Final Environmental Assessment for System Improvements of the Dalecarlia WTP and McMillan WTP for Disinfection and pH Control

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Executive Summary

Washington Aqueduct, a division of the U.S. Army Corps of Engineers (USACE), Baltimore District, operates the Dalecarlia and McMillan Water Treatment Plants (WTPs) in Washington, D.C. and is proposing to modify its disinfection and pH control systems in order to enhance the reliability of the production of safe drinking water and to reduce operational risk. Specifically under consideration is the replacement of liquid chlorine storage and feed systems with aqueous sodium hypochlorite and the full or partial replacement of lime storage and feed system with new caustic soda and sulfuric acid storage and feed systems. Implementation of the proposed action would allow the Washington Aqueduct to more effectively and safely accomplish its mission of providing high quality drinking water, meeting all regulatory requirements, in sufficient quantities as needed by customers in the service area.

Currently liquid chlorine, an extremely hazardous chemical, is used for disinfection at the Dalecarlia WTP and the McMillan WTP. Currently engineering and management controls effectively reduce the potential for off-site consequences of an uncontrolled release of liquid chlorine, which would expand rapidly and become gaseous. Aqueous sodium hypochlorite is a chemical that can perform the same function as liquid chlorine, but is inherently safer. Sodium hypochlorite can be purchased and delivered in bulk, or it can be produced in a dilute concentration with equipment on-site. Both options for using sodium hypochlorite are technically feasible, although there is some uncertainty regarding the suitability of on-site sodium hypochlorite generation systems for the Washington Aqueduct water treatment plants related to the reliability, system efficiency and effectiveness. Further study of on-site sodium hypochlorite generation systems and their compatibility with the conditions experienced by the Washington Aqueduct is warranted.

There are some advantages to continuing the evaluation of on-site sodium hypochlorite generation. The initial capital costs for on-site sodium hypochlorite generation systems are higher than bulk sodium hypochlorite systems, but the life cycle costs over 20 years were estimated to be lower. The number of deliveries that would be required with on-site sodium hypochlorite generation systems is much fewer than with bulk sodium hypochlorite generation systems.

Lime is a chemical that is currently used at both the Dalecarlia WTP and at the McMillan WTP for the control of pH. Two factors necessitate the consideration of alternative methods for controlling pH: new requirements from the United States Environmental Protection Agency (US EPA), and the potential lower pH control chemical requirement with a switch in disinfectants from liquid chlorine to aqueous sodium hypochlorite. Therefore, simultaneous consideration of potential changes to the disinfection and pH control processes is necessary. The existing slaked-lime feed system is incapable of dosing lime with the precision necessary to comply with the new US EPA corrosion control requirements. The existing lime feed systems would be oversized and incapable of feeding the low doses of chemicals needed for pH control, if conversion to sodium hypochlorite were to occur.

Evaluation of potential impacts on the affected environment demonstrated that there are no anticipated significant impacts associated with any of the alternatives considered, including the no-action alternative. However, the proposed action is preferable to the no-action alternative because the existing risk of an uncontrolled release of liquid chlorine, although improbable, would be eliminated. In the interest of an expeditious transition to the use of sodium hypochlorite, a safer alternative to liquid chlorine, construction of bulk sodium hypochlorite storage and feed systems with the potential future opportunity for installation of on-site sodium hypochlorite generation equipment is preferred. Although lime is less hazardous than caustic soda, construction of caustic soda storage and feed systems is preferred in order to allow Washington Aqueduct to achieve the US EPA requirements for controlling pH in the interest of minimizing corrosion in the distribution system.

Implementation of the proposed action would comply with all applicable regulations, as indicated in Table ES-1, and a summary of the anticipated impacts associated with the alternatives considered is presented in Table ES-2.

In the interest of minimizing any potential impacts, the following measures will be addressed in the design and implementation of the preferred alternative, if implemented:

- Design chemical offloading areas to control offsite observance of noise.
- Study and consider further the operational uncertainties associated with installing on-site sodium hypochlorite generation equipment. Consideration of installing on-site sodium hypochlorite generation equipment would be described in additional National Environmental Policy Act documentation.
- Spill prevention and response planning for any new bulk chemical would be incorporated into existing Washington Aqueduct emergency response planning documentation.
- Deliveries will typically occur during off-peak traffic hours.

Table ES-1 Compliance with Federal Environmental Statutes and Executive Orders.

Acts	Compliance
Clean Air Act, as amended (Public Law 88-206)	FULL
Clean Water Act, as amended (Public Law 95-217)	FULL
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986	FULL
Endangered Species Act of 1973	FULL
Farmland Protection Policy Act	FULL
Fish and Wildlife Coordination Act, as amended (16 United States Code [U.S.C.] 661, et seq.)	FULL
National Environmental Policy Act of 1969 (Public Law 91-190)	FULL
National Historic Preservation Act of 1966, as amended (Public Law 89-665)	FULL
Noise Control Act of 1972, as amended	FULL
Resource Conservation and Recovery Act (Public Law 94-580)	FULL
Safe Drinking Water Act, as amended (Public Law 93-523)	FULL
Solid Waste Disposal Act of 1965, as amended	FULL
Toxic Substances Control Act of 1976 (Public Law 94-469)	FULL
Watershed Protection and Flood Prevention Act of 1954 (16 U.S.C. 1101, et seq.)	FULL
Wetlands Conservation Act (Public Law 101-233	FULL
Wild and Scenic Rivers Act	FULL
Executive Orders	FULL
Floodplain Management (Executive Order 11988)	FULL
Protection of Wetlands (Executive Order 11990)	FULL
Environmental Justice in Minority Populations and Low-Income Populations (Executive Order 12898)	FULL

Table ES-2 Summary of anticipated impacts associated with the proposed action and no-action alternative.

Resource	McMillan WTP				Dalecarlia WTP				
	Bulk Sodium Hypochlorite	On-site Sodium Hypochlorite Generation	Full Caustic	No-Action Alternative	Bulk Sodium Hypochlorite	On-site Sodium Hypochlorite Generation	Lime/Caustic Trimming	Full Caustic	No-Action Alternative
Land use	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Geology and Soils	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Topography and Drainage	No Impacts	No Impacts	No Impacts	No Impacts	Minor Impacts	Minor Impacts	No Impacts	No Impacts	No Impacts
Climate	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Air Quality	Minor Impacts	Minor Impacts	Minor Impacts	No Impacts	Minor Impacts	Minor Impacts	Minor Impacts	Minor Impacts	No Impacts
Surface Water	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Floodplains	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Groundwater	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Wild and Scenic Rivers	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Aquatic Resources	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Wetlands	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Vegetation	No Impacts	No Impacts	No Impacts	No Impacts	Minor Impacts	Minor Impacts	No Impacts	No Impacts	No Impacts
Wildlife Resources	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Rare, Threatened, or Endangered Species	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Cultural Resources	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Contaminated Sites	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Hazardous Material Use, Handling, and Storage and Hazardous Substance Generation	Minor Positive Impacts	Minor Positive Impacts	Minor Impacts	No Impacts	Minor Positive Impacts	Minor Positive Impacts	Minor Impacts	Minor Impacts	No Impacts
Storage Tanks	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Toxic Contaminants	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Traffic, Roadways and Transportation System	Minor Impacts	Minor Impacts	Minor Impacts	No Impacts	Minor Impacts	Minor Impacts	Minor Impacts	Minor Impacts	No Impacts
Potable Water	Minor Impacts	Minor Impacts	Minor Impacts	No Impacts	Minor Impacts	Minor Impacts	Minor Impacts	Minor Impacts	No Impacts
Sanitary Sewer/Wastewater	Minor Impacts	Minor Impacts	Minor Impacts	No Impacts	Minor Impacts	Minor Impacts	Minor Impacts	Minor Impacts	No Impacts
Stormwater Systems	No Impacts	No Impacts	No Impacts	No Impacts	Minor Impacts	Minor Impacts	No Impacts	No Impacts	No Impacts
Solid Waste Management	No Impacts	Minor Impacts	No Impacts	No Impacts	No Impacts	Minor Impacts	No Impacts	No Impacts	No Impacts
Utilities	Minor Impacts	Minor Impacts	Minor Impacts	No Impacts	Minor Impacts	Minor Impacts	Minor Impacts	Minor Impacts	No Impacts
Demographics and Environmental Justice	Minor Positive Impacts	Minor Positive Impacts	Minor Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Economics	Minor Positive Impacts	Minor Positive Impacts	Minor Positive Impacts	No Impacts	Minor Positive Impacts	Minor Positive Impacts	Minor Positive Impacts	Minor Positive Impacts	No Impacts
Schools, Recreational Facilities and Children's Safety	Minor Positive Impacts	Minor Positive Impacts	Minor Impacts	No Impacts	Minor Positive Impacts	Minor Positive Impacts	Minor Impacts	Minor Impacts	No Impacts
Noise	Minor Impacts	Minor Impacts	Minor Impacts	No Impacts	Minor Impacts	Minor Impacts	Minor Impacts	Minor Impacts	No Impacts
Visual and Aesthetic Value	No Impacts	No Impacts	No Impacts	No Impacts	Minor Impacts	Minor Impacts	No Impacts	No Impacts	No Impacts

1. Purpose and Need

1.1. Introduction

Washington Aqueduct, a division of the U.S. Army Corps of Engineers (USACE), Baltimore District, operates the Dalecarlia and McMillan Water Treatment Plants (WTPs) in Washington, D.C., serving potable water to over one million persons in the District of Columbia and northern Virginia. The treatment process removes solid particles from the Potomac River supply water, treats and disinfects the water, and distributes the finished water to the metropolitan service area. Washington Aqueduct is considering modification of two components of the treatment process – disinfection and control of pH – at both the Dalecarlia WTP and the McMillan WTP to enhance the reliability of the production of safe drinking water and to reduce operational risk.

The fundamental objective of the Washington Aqueduct, at both water treatment plants, is to reliably and safely provide high quality drinking water, meeting all regulatory requirements, and a sufficient quantity of drinking water as needed by customers in the service area. A secondary objective of the Washington Aqueduct is to minimize costs borne by the customers without compromising the fundamental objective. Because of the around-the-clock need for reliability and safety in the provision of drinking water to ensure our fundamental objective is never compromised, conservatism in decision-making for any process changes is paramount for the Washington Aqueduct.

1.2. Disinfection

Chlorine has been used by Washington Aqueduct to disinfect the drinking water since 1923. Bulk liquid chlorine, created by compressing pure chlorine gas, has been used throughout the history of disinfection at the Dalecarlia WTP and the McMillan WTP. Due to the extremely hazardous nature of pure chlorine, engineering and management controls are employed to minimize risks associated with handling and utilization of pure chlorine. As an alternative to using liquid chlorine, chlorine as sodium hypochlorite, an inherently safer aqueous form, is commercially available and frequently used in the water treatment industry. Washington Aqueduct is considering converting the disinfection process at the Dalecarlia WTP and the McMillan WTP from using bulk liquid chlorine to using sodium hypochlorite for disinfection in order to eliminate the inherent risks associated with storing and handling liquid chlorine.

In November 2000, Washington Aqueduct began normally adding ammonia throughout most of the year following chlorination to create chloramines in order to ensure compliance with disinfection byproduct formation regulations. The potential conversion of the use of liquid chlorine to sodium hypochlorite would not change the utilization of ammonia for the creation of chloramines. The chemical reaction between chlorine and ammonia remains the same regardless of the type of chlorine used.

Conversion to a sodium hypochlorite disinfection system would involve modification of existing structures at the Dalecarlia WTP and the McMillan WTP, potentially resulting in expansion of these structures, or in construction of new structures depending on how the conversion would be implemented. Deliveries and storage of liquid chlorine would be replaced with deliveries and storage of sodium hypochlorite, resulting in an increase in deliveries depending on how the conversion would be implemented. The potential for a rapid concentrated release of gaseous chlorine would be eliminated by implementation.

1.3. Control of pH

In 2004, in the interest of managing corrosion observed in parts of the District of Columbia water distribution system, Washington Aqueduct was provided approval from the Environmental Protection Agency to take steps to modify the water treatment process. The initial step taken was to introduce a chemical corrosion inhibitor. In addition, the acceptable range for pH in finished water was modified. The United States Environmental Protection Agency (US EPA) stipulated that the pH of finished drinking water will be 7.7 ± 0.1. Currently, both the Dalecarlia WTP and the McMillan WTP have adjusted pH using slaked lime. The addition of lime is dependent on the rate of flow of water.

Additionally, when the demand for water is low, the existing feed equipment doses lime with lower precision than when demand is average or greater. At the currently acceptable level of tolerance (± 0.3 pH units), the precision when the demand is low is adequate. However, the equipment cannot reliably achieve the new level of tolerance required (± 0.1) by US EPA. The new level of tolerance coupled with the proposed use of sodium hypochlorite instead of liquid chlorine would further reduce the required need for raising pH with lime, and further exacerbating the implication on precision when the demand for water is low.

Washington Aqueduct is currently considering implementing a process called caustic trimming for the Dalecarlia WTP, which would involve installing new equipment and utilizing caustic soda as a measure to allow for more precise control of pH. For the McMillan WTP, Washington Aqueduct is considering the complete replacement of the existing lime system and replacement with a caustic storage and feed system.

1.4. Simultaneous Evaluation of Potential Process Changes

The two potential process modifications are linked together due to the difference between pure chlorine and aqueous sodium hypochlorite in affecting pH in water. Addition of sodium hypochlorite results in a less acidic pH in disinfected water, when compared to addition of pure chlorine. Due to the effects on water pH with the different disinfection process, evaluation of a conversion to using caustic soda trimming is necessarily linked to evaluation of the potential change in disinfection.

