This document gives pertinent information concerning the reissuance of the VPDES Permit listed below. This permit is being processed as a **Major, Municipal** permit. The discharge results from the operation of a 40 MGD wastewater treatment plant. This permit action consists of updating the proposed effluent limits to reflect the current Virginia WQS (effective January 6, 2011) and updating permit language as appropriate. The effluent limitations and special conditions contained in this permit will maintain the Water Quality Standards of 9VAC25-260 et seq.

1. Facility Name and Mailing Address: Arlington County WPCP, 3402 South Glebe Road, Arlington, VA 22202 — SIC Code: 4952 WWTP

   Facility Location: 3402 South Glebe Road, Arlington, VA 22202 — County: Arlington

   Facility Contact Name: Larry Slattery — Telephone Number: 703-228-6820

   Facility E-mail Address: lslattery@arlingtonva.us

2. Permit No.: VA0025143 — Expiration Date of previous permit: 09/22/2013

   Other VPDES Permits associated with this facility: VAR051421, VAN010021

   Other Permits associated with this facility: Air Registration No. 70026; EPA Hazardous Waste ID No. VAD980720411; AST Registration ID 3011817

   E2/E3/E4 Status: NA

3. Owner Name: Arlington County Board

   Owner Contact/Title: Carl Newby, Deputy Director, Dept. of Environmental Services — Telephone Number: 703-228-6494

   Owner E-mail Address: cnewby@arlingtonva.us

4. Application Complete Date: 03/28/2013

   Permit Drafted By: Anna Westernik — Date Drafted: 05/17/2013

   Draft Permit Reviewed By: Alison Thompson — Date Reviewed: 06/03/2013

   WPM Review By: Bryant Thomas — Date Reviewed: 06/11/2013

   Public Comment Period: Start Date: 12/4/2013 — End Date: 01/7/2014

5. Receiving Waters Information: See **Attachment 1** for the Flow Frequency Determination*

Receiving Stream Name:	Four Mile Run	Stream Code:	1aFOU
Drainage Area at Outfall:	17 sq.mi.	River Mile:	0.94
Stream Basin:	Potomac	Subbasin:	Potomac River
Section:	6	Stream Class:	II
Special Standards:	b, y	Waterbody ID:	VAN-A12E
7Q10 Low Flow:	0.67 MGD	7Q10 High Flow:	1.73 MGD
1Q10 Low Flow:	0.52 MGD	1Q10 High Flow:	1.32 MGD
30Q10 Low Flow:	1.49 MGD	30Q10 High Flow:	2.12 MGD
Harmonic Mean Flow:	6.19 MGD	30Q5 Flow:	1.81 MGD

*Flow statistics were computed to evaluate potential dilution available in the tidal receiving waters. They are presented for information purposes only.

6. Statutory or Regulatory Basis for Special Conditions and Effluent Limitations:

✓	State Water Control Law		EPA Guidelines
✓	Clean Water Act	✓	Water Quality Standards
✓	VPDES Permit Regulation	✓	Policy for the Potomac River Embayments (9VAC25-415-10 et seq.)
✓	EPA NPDES Regulation		

7. Licensed Operator Requirements: Class I

8. Reliability Class: Class I

9. Permit Characterization:

	Private	✓	Effluent Limited	✓	Possible Interstate Effect (D.C.)
	Federal	✓	Water Quality Limited		Compliance Schedule Required
	State	✓	Whole Effluent Toxicity Program Required		Interim Limits in Permit
✓	POTW	✓	Pretreatment Program Required		Interim Limits in Other Document
✓	TMDL				

10. Wastewater Sources and Treatment Description:

Attachment 2 is a schematic of the plant operation. Plant treatment processes include: preliminary, primary, secondary, tertiary treatment, and sludge dewatering. Three odor control treatment systems are present at the facility (one at the flow equalization system, one at the secondary system, and one at the sludge dewatering building). Land application of sludge began in early 1998, when the on-site incinerator was eliminated. Section 11 of this fact sheet discusses sludge treatment and disposal methods in detail.

a) **Primary Treatment**

Eight parallel primary treatment rectangular tanks serve as primary clarifiers. Four of the tanks are of newer construction and have a capacity of 39,000 ft^3 (0.29 MG). The older tanks are larger with a capacity of 58,000 ft^3 (0.43 MG). All the tanks are not always in use. A BOD removal of 46% and a TSS removal of 70% can be achieved with four to five tanks in use. A chain and flight collector mechanism moves the settled material (primary sludge) to the influent end of the tank, and the floating material (grease) to the effluent end of the tank. The primary sludge is pumped to the gravity thickener for additional dewatering. The grease is concentrated and blended with the grit and screenings for disposal at the Lorton Landfill. Three equalization basin totaling 16.6 MG are used to control wet weather flows from the collection system.

b) **Secondary Treatment**

The secondary treatment system consists of six 2.5-MG parallel pass aeration basins that are configured to operate the activated sludge process in a modified step-feed mode. Fine bubble membrane diffusers, supplied by five blowers, are used to mix and aerate the activated sludge. Surface wasting and chemicals are used to control the filamentous growth. All aeration tanks have anoxic fractions for denitrification. The degree of anoxic zone necessary is temperature dependent. Nine center-feed circular clarifiers follow this treatment. The waste sludge from this process is pumped to a dissolved air flotation thickener.

c) **Tertiary Treatment**
The advanced treatment processes include phosphorous removal, denitrification & gravity filtration, disinfection, dechlorination, and post aeration.

1) Phosphorus Removal. Multiple point ferric chloride addition is utilized to precipitate phosphorous in the primary clarifiers, aeration tanks, secondary clarifiers, and denitrification facility.

2) Denitrification & Gravity Filtration. 17 deep bed monomedia denitrification filters with supplemental carbon addition (methanol) are used to remove nitrogen, phosphorous, and solids.

3) Disinfection. A 5% sodium hypochlorite solution is used for disinfection and is currently being added at the chlorine contact tanks influent. There are four chlorine contact tanks, two with a capacity of approximately 0.925 MG and two with a capacity of approximately 0.33 MG. The average retention time if all tanks are in service is approximately 90 minutes at 40 MGD. If only one train is in service, the average retention time is approximately 45 minutes at 40 MGD (0.925 MG and 0.33 MG). The chlorine residual is currently maintained at 0.50 mg/L prior to dechlorination.

4) Post Aeration. Two tanks in parallel (approximately 0.325 MG each) utilize air diffusers to replenish the oxygen in the process stream to greater than 6.0 mg/L.

5) Dechlorination. Sodium bisulfite is added after the chlorine contact tank to neutralize chlorine residual in the wastewater. A splitter box is used to distribute the dose.

6) Sampling. The sampling point for Outfall 001sampling point is immediately after dechlorination.

e) **Bypass Points**
Bypasses at this water pollution control plant can occur at three levels of treatment.

1) Secondary Effluent (AWT Bypass). Bypasses can occur due to hydraulic overload caused by a power failure or AWT breakdown. Treatment consists of, screen and grit removal, primary sedimentation, biological treatment using activated sludge, secondary clarification, and post chlorination. Discharge is to Outfall 001.

2) Primary Effluent (Secondary Bypass). Bypasses can occur due to hydraulic overload. Treatment consists of screening, grit removal, primary settling, and chlorination. Discharge is to the designated bypass overflow point.

3) Raw Effluent (Plant Bypass). Bypasses can occur due to flooding and power failures. Treatment consists of chlorination. No contact time is provided. Discharge is to the designated bypass overflow point.

TABLE 1 – Outfall Description				
Outfall Number	**Discharge Sources**	**Treatment**	**Design Flow(s)**	**Outfall Latitude and Longitude**
001	Domestic and/or Commercial Wastewater	See Item 10 above.	40 MGD	38° 50' 37.74" N; 77° 03' 39.3" W
--	Plant Bypass	See Item 10 above	Variable	38° 50' 28.62" N; 77° 03' 19.20" W
See **Attachment 3** for DEQ #204 d topographic map.				

11. **Sludge Treatment and Disposal Methods:**
Secondary and tertiary solids are pumped to two dissolved air floatation thickeners (DAF) for dewatering. Primary treatment sludge, DAF overflow, and occasional waste activated sludge (WAS) from the secondary clarifiers is pumped to a gravity thickener unit for dewatering. The combined thickened sludge from the gravity and floatation thickeners is then pumped into two 180,000-gallon holding tanks.

Sludge is transferred from the holding tanks to the sludge dewatering building where a dilute concentration of 0.2-0.5% polymer is mixed with the thickened sludge in three centrifuges. Sludge consisting of approximately 28% cake solids is sent to four sludge cake storage bins within the building. The sludge cake is removed from the storage bins by the sludge conveyance system and combined with lime before discharging to hauling trucks. To reduce pathogens and vector attraction in the dewatered sludge, it is lime stabilized for at least two hours to obtain a pH of 12.0 S.U. and retained at a pH of at least 11.5 for 24 hours. Odors generated from the dewatering building are controlled with a wet chemical scrubber system. Water generated from the odor control system is sent to the plant influent.

All biosolids are to be land applied on Department of Environmental Quality (DEQ) permitted sites in Virginia by Synagro Mid-Altlantic, Inc. Disposal at Atlantic Waste Disposal in Richmond, Virginia or other approved landfill sites may be used as disposal options change.

12. **Discharges, Intakes, Monitoring Stations, Other Items in Vicinity of Discharge:**

TABLE 2 INDIVIDUAL VPDES DISCHARGES WITHIN WATERBODY VAN-A12R and VAN-A12E			
Description	**Type**	**Latitude/ Longitude**	**Rivermile**
VA0089796 -- The Nature Conservancy	0.0144 Groundwater Remediation System	38° 52' 57"/77° 06' 47"	0.27 Lubber Run, UT
VA0025143 – The Arlington County WPCP	40 MGD Municipal Wastewater Discharge	38° 50' 37.74"/77° 03' 39.30"	1.27 Four Mile Run
VA0032000 – U.S. Department of the Defense, Pentagon	Industrial Wastewater Discharge	Outfall 001 38° 51' 55"/77° 02' 46" Outfall 002 38° 52' 07"/77° 02' 36.6"	0.46 Roaches Run (Outfalls 001 and 002)
VA0087068 – Alexandria Combined Sewer System	Wet Weather Flows of Combined Sewage	Outfall 001 38° 48' 36"/77° 02' 49" Outfall 002 38° 47' 30"/77° 02' 49" Outfall 003 38° 48' 15"/77° 03' 33 Outfall 004 38° 48' 13"/77° 03' 34	108.72 Oronoco Bay 0.60 Hunting Creek 0.70 Hooffs Run 0.63 Hoofss Run

TABLE 3 GENERAL VPDES DISCHARGES WITHIN WATERBODY VAN-A12R and VAN-A12E		
Single Family Homes		
Permit Number	**Facility Name**	**Receiving Stream**
VAG406537	Hogan Philip Residence	Chestnut Lick, UT
VAG406502	Forth Kary and Janet Residence	Chestnut Lick, UT
VAG406534	Bruce and Lee Residence	Chestnut Lick, UT
Storm Water Industrial		
Permit Number	**Facility Name**	**Receiving Stream**
VAR051421	Arlington County Water Pollution Control Facility	Four Mile Run
VAR051001	Robinson Terminal Warehouse	Potomac River
VAR051790	US NPS - George Washington Memorial Pkwy Maintenance	Four Mile Run, UT
VAR051097	WMATA - Four Mile Run Bus Garage	Four Mile Run
VAR050997	Red Top Cab - Transportation Incorporated	Potomac River
VAR051096	WMATA - West Falls Church Metro Rail Yard	Pimmit Run, UT
VAR051296	US Joint Base - Myer Henderson Hall	Potomac River, UT
Concrete		
Permit Number	**Facility Name**	**Receiving Stream**
VAG110319	Lafarge Mid Atlantic Limited Liability Corporation	Roaches Run, UT
VAG110087	Virginia Concrete Company Inc - Shirlington	Four Mile Run
Carwash		
Permit Number	**Facility Name**	**Receiving Stream**
VAG750207	Enterprise Rent A Car -- 2778 Arlington Mill Dr.	Four Mile Run
VAG750155	Universal Air and Vacuum Service	Four Mile Run
VAG750208	Avis Car Rental	Rocky Run
VAG750217	Z & I1 Inc	Four Mile Run, UT
Petroleum		
Permit Number	**Facility Name**	**Receiving Stream**
VAG830420	Alexandria City Tax Map	Potomac River
VAG830436	Three Metropolitan Park	Roaches Run
VAG830321	Halstead at Arlington	Long Branch
VAG830450	Pike 3400 Associates Parcel 1 2	Lower Long Branch, UT
VAG830455	LBG Parcel C LLC and LBG Parcel F LLC	Potomac River, UT
VAG830340	1812 Holdings LLC Property	Little River in the Potomac River
VAG830337	Shell 139445 - Columbia Pike	Four Mile Run
VAG830428	Monument View II	Roaches Run
VAG830441	Monroe Square	Potomac River, UT

13. **Material Storage:** See **Attachment 4.**

14. **Site Inspection:**

Performed by Anna Westernik and Bryant Thomas on May 14, 2013 (See **Attachment 5).**

15. **Receiving Stream Water Quality and Water Quality Standards:**

a) Ambient Water Quality Data

This facility discharges into tidal Four Mile Run. DEQ monitoring station 1aFOU000.19 is located at the George Washington Parkway bridge, approximately 0.75 miles downstream of Outfall 001. The following the water quality summary for tidal Four Mile Run, as taken from the Draft 2012 Integrated Report*:

Class II, Section 6, special standards b, y.

DEQ ambient water quality monitoring station 1aFOU000.19, at George Washington Parkway and DEQ fish tissue monitoring station 1aFOU000.45.

The fish consumption use is categorized as impaired due to a Virginia Department of Health, Division of Health Hazards Control, PCB fish consumption advisory and for total chlordane and PCB, based on fish tissue monitoring. Additionally, fish tissue monitoring data revealed an exceedance of the water quality criterion based tissue value (TV) of 4.4 parts per billion (ppb) for heptachlor epoxide in carp (2008) and of 300 (ppb) for mercury in largemouth bass (2008), each noted by an observed effect for the fish consumption use. A PCB TMDL for the tidal Potomac River watershed has been completed and approved.

E. coli monitoring finds a bacteria impairment, resulting in an impaired classification for the recreation use. A bacteria TMDL for Tidal Four Mile Run has been completed and approved.

The aquatic life use is fully supporting. The submerged aquatic vegetation data is assessed as fully supporting the aquatic life use. For the open water aquatic life subuse; the thirty day mean is acceptable, however, the seven day mean and instantaneous levels have not been assessed. The wildlife use is considered fully supporting. There is a downstream TMDL that has been completed by EPA to address poor water quality in the Chesapeake Bay. This TMDL covers the entire Bay watershed, including the upstream tidal tributaries such as Four Mile Run.

*Virginia's Draft 2012 IR has been through the public comment period and reviewed by EPA. The 2012 IR is currently awaiting final approval.

b) 303(d) Listed Stream Segments and Total Maximum Daily Loads (TMDLs)

TABLE 4 – 303(d) IMPAIRMENT AND TMDL INFORMATION FOR THE RECEIVING STREAM SEGMENT						
Waterbody Name	**Impaired Use**	**Cause**	**TMDL completed**	**WLA**	**Basis for WLA**	**TMDL Schedule**
Impairment Information in the Draft 2012 IR*						
Four Mile Run	Recreation	*E. coli*	Tidal Four Mile Run Watershed Bacteria 6/14/2012	6.96E+13 cfu/yr *E. coli*	126 cfu/100 ml --- 40 MGD	NA
	Fish Consumption	PCBs	Tidal Potomac PCB 10/31/2007	3.54 grams/yr PCB	0.064 ng/L --- 40 MGD	NA
		Chlordane	No	---	---	2022

*Virginia's Draft 2012 IR has been through the public comment period and reviewed by EPA. The 2012 IR is currently awaiting final approval.

