

Mt. Tabor Adjustments Project and the LT2 Rule

June, 2013

Questions and Answers

What is the LT2 and why does it affect Mt. Tabor?

The Long Term 2 Enhanced Surface Water Treatment Rule (LT2) was issued by the federal Environmental Protection Agency (EPA) to reduce illness linked with the contaminant *Cryptosporidium* and other disease-causing microorganisms in drinking water.

LT2 affects uncovered finished drinking water reservoirs—like those in Mt. Tabor and Washington Parks—by requiring that water systems cover, provide treatment at the outlets or replace the uncovered reservoirs to prevent the introduction of *Cryptosporidium*, *Giardia*, or viruses into the drinking water system.

A finished drinking water reservoir contains water that has been through all the treatment steps required by the federal Safe Drinking Water Act and can be delivered to the public without further treatment.

Five of Portland's finished drinking water reservoirs are uncovered. Three are located in Mt. Tabor Park and two are located in Washington Park.

When does the City need to comply with the LT2 Rule?

Under a state-approved LT2 Compliance Schedule, Portland Water Bureau (PWB) is required to construct additional drinking water storage capacity at Powell Butte and Kelly Butte, and to disconnect the Mt. Tabor uncovered reservoirs from the drinking water system by December 31, 2015.

PWB is required to disconnect the existing uncovered reservoirs in Washington Park from the drinking water system by December 31, 2020.

What is the work currently going on at Mt. Tabor?

There is exploratory excavation underway in support of the design work that is necessary to eventually disconnect the Mt. Tabor reservoirs from the drinking water system. This project is the second phase of a project called the Mt. Tabor Adjustments, and is part of the LT2 Compliance Schedule which contains a number of milestones necessary for Portland to comply

with the LT2 Rule. Construction of new piping and installation of adjustments to the existing system is expected to begin in late 2014 or early 2015.

Who is doing the work at Mt. Tabor?

The design work is being done in-house by Water Bureau staff. The exploratory work currently going on at Mt. Tabor is being performed by PWB field crews, under supervision by PWB engineers. There are no contractors involved at this time.

What are the crews doing?

PWB crews are doing work called "potholing" at Mt. Tabor south of Reservoir 1 to verify the location of existing pipes and important connection locations. Potholing involves excavating a relatively small hole to accurately identify the pipe material and its lateral location and depth. This current effort is the 12th time this year that the PWB has potholed in and around Mt. Tabor.

Why do the crews need to pothole?

Electronic means of locating a pipe can only determine the lateral location. It does not give depth nor does it confirm material type. For design work PWB needs accurate horizontal and vertical locations and confirmation of the pipe material. This is particularly true for very old facilities that are not documented by modern standards.

What else is happening as part of the Mt. Tabor Adjustments Project?

Additional potholing at three locations along Division St, south of Mt. Tabor has begun. New piping in Division Street will allow water to be bypassed around the Mt. Tabor Reservoirs. Design of this project is complete. Construction by a contractor will begin on the bypass piping after October 1, 2013.

Who is designing the projects?

All the design work for the Mt. Tabor Adjustments project is being completed in-house by PWB staff. Construction contractors will likely not be on site until the end of 2014 or early 2015.

Does the city have a plan for what will happen to the reservoir sites at Mt. Tabor once they are disconnected from the drinking water system?

There are no existing plans for the park space currently occupied by the drinking water reservoirs at Mt. Tabor. The mayor has indicated that a full public input process involving parks advocates, Mt. Tabor neighbors and ratepayer interests will be convened prior to any final decisions regarding the future use of this space.

What about all the work that has been done at the reservoirs in the past decade?

The Mt Tabor and Washington Park Security and Deferred Maintenance Project was initiated after the Independent Review Panel (IRP) was finished in summer 2004 and project elements were based upon the recommendations of the panel. The project elements were carefully chosen to maximize long term value to the water system and were not dependant upon the final outcome of LT2 and the potential impacts to the open reservoirs. The improvements were designed by HDR, Black & Veatch, and in-house engineering staff and constructed by Slayden. The improvements were interim maintenance measures and were not designed to prolong the useful life of the reservoirs to 2050 as no work was done to replace the deteriorated water holding concrete or yard piping.

The project included security cameras and other security features, new electrical, new access gates, card key access to gatehouses, new valves and valve vaults, new control valves, PRV vault and 48 inch emergency bypass pipe (to bypass from Tabor 411 to Tabor 302), new decorative fencing and pedestrian walkway at Washington Park, rehabilitation of the interior of Gatehouse 5, replacement of the door on GH 5, painting of doors and window trims, sidewalk repairs at all reservoirs and other miscellaneous work. An additional bypass connection was added at SE 60th and Hawthorne towards the end of the project in 2010.

Total cost of the project was approximately \$26.9 M, which includes construction costs of \$23.6 M and design costs of \$3.3 M. Of the \$26.9 M, approximately \$1.0 M (construction costs of \$900,000 and an estimate of the proportionate design costs) could be considered lost value if Reservoirs 1, 4, 5 and 6 are decommissioned. This includes some of the valves and controls (primarily at Res 6 Outlet gatehouse, drain valves, conduit valves), water quality instrumentation installation and the valve platform at Res 1. The valves and water quality instrumentation can be salvaged and reused in the water system, which would reduce the \$1.0 million to a smaller amount, but no attempt has been made to quantify the salvage value.