1.5. Regulatory Oversight

The Washington Aqueduct drinking water treatment process is regulated by Region 3 of the US EPA under the authority of the Safe Drinking Water Act of 1974 as amended in 1986 and 1996. Certain modifications of components of the treatment system require US EPA approval or may be stipulated by US EPA.

Other related environmental and public information regulations include those from the Emergency Planning and Community Right-to-Know Act, the Clean Air Act, and the Comprehensive Environmental Response, Compensation, and Liability Act. Aspects of oversight for these regulations are under the authority of US EPA, the District of Columbia, the State of Maryland, and Montgomery County (Maryland).

1.6. Scoping, Agency and Public Consultation or Coordination

The Washington Aqueduct has engaged agencies, elected officials, as well as members of the public as individuals and as representatives of community organizations through direct correspondence and through publication of notices. A detailed description of coordination and consultation activities, including a list of contacts, is available in the Appendix. Initial scoping for the environmental assessment yielded comments from: the Maryland State Highway Administration, a group of neighbors of the Dalecarlia Water Treatment Plant, and from Congressman Chris Van Hollen, who represents constituents in Maryland living near the Dalecarlia Water Treatment Plant and transportation routes commonly used in deliveries to Dalecarlia. The comment letters are included in the Appendix.

The Maryland State Highway Administration acknowledged their interest in safety on roadways in Maryland, which they indicated would be improved by a transition from liquid chlorine (compressed chlorine gas) to aqueous sodium hypochlorite, even when considering a potential increase in the overall number of deliveries. The agency also suggested consideration of deliveries during off-peak hours and at night as feasible. The agency also offered to provide information on the transportation of hazardous materials.

The neighborhood group requested that two separate Environmental Impact Statements be developed for the NEPA evaluation of the conversion to aqueous sodium hypochlorite as well as the conversion to use of caustic soda as part of the overall pH control system for the Washington Aqueduct. The group listed several factors listed by the Council of Environmental Quality in NEPA guidance documents that would indicate a need for evaluation within an Environmental Impact Statement. The group requested an opportunity to be involved in developing screening criteria if an Environmental Impact Statement were to be developed. The group also requested answers to several specific questions. These included the following:

- What are the safety risks to residents from the delivery, storing, usage, or cleaning of Aqueous Sodium Hypochlorite and Caustic Soda?
- What are the plans for using or disposing of excess bulk liquid chlorine?
- What impact will the additional trucks have on ambient noise levels as they travel neighborhood roads and within the McMillan and Dalecarlia facilities? What routes will the trucks travel? What hours will the truck travel: During rush hour? During school bus hours? Will trucks incorporate alternate clean burning fuels? Will truck sizes be limited for the residential roads?
- Will trees be cleared to build or expand the facilities? What air quality and noise impacts will the new or expanded facilities have on neighbors and the Capital Crescent Trail?

Congressman Chris Van Hollen concurred with the comments from the group and included a copy of the letter that they submitted directly to the Washington Aqueduct. Mr. Van Hollen requested development of an Environmental Impact Statement based on the same factors listed by the group.

During the Draft EA comment period, Washington Aqueduct received comments from seven different agencies in the District of Columbia, Montgomery County, the State of Maryland, and the National Park Service. The comments included requests to formally document a need for spill prevention and emergency planning documentation for any new bulk chemicals to be used by the Washington Aqueduct. Additionally, visual impacts to park lands including the Potomac Gorge were a concern of the National Park Service. The National Park Service also requested that Washington Aqueduct acknowledge the prohibition of commercial traffic on park roads. The District of Columbia Historic Preservation Office requested further consultation during the future development of a design. Staff from the Montgomery County Planning Department recommended Washington Aqueduct contact the Coalition for the Capital Crescent Trail.

Response to the comments and related discussion is included herein the Environmental Assessment document in Sections 3, 4 and 5, and are compiled in Appendix A.

2. Description of the Proposed Action and Alternatives

The proposed action includes the replacement of the existing liquid chlorine storage and feed system with an aqueous sodium hypochlorite storage and feed system for disinfection of drinking water; it also includes partial or complete replacement of the existing lime storage and feed system with a caustic soda storage and feed system for control of the drinking water pH. Addition of a sulfuric acid feed system is proposed for the McMillan WTP and space for future potential sulfuric acid storage facilities is proposed for the Dalecarlia WTP in order to ensure precise control of pH, particularly in anticipation of the possible future use of polyaluminum chloride as an alternative coagulant to the currently used aluminum sulfate.

The “no action” alternative would include maintaining the status quo operation of the Washington Aqueduct treatment facilities: delivery, storage and feed of liquid chlorine for disinfection; and delivery, storage and feed of lime for pH control.

The range of the “action” alternatives considered includes combinations of changes of the different chemical storage and feed systems. The following is a list of the variety of options related to the proposed action.

Disinfection

- Bulk sodium hypochlorite delivery, storage and feed:
  - Construction of aqueous sodium hypochlorite storage and feed systems
  - Deliveries of aqueous sodium hypochlorite at a concentration of 12%
  - Storage of aqueous sodium hypochlorite at a concentration of 12% or, if diluted following delivery, 6%
- Sodium hypochlorite generation on-site, storage and feed:
  - Construction of aqueous sodium hypochlorite generation, storage and feed systems
  - Generation of sodium hypochlorite at the sites of the Dalecarlia WTP and/or the McMillan WTP at a concentration of approximately 0.8%
  - Deliveries of sodium chloride (table salt)
  - Greater relative usage of electricity and softened water

pH Control

- Complete replacement of the existing lime storage and feed systems with caustic soda storage and feed systems.
- Addition of a caustic soda storage and feed system for caustic trimming while continuing to use lime.
- Addition of sulfuric acid storage and feed systems.

A detailed description and evaluation of various technical options is in the Feasibility Study (Appendix B). The remainder of Section 2 summarizes aspects of the options presented in the Feasibility Study.

2.1. Storage and Use of Chemicals

For all of the proposed new chemical storage and feed systems, a variety of storage options are possible. The construction of new structures or additions to existing structures is dependent on the amount of storage determined as appropriate for the respective chemicals. Tables 2.1 (McMillan WTP) and 2.2 (Dalecarlia WTP) summarize the estimated minimum required storage volume for sodium hypochlorite, caustic soda, sulfuric acid, liquid chlorine and lime at different concentrations as applicable based on the design flow, dosage requirement, and the required number of days of storage based on either EPA guidance or best management practices established by Washington Aqueduct.

For the use of bulk sodium hypochlorite, a 15 day supply is appropriate and was used for conceptual estimates for sizing storage facilities. For on-site generation of sodium hypochlorite, storage requirements for a 45 day supply of sodium chloride for brine and for a one day supply of sodium hypochlorite is presented. For the pH control chemicals, storage requirements for 30 day supplies are presented. The design flow and the average expected dose were used to estimate the storage requirement for all of the chemicals. The Feasibility Study presents alternatives with greater volumes of storage, and correspondingly the estimated costs are higher than what would be expected with systems with smaller volumes. A memorandum detailing a supplementary cost analysis, in the Appendix, explains the basis for the costs presented in this Section.

2.1.1. Sodium Hypochlorite

The new system could involve storage of aqueous sodium hypochlorite at different strengths. Sodium hypochlorite is typically transported at 12% concentration. Upon delivery, the chemical can be diluted to the desired storage concentration. EPA typically requires storage of a 30-day supply of treatment chemicals, however due to the relatively low concentration of sodium hypochlorite and heavy usage, a 15-day or less supply storage criterion is used by some water treatment facilities.

While storage at higher concentrations necessitates lower required volumes, higher concentrations accelerate the breakdown of sodium hypochlorite to undesired byproducts. Other factors that accelerate the breakdown of sodium hypochlorite include increasing temperature, increasing exposure to ultraviolet light, and deviation from the optimal pH range. Water treatment plants normally store sodium hypochlorite in bulk at concentrations of either 12% or 6%.

On-site generation of sodium hypochlorite using conventional equipment produces concentrations of approximately 0.8%, using sodium chloride brine and electricity. Softening is necessary for the feed water used to prepare the brine. The equipment manufacturer recommends storing a one day quantity of sodium hypochlorite, however some plants that currently use on-site sodium hypochlorite generation equipment store more than the recommended amount in order to reduce risks of affecting the reliability of the treatment system. Sufficient storage of sodium chloride, necessary for making the brine reagent in the sodium hypochlorite generation process, is comparable to the required storage of bulk sodium hypochlorite.

There are also newer, more complicated on-site sodium hypochlorite generation systems that have been developed for application at water treatment plants that generate higher concentrations using less relative energy and less reactant chemicals. The complexity of these systems, particularly related to the system start-up and shut-down process, and the limited industry experience with the systems results in a greater uncertainty related to the reliability and risk of operating the system.

The on-site equipment that could be used by Washington Aqueduct at the Dalecarlia WTP or the McMillan WTP consists of a series of modules containing electrolytic cells that each generate sodium hypochlorite from brine when an electric current is introduced. Providing extra modules allows for redundancy in the event that a cell or module is inoperable. However, in the event of a power outage, emergency generators are needed to provide back-up power for the sodium hypochlorite generators to ensure that disinfectant remains available.

Additional redundancy is available for on-site generation of sodium hypochlorite if a sufficient supply of bulk sodium hypochlorite (at a concentration of 6% or 12%) is stored for power outage events. A sufficient supply might be the amount needed while waiting for additional deliveries of bulk sodium hypochlorite following the onset of a power outage. However, the routine use of a combination of systems adds to operational complexity, particularly when degradation of bulk sodium hypochlorite is considered.

The amount of storage of sodium hypochlorite does not affect the number of deliveries that would be required, which is directly related to the production of safe drinking water. However, for an equivalent amount of disinfectant, the use of sodium hypochlorite generated off-site would increase the frequency of deliveries compared to the current frequency of deliveries by a factor of approximately 5.3. For the generation of sodium hypochlorite on-site, deliveries would increase in frequency compared to the current frequency by a factor of approximately 1.5.

As shown in Table 2.3, the initial capital costs for purchasing and installing on-site generation systems are higher when compared to the cost of storing chemical generated off-site, but annual operating and maintenance costs are typically lower. It is impossible to predict the market value of sodium hypochlorite generated by manufacturers off-site or to predict the market value of the energy and chemicals required for generating sodium hypochlorite on-site, but the annual operating and maintenance costs for on-site generation is expected to continue to be lower. One significant part of the anticipated higher annual cost for off-site manufactured sodium hypochlorite is related to the higher number of deliveries required and the associated cost of transportation.

2.1.2. pH Control Chemicals

Caustic soda is an extremely corrosive chemical, however properly designed structural controls and proper training of personnel can mitigate potential risks associated with handling the chemical. When compared to lime, as used for pH control in drinking water treatment systems, caustic soda provides more flexibility and precision operationally. The use of caustic soda exclusively, or as a trimming step following the use of lime, will allow Washington Aqueduct to reliably achieve the required pH level within the tolerances established by US EPA.

The lime slaker systems in use at the Dalecarlia WTP and the McMillan WTP are operationally and maintenance intensive. The feed line between the slakers and the feed point is cleaned weekly to prevent clogging by a build-up of materials. Since caustic soda is liquid and not fed in a slurry form like lime, caustic soda systems are expected to be less maintenance intensive. However, lime is a much cheaper product than caustic soda, so a comparison of capital, operational and maintenance costs is warranted to determine if exclusive use of caustic soda is preferable to the use of lime and caustic trimming.

The two concentrations of caustic soda that are typically used in bulk applications for the water treatment industry are 25% and 50%. Unlike 25% caustic soda, the viscosity of 50% caustic soda increases rapidly at temperatures below 16° C, potentially causing problems with feeding the chemical at temperatures that may be expected quite frequently. Although twice the storage volume and twice the deliveries are required, it is advisable that 25% caustic soda is stored in order to ensure the system is reliable.

Concentrated sulfuric acid could be used to depress pH as necessary in accordance with US EPA requirements for corrosion control. Additionally, acid might potentially be needed to depress pH in the future if polyaluminum chloride were to be used as a coagulant for the Dalecarlia WTP or the McMillan WTP. A bench-scale evaluation of polyaluminum chloride at different pH levels did not suggest an optimal pH level for coagulation in the interest of water quality, however further evaluation is warranted. This evaluation of polyaluminum chloride will be continued in a separate project, and the continuation of the analysis of acid requirements will accompany that evaluation. However, due to a periodic increase expected in pH of the water entering the McMillan WTP, it was determined that a small amount of acid would be needed under certain conditions to achieve the required pH for corrosion control following a potential transition to using sodium hypochlorite. Acid was determined to not be needed at the Dalecarlia WTP following a potential transition to using sodium hypochlorite.

2.2. Range of Alternatives

The range of alternatives is systematically tabulated for the McMillan WTP (Table 2-1) and the Dalecarlia WTP (Table 2-2), including the proposed action and the no-action alternatives. The tables present the corresponding size of the needed storage requirements, whether any new structures are required, the average and maximum expected number of deliveries required for disinfection and pH control related chemicals. The estimated capital cost and the estimated present worth of 20 years of operation and maintenance costs for combinations of alternatives are presented in Table 2-3.

The budgeted amount for capital construction is $13 million. Three combinations of alternatives are estimated to cost within the budgeted amount; these combinations essentially involving the minimum requirement for storage of bulk sodium hypochlorite at both the Dalecarlia WTP and the McMillan WTP, and the use of only caustic soda at the McMillan WTP and the use of both lime and caustic soda at the Dalecarlia WTP. The least expensive combination of alternatives in terms of life cycle costs involves on-site generation of sodium hypochlorite at both water treatment plants.

