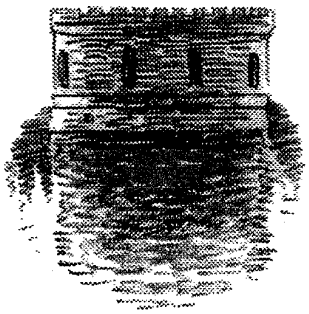

FRIENDS *of the* RESERVOIRS

Citizens joining to protect Portland's historic reservoirs and water system

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www.lists.pdx.edu/mttabor

Friends of the Reservoirs Offer Alternatives to Enhance Water Security

As citizens and water users, the Friends of the Reservoirs are concerned about water quality and safety. However, we believe that the City is exaggerating concerns about intentional contamination and misrepresenting the actual water quality issues in order to justify replacement of its open reservoirs with buried storage. We maintain that alternatives to burial have not been adequately explored. We see a conflict of interest in the fact that the alternatives analysis, which found no feasible alternative to buried storage, was completed by the same engineering company that has been awarded the contract for burial design and construction oversight (*Mt Tabor Reservoirs Alternatives Analysis to Secure Storage*, Mallon, Dec. 2002). We believe that alternatives to the Open Reservoir Replacement Project are realistic and less costly and that the City rushed into this project without a serious examination of alternatives.

First, we present some background information which will enable the reader to put the issues of water safety and water quality into context.

SECURITY

We believe that concerns about intentional contamination are exaggerated. We agree with US Senator Bill Frist, M.D. that "Most experts have concluded that it would be virtually impossible to cause widespread health problems by contaminating a major public water supply." (*When Every Moment Counts: What You Need to Know About Bioterrorism*, First, 2002). We also question why the City has emphasized concerns about open reservoirs while ignoring more immediate and realistic concerns about backflow contamination (Wall Street Journal, Dec 28,01 http://cryptome.org/backflow-panic.htm). We note that although the federal government has been dispensing money to cities to upgrade their security measures, Portland has not qualified for this money because it is not considered to be sufficiently at risk.

We believe that the City Council's actual level of concern is demonstrated by its actions: Since 9/11, the City has been satisfied by the additional security provided by two extra security guards. No additional setbacks, lighting, or other intrusive measures have been deemed necessary by the City. In the 5-year plus timeline that it would take to finish the reservoir burial project, the City will continue to use water from uncovered reservoir 6 and reservoir 1.

The 5-year timeline and comfort with current security measures clearly suggests that there is time to look for cheaper and more socially acceptable alternatives, and to allow the rapidly – developing real-time monitoring technologies to mature. Pittsburgh resisted pressure from its state government to cover its Highland Park 1 reservoir until microfiltration technology matured enough to be economically feasible.

WATER QUALITY

On August 11, 2003, the EPA posted to the Federal Register the proposed *Long Term 2 Enhanced Surface Water Protection Rule* (http://www.epa.gov/safewater/lt2/index.html). This posting began its 90 day comment period. The Water Bureau has often cited this proposed rule as justification for the need to bury the reservoirs. But the rule does not mandate burial of our reservoirs. For Portland, the new rule is all about Cryptosporidium.

The proposed rule would establish different requirements for unfiltered (like Portland and New York) and filtered source water systems. Filtered water systems with a measured Cryptosporidium level <0.075/L would not be required to provide any additional treatment. However, although the Crypto levels in unfiltered systems are, on average, TEN TIMES LOWER that the average level in filtered systems, the EPA declined to establish an absolute Cryptosporidium level for unfiltered systems below which the system would be allowed to forgo treatment. Instead, the EPA would require every unfiltered system to provide additional treatment, no matter how pure its source water. The City of Portland should challenge this part of the rule: the EPA should establish a specific level of Cryptosporidium below which treatment is not required.

The level for Portland is unknown, because the city does not want to institute monitoring. In a snapshot analysis for the 1998 Technical Memorandum 2.7 Water Quality Evaluation, no Cryptosporidium, fecal bacteria, or heavy metals were detected in the Mt. Tabor reservoirs.