TABLE 5 – INFORMATION ON DOWNSTREAM 303(d) IMPAIRMENTS AND TMDLS							
Waterbody Name	**Impaired Use**	**Cause**	**Distance From Outfall**	**TMDL completed**	**WLA**	**Basis for WLA**	**TMDL Schedule**
Information in the Chesapeake Bay TMDL							
Chesapeake Bay	Aquatic Life	Total Nitrogen (TN)	---	Chesapeake Bay TMDL 12/29/2010	121,822 lbs/yr TN	Edge of Stream (EOS) Loads	NA
		Total Phosphorus (TP)			9,137 lbs/yr TP		
		Total Suspended Solids (TSS)			913,668 lbs/yr TSS		

Significant portions of the Chesapeake Bay and its tributaries are listed as impaired on Virginia's 303(d) list of impaired waters for not meeting the aquatic life use support goal, and the 2010 Virginia Water Quality Assessment 305(b)/303(d) Integrated Report indicates that much of the mainstem Bay does not fully support this use support goal under Virginia's Water Quality Assessment guidelines. Nutrient enrichment is cited as one of the primary causes of impairment. EPA issued the Bay TMDL on December 29, 2010. It was based, in part, on the Watershed Implementation Plans developed by the Bay watershed states and the District of Columbia.

The Chesapeake Bay TMDL addresses all segments of the Bay and its tidal tributaries that are on the impaired waters list. As with all TMDLs, a maximum aggregate watershed pollutant loading necessary to achieve the Chesapeake Bay's water quality standards has been identified. This aggregate watershed loading is divided among the Bay states and their major tributary basins, as well as by major source categories (wastewater, urban storm water, onsite/septic agriculture, air deposition). Section 17.e of the fact sheet provides additional information on specific nutrient limitations for this facility to implement the provisions of the Chesapeake Bay TMDL.

The full planning statement is found in **Attachment 6**.

c) Receiving Stream Water Quality Criteria

Part IX of 9VAC25-260(360-550) designates classes and special standards applicable to defined Virginia river basins and sections. The receiving stream, Four Mile Run, is located within Section 6 of the Potomac River Basin, and classified as a Class II water.

Class II tidal waters in the Chesapeake Bay and it tidal tributaries must meet dissolved oxygen concentrations as specified in 9VAC25-260-185 and maintain a pH of 6.0-9.0 standard units as specified in 9VAC25-260-50. In the Northern Virginia area, Class II waters must meet the Migratory Fish Spawning and Nursery Designated Use from February 1 through May 31. For the remainder of the year, these tidal waters must meet the Open Water use. The applicable dissolved oxygen concentrations are presented **Attachment 7.**

Attachment 8 details other water quality criteria applicable to the receiving stream.

Ammonia:
The freshwater aquatic life water quality criteria for ammonia are dependent on the in-stream temperature and pH. The 90th percentile temperature and pH values are used to calculate ammonia criteria because they best represent the critical design conditions of the receiving stream. Effluent data were used to calculate ammonia criteria in this and previous permit reissuances because at low tide and during drought conditions Four Mile Run consists primarily of effluent. Using freshwater data derived from USGS Gaging Station 01652000 located on Four Mile Run at a discharge of 40 MGD from Outfall 001, the High Flow 30Q10 will yield an in-stream waste concentration (IWC) of 95%; the Low Flow 30Q10 will yield an IWC of 96%.

The Arlington County WPCP discharges into the tidal freshwater Potomac River and tributaries that enter the tidal freshwater Potomac River from Cockpit Point to the fall line at Chain Bridge are subject to Special Standard "y" as found in 9VAC25-260-310. During November 1 through February 14 of each year, the 30-day average concentration of total ammonia nitrogen (in mg N/L) in this segment of the Potomac River shall not exceed, more than once every three years on the average, the following ammonia criteria:

Chronic Criteria (early life stages of fish absent)

$$[0.0577/(1+10^{7.688-pH}) + 2.487/(1 + 10^{pH-7.688})]\ 1.45 \times 10^{0.028\,(25-MAX)}$$

MAX = temperature in °C or 7, whichever is greater

Therefore, ammonia criteria can be established in this permit reissuance for the following three seasons: April through October, November through January, and February through March. Acute criteria are calculated in the same manner for all seasons, using the assumption that trout are absent. Chronic criteria for April through October and February through March are calculated with the assumption that early life stages of fish are present. Chronic criteria for November through January are calculated with the assumption that early life stages of fish are absent. Pursuant to the Virginia Water Quality Standards, ammonia criteria are calculated using the following formulas below and the formula discussed above to calculate chronic criteria when early life stages of fish are absent:

Acute Criteria (when trout are absent)

$$0.411/(1 + 10^{7.204-pH}) + 5.84/(1 + 10^{pH-7.204})$$

Chronic Criteria (early life stages of fish present)

$$[0.0577/(1+10^{7.688-pH}) + 2.487/(1 + 10^{pH-7.688})]MIN$$

MIN = 2.85 or $1.45 \times 10^{0.028\,(25-T)}$, whichever is less

T = temperature in °C

The temperature values of the Arlington County WPCP effluent in the November through January period using data from 2011 and 2012 are: an average temperature of 19°C; a minimum temperature of 16°C, a 90th percentile temperature of 22°C, and a maximum temperature of 25°C. Pursuant to 9VAC25-260-155.C of the Virginia Water Quality Standards, at 15°C and above, the criterion for fish early life stages absent is the same as the criterion for fish early life stages present. Therefore, there is no need to establish three seasonal ammonia tiers in this permit.

Two ammonia tiers will be present in this permit reissuance (April through October and November through March). Temperature and pH data for the January, November, December 2011 and corresponding 2012 period can be found in the permit correspondence file.

Staff has re-evaluated the effluent data from the period of July 1, 2011(the month following the issuance of the first conditional Certificate to Operate for the 40 MGD facility) through December 31, 2012 for pH and temperature and finds no significant difference from the data used to establish ammonia criteria and subsequent effluent limits in the previous permit. The derivation of the 90th percentile values of the effluent pH and temperature data can be found in the 2013 permit reissuance file. Table 6 below is an illustration of the 90th percentile pH and temperature values and the ammonia criteria.

TABLE 6 – ACUTE AND CHRONIC AMMONIA CRITERIA				
Season	**90th Percentile pH (S.U.)**	**90th Percentile Temperature (°C)**	**Acute Ammonia Criteria (mg/L)**	**Chronic Ammonia Criteria (mg/L)**
Apr – Oct (2008 Reissuance)	7.1	27.6	36.1	2.5
Apr – Oct (2013 Reissuance)	7.2	28.1	30	2.2
Nov – Mar (2008 Reissuance)	7.0	21.7	36.1	3.7
Nov – Mar (2013 Reissuance)	7.2	21.6	30	3.4

Metals Criteria:
The Water Quality Criteria for some metals are dependent on the receiving stream's hardness (expressed as mg/L calcium carbonate). Since the IWC exceeds 95% during the critical stream flow conditions, effluent hardness shall be used to determine the metals criteria. Staff used effluent hardness data collected during toxics monitoring conducted from November 2010 through October 2012 to calculate an average hardness of 140 mg/L. The hardness-dependent metals criteria used in the Commonwealth of Virginia and the District of Columbia is shown in **Attachment 8**.

Bacteria Criteria:
The Virginia Water Quality Standards at 9VAC25-260-170A and Title 21 of the District of Columbia Municipal Regulations, Section 1104.8, Water Quality Standards effective October 1, 2010 state that the following criteria shall apply to protect primary recreational uses in surface waters:

E. coli bacteria per 100 ml of water shall not exceed a monthly geometric mean of the following:

	Geometric Mean[1]
Freshwater *E. coli* (N/100 ml)	126

[1]For a minimum of four weekly samples taken during any calendar month.
[2]See 9VAC25-260-140 C for fresh water and transition zone delineation.

The discharge area of the Arlington County WPCP is considered to be fresh water; thus, per the Virginia Water Quality Standards, *E. coli* criteria apply to this permit.

d) Receiving Stream Special Standards

The State Water Control Board's Water Quality Standards, River Basin Section Tables (9VAC25-260-360, 370 and 380) designates the river basins, sections, classes, and special standards for surface waters of the Commonwealth of Virginia. The receiving stream, Four Mile Run, is located within Section 6 of the Potomac River Basin. This section has been designated with special standards of "b" and "y".

Special Standard "b" (Potomac Embayment Standards) established effluent standards for all sewage plants discharging into Potomac River embayments and for expansions of existing plants discharging into non-tidal tributaries of these embayments. 9VAC25-415, Policy for the Potomac Embayments, controls point source discharges of conventional pollutants into the Virginia embayment waters of the Potomac River and associated tributaries from the fall line at Chain Bridge in Arlington County to the Route 301 Bridge in King George County. The regulation sets effluent limits for BOD_5, total suspended solids, phosphorus, and ammonia to protect the water quality of these high profile waterbodies.

Special Standard "y" is the chronic ammonia criterion for the tidal freshwater Potomac River and tributaries that enter the tidal freshwater Potomac River from Cockpit Point (below Occoquan Bay) to the fall line at Chain Bridge. During November 1 through February 14 of each year, the thirty-day average concentration of total ammonia nitrogen (in mg N/L) shall not exceed more than once every three years on the average the following chronic ammonia criterion:

$$\frac{.0577}{+10^{7.688-pH}} \quad \frac{.487}{+10^{pH-7.688}} \quad 1.45(10^{0.028(25-MAX)})$$

MAX = temperature in °C or 7, whichever is greater.

The default design flow for calculating steady state waste load allocations for this chronic ammonia criterion is the 30Q10 unless statistically valid methods are employed that demonstrate compliance with the duration and return frequency of this water quality criterion.

e) Threatened or Endangered Species

The Virginia DGIF Fish and Wildlife Information System Database was searched on April 16, 2013 for records to determine if there are threatened or endangered species in the vicinity of the discharge. The following threatened or endangered species were identified within a two-mile radius of the discharge: Atlantic Sturgeon, Brook Floater, Wood Turtle, Upland Sandpiper, Loggerhead Shrike, Appalachian Grizzled Skipper, and Migrant Loggerhead Shrike. The limits proposed in this draft permit are protective of the Virginia Water Quality Standards and protect the threatened and endangered species found near the discharge.

The stream that the facility discharges to is within a reach identified as having an Anadromous Fish Use. It is staff's best professional judgment that the proposed limits are protective of this use.

16. **Antidegradation (9VAC25-260-30):**

All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

Staff has determined that the receiving waters, the tidal segment of Four Mile Run (Rivermile 1.46 - 0.0), are Tier 1 due to the their location in a highly developed watershed and the associated impacts of urban storm water as well as the impairments discussed in Part 15 of this fact sheet and **Attachment 6** (the planning statement). The 2012 draft Integrated Assessment lists impairments for bacteria and PCBs. Permit limits proposed have been established by determining wasteload allocations that will attain and/or maintain all water quality criteria applicable to the receiving

stream, including narrative criteria. Hence, these wasteload allocations will provide for the protection and maintenance of all existing uses.

17. **Effluent Screening, Wasteload Allocation, and Effluent Limitation Development:**

To determine water quality-based effluent limitations for a discharge, the suitability of data must first be determined. Data is suitable for analysis if one or more representative data points is equal to or above the quantification level ("QL") and the data represent the exact pollutant being evaluated.

Next, the appropriate Water Quality Standards (WQS) are determined for the pollutants in the effluent. Then, the Wasteload Allocations (WLAs) are calculated. Since it likely that the IWC will exceed 90% at a design flow of 40 MDG, no dilution will be allowed. Therefore, the WLA's are equal to the WQS. The WLA values are then compared with available effluent data to determine the need for effluent limitations. Effluent limitations are needed if the 97th percentile of the daily effluent concentration values is greater than the acute wasteload allocation or if the 97th percentile of the four-day average effluent concentration values is greater than the chronic wasteload allocation. In the case of ammonia evaluations, limits are needed if the 97th percentile of the thirty-day average effluent concentration values is greater than the chronic WLA. Effluent limitations are based on the most limiting WLA, the required sampling frequency, and statistical characteristics of the effluent data.

a) Effluent Screening:
Effluent data obtained from the permit application and discharge monitoring reports (DMR) has been reviewed and determined to be suitable for evaluation. The following pollutants were detected above the quantification level: molybdenum, bis(2-ethylhexyl)phthalate, dichloromethane, bromodichloromethane, chloroform, copper, nickel, and zinc. Copper, nickel, and zinc require a wasteload alloction analysis since acute and chronic water quality criteria are present for these parameters (see Section 17.b. below).

The Certificate of Analyses for the permit application monitoring events is on file at the DEQ Northern Regional Office (DEQ-NRO). A summary of the detected pollutants is attached (**Attachment 9**).

b) Wasteload allocations
Staff derived wasteload allocations where parameters are reasonably expected to be present in an effluent discharged (e.g., total residual chlorine where chlorine is used as a means of disinfection) and where effluent data indicate the pollutant is present in the discharge above quantifiable levels. With regard to the Outfall 001 discharge, ammonia as N is likely present since this is a wastewater treatment plant, total residual chlorine may be present since chlorine is used for disinfection, and water quality criteria monitoring indicate total recoverable copper, total recoverable nickel, and total recoverable zinc are present in the discharge.

Four Mile Run in the Arlington County WPCP area is a tidal water body that discharges to the Potomac River. DEQ guidance states that for surface discharges into tidal estuaries or estuarine embayments, the acute wasteload allocation (WLAa) should be set at two times the acute criteria and the chronic (WLAc) and human health (WLAh) wasteload allocations should be set at 50 times the respective criteria. In this case, staff believes that the guidance for establishing acute, chronic, and human health WLAs is not applicable since the discharge from the Arlington County WPCP comprises most of the waterbody during low flow periods. Until dilution is demonstrated through a site-specific study, water quality criteria will apply at the point of discharge.

Attachment 8 details the criteria and hence, the WLA derivations for these pollutants.

c) Effluent Limitations Toxic Pollutants, Outfall 001 –
9VAC25-31-220.D. requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Those parameters with WLAs that are near effluent concentrations are evaluated for limits.

The VPDES Permit Regulation at 9VAC25-31-230.D requires that monthly and weekly average limitations be imposed for continuous discharges from POTWs and monthly average and daily maximum limitations be imposed for all other continuous non-POTW discharges.

1) **Ammonia as N (November – March):**
Staff evaluated new effluent data collected from the 40 MGD facility from July 1, 2011 through December 31, 2012 and has concluded it is not significantly different than what was used to derive the existing ammonia limits (**Attachment 10**). Recalculation of ammonia limits using a weekly sampling frequency in accordance with DEQ Guidance for sewage treatment plants >2.0 MGD, results in a monthly average of 4.7 mg/L and a weekly average of 6.7 mg/L. In accordance with the antibacksliding provisions of the Clean Water Act, the existing monthly average of 3.5 mg/L and a weekly average of 4.2 mg/L for ammonia for the November through March period shall continue in the reissued permit.

2) **Total Residual Chlorine (TRC):**
Chlorine is used for disinfection and is potentially in the discharge. Staff calculated WLAs for TRC using current critical flows. In accordance with current DEQ guidance, staff used a default data point of 0.2 mg/L and the calculated WLAs to derive limits. A monthly average of 0.007 mg/L and a weekly average limit of 0.007 mg/L are proposed for this discharge.

3) **Metals/Organics:**
No limits are needed for metals or organics. Quarterly monitoring for total recoverable copper was required in the 2008 permit reissuance. Annual monitoring for total recoverable copper shall be required during the February through March period due to the discharge of chiller water from the Pentagon to the Arlington County WPCP.

