New Model of the Barry Arm Landslide in Alaska Reveals Potential Tsunami Wave Heights of 2 Meters, Values Much Lower Than Previously Estimated

...However, waves could still be hazardous to Whittier and other nearshore communities in Prince William Sound.

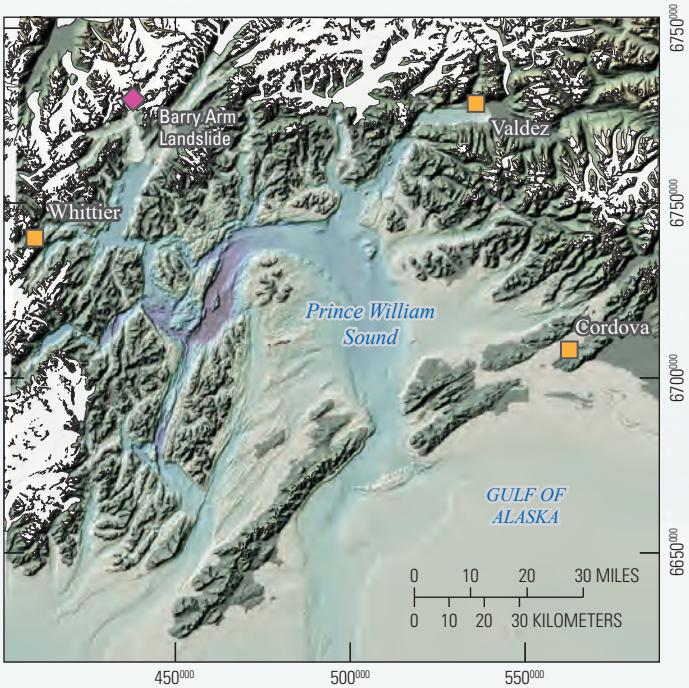
The retreat of Barry Glacier has contributed to the destabilization of slopes in Barry Arm, creating the possibility that a landslide could rapidly enter the fjord and trigger a tsunami.

The U.S. Geological Survey (USGS) recently released a report documenting potential tsunami wave heights in the event of a large, fast-moving landslide at the Barry Arm fiord near Prince William Sound, Alaska (Barnhart and others, 2021). This new work shows that the largest plausible wave height is smaller than initial estimates published in Dai and others (2020), but waves still represent a substantial hazard to the people who live, work, and recreate in Prince William Sound. Thus, it is important that residents and visitors remain informed about this hazard and prepare accordingly.

Summary of New Findings

The Barry Arm landslide has the potential to move downhill slowly or to rapidly collapse into the fjord, displacing a massive amount of water and causing a tsunami. Although Barnhart and others (2021) explored multiple landslide scenarios, the tsunami triggered by the rapid failure of the entire Barry Arm landslide is of particular importance because of its proximity to the town of Whittier. Tsunami waves triggered by this worst-case scenario could reach heights of up to 2 meters (7 feet) just offshore of Whittier (fig. 1), which could cause severe property damage and put residents at risk. Notably, this scenario is much less severe than the 9-meter- (30-foot-) high wave assessment published previously (Dai and others, 2020). Although the revised estimate of the maximum wave height is smaller, this wave could travel fast enough to reach Whittier in less than 20 minutes from the time of the landslide. Areas closer to the landslide, such as Barry Arm, Harriman Fiord, Port Wells, and College Fiord (not shown), could see much higher waves than at Whittier. The wave heights in these regions vary depending on their proximity to the landslide and the local water depth. Higher wave heights are most common in shallow waters, such as at fjord heads. In models of the area north of Point Doran (not shown) in Barry Arm, maximum wave heights exceed 20 meters (66 feet). Maximum wave heights of 5 to 20 meters (16 to 66 feet) were simulated in the southern part of Barry Arm and in Harriman Fiord and 2 to 5 meters (7 to 16 feet) in Port Wells and College Fiord. In the event of a rapid landslide, marine traffic in these areas could face life-threatening wave hazards without enough time to evacuate.