What is the condition of the existing reservoirs?

No upgrades to Reservoir 1 have been completed that repair the significant infrastructure issues such as concrete floor distress. There is much more to state in regards to the seriously degraded condition of our open reservoirs. Not only are the impounding walls (of major note is Reservoir 1) in poor shape but the piping and other appurtenances are well past end of life. The existing Reservoir 5 liner is nearing end of life and the Reservoir 3 liner is not too far behind.

The open reservoirs range from 100 to 117 years old. While they may look fine when full, they are in poor condition. The concrete is deteriorated, with cracks and chunks missing, the lining panels have eroded, and the steel pipes and valves are corroding. Perhaps most importantly, the reservoirs and pipes are not structurally sound enough to withstand an earthquake, and would be unusable for water storage at a time when they would be most needed. It has been estimated that the reservoirs would need over \$125 million dollars in improvements to

seismically reinforce them. This would still not meet the EPA's regulatory requirement to cover them or treat the water exiting them.

To the casual passer-by the reservoirs may look fine, particularly when full. From an engineering perspective, that is not the case. These century old reservoirs are rated in "Poor Condition" as bureau assets. Over 100 years of the combined effects of temperature changes, weathering and loading have literally worn the reservoirs out. Each time the bureau drains the open reservoirs, every 6 months or so, the bureau patches and repairs. Severe joint failure is becoming more and more common. Cracking and spalling (chunks breaking off), particularly in the wetted zones, is evident everywhere.

Flexible liners have been added to three (two hypalon and one asphalt) of the five reservoirs to both reduce leakage from the reservoirs and prevent the intrusion of groundwater. Properly functioning concrete reservoirs do not need flexible liners. It is telling commentary on the poor condition of the reservoirs that liners had to be added. It is similarly telling how long ago the liners started being added. In the case of Reservoir 6 the asphalt liner was added in 1965 to repair leaks. Reservoir 3 had a hypalon liner installed first in 1978 and then replaced in 2003. Reservoir 5 had a hypalon liner installed in 1998. The life of the hypalon liners is about 15-20 years.

The liners do not solve the long term problem. They stop leakage and intrusion for a time. But the reinforced concrete continues to undergo all the effects listed above. Structurally, the reinforced concrete basins continue to deteriorate. Risk increases for more damaging types of failure and the bureau is at a disadvantage because personnel cannot see under the liners. Liners obviously do nothing for the risks associated with open exposure to the environment outlined above.

Design standards have advanced greatly since the 1900s. Design standards and formulae used in the 1900s were much simpler and did not account for many of the risks and conditions that are common practice today. Current analytical tools result in much stronger designs, designs that can handle a wider variety of conditions. Of particular relevance, is the improved understanding of earthquakes, the forces earthquakes generate and solutions to resist earthquake forces. The open reservoirs do not meet current seismic design standards. The Water Bureau's open reservoirs would likely be severely damaged and likely not hold water in the event of a significant earthquake like an earthquake occurring on the East Bank Fault, West Hills Fault or from the Cascadia Subduction Zone.

If the reservoirs are to remain operational for any length of time, they need extensive infrastructure repairs, renewal and modernization. All of the open reservoirs are over 100 years old and have exceeded their life expectancy and are due for replacement regardless of what happens with LT2.

Due to the condition of the floors and walls of the reservoirs, liners and covers would be required. Liners and floating covers whether temporary or permanent limit access to the reservoir for making repairs and maintenance of the structure itself. The necessary repairs and improvements should all occur before covering the reservoirs; otherwise the investment in liners and covers will be lost until some future Council authorizes the needed work.

Regardless of the outcome of the LT2 reservoir debate, Kelly Butte is needed. We have determined we can live with the operational risk of having Kelly Butte reservoir out of service for 2 years. However, we can not live with out it longer than that without impacting operations, system reliability and emergency preparedness.

Kelly Butte reservoir provides critical covered storage at a hydraulic elevation of 427 feet serving over 800,000 customers. Kelly Butte is not subject to the types of contamination events that have caused the open water storage at Tabor to be placed out of service. The old Kelly Butte reservoir has been demolished and construction of the new reservoir has begun. With Kelly Butte out of service, we are operating the water system at an elevated risk.

Kelly Butte reservoir provides the operational flexibility to remove the Mt. Tabor open reservoirs from the system, temporarily or permanently. While we could operate in the winter without Kelly Butte, we cannot operate reliably in the summer and, in any case, a major main break or fire response could result in sufficient pressure drop to require boil water notices and perhaps spot outages requiring disinfection regardless of season.

Kelly Butte is designed to current seismic codes. It would likely survive an earthquake and could push water around the failed Mt. Tabor reservoirs, providing fire fighting and supply and giving the bureau time to do a major rebuild.