Portland, like New York City, currently holds a waiver to an earlier EPA requirement to filter its source water. New York City's Catskill Watershed, which is not as well protected as ours, has applied for and received a 5-year extension to its waiver. Commissioner Saltzman has inexplicably declined to apply for such an extension to Portland's waiver, preferring to build a $210 million membrane filtration plant at Powell Butte. (Mr. Saltzman has sent a "letter of inquiry" to EPA but not an application) New York City performs twice-monthly monitoring and plans to fight any requirement that it cover or filter its 900 million gallon reservoir of unfiltered uncovered finished water. We are certain that, if monitored, our source water would be found to have lower Crypto levels than New York's. We suggest that monitoring would be cheaper than the treatment plant at Powell Butte and its corollary, burial of Portland's open reservoirs.

The other requirement of interest proposed by the new EPA rule applies to uncovered finished water reservoirs (like Mt Tabor and Washington Park). This part of the rule assumes that Cryptosporidium has been abated upstream by watershed protection or treatment. This part of the rule directs such water systems to provide additional protection against viruses by either treating the water at the outlet, covering the water, or proving to the State that its health risk mitigation plan is adequate. This part of the rule should also be challenged. Systems should be allowed to provide monitoring data that show that its virus levels meet a minimum requirement.

If Portland and New York cannot successfully challenge the treatment requirements for unfiltered uncovered systems, the EPA accepts UV as a sufficient treatment. A cheap UV reactor at the outlet of any or all open reservoirs would satisfy both parts of the proposed EPA requirement.

ALTERNATIVES

UV treatment is only one of many alternatives to burial. We feel that Portland should allocate the resources necessary to independently evaluate all alternatives to this project. If reservoir replacement proceeds as planned, it will irrevocably damage significant historic resources, the fabric of a major park and a community, and cost ratepayers hundred of millions of dollars. Below we outline alternatives that deserve further consideration.

TREATMENT AT OUTLET

Build a small treatment plant at the outlet of one or more reservoirs. Bypass peak flows around the reservoir, placing peak flow storage at Powell Butte. Outlet treatment could use one of the following technologies:

- **Ultraviolet light (u.v.):** U.V. is an inexpensive and tested technology becoming widely used. It can defeat biological pathogens including cryptosporidium,viruses, and anthrax, requires only a small footprint, and has the ability to rapidly treat huge volumes of water without producing disinfection byproducts (www.awwarf.com/research/TopicsAndProjects/topicSnapShot.aspx?Topic=UV).

- **Ozone:** Ozone treatment has been found to be very effective for inactivating Cryptosporidium, which is very resistant to disinfection. Ozone also provides additional benefits during water treatment by acting as a coagulant and filtration aid and controlling tastes and odors (www.awwarf.com/research/TopicsAndProjects/topicSnapShot.aspx?Topic=Ozone).

- **Reverse osmosis:** This technology is used by the US military to purify water for troops in the field. It is known to remove every possible contaminant, including biological toxins. Its application to municipal water systems is recently emerging. Tampa, Florida will probably be the first US city to utilize this technology (www.water-technology.net/projects/tampa/).

- **Membrane filtration:** Membrane microfiltration was the only treatment-at-the-outlet process discussed in the MWH alternatives analysis report, and it was not given fair exposure in the document. The MWH report assumed that a massive plant treating 92 MG/day would be needed, which would be too large and too expensive. Our research indicates that costs have diminished and it is feasible to use a medium size and lower cost filtration plant such as the one built by MWH in Kenosha, Wisconsin (http://www.mwhglobal.com/case_kenosha.asp). Microfiltration is also the solution adopted by Pittsburgh for the historic Highland Park Reservoir where a small (20 MG/day) tasteful building houses the treatment facility and blends into the park landscape. The plant cost $12 million to build and its footprint is 160' x 50' (www.post-gazette.com/localnews/20020610reservoirlocal3p3.asp). The costs for either the

Pittsburgh or the Kenosha plant are far less than the projected $200 million costs associated with the Open Reservoir Replacement Project.

