

## EROSION EXPOSURE ASSESSMENT—POINT HOPE

Richard M. Buzard, Mark M. Turner, Katie Y. Miller, Donald C. Antrobus, and Jacquelyn R. Overbeck



Point Hope, Alaska, in 2012. Shorezone, [shorezone.org](https://shorezone.org).



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Report of Investigation 2021-3 Point Hope

State of Alaska  
Department of Natural Resources  
Division of Geological & Geophysical Surveys

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# EROSION EXPOSURE ASSESSMENT—POINT HOPE

Richard M. Buzard<sup>1</sup>, Mark M. Turner<sup>1</sup>, Katie Y. Miller<sup>1</sup>, Donald C. Antrobus<sup>2</sup>, and Jacquelyn R. Overbeck<sup>1</sup>

## POINT HOPE EROSION EXPOSURE ASSESSMENT

This is a summary of erosion forecast results near infrastructure at Point Hope, Alaska. We conduct a shoreline change analysis, forecast 60 years of erosion, and estimate the replacement cost of infrastructure in the forecast area. Buzard and others (2021) describe the method and guidance for interpreting tables and maps.

Source data for this summary include the following:

- Delineated vegetation lines and change assessment by Buzard and others (2021) following the methods of Overbeck and others (2020).
- Infrastructure AutoCAD outlines and metadata from Division of Community & Regional Affairs (2013) Community Profile Map series.
- Added infrastructure such as roads, water and sanitation facilities, and outbuildings, delineated if visible in the most up-to-date high resolution ( $\leq 0.66$  ft [20 cm] ground sample distance) aerial orthoimagery (Quantum Spatial, 2019).
- Computed infrastructure cost of replacement based on square or linear footage from Buzard and others (2021).

Point Hope is on a spit on the western edge of the Lisburne Peninsula. The Chukchi Sea borders the north and south shore of the spit. Overbeck and others (2020) report erosion rates of the high water line shoreline along the north shore range between 1.0 and 7.9 feet per year, meanwhile accretion on the south shore ranges from 0 to 2.3 feet per year. On the northern shore, erosion is driven by wave action, especially during ice-free months (North Slope Borough [NSB], 2017). Ocean currents deposit



sediment on the southern shore (NSB, 2017). The tidal range at Point Hope 0.67 feet (National Oceanographic and Atmospheric Administration Center for Operational Oceanographic Products and Service, 2021).

We forecast erosion 60 years from the most recent (2019) shoreline at 20-year intervals to identify the exposure of infrastructure to erosion. The analysis is carried out on the northern side of Point Hope. The southern shore is not included in the analysis because shoreline changes rates are near stable or accreting (Overbeck and others, 2020). The community mitigates erosion on the northern shore using erosion protection (seawalls and gravel and sand filled drums; NSB, 2017). Storms washed out erosion protection (NSB, 2017), so we include these areas in the analysis.

The airport is the only infrastructure exposed to erosion by 2079 (tables 1 and 2), with a total replacement cost of \$7.0 million ( $\pm$  \$2.1 million). The Alaska Department of Transportation & Public Facilities is currently realigning the airport to maintain the airport facility, but the project is not complete so is not included in this analysis (Alaska Department of Transportation & Public Facilities, 2014). The forecast shows Ipiutak Lagoon may breach around 2079, but uncertainty is  $\pm$  60 years so we do not consider this a reliable result. Repeat

<sup>1</sup> Alaska Division of Geological & Geophysical Surveys, 3354 College Rd., Fairbanks, Alaska 99709-3707

<sup>2</sup> Alaska Native Tribal Health Consortium, 4000 Ambassador Drive, Anchorage, Alaska 99508

**Table 1.** Quantity of infrastructure with estimated erosion exposure by linear footage (LF) or count (n).

Quantity of Exposed Infrastructure						
Erosion Forecast Date Range	Buildings & Tank Facilities (n)	Power Lines (LF)	Fuel Lines (LF)	Water Lines (LF)	Roads (LF)	Airport (LF)
2019 to 2039	0	0	0	0	0	282
2039 to 2059	0	0	0	0	0	231
2059 to 2079	0	0	0	0	0	191
Combined Total	0	0	0	0	0	704

**Table 2.** Replacement cost of infrastructure exposed to erosion per 20-year interval.

Cost to Replace Exposed Infrastructure							
Erosion Forecast Date Range	Buildings & Tank Facilities	Power Lines	Fuel Lines	Water Lines	Roads	Airport	Sum
2019 to 2039	\$0	\$0	\$0	\$0	\$0	\$2,815,100	\$2,815,100
2039 to 2059	\$0	\$0	\$0	\$0	\$0	\$2,309,800	\$2,309,800
2059 to 2079	\$0	\$0	\$0	\$0	\$0	\$1,912,800	\$1,912,800
Combined Total	\$0	\$0	\$0	\$0	\$0	\$7,037,700	\$7,037,700

elevation surveys, community-based observations, and erosion monitoring can help determine whether and when the lagoon could breach.