Molybdenum monitoring is not required; there are no water quality standards for this pollutant, and the levels in the sludge samples are satisfactory. Monitoring for dichloromethane (WLA_h = 5,900 µg/L), bromodichloromethane (WLA_h = 130 µg/L), and chloroform (WLA_h = 11,000 µg/L) is not required because these pollutants were found at levels far below their respective human health standards. Bis(2-ethylhexyl)phthalate was detected at 56.5 µg/L in a November 2010 sampling event (WLA_h = 22 µg/L). However, subsequent sampling events conducted in 2011 and 2012 (after the treatment plant upgrade) were less than the human health criteria or QL. Therefore, monitoring for bis(2-ethylhexyl)phthalate shall not be required in the permit.

Quarterly monitoring for tetrachloroethylene was present in the 2008 permit reissuance. However, since tetrachloroethylene was not detected in any sampling events from the fourth quarter of 2008 to the first quarter of 2013, the monitoring requirement has been removed from the permit.

See **Attachment 11** for derivation of the limits.

4) **Effluent Limitations Policy for the Potomac River Embayments:**
The Potomac Embayment Standards (PES) include monthly average effluent limits that apply to all sewage treatment plants. The Policy for the Potomac River Embayments states in part that "the above limitations shall not replace or exclude the discharge from meeting the requirements of the State's Water Quality Standards (9 VAC 25-260-10 et seq.)." Section 27 of this fact sheet discusses this policy in detail. Table 7 below outlines the PES limits.

TABLE 7 – POLICY FOR THE POTOMAC RIVER EMBAYMENT LIMITATIONS	
Parameter	**Monthly Average (mg/L)**
$CBOD_5$	5
Total Suspended Solids	6
Total Phosphorus	0.18
NH_3 (Apr 1 – Oct 31)	1

d) Effluent Limitations and Monitoring, Outfall 001 – Conventional and Non-Conventional Pollutants
No changes to dissolved oxygen (D.O.), carbonaceous biochemical oxygen demand-5 day ($CBOD_5$), total suspended solids (TSS), total kjeldahl nitrogen (TKN), and pH limitations are proposed.

e) Effluent Annual Average Limitations and Monitoring, Outfall 001 – Nutrients
VPDES Regulation 9VAC25-31-220(D) requires effluent limitations that are protective of both the numerical and narrative water quality standards for state waters, including the Chesapeake Bay.

As discussed in Section 15, significant portions of the Chesapeake Bay and its tributaries are listed as impaired with nutrient enrichment cited as one of the primary causes. Virginia has committed to protecting and restoring the Bay and its tributaries. Only concentration limits are now found in the individual VPDES permit when the facility installs nutrient removal technology. The basis for the concentration limits is 9VAC25-40-70 - *Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed* which requires new or expanding discharges with design flows of ≥0.04 MGD to treat for TN and TP to either BNR levels (TN = 8 mg/L; TP = 1.0 mg/L) or SOA levels (TN = 3.0 mg/L and TP = 0.3 mg/L).

This facility has also obtained coverage under 9VAC25-820 *General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia.* This regulation specifies and controls the nitrogen and phosphorus loadings from facilities and specifies facilities that must register under the general permit. Nutrient loadings for those facilities registered under the general permit as well as compliance schedules and other permit requirements, shall be authorized, monitored, limited, and otherwise regulated under the general permit and not this individual permit. This facility has coverage under this General Permit; the permit number is VAN010021. Total Nitrogen (TP) Annual Loads and Total Phosphorus (TP) Annual Loads from this facility are found in 9VAC25-720 – *Water Quality Management Plan Regulation,* which sets forth TN and TP maximum wasteload allocations for facilities designated as significant discharges (i.e., those with design flows of ≥0.5 MGD above the fall line and ≥0.1 MGD below the fall line).

Monitoring for Nitrates + Nitrites, Total Kjeldahl Nitrogen, TN, and TP are included in this permit. The monitoring is needed to protect the Water Quality Standards of the Chesapeake Bay. Monitoring frequencies are set at the frequencies set forth in 9VAC25-820. Annual average TN effluent limitations and monthly and year-to-date calculations for TN are included in this individual permit. The TN annual average is based on the technology installed as part of the WQIF grant funding.

No TP annual average limits are included in this permit reissuance since the facility has monthly average and weekly average concentration limits in place for local water quality. Additionally, the Policy for the Potomac River Embayments (PPRE) suggests water quality modeling may be required if staff believed the PPRE limits may not be sufficient to protect the receiving waters.

f) Effluent Limitations and Monitoring Summary.

The effluent limitations are presented in the tables that follow. Limits have been established for $CBOD_5$, TSS, ammonia, pH, D.O., Total Phosphorus, Total Nitrogen, *E. coli,* and TRC. Monitoring is included for Nitrates + Nitrites, TKN, and total recoverable copper.

1) $CBOD_5$, TSS, phosphorus, and ammonia (April -- October) limits are based on the Policy for Potomac River Embayments (9 VAC 25-415-10 et seq.) and an approved TMDL (see Part 15.b.of this fact sheet).

2) The limits for ammonia (November – March and April – October weekly average) and *E. coli* are based on the Virginia Water Quality Standards (9 VAC 25-260-170), Title 21 of the District of Columbia Municipal Regulations, Section 11,Water Quality Standards, and an approved TMDL (see Part 15.b of this fact sheet).

3) The limits for pH are based on based on Title 21 of the District of Columbia Municipal Regulations, Section 11,Water Quality Standards.

4) The limits for TRC are based on both the Virginia Water Quality Standards (9VAC 25-260-170) and Title 21 of the District of Columbia Municipal Regulations, Section 11,Water Quality Standards.

5) The limits for D.O. are based on 1988 modeling by the Northern Virginia Planning District Commission (NVPDC) conducted in conjunction with the Policy for the Potomac Embayments and an approved TMDL (see Part 15.b of this fact sheet).

The mass loading (kg/d) for monthly and weekly averages were calculated by multiplying the concentration values (mg/L), with the flow values (in MGD) and a conversion factor of 3.785.

The mass loading (lb/d) for TP monthly and weekly averages were calculated by multiplying the concentration values (mg/L), with the flow values (in MGD) and a conversion factor of 8.345.

Sample Type and Frequency are in accordance with the recommendations in the VPDES Permit Manual.

The VPDES Permit Regulation at 9VAC25-31-30 and 40 CFR Part 133 require that the facility achieve at least 85% removal for BOD/CBOD and TSS (or 65% for equivalent to secondary). The limits in this permit are water-quality-based effluent limits and result in greater than 85% removal.

18. **Antibacksliding:**

All limits in this permit are at least as stringent as those previously established. Backsliding does not apply to this reissuance.

19. Effluent Limitations/Monitoring Requirements:

Design flow is 40 MGD.

Effective Dates: During the period beginning with the permit's effective date and lasting until the expiration date.

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
		Monthly Average	Weekly Average	Minimum	Maximum	Frequency	Sample Type
Flow (MGD)	NA	NL	NA	NA	NL	Continuous	TIRE
pH	1	NA	NA	6.0 S.U.	8.5 S.U.	1/D	Grab
$CBOD_5$	2	5 mg/L 800 kg/day	8 mg/L 1000 kg/day	NA	NA	1/D	24H-C
Total Suspended Solids (TSS)	2	6.0 mg/L 910 kg/day	9.0 mg/L 1400 kg/day	NA	NA	1/D	24H-C
Dissolved Oxygen (D.O.)	1,3,5	NA	NA	6.0 mg/L	NA	1/D	Grab
Total Kjeldahl Nitrogen (TKN)	1,3,4,6	NL (mg/L)	NL (mg/L)	NA	NA	1/W	24H-C
Ammonia, as N (Apr - Oct)	2	1.0 mg/L 150 kg/day	2.7 mg/L 410 kg/day	NA	NA	1/D	24H-C
Ammonia as N (Nov – Mar)	1,4	3.5 mg/L	4.2 mg/L	NA	NA	1/W	24H-C
E. coli (Geometric Mean) [a]	1,3,4	126 n/100mls	NA	NA	NA	5D/W	Grab
Total Residual Chlorine (after contact tank) [b]	7	NA	NA	0.5 mg/L	NA	1/ 2 hrs	Grab
Total Residual Chlorine (after dechlorination)	1,4	0.007 mg/L	0.007 mg/L	NA	NA	1/ 2 hrs	Grab
Nitrate+Nitrite, as N	3,5	NL mg/L	NA	NA	NA	1/W	24H-C
Total Nitrogen [c]	1,3,4,6	NL mg/L	NA	NA	NA	1/W	Calculated
Total Nitrogen – Year to Date [d]	1,3,4,6	NL mg/L	NA	NA	NA	1/M	Calculated
Total Nitrogen - Calendar Year [d]	1,3,4,6	3.0 mg/L	NA	NA	NA	1/Y	Calculated
Total Phosphorus	1,2,3,4,6	0.18 mg/L 60 lb/day	0.27 mg/L 90 lb/day	NA	NA	1/D	24H-C
Total Recoverable Copper (Feb – Mar)	1,4	NL mg/L	NL mg/L	NA	NA	1/Y	Grab
Chronic Toxicity – *C. dubia* (TU_c)	NA	NA	NA	NA	NL	1/Y	24H-C
Chronic Toxicity – *P. promelas* (TU_c)	NA	NA	NA	NA	NL	1/Y	24H-C

The basis for the limitations codes are:

1. D.C. Water Quality Standards (Oct 1, 2010)
2. Policy for the Potomac River Embayments (9 VAC 25-425-10 et seq.)
3. Approved TMDLs (See Part 15 b) of Fact Sheet)
4. VA Water Quality Standards (Jan 6, 2011)
5. NVPDC Modeling
6. 9 VAC 25-40-70 and 9 VAC 820-10 (Nutrient Regulations)
7. Disinfection Design Requirements

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
TIRE = Totalizing, indicating, and recording equipment.
S.U. = Standard units.

1/D = Once every day.
1/W = Once every week
5D/W = Five days a week.
1/ 2 hrs = Once every two hours.
1/M = Once every month.
1/Y = Once every year.

24H-C = A flow proportional composite sample collected manually or automatically and discretely or continuously for the entire discharge of the monitored 24-hour period. Where discrete sampling is employed, the permittee shall collect a minimum of twenty-four (24) aliquots for compositing. Discrete sampling may be flow proportioned either by varying the time interval between each aliquot or the volume of each aliquot. Time composite samples consisting of a minimum of twenty-four (24) grab samples obtained at hourly or smaller intervals may be collected where the permittee demonstrates that the discharge flow rate (gallons per minute) does not vary by 10% or more during the monitored discharge.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

a. Samples shall be collected between 10:00 a.m. and 4:00 p.m.

b. See Part I.B.1 of the permit for limitations and monitoring information.

c. Total Nitrogen = Sum of TKN plus Nitrate+Nitrite.

d. See Part I.B.4 of the permit for nutrient reporting calculations.

20. Other Permit Requirements:

a) Part I.B. of the permit contains additional chlorine monitoring requirements, quantification levels and compliance reporting instructions.
In accordance with Virginia Sewage Collection and Treatment Regulations at 9VAC25-790, a minimum total residual chlorine (TRC) residual must be maintained at the exit of the chlorine contact tank to assure adequate disinfection. No more that 10% of the monthly test results for TRC at the exit of the chlorine contact tank shall be <1.0 mg/L with any TRC value <0.6 mg/L considered a system failure. Variance from these requirements are allowed where the discharger provides adequate indicator microorganism test results for the effluent that verify disinfection standards were met during the TRC violations. *E. coli* limits are defined in this section as well as monitoring requirements to take effect should an alternate means of disinfection be used. The Arlington County WPCP has been allowed a minimum chlorine contact value of 0.5 mg/L at 40 MGD of flow since *E. coli* values are less than or equal to 126/100 ml when that level of TRC is present after the chlorine contact tank (see **Attachment 12**, Chlorine Reduction Study approved by DEQ on September 13, 2011). The permit does not allow for a level of chlorine below 0.2 mg/L to leave the chlorine contact tank.

If it is found that the level of chlorine feed established in the Chlorine Reduction Study is not adequate as shown by violation of the monthly average for *E. coli* (see Part I.B.1.f of the VPDES permit), the chlorine disinfection requirements shall be changed to of a minimum of 1.0 mg/L of total residual chlorine with 36 exceptions and no total residual chlorine sample below 0.6 mg/L until it can be demonstrated those that adequate disinfection can occur using a lower level of chlorine.

9VAC25-31-190.L.4.c. requires an arithmetic mean for measurement averaging and 9VAC25-31-220.D requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Specific analytical methodologies for toxics are listed in this permit section as well as quantification levels (QLs) necessary to demonstrate compliance with applicable permit limitations or for use in future evaluations to determine if the pollutant has reasonable potential to cause or contribute to a violation. Required averaging methodologies are also specified.

The calculations for the Nitrogen and Phosphorus parameters shall be in accordance with the calculations set forth in 9VAC25-820 *General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia.* §62.1-44.19:13 of the Code of Virginia defines how annual nutrient loads are to be calculated; this is carried forward in 9VAC25-820-70. As annual concentrations (as opposed to loads) are limited in the individual permit, these reporting calculations are intended to reconcile the reporting calculations between the permit programs, as the permittee is collecting a single set of samples for the purpose of ascertaining compliance with two permits.

b) Permit Section Part I.C. details the requirements of a Pretreatment Program.
The VPDES Permit Regulation at 9VAC25-31-210 requires monitoring and 9VAC25-31-220.D requires all discharges to protect water quality. The VPDES Permit Regulation at 9VAC25-31-730 through 900., and the Federal Pretreatment Regulation at 40 CFR Part 403 requires POTWs with a design flow of >5.0 MGD and receiving from Industrial Users (IUs) pollutants which pass through or interfere with the operation of the POTW or are otherwise subject to pretreatment standards to develop a pretreatment program.

This treatment works is a POTW with a design capacity of 40 MGD. The Pretreatment Program was originally approved on February 15, 1984, with subsequent substantial modifications shown in Table 8 below:

TABLE 8 – MODIFICATIONS TO THE PRETREATMENT PROGRAM	
Modification Date	**Modification**
February 23, 1994	Revision of the legal authority/ordinance for Arlington County and adoption of technically-based local limits and a permit boilerplate.
January 11, 1995	Incorporation of Interjurisdictional Agreements with Alexandria Renew Enterprises (formerly know of Alexandria Sanitation Authority) and Fairfax County, Sewer Use Ordinance revisions, and the adoption of an Enforcement Response Plan.
November 11, 1995	Revision of the county's legal authority to resolve inconsistencies between the Sewer Use Ordinance and the program, adjustment of the existing fee schedule for pretreatment dischargers, and adoption of a nonsubstantial program modification that reorganized wastewater permits into two classes--Group 1 and 2 [Significant Industrial Users (SIUs) and minor permits].
June 6, 2000	Revision of local limits that were calculated using current influent, effluent, and sludge monitoring data and changes to the wastewater treatment process.
December 29, 2009	Revision of the local limits was approved by DEQ.
March 2, 2012	DEQ approval included revisions to the Sewer Use Ordinance (incorporation of the EPA 2006 Pretreatment Streamlining Rule), the Enforcement Response Plan, and the Pretreatment Procedures. The Pretreatment Procedures were updated to include changes to the permit application boilerplate, boilerplate permit, survey form, changes in plant processes, the sampling and monitoring plan, the procedure for developing local limits, the procedure for handling enforcement actions, the resources outline, the City of Falls Church Interjurisdictional Agreement, minor permit procedures, and the permit fees.

All SIUs in Arlington County are non-categorical. SIU classification is based upon those facilities that have the potential to impact the POTW. Table 9 below lists the SIUs currently discharging to the Arlington County WPCP.

