Report of Investigation 2021-3 Clark's Point

EROSION EXPOSURE ASSESSMENT—CLARK'S POINT

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

Clark's Point, Alaska, in 2006. Photo: ShoreZone, shorezone.org.

Published by
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
2021

EROSION EXPOSURE ASSESSMENT—CLARK'S POINT

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

Report of Investigation 2021-3 Clark's Point

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

STATE OF ALASKA
Mike Dunleavy, Governor

DEPARTMENT OF NATURAL RESOURCES
Corri A. Feige, Commissioner

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
Steve Masterman, State Geologist and Director

Publications produced by the Division of Geological & Geophysical Surveys (DGGS) are available to download from the DGGS website (dggs.alaska.gov). Publications on hard-copy or digital media can be examined or purchased in the Fairbanks office:

Alaska Division of Geological & Geophysical Surveys
3354 College Rd., Fairbanks, Alaska 99709-3707
Phone: (907) 451-5010 Fax (907) 451-5050
dggspubs@alaska.gov | dggs.alaska.gov

DGGS publications are also available at:
Alaska State Library,
Historical Collections & Talking Book Center
395 Whittier Street
Juneau, Alaska 99811

Alaska Resource Library and Information Services (ARLIS)
3150 C Street, Suite 100
Anchorage, Alaska 99503

Suggested citation:
Buzard, R.M., Turner, M.M., Miller, K.Y., Antrobus, D.C., and Overbeck, J.R., 2021, Erosion Exposure Assessment of Infrastructure in Alaska Coastal Communities: Alaska Division of Geological & Geophysical Surveys Report of Investigation 2021-3.https://doi.org/10.14509/30672

Contents

Figures

Tables

EROSION EXPOSURE ASSESSMENT—CLARK'S POINT

Richard M. Buzard[1], Mark M. Turner[1], Katie Y. Miller[1], Donald C. Antrobus[2], and Jacquelyn R. Overbeck[1]

CLARK'S POINT EROSION EXPOSURE ASSESSMENT

This is a summary of results from an erosion forecast near infrastructure at Clark's Point, 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 (2003) Community Profile Map series.
- Added infrastructure such as roads and buildings, delineated if visible in the most up-to-date high resolution (≤ 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).

Clark's Point is located on the northeast side of Nushagak Bay in Bristol Bay on a low-lying spit that transitions into mud flats and is backed by bluffs. Riverine processes and wave action are the primary drivers of erosion (U.S. Army Corps of Engineers, 2007). Overbeck and others (2020) find erosion rates from 1.0 to 8.5 feet per year

along the northern shoreline fronted by mud flats and stability of the coastal bluffs.

We forecast erosion 60 years from the most recent shoreline (2018) at 20-year intervals to identify the exposure of infrastructure to erosion. Erosion is greatest near the cannery on the northern shore of the community. Most infrastructure is further south. A total of 11 buildings are within the erosion forecast area by 2038 and five more buildings by 2078 (tables 1 and 3). Over 600 feet of water lines may be exposed to erosion between 2038 and 2078 (table 1). The total replacement cost of infrastructure exposed to erosion is $4.7 million (± $1.4 million) over the next 60 years (table 2; figs. 1 and 2). We did not estimate erosion exposure for power and fuel lines because the data were not available.

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 Clark's Point was not consulted for this report.

[1] Alaska Division of Geological & Geophysical Surveys, 3354 College Rd., Fairbanks, Alaska 99709-3707
[2] 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 (n)**	**Water Lines (LF)**	**Roads (LF)**
2018 to 2038	11	0	0
2038 to 2058	4	404	13
2058 to 2078	1	261	14
Combined Total	16	665	27

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

Cost to Replace Exposed Infrastructure				
Erosion Forecast Date Range	**Buildings**	**Water Lines**	**Roads**	**Sum**
2018 to 2038	$3,499,700	$0	$0	$3,499,700
2038 to 2058	$812,000	$161,500	$200,000	$1,173,500
2058 to 2078	$0	$104,400	$0	$104,400
Combined Total	$4,311,700	$265,900	$200,000	$4,777,600

Table 3. Cost estimate of erosion exposure to buildings and tank facilities by 20-year interval. The count of exposed residential or unspecified buildings is denoted in parentheses. NCA designates buildings with no cost assigned.