## ACKNOWLEDGMENTS

This work was funded by the Denali Commission Village Infrastructure Protection Program through the project “Systematic Approach to Assessing the Vulnerability of Alaska’s Coastal Infrastructure to Erosion.” The community of Point Hope was not consulted for this report.

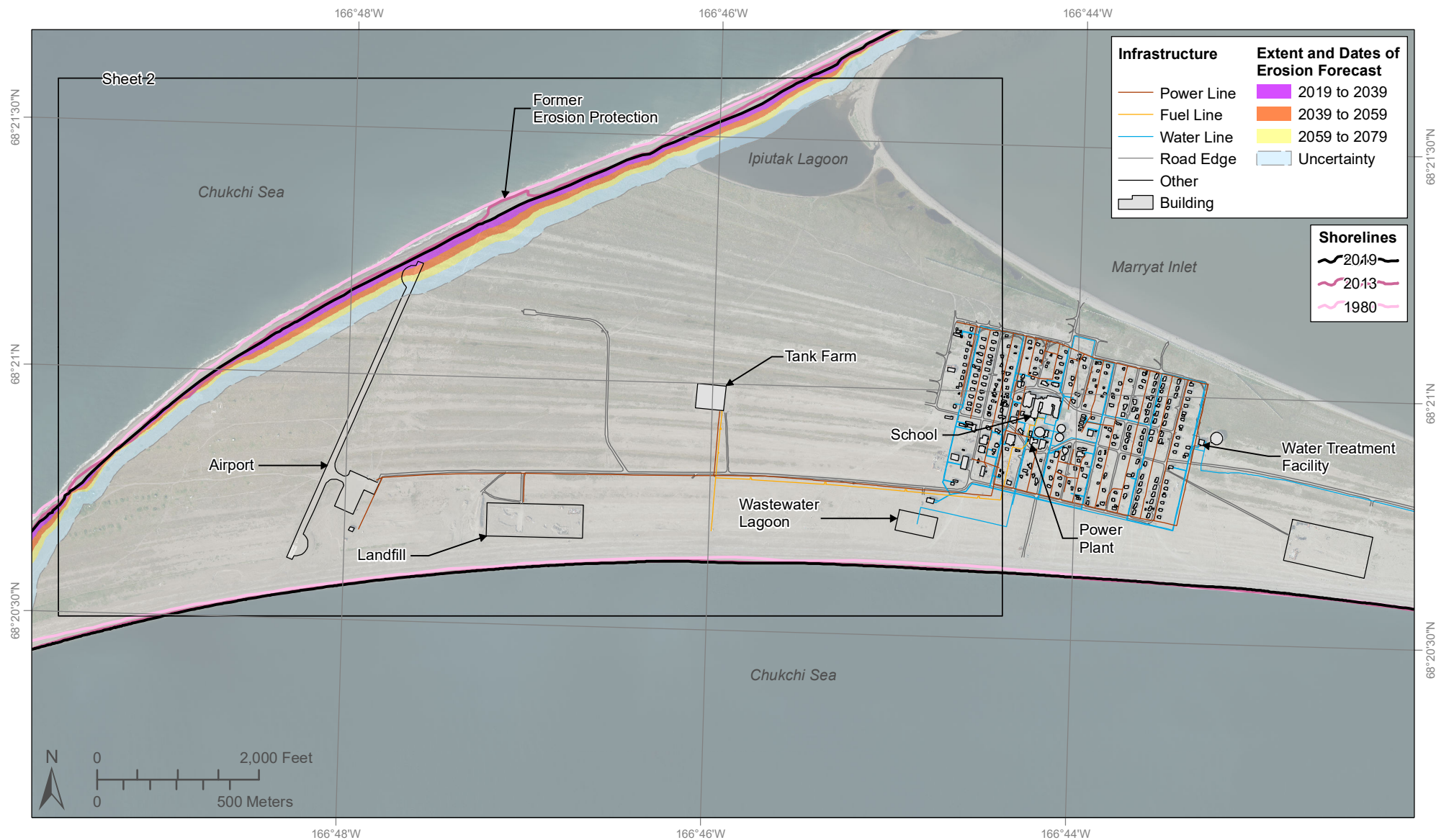
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# Erosion Forecast Point Hope, Alaska

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Buzard and others, 2021  
Point Hope, Sheet 1 of 2



