UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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Gentlemen:

This letter responds to Mr. Jacobus' letter dated April 15, 2004 submitting the final Desktop Corrosion Control Study prepared by CH2MHill on behalf of the Washington Aqueduct ("Desktop Study"). Pursuant to that letter, the Washington Aqueduct recommends an interim modification of the approved optimal corrosion control treatment ("OCCT") for the Washington Aqueduct and the District of Columbia Water and Sewer Authority ("DCWASA"). The Washington Aqueduct recommends a trial application of the corrosion inhibitor zinc orthophosphate with the expectation that this interim modification will reduce the levels of lead in drinking water in the District of Columbia distribution system and ultimately result in a revised OCCT for maintaining reduced levels of lead in the District of Columbia distribution system.

As you are aware, the U.S. Environmental Protection Agency has primacy for the Public Water System Supervision program ("PWSS") in the District of Columbia. As the primacy agency, EPA must, among other things, designate an OCCT under the Lead and Copper Rule ("LCR") for public water systems. *See* 40 C.F.R. §§ 141.81 & .82. This letter addresses the Washington Aqueduct's request for an interim modification of the approved OCCT to conduct a partial system application of the corrosion inhibitor zinc orthophosphate to the 4th High Pressure Zone portion of the DCWASA's water distribution system commencing on or about June 1, 2004. The proposed full system application tentatively scheduled for later in the summer will be addressed in a separate letter closer in time to the proposed full system application.

The Washington Aqueduct is a wholesaler of water and has no distribution system of its own. Thus, any treatment, including OCCT, applied by the Washington Aqueduct will affect its customer water systems. Because this letter is limited to a partial system application to the 4th High Pressure Zone, the only affected public water systems ("PWS") are the Washington Aqueduct Division, U.S. Army Corps of Engineers (PWS Identification Number DC0000001)

and DCWASA (PWS Identification Number DC0000002). (While the Washington Aqueduct also supplies drinking water to Arlington County, the City of Falls Church, Virginia, and the Ronald Reagan National Airport, those systems will not be affected by the partial system application to the 4th High Pressure Zone). DCWASA is a consecutive community water system which provides no additional treatment to the water received from the Washington Aqueduct before it is distributed to DCWASA's retail customers.

By way of background, the Desktop Study is one of a series of steps outlined in the Action Plan to Reduce the Occurrence of Lead Leaching from Service Lines, Solder or Fixtures into Tap Water in the District of Columbia, Arlington County and Falls Church, Virginia ("Action Plan"). The Action Plan was released on March 10, 2004 by the Technical Expert Working Group, whose members consist of representatives from the U.S. Environmental Protection Agency Region III ("EPA"), EPA Headquarters' Office of Ground Water and Drinking Water, EPA's Office of Research and Development, the Washington Aqueduct, DCWASA, the District of Columbia Department of Health ("DOH"), Arlington County, Falls Church, Virginia and the Centers for Disease Control and Prevention.

Because most of the lead and copper found in drinking water is caused by corrosion of plumbing materials containing lead and copper, EPA's Lead and Copper Rule ("LCR"), 40 C.F.R. § 141.80 - .91, requires, among other things, that public water systems install OCCT, defined as "the corrosion control treatment that minimizes the lead and copper concentrations at users' taps while insuring that the treatment does not cause the water system to violate any national primary drinking water regulations." 40 C.F.R. § 141.2; *see also id.* §§141.81, 141.82.

In June 1994, the Washington Aqueduct conducted a "Lead and Copper Rule Corrosion Control Study." The Washington Aqueduct also conducted a "Caustic Soda Feasibility Study" in October 1997, and a "Corrosion Inhibitor Study for Dalecarlia and McMillan Treatment Plants" in May 1998. In addition, a "Review of Washington, D.C. Corrosion Control Recommendation" letter was prepared for EPA in December 1996.

On July 16, 1997, EPA granted a conditional OCCT to the Washington Aqueduct and required additional study. In February 2000, EPA approved the use of pH adjustment as the OCCT for the District of Columbia Water System, which required the Washington Aqueduct to maintain a pH in the finished water between 7.7 and 8.5. On May 17, 2002, EPA revised its designation of the approved OCCT with respect to the pH water quality control parameters.

On August 26, 2002, DCWASA reported that, during the compliance period July 1, 2001- June 30, 2002, levels of lead in first draw water samples from 53 residences were 75 parts per billion at the 90th percentile. Because this monitoring exceeded the LCR lead action level of 15 parts per billion at the 90th percentile, DCWASA was required to increase monitoring of tap samples, implement a lead public education program, and initiate lead service line replacement at a rate of seven percent of the inventory per year. On July 29, 2003, DCWASA reported that, during the compliance period January - June 2003, levels of lead in first draw water samples from 104 residences were 40 parts per billion at the 90th percentile, again exceeding the lead

action level. DCWASA reported that, during the compliance period July - December 2003, levels of lead in first draw water samples were 63 parts per billion at the 90th percentile.