There are several apparent advantages to the implementation of on-site sodium hypochlorite generation, despite the higher initial capital cost. The life cycle costs are estimated to be lower for on-site generation of sodium hypochlorite when compared to other alternatives. Due to the very low concentration of sodium hypochlorite produced with on-site equipment (0.8%), and the nearly immediate use of sodium hypochlorite due to the low concentration, there is negligible degradation and essentially no formation of chlorite. Additionally, there are many fewer deliveries required with the on-site generation alternatives when compared to alternatives using bulk sodium hypochlorite. The chemical needed for on-site generation, sodium chloride, is much less hazardous than bulk sodium hypochlorite.

There are some complications associated with on-site generation. The technology has been used for many years in the drinking water treatment industry, but there are no other surface water treatment plants the same size as the Dalecarlia WTP and the McMillan WTP that are known to use the technology. No other water treatment plants using water from the Potomac River are known to use on-site sodium hypochlorite generation technology. Therefore, there is some uncertainty associated with the reliability and performance of on-site generation equipment for the Washington Aqueduct. These issues, however, can be studied and the effectiveness and expected reliability of on-site sodium hypochlorite generation equipment can be better understood.

There are a limited number of manufacturers of on-site sodium hypochlorite generation equipment. These manufacturers have varying levels of experience. For procurement of equipment by the government under the Federal Acquisition Regulation, generally competition is required. If on-site sodium hypochlorite generation were selected to be implemented by the Washington Aqueduct, selection of a manufacturer would be complicated and might possibly require authorization of sole source selection, depending on criteria that could be determined to be essential by Washington Aqueduct – that is, not all of the manufacturers may necessarily provide a product that would meet minimum criteria necessary to ensure high water quality and reliability. Certainly following selection of a particular manufacturer's equipment, replacement parts and repairs would be necessarily be from the selected manufacturer because parts are not interchangeable between different manufacturer systems. It is therefore possible that some of the anticipated savings associated with on-site sodium hypochlorite generation may not be evidenced due to the "captive customer" dilemma where a manufacturer boosts the cost of replacement parts because there is no alternative source available.

Dependence on electricity necessitates the installation and maintenance of emergency generators. Also, in the event that the on-site generation system was to completely fail, at best storage would provide sodium hypochlorite for only approximately one day. It is possible to construct a system that could store sodium hypochlorite at either 0.8% or at different concentrations such as 12%. In the event of an emergency, bulk sodium hypochlorite could be purchased and delivered to be used in lieu of the on-site generated sodium hypochlorite. This would require a contracting mechanism that could be exercised immediately upon identification of the emergency condition. If such a condition were to be recognized outside of normal business hours, it may take 12 hours or more to make an order for sodium hypochlorite. Depending on the ability of the bulk sodium hypochlorite vendor to provide their product on demand, it might take 2-3 days or more to make the delivery. During this time, sodium hypochlorite must be available in order to ensure that the Washington Aqueduct could meet its fundamental objective to provide sufficient quantities of high quality drinking water to customers. Two options to ensure the ability to disinfect the drinking water under this scenario are: to provide sufficient storage space for at least four days at 0.8%; or to provide a dual system with three days storage of bulk sodium hypochlorite at all times in addition to the on-site sodium hypochlorite generation equipment and corresponding storage. Under the former option, initial capital costs and storage facilities would dramatically increase. Under the latter option, initial capital costs would increase somewhat, operational complexity would increase significantly, and life cycle savings would decrease.

Due to the similarity between storage facilities for bulk sodium hypochlorite and for sodium hypochlorite generated on-site, it is possible to take a phased approach at implementation. It is possible to design and construct bulk sodium hypochlorite storage and feed facilities in a way that would allow for and facilitate future installation of on-site generation equipment. This approach would eliminate the risks associated with the use of liquid chlorine in the short-term, while allowing for additional time to study the possible ramification of implementation of on-site sodium hypochlorite generation. There is not an expected significant loss in value for taking this approach in the event that on-site sodium hypochlorite generation were to be determined to be infeasible operationally in the future.

2.3. Preferred Alternative

Based on consideration of the feasibility, the cost, and the potential impacts associated with the alternatives considered, the preferred alternative includes the following features:

- Design, construction and operation of bulk sodium hypochlorite storage and feed systems at both the Dalecarlia WTP and the McMillan WTP, with consideration for facilitating the possible installation of on-site sodium hypochlorite generation equipment in the future.
- Continued study and future consideration of on-site sodium hypochlorite generation systems for the Dalecarlia WTP and the McMillan WTP.
- Design, construction, and operation of a caustic soda storage and feed system in order to trim pH following pH adjustment with lime at the Dalecarlia WTP.
- Design, construction, and operation of caustic soda and sulfuric acid storage and feed systems for the control of pH at the McMillan WTP.
- Construction of a new structure adjacent to an existing storage building at the Dalecarlia WTP (see Figure 2-1 for representation of new structure in the context of the existing storage building).
- No new structures at the McMillan WTP.

This alternative was identified as preferred because:

- The cost estimate meets the initial $13 million capital construction budget.
- The conversion of the disinfection systems to using aqueous sodium hypochlorite will not be delayed while on-site generation is studied further to investigate the uncertainties associated with operating such a system with the specific conditions experienced at the Washington Aqueduct water treatment plants.

- The control of pH can be achieved in accordance with US EPA requirements.
- There are no anticipated significant impacts associated with any aspect of the preferred set of alternatives (see Section 4).

The preferred alternative is also the environmentally preferred alternative because there is certainty in taking a phased approach as it allows for the immediate conversion from the use of liquid chlorine while allowing for possible future reduction in deliveries and transportation of bulk sodium hypochlorite without a significant waste of capital investment. In addition, with the preferred alternative the construction of new buildings is avoided at the McMillan WTP while minimized at the Dalecarlia WTP.

Table 2-1 Features associated with alternatives for disinfection and pH control at the McMillan WTP

Option	New Storage Requirements	New Structure	Average Monthly Deliveries
No-Action (Liquid Chlorine)	0	No	4
12% Sodium Hypochlorite	Minimum 78,000-GAL	No	21
6% Sodium Hypochlorite	Minimum 124,000-GAL	No (Storage<140,000-GAL) Yes (Storage>140,000-GAL)	21
On-Site Sodium Hypochlorite Generation, 0.8% Storage	Minimum 109,200-GAL	No (Storage<140,000-GAL) Yes (Storage>140,000-GAL)	6
No-Action (Lime)	0	No	3
Caustic Soda, Sulfuric Acid	21,000-GAL (Caustic Soda) 3,000-GAL (Sulfuric Acid)	No	3

Table 2-2 Features associated with alternatives for disinfection and pH control at the Dalecarlia WTP

Option	New Storage Requirements	New Structure Needed?	Average Monthly Deliveries
No-Action (Liquid Chlorine)	0	No	7
12% Sodium Hypochlorite	Minimum 140,000-GAL	Yes	37
6% Sodium Hypochlorite	Minimum 240,000-GAL	Yes	37
On-Site Sodium Hypochlorite Generation, 0.8% Storage	Minimum 180,000-GAL	Yes	10
No-Action (Lime)	0	No	7
Lime/Caustic Soda Trimming	47,000-GAL (Caustic Soda)	No	8
Full Caustic Soda	106,200-GAL	No	14

Table 2-3 Matrix of estimated capital costs (and estimated present value costs considering estimated present worth of annual operational and maintenance costs over 20 years with present value replacement of some equipment) for possible combinations of alternatives satisfying the proposed action objective. Values are presented in millions of dollars (present value costs shown in parenthesis).

		Dalecarlia WTP													
		7 Sodium Hypochlorite Tanks	8 Sodium Hypochlorite Tanks	9 Sodium Hypochlorite Tanks	10 Sodium Hypochlorite Tanks	11 Sodium Hypochlorite Tanks	12 Sodium Hypochlorite Tanks	On-Site Sodium Hypochlorite Generation	7 Sodium Hypochlorite Tanks	8 Sodium Hypochlorite Tanks	9 Sodium Hypochlorite Tanks	10 Sodium Hypochlorite Tanks	11 Sodium Hypochlorite Tanks	12 Sodium Hypochlorite Tanks	On-Site Sodium Hypochlorite Generation
		Caustic Trim	Caustic Trim	Caustic Trim	Caustic Trim	Caustic Trim	Caustic Trim	Caustic Trim	Full Caustic	Full Caustic	Full Caustic	Full Caustic	Full Caustic	Full Caustic	Full Caustic
McMillan WTP	5 Sodium Hypochlorite Tanks, Full Caustic	$12.8 ($57)	$13.0 ($57.2)	$13.3 ($57.5)	$13.6 ($57.8)	$13.8 ($58)	$14.1 ($58.3)	$23.8 ($53.4)	$13.7 ($59.2)	$13.9 ($59.4)	$14.2 ($59.7)	$14.5 ($60)	$14.7 ($60.2)	$15.0 ($60.5)	$24.7 ($55.6)
	6 Sodium Hypochlorite Tanks, Full Caustic	$13.0 ($57.2)	$13.2 ($57.4)	$13.5 ($57.7)	$13.8 ($58)	$14.0 ($58.2)	$14.3 ($58.5)	$24.0 ($53.6)	$13.9 ($59.4)	$14.1 ($59.6)	$14.4 ($59.9)	$14.7 ($60.2)	$14.9 ($60.4)	$15.2 ($60.7)	$24.9 ($55.8)
	7 Sodium Hypochlorite Tanks, Full Caustic	$13.3 ($57.5)	$13.5 ($57.7)	$13.8 ($58)	$14.1 ($58.3)	$14.3 ($58.5)	$14.6 ($58.8)	$24.3 ($53.9)	$14.2 ($59.7)	$14.4 ($59.9)	$14.7 ($60.2)	$15.0 ($60.5)	$15.2 ($60.7)	$15.5 ($61)	$25.2 ($56.1)
	8 Sodium Hypochlorite Tanks, Full Caustic	$13.6 ($57.8)	$13.8 ($58)	$14.1 ($58.3)	$14.4 ($58.6)	$14.6 ($58.8)	$14.9 ($59.1)	$24.6 ($54.2)	$14.5 ($60)	$14.7 ($60.2)	$15.0 ($60.5)	$15.3 ($60.8)	$15.5 ($61)	$15.8 ($61.3)	$25.5 ($56.4)
	9 Sodium Hypochlorite Tanks, Full Caustic	$13.8 ($58)	$14.0 ($58.2)	$14.3 ($58.5)	$14.6 ($58.8)	$14.8 ($59)	$15.1 ($59.3)	$24.8 ($54.4)	$14.7 ($60.2)	$14.9 ($60.4)	$15.2 ($60.7)	$15.5 ($61)	$15.7 ($61.2)	$16.0 ($61.5)	$25.7 ($56.6)
	On-Site Sodium Hypochlorite Generation, Full Caustic	$19.5 ($55.6)	$19.7 ($55.8)	$20 ($56.1)	$20.3 ($56.4)	$20.5 ($56.6)	$20.8 ($56.9)	$30.5 ($52)	$20.4 ($57.8)	$20.6 ($58)	$20.9 ($58.3)	$21.2 ($58.6)	$21.4 ($58.8)	$21.7 ($59.1)	$31.4 ($54.2)

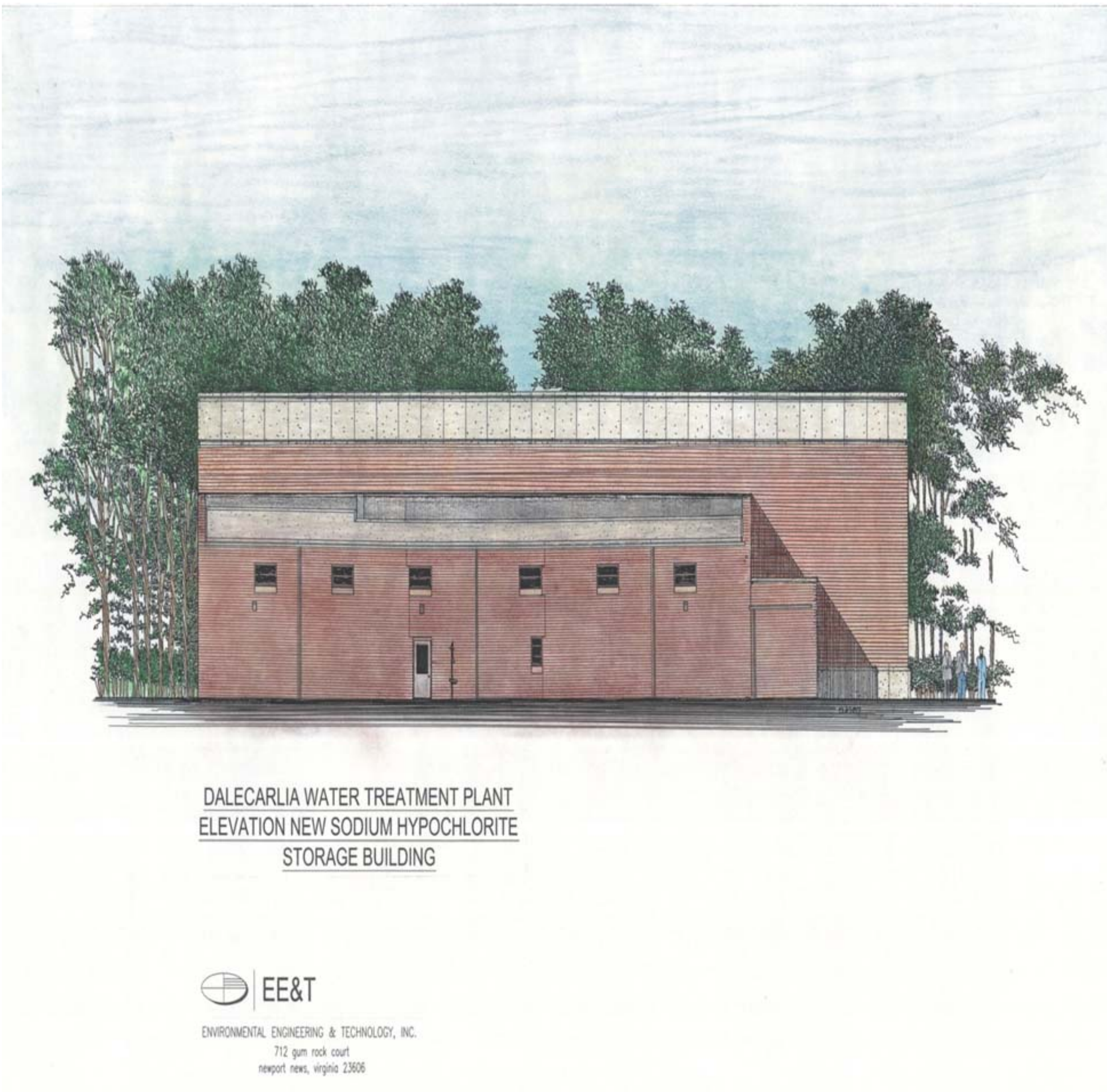

Figure 2-1 Representation of a possible new structure for bulk sodium hypochlorite storage at the Dalecarlia WTP, from the perspective of the Capital Crescent Trail. The structure in the foreground is existing; the proposed structure is in the background. The preferred alternative includes a proposal for a new structure with the same height as the one shown in this representation, but with a smaller footprint adjacent to the existing structure.