TABLE 9 – SIGNIFICANT INDUSTRIAL USERS THAT DISCHARGE TO THE ARLINGTON COUNTY WPCP			
Facility	**Permit No.**	**Effective Date**	**Expiration Date**
Virginia Hospital Center	0995.1	10/01/2010	09/30/2014
Reagan Washington National Airport	0788.2	01/01/2000	12/31/2013

In addition to issuing permits to SIUs, Arlington County also issues Group 2 minor permits that are generally remediation permits. There is current an active permit for Pershing Auto Care (B-0402.1) that was issued on May 1, 2010 and expires on April 30, 2014. The permit requires monitoring for total petroleum hydrocarbons and benzene.

The pretreatment program conditions in the proposed permit reissuance will include: implementation of the approved pretreatment program that complies with the Clean Water Act, State Water Control Law, state regulations, and the approved program.

c) Permit Section Part I.D., details the requirements for Whole Effluent Toxicity (WET) Program.
The VPDES Permit Regulation at 9VAC25-31-210 requires monitoring and 9VAC25-31-220.I, requires limitations in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act. A WET Program is imposed for municipal facilities with a design rate >1.0 MGD; with an approved pretreatment program or required to develop a pretreatment program; or those determined by the Board to need a program based on effluent variability, compliance history, IWC, and receiving stream characteristics. The Arlington County WPCP meets two of the criteria for a WET Program: 1) it is a Publicly Owned Treatment Works (POTW) with a design flow > 1.0 MGD and 2) it is a POTW with a pretreatment program.

During the previous permit cycle, three annual chronic tests and five quarterly chronic tests were conducted using both *Ceriodaphnia dubia* and *Pimephales promelas*. A WET test for *Ceriodaphnia dubia* conducted on May 15, 2012 yielded 40% survival and a TU_c result of 4. A retest conducted during the same quarter on June 13, 2012 passed all decision criteria.

Since the June 13, 2012 retest and all other testing conducted during the previous permit cycle has passed all decision criteria, the permittee will monitor chronic toxicity annually during the term of this permit reissuance using *Ceriodaphnia dubia* and *Pimephales promelas*. If the effluent is found to be toxic, a toxicity reduction evaluation (TRE) will be required and a whole effluent toxicity (WET) limit will be imposed unless the TRE has successfully identified the chemical(s) causing the toxicity. In that case, a chemical specific limit will be used in lieu of the WET limit. Sampling and reporting procedures are outlined in Part I.E of the permit.

The discharge area for Outfall 001 has tidal influence and is effluent dominated. Dilution will not be used in this permit to determine the WLAc for toxic parameters and the NOEC criteria for toxicity monitoring.

d) Permit Section Part 1.E. details requirements of the Sewage Sludge Management Plan, Sludge Monitoring and Additional Reporting Requirements.

1) **Regulations:**
Part VI of the VPDES Permit Regulation at 9VAC25-31-420--720 has incorporated technical standards for the use or disposal of sewage sludge, specifically land application and surface disposal, promulgated under 40 CFR Part 503.

The Permit Regulation at9VAC25-31-420 also establishes the standards for the use or disposal of sewage sludge. This part establishes standards that consist of general requirements, pollutant limits, management practices, and operational standards for the final use or disposal of sewage sludge generated during the treatment of domestic sewage in the treatment works.

2) **Evaluations:**
Sludge Classification
The Arlington County WPCP is considered as Class I sludge management facility. The permit regulation at 9VAC25-31-500 defines a Class I sludge management facility as any POTW that is required to have an approved pretreatment program defined under Part VII of the VPDES Permit Regulation at 9VAC25-31-730 to 900 and/or any treatment works treating domestic sewage sludge that has been classified as a Class I facility by the Board because of the potential for its sewage sludge use or disposal practice to adversely affect public health and the environment.

Sludge Pollutant Concentration

The average pollutant concentrations from sewage sludge analyses provided as part of the Arlington County WPCP application for the permit reissuance are presented in Table 8. The analysis results are from samples collected during the period from July 2008 through September 2012.

TABLE 10 – ARLINGTON COUNTY WPCP RESULTS		
Pollutant	**Average Concentration (mg/kg dry weight)**	**Sample Type**
Arsenic	2.55	Composite
Cadmium	0.85	Composite
Copper	153.74	Composite
Lead	27.28	Composite
Mercury	0.64	Composite
Molybdenum	7.59	Composite
Nickel	9.35	Composite
Selenium	1.80	Composite
Zinc	375.55	Composite

All sewage sludge applied to the land must meet the ceiling concentration for the pollutants listed in Table 11 and also meet either the pollutant concentration limits, the cumulative pollutant loading rate limits, or the annual pollutant loading rate limits listed in Table 11.

Cumulative pollutant loading limits or annual pollutant loading limits may be applied to sewage sludge exceeding pollutant concentration limits but meeting the ceiling concentrations depending upon the levels of treatment achieved and the form (bulk or bag) of sludge applied. It should be noted that ceiling concentration limits are instantaneous values and pollutant concentration limits are monthly average values. Calculations of cumulative pollutant loading should be based on the monthly average values and the annual whole sludge application rate.

TABLE 11 – SEWAGE SLUDGE POLLUTANT LIMITS				
Pollutant	**Ceiling Concentration Limits for All Sewage Sludge Applied to Land (mg/kg)***	**Pollutant Concentration Limits for EQ and PC Sewage Sludge (mg/kg)***	**Cumulative Pollutant Loading Rate Limits for CPLR Sewage Sludge (kg/hectare)**	**Annual Pollutant Rate Limits for APLR Sewage Sludge (kg/hectare/356 day period)****
Arsenic	75	41	41	2.0
Cadmium	85	39	39	1.9
Copper	4,300	1500	1500	75
Lead	840	300	300	15
Mercury	57	17	17	0.85
Molybdenum	75	---	---	---
Nickel	420	420	420	21
Selenium	100	100	100	5.0
Zinc	7,500	2,800	2,800	140
Applies to:	All sewage sludge that is land applied	Bulk sewage sludge and bagged sewage sludge	Bulk sewage sludge	Bagged sewage
Per VPDES Permit Reg. Part VI	Table 1 9VAC 25-31-540	Table 3 9VAC 25-31-540	Table 2 9VAC 25-31-540	Table 4 9VAC 25-31-540

*Dry-weight basis

**Bagged sewage sludge is sold or given away in a bag or other container.

Comparison of Table 10 and Table 11 data shows metal concentrations are significantly below the ceiling concentration and PC limits.

3) **Options for Meeting Land Application:**
There are four equally safe options for meeting land application requirements. The options include the Exceptional Quality (EQ) option, the Pollutant Concentration (PC) option, the Cumulative Pollutant Loading Rate (CPLR) option, and the Annual Pollutant Loading Rate (APLR) option.

Pollutant Concentration (PC) is the type of sludge that may only be applied in bulk and is subject to general requirements and management practices; however, tracking of pollutant loadings to the land is not required. The sludge from the Arlington County WPCP is considered PC sewage sludge for the following reasons:

a. The bulk sewage sludge from the Arlington County WPCP meets the PC limits in Table 1 of the VPDES Permit Regulation Part VI, 9 VAC 25-31-540.

b. The VPDES Permit Regulation, Part VI, Subpart D, 9VAC25-31-690 through 720 establishes the requirements for pathogen reduction in sewage sludge. The Arlington County WPCP is considered to produce a Class B sludge in accordance with the VPDES Permit Regulation at 9VAC25-31-710.B.2., Class B--Alternative 2. Alternative 2 defines Class B sludge as sewage sludge that is used or disposed that has been treated in a process that is equivalent to a Process to Significantly Reduce Pathogens (PSRP) as described in 9VAC25-31-710.D of the VPDES Permit Regulation.

The Arlington County WPCP treats sludge using a lime stabilization process to reduce pathogens in accordance with the requirements of 9 VAC 25-31-710.D.5 of the VPDES Permit Regulation.

c. The VPDES Permit Regulation, Part VI, Subpart D, 9VAC25-31-690 through 720 also establishes the requirements for Vector Attraction Reduction action in sewage sludge. Based on the information supplied with the VPDES Sludge Application, the Arlington County WPCP meets the requirements for Vector Attraction Reduction as defined by 9 VAC 25-31-720.B.6 of the VPDES Permit Regulation: Lime stabilization is used to raise the pH to 12 or higher for 2 hours and then at 11.5 or higher for 22 hours.

4) **Parameters to be Monitored:**
In order to assure the sludge quality, the following parameters require monitoring: arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc.

In order to ensure that proper nutrient management and pH management practices are employed, the following parameters shall be monitored: pH, total kjeldahl nitrogen, ammonia nitrogen, nitrate nitrogen, total phosphorus, total potassium, and alkalinity (lime treated sludge should be analyzed for percent calcium carbonate equivalence). The nutrient and pH monitoring requirements apply only if the permittee land applies their own sludge. Since the Arlington County WPCP has contracted biosolids land application responsibilities to Synagro Mid-Altlantic, Inc., they are not required to monitor for nutrients, pH, total potassium, and alkalinity.

Soil monitoring in conjunction with soil productivity information is critical (especially for frequent applications) to making sound biosolids application decisions from both an environmental and an agronomic standpoint. Since the Arlington County WPCP has contracted the land application responsibilities to Synagro Mid-Altlantic, Inc., they are not required to perform soil monitoring.

5) **Monitoring Frequency:**
The total dry metric tons of sludge generated at the Arlington County WPCP in calendar year 2012 was 11,794. Per 9VAC 25-31-660.A. of the VPDES Permit Regulation, the monitoring frequency for sludge to be land applied is once per every two months (6 times per year) for facilities that produce equal to or greater than 1,500 but less than 15,000 metric tons per 365 days. This monitoring frequency is required by this permit reissuance. The frequency of monitoring may be increased during the permit cycle if DEQ deems it necessary.

6) **Sampling:**
Representative sampling is an important aspect of monitoring. Because the pollutant limits pertain to the quality of the final sewage sludge applied to the land, samples must be collected after the last treatment process prior to land application (i.e., from the bed of the truck before it leaves the treatment plant). Composite samples should be required for all samplings from this facility with the exception of pH.

7) **Sludge Management Plan (SMP):**
Submittal of a SMP is required as part of the VPDES permit application. The VPDES Sewage Sludge Permit Application Form and its attachments constitute the initial stage of the applicant's SMP. In order to ensure adequate holding time and representative sampling, a detailed sludge monitoring plan must be submitted within 90 days of the permit reissuance. The permittee shall conduct all sewage sludge use or disposal activities in accordance with the SMP. Any proposed changes in the sewage sludge use or disposal practices or procedures followed by the permittee shall be documented and submitted to DEQ for review and approval no less than 90 days prior to the effective date of the changes.

Upon approval, the SMP becomes an enforceable part of the permit. The permit may be modified or alternatively revoked and reissued to incorporate limitations/conditions necessitated by substantial changes in sewage sludge use or disposal practices.

8) **Reporting Requirements:**
Per 9VAC25-31-680 of the VPDES Permit Regulation and 40 CFR Part 503, the Arlington County WPCP is required to provide the results of all monitoring performed in accordance with Part I.A.2 of the VPDES permit and information on management practices and appropriate certifications to DEQ-NRO no later than February 19th of each year. Each report must document the previous calendar year's activities.

This reporting requirement is for POTWs with a design flow rate equal to or greater than 1.0 MGD (majors), POTWs that serve a population of 10,000 or greater, and Class I sludge management facilities. The Arlington County WPCP shall use the Discharge Monitoring Report (DMR) forms as part of the annual report. The generators who land apply sewage sludge are responsible for submitting additional information required by 9VAC 25-31-590 (i.e., appropriate certification statements, descriptions of how pathogen and vector attraction reduction requirements are met, descriptions of how the management practices are being met, and descriptions of how site restrictions are being met).

9) **Record Keeping:**
This special condition outlines record retention requirements for sludge meeting Class B pathogen reduction and vector attraction reduction alternative 1-10. Table 12 presents the record keeping requirements.

TABLE 12 – RECORD KEEPING FOR PC SLUDGE	
1	Pollutant concentrations of each pollutant in Part I.A.2. of the permit;
2	Description of how the pathogen reduction requirement in Part I.A.2. of the permit are met;
3	Description of how the vector attraction requirements in Part I.A.2. of the permit are met;
4	Description of how the management practice specified in the approved Sludge Management Plan and/or the permit are met;
5	Description of how the site restriction specified in the Sludge Management Plan and/or the permit are met;
6	Certification statement in Part I.E.2.f. of the permit.

10) **Sludge Reopener:**
The Board may promptly modify or revoke and reissue this permit if any applicable standard for sewage sludge use or disposal promulgated under Section 405(d) of the Clean Water Act is more stringent than any requirements for sludge use or disposal in this permit, or controls a pollutant or practice not limited in this permit.

TABLE 13 – SEWAGE SLUDGE ANNUAL PRODUCTION MONITORING

Effective Dates: During the period beginning with the permit's effective date and lasting until the permit's expiration date, the permittee is authorized to manage sewage sludge according to the approved SMP. The pollutants in sewage sludge and land application sites shall be limited and monitored by the permittee as specifie on form SP1 of the Discharge Monitoring Report (DMR) in accordance with Part I.A.2 of the permit.

MONITORING/RECORDING REQUIREMENT	BASIS FOR LIMITS	FREQUENCY	METHOD OF ANALYSIS
Annual Sludge Production (Dry Metric Tons per Year)	1,2	Once/Year	Measured/Calculated
Annual Sludge Land Applied (Dry Metric Tons per Year)	1,2	Once/Year	Measured/Calculated

The basis for the limits codes are:

1. 9VAC25-31-420--720
2. 40 CFR Part 503

TABLE 14 – SEWAGE SLUDGE CHEMICAL LIMITATIONS AND MONITORING REQUIREMENTS

Effective Dates: During the period beginning with the permit's effective date and lasting until the permit's expiration date, the permittee is authorized to manage sewage sludge according to the approved SMP. The pollutants in sewage sludge and land application sites shall be limited and monitored by the permittee as specified below and reported in accordance with Part I.A.2 of the permit. Form S01 of the DMR must be completed each time sludge is land applied. Analysis must be based on a representative sample of the Arlington County WPCP sludge that is being land applied.

SLUDGE CHARACTERISTICS	BASIS FOR LIMITATIONS	LIMITATIONS		MONITORING REQUIREMENTS	
		CEILING CONCENTRATION MAX (mg/kg)	MONTHLY AVG (mg/kg)	FREQUENCY	SAMPLE TYPE
Percent Solids (%)	9VAC 25-31-540	NA	NL	1/2M	Composite
Total Arsenic	9VAC 25-31-540	75	41	1/2M	Composite
Total Cadmium	9VAC 25-31-540	85	39	1/2M	Composite
Total Copper	9VAC 25-31-540	4300	1500	1/2M	Composite
Total Lead	9VAC 25-31-540	840	300	1/2M	Composite
Total Mercury	9VAC 25-31-540	57	17	1/2M	Composite
Total Molybdenum	9VAC 25-31-540	75	NA	1/2M	Composite
Total Nickel	9VAC 25-31-540	420	420	1/2M	Composite
Total Selenium	9VAC 25-31-540	100	100	1/2M	Composite
Total Zinc	9VAC 25-31-540	7,500	2,800	1/2M	Composite
pH (25°C)	NA	NL	Per SMP	1/2M	Grab
Level of Pathogen Requirements Achieved		The approved SMP Indicates that Class B Sludge is produced when the current level of treatment is used. When this type of treatment is used, a number 2 should be reported on the DMR under item 688 (2).			
Pathogen Alternative Used		The approved SMP indicates that Alternative 2, lime stabilization, is used. This is represented by a number 2 on the DMR under item 689 (2).			
Vector Attraction Reduction Alternative Used		The approved SMP indicates that Option 6, raising sludge pH under specified conditions, is used for Vector Attraction Reduction. This is represented by a number 6 on the DMR under item 690 (6).			