EPA recognized the need to conduct additional research into the cause of elevated levels of lead in the District of Columbia drinking water distribution system. (Arlington County and the City of Falls Church have not reported elevated lead levels in their drinking water distribution systems.) EPA contracted with an independent corrosion expert in May 2003 to research the cause of the increased lead levels. The expert presented a written report to EPA in October 2003. DCWASA developed a research strategy, which it presented to the Washington Aqueduct, Arlington County, the City of Falls Church and EPA in January 2004.

In February 2004, the TEWG was formed to facilitate and expedite ongoing research to identify a long-term solution to the corrosion of lead from water pipes and fixtures in the District of Columbia.

The TEWG's Production Treatment Operations Team, led by the Washington Aqueduct and its contractor, developed a Desktop Study. The Desktop Study considered various treatment options, including maintaining a constant high pH at the Dalecarlia and McMillan water treatment plants using either quicklime (current practice) and/or sodium hydroxide (caustic soda), and feeding a corrosion inhibitor, such as orthophosphate, while maintaining a constant pH throughout the year of about 7.7. The Desktop Study reviewed the various reports and recommendations previously prepared for the Washington Aqueduct and EPA, conducted a telephone survey of treatment techniques employed by drinking water treatment and distribution facilities similar to Washington, D.C.'s, performed mathematical modeling of corrosion abatement strategies, and reviewed water treatment industry accepted corrosion control practices.

The Desktop Study and its recommendations were presented to the TEWG and reviewed by an independent Peer Review Panel assembled by EPA's Office of Ground Water and Drinking Water in Washington, D.C. The Peer Review Panel consists of a representative from a large private utility, a state agency water treatment expert, and two independent corrosion control experts. The Peer Review Panel made recommendations which were incorporated into the Desktop Study. The TEWG has reviewed the revised Desktop Study and recommended that the Washington Aqueduct present it to EPA.

This letter addresses the Washington Aqueduct's recommendation of an interim modification of the approved OCCT to conduct a partial system application of zinc orthophosphate as a corrosion inhibitor in the 4th High Pressure Zone portion of the DCWASA distribution system commencing on or about June 1, 2004. It is expected that the zinc orthophosphate will react with other minerals in the water to create a protective lining on lead service lines, household pipes and plumbing fixtures, thus reducing over time the amount of lead that is dissolved from inside those pipes and fixtures. The temporary chemical feed facility would be located at the Fort Reno pumping station, which is the entry point for the 4th High Pressure Zone portion of the distribution system. The Washington Aqueduct recommends that the system's flushing program be accelerated in anticipation of the partial system application.

The 4th High Pressure Zone is hydraulically isolated from the remainder of the District of Columbia's water distribution system, but is representative of the entire system in terms of component materials (lead service lines, unlined cast iron pipe, etc.). The purpose of the proposed partial system application is to assess operational characteristics and any unanticipated effects that may occur prior to a full system application. During the partial system application, the Washington Aqueduct proposes interim optimum water quality parameters for entry points in the distribution system be set at pH of 7.8-7.9 +/- 0.3 and corrosion inhibitor at a level at which a concentration of 3.0 mg/l of zinc orthophosphate measured as orthophosphate is detected in tap water samples from the distribution system.

Following the partial system application, and assuming there are no unresolvable adverse effects associated with the partial system application, the Washington Aqueduct recommends a modification of the OCCT to conduct a full system application beginning on or about July 15, 2004. With respect to the full system application, the Washington Aqueduct proposes interim optimum water quality parameters for entry points be set at pH of 7.7 +/- 0.3 and corrosion inhibitor at a level at which a concentration of 3.0 mg/l of zinc orthophosphate measured as orthophosphate is detected in tap water samples from the distribution system, recognizing that the Washington Aqueduct contemplates starting with a higher passivation dose of corrosion inhibitor to reach 3.0 mg/l in the distribution system and then backing down on that dose to maintain a level of 0.5-1.5 mg/l of zinc orthophosphate as a maintenance dose once lead tap samples are below the lead action level of 0.015 mg/l at the 90th percentile. The Washington Aqueduct states that it intends to conduct a study to optimize pH control so that the proposed interim optimum water quality parameters may be revised and tightened at a future date. It should be noted that the proposed application of zinc orthophosphate will not immediately decrease lead levels in the tap water. It is expected that it will take six months or more for lead levels to decrease following implementation of the proposed treatment. The recommended full system introduction will be addressed in a separate letter.