3. Affected Environment

The existing condition and the environmental and socioeconomic context of the two facilities that will be potentially affected by the proposed action are succinctly described in this section. The two potentially affected facilities are the McMillan WTP and the Dalecarlia WTP. The particular aspects of the environmental and socioeconomic context of these facilities that are reviewed in this section are:

- Land use
- Geology and Soils
- Topography and Drainage
- Climate
- Air Quality
- Water Resources
  - Surface Water
  - Floodplains
  - Groundwater
  - Wild and Scenic Rivers
- Biological Resources
  - Aquatic Resources
  - Wetlands
  - Vegetation
  - Wildlife Resources
  - Rare, Threatened, or Endangered Species
- Cultural Resources
- Hazardous, Toxic, and Radioactive Substances
  - Contaminated Sites
  - Hazardous Material Use, Handling, and Storage and Hazardous Substance Generation
  - Storage Tanks
  - Toxic Contaminants (PCBs, Asbestos-Containing Material, Lead-Based Paint)
- Infrastructure
  - Traffic, Roadways and Transportation System
  - Potable Water
  - Sanitary Sewer/Wastewater
  - Stormwater Systems
  - Solid Waste Management
  - Utilities
- Socioeconomic
  - Demographics and Environmental Justice
  - Economics
  - Schools, Recreational Facilities and Children's Safety
  - Noise
  - Visual and Aesthetic Value

The original components of the Washington Aqueduct system were constructed in the 1850s and water was first provided to parts of the District of Columbia in 1859. The original system provided an abundant albeit untreated supply of water. The McMillan WTP was constructed and began operation in 1905. The new filtration system consisted of 29 slow sand filters and provided a much higher quality of water than what was available previously. The Dalecarlia WTP was constructed and began operation in 1928 in order to increase the supply of treated water to accommodate the dramatically increasing population in the District of Columbia, and also to provide water to Arlington County, Virginia.

The Washington Aqueduct was among the first water treatment systems in the United States to operate a disinfection step in the treatment process with the addition of chlorine, which was initiated in 1923 at the McMillan WTP[1]. Disinfection using chlorine has become a fundamental standard within the entire water treatment industry. The addition of lime coincided with the start of chlorination in order to raise the pH of treated water following chlorination.

The contemporary mission of the Washington Aqueduct, including both the McMillan WTP and the Dalecarlia WTP, is to reliably and cost-effectively provide a sufficient supply of safe drinking water as required by its customers.

3.1. McMillan WTP

The McMillan WTP is located in the District of Columbia on 24 acres, including the McMillan Reservoir, approximately 2 ¼ miles north of the Capitol. The immediate vicinity of the McMillan WTP is urban and includes various residential communities, the Washington Hospital Center, Children's Hospital, Veterans' Hospital, and the campus of Howard University.

3.1.1. Land use

The exclusive use of the McMillan WTP is toward meeting the mission of the Washington Aqueduct, namely to reliably and cost-effectively provide a sufficient supply of safe drinking water as required by its customers, as indicated in the Master Plan[2]. In accordance with the Master Plan, the filtration and chemical storage facilities were modernized in the 1980s and 29 acres of property containing some of the original slow sand filters were transferred to the District of Columbia Government following the modernization.

Currently, the McMillan WTP site consists of: the McMillan Reservoir; various operational, maintenance and administrative facilities; roadways and parking for staff; landscaped open areas; and various unused structures including some of the original slow-sand filters. Originally the McMillan Reservoir was a recreational facility open to the public with landscaped features as designed by Frederick Law Olmsted, Jr., but the reservoir is not currently open to the public.

The number of employees is listed in the Master Plan as ranging from 35 to 175. However, currently only 26 Washington Aqueduct employees work at the McMillan WTP.

Other than the proposed action, there are no potential plans for development or major modifications of the treatment process at the McMillan WTP. However, a study is under development regarding the conceptual feasibility of constructing sedimentation facilities at the McMillan WTP. The potential benefit, need and feasibility of such a project are unclear at this time.

3.1.2. Geology and Soils

A thorough description of the geology and soils present in the vicinity of the McMillan WTP is contained in the Environmental Baseline Report for the Dalecarlia, Georgetown and McMillan Reservoirs (1994).

The McMillan WTP is within the transition between the Piedmont Plateau and the Atlantic Coastal Plain. The underlying formations at McMillan are the Potomac Group (gravel, sand and arkose with occasional sandy clay lenses overlying crystalline rocks) and artificial fill. The dominant soil types observed at the McMillan WTP is Udorthents and a small strip of Chillum-Urban Land Complex. The observed soils have been disturbed or altered by grading.

The U.S. Natural Resources Conservation Service determined that the McMillan WTP is not located on prime or unique farmland.[3]

3.1.3. Topography and Drainage

The McMillan WTP site is fairly level; elevations range on the property between 150 to 180 feet above mean sea level. The drainage on the property discharges to either the District of Columbia storm sewer system, or to the McMillan Reservoir. The storm drainage system in the vicinity of McMillan consists of combined sanitary/storm sewers.

3.1.4. Climate

The average annual precipitation for the District of Columbia (at Reagan National Airport) is 39 inches and the average temperatures for the spring, summer, autumn and winter are 56°F, 77°F, 59°F, and 38°F respectively[4]. The area experiences thunderstorms approximately 30 days per year. The annual average relative humidity is 53 percent during mid-afternoon and 74 percent at sunrise. The average wind speed is 9.4 miles per hour prevailing from the south.

3.1.5. Air Quality

Analysis of the existing emissions of select pollutants from the Washington Aqueduct can be found in the Air Quality Memorandum in the Appendix.

Based on the US EPA regulations derived from the Clean Air Act, the District of Columbia is in nonattainment with the National Ambient Air Quality Standards (NAAQS) for fine particulate matter (PM2.5) and for ozone. The area was determined according to the NAAQS regulations to be a moderate maintenance area for 8-hour ozone concentrations and a severe non-attainment area for one-hour ozone concentrations. In effect, the strictest designation establishes 25 tons/year as a *de minimis* threshold for both the emission of volatile organic compounds and nitrogen oxide compounds. Currently, based on an analysis and inventory of various emission sources at the McMillan WTP, the emission of the regulated compounds is much less than the *de minimis* threshold. No *de minimis* threshold has been established for fine particulate matter, however a *de minimis* threshold of 100 tons/year was recommended by EPA for determining conformity for non-attainment areas.[5]

The area is in attainment with the NAAQS for other pollutants including for lead, carbon monoxide, nitrogen dioxide, and sulfur dioxide. For each of these pollutants, the *de minimis* threshold was established as 100 tons/year, and emissions from the McMillan WTP are much lower than the applicable thresholds.

3.1.6. Water Resources

The McMillan WTP site includes the McMillan Reservoir, which is a component of the drinking water treatment system. The McMillan Reservoir receives the majority of water from the Potomac River via various Washington Aqueduct conduits, the Dalecarlia Reservoir, and the Georgetown Reservoir.

3.1.6.1. Surface Water

There are no surface water resources on the site of the McMillan Reservoir. Precipitation falling on the site drains to either the District of Columbia storm sewer system, or to the McMillan Reservoir.

3.1.6.2. Floodplains

Due to the lack of presence of any surface water resources, there are no floodplains on the site of the McMillan WTP. The volume of water in and the staging of the McMillan Reservoir are controlled by the

Washington Aqueduct and are influenced by the demand for drinking water in the Washington Aqueduct service area.

3.1.6.3. Groundwater

The McMillan Reservoir was constructed on the site of a spring that had been used historically as a water source in the District of Columbia. Some interaction between the groundwater and the McMillan Reservoir would necessarily be expected, but due to the high quality of water in the McMillan Reservoir, no negative influence is expected from this interaction.

3.1.6.4. Wild and Scenic Rivers

There are no wild and scenic rivers in the vicinity of the McMillan WTP.

3.1.7. Biological Resources

The source of information in this section is from the Final Environmental Baseline Report for the Dalecarlia, Georgetown, and McMillan Reservoirs (1994), and the Biological Memorandum in the Appendix.

3.1.7.1. Aquatic Resources

The extent of observed aquatic resource on the site of the McMillan WTP is within the McMillan Reservoir and consists of submerged aquatic vegetation. Although no survey of the submerged aquatic vegetation has been completed, it is likely that species include hydrilla (*Hydrilla verticilatta*) and water star grass (*Heteranthera dubia*).

3.1.7.2. Wetlands

There are no jurisdictional wetlands located at the McMillan WTP.

3.1.7.3. Vegetation

Vegetation at the McMillan WTP is landscaped and includes: grasses, arrowwood (V*iburnm sp.*), walnut (*Juglans sp.*), dogwood (C*ornus kousa*), spruce (*Picea sp.*), pine (*Pinus sp.*), oak (*Quecus sp.*), Eastern cedar (*Juniperus virginiana*), wild cherry (*Prunus serotina*), locust trees (*Robinia sp.*), mulberry (*Morus sp.*), American holly (*Ilex opaca*), maple (*Acer sp.*), ash (*Fraxinus sp.*), American hophornbeam (*Ostrya virginiana*), and elm (*Ulmus sp.*).

3.1.7.4. Wildlife Resources

The area within and surround the McMillan WTP site is highly developed and urban in character. The types of species normally observed are typical of this type of environment. Typical species in this type of environment include voles (*Microtus sp.*), muskrat (*Ondatra zibethicus*), opossum (*Dedelphis virginiana*), feral cat (*Felis domesticus*), eastern cottontail (*Sylvilagus floridanus*), house mouse (*Mus musculus*), Norway rat (*Rattus norvegicus*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), groundhog (*Marmota monax*), grey squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), eastern chipmunk (*Tamias striatus*), least shrew (*Cryptotis parva*), southeastern shrew (*Sorex longirostris*), star-nosed mole (*Condylura cristata*), and eastern mole (*Scalopus aquaticus*). Avian species typically found in this type of environment include: American robin, catbird, mockingbird, Carolina chickadee, Carolina wren, house wren, downy woodpecker, common flicker, European starling, house sparrows, rock dove, mourning dove, and song sparrows. Due to the presence of the McMillan Reservoir, waterfowl that may be expected in this urban environment include herring gulls, laughing gulls, ring-billed gulls, wood ducks and mallards. There is also a population of resident Canadian geese that do not migrate from the McMillan WTP site.

During a recent visit to the project site, only common types of birds were observed in the vicinity of the project area. The birds observed included European starlings, Canadian geese, several species of gulls, and shorebirds (possibly killdeers, *Charadrius vociferous*).

3.1.7.5. Rare, Threatened, or Endangered Species

There are no listed rare, threatened, or endangered species or critical habitats that have been observed in the vicinity of the McMillan WTP.

3.1.8. Cultural Resources

Several facilities within the McMillan WTP are eligible to be registered on the National Register of Historic Places and are included in the National Register Washington Aqueduct Historic District, however not all of the facilities have historic significance or are part of the Historic District. Any new structures that could potentially be constructed at the McMillan WTP must be evaluated within the context of adjacent historical structures. Structural changes or renovation of historic buildings must be performed within the context of federal standards under consultation with the District of Columbia State Historic Preservation Office. Impacts to viewsheds of historic buildings would be considered adverse, and should be avoided.

The slow sand filter structures, eligible for listing on the National Register of Historic Places, are under consideration for use in housing storage equipment. Any construction affecting the slow sand filter structure should be done in accordance with the Washington Aqueduct Cultural Resource Management Plan (1998) and the current *Secretary of the Interior Standards for the Treatment of Historic Properties*, in order to protect the historic integrity of the structures.

3.1.9. Hazardous, Toxic, and Radioactive Substances

3.1.9.1. Contaminated Sites

There are no known contaminated sites at the McMillan WTP.

3.1.9.2. Hazardous Material Use, Handling, and Storage and Hazardous Substance Generation

Hazardous materials are used as part of the operation and maintenance of the McMillan WTP. Bulk quantities of hazardous materials stored at the McMillan WTP are reported annually to the US EPA, the District of Columbia Emergency Management Administration (serving as the State Emergency Planning Commission and the Local Emergency Planning Commission), and to the District of Columbia Department of Fire and Emergency Medical Services. All necessary Toxic Release Inventory reports for the McMillan WTP are submitted annually to US EPA and to the District of Columbia Department of the Environment (formerly to the District of Columbia Department of Health).