NL = No limitation, monitoring required. NA = Not Applicable 1 /2M = Once every two months.

(1) Dry weight basis unless otherwise stated.

(2) Pathogen Reduction. (Class B, Alternative 2 – Lime Stabilization): Sewage sludge is treated through raising the pH of the sludge to 12 S.U. for at least two hours. . If time and pH conditions cannot be met, fecal coliform testing can be conducted in accordance with 9VAC25-31-710.B.2.b of the VPDES Permit Regulation to prove that adequate pathogen reduction has been achieved. Land application of the sludge cannot occur until the results of the fecal coliform testing are received. The permittee shall adequately perform monitoring and maintain bench sheets to ensure that the required pH and holding time are met. Copies of the bench sheets shall be submitted with annual reports for sludge analysis.

(3) Vector Attraction Reduction, Option 6 – (Raising Sludge pH Under Specified Conditions): As stated in 9 VAC 25-31-720.B.6, the pH of the sewage sludge is to be raised to 12 S.U. or higher and maintained at 11.5 S.U. – 12 S.U. for at least 22 hours without the addition of more alkaline material. The permittee shall adequately monitor the sludge pH and holding time to ensure that the required reduction is being achieved. Copies of the bench sheet shall be submitted with annual reports for sludge analysis.

(4) All sampling shall be collected and analyzed in accordance with the approved Operations and Maintenance (O&M) Manual, SMP, and the current VPDES permit.

21. Other Special Conditions:

a) 95% Capacity Reopener. The VPDES Permit Regulation at 9VAC25-31-200.B.4 requires all POTWs and PVOTWs develop and submit a plan of action to DEQ when the monthly average influent flow to their sewage treatment plant reaches 95% or more of the design capacity authorized in the permit for each month of any three consecutive month period. This facility is a POTW.

b) Indirect Dischargers. Required by VPDES Permit Regulation, 9VAC25-31-200 B.1 and B.2 for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

c) O&M Manual Requirement. Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9VAC25-790; VPDES Permit Regulation, 9VAC25-31-190.E. The permittee shall maintain a current Operations and Maintenance (O&M) Manual. The permittee shall operate the treatment works in accordance with the O&M Manual and shall make the O&M Manual available to Department personnel for review upon request. Any changes in the practices and procedures followed by the permittee shall be documented in the O&M Manual within 90 days of the effective date of the changes. Non-compliance with the O&M Manual shall be deemed a violation of the permit.

d) CTC, CTO Requirement. The Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9VAC25-790 requires that all treatment works treating wastewater obtain a Certificate to Construct prior to commencing construction and to obtain a Certificate to Operate prior to commencing operation of the treatment works.

e) Licensed Operator Requirement. The Code of Virginia at §54.1-2300 et seq. and the VPDES Permit Regulation at 9VAC25-31-200 C, and Rules and Regulations for Waterworks and Wastewater Works Operators (18VAC160-20-10 et seq.) requires licensure of operators. This facility requires a Class I operator.

f) Reliability Class. The Sewage Collection and Treatment Regulations at 9VAC25-790 require sewage treatment works to achieve a certain level of reliability in order to protect water quality and public health consequences in the event of component or system failure. Reliability means a measure of the ability of the treatment works to perform its designated function without failure or interruption of service. The facility is required to meet a Reliability Class of I.

g) Water Quality Criteria Reopener. The VPDES Permit Regulation at 9VAC25-31-220 D. requires establishment of effluent limitations to ensure attainment/maintenance of receiving stream water quality criteria. Should effluent monitoring indicate the need for any water quality-based limitations, this permit may be modified or alternatively revoked and reissued to incorporate appropriate limitations.

h) E3/E4. 9VAC25-40-70 B authorizes DEQ to approve an alternate compliance method to the technology-based effluent concentration limitations as required by subsection A of this section. Such alternate compliance method shall be incorporated into the permit of an Exemplary Environmental Enterprise (E3) facility or an Extraordinary Environmental Enterprise (E4) facility to allow the suspension of applicable technology-based effluent concentration limitations during the period the E3 or E4 facility has a fully implemented environmental management system that includes operation of installed nutrient removal technologies at the treatment efficiency levels for which they were designed.

i) Bypass Point Sources. The VPDES Permit Regulation at 9VAC 25-31-190 states that the permittee may allow any bypass to occur that does not cause effluent limitations to be exceeded if it is for essential maintenance to assure efficient operation. The permittee is not authorized to discharge from any location except Outfall 001 except as provided for in 9 VAC 25-31-190 and Part II.U of this permit. The permittee shall notify the Alexandria and Arlington Health Departments and DEQ of each external bypass event as soon as possible but in no case more than 24 hours after the initial discharge enters Four Mile Run. Written record of notification shall be submitted to DEQ-NRO within five days of each event.

j) Nutrient Reopener. 9VAC25-40-70 A authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade. 9VAC25-31-390 A authorizes DEQ to modify VPDES permits to promulgate amended water quality standards.

k) PCB Pollutant Minimization Plan. This special condition requires the permittee, upon notification from DEQ-NRO, to submit a Pollutant Minimization Plan (PMP) to identify known and unknown sources of low-level PCBs in the effluent. This special condition details the contents of the PMP and also requires an annual report on progress to identify sources.

j) Final Effluent Monitoring Alternative. 9 VAC 25-31-30 Federal Effluent Guidelines incorporates by reference Secondary Treatment 40 CFR Part 133 (1999). 40 CFR Part 133.104 permits the substitution of chemical oxygen demand (COD) or total organic carbon (TOC) for BOD_5 when a long-term BOD_5: COD or BOD_5: TOC correlation has been demonstrated. This special condition allows the permittee to develop a facility- specific correlation between $cBOD_5$ and COD for final effluent compliance monitoring.

The permittee may submit to DEQ for review and approval a plan of study prior to the start of the study. The plan shall include: method of analysis for COD or TOC, QA/QC procedures for the method, time frame for the study, number of samples to be analyzed to establish the correlation, the statistical methods for determining the correlation, and the method of validating the established correlation.

Once the study is completed and a correlation is established the data, QA/QC information, and correlation calculations are to be submitted to DEQ for review and approval. Upon DEQ's approval of the results, the correlation shall be used to calculate monthly average and weekly average COD or TOC effluent limits and monitoring for COD or TOC will be once per day and sampling will be 24 hour composites. Monitoring for $cBOD_5$ shall be reduced to once per week for the remaining term of the permit. COD or TOC results shall be reported in accordance with Part II.C.

The facility shall be required to validate the established correlation outlined in the plan of study and report the validation with the monthly DMR. A summary of the validation data shall also be submitted with the permit application. If the facility fails to submit the summary validation data, the permittee will have to complete a new study for review and approval by DEQ and also return to $cBOD_5$ final effluent monitoring at the frequency required by the permit prior to beginning COD or TOC monitoring.

This special condition also allows the facility to cease COD or TOC final effluent monitoring and return to $cBOD_5$ monitoring initially established at the time of permit reissuance by notifying DEQ in writing. The $cBOD_5$ final effluent monitoring will become effective the first day of the next month following the written request.

l) TMDL Reopener: This special condition is to allow the permit to reopened if necessary to bring it in compliance with any applicable TMDL that may be developed and approved for the receiving stream.

22. **Permit Section Part II:**
Part II of the permit contains standard conditions that appear in all VPDES Permits. In general, these standard conditions address the responsibilities of the permittee, reporting requirements, testing procedures and records retention.

23. **Changes to the Permit from the Previously Issued Permit:**

a) Special Conditions:
1) The Water Quality Criteria Monitoring Special Condition has been removed.
2) A Water Quality Reopener Special Condition has been added.
3) A requirement for amending the Sludge Management Plan has been added.
4) The sludge monitoring requirement has been changed from annual to once per every two months with an option to increase monitoring if necessary. The option to reduce the monitoring frequency has been removed from the permit.
5) The sludge language in the permit and fact sheet has been updated per the current VPDES Permit Regulation and best professional judgment.
6) The PCB Monitoring Special condition has been removed.
7) A requirement to submit a written record of notification to DEQ regarding bypasses has been added to the Bypass Point Source Special Condition.
8) A PCB Pollutant Minimization Plan Special Condition has been added.

b) Monitoring and Effluent Limitations:
1) The requirement for tetrachloroethylene monitoring has been removed since it was not detected in any monitoring events during the last permit cycle.
2) The total recoverable copper monitoring frequency has been reduced from a quarterly to an annual frequency.
3) The total residual chlorine monitoring frequency after dechlorination has been changed from daily from once every two hours per current DEQ guidance.
4) The total residual chlorine monitoring limits after dechlorination have been changed from a monthly and weekly average of 0.008 mg/L and 0.01 mg/L to a monthly and weekly average of 0.007 mg/L and 0.007 mg/L due to the change in monitoring frequency.
5) The monitoring frequency for ammonia for the November through March period has changed from daily to weekly in accordance with current DEQ guidance regarding the ammonia monitoring frequency for sewage treatment plants discharging >2.0 MGD.
6) The monitoring frequency for TKN, nitrate+nitrite as nitrogen, and total nitrogen has been changed from three days per week to once per week in accordance with DEQ guidance.
7) Part I.B. of the permit has been changed to require a higher level of chlorine residual after the chlorine contact tank if there is one violation of the monthly average for *E. coli* instead of three violations of the monthly average fore *E. coli.* An option to conduct another Chlorine Reduction Study has also been added.
8) The monitoring frequency for sludge has been increased from annual to once every two months.
9) The requirement to monitor fecal coliform bacteria or *Salmonella* in the sludge every five years has been removed.

c) Other:
1) The 30 MGD design flow tier has been removed.
2) The EPA Checklist has been removed as an attachment.
3) Part II of the permit has been updated to include VELAP language.

24. **Variances/Alternate Limits or Conditions:**
The Arlington County WPCP has been allowed a minimum chlorine contact value of 0.5 mg/L since it has been demonstrated that disinfection standards were met at this chlorine contact value.

25. **Public Notice Information:**

First Public Notice Date: 11/26/2013 Second Public Notice Date: 12/03/2013

Public Notice Information is required by 9VAC25-31-280 B. All pertinent information is on file and may be inspected, and copied by contacting Anna Westernik at the DEQ Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193, (703) 583-3837, anna.westernik@deq.virginia.gov. See **Attachment 13** for a copy of the public notice document.

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer and of all persons represented by the commenter/requester, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit. Requests for public hearings shall state 1) the reason why a hearing is requested; 2) a brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit; and 3) specific references, where possible, to terms and conditions of the permit with suggested revisions. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given. The public may request an electronic copy of the draft permit and fact sheet or review the draft permit and application at the DEQ Northern Regional Office by appointment.

26. **Additional Comments:**

a) Development of the Policy for the Potomac River Embayments (9 VAC 25-415-10):
The State Water Control Board adopted the Potomac Embayment Standards (PES) in 1971 to address serious nutrient enrichment problems evident in the Virginia embayments and Potomac River at the time. These standards applied to sewage treatment plants discharging into Potomac River embayments in Virginia and for expansions of existing plants discharging into the non-tidal tributaries of these embayments. The standards were actually effluent limitations for BOD, unoxidized nitrogen, total phosphorus, and total nitrogen:

Parameter	PES Standard (monthly average)
BOD_5	3 mg/L
Unoxidized Nitrogen	1 mg/L (April – October)
Total Phosphorus	0.2 mg/L
Total Nitrogen	1 mg/L (when technology is available)

Based upon these standards, several hundred million dollars were spent during the 1970s and 1980s upgrading major treatment plants in the City of Alexandria and the counties of Arlington, Fairfax, Prince William, and Stafford. Today, these localities operate advanced wastewater treatment plants that have contributed a great deal to the dramatic improvement in the water quality of the upper Potomac estuary.

Before the planned upgrades at these facilities were completed, and the water quality improved, questions arose over the high capital and operating costs that would result from meeting all of the requirements contained in the PES. Questions also arose because the PES were blanket effluent limitations that applied equally to different bodies of water. Therefore, in 1978, the State Water Control Board committed to reevaluate the PES. In 1984, a major milestone was reached when the Virginia Institute of Marine Science (VIMS) completed state-of-the-art models for each of the embayments. The Board then selected NVPDC to conduct wasteload allocation studies of the Virginia embayments using the VIMS models. In 1988, these studies were completed and effluent limits that would protect the embayments and the mainstem of the Potomac River were developed for each major facility (**Attachment 14**).

Since the PES had not been amended or repealed, VPDES permits had included the PES standards as effluent limits. Since the plants could not meet all of the requirements of the PES, the plant owners operated under consent orders or consent decrees with operating effluent limits for the treatment plants that were agreed upon by the owners and the Board.

In 1991 and 1992, several Northern Virginia jurisdictions with embayment treatment plants submitted a petition to the Board requesting that the Board address the results of the VIMS/NVPDC studies. Their petition requested revised effluent limitations and a defined modeling process for determining effluent limitations.

The recommendations in the petition were designed to protect the extra sensitive nature of the embayments along with the Potomac River, which had become a popular recreational resource during recent years. The petition included requirements more stringent than would be applied using the results of the modeling/allocation work conducted in the 1980s. With the inherent uncertainty of modeling, the petitioners question whether the results of modeling would provide sufficient protection for the embayments. By this petition, the local governments asked for continued special protection for the embayments based upon a management approach that uses stringent effluent limits. They believe this approach has proven successful over the past two decades. In addition, the petition included a modeling process that will be used to determine if more stringent limits are needed in the future due to increased wastewater discharges.

The State Water Control Board adopted the petition, with revisions, as a regulation on September 12, 1996. The regulation is entitled *Policy for the Potomac River Embayments* (9VAC25-415-10, **Attachment 15**). On the same date, the Board repealed the old PES. The new regulation became effective on April 3, 1997, and contains the following effluent limits:

Parameter	PES Standard (monthly average)
$CBOD_5$	5 mg/L
TSS	6 mg/L
Total Phosphorus	0.18 mg/L
Ammonia as Nitrogen	1 mg/L (April - October)

The Policy for the Potomac River Embayments at 9VAC 25-415-50 states in part that, "water quality models may be required to predict the effects of wastewater discharges on the water quality of the receiving waterbody, the embayment, and the Potomac River. The purpose of the modeling shall be to determine if more stringent limits than those required by 9VAC 25-415-40 are required to meet water quality standards."

b) Previous Board Actions:

On April 1, 2002, a Consent Special Order was issued by the State Water Control Board to the Arlington County Board for issues concerning bypasses from the Arlington County WPCP. On February 12, 2003, DEQ determined that the Arlington County Board had complied with all terms in Appendix A of the Consent Special Order; and hence, cancelled the aforementioned

On April 8, 2004, the Arlington County WPCP was referred to enforcement for failure to verify or submit an updated O&M Manual, total phosphorus exceedances, and failure to submit a toxicity test. The case was dereferred on October 1, 2004 because compliance was achieved through informal action.

On March 15, 2005, a Consent Special Order was issued by the State Water Control Board to the Arlington County Board in response to issues with wet weather flows to the Arlington County WPCP. In September 2007, DEQ-NRO enforcement staff granted an extension to comply with some deadlines set forth in Appendix A of the consent order. This order was terminated on June 15, 2011 because Arlington County complied with all requirements in the order.

On September 27, 2010, a penalty only Consent Special Order was issued by the State Water Control Board to the Arlington County Board in response to unauthorized discharges of partially treated sewage from the sewage treatment plant into Four Mile Run, an unauthorized discharge of sewage from a pump station into Windy Run, an unauthorized discharge of sewage and groundwater from a manhole into Doctor's Branch, failure to report *E. coli* sampling results, exceedance of ammonia as nitrogen limits, failure to meet minimum pH limits, exceedence of the Total Nitrogen concentration, exceedence of the CBOD monthly concentration and mass load limits, exceedence of the TSS concentration limit, exceedence of the Total Phosphorus monthly average concentration limit and mass loading limits, failure to maintain the total residual chlorine concentration, failure to operate and maintain the sludge pumps in accordance with the O&M Manual, and failure to monitor the bypass for BOD. This order was terminated on February 4, 2011.

c) Public Comment:
No comments were received during the public notice period.