TEMPORARILY BYPASS RESERVOIRS The reservoirs could be kept offline until real-time water monitoring technology matures, at which time they could be refurbished and brought back into use. This option was used in Encino, California and is feasible for Mt Tabor (www.ladwp.com/whatnew/dwpnews/111202.htm). The Los Angeles Water Bureau is now exploring real-time water monitoring technology that could bring offline reservoirs back into use.

REFURBISH EXISTING RESERVOIRS, INSTALL BIRDWIRES
Relining and refurbishing Reservoir 5 was recently completed. Reconditioning could be done for other reservoirs for a fraction of the reservoir replacement costs. Repair and restore the use of the reservoir fountains which will oxygenate the water for flavor, remove odor, has disinfection properties (02) and will vent gases, i.e. radon from the wellfield, as well as disinfection by-products such as chloroform, VOC, halomethane. The often expressed concern about birds and bird droppings could be solved by installing birdwires across the reservoirs. This is a simple and proven technology.

REAL-TIME MONITORING
Continuous real-time water monitoring, using a variety of technologies, is the subject of intensive research and development around the world. The purpose of these technologies is to provide real-time detection and thus enable rapid reaction against inadvertent or intentional contamination of water supplies. Continuous monitoring systems are becoming available to quickly identify Cryptosporidium, as well as various other waterborne contaminants such as Giardia, E. Coli, and various types of algae. Continuous monitoring is also becoming available for chemical contaminants including the types of neurotoxins most often identified as dangerous for inadvertent or intentional contamination. Monitoring within the distribution system has the potential to provide protection against backflow events as well as primary episodes of contamination.

There are a number of cost-efficient systems in development for continuous real-time monitoring of the water supply.

- **Source Sentinel system**: New York City has 19 reservoirs supplying water to 9 million people and, unlike Portland, is considered a high-level terrorist target. Since Sept. 11, New York City has undertaken a plan including increasing security and developing this early warning system which will detect almost instantaneously contaminants in its water supply. The Source Sentinel system uses microchips programmed to detect traces of chemicals, bacteria and toxic compounds by detecting disruptions caused by the particles in a laser beam passed through water. It transmits data to a satellite which relays data to a computer where results can be monitored. This system is expected to cost about $1-2 million. This alternative has the advantage of being able to monitor at the point of water delivery and not being limited to specific water storage sites (www.thejournalnews.com/newsroom/033003/a0730warbiochip.html) (www.esf.edu/newspubs/news/2003/04.20.boyer.pdf).

- **Point Source Technologies:** Point Source Technologies patented technique sends a laser light through a stream of water tapped from the regular flowing water source. As the light passes through the water it is scattered and measured. Using mathematical comparisons, the system can identify the patterns of known microorganisms and there expected level in the water supply. Variations to the expected patterns, no matter what the source, register as an alert to the system. The Point Source system was used to test water at the Super Bowl and has been used successfully by the U.S. military and private companies in other related applications since the 1980's. A version being developed to detect radioactive, biological and chemical contaminants is currently being tested by a Los Angeles water utility in cooperation with the American Waterworks Research Foundation (www.pointsourcetech.com/products.htm) (www.nytimes.com/2003/03/10/technology/10PATE.html?ex=1048371892&ei=1&en=d\a62d2f305d3b98e).

- **ORNL's Large-Scale Drinking Water Sentinel:** Researchers at Oak Ridge National Laboratories have developed a technique to measure changes in the fluorescence induction curves of naturally occurring algae in sunlight exposed drinking water. The technique detectes changes created by chemicals agents such as herbicides, pesticides, rodenticides that are so small that they would not cause serious health affects in humans. These classes of chemical agents are structurally and functionally similar to chemical warfare agents such as VX and Tabun. In the abstract of their research report, the authors, Greenbaum, Rodriguez, and Sanders note, "The unique aspect of this approach to real-time water quality monitoring is that unlike conventional sensing devices, this sensor material is external to the detecting instrument and is continuously refreshed. These biosensors may be used as continuous rapid-warning sentinels for detection of chemical warfare agents in sunlight-exposed drinking water supplies." (http://cimic.rutgers.edu/drinkingwater/abstracts/Greenbaum.pdf).