The hazardous materials that are used in bulk at the McMillan WTP include: chlorine, aqua ammonia, lime, phosphoric acid, polyaluminum chloride, cationic polymer, #2 heating oil, diesel fuel and sodium permanganate.

Liquid chlorine is an extremely hazardous chemical that has the potential to cause significant off-site consequences in the event of a release. One of the objectives of the proposed action is to eliminate the potential for off-site consequences that could be caused by an uncontrolled release of liquid chlorine. Currently, engineering and management controls are used to minimize the potential for such an event to occur.

The McMillan WTP is not a generator of hazardous waste, except for universal wastes such as batteries and florescent light bulbs, which are recycled. Hazardous materials are either completely utilized at the McMillan WTP or are transferred to the Dalecarlia WTP for use.

3.1.9.3. Storage Tanks

The McMillan WTP has storage tanks for #2 heating oil and for diesel fuel, but the tanks that store these materials are not within the potential project area.

3.1.9.4. Toxic Contaminants (PCB Management, Asbestos-Containing Material, Lead-Based Paint)

Due to the age of facilities at the McMillan WTP, toxic materials were used such as asbestos-containing materials, lead-based paint and PCBs. Equipment containing PCBs has been replaced at the McMillan WTP. Lead-based paint and asbestos-containing materials exist within older structures, and these materials are properly managed. The proposed action would largely impact only newer facilities that do not have lead-based paint or asbestos-containing materials, but any construction in facilities with those materials would be required to be done in accordance with all applicable regulations.

3.1.10. Infrastructure

3.1.10.1. Traffic, Roadways and Transportation System

Analysis of the traffic, roadways and transportation system in the vicinity of the McMillan WTP is in the Transportation Letter by O.R. George & Associates in the Appendix.

The McMillan WTP is accessible from First Street, NW, which is a collector roadway according to the District Columbia Functional Classification. Other area roadways include Michigan Avenue, North Capitol Street and Irving Street. All intersections in the vicinity of the McMillan WTP operate at acceptable levels of service during morning and afternoon peak hours. There are no posted restrictions to truck traffic on the aforementioned roadways in the vicinity of the McMillan WTP; however the roads are not major truck routes for the District of Columbia. Georgia Avenue is also in the proximity of the McMillan WTP. Trucks currently represent approximately 17% of traffic on Georgia Avenue.

3.1.10.2. Potable Water

The McMillan WTP produces potable water for its own operational requirements.

3.1.10.3. Sanitary Sewer/Wastewater and Stormwater Systems

The District of Columbia Water and Sewer Authority manages the combine stormwater/sanitary sewer system that collects both storm drainage and sanitary waste from the McMillan WTP.

3.1.10.4. Solid Waste Management

Solid waste collection and disposal services are contracted by Washington Aqueduct to private contractors.

3.1.10.5. Utilities

Electricity is provided to the McMillan WTP by the Potomac Electric Power Company. The McMillan WTP uses approximately 16-17 million kilowatt-hours of electricity annually. Heating oil is used for boilers at the McMillan WTP, and is purchased as needed. Annually, approximately 20,000 gallons of heating oil are used at the McMillan WTP. Natural gas is not used at the McMillan WTP.

3.1.11. Socioeconomic

An analysis of the socioeconomic conditions within one mile of the project area at the McMillan WTP can be found in the Socioeconomic Memorandum in the Appendix. The information in the Socioeconomic Memorandum is derived from various sources including the 2000 United States Census.

3.1.11.1. Demographics and Environmental Justice

The population living within one mile of the project area at the McMillan WTP includes 79.9 percent Black or African American individuals, which is a minority group according to Council of Environmental Quality guidance. In addition, the poverty rate in the same area is 23.7 percent. The presence of these demographic groups has significance with respect to Environmental Justice as defined in Executive Order 12898.

3.1.11.2. Economics

The regional economy is largely influenced by federal spending, which in 2002 was approximately $87.5 billion. In addition, in 2002 construction spending was approximately $1.65 billion.

3.1.11.3. Schools, Recreational Facilities, and Children's Safety

There is a wide variety of schools, universities and colleges, parks and other recreation areas, and hospitals within one mile proximity of the project area at the McMillan WTP. A list of these facilities can be found in the Socioeconomic Memorandum in the Appendix. There are children that reside within one mile radius of the project area, and due to the presence of schools and recreational facilities, children are expected to be within the project area that might not be residents.

3.1.11.4. Noise

Currently operational and maintenance sounds can be observed at the McMillan WTP. Most operational and maintenance activity generating sound occurs during daylight hours. Some sound is observable from the offloading of certain chemicals, such as lime. Movement of vehicles and equipment generates sound as well. These types of sounds are similar to sounds heard from other activities expected in urban/suburban areas, such as from the movement of vehicular traffic on surrounding roads.

3.1.11.5. Visual and Aesthetic Value

Different views of the McMillan WTP have some aesthetic value in several ways. Although the McMillan WTP is an industrial facility, the presence of the McMillan Reservoir and adjacent landscaped areas, as well as the architectural qualities of the historic and contemporary structures on the campus may be considered pleasant from different perspectives. The McMillan WTP is visible in the immediate vicinity from points within the adjacent hospital complexes, from the roadways surrounding the facility, from Howard University, and from residential areas near the facility.

The United States Commission of Fine Arts and the District of Columbia State Historic Preservation Office are consulted regarding all projects involving construction of new facilities to consider potential impacts to the aesthetics of the McMillan WTP campus.

3.2. Dalecarlia WTP

The Dalecarlia WTP is located on 277 acres in two noncontiguous areas, separated by MacArthur Boulevard, include: the Dalecarlia Reservoir and some adjacent undeveloped land; and the Dalecarlia WTP site proper. These two sites are both on the border of the District of Columbia and Montgomery County, Maryland, east of the C&O Canal National Historic Park and the Potomac River. The immediate vicinity of these sites is urban and includes various residential communities, offices of another federal agency, a few commercial enterprises, land within the National Parks system, the Capital Crescent Trail, and Sibley Memorial Hospital.

This project includes consideration of possible modification to structures or construction of new structures in the Dalecarlia WTP area, but not the Dalecarlia Reservoir area. Discussion of the existing environmental conditions will be limited to the Dalecarlia WTP area, however off-site activities related to the Dalecarlia Reservoir area that have a potential to cause cumulative impacts will be discussed.

3.2.1. Land use

The use of the Dalecarlia WTP area is exclusively toward meeting the mission of the Washington Aqueduct, namely to reliably and cost-effectively provide a sufficient supply of safe drinking water as required by its customers, as indicated in the Master Plan[6]. The Dalecarlia WTP area consists of five different categories of use: water treatment facilities; administration; service and storage; permanent open space; and housing. There are roadways and parking within these designated areas. The housing function has been eliminated, as approved by the National Capital Planning Commission, but the designation in the Master Plan remains at this time. The Dalecarlia WTP is not openly accessible to the public.

The number of employees is listed in the Master Plan at the Dalecarlia WTP is 230. However, currently only 170 Washington Aqueduct employees work at the Dalecarlia WTP.

Other than the proposed action, there are no potential plans for development outside of existing structures in the Dalecarlia WTP area, except for plans for a new small pumping station adjacent to the sedimentation basins as part of the water treatment residuals management project. This project, which is currently under design, will also involve modification of the sedimentation basins and construction or modification of underground utility lines in the Dalecarlia WTP area.

3.2.2. Geology and Soils

A thorough description of the geology and soils present in the vicinity of the Dalecarlia WTP is contained in the Final Environmental Impact Statement for a Proposed Water Treatment Residuals Management Process for the Washington Aqueduct (2005).

The Dalecarlia WTP is within the transition between the Piedmont Plateau and the Atlantic Coastal Plain. The underlying formations in the area are the Wissahickon Formation of the Glenarm Series (medium to course crystalline, layered to massive, jointed quartz-feldsparbiotite gneiss with scattered quartz pods and schist and amphibolite cobbles overlain by sandy reddish-brown, well drained saprolite) and artificial fill. The dominant soil types observed at the Dalecarlia WTP are Glenelg-Manor-Chester and Manor-Glenelg.

The U.S. Natural Resources Conservation Service determined that the Dalecarlia WTP is not located on prime or unique farmland.[7]

3.2.3. Topography and Drainage

The Dalecarlia WTP site is fairly level; elevations range on the property between 140 to 150 feet above mean sea level. The drainage on the property discharges to either the District of Columbia storm sewer system, to the Dalecarlia Reservoir (via the plant drain), or to Little Falls Branch in Montgomery County, MD.

3.2.4. Climate

The average annual precipitation for the District of Columbia (at Reagan National Airport) is 39 inches and the average temperatures for the spring, summer, autumn and winter are 56°F, 77°F, 59°F, and 38°F respectively[8]. The area experiences thunderstorms approximately 30 days per year. The annual average relative humidity is 53 percent during mid-afternoon and 74 percent at sunrise. The average wind speed is 9.4 miles per hour prevailing from the south.

3.2.5. Air Quality

Analysis of the existing emissions of select pollutants from the Washington Aqueduct can be found in the Air Quality Memorandum in the Appendix.

Based on the US EPA regulations derived from the Clean Air Act, the District of Columbia and Montgomery County, MD, is in nonattainment status with the National Ambient Air Quality Standards (NAAQS) for fine particulate matter (PM2.5) and for ozone. The area was determined according to the NAAQS regulations to be a moderate maintenance area for 8-hour ozone concentrations and a severe non-attainment area for one-hour ozone concentrations. Based on these designations, in effect, the strictest designation establishes 25 tons/year as a *de minimis* threshold for both the emission of volatile organic compounds and nitrogen oxide compounds. Currently, based on an analysis and inventory of various emission sources at the Dalecarlia WTP, the emission of the regulated compounds is much less than the *de minimis* threshold. No *de minimis* threshold has been established for fine particulate matter, however a *de minimis* threshold of 100 tons/year was recommended by EPA for determining conformity for non-attainment areas.[9]

The District of Columbia and Montgomery County, MD, is in attainment with the NAAQS for other pollutants including for lead, carbon monoxide, nitrogen dioxide, and sulfur dioxide. For each of these pollutants, the *de minimis* threshold was established as 100 tons/year, and emissions from the Dalecarlia WTP are much less than the applicable thresholds.

3.2.6. Water Resources

3.2.6.1. Surface Water

There are no natural surface water resources on the site of the Dalecarlia WTP, but some precipitation drains to Little Falls Branch in Maryland, which is off-site. This nonpoint source stormwater discharge is permitted by the State of Maryland under the National Pollutant Discharge Elimination System. The remaining precipitation falling on the site drains to either the District of Columbia storm sewer system or to the Dalecarlia Reservoir.

3.2.6.2. Floodplains

There are no floodplains on the site of the Dalecarlia WTP in the vicinity of the proposed project area.

3.2.6.3. Groundwater

Groundwater in the vicinity of the Dalecarlia WTP is influenced by the Dalecarlia Reservoir, and is currently being studied by two groups: the United States Geologic Survey in cooperation with the Washington Aqueduct; and also the Spring Valley Cleanup Partnership between the US Army Corps of Engineers, US EPA Region 3, and the District of Columbia. In the proximity of the Dalecarlia WTP, there is an underdrain system beneath the sedimentation basins that collects groundwater and discharges it to the Potomac River. Based on the recent monitoring efforts, groundwater levels are typically much deeper than the elevation of the proposed project area. Perchlorate, a contaminant that is not currently regulated by US EPA or the District of Columbia, has been observed in the groundwater in the vicinity of the Dalecarlia WTP.

3.2.6.4. Wild and Scenic Rivers

There are no wild and scenic rivers in the vicinity of the Dalecarlia WTP.

3.2.7. Biological Resources

The source of information in this section is from the Final Environmental Baseline Report for the Dalecarlia, Georgetown, and McMillan Reservoirs (1994), the Final Environmental Impact Statement for a Proposed Water Treatment Residuals Management Process for the Washington Aqueduct (2005), and the Biological Memorandum in the Appendix.

3.2.7.1. Aquatic Resources

There are no aquatic resources located in the vicinity of the proposed project area at the Dalecarlia WTP.

3.2.7.2. Wetlands

There are no jurisdictional wetlands located at the Dalecarlia WTP.

3.2.7.3. Vegetation

Vegetation at the Dalecarlia WTP is landscaped and includes grasses and a variety of ornamental trees and shrubs planted and maintained in accordance with the approved landscape plan in the Master Plan for the Dalecarlia Reservation.

3.2.7.4. Wildlife Resources

The area within and surround the Dalecarlia WTP site is highly developed and urban in character. The types of species normally observed are typical of this type of environment. Typical species in this type of environment include voles (*Microtus sp.*), muskrat (*Ondatra zibethicus*), opossum (*Dedelphis virginiana*), feral cat (*Felis domesticus*), eastern cottontail (*Sylvilagus floridanus*), house mouse (*Mus musculus*), Norway rat (*Rattus norvegicus*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), groundhog (*Marmota monax*), grey squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), eastern chipmunk (*Tamias striatus*), least shrew (*Cryptotis parva*), southeastern shrew (*Sorex longirostris*), star-nosed mole (*Condylura cristata*), and eastern mole (*Scalopus aquaticus*). Avian species typically found in this type of environment include: American robin, catbird, mockingbird, Carolina chickadee, Carolina wren, house wren, downy woodpecker, common flicker, European starling, house sparrows, rock dove, mourning dove, and song sparrows. Due to the presence of the Dalecarlia WTP sedimentation basins, waterfowl that may be expected in this urban environment include herring gulls, laughing gulls, ring-billed gulls, wood ducks and mallards. There is also a population of resident Canadian geese that do not migrate from the Dalecarlia WTP site.