List of Attachments

Attachment 1	Flow Frequency Determination
Attachment 2	Arlington County WPCP Unit Process Flow Diagram
Attachment 3	USGS Topographic Map 204D (Alexandria) showing Outfall 001 and the Bypass Point in Relation to the Potomac River
Attachment 4	Summary of Volumes and Spill Prevention Measures for all Materials Stored Onsite
Attachment 5	Memorandum Detailing May 14, 2013 Visit to the Arlington County WPCP
Attachment 6	June 6, 2013 Planning Statement for the Arlington County WPCP
Attachment 7	Dissolved Oxygen Water Quality Criteria
Attachment 8	Commonwealth of Virginia Freshwater Water Quality Criteria and Wasteload Allocations and District of Columbia Water Quality Standards
Attachment 9	Summary of Effluent Data
Attachment 10	November through March pH/Temperature Values
Attachment 11	Derivation of Water-Quality Based Permit Limits
Attachment 12	Chlorine Reduction Study
Attachment 13	Public Notice
Attachment 14	Potomac Embayments Wasteload Allocation Study (Executive Summary, Sensitivity Results for Four Mile Run, Final WLA Alternative Analysis for Four Mile Run)
Attachment 15	Policy for the Potomac River Embayments (9 VAC 25-415-10 et seq.)

Flow Frequencies Calulations for Outfall 001--Arlington County WPCP (VA0025143)

Updated April 10, 2013

Four Mile Run at Alexandria (Gaging Station #01652500)						
	cfs	**MGD**			**cfs**	**MGD**
30Q10 High Flow	2.7	1.75		30Q10 Low Flow	1.9	1.23
7Q10 High Flow	2.2	1.42		7Q10 Low Flow	0.85	0.55
1Q10 High Flow	1.7	1.09		1Q10 Low Flow	0.66	0.43
30Q5	2.3	1.49		Harmonic Mean	79	5.10
Four Mile Run at Discharge Point (Outfall 001)						
30Q10 High Flow (MGD)		2.12		30Q10 Low Flow (MGD)		1.49
7Q10 High Flow (MGD)		1.73		7Q10 Low Flow (MGD)		0.67
1Q10 High Flow (MGD)		1.32		1Q10 Low Flow (MGD)		0.52
30Q5 (MGD)		1.81		Harmonic Mean (MGD)		6.19

The Flow Value in MGD is calculated as such: cfs x 0.6463 = MGD

Flow frequencies were calculated using data collected at Gaging Station #01652500.
Monitoring at this station occurred from 1951-1969; 1974-1975; 1979-1982; and 2001-2013.
Flow values for the gaging station derived in 1998, 2006, and 2010 were used to determine the flows at the station and Outfall 001.
The gage is approximately 1.0 miles upstream of the discharge point.
The values at the discharge point were calculated using drainage area proportions and do not address any withdrawals, discharges, or springs lying between the gage and the discharge point.

The following formula was used to determine the flow at the discharge point:

$$\frac{\text{Drainage Area at Discharge Point (Flow at Gaging Station)}}{\text{Drainage Area at Gaging Station}}$$

14 = DA at Gaging Station
17 = DA at Outfall 001

Cold weather months are Nov-Mar

Attachment 1

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
Water Quality Assessments and Planning
629 E. Main Street P.O. Box 10009 Richmond, Virginia 23240

SUBJECT: Flow Frequency Determination
Arlington STP - VA#0025143

TO: Doug Stockman, NRO

FROM: Paul E. Herman, P.E., WQAP

DATE: February 6, 1998

COPIES: Ron Gregory, Charles Martin, File

This memo supercedes my July 25, 1994 memo to Kultar Singh concerning the subject VPDES permit.

The Arlington STP discharges to the Fourmile Run in Arlington, VA. Stream flow frequencies are required at this site for use by the permit writer in developing effluent limitations for the VPDES permit. The Policy for the Potomac Embayments (PES) apply to this facility thereby requiring special flow frequency analyses to determine the 1Q10 and 7Q10 during the winter months (November - March) defined by the Standard. The 1Q10 and 7Q10 flow frequencies for the summer months (April - October) are based on the analysis of data available for the period of record at the selected reference gaging station.

Fourmile Run is tidal at the discharge point. Flow frequencies are indeterminable at this site due to tidal fluctuation. A dilution factor should be used when determining effluent limitations. For more information on dilution factors, please contact Dale Phillips at (804) 698-4077.

For modeling purposes, the freshwater contribution from the Fourmile Run watershed have been calculated for the specified flow frequencies. These calculations applied drainage area proportions using a continuous record gage as a reference.

The seasonal, temperature based, flow frequencies have been determined for the reference gage used in this analysis; Fourmile Run at Alexandria, VA (#01652500) which has been operated by the USGS from 1951 to 1969, from 1973 to 1975, and from 1979 to 1982. The gage is located approximately 1.0 mile upstream of the discharge point. The flow frequencies for the gage and the discharge point are presented below.

Fourmile Run at Alexandria, VA (#01652500):

Drainage Area = 13.8 mi^2

1Q10 = 0.59 cfs	PES 1Q10 = 1.68 cfs
7Q10 = 0.80 cfs	PES 7Q10 = 2.20 cfs
30Q5 = 1.8 cfs	HM = 0.0 cfs

The flows provided below represent the freshwater inflow to the Fourmile Run.

Fourmile Run at discharge point:

Drainage Area = 16.88 mi^2

1Q10 = 0.72 cfs	PES 1Q10 = 2.1 cfs
7Q10 = 0.98 cfs	PES 7Q10 = 2.7 cfs
30Q5 = 2.2 cfs	HM = 0.0 cfs

Be advised, the seasonal tiering defined in the Policy for Potomac Embayments is not based on stream flow. Rather, the tiers are temperature based. Procedures for establishing flows during the months included in a temperture tier are not addressed in Section III-A pages 12-17 of the "Virginia Water Control Board VPDES Technical Reference Manual".

If you have any questions concerning this analysis, please let me know.

Westernik,Anna

From: Powell,Gene
Sent: Wednesday, July 30, 2003 4:44 PM
To: Westernik,Anna
Subject: RE: 4-Mile Run 30Q10 Data

Anna, using what data is available for Four Mile Run from 1951-1969, 1974-1975, 1979-1982, and 1998-2001, the 30Q10 is 2.7cfs for months of November thru March, and the 30Q10 is 0.91cfs for months of April thru October.

Gene

-----Original Message-----
From: Westernik,Anna
Sent: Monday, July 28, 2003 10:36 AM
To: Powell,Gene
Subject: 4-Mile Run 30Q10 Data

Hi Gene,

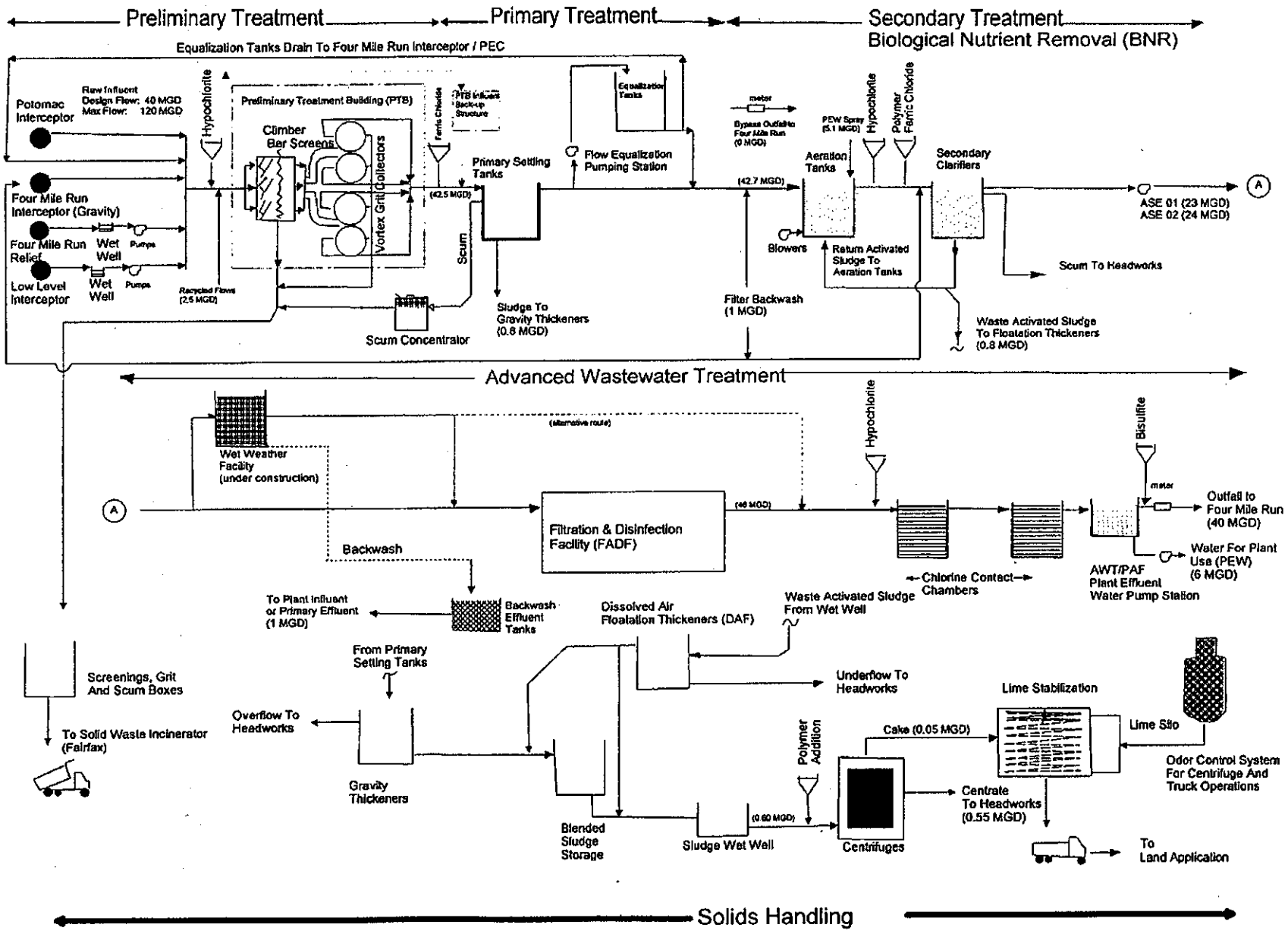
Could you please send me an e-mail verifying the high and low flow 30Q10 data (Nov-Mar and Apr-Oct) for USGS Station 01652500 on Four Mile Run we discussed on July 15?

Thanks,

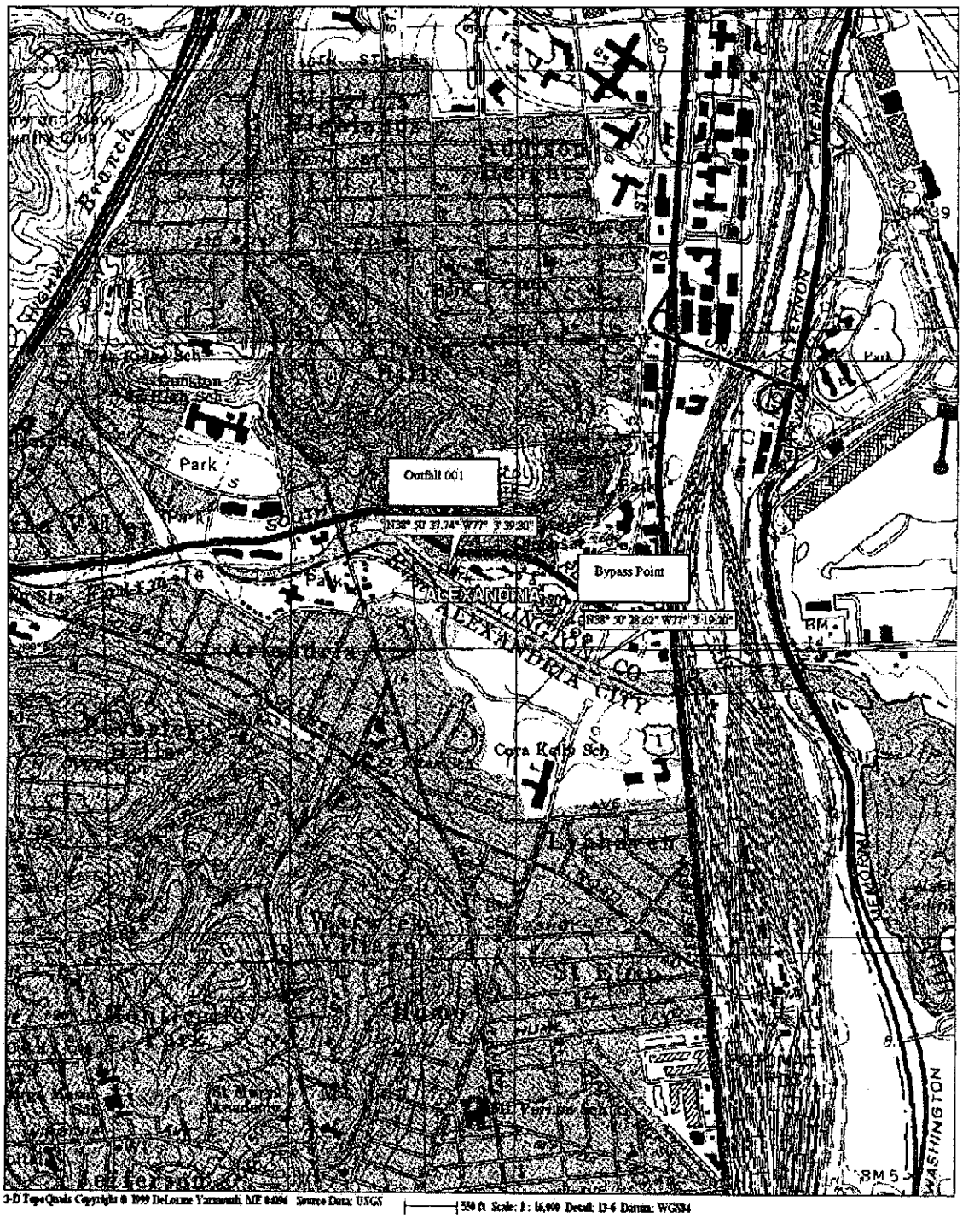
Anna T. Westernik
Environmental Specialist II
Telephone 703-583-3837
Fax 703-583-3841

Arlington County Water Pollution Control Plant
Unit Process Flow Diagram

Attachment 2



Outfalls 001 and the Bypass of the Arlington Water Pollution Control Plant (VA0025143)



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS 350 ft Scale: 1 : 16,000 Detail: 13-6 Datum: WGS84

Distance between Outfalls 001 and 002 is approximately 1900 feet.