Cost to Replace Buildings and Tank Facilities		
Erosion Forecast Date Range	**Buildings**	**Sum**
2018 to 2038	Residential (6)	$875,100
	Unspecified (5)	$2,624,600
2038 to 2058	Residential (1)	$412,000
	Unspecified (3)	$400,000
2058 to 2078	Commercial (1)	NCA

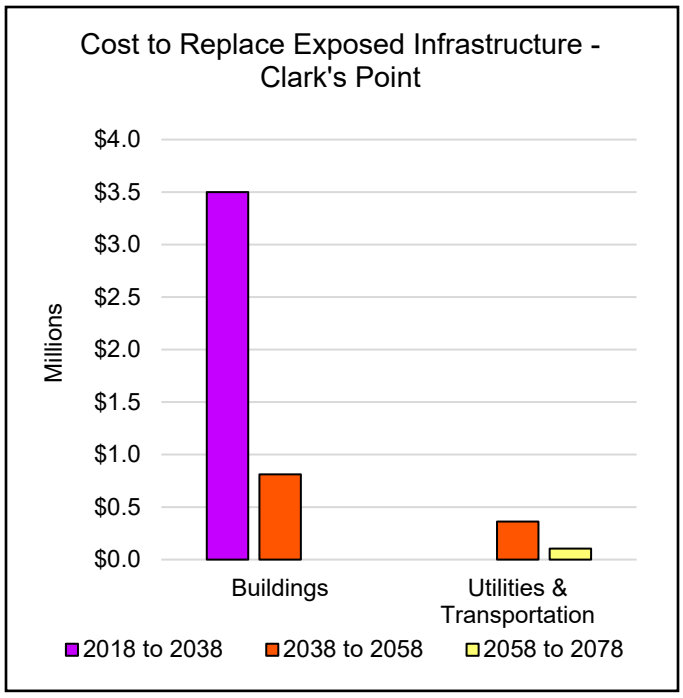


Figure 1. This figure summarizes the replacement cost of all infrastructure in the erosion forecast area. Twenty-year intervals are symbolized by color: purple represents the time interval 2018 to 2038, orange represents 2038 to 2058, and yellow represents 2058 to 2078. The bulk of costs are buildings, especially from 2018 to 2038.

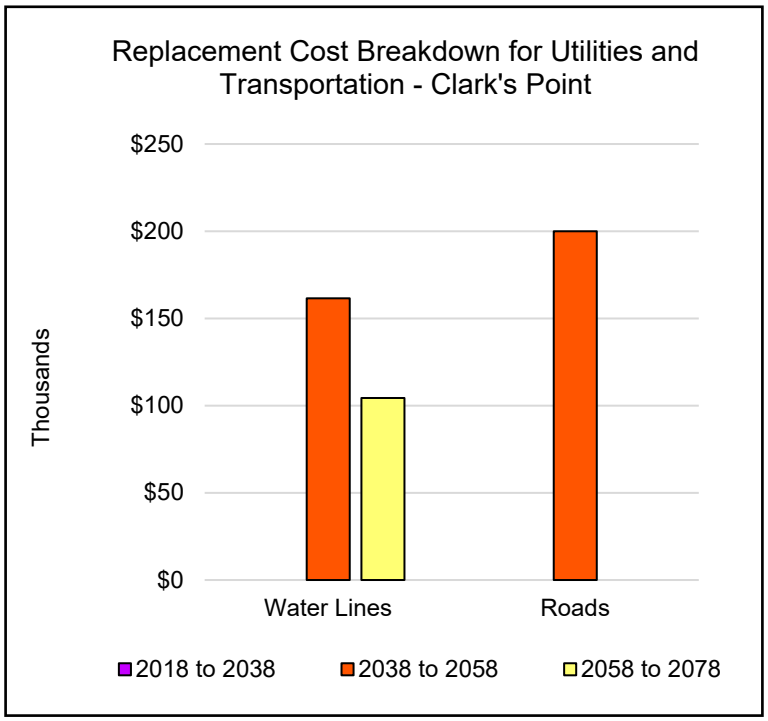


Figure 2. This figure breaks down the replacement cost of all utilities and transportation. The greatest cost is roads from 2038 to 2058.

REFERENCES

Bristol Bay Native Association, 2019, Village of Clark's Point tribal hazard mitigation plan: Bristol Engineering Services Company LLC, 258p.

Buzard, R.M., Turner, M.M., Miller, K.Y., Antrobus, D.C., and Overbeck, J.R., 2021, Erosion exposure assessment of infrastructure in Alaska coastal communities: Alaska Division of Geological & Geophysical Surveys Report of Investigation 2021-3. https://doi.org/10.14509/30672

Division of Community & Regional Affairs, 2003, Community profile map, Clark's Point: Department of Commerce, Community, and Economic Development. https://www.commerce.alaska.gov/web/dcra/PlanningLandManagement/CommunityProfileMaps.aspx