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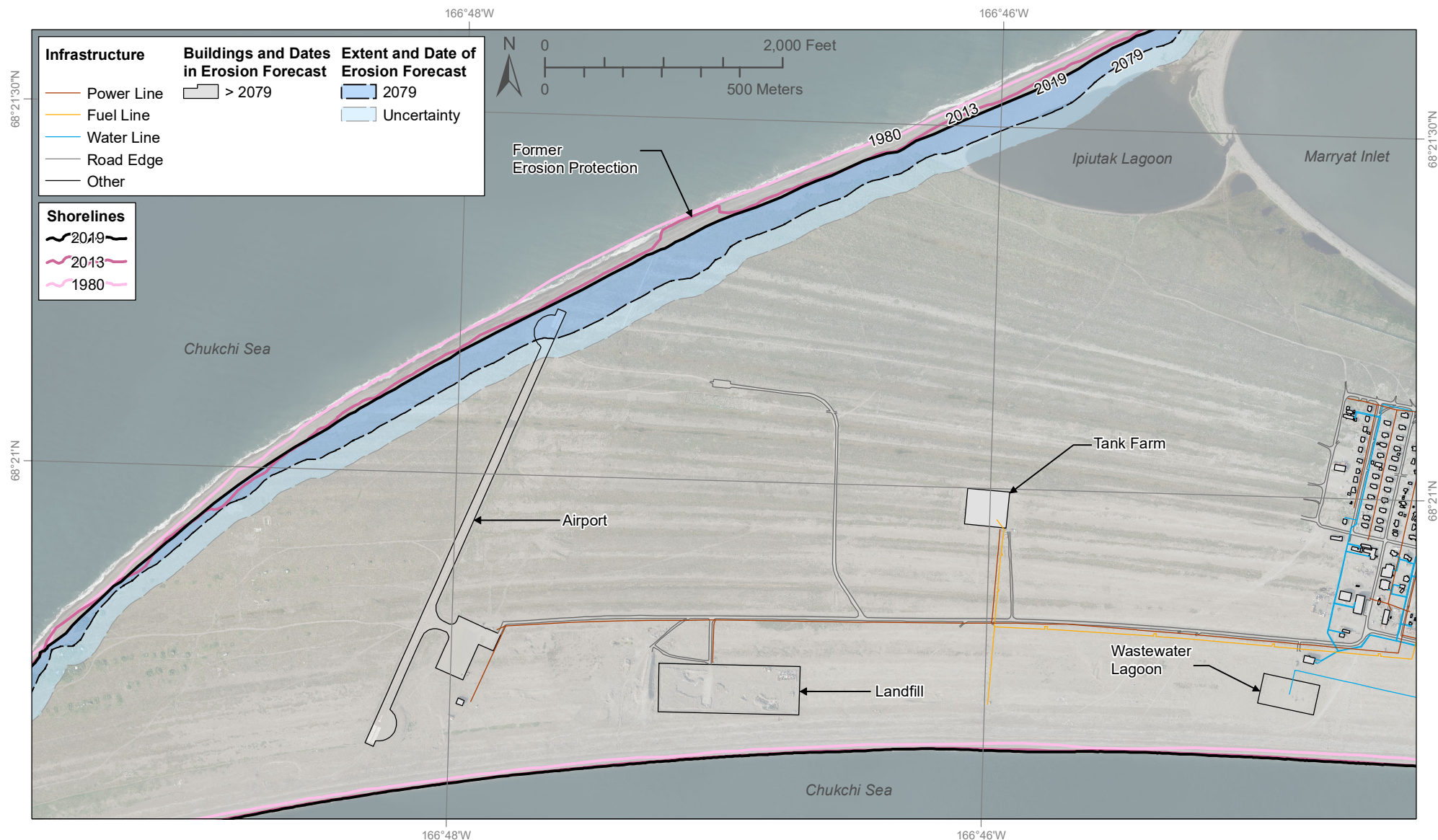
Erosion and accretion of coasts and rivers result in shoreline change. These rates of shoreline change at Alaska communities are calculated from historical and modern shorelines (shorelines shown as lines in pink scale and labeled by year). The long-term (1980 to 2019) shoreline change rate is used to forecast where erosion could impact community infrastructure. Erosion is forecast to reach the colored areas by specified time intervals: 2019 to 2039 (purple), 2039 to 2059 (orange), and 2059 to 2079 (yellow). The area of uncertainty of the 2079 shoreline at a 90 percent confidence interval is light blue. Areas that are not colored by time interval are not forecast to erode by 2079 based on the historical shoreline change rate. For more detailed information about the impacts to infrastructure from erosion at Point Hope, refer to the Point Hope erosion exposure assessment report.

This work is part of the Coastal Infrastructure Erosion Vulnerability Assessment project funded by the Denali Commission Environmentally Threatened Communities Grant Program. Components of this map were prepared by the Alaska Department of Commerce, Community, and Economic Development (DCCED) using funding from multiple municipal, state, federal, and tribal partners. The original AutoCAD drawing of the infrastructure data layers was converted to ArcGIS.



# Erosion Exposure Point Hope, Alaska

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Point Hope, Sheet 2 of 2



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Erosion and accretion of coasts and rivers result in shoreline change. These rates of shoreline change at Alaska communities are calculated from historical and modern shorelines (shorelines shown as lines in pinkscale and labeled by year). The long-term (1980 to 2019) shoreline change rate is used to forecast where erosion could impact community infrastructure. Erosion is forecast to year 2079 (dark blue) with a 90 percent confidence interval area of uncertainty (light blue). Buildings forecast to be impacted by erosion are colored by the range of years when the impact is forecast to occur: 2019 to 2039 (purple), 2039 to 2059 (orange), 2059 to 2079 (yellow), and no impacts expected by 2079 (gray). For more detailed information about the impacts to infrastructure from erosion at Point Hope, refer to the Point Hope erosion exposure assessment report.

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