During a recent site visit to the proposed project area, no wildlife was observed.

3.2.7.5. Rare, Threatened, or Endangered Species

There are no listed rare, threatened, or endangered species or critical habitats that have been observed in the vicinity of the Dalecarlia WTP.

3.2.8. Cultural Resources

Several facilities within the Dalecarlia WTP area are eligible for registration on the National Register of Historic Places and are part of the National Register Washington Aqueduct Historic District, however not all of the facilities have historic significance or are part of the Historic District. Any new structures that could potentially be constructed at the Dalecarlia WTP must be evaluated within the context of adjacent historical structures. Structural changes or renovation of historic buildings must be performed within the context of federal standards under consultation with the District of Columbia State Historic Preservation Office. Impacts to viewsheds of historic buildings would be considered adverse, and should be avoided.

3.2.9. Hazardous, Toxic, and Radioactive Substances

3.2.9.1. Contaminated Sites

There are no known contaminated sites at the Dalecarlia WTP.

3.2.9.2. Hazardous Material Use, Handling, and Storage and Hazardous Substance Generation

Hazardous materials are used as part of the operation and maintenance of the Dalecarlia WTP. Bulk quantities of hazardous materials stored at the Dalecarlia WTP are reported annually to the US EPA, the District of Columbia Emergency Management Administration (serving as the State Emergency Planning Commission and the Local Emergency Planning Commission), to the District of Columbia Department of Fire and Emergency Medical Services, to the Maryland Department of the Environment (coordinates with the State Emergency Planning Commission), the Montgomery County Office of Emergency Management (coordinates with the Local Emergency Planning Commission), and Montgomery County Fire and Rescue. All necessary Toxic Release Inventory reports for the Dalecarlia WTP are submitted annually to US EPA, the Maryland Department of the Environment, and to the District of Columbia Department of the Environment (formerly within the Department of Health).

The hazardous materials that are used in bulk at the Dalecarlia WTP include: chlorine, aqua ammonia, aluminum sulfate, hydrofluorosilicic acid, lime, phosphoric acid, activated carbon, copper sulfate, polyaluminum chloride, sodium hydroxide, cationic polymer, sodium bisulfite, #2 heating oil, diesel fuel, gasoline, and sodium permanganate.

Liquid chlorine is an extremely hazardous chemical that has the potential to cause significant off-site consequences in the event of a release. One of the objectives of the proposed action is to eliminate the potential for off-site consequences that could be caused by an uncontrolled release of liquid chlorine. Currently, engineering and management controls are used to minimize the potential for such an event to occur.

The Dalecarlia WTP is a conditionally exempt generator of hazardous waste in the District of Columbia. The majority of hazardous waste that is generated is derived from the operation of the water quality laboratory. Universal wastes such as batteries and fluorescent light bulbs are also generated at the Dalecarlia WTP.

3.2.9.3. Storage Tanks

The Dalecarlia WTP has storage tanks for #2 heating oil, diesel fuel, and gasoline, but the tanks that store these materials are not within the potential project area.

3.2.9.4. Toxic Contaminants (PCB Management, Asbestos-Containing Material, Lead-Based Paint)

Due to the age of facilities at the Dalecarlia WTP, toxic materials were used such as asbestos-containing materials, lead-based paint and PCBs. Equipment containing PCBs has been replaced at the Dalecarlia WTP. Lead-based paint and asbestos-containing materials exist within older structures, and these materials are properly managed. Any construction in facilities with those materials would be required to be done in accordance with all applicable regulations.

3.2.10. Infrastructure

3.2.10.1. Traffic, Roadways and Transportation System

Analysis of the traffic, roadways and transportation system in the vicinity of the Dalecarlia WTP is in the Transportation Letter by O.R. George & Associates in the Appendix.

The Dalecarlia WTP is accessible from MacArthur Boulevard, NW, in the District of Columbia near the border with Montgomery County, Maryland. Trucks are restricted on MacArthur Boulevard north of the Dalecarlia WTP due to the presence of the Washington Aqueduct raw water conduits below the roadway surface. In the District of Columbia south of the Dalecarlia WTP, MacArthur Boulevard is designated as a major arterial and is recognized as a de facto truck route.

On roadways between the Dalecarlia WTP and I-495, traffic volumes have remained relatively stable or declined in recent years. Most of the intersections in the vicinity of the Dalecarlia WTP currently operate at acceptable levels of service. In the Final Environmental Impact Statement an analysis of potential impacts on area roads due to traffic associated with transporting dewatered water treatment residuals found that there were no significant impacts associated with the expected increase in traffic.

Although there are some National Park roadways in the vicinity of the Dalecarlia WTP, commercial traffic is prohibited from these roads, so they were not including among the trucking routes considered in the aforementioned Final Environmental Impact Statement or Transportation Letter.

3.2.10.2. Potable Water

The Dalecarlia WTP produces potable water for its own operational requirements.

3.2.10.3. Sanitary Sewer/Wastewater and Stormwater Systems

The District of Columbia Water and Sewer Authority manages the sanitary sewer system that collects sanitary waste and the storm sewer system that collects drainage from the Dalecarlia WTP. Some stormwater is not drained by the storm sewer system, but rather is discharged to either the Dalecarlia Reservoir or to Little Falls Branch.

3.2.10.4. Solid Waste Management

Solid waste collection and disposal services are contracted by Washington Aqueduct to private contractors.

3.2.10.5. Utilities

Electricity is provided to the Dalecarlia WTP by the Potomac Electric Power Company. The Dalecarlia WTP uses approximately 34-36 million kilowatt-hours of electricity annually. Heating oil and natural gas are both used for heating at the Dalecarlia WTP. Heating oil is purchased as needed and approximately 30,000 gallons are used on average annually at the Dalecarlia WTP. Approximately 110,000 therms of natural gas are supplied to the Dalecarlia WTP annually by Washington Gas.

The new Residuals Processing Facility will increase natural gas and electricity usage by Washington Aqueduct in the vicinity of the Dalecarlia WTP. New electrical feeders and gas lines will provide power and gas to the new facility, so there will be no impact on the existing electrical and gas distribution system at main site of the Dalecarlia WTP from the residuals project.

3.2.11. Socioeconomic

An analysis of the socioeconomic conditions within one mile of the project area at the Dalecarlia WTP can be found in the Socioeconomic Memorandum in the Appendix. The information in the Socioeconomic Memorandum is derived from various sources including the 2000 United States Census.

3.2.11.1. Demographics and Environmental Justice

The population within one mile radius of the project area at the Dalecarlia WTP does not include a significant fraction of minority or economically disadvantaged groups, according to criteria established by the Council on Environmental Quality.

3.2.11.2. Economics

The regional economy is largely influenced by federal spending, which in 2002 was approximately $87.5 billion. In addition, in 2002 construction spending was approximately $1.65 billion.

3.2.11.3. Schools, Recreational Facilities and Children's Safety

There is a wide variety of schools, universities and colleges, parks and other recreation areas, and a hospital within one mile proximity of the project area at the Dalecarlia WTP. A list of these facilities can be found in the Socioeconomic Memorandum in the Appendix. There are children that reside within one mile radius of the project area, and due to the presence of schools and recreational facilities, children are expected to be within the project area that might not be residents.

3.2.11.4. Noise

Currently operational and maintenance sounds can be observed at the Dalecarlia WTP. Most operational and maintenance activity generating sound occurs during daylight hours. Some sound is observable from the offloading of certain chemicals, such as lime. Movement of vehicles and equipment generates sound as well. These types of sounds are similar to sounds heard from other activities expected in urban/suburban areas, such as from the movement of vehicular traffic on surrounding roads.

3.2.11.5. Visual and Aesthetic Value

Different views of the Dalecarlia WTP have some aesthetic value in several ways. Although the Dalecarlia WTP is an industrial facility, the architecture consistent with the historical buildings throughout the campus, landscaping and open spaces may be considered pleasant from different perspectives. The Dalecarlia WTP campus is visible in the immediate vicinity from MacArthur Boulevard, from the Palisades neighborhood to the south, from Sibley Memorial Hospital and the Grand Oaks assisted living facility, and from the Capital Crescent Trail. The campus is also visible, albeit obstructed, from locations beyond the immediate vicinity.

The United States Commission of Fine Arts and the District of Columbia State Historic Preservation Office are consulted regarding all projects involving construction of new facilities to consider potential impacts to the aesthetics of the Dalecarlia WTP campus.

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[1] Ways, Harry C. (1993). The Washington Aqueduct: 1852-1992.
[2] U.S. Army Corps of Engineers, Baltimore District. 1971, revised 1972. Master Plan, McMillan Reservation, Washington Aqueduct Division, U.S. Army Corps of Engineers
[3] U.S. Army Corps of Engineers, Baltimore District. 1997. Final Environmental Assessment, Ammonia Storage, Feed, and Monitoring Facilities, Washington Aqueduct; and U.S. Army Corps of Engineers, Baltimore District. 1994. Environmental Baseline Report, Washington Aqueduct, Dalecarlia, Georgetown, and McMillan Reservoirs.
[4] U.S. Army Corps of Engineers, Baltimore District. 1994. Environmental Baseline Report, Washington Aqueduct, Dalecarlia, Georgetown, and McMillan Reservoirs; and National Oceanic & Atmospheric Administration. February

19, 2007. Reagan National Average Monthly Temperature (since 1871). http://www.erh.noaa.gov/lwx/climate/dca/dcatemps.txt.

[5] Air Force Institute for Environment, Safety and Occupational Health Risk Analysis. 2000. 1999 Air Emissions Inventory for Washington Aqueduct.

[6] U.S. Army Corps of Engineers, Baltimore District. 1971, updated 1983. Master Plan, Dalecarlia Reservation, Washington Aqueduct Division, U.S. Army Corps of Engineers.

[7] U.S. Army Corps of Engineers, Baltimore District. 1997. Final Environmental Assessment, Ammonia Storage, Feed, and Monitoring Facilities, Washington Aqueduct; and U.S. Army Corps of Engineers, Baltimore District. 1994. Environmental Baseline Report, Washington Aqueduct, Dalecarlia, Georgetown, and McMillan Reservoirs.

[8] U.S. Army Corps of Engineers, Baltimore District. 1994. Environmental Baseline Report, Washington Aqueduct, Dalecarlia, Georgetown, and McMillan Reservoirs; and National Oceanic & Atmospheric Administration. February 19, 2007. Reagan National Average Monthly Temperature (since 1871). http://www.erh.noaa.gov/lwx/climate/dca/dcatemps.txt.

[9] Air Force Institute for Environment, Safety and Occupational Health Risk Analysis. 2000. 1999 Air Emissions Inventory for Washington Aqueduct.

4. Environmental Consequences

This section includes discussion of anticipated impacts for the potentially affected environment related to the different resources areas as presented in Section 3.

Although some effects to different resources are anticipated for the alternatives under consideration, upon evaluation none of the effects are anticipated to be significant impacts to the respective affected resource. This section presents the rationale for the determination that there are no significant impacts anticipated to any resource area for any of the alternatives under consideration. However, operational and cost considerations may preclude selection of some of the alternatives, at least in the immediate future, as discussed in Section 2.

Discussion of potential cumulative impacts from other reasonably foreseeable projects is included in this section, where applicable, in the consideration of potential effects on resources.

4.1. McMillan WTP

4.1.1. Land use

All of the alternatives, including the no-action alternative, are involved in the treatment of drinking water, which is the existing land use at the McMillan WTP. Therefore, implementation of any of the alternatives, including the no-action alternatives, will not change the existing land use at the McMillan WTP.

There are no anticipated significant impacts to land use for any of the alternatives under consideration.

4.1.2. Geology and Soils

None of the alternatives will affect the existing geology and soils at the McMillan WTP. Similar to any other project in the District of Columbia, any cut or fill operations or disturbance of soil as part of construction activities would require approval from the District of Columbia Departments of the Environment and of Consumer and Regulatory Affairs.

There are no anticipated significant impacts to site geology or soils for any of the alternatives under consideration.

4.1.3. Topography and Drainage

None of the alternatives will significantly affect existing topography of the site at the McMillan WTP. New construction could marginally affect drainage characteristics for the site. Consideration of stormwater management based on these changes will be required to be submitted to the District of Columbia government for approval, if applicable. Any potential changes that would require new stormwater management controls would be identified and the new controls would be designed to mitigate any potential impacts.

Therefore there are no anticipated significant impacts to topography and drainage for any of the alternatives under consideration.

4.1.4. Climate

There is a potential for feed problems when using 50% caustic soda at low temperatures, so the use of 25% caustic soda is preferable operationally. No other aspects of the alternatives under consideration are expected to be affected by climate, nor are any of the alternatives expected to affect climate.

There are no anticipated significant impacts to climate for any of the alternatives under consideration.

4.1.5. Air Quality

Based on the analysis of potential new emission sources for different alternatives and consideration of current emission sources, as presented in the Air Quality Memorandum in the Appendix, none of the alternatives will cause the total emissions directly from or indirectly associated with the McMillan WTP to exceed the applicable *de minimis* thresholds.

Selection of the no-action alternative will retain the existing improbable risk for off-site consequences in the event of an uncontrolled release of liquid chlorine either at the site of the McMillan WTP or in transport. Selection of any of the other alternatives will eliminate this potential risk. However, due to the measures currently implemented to manage the potential risk associated with liquid chlorine, selection of the no-action alternative is not expected to result in a significant impact to air quality.

There are no anticipated significant impacts to air quality for any of the alternatives under consideration.