Zinc orthophosphate is an approved and commonly used drinking water additive. The Washington Aqueduct will use a zinc orthophosphate product that meets ANSI/NSF Standard 60: Drinking Water Chemicals – Health Effects, and that has a 1:10 zinc to orthophosphate concentration ratio. Zinc orthophosphate is a proven corrosion inhibitor that is also currently successfully used by at least one other drinking water system for corrosion inhibition on Potomac River water. Based on the NSF certification, the application of zinc orthophosphate is not expected to cause adverse human health effects. The application of zinc orthophosphate could possibly cause temporary rust-colored or "red water" events in the tap water. DCWASA plans to conduct system flushing prior to the application in order to minimize the occurrence of red water. Residents, especially those diagnosed with an iron storage disorder, have been advised by DOH not to drink or cook with discolored water, and to run their tap water until it clears before cooking, drinking or clothes washing. In addition, the proposed treatment regime may cause an increase in total coliform bacteria due to breakdown of biofilm on the pipes. In the absence of fecal coliform bacteria, coliform bacteria generally are not harmful themselves. DCWASA has submitted a plan for increased monitoring during the partial system application. In addition, the proposed treatment could result in increased calcium (lime) deposits in water

mains and residential plumbing. EPA Region III has conducted two public information sessions on April 27 and 29, 2004 to publicly review the recommended application of zinc orthophosphate, provide advice on steps that should be taken if there is an occurrence of red water, receive comments and answer questions. In addition, TEWG has released a fact sheet describing the recommended treatment option and potential effects. DCWASA , DOH and the Washington Aqueduct will continue with outreach programs designed to inform consumers of steps that should be taken as a result of the partial system application.

It is EPA's understanding that the 4th High Pressure Zone is a hydraulically isolated portion of the DCWASA distribution system. EPA is unaware of any connection from the 4th High Pressure Zone to the combined sewer system that discharges to Rock Creek. The 4th High Pressure Zone is served by separate sanitary and storm water sewers. Accordingly, application of zinc orthophosphate to the 4th High Pressure Zone involves introduction to a closed system. It is expected that the Blue Plains wastewater treatment facility will be able to treat wastewater containing zinc orthophosphate from the proposed partial system trial application in the 4th High Pressure Zone and remain in compliance with its National Pollutant Discharge Elimination System discharge limits. While there may be some discharges of zinc or phosphorus to the stormwater sewers by way of lawn watering, fire hydrant use, or similar activities, those discharges are expected to be de minimis. In anticipation of the full system application, DCWASA and the Virginia utilities are evaluating the impact of a potential full system application on their respective systems. In addition, EPA has retained a contractor to assess any impact on the Blue Plains water treatment facility, all permitted outfalls (including combined sewer overflows), and the Virginia receptors of water originating at the Washington Aqueduct. That report is due to EPA no later than June 15, 2004.

EPA considers the Desktop Study and the April 15, 2004 letter to be part of an ongoing process. Pursuant to 40 C.F.R. § 141.82(h), "[u]pon its own initiative or in response to a request by a water system or other interested party, [EPA] may modify its determination of the optimal corrosion control treatment ... where it concludes that such change is necessary to ensure that the system continues to optimize corrosion control treatment. A revised determination shall be made in writing, set forth the new treatment requirements, explain the basis for [EPA's] decision and provide an implementation schedule for completing the treatment modifications." EPA views the April 15, 2004 letter and this response as part of – but not the end – of that process. EPA's consideration of the recommended partial system application is informed by its understanding that additional studies are being undertaken. For example, the TEWG is conducting pipe loop experiments to evaluate optimal treatment dose, pH and other factors. The Washington Aqueduct also is studying means to optimize pH stability. Other ongoing research includes investigation into galvanic corrosion related to water meter replacement, lead profiling, pipe scale analysis and a study of lead leaching rates.

Accordingly, EPA agrees with the recommended interim modification of the approved OCCT to conduct a partial system application of zinc orthophosphate as a corrosion inhibitor in the 4th High Pressure Zone portion of the DCWASA distribution system commencing on or

about June 1, 2004 as recommended in the Desktop Study submitted by the Washington Aqueduct on April 15, 2004, subject to the modifications and conditions set forth below.

Pursuant to 40 C.F.R. § 141.82(f), EPA is required to set water quality control parameters (WQP) for water supplies implementing corrosion control treatment. Monitoring for these parameters is to be conducted according to the requirements in 40 C.F.R. § 141.87, except that frequency shall be as set forth in the DCWASA's partial system application monitoring plan. These parameters are intended to serve as boundaries within which the treatment system and distribution system are to operate to ensure optimal corrosion control.