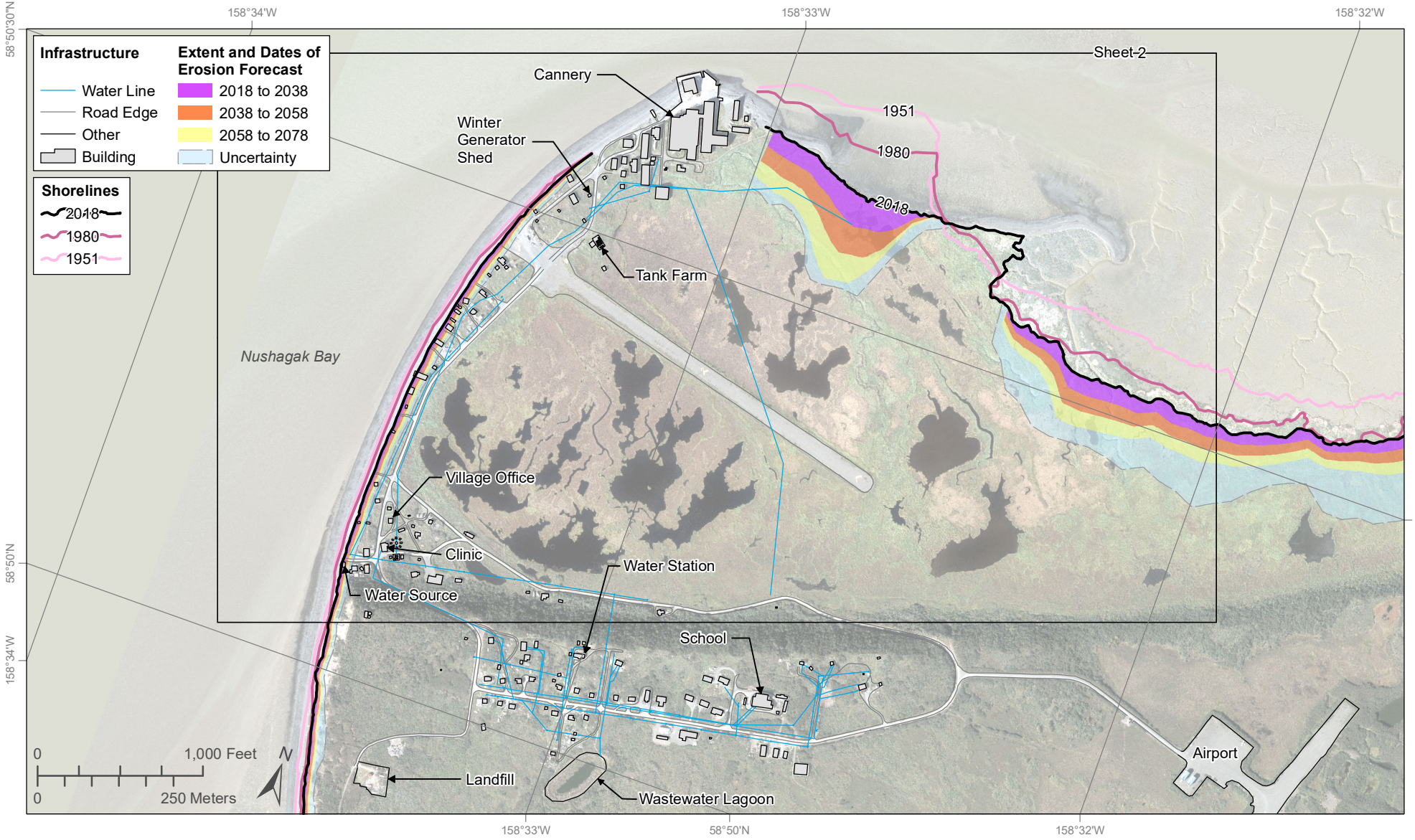
Overbeck, J.R., Buzard, R.M., Turner, M.M., Miller, K.Y., and Glenn, R.J., 2020, Shoreline change at Alaska coastal communities: Alaska Division of Geological & Geophysical Surveys Report of Investigation 2020-10, 29 p., 45 sheets. https://doi.org/10.14509/30552

Quantum Spatial, 2019, Bristol Bay shoreline 2018 imagery—Technical data report: Quantum Spatial, 10 p.

U.S. Army Corps of Engineers, 2007, Alaska baseline erosion assessment report summary in Clark's Point: U.S. Army Corps of Engineers Alaska District, 4 p.