4.1.6. Water Resources

4.1.6.1. Surface Water

Since there are no surface water resources in the project area, no significant impacts are anticipated for any of the alternatives under consideration. Discussion of site drainage at the McMillan WTP can be found in Section 4.1.3.

4.1.6.2. Floodplains

Since there are no floodplains in the project area, no significant impacts are anticipated for any of the alternatives under consideration.

4.1.6.3. Groundwater

None of the alternatives are expected to affect groundwater, so no significant impacts are anticipated for any of the alternatives under consideration.

4.1.6.4. Wild and Scenic Rivers

There are no wild and scenic rivers in the vicinity of the proposed project area, so there are no significant impacts to wild and scenic rivers anticipated for any of the alternatives under consideration.

4.1.7. Biological Resources

4.1.7.1. Aquatic Resources

Since there are no aquatic resources in the project area, no significant impacts are anticipated for any of the alternatives under consideration.

4.1.7.2. Wetlands

Since there are no wetlands in the project area, no significant impacts are anticipated for any of the alternatives under consideration.

4.1.7.3. Vegetation

Alternatives involving construction of new facilities will affect an area landscaped with grass at the McMillan WTP. New landscaping consistent with the existing landscaping plan can be incorporated into the design of new structures. No significant impacts on vegetation are anticipated for any of the alternatives, even those including construction of new structures.

4.1.7.4. Wildlife Resources

Since the land use of the McMillan WTP will remain the same regardless of the alternative selected, and since habitat for any of the wildlife resources typically expected to be found in the area will not be significantly affected, there are no significant impacts to wildlife anticipated for any of the alternatives under consideration.

4.1.7.5. Rare, Threatened, or Endangered Species

Since there are no known rare, threatened, or endangered species or critical habitats in the proposed project area, there are no significant impacts related to these categories of species anticipated for any of the alternatives under consideration.

4.1.8. Cultural Resources

The extent of cultural resources known to exist within the project area is the presence of historic structures eligible for listing on the National Register of Historic Places.

Alternatives involving construction of new structures will affect the off-site viewshed of the McMillan WTP. However, the possible location proposed for alternatives requiring a new facility would be adjacent to the contemporary filter building, which is not a cultural resource. In the context of the contemporary structure, there would not be a significant change to the character of the site. The District of Columbia State Historic Preservation Office must be given the opportunity to review any assessment regarding impacts to historic properties, including potential viewshed impacts.

The remaining alternatives involve either no construction (no-action alternative), or construction within existing facilities. The existing chlorine storage building and the chemical building at the McMillan WTP are two contemporary structures that are not eligible to be listed on the National Register of Historic Places. Changes to these contemporary facilities will not result in any impact to cultural resources. The slow sand filters are historic facilities that could be potentially used to house chemical storage equipment. The structural integrity of the slow sand filters is uncertain, so it is unclear if it would be advantageous to utilize the available space within the structures. If the slow sand filters are used, and structural renovations to the slow sand filters are included with the construction of the storage equipment, work must be done in conformance with the Washington Aqueduct Cultural Resource Management Plan (1998) and the current *Secretary of the Interior Standards for the Treatment of Historic Properties*, in order to protect the historic integrity of the structures.

By following applicable standards for renovation of historic properties, and pending concurrence with the District of Columbia State Historic Preservation Office, no significant impacts are anticipated related to cultural resources for any of the alternatives under consideration.

4.1.9. Hazardous, Toxic, and Radioactive Substances

4.1.9.1. Contaminated Sites

Since there are no known contaminated sites in the project area, there are no anticipated significant impacts for any of the alternatives under consideration.

4.1.9.2. Hazardous Material Use, Handling, and Storage and Hazardous Substance Generation

Liquid chlorine is categorized as an extremely hazardous substance by US EPA. Aqueous sodium hypochlorite, while having the same disinfecting characteristics, is a less hazardous chemical for transportation, storage, and handling. Lime is also less hazardous than caustic soda. As the concentration of aqueous sodium hypochlorite or caustic soda decreases, the chemicals are less hazardous – for instance, 0.8% sodium hypochlorite is less hazardous than 6% sodium hypochlorite. However, the hazardous nature of all of these chemicals can be managed through proper engineering and management controls, minimizing or eliminating the potential for impacts.

However, management of less hazardous chemicals is typically easier and more reliable than management of more hazardous chemicals. Use of less hazardous chemicals may therefore be preferable in some situations; however operational requirements may necessitate the use of more hazardous chemicals in other situations.

For the McMillan WTP, the operational requirement for disinfection can be achieved through the use of either liquid chlorine or through the use of aqueous sodium hypochlorite. Therefore, from the perspective of using the least hazardous chemical possible, the storage and use of aqueous sodium hypochlorite at the lowest concentration feasible would be preferable to the use of liquid chlorine. However, at the McMillan WTP the operational requirement for pH control cannot be achieved through the use of lime, so caustic soda is necessary.

With the implementation of any alternative resulting in the use of new bulk chemicals, the existing Washington Aqueduct spill prevention and emergency response planning documentation must be modified appropriately.

All of the chemicals proposed for use in the alternatives under consideration can be managed properly with engineering and management controls to reduce potential risks, therefore no significant impacts are anticipated for any of the alternatives under consideration.

4.1.9.3. Storage Tanks

Since there are no storage tanks in the project area, there is no significant impact anticipated for any of the alternatives under consideration.

4.1.9.4. Toxic Contaminants (PCB Management, Asbestos-Containing Material, Lead-Based Paint

Through proper construction practices, the presence of any asbestos-containing material or lead-based paint can be managed in accordance with applicable regulations, precluding any potential significant impacts. Since there is no known PCB containing equipment in the project area, there are no potential impacts associated with the alternatives under consideration.

There are no significant impacts related to toxic contaminants anticipated for any of the alternatives under consideration.

4.1.10. Infrastructure

4.1.10.1. Traffic, Roadways and Transportation System

The estimated number of deliveries required for different alternatives are listed in Table 2-1. The alternative requiring the fewest number of deliveries is the no-action alternative. The alternatives requiring the largest number of deliveries involve the delivery, storage and use of bulk sodium hypochlorite and the exclusive use of caustic soda for pH control. Based on the existing conditions and consideration of the alternatives with the greatest possible increase in delivery frequency, as indicated in the Transportation Analysis Letter in the Appendix, none of the alternatives are expected to significantly affect the level of service on any of the existing roads that are likely to be used for deliveries.

There are no significant impacts related to traffic, roadways and transportation systems for any of the alternatives under consideration.

4.1.10.2. Potable Water

The available supply of potable water is sufficient for all of the alternatives under consideration, so there are no significant impacts anticipated for any of the alternatives under consideration.

4.1.10.3. Sanitary Sewer/Wastewater

Additional loading on the sanitary sewer system is not anticipated for any of the alternatives under consideration. For alternatives involving water softening systems, disposal of waste materials would be handled through a solid waste disposal contract and not through the sanitary sewer system.

There are no significant impacts anticipated for any of the alternatives under consideration.

4.1.10.4. Stormwater Systems

See the discussion on drainage related in Section 4.1.3.

4.1.10.5. Solid Waste Management

There is not expected to be a significant change in quantities of solid waste requiring disposal between the alternatives under consideration, including the no-action alternative.

There are no significant impacts anticipated for any of the alternatives under consideration

4.1.10.6. Utilities

The use of bulk sodium hypochlorite compared to liquid chlorine is not expected to increase usage of power at the McMillan WTP. The generation of sodium hypochlorite with equipment on-site would increase the total amount of power required for the McMillan WTP by approximately 20%. It is possible that new electrical distribution lines may be necessary, but this can be incorporated into the system design and construction. Heating fuel usage is not expected to increase significantly if existing structures are reused. For alternatives involving a construction of a new facility, heating oil usage would be expected to increase proportionally to the total volume of the building. However, the aforementioned potential increases in energy usage among some of the alternatives are not anticipated to cause a significant impact on the utilities providing the energy services.

There are no significant impacts to utilities anticipated for any of the alternatives under consideration.

4.1.11. Socioeconomic

4.1.11.1. Demographics and Environmental Justice

Through proper engineering and management controls at the McMillan WTP, the risk of a potential uncontrolled release of liquid chlorine has been minimized. However, an improbable risk does exist, particularly with consideration of the potential for an incident associated with liquid chlorine delivery vehicles on or off-site.

Adoption of the proposed action is advantageous to selection of the “no-action” alternative in considering environmental justice due to the presence of minority and economically disadvantaged populations within the community around the McMillan WTP because it would eliminate the existing potential, although improbable, risk.

There are no significant impacts anticipated to the existing demographic groups within the proximity of the proposed project, including minority and economically disadvantaged groups, for any of the alternatives under consideration.

4.1.11.2. Economics

The planned budget for the proposed action is $13 million. Compared to the typical amount of federal spending and the cost of new construction annually in the region of influence, the proposed project budget would cause only a minor positive impact. Selection of the proposed action for implementation, or selection of the status quo “no-action” alternative would not have a significant impact on the economic development.

4.1.11.3. Schools, Recreational Facilities and Children’s Safety

Adoption of the proposed action would be advantageous under the same rationale as presented in Section 4.1.11.1, in the protection of children and in considering the proximity of area schools, hospitals and recreation facilities near the McMillan WTP. However, selection of the “no-action” alternative would not result in a significant impact because the existing engineering and management controls minimize the potential risk and make occurrence of an uncontrolled release of chlorine improbable.

There are no significant impacts anticipated to schools, recreational facilities and to the safety of children for any of the alternatives under consideration.

4.1.11.4. Noise

The emission of additional sound is expected with an increase in deliveries to the McMillan WTP, and is therefore expected with all of the alternatives except the no-action alternative. However, the additional sound expected is consistent with the existing types of sound that can be observed at the McMillan WTP. Noise from the movement of trucks is expected to be incorporated into background noise. The offloading of chemicals can be a more intense source of noise, but proper design of chemical offloading areas is expected to mitigate potential impacts from noise potentially derived from offloading chemicals. Design of chemical offloading areas to mitigate potential impacts from noise has been routinely used in other Washington Aqueduct facilities.

There are no significant impacts from noise anticipated for any of the alternatives under consideration.

4.1.11.5. Visual and Aesthetic Value

For the alternatives involving no construction of new facilities at the McMillan WTP there are no changes to the existing visual and aesthetic value of the vicinity. For the other alternatives, the potential construction of a new facility would occur in a grassed area adjacent to the contemporary filter building. The architectural characteristics of the new structure would be presented to and reviewed by the United States Commission of Fine Arts. It is reasonable to expect that the building would be similar in appearance to the existing contemporary filter building. Although a change in the visual character of the site would occur, the change would be consistent with the existing blend of historic and contemporary structures.

There are no significant impacts to the visual and aesthetic value of the vicinity for any of the alternatives under consideration.

4.2. Dalecarlia WTP

4.2.1. Land use

All of the alternatives, including the no-action alternative, are involved in the treatment of drinking water, which is the existing land use at the Dalecarlia WTP. Therefore, implementation of any of the alternatives, including the no-action alternatives, will not change the existing land use at the McMillan WTP.

There are no anticipated significant impacts to land use for any of the alternatives under consideration.

4.2.2. Geology and Soils

None of the alternatives will affect the existing geology and soils at the Dalecarlia WTP. Similar to any other project in the District of Columbia, any cut or fill operations or disturbance of soil as part of construction activities would require approval from the District of Columbia Departments of the Environment and of Consumer and Regulatory Affairs.

There are no anticipated significant impacts to site geology or soils for any of the alternatives under consideration.

4.2.3. Topography and Drainage

None of the alternatives will significantly affect existing topography of the site at the Dalecarlia WTP. New construction could marginally affect drainage characteristics for the site. Consideration of stormwater management based on these changes will be required to be submitted to the District of Columbia government for approval, if applicable. Any potential changes that would require new stormwater management controls would be identified and the new controls would be designed to mitigate any potential impacts.

Therefore there are no anticipated significant impacts to topography and drainage for any of the alternatives under consideration, although with a small increase in impervious surfaces, there will be a minor impact.

4.2.4. Climate

There is a potential for feed problems when using 50% caustic soda at low temperatures, so the use of 25% caustic soda is preferable operationally. No other aspects of the alternatives under consideration are expected to be affected by climate, nor are any of the alternatives expected to affect climate.

There are no anticipated significant impacts to climate for any of the alternatives under consideration.

4.2.5. Air Quality

Based on the analysis of potential new emission sources for different alternatives and consideration of current emission sources, as presented in the Air Quality Memorandum in the Appendix, none of the alternatives will cause the total emissions directly from the or indirectly associated with the McMillan WTP to exceed the applicable *de minimis* thresholds.

Selection of the no-action alternative will retain the existing improbable risk for off-site consequences in the event of an uncontrolled release of liquid chlorine either at the site of the Dalecarlia WTP or in transport. Selection of any of the other alternatives will eliminate this potential risk. However, due to the measures currently implemented to manage the potential risk associated with liquid chlorine, selection of the no-action alternative is not expected to result in a significant impact to air quality.

There are no anticipated significant impacts to air quality for any of the alternatives under consideration.

4.2.6. Water Resources

4.2.6.1. Surface Water

Since there are no surface water resources in the project area, no significant impacts are anticipated for any of the alternatives under consideration. Discussion of site drainage at the Dalecarlia WTP can be found in Section 4.2.3.

4.2.6.2. Floodplains

Since there are no floodplains in the project area, no significant impacts are anticipated for any of the alternatives under consideration.

4.2.6.3. Groundwater

None of the alternatives are expected to affect groundwater, so no significant impacts are anticipated for any of the alternatives under consideration.

4.2.6.4. Wild and Scenic Rivers

There are no wild and scenic rivers in the vicinity of the proposed project area, so there are no significant impacts to wild and scenic rivers anticipated for any of the alternatives under consideration.