These revised tsunami estimates are based on models that use new highly detailed maps collected by the Alaska Division of Geologic and Geophysical Survey (DGGS) and the National Oceanic and Atmospheric Administration (NOAA) in 2021. These maps better represent the shape of the landslide and seafloor, which help scientists model how the landslide displaces seawater as it impacts the fjord. This interaction between the landslide material and the seawater in the fjord is key to estimating tsunami wave heights and speed. Although the landslide is not guaranteed to fail rapidly or in its entirety, understanding the worst-case scenario is important to prepare appropriately.



Base from National Oceanic and Atmospheric Administration National Geophysical Data Center, Digital data, 2021

EXPLANATION

Elevation, in meters

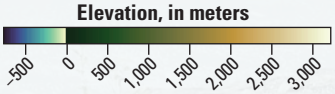


Figure 1. Map showing the location of the Barry Arm landslide relative to nearby cities and towns in Alaska (modified from Barnhart and others, 2021).

What Does This New Information Mean?

Although maximum possible wave heights in Passage Canal are smaller than those originally estimated, a tsunami triggered by rapid failure of the Barry Arm landslide could still represent a considerable hazard for the residents of Whittier and for marine traffic in Prince William Sound. At this time, it is important that residents continue to follow guidance from officials related to emergency planning, evacuation, and marine safety. In addition, residents may benefit from

- Attending community meetings about the Barry Arm landslide and subsequent tsunami hazards.
- Preparing an emergency supplies kit of important items and keeping it somewhere easily accessible. The National Tsunami Warning Center website (link in "Additional Resources" section) has information on what to include in a kit.
- Reviewing the ways in which they can receive tsunami and other weather alert messages (see "Additional Resources" section).
- Practicing an evacuation route with their household and rehearsing a communication plan.
- Familiarizing themselves with guidelines posted on the DGGS website (link in "Additional Resources" section).
- Reviewing all information within resources listed in the "Additional Resources" section.

Continued Hazard Monitoring and Preparation

The USGS and its partner agencies, the DGGS, the National Tsunami Warning Center, and the Alaska Earthquake Center are working in and around Barry Arm to improve our understanding of the landslide and how its rapid movement into the waters of the fjord may create tsunami hazards to the surrounding communities. This interagency team is also planning to develop an early warning system to alert authorities and the public should a slope failure and tsunami occur or should scientists observe increased landslide activity. Residents may see heightened activity of helicopters and boats as scientists install and maintain monitoring equipment and survey the terrain. The USGS plans to provide additional information and scientific findings related to hazard and risk to the communities of Prince William Sound through public meetings, reports, social media posts, and briefings to local officials.

Additional Resources

Visit the following agencies for information on how you can prepare for a tsunami and other emergencies.

- *Alaska Division of Geological and Geophysical Surveys.*—The most up-to-date source of information on the Barry Arm landslide, including links to partner agencies, available at https://dggs.alaska.gov/hazards/barry-arm-landslide.html.
- *Alaska Department of Homeland Security and Emergency Management.*—Information on mitigation and community preparedness for tsunami hazards, available at https://www.ready.alaska.gov/Mitigation/Tsunamis.
- *NOAA's National Tsunami Warning Center.*—Information on tsunami preparedness, available at https://tsunami.gov/.
- *NOAA's National Weather Service*.—Current tsunami alerts, available at https://www.weather.gov/safety/tsunami-alerts.
- *Alaska Earthquake Center*.—Information on earthquake preparedness, available at https://earthquake.alaska.edu.
- For the full publication by Barnhart and others (2021), visit https://doi.org/10.3133/ofr20211071.

U.S. Geological Survey scientists, Brian Collins (left) and Jeff Coe (right), measure rock properties on the east side of Barry Arm. Determining the type of rock and its degree of breakdown helps to assess slope stability and provides an analog to detect possible landslide hazards in other areas.

Banner. Image of a steep slope comprising the Barry Arm landslide.

Background. U.S. Geological Survey scientist Brian Collins evaluates a rock ledge to install landslide monitoring equipment. When deciding its location, he considers potential hazards to the equipment or installation team and the visibility of the landslide.

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