For the partial system application of zinc orthophosphate, EPA is setting interim WQPs. In addition, EPA is setting operational goals for both the water quality entering the 4th High Pressure Zone distribution system and for water quality as measured in tap water samples from the distribution system. The WQP goals will be tighter than the interim WQPs. These goals will serve as the target for which both the Washington Aqueduct and DCWASA should strive during the partial system application. These targets likely would form the basis for any final WQPs that would be established after final designation of a revised OCCT and its implementation for a period of time.

The Washington Aqueduct will be responsible for meeting the interim WQPs set for water entering the 4th High Pressure Zone distribution system. The DCWASA will be responsible for meeting the interim WQPs set for distribution system samples. The Washington Aqueduct will have to adjust treatment such that these parameters are met in the distribution system to enable the corrosion control treatment to have its intended effect.

The system flushing program shall be accelerated so that at least eighty percent (80%) of the 4th High Pressure Zone is flushed prior to the partial application. Consistent with the Peer Review Panel's recommendation, EPA also expects that the system-wide flushing program will be accelerated both in anticipation of and in concurrence with the proposed full system application.

Interim Water Quality Parameters for the Partial System Applications

These interim WQPs apply to the partial system application of zinc orthophosphate. Interim WQPs applied to water as sampled at the entry point to the distribution system are to be set so that a pH of 7.7 is maintained in the distribution system as measured in samples collected from designated WQP sampling sites. The zinc orthophosphate concentration leaving the plant is to be set at a level at which a concentration of 3.0 mg/l of zinc orthophosphate is detected in tap water samples from the distribution system. This WQP applies to the Washington Aqueduct. The interim WQP for zinc orthophosphate leaving the plant is set as a range to account for the possibility that the Washington Aqueduct may need to adjust treatment for a short period of time to respond to temporary adverse reactions in the distribution system (such as red water). The pH values for water at the entry point to the distribution system are expressed as a range to account for the need to achieve consistent attainment of WQP in the distribution system.

DCWASA is responsible for maintaining optimal water quality parameters in distribution system samples taken from taps. DCWASA has submitted a partial system application monitoring and sampling plan. In a separate letter, EPA will provide DCWASA with comments on its monitoring and sampling plan. Sample site locations must include sites that will collect water from water mains prone to low flow conditions where nitrification can occur. In addition, as set forth below, the plan must provide for monitoring for ammonia nitrogen and nitrate/nitrite nitrogen.

EPA is requiring WASA to monitor and report levels of ammonia nitrogen and nitrate/nitrite nitrogen, as these parameters can indicate the lack of nitrification in the distribution system. Nitrification can occur with the degradation of chloramines. This, in turn, can depress pH in areas of the distribution system where nitrification occurs. Monitoring for these parameters now will inform a decision as to final WQPs for full system application.

Monitoring for the interim WQPs shall be conducted in accordance with 40 C.F.R. § 141.87, except that frequency shall be as set forth in DCWASA's partial system application monitoring and sampling plan.

For water entering the 4th High Pressure Zone distribution system (These apply to Washington Aqueduct):

	WQP Goals	Interim WQPs
pH:	7.8 ± 0.1	7.8-7.9 ± 0.3
zinc orthophosphate measured as orthophosphate	3.0 mg/l*	1.0-5.0 mg/l*

*dose to reach this residual in tap samples

For water samples from the 4th High Pressure Zone distribution system (These apply to DCWASA):

	WQP Goals	Interim WQPs
pH	7.7 ± 0.1	7.7 ± 0.3
zinc orthophosphate measured as orthophosphate in residual in tap samples	3.0 mg/l	1.0-5.0 mg/l
ammonia nitrogen	to be determined	monitor and report
nitrate/nitrite nitrogen	to be determined	monitor and report

Should pH, as measured in the distribution system at approved sample sites, be above or below the interim WQP range set above, DCWASA shall take necessary steps within twenty-four hours of becoming aware of the these measurements to bring pH back to within the acceptable range. DCWASA shall submit to EPA by May 21, 2004, a plan for addressing any excursions from the interim WQPs for the distribution system. In addition, DCWASA's plan shall describe how DCWASA will respond to elevated levels of total coliform bacteria or HPC bacteria.

EPA is aware that the Washington Aqueduct's April 15, 2004 letter also recommends a full system application of zinc orthophosphate to commence later in the summer. That recommendation, including any additional WQPs for full system application, will be addressed in a separate letter closer in time to the proposed full system application.

The recommended partial system application is the result of significant efforts by personnel representing a variety of federal, state and local entities. The Washington Aqueduct, DCWASA and the TEWG should be commended for coordinating and analyzing a significant volume of information in a short period of time. Thank you for your efforts to help secure a long term solution to elevated lead levels in the DCWASA water distribution system. If you or your staff require additional information, please contact Rick Rogers, Chief, Drinking Water Branch, EPA Region III at (215) 814-5711.

Sincerely,

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