Report of Investigation 2021-3 Kivalina

EROSION EXPOSURE ASSESSMENT—KIVALINA

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Kivalina, Alaska, in 2012. Photo: ShoreZone, shorezone.org.

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EROSION EXPOSURE ASSESSMENT—KIVALINA

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KIVALINA EROSION EXPOSURE ASSESSMENT

This is a summary of results from an erosion forecast near infrastructure at Kivalina, 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:

- Shoreline change assessment ArcGIS shapefiles from Overbeck and others (2020) updated to the vegetation line if appropriate.
- Infrastructure AutoCAD outlines and metadata from Division of Community & Regional Affairs (2004) 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 (≤ 0.66 ft [20 cm] ground sample distance) aerial orthoimagery (Overbeck and others, 2016).
- Computed infrastructure cost of replacement based on square or linear footage from Buzard and others (2021).

Kivalina is built on vegetated dunes at the end of an eight-mile barrier island off the southwest coast of the Lisburne Peninsula. From 1952 to 2016, the island experienced a mix of erosion and accretion that resulted in a net-stable shoreline (Overbeck and others, 2020; U.S. Army Corps of Engineers [USACE], 2009). However, storm surge can erode soil and undercut infrastructure close to the coastline.

Despite long-term stability, USACE (2009) forecast major erosion impacts. A rock revetment was built in 2010 to protect most of the community from erosion. Comparisons of historical and modern aerial imagery show that the expansion of the airport runway changed the position of the shoreline, and some erosion protection was placed in the area as well. We cannot forecast erosion in Kivalina due to the shoreline modifications that are present along the entire shoreline of the community. Unprotected lengths of shoreline are exposed to erosion from storm events. The revetment appears to have stabilized the shoreline, reducing anticipated erosion exposure. The revetment may require upkeep. Beach erosion can be measured from repeated beach elevation surveys using GPS or digital elevation models. Continued monitoring and a longer record of beach elevation data can help identify whether and when infrastructure may become exposed to erosion.

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