Erosion Forecast
Clark's Point, Alaska

Report of Investigation 2021-3
Buzard and others, 2021
Clark's Point, Sheet 1 of 2



STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

website: dggs.alaska.gov

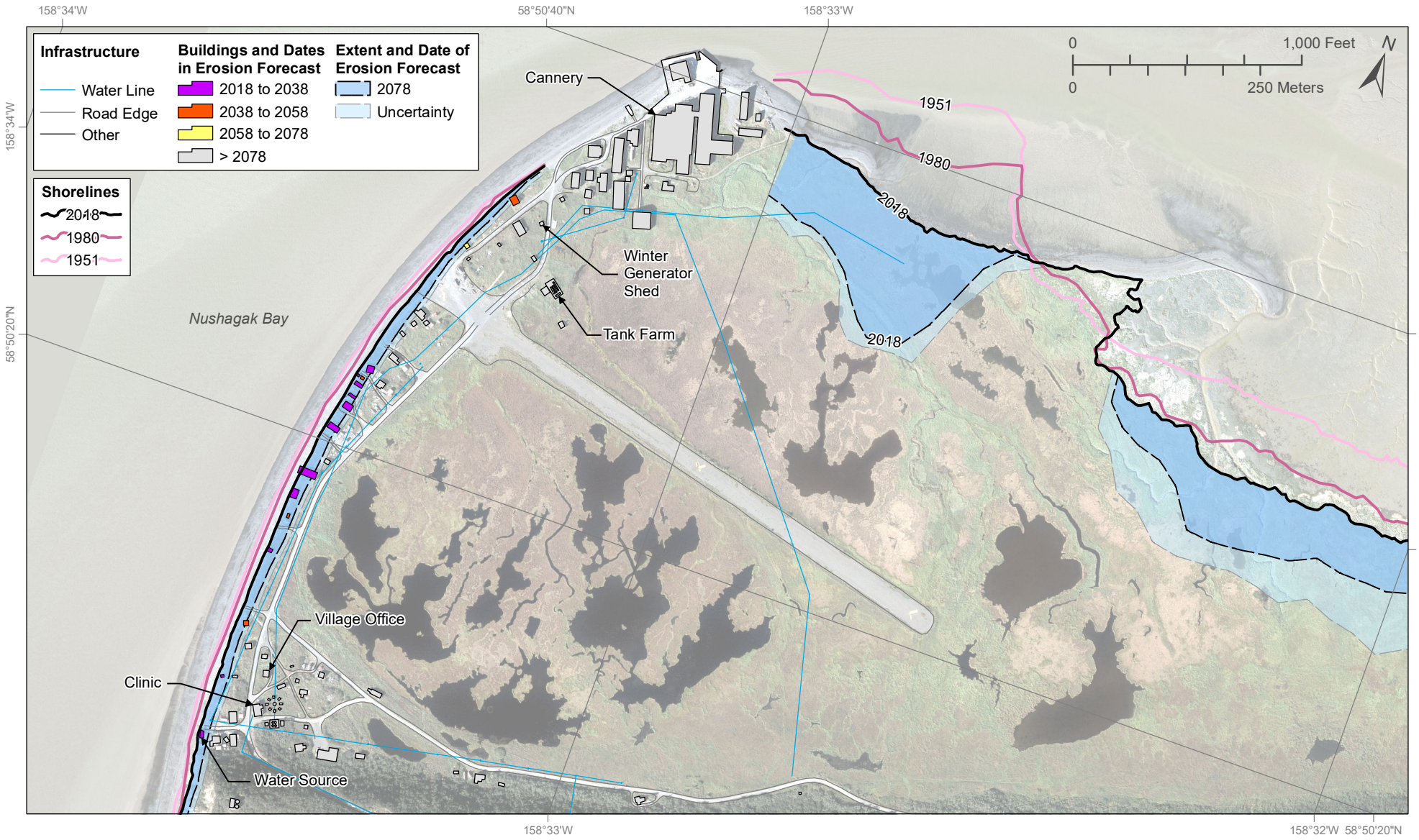
Projection: NAD83 UTM Zone 4N. Orthoimagery year: 2018. Orthoimagery available from elevation.alaska.gov

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 (1951 to 2018) 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: 2018 to 2038 (purple), 2038 to 2058 (orange), and 2058 to 2078 (yellow). The area of uncertainty of the 2078 shoreline at a 90 percent confidence interval is light blue. Areas that are not colored by time interval are not forecast to erode by 2078 based on the historical shoreline change rate. For more detailed information about the impacts to infrastructure from erosion at Clark's Point, refer to the Clark's Point 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
Clark's Point, Alaska

Report of Investigation 2021-3
Buzard and others, 2021
Clark's Point, Sheet 2 of 2



STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

website: dggs.alaska.gov

Projection: NAD83 UTM Zone 4N. Orthoimagery year: 2018. Orthoimagery available from elevation.alaska.gov

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 (1951 to 2018) shoreline change rate is used to forecast where erosion could impact community infrastructure. Erosion is forecast to year 2078 (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: 2018 to 2038 (purple), 2038 to 2058 (orange), 2058 to 2078 (yellow), and no impacts expected by 2078 (gray). For more detailed information about the impacts to infrastructure from erosion at Clark's Point, refer to the Clark's Point 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.