

## No action –

Repair and replacement of the intake gate structure at the Spirit Lake Outlet does not occur. The Spirit Lake Outlet does not provide alternate or redundant gates or method of closure to allow for inspection, repair, or maintenance. The Spirit Lake Outlet is unable to safely store lake water or release water faster during summer seasons. The existing fracture critical intake gate, identified in the October 2016 Comprehensive Spirit Lake Outlet inspection as an item requiring near-term replacement, is not replaced.

Spoils pile in front of the Spirit Lake Outlet continues to accumulate log debris mat and obstruct administrative marine access for inspection, repair, or maintenance. Spoils pile and log debris mat restricts drainage of Spirit Lake, resulting in elevated lake water elevation and increased geohazard risk.

Geotechnical investigation and core sampling does not occur on the debris blockage. The seismic performance of the debris blockage is unknown for liquefaction during earthquakes. The understanding of risk for internal erosion failure of the debris blockage remains incomplete. The low elevation of the interface between highly erodible upper deposits and moderately erodible lower deposits in the debris blockage remains unknown. Seismic and internal erosion considerations affect current knowledge and determination of safe lake level. Possible future Spirit Lake outflow alternatives are difficult to assess without geotechnical investigation and core sampling.

Cumulatively, no action does not reduce the risk presented by the Spirit Lake and Toutle River system at Mt. St. Helens. Lake breach models suggest that a full-catastrophic breach of the debris blockage could inundate significant portions of the cities of Kelso and Longview, Washington.

## Common Actions –

[Repair and replace the intake gate structure at the Spirit Lake Outlet.](#)

Perform the following actions during the first season of construction.

Construct an access route. Access route alternatives are described on page [x].

Place barges, boats, and construction equipment onto Spirit Lake for construction activities.

Dredge approximately [4000 to] 7100 cubic yards of spoils material from existing spoils pile in front of Spirit Lake Outlet. Dredged material includes wooden debris, rock, ask, and sand. Dredged material will first be placed onto a scow barge. Approximately 2700 cubic yards of suitable dredged material will be used to construct an access ramp to the existing helipad at the Spirit Lake Outlet. Dredged material can be unloaded onto the base of the ramp, from which equipment can push the material up towards the helipad. Remaining dredged material will be unloaded [into Spirit Lake] several hundred feet away from the Spirit Lake Outlet.

Perform the following actions during the second and following seasons of construction.

Perform necessary maintenance on access route. Place barges, boats, and construction equipment onto Spirit Lake for construction activities.

Construct a cofferdam to stop water flow through the inlet channel and allow access to the gate and intake structure at the Spirit Lake Outlet. Cofferdam construction may consist of large sandbags filled

with gravel and sand material. A pump will operate occasionally to evacuate water from the intake structure area. Additional pumps will maintain the lake level during construction by pumping from the lake to downstream of the intake gate structure. Estimated pumping capacity is approximately 25000 gallons per minute for 10-12 hours per day.

Remove and replace the existing gate and intake structure at the Spirit Lake Outlet. Demolish the existing trash rack and gate. Construct concrete formwork and cast in-place new concrete structure. Fabricate new trash rack and service platform. Install new gates, service platform, and trash rack.

#### Geotechnical investigation and core sampling

Implementation may begin when necessary access route is complete [or by helicopter access] and is estimated to take 1 to 5 field seasons.

Once on location, drill rigs would traverse from hole to hole, it is estimated that 3-5 drill rigs would be used during the operations, with approximately 30 personnel onsite. Take core samples at approximately 30 locations within the footprint of the 1982-1983 drilling site. Core samples would include drill holes 100-300 feet deep, 1-4 inches in diameter. Additional connected actions include management of drilling mud, water, and waste. Each drill hole location may occupy approximately 1000 square feet area during drilling operation.

## Access Alternatives

### Windy Ridge – TT – Pump Station

Improve the 99 road extension from the Windy Ridge recreation site to the Researcher Parking Lot in order to allow passage for a truck with a lowboy trailer.

Construct temporary road from Researcher Parking Lot to the location where lake drainage pumping occurred the 1980's, henceforth referred to as the pumping station. Temporary road will follow the access route utilized by the previous pumping and construction operations where possible, currently known as the Truman Trail. Construction may include new materials, road building activities, stream crossings, drainage features, and other road structures. The temporary road surface will generally be 16 feet wide before curve widening and allow passage of a truck with a lowboy trailer. Seasonal maintenance may be necessary.

Construct equipment and material staging area at the pumping station near the shore of Spirit Lake. Construct a barge loading facility at the pumping station on the shore of Spirit Lake. Construction will occur within the area disturbed by previous pumping and construction efforts.

### Windy Ridge - Duck Bay (Gate) – Helicopter (Drilling)

Improve the 99 road extension from the Windy Ridge recreation site to the Researcher Parking Lot in order to allow passage for a truck with a lowboy trailer.

Construct a temporary road from the Researcher Parking Lot towards Duck Bay. Temporary road will follow the existing disturbed area over the Truman Trail for [x] miles and then depart northeast over the pumice plain towards Duck Bay. Construction may include new materials, road building activities, stream crossings, drainage features, and other road structures. The temporary road surface will generally be 16 feet wide before curve widening and allow passage of a truck with a lowboy trailer. Seasonal maintenance may be necessary.

Construct equipment and material staging area near the shore of Spirit Lake at Duck Bay. Construct a barge loading facility on the shore of Spirit Lake at Duck Bay.

Drilling access will be accomplished by helicopter. [??? Additional connected actions such as transport between drill hole locations and water supply].