- **Daphnia Toximeter**: Another promising technique uses the common freshwater Daphia as the "canary in the coal mine." The Daphnia Toximeter, commerically available from bbe-Moldaenke, monitors live daphnia in a water refreshed chamber for deviations from predicted behavior. Daphnia are very sensitive to any environmental change and the system was used as a real time monitoring of water at the Salt Lake City Olympics (http://www.bbe-moldaenke.com/).

- **New Jersey EPA grant**: U.S. EPA Region 2 has allocated $500,000 to create a pilot project that will provide system operators with real-time information about the safety and quality of their water supplies. In order to expedite the real-time monitoring pilot, EPA is working with USGS and the Rutgers University Center for Information, Integration and Connectivity to create a Regional Drinking Water Safety and Security Consortium (http://www.epa.gov/region2/news/2002/02130.htm). The EPA and Rutgers co-sponsored the "Second Workshop on Advanced Technologies in Real-Time Monitoring and Modeling for Drinking Water Safety and Security held in December '02 (http://cimic.rutgers.edu/workshop2.html)

- **Laser Flow Cytometry**: Randall Smith, *lymphocyte58@hotmail.com*, a researcher at OHSU said this in email discussions about the potential for Laser Flow Cytometry. "I

have been working on Laser Flow Cytometry at OHSU and PSU, a system for measuring blood cells by fluorescence. I believe that some of these laser systems could be modified for water analysis at a rapid rate, and I don't believe the Water bureau has examined these types of systems. I talked with Dr. Barry Sherr at the College of Oceanography in Corvallis last week, and he has modified a flow cytometry system for microplankton and bacteria in coastal waters. I think this shows some promise for our problem.

Flow cytometry offers not only a method for general analysis, but very specific analysis for known contaminants. One system even has specific gene sequences on beads that will bind to any soluble product of interest in the water. In this way, very dilute contaminants can be picked up and amplified for detection in a rapid, continuous monitoring system.

In looking for more specifics, I found that flow cytometry has been used for Giardia and Cryptosporidium analysis for several years, especially in Australia. There are antibodies available, and several basic mechanisms have been worked out already. Several projects have been done with municipal water in the Netherlands, Canada and in the U.K. If this has not been reviewed by our Water Bureau, then it was submerged, as there are several large projects in the literature, particularly in regard to Cryptosporidium." (www.bio.mq.edu.au/flowgird) (www.bio.mq.edu.au/flowgird/root/Publications/Publications.html)

In short, the Friends of the Reservoirs believe that the security issue is speculative, and that the actions of the City and the Federal Government suggest that the level of risk from a terrorist attack is low, and planned time frame to mitigate the hypothetical risk so long, that it is politically and economically feasible to wait for the maturation of monitoring technology that would render irrelevant any hypothetical risk.

As for the water quality issue, Portland should apply for an extension to its source water treatment wavier as has New York City, it should submit comments to contest the current EPA draft rule that would require unfiltered and uncovered systems to treat no matter how pure their source water is, and, if the rule is not changed, consider lower cost treatment at the reservoir outlets.

There are many possible creative combinations that should be explored including: treatment at outlets, combined with new piping and shut-off valves to allow some bypassing of the reservoirs, plus real-time monitoring to detect trace pollutants. These would provide an inexpensive alternative to the extremely costly and destructive Open Reservoir Replacement Project. The City should take a step back from its initial decision and consider what has been offered in good faith by concerned citizens. If they do, the stage is set to preserve and continue to use these marvels of engineering and community life.

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