Attachment 3

Arlington County Water Pollution Control Plant
Chemical Storage

Attachment 4

Chemicals Storage And Containment

Building	Chemical Stored	Maximum Amount Stored	Type of Storage	Type of Containment
Biological Solids Processing Building 538 South 31st Street	Polymer Sodium Hypochlorite, 5-15%	7,500 gallons 7,500 gallons	AST AST	Both AST's in building basement: no access to the environment
Dewatering Building 3208 South Eads Street	Polymer Sodium Hypochlorite, 5-15% Hydrochloric Acid Lime, unhydrated Polymer (dry)	3,750 gallons 3,750 gallons 1,000 gallons 300,000 lbs 1000 lbs	AST AST 55-gal drums AST BAG	Building 1st floor with containment wall Building 1st floor with containment wall Inside building, with containment berms No containment: material is solid Pallets
Preliminary Treatment Building 3139 South Fern Street	Sodium Hypochlorite, 5-15% Polymer	3,750 gallons 11, 250 gallons	AST AST	Inside building with subfloor spill containment Inside building with subfloor spill containment
Blower Building (3404 South Glebe Road)	Sodium hypochlorite, 5-15% Sodium hydroxide, 40% Lubricating oil	2,700 gallons 7,800 gallons 625 gallons	AST AST 55-gal drums	Both AST in building with separate containment berms Pallets
Secondary Pump Room (3440 South Glebe Road)	Sodium hypochlorite, 5-15% Polymer (dry)	1900 gallons 6000 lbs	AST BAG	Inside building with containment berm Pallets
Post Aeration Facility 3304 S Glebe Road	Sodium bisulfite, 40% Sodium hydroxide, 40% Defoamer	12,000 gallons 500 gallons 800 gallons	AST IBC 55-gal drums	2-6000 gal ASTs inside building w/spill containment 2-250 gallon double-walled containers Pallets
Filtration and Disinfection Facility 3322 S. Glebe Road	Sodium hypochlorite, 5-15% Phosphoric Acid 35%	72,000 gallons 1200 gallons	AST IBC	4 ASTs inside building with subfloor spill containment Inside building with spill pallets
Methanol Feed Facility 3328 S. Glebe Road	Methanol	24,400 gallons	AST	2-outside storage tanks with spill pad sumps
HHW Facility 538 South 31st Street (west side)	Miscellaneous Hazardous & Flammable Materials	2000 lbs	55-gal drums	Cement block structure with internal containment
New Maintenance Building 3111 South Fern Street	Miscellaneous lubricants	2500 gallons	55-gal drums	Inside building with containment berm
North Ferric Facility 3165 South Fern Street	Ferric Chloride 38% Sodium hypochlorite 5-	20,200 gallons 11,000 gallons	AST AST	4 ASTs inside with separate containment structures

Arlington County Water Pollution Control Plant
Chemical Storage

	15% Sodium hydroxide, 40%	11,000 gallons	AST	
Operations Control Building 3402 South Glebe Road	Small amounts of lab chemicals/reagents	< 100 gallons	Small glass/plastic containers	Chemical storage cabinets
South Ferric Facility 3448 South Glebe Road	Ferric Chloride 38%	10,000 gallons	AST	2 ASTs inside with subfloor spill containment
West Secondary Services Building 3340 South Glebe Road	Ferric Chloride 38%	10,000 gallons	AST	2 ASTs inside with subfloor spill containment
Contractor Fuel Station 3304 South Glebe Road	Diesel	1000 gallons	AST	Double-walled field tank
Dissolved Air Floatation Building	Polymer (dry)	6000 lbs	BAG	Pallets
Standby Generator Facility	Fuel Oil #2 Urea, 32% Glycol	12,000 gallons 3750 gallons 30 gallons	AST AST IBC	Outside double-walled AST Inside with containment wall Inside with double-walled tank

Attachment 5

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

MEMORANDUM

Northern Regional Office

TO: File

FROM: Anna Westernik, Water Permit Writer

DATE: May 17, 2013

SUBJECT: May 14, 2013 Site Inspection of the Arlington County WPCP (VA0025143)

On May 14, 2013, Bryant Thomas and myself from the Department of Environmental Quality, Northern Regional Office (DEQ-NRO) visited the Arlington County WPCP for the purpose of reissuing the municipal permit. Arlington County personnel present during the inspection were Larry Slattery, Beau Dodge, Frank Corsoro, and Wilbur Brown.

The Arlington County WPCP treatment plant serves all of Arlington County and some neighboring jurisdictions (the City of Alexandria, the City of Falls Church, and Fairfax County). The estimated population served by this 40 MGD treatment plant is approximately 300,000 residents. Commercial, industrial, and domestic wastewater are treated by the plant.

Before proceeding on the plant tour, Larry Slattery and Beau Dodge gave a detailed presentation about the Chlorine Reduction Study. Additionally, Frank Corsoro showed DEQ staff the control room and described operations.

The majority of the treatment plant upgrades for the 40 MGD expansion were completed in June 2011. Plant treatment processes include: preliminary, primary, secondary, tertiary treatment, and sludge dewatering. Three odor control treatment systems are present at the facility (one at the flow equalization system, one at the secondary system, and one at the sludge dewatering building).

a) **Primary Treatment**
Eight parallel primary treatment rectangular tanks serve as primary clarifiers. A chain and flight collector mechanism moves the settled material (primary sludge) to the influent end of the tank, and the floating material (grease) to the effluent end of the tank. The primary sludge is pumped to the gravity thickener for additional dewatering. The grease is concentrated and blended with the grit and screenings for disposal at the Lorton Landfill. Three equalization basins totaling 16.6 MG are used to control wet weather flows from the collection system. This treatment plant also has a designated bypass point to protect the aeration basins from excessive wet weather flows.

b) **Secondary Treatment**
The secondary treatment system consists of four 2.5-MG parallel pass aeration basins that are configured to operate the activated sludge process in a modified step-feed mode. Fine bubble membrane diffusers, supplied by six blowers, are used to mix and aerate the activated sludge. A defoaming agent is added to control the filamentous growth. All aeration tanks have anoxic fractions for denitrification. The degree of anoxic zone necessary is temperature dependent. Six center-feed circular clarifiers follow this treatment. The waste sludge from this process is pumped to a dissolved air flotation thickener.

c) **Tertiary Treatment**
The advanced treatment processes include phosphorus removal, gravity filtration, disinfection, and dechlorination.

1) Phosphorus Removal. This is a one-stage process that uses three 2.2-MG reaction clarifiers. A 34-38% ferric chloride concentration can be added directly to the clarifiers to chemically precipitate phosphorus. Algae in the wiers is controlled by the addition of sodium hypochlorite in the distribution box. Polymer is also available to enhance precipitation and settling, but is not regularly used.

2) Gravity Filtration. Eight multimedia rectangular basins follow the phosphorus removal process. Filtration removes additional solids and phosphorus.

3) Disinfection. A 5% sodium hypochlorite solution is used for disinfection and is currently being added at the advanced wastewater treatment (AWT) wet well or the chlorine contact tanks influent. There are four chlorine contact tanks, each with a capacity of approximately 84,000 ft^3 (0.63 mg). The average retention time in each contact tank is 100 minutes. The chlorine residual is currently maintained at 0.50 mg/L.

4) Dechlorination. Sodium bisulfite is added after the chlorine contact tank to neutralize chlorine residual in the wastewater. A splitter box is used to distribute the dose.

5) Sampling. The sampling point for Outfall 001sampling point is immediately after dechlorination.

Discharge via Outfall 001 is directly after cascade aeration to a channelized portion of Four-Mile Run adjacent to the Four-Mile Run Bike Trail.

Primary treatment sludge, dissolved air floatation thickeners (DAF) overflow, and occasional waste activated sludge (WAS) from the secondary clarifiers is pumped to a gravity thickener unit for dewatering. The combined thickened sludge from the gravity and floatation thickeners is then pumped into two 180,000-gallon holding tanks. Sludge from the holding tanks to transferred to the dewatering building where polymer is mixed with the thickened sludge in three centrifuges. The sludge cake is placed into storage bins by the sludge conveyance system and combined with lime before discharging to hauling trucks where it is held for stabilization.

To:	Anna Westernik
From:	Jennifer Carlson
Date:	June 6, 2013
Subject:	Planning Statement for the Arlington County WPCP
Permit Number:	VA0025143

Information for Outfall 001:

Discharge Type:	Major Municipal
Discharge Flow:	40 MGD
Receiving Stream:	Four Mile Run
Latitude / Longitude:	38° 50' 37.74" N; 77° 03' 39.3" W
Rivermile:	0.94
Streamcode:	1aFOU
Waterbody:	VAN-A12E
Water Quality Standards:	Class II, Section 6, special stds. b, y
Drainage Area:	17 mi^2

1. Please provide water quality monitoring information for the receiving stream segment. If there is not monitoring information for the receiving stream segment, please provide information on the nearest downstream monitoring station, including how far downstream the monitoring station is from the outfall.

   This facility discharges into tidal Four Mile Run. DEQ monitoring station 1aFOU000.19 is located at the George Washington Parkway bridge, approximately 0.75 miles downstream of Outfall 001. The following the water quality summary for tidal Four Mile Run, as taken from the Draft 2012 Integrated Report*:

   Class II, Section 6, special stds. b, y.

   DEQ ambient water quality monitoring station 1aFOU000.19, at George Washington Parkway and DEQ fish tissue monitoring station 1aFOU000.45.

   The fish consumption use is categorized as impaired due to a Virginia Department of Health, Division of Health Hazards Control, PCB fish consumption advisory and for total chlordane and PCB, based on fish tissue monitoring. Additionally, fish tissue monitoring data revealed an exceedance of the water quality criterion based tissue value (TV) of 4.4 parts per billion (ppb) for heptachlor epoxide in carp (2008) and of 300 (ppb) for mercury in largemouth bass (2008), each noted by an observed effect for the fish consumption use. A PCB TMDL for the tidal Potomac River watershed has been completed and approved.

   E. coli monitoring finds a bacteria impairment, resulting in an impaired classification for the recreation use. A bacteria TMDL for Tidal Four Mile Run has been completed and approved.

   The aquatic life use is fully supporting. A TMDL has been completed for the Chesapeake Bay watershed^. The submerged aquatic vegetation data is assessed as fully supporting the aquatic life use. For the open water aquatic life subuse; the thirty day mean is acceptable,

however, the seven day mean and instantaneous levels have not been assessed. The wildlife use is considered fully supporting.

^Tidal Four Mile Run is the receiving stream for the discharge from this facility, and is listed as fully supporting the aquatic life use. There is a downstream TMDL that has been completed by EPA to address poor water quality in the Chesapeake Bay. This TMDL covers the entire Bay watershed, including the upstream tidal tributaries such as Four Mile Run.

**Virginia's Draft 2012 Integrated Report (IR) has been through the public comment period and reviewed by EPA. The 2012 IR is currently awaiting final approval.*

2. Does this facility discharge to a stream segment on the 303(d) list? If yes, please fill out Table A.

   Yes.

Table A. 303(d) Impairment and TMDL information for the receiving stream segment

Waterbody Name	Impaired Use	Cause	TMDL completed	WLA	Basis for WLA	TMDL Schedule
Impairment Information in the Draft 2012 Integrated Report*						
Four Mile Run	Recreation	*E. coli*	Tidal Four Mile Run Watershed Bacteria 6/14/2012	6.96E+13 cfu/year *E. coli*	126 cfu/100 ml --- 40 MGD	N/A
	Fish Consumption	PCBs	Tidal Potomac PCB 10/31/2007	3.54 grams/year PCB	0.064 ng/L --- 40 MGD	N/A
		Chlordane	No	---	---	2022

**Virginia's Draft 2012 Integrated Report (IR) has been through the public comment period and reviewed by EPA. The 2012 IR is currently awaiting final approval.*

3. Are there any downstream 303(d) listed impairments that are relevant to this discharge? If yes, please fill out Table B.

   Yes.

Table B. Information on Downstream 303(d) Impairments and TMDLs

Waterbody Name	Impaired Use	Cause	Distance From Outfall	TMDL completed	WLA	Basis for WLA	TMDL Schedule
Information in the Chesapeake Bay TMDL							
Chesapeake Bay	Aquatic Life	Total Nitrogen	---	Chesapeake Bay TMDL 12/29/2010	121,822 lbs/yr TN	Edge of Stream (EOS) Loads	N/A
		Total Phosphorus			9,137 lbs/yr TP		
		Total Suspended Solids			913,668 lbs/yr TSS		

4. Is there monitoring or other conditions that Planning/Assessment needs in the permit?

   The tidal Potomac River is listed with a PCB impairment and a TMDL has been developed to address this impairment. This facility has been included in the Tidal Potomac River PCB TMDL and has received a WLA. This facility conducted PCB monitoring during the last permit cycle in support of the PCB TMDL. The PCB monitoring data will be evaluated, and source reductions through pollution minimization plans may be needed.

5. Fact Sheet Requirements – Please provide information regarding any drinking water intakes located within a 5 mile radius of the discharge point.

   There are no public water supply intakes located within 5 miles of this discharge.

Dissolved Oxygen Criteria (9 VAC 25-260-185)

Designated Use	Criteria Concentration/Duration	Temporal Application
Migratory fish spawning and nursery	7-day mean > 6 mg/L (tidal habitats with 0-0.5 ppt salinity)	February 1 – May 31
	Instantaneous minimum > 5 mg/L	
Open-water[1,2]	30-day mean > 5.5 mg/L (tidal habitats with 0-0.5 ppt salinity) 30-day mean > 5 mg/L (tidal habitats with >0.5 ppt salinity)	Year-round
	7-day mean > 4 mg/L	
	Instantaneous minimum > 3.2 mg/L at temperatures < 29°C Instantaneous minimum > 4.3 mg/L at temperatures > 29°C	
Deep-water	30-day mean >3 mg/L	June 1-September 30
	1-day mean > 2.3 mg/L	
	Instantaneous minimum > 1.7 mg/L	
Deep-channel	Instantaneous minimum > 1 mg/L	June 1-September 30

[1]See subsection aa of 9 VAC 25-260-310 for site specific seasonal open-water dissolved oxygen criteria applicable to the tidal Mattaponi and Pamunkey Rivers and their tidal tributaries.

[2]In applying this open-water instantaneous criterion to the Chesapeake Bay and its tidal tributaries where the existing water quality for dissolved oxygen exceeds an instantaneous minimum of 3.2 mg/L, that higher water quality for dissolved oxygen shall be provided antidegradation protection in accordance with section 30 subsection A.2 of the Water Quality Standards.