4.2.7. Biological Resources

4.2.7.1. Aquatic Resources

Since there are no aquatic resources in the project area, no significant impacts are anticipated for any of the alternatives under consideration.

4.2.7.2. Wetlands

Since there are no wetlands in the project area, no significant impacts are anticipated for any of the alternatives under consideration.

4.2.7.3. Vegetation

Alternatives involving construction of new facilities will affect an area landscaped with grass and one ornamental tree at the Dalecarlia WTP. New landscaping consistent with the existing landscaping plan can be incorporated into the design of new structures. No significant impacts on vegetation are anticipated for any of the alternatives, even those including construction of new structures.

4.2.7.4. Wildlife Resources

Since the land use of the Dalecarlia WTP will remain the same regardless of the alternative selected, and since habitat for any of the wildlife resources typically found in the area will not be affected, there are no significant impacts to wildlife anticipated for any of the alternatives under consideration.

4.2.7.5. Rare, Threatened, or Endangered Species

Since there are no known rare, threatened, or endangered species or critical habitats in the proposed project area, there are no significant impacts related to these categories of species anticipated for any of the alternatives under consideration.

4.2.8. Cultural Resources

The extent of cultural resources known to exist within the project area is the presence of historic structures eligible for listing on the National Register of Historic Places.

Alternatives involving construction of new structures will affect the off-site viewshed of the Dalecarlia WTP, however the possible location proposed for a new facility for these alternatives is adjacent to an existing contemporary building which is not a cultural resource. In the context of the contemporary structure, there is not a significant change to the character of the site, nor would the new structure obscure the view of any historic structures from either of the off-site perspectives from the Capital Crescent Trail or from MacArthur Boulevard. The Maryland Historic Trust and the District of Columbia Historic Preservation Office must be given the opportunity to review any assessment regarding impacts to historic properties, including potential viewshed impacts. None of the existing structures considered to be renovated and used for a new purpose as part of the proposed action are historically significant.

The no-action alternatives would involve no construction and therefore will not affect cultural resources.

Pending concurrence with the Maryland Historic Trust and the District of Columbia Historic Preservation Office, no significant impacts are anticipated related to cultural resources.

4.2.9. Hazardous, Toxic, and Radioactive Substances

4.2.9.1. Contaminated Sites

Since there are no known contaminated sites in the project area, there are no anticipated significant impacts for any of the alternatives under consideration.

4.2.9.2. Hazardous Material Use, Handling, and Storage and Hazardous Substance Generation

Liquid chlorine is categorized as an extremely hazardous substance by US EPA. Aqueous sodium hypochlorite, while having the same disinfecting characteristics, is a less hazardous chemical for transportation, storage, and handling. Lime is also less hazardous than caustic soda. As the concentration of aqueous sodium hypochlorite or caustic soda decreases, the chemicals are less hazardous – for instance, 0.8% sodium hypochlorite is less hazardous than 6% sodium hypochlorite. However, the hazardous nature of all of these chemicals can be managed through proper engineering and management controls, minimizing or eliminating the potential for impacts.

However, management of less hazardous chemicals is typically easier and more reliable than management of more hazardous chemicals. Use of less hazardous chemicals may therefore be preferable in some situations; however operational requirements may necessitate the use of more hazardous chemicals in other situations.

For the Dalecarlia WTP, the operational requirement for disinfection can be achieved through the use of either liquid chlorine or through the use of aqueous sodium hypochlorite. Therefore, from the perspective of using the least hazardous chemical possible, the storage and use of aqueous sodium hypochlorite at the lowest concentration feasible would be preferable to the use of liquid chlorine. However, the operational requirement for pH control cannot be achieved through the sole use lime, so caustic soda is necessary at least in a pH trimming capacity.

With the implementation of any alternative resulting in the use of new bulk chemicals, the existing Washington Aqueduct spill prevention and emergency response planning documentation must be modified appropriately.

All of the chemicals proposed for use in the alternatives under consideration can be managed properly with engineering and management controls to reduce potential risks, therefore no significant impacts are anticipated for any of the alternatives under consideration.

4.2.9.3. Storage Tanks

Since there are no storage tanks in the project area, there is no significant impact anticipated for any of the alternatives under consideration.

4.2.9.4. Toxic Contaminants (PCB Management, Asbestos-Containing Material, Lead-Based Paint

Through proper construction practices, the presence of any asbestos-containing material or lead-based paint can be managed in accordance with applicable regulations, precluding any potential significant impacts. Since there is no known PCB containing equipment in the project area, there are no potential impacts associated with the alternatives under consideration.

There are no significant impacts related to toxic contaminants anticipated for any of the alternatives under consideration.

4.2.10. Infrastructure

4.2.10.1. Traffic, Roadways and Transportation System

The estimated number of deliveries required for different alternatives are listed in Table 2-2. The alternative requiring the fewest number of deliveries is the no-action alternative. The alternatives requiring the largest number of deliveries involve the delivery, storage and use of bulk sodium hypochlorite and the exclusive use of caustic soda for pH control. Based on the existing conditions, reasonably foreseeable future conditions (such as with the operation of the planned residuals management facility), and consideration of the alternatives with the greatest possible increase in delivery frequency, as indicated in the Transportation Analysis Letter in the Appendix, none of the alternatives are expected to significantly affect the level of service on any of the existing roads that are likely to be used for deliveries.

There are no significant impacts related to traffic, roadways and transportation systems for any of the alternatives under consideration.

4.2.10.2. Potable Water

The available supply of potable water is sufficient for all of the alternatives under consideration, so there are no significant impacts anticipated for any of the alternatives under consideration.

4.2.10.3. Sanitary Sewer/Wastewater

Additional loading on the sanitary sewer system is not anticipated for any of the alternatives under consideration. For alternatives involving water softening systems, disposal of waste materials would be handled through a solid waste disposal contract and not through the sanitary sewer system.

There are no significant impacts anticipated for any of the alternatives under consideration.

4.2.10.4. Stormwater Systems

See the discussion on drainage related in Section 4.2.3.

4.2.10.5. Solid Waste Management

There is not expected to be a significant change in quantities of solid waste requiring disposal between the alternatives under consideration, including the no-action alternative.

There are no significant impacts anticipated for any of the alternatives under consideration

4.2.10.6. Utilities

The use of bulk sodium hypochlorite compared to liquid chlorine is not expected to increase usage of power at the Dalecarlia WTP. The generation of sodium hypochlorite with equipment on-site would increase the total amount of power required for the Dalecarlia WTP by approximately 15%. It is possible that new electrical distribution lines may be necessary, but this can be incorporated into the system design and construction. Natural gas usage for heating is not expected to increase significantly if existing structures are reused. For alternatives involving construction of a new facility, natural gas usage would be expected to increase proportionally to the total volume of the building. However, the aforementioned potential increases in energy usage among some of the alternatives are not anticipated to cause a significant impact on the utilities providing the energy services.

There are no significant impacts to utilities anticipated for any of the alternatives under consideration.

4.2.11. Socioeconomic

4.2.11.1. Demographics and Environmental Justice

Through proper engineering and management controls at the Dalecarlia WTP, the risk of a potential uncontrolled release of liquid chlorine has been minimized. However, an improbable risk does exist, particularly with consideration of the potential for an incident associated with liquid chlorine delivery vehicles on or off-site.

Although there are no significant numbers of minority or economically disadvantaged individuals, as defined by Council of Environmental Quality guidance, adoption of the proposed action is advantageous to selection of the “no-action” alternative for the population living or working in the vicinity of the Dalecarlia WTP because it would eliminate the existing potential, although improbable, risk.

There are no significant impacts anticipated to the existing demographic groups within the proximity of the proposed project for any of the alternatives under consideration.

4.2.11.2. Economics

The planned budget for the proposed action is $13 million. Compared to the typical amount of federal spending and the cost of new construction annually in the region of influence, the proposed project budget would cause only a minor positive impact. Selection of the proposed action for implementation, or selection of the status quo “no-action” alternative would not have a significant impact on the economic development.

4.2.11.3. Schools, Recreational Facilities and Children’s Safety

Adoption of the proposed action would be advantageous under the same rationale as presented in Section 4.2.11.1, in the protection of children and in considering the proximity of area schools, hospital and recreation facilities near the Dalecarlia WTP. However, selection of the “no-action” alternative would not result in a significant impact because the existing engineering and management controls minimize the potential risk and make occurrence of an uncontrolled release of chlorine improbable.

There are no significant impacts anticipated to schools, recreational facilities and to the safety of children for any of the alternatives under consideration.

4.2.11.4. Noise

The emission of additional sound is expected with an increase in deliveries to the Dalecarlia WTP, and is therefore expected with all of the alternatives except the no-action alternative. However, the additional sound expected is consistent with the existing types of sound that can be currently observed at the Dalecarlia WTP. Noise from the movement of trucks is expected to be incorporated into background noise. The offloading of chemicals can be a more intense source of noise, but proper design of chemical offloading areas is expected to mitigate potential impacts from noise potentially derived from offloading chemicals. Design of chemical offloading areas to mitigate potential impacts from noise has been routinely used in other Washington Aqueduct facilities.

There are no significant impacts from noise anticipated for any of the alternatives under consideration.

4.2.11.5. Visual and Aesthetic Value

For the no-action alternative there is no construction of new facilities at the Dalecarlia WTP so there are no changes to the existing visual and aesthetic value of the vicinity. For the other alternatives, the potential construction of a new facility would occur in a grassed area between an existing structure and the large grassed area above one of the Dalecarlia WTP clearwell structures. The new structure would be visible from MacArthur Boulevard and would be partially obscured, but visible, from the Capital Crescent Trail. A rendering of an example structure from the perspective of the Capital Crescent Trail is presented as Figure 2-1.

The architectural characteristics of the new structure would be presented to and reviewed by the United States Commission of Fine Arts. It is reasonable to expect that the building would be similar in appearance to the existing adjacent structure. Although a change in the visual character of the site would occur, the change would be consistent with the Dalecarlia WTP campus. The new structure would not obscure any views of value from the perspective of the Capital Crescent Trail or from MacArthur Boulevard.

There are no significant impacts to the visual and aesthetic value of the vicinity for any of the alternatives under consideration.

5. Conclusions

The proposed action is preferable to the no-action alternatives. Among the alternatives considered that could be implemented to replace liquid chlorine and to improve the control of pH, there are no anticipated significant impacts to any resources in the potentially affected environment.

In the interest of an expeditious transition to the use of sodium hypochlorite, a safer alternative to liquid chlorine, construction of bulk sodium hypochlorite storage and feed systems with the potential future opportunity for installation of on-site sodium hypochlorite generation equipment is preferred. Although lime is less hazardous than caustic soda, construction of caustic soda storage and feed systems is preferred in order to allow Washington Aqueduct to achieve the US EPA requirements for controlling pH in the interest of minimizing corrosion in the distribution system.

Additional study of the feasibility of using equipment on-site for generating aqueous sodium hypochlorite is needed to clearly determine if there would be potential impacts on reliability to the disinfection of drinking water at the Washington Aqueduct with the use of such equipment. If the equipment is found to not reduce reliability, there may be benefits to operational costs and to transportation with installation of the equipment at a future time.

In the interest of minimizing any potential impacts, the following measures will be addressed in the design and implementation of the preferred alternative, if implemented:

- Design chemical offloading areas to control offsite observance of noise.
- Study and consider further the operational uncertainties associated with installing on-site sodium hypochlorite generation equipment. Consideration of installing on-site sodium hypochlorite generation equipment would be described in additional National Environmental Policy Act documentation.
- Spill prevention and response planning for any new bulk chemical would be incorporated into existing Washington Aqueduct emergency response planning documentation.
- Deliveries will typically occur during off-peak traffic hours.

6. List of Preparers

6.1. Environmental Assessment

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6.2. Associated Documents

David Cornwell, Principal, EE&T, Inc., Feasibility Study

James R. Reed, Jr. Ph.D., Biological Factors Analysis, Christopher Newport University

Osborne R. George, Transportation Impact Assessment, O.R. George & Associates, Inc.

7. References

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8. Appendices

Appendix A. Public Involvement Memorandum
Appendix B. Feasibility Study EE&T (2007)
Appendix C. Optimal Corrosion Control Treatment Requirements for the Washington Aqueduct
Appendix D. Lists of Site Visits and Vendor Presentations
Appendix E. Biological Factors Memorandum
Appendix F. Transportation Analysis Memorandum
Appendix G. Supplementary Cost Estimate Memorandum
Appendix H. Socioeconomic Memorandum
Appendix I. Air Quality Memorandum

Administrative Record

- *1999 Air Emissions Inventory for Washington Aqueduct* (2000).
- *Reagan National Average Monthly Temperature (since 1871)* (2007).
- *Master Plan, McMillan Reservation, Washington Aqueduct Division, U.S. Army Corps of Engineers (*1971, revised 1972).
- *Master Plan, Dalecarlia Reservation, Washington Aqueduct Division, U.S. Army Corps of Engineers (*1971, revised 1983).
- *Environmental Baseline Report, Washington Aqueduct, Dalecarlia, Georgetown, and McMillan Reservoirs* (1994).
- *Final Environmental Assessment, Ammonia Storage, Feed, and Monitoring Facilities, Washington Aqueduct* (1998).
- *Sodium Hypochlorite Feasibility Study* (2001).
- *pH Study Report* (2004).
- *Pamphlet 96: Sodium Hypochlorite Manual Edition 3* (2006)
- *Final Environmental Impact Statement for a Proposed Water Treatment Residuals Management Process for the Washington Aqueduct* (2003).
- *The Washington Aqueduct: 1852-1992* (1992).