



## LAKE WHATCOM WATER & SEWER DISTRICT

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# MEMORANDUM

To: LWWSD Board of Directors Date: January 28, 2025

From: Greg Nicoll, P.E., District Engineer

RE: Justification for Demolition of Existing Division 7 Reservoir

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The Division 7 reservoir is a one-million-gallon welded steel drinking water reservoir that was originally constructed in 1971. The District is currently constructing two new concrete reservoirs with a combined capacity of 476,000 gallons to replace the existing reservoir. This project includes demolition of the existing reservoir. This memo summarizes the background and provides justification for demolition of the existing reservoir and the ability to provide fire protection, including the potential need to fight wildfire within the service area.

### Background

The existing reservoir was constructed prior to development of current seismic design standards that were developed to ensure that critical infrastructure, which includes water reservoirs, can withstand a major seismic event. In 2016, the District completed a seismic evaluation of all of the District-owned welded steel reservoirs to determine if the existing reservoirs meet current seismic standards, including the existing Division 7 reservoir. This evaluation determined that the existing Division 7 reservoir does not meet current seismic standards and would be unlikely to survive a major seismic event. The study further concluded that the existing Division 7 reservoir presented the highest risk of all of the existing steel reservoirs operated by the District. As a result of this determination, the District applied for and was awarded a Hazard Mitigation Grant funded by the Federal Emergency Management Agency and the Washington Military Department Emergency Management Division to complete seismic improvements to the reservoir. The District subsequently completed an alternative analysis to meet seismic design standards and determined that replacement of the reservoirs with two new concrete reservoirs was the preferred alternative. This alternative was selected because:

1. Due to revisions to the Division 7 service area since its original construction, the existing welded steel reservoir is substantially oversized for the current service area and,
2. The existing reservoir coatings are near the end of their useful life and the cost of the required structural improvements and recoating the reservoir would exceed the cost of replacing the reservoir with two new reservoirs.

## Design

In 2021, the District contracted with Wilson Engineering to design the new water reservoirs to replace the existing reservoir. As a first phase of work, Wilson completed a sizing analysis, which included an evaluation of operational, dead, fire flow, and standby storage. Detailed calculations are provided in the Project Report prepared by Wilson Engineering (2023) and combined storage capacities of the two new reservoirs are summarized in Table 1 below:

Table 1  
Reservoir Storage

Storage Type	Volume (gallons)
Operational	188,640
Standby/ Fire Suppression	269,500 (45,000 gallons for fire)
Dead	8,812
Total	466,952

As shown in Table 1, the combined storage in the new reservoirs for fire suppression is 45,000 gallons, which is equivalent to a flow of 750 gallons per minute for a period of 60 minutes and complies with Whatcom County Coordinated Water System Plan Regional Supplement requirements.

## Fire Suppression and Water Requirements

During design of the new reservoirs, the District consulted with the South Whatcom Fire Authority (SWFA) Chief Mitch Nolze to ensure sufficient fire suppression was provided by the two new reservoirs. This consultation included a review of both structure fires and wildland fires. Chief Nolze stated that structure fires are the primary concern of the fire department since wild land fires in a coastal forest travel much slower (even during very dry conditions) and require much less water than is required for a structure fire. The approach to fighting wild land fires focuses on containment by controlling and saturating potential fuels with high pressure, low volume application of water. In the event of a major forest fire in the District, firefighting efforts would be a combined effort shared between the SWFA and Washington State Department of Natural Resources (WADNR). SWFA has stated that they would draw any additional water required for fighting the fire directly from Lake Whatcom and WADNR would utilize firefighting methods that would not rely on the potable water system. The District reviewed all design parameters and plans for demolition of the existing reservoir with Chief Nolze who concurred with the proposed modified system.

