-03)
Administered by	Alaska Regional Office
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Procurement Type(s)	Contract
Conducting Organization(s)	Coastal Frontiers Corporation
Total BOEM Cost	\$347,055
Performance Period	FY 2020–2022
Final Report Due	October 2022
Date Revised	September 20, 2022
Problem	River overflow on the sea ice occurs annually in the nearshore region of the Alaskan Beaufort Sea during a brief period in the spring when river break-up precedes the break-up of the landfast sea ice. River overflow constitutes a potential hazard to offshore oil and gas development, as it relates to facilities access, oil spill spreading and response, and the associated phenomenon of strudel drainage and potential seabed scouring, which can increase the possibility of an oil spill.
Intervention	The Department of the Interior commissioned a study in 2007 (Outer Continental Shelf [OCS] Study MMS-2009-017; Hearon, et al., 2009) designed to map the annual extent of peak river overflowing onto the landfast ice of the Alaskan Beaufort Sea during the 13-year period from 1995 and 2007. This study will update the original by incorporating an additional 13 years of overflow observations, nearly doubling the existing database. In addition, the database of industry-based strudel scour measurements developed during the initial study will be updated to the extent industry is willing to grant access to the information acquired since 2007.
Comparison	The overall goal of this study is to improve the knowledge of the spatial and temporal variability in overflowing and related pipeline and facility siting concerns. The results will be used for environmental assessment and hazard mitigation for present and future oil and gas facilities that may be located within or adjacent to the areas influenced by the overflow.
Outcome	The project will produce a more comprehensive geographic information system (GIS)-based dataset of river overflow boundaries and strudel scour characteristics. The results will include a probabilistic assessment of annual overflow extent, and evaluation of potential changes in river overflow associated with climate change.
Context	Alaska Beaufort Sea nearshore coastal areas.

**BOEM Information Need(s):** BOEM requires an improved understanding of the spatial and temporal variability in overflowing to evaluate environmental impacts and hazards associated with 1) subsea

pipelines traversing through the zone of river overflow from offshore federal leases and 2) ice roads used to access offshore federal leases. Furthermore, BOEM needs an understanding of the potential impacts of climate change on the overflow phenomena. Because river overflowing marks the transition from winter to break-up, the study results will provide valuable information on the timing, length, and trends associated with the ice road season and the open-water season.

**Background:** River overflow constitutes a potential hazard to offshore oil and gas development in that it can impede access to facilities, disperse spilled oil, and expose buried subsea pipelines through scouring of the seabed below the landfast ice (strudel scouring). A comprehensive database of river overflow boundaries and strudel scour characteristics will allow BOEM to assess environmental impacts and hazards for present and future oil and gas facilities that may be located within or adjacent to the areas influenced by the overflow. The proposed study will update an earlier project by extending the record of overflow observations by more than a decade (Hearon *et al.*, 2009). While the existing study provides critical information on river overflow, the expanded database will provide additional information on the statistical variability of the phenomena. In addition, because river overflowing marks the transition from winter to break-up, this study also will complement a recent investigation of sea ice break-up commissioned by the Bureau of Safety & Environmental Enforcement (Coastal Frontiers and Vaudrey, 2018).

**Objectives:** The overall goal of this study is to improve the knowledge of the spatial and temporal variability in overflowing and related pipeline and facility siting concerns. The specific study objectives are to:

- Expand the existing overflow and strudel scour database by documenting maximum river overflow boundaries and collating industry acquired strudel scour data from Smith Bay to Camden Bay between 2008 and 2020.
- Evaluate isolines of annual overflow occurrence probability.
- Assess hazards associated with river overflow.

**Methods:** Researchers will map river overflow boundaries for all major rivers and streams in the study area for the 13-year period between 2008 and 2020 using satellite imagery. The 2009 study concluded that several imagery platforms are suitable for mapping river overflow boundaries. The study products will be incorporated into an ArcGIS® database that includes interpreted overflow boundaries, isolines of annual overflow occurrence probability, and available strudel drain and scour data.

**Specific Research Question(s):**

1. Has the seasonal timing of spring overflowing or the spatial extent of the overflowing changed over the last twelve years?
2. Have the ice roads from offshore development impacted the location and extent of overflowing events?
3. What is the severity of strudel scour occurrence associated with the zone of overflowing, areas of ice road construction, and the locations of offshore sub seabed pipelines? Has this changed overtime?

**Current Status:** Completed

**Publications Completed:**

Hearon G, Plana Casado A, Scott C, Dickins D (Coastal Frontiers Corporation, Moorpark, CA and DF Dickins Associates, LLC, Monterey, CA). 2022. Update of the river overflow on sea ice and strudel scour in the U.S. Beaufort Sea. Anchorage (AK): U.S. Department of the Interior, Bureau of Ocean Energy Management, Alaska OCS Region. 98 p. plus appendices. Report No.: OCS Study BOEM 2022-044. Contract No.: M0121C0001.

**Affiliated WWW Sites:** <http://www.boem.gov/akstudies/>

**References:**

Coastal Frontiers Corporation and Vaudrey and Associates, Inc. 2018. 2017 Break-Up Study of the Alaskan Beaufort and Chukchi Seas. Prepared for Bureau of Safety and Environmental Enforcement, U.S. Dept. of the Interior, Moorpark, CA, 143 p. plus appendices.

Hearon G, Dickins D, Ambrosius K, Morris K (DF Dickins Associates, La Jolla, CA). 2009. Mapping sea ice overflow using remote sensing: Smith Bay to Camden Bay. U.S. Department of the Interior, Minerals Management Service, Alaska OCS Region. 127 p. Report No.: OCS Study MMS 2009-017. <https://epis.boem.gov/final%20reports/4871.pdf>