## Evaluation of Alternative to Retain Existing Division 7 Reservoir

During design and construction of the new Division 7 reservoirs, the District has received feedback from District customers advocating for retention of the existing Division 7 to provide additional fire

storage. In response to this request, District staff has evaluated the feasibility, operational impacts and capital improvements required to retain the existing reservoir for fire storage.

### *Required Maintenance and Capital Improvements*

As previously described, the existing Division 7 reservoir is a one-million gallon coated welded steel tank that was constructed in 1971. Per the 2016 seismic evaluation, this reservoir does not meet current seismic standards and is susceptible to catastrophic failure in the event of a major earthquake. Such a failure could result in release of the entire volume of water stored in the tank, which would endanger structures, roads, infrastructure and human safety in addition to compromising the District's ability to provide treated water for both consumption and fire protection. To prevent such a failure, it would be necessary to complete structural improvements to address the tank's current seismic deficiencies. To meet seismic design standards, it would be necessary to construct a 7-foot tall, 3-foot wide concrete ring wall around the existing reservoir and attach the existing reservoir to the ring wall with welded steel anchors. In addition, the reservoir has not been recoated since it was originally constructed and the existing coating is failing. To preserve the steel structure, it will be necessary to completely recoat the interior and exterior of the reservoir. The estimated costs for the seismic improvements and recoating included in the 2021 Division 7 Reservoir Project Report (escalated to 2026 dollars based on the annual construction cost index) is \$2,700,000. In addition, recoating of the structure would be required every 15 to 20 years at a cost of approximately \$800,000 to \$850,000 per recoating (2026 dollars).

In addition to the maintenance and capital improvements required, the permits obtained for construction of the new reservoirs included demolition of the existing reservoir and restoration of the site. If the existing reservoir was retained, it may be necessary to revisit the permits obtained and additional mitigation or stormwater improvements may be needed to account for the retention of the existing reservoir.

### *Operational Evaluation*

If connected to the District's water distribution system, retaining the existing Division 7 reservoir in addition to the two new reservoirs that are currently under construction would result in a total storage volume of 1,476,000 gallons in the Division 7 service area. This amount of storage would far exceed operational, standby, fire flow and dead storage requirements. As a result, the water, which contains residual chlorine to maintain disinfection of the potable water, would reside in the storage reservoirs far longer than recommended, resulting in loss of the residual chlorine. In order to meet disinfection requirements, it would be necessary to add supplemental chlorine to the system, which would require additional capital improvements to add dosing systems, controls, mixing, and sampling infrastructure. Additional District staff time and chlorine costs would be required to manage and operate this dosing system. Due to the elevation difference between the two new reservoirs and the existing reservoir, it would be very difficult to operate all three reservoirs together due to pressure differences and preferential draw from the two new reservoirs.

To avoid the operational challenges summarized above, the District evaluated an alternative to retain the existing Division 7 reservoir but disconnect it from the distribution system, using it solely for fire flow storage. The water stored in this reservoir would not be sufficiently chlorinated due to long storage periods and would be considered non-potable water. The connection to the transmission main that conveys water from the Sudden Valley Water Treatment Plant to the Division 7 reservoirs would be retained with the addition of an air gap to separate the non-potable water stored in the reservoir and the potable water being conveyed by the transmission main, which also fills the two new reservoirs and serves the distribution system. Because the water would be non-potable, the reservoir would be disconnected from the distribution system and the hydrants in the system could not be served by this reservoir. Therefore, the reservoir could only be used to fill fire trucks which is a need that could be fulfilled by direct draw from Lake Whatcom.

### Conclusion

Based on the District's review of firefighting needs, operational constraints, and capital improvement costs and discussions with local fire department officials, the existing reservoir is not needed to meet firefighting demands for either house fires or wildfires. In addition, retention of the reservoir for fire water storage would require initial and on-going capital improvement, maintenance and operating costs that cannot be managed within the current District revenues while continuing to maintain the rest of the District infrastructure. Therefore, District staff does not support retention of the existing Division 7 reservoir.