Attachment 8

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Arlington WPCP Permit No.: VA0025143

Receiving Stream: Four Mile Run Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information

Mean Hardness (as CaCO3) =	mg/L
90% Temperature (Annual) =	deg C
90% Temperature (Wet season) =	deg C
90% Maximum pH =	SU
10% Maximum pH =	SU
Tier Designation (1 or 2) =	1
Public Water Supply (PWS) Y/N? =	n
Trout Present Y/N? =	n
Early Life Stages Present Y/N? =	y

Stream Flows

1Q10 (Annual) =	0 MGD
7Q10 (Annual) =	0 MGD
30Q10 (Annual) =	0 MGD
1Q10 (Wet season) =	0 MGD
30Q10 (Wet season)	0 MGD
30Q5 =	0 MGD
Harmonic Mean =	0 MGD
	0

Mixing Information

Annual - 1Q10 Mix =	0 %
- 7Q10 Mix =	0 %
- 30Q10 Mix =	0 %
Wet Season - 1Q10 Mix =	0 %
- 30Q10 Mix =	0 %

Effluent Information

Mean Hardness (as CaCO3) =	140 mg/L
90% Temp (Annual) =	28.1 deg C
90% Temp (Wet season) =	21.64 deg C
90% Maximum pH =	7.2 SU
10% Maximum pH =	6.6 SU
Discharge Flow =	40 MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Acenapthene	0	--	--	na	9.9E+02	--	--	na	9.9E+02	--	--	--	--	--	--	--	--	--	--	na	9.9E+02
Acrolein	0	--	--	na	9.3E+00	--	--	na	9.3E+00	--	--	--	--	--	--	--	--	--	--	na	9.3E+00
Acrylonitrile[c]	0	--	--	na	2.5E+00	--	--	na	2.5E+00	--	--	--	--	--	--	--	--	--	--	na	2.5E+00
Aldrin [c]	0	3.0E+00	--	na	5.0E-04	3.0E+00	--	na	5.0E-04	--	--	--	--	--	--	--	--	3.0E+00	--	na	5.0E-04
Ammonia-N (mg/l) (Yearly)	0	2.95E+01	2.25E+00	na	--	2.95E+01	2.25E+00	na	--	--	--	--	--	--	--	--	--	2.95E+01	2.25E+00	na	--
Ammonia-N (mg/l) (High Flow)	0	2.95E+01	3.41E+00	na	--	2.95E+01	3.41E+00	na	--	--	--	--	--	--	--	--	--	2.95E+01	3.41E+00	na	--
Anthracene	0	--	--	na	4.0E+04	--	--	na	4.0E+04	--	--	--	--	--	--	--	--	--	--	na	4.0E+04
Antimony	0	--	--	na	6.4E+02	--	--	na	6.4E+02	--	--	--	--	--	--	--	--	--	--	na	6.4E+02
Arsenic	0	3.4E+02	1.5E+02	na	--	3.4E+02	1.5E+02	na	--	--	--	--	--	--	--	--	--	3.4E+02	1.5E+02	na	--
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Benzene [c]	0	--	--	na	5.1E+02	--	--	na	5.1E+02	--	--	--	--	--	--	--	--	--	--	na	5.1E+02
Benzidine[c]	0	--	--	na	2.0E-03	--	--	na	2.0E-03	--	--	--	--	--	--	--	--	--	--	na	2.0E-03
Benzo (a) anthracene [c]	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	--	--	na	1.8E-01
Benzo (b) fluoranthene [c]	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	--	--	na	1.8E-01
Benzo (k) fluoranthene [c]	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	--	--	na	1.8E-01
Benzo (a) pyrene [c]	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	--	--	na	1.8E-01
Bis2-Chloroethyl Ether [c]	0	--	--	na	5.3E+00	--	--	na	5.3E+00	--	--	--	--	--	--	--	--	--	--	na	5.3E+00
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	6.5E+04	--	--	--	--	--	--	--	--	--	--	na	6.5E+04
Bis 2-Ethylhexyl Phthalate [c]	0	--	--	na	2.2E+01	--	--	na	2.2E+01	--	--	--	--	--	--	--	--	--	--	na	2.2E+01
Bromoform [c]	0	--	--	na	1.4E+03	--	--	na	1.4E+03	--	--	--	--	--	--	--	--	--	--	na	1.4E+03
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	1.9E+03	--	--	--	--	--	--	--	--	--	--	na	1.9E+03
Cadmium	0	5.7E+00	1.5E+00	na	--	5.7E+00	1.5E+00	na	--	--	--	--	--	--	--	--	--	5.7E+00	1.5E+00	na	--
Carbon Tetrachloride [c]	0	--	--	na	1.6E+01	--	--	na	1.6E+01	--	--	--	--	--	--	--	--	--	--	na	1.6E+01
Chlordane [c]	0	2.4E+00	4.3E-03	na	8.1E-03	2.4E+00	4.3E-03	na	8.1E-03	--	--	--	--	--	--	--	--	2.4E+00	4.3E-03	na	8.1E-03
Chloride	0	8.6E+05	2.3E+05	na	--	8.6E+05	2.3E+05	na	--	--	--	--	--	--	--	--	--	8.6E+05	2.3E+05	na	--
TRC	0	1.9E+01	1.1E+01	na	--	1.9E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	1.9E+01	1.1E+01	na	--
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	1.6E+03	--	--	--	--	--	--	--	--	--	--	na	1.6E+03

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	1.3E+02	--	--	--	--	--	--	--	--	--	--	na	**1.3E+02**
Chloroform	0	--	--	na	1.1E+04	--	--	na	1.1E+04	--	--	--	--	--	--	--	--	--	--	na	**1.1E+04**
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	1.6E+03	--	--	--	--	--	--	--	--	--	--	na	**1.6E+03**
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	1.5E+02	--	--	--	--	--	--	--	--	--	--	na	**1.5E+02**
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	8.3E-02	4.1E-02	na	--	--	--	--	--	--	--	--	--	**8.3E-02**	**4.1E-02**	na	--
Chromium III	0	7.5E+02	9.8E+01	na	--	7.5E+02	9.8E+01	na	--	--	--	--	--	--	--	--	--	**7.5E+02**	**9.8E+01**	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.6E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	**1.6E+01**	**1.1E+01**	na	--
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Chrysene [C]	0	--	--	na	1.8E-02	--	--	na	1.8E-02	--	--	--	--	--	--	--	--	--	--	na	**1.8E-02**
Copper	0	1.8E+01	1.2E+01	na	--	1.8E+01	1.2E+01	na	--	--	--	--	--	--	--	--	--	**1.8E+01**	**1.2E+01**	na	--
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	2.2E+01	5.2E+00	na	1.6E+04	--	--	--	--	--	--	--	--	**2.2E+01**	**5.2E+00**	na	**1.6E+04**
DDD [C]	0	--	--	na	3.1E-03	--	--	na	3.1E-03	--	--	--	--	--	--	--	--	--	--	na	**3.1E-03**
DDE [C]	0	--	--	na	2.2E-03	--	--	na	2.2E-03	--	--	--	--	--	--	--	--	--	--	na	**2.2E-03**
DDT [C]	0	1.1E+00	1.0E-03	na	2.2E-03	1.1E+00	1.0E-03	na	2.2E-03	--	--	--	--	--	--	--	--	**1.1E+00**	**1.0E-03**	na	**2.2E-03**
Demeton	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	--	**1.0E-01**	na	--
Diazinon	0	1.7E-01	1.7E-01	na	--	1.7E-01	1.7E-01	na	--	--	--	--	--	--	--	--	--	**1.7E-01**	**1.7E-01**	na	--
Dibenz(a,h)anthracene [C]	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	--	--	na	**1.8E-01**
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	1.3E+03	--	--	--	--	--	--	--	--	--	--	na	**1.3E+03**
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	9.6E+02	--	--	--	--	--	--	--	--	--	--	na	**9.6E+02**
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	1.9E+02	--	--	--	--	--	--	--	--	--	--	na	**1.9E+02**
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	2.8E-01	--	--	--	--	--	--	--	--	--	--	na	**2.8E-01**
Dichlorobromomethane [C]	0	--	--	na	1.7E+02	--	--	na	1.7E+02	--	--	--	--	--	--	--	--	--	--	na	**1.7E+02**
1,2-Dichloroethane [C]	0	--	--	na	3.7E+02	--	--	na	3.7E+02	--	--	--	--	--	--	--	--	--	--	na	**3.7E+02**
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	7.1E+03	--	--	--	--	--	--	--	--	--	--	na	**7.1E+03**
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	1.0E+04	--	--	--	--	--	--	--	--	--	--	na	**1.0E+04**
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	2.9E+02	--	--	--	--	--	--	--	--	--	--	na	**2.9E+02**
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	1.5E+02	--	--	--	--	--	--	--	--	--	--	na	**1.5E+02**
1,3-Dichloropropene [C]	0	--	--	na	2.1E+02	--	--	na	2.1E+02	--	--	--	--	--	--	--	--	--	--	na	**2.1E+02**
Dieldrin [C]	0	2.4E-01	5.6E-02	na	5.4E-04	2.4E-01	5.6E-02	na	5.4E-04	--	--	--	--	--	--	--	--	**2.4E-01**	**5.6E-02**	na	**5.4E-04**
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	4.4E+04	--	--	--	--	--	--	--	--	--	--	na	**4.4E+04**
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	8.5E+02	--	--	--	--	--	--	--	--	--	--	na	**8.5E+02**
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	1.1E+06	--	--	--	--	--	--	--	--	--	--	na	**1.1E+06**
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	4.5E+03	--	--	--	--	--	--	--	--	--	--	na	**4.5E+03**
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	5.3E+03	--	--	--	--	--	--	--	--	--	--	na	**5.3E+03**
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	2.8E+02	--	--	--	--	--	--	--	--	--	--	na	**2.8E+02**
2,4-Dinitrotoluene [C]	0	--	--	na	3.4E+01	--	--	na	3.4E+01	--	--	--	--	--	--	--	--	--	--	na	**3.4E+01**
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	5.1E-08	--	--	--	--	--	--	--	--	--	--	na	**5.1E-08**
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	2.0E+00	--	--	--	--	--	--	--	--	--	--	na	**2.0E+00**
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.2E-01	5.6E-02	na	8.9E+01	--	--	--	--	--	--	--	--	**2.2E-01**	**5.6E-02**	na	**8.9E+01**
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.2E-01	5.6E-02	na	8.9E+01	--	--	--	--	--	--	--	--	**2.2E-01**	**5.6E-02**	na	**8.9E+01**
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	2.2E-01	5.6E-02	--	--	--	--	--	--	--	--	--	--	**2.2E-01**	**5.6E-02**	--	--
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	--	--	--	--	--	--	--	--	na	**8.9E+01**
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	8.6E-02	3.6E-02	na	6.0E-02	--	--	--	--	--	--	--	--	**8.6E-02**	**3.6E-02**	na	**6.0E-02**
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	3.0E-01	--	--	--	--	--	--	--	--	--	--	na	**3.0E-01**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	2.1E+03	--	--	--	--	--	--	--	--	--	--	na	2.1E+03
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	1.4E+02	--	--	--	--	--	--	--	--	--	--	na	1.4E+02
Fluorene	0	--	--	na	5.3E+03	--	--	na	5.3E+03	--	--	--	--	--	--	--	--	--	--	na	5.3E+03
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Guthion	0	--	1.0E-02	na	--	--	1.0E-02	na	--	--	--	--	--	--	--	--	--	--	1.0E-02	na	--
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	5.2E-01	3.8E-03	na	7.9E-04	--	--	--	--	--	--	--	--	5.2E-01	3.8E-03	na	7.9E-04
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	5.2E-01	3.8E-03	na	3.9E-04	--	--	--	--	--	--	--	--	5.2E-01	3.8E-03	na	3.9E-04
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	2.9E-03	--	--	--	--	--	--	--	--	--	--	na	2.9E-03
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	1.8E+02	--	--	--	--	--	--	--	--	--	--	na	1.8E+02
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	--	--	--	--	--	--	--	--	na	4.9E-02
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	1.7E-01	--	--	--	--	--	--	--	--	--	--	na	1.7E-01
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	1.8E+00	9.5E-01	--	na	1.8E+00	--	--	--	--	--	--	--	--	9.5E-01	--	na	1.8E+00
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	1.1E+03	--	--	--	--	--	--	--	--	--	--	na	1.1E+03
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	3.3E+01	--	--	--	--	--	--	--	--	--	--	na	3.3E+01
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	2.0E+00	na	--	--	--	--	--	--	--	--	--	--	2.0E+00	na	--
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	--	--	na	1.8E-01
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	9.6E+03	--	--	--	--	--	--	--	--	--	--	na	9.6E+03
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Lead	0	1.8E+02	2.1E+01	na	--	1.8E+02	2.1E+01	na	--	--	--	--	--	--	--	--	--	1.8E+02	2.1E+01	na	--
Malathion	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	--	1.0E-01	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	--	--	1.4E+00	7.7E-01	--	--	--	--	--	--	--	--	--	--	1.4E+00	7.7E-01	--	--
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	1.5E+03	--	--	--	--	--	--	--	--	--	--	na	1.5E+03
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	5.9E+03	--	--	--	--	--	--	--	--	--	--	na	5.9E+03
Methoxychlor	0	--	3.0E-02	na	--	--	3.0E-02	na	--	--	--	--	--	--	--	--	--	--	3.0E-02	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Nickel	0	2.4E+02	2.7E+01	na	4.6E+03	2.4E+02	2.7E+01	na	4.6E+03	--	--	--	--	--	--	--	--	2.4E+02	2.7E+01	na	4.6E+03
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	6.9E+02	--	--	--	--	--	--	--	--	--	--	na	6.9E+02
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	3.0E+01	--	--	--	--	--	--	--	--	--	--	na	3.0E+01
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	6.0E+01	--	--	--	--	--	--	--	--	--	--	na	6.0E+01
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	5.1E+00	--	--	--	--	--	--	--	--	--	--	na	5.1E+00
Nonylphenol	0	2.8E+01	6.6E+00	--	--	2.8E+01	6.6E+00	na	--	--	--	--	--	--	--	--	--	2.8E+01	6.6E+00	na	--
Parathion	0	6.5E-02	1.3E-02	na	--	6.5E-02	1.3E-02	na	--	--	--	--	--	--	--	--	--	6.5E-02	1.3E-02	na	--
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	1.4E-02	na	6.4E-04	--	--	--	--	--	--	--	--	--	1.4E-02	na	6.4E-04
Pentachlorophenol [C]	0	5.8E+00	4.5E+00	na	3.0E+01	5.8E+00	4.5E+00	na	3.0E+01	--	--	--	--	--	--	--	--	5.8E+00	4.5E+00	na	3.0E+01
Phenol	0	--	--	na	8.6E+05	--	--	na	8.6E+05	--	--	--	--	--	--	--	--	--	--	na	8.6E+05
Pyrene	0	--	--	na	4.0E+03	--	--	na	4.0E+03	--	--	--	--	--	--	--	--	--	--	na	4.0E+03
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Beta and Photon Activity (mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	2.0E+01	5.0E+00	na	4.2E+03	--	--	--	--	--	--	--	--	**2.0E+01**	**5.0E+00**	**na**	**4.2E+03**
Silver	0	6.2E+00	--	na	--	6.2E+00	--	na	--	--	--	--	--	--	--	--	--	**6.2E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	4.0E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.0E+01**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	3.3E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.3E+01**
Thallium	0	--	--	na	4.7E-01	--	--	na	4.7E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.7E-01**
Toluene	0	--	--	na	6.0E+03	--	--	na	6.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.0E+03**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	7.3E-01	2.0E-04	na	2.8E-03	--	--	--	--	--	--	--	--	**7.3E-01**	**2.0E-04**	**na**	**2.8E-03**
Tributyltin	0	4.6E-01	7.2E-02	na	--	4.6E-01	7.2E-02	na	--	--	--	--	--	--	--	--	--	**4.6E-01**	**7.2E-02**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	7.0E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.0E+01**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	1.6E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.6E+02**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	3.0E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.0E+02**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	2.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.4E+01**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	2.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.4E+01**
Zinc	0	1.6E+02	1.6E+02	na	2.6E+04	1.6E+02	1.6E+02	na	2.6E+04	--	--	--	--	--	--	--	--	**1.6E+02**	**1.6E+02**	**na**	**2.6E+04**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	6.4E+02
Arsenic	9.0E+01
Barium	na
Cadmium	8.9E-01
Chromium III	5.9E+01
Chromium VI	6.4E+00
Copper	7.2E+00
Iron	na
Lead	1.2E+01
Manganese	na
Mercury	4.6E-01
Nickel	1.6E+01
Selenium	3.0E+00
Silver	2.5E+00
Zinc	6.2E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

DISTRICT DEPARTMENT OF THE ENVIRONMENT

NOTICE OF FINAL RULEMAKING

Triennial Review of the District of Columbia's Water Quality Standards

The Acting Director of the District Department of the Environment (DDOE), in accordance with the authority set forth in the District Department of the Environment Establishment Act of 2005, effective February 15, 2006 (D.C. Law 16-51; D.C. Official Code §§ 8-151.01 *et seq.*), sections 5 and 21 of the Water Pollution Control Act of 1984, effective March 16, 1985 (D.C. Law 5-188; D.C. Official Code §§ 8-103.04 and 8-103.20), and Mayor's Order 98-50, dated April 15, 1998, as amended by Mayor's Order 2006-61, dated June 14, 2006, hereby gives notice of final rulemaking action to amend Chapter 11 of Title 21 of the District of Columbia Municipal Regulations (DCMR) (Water Quality Standards).

DDOE conducted its triennial review of the District of Columbia's water quality standards as required by the Water Pollution Control Act of 1984 and section 303(c) of the federal Clean Water Act (CWA)(33 U.S.C. § 1313(c)). This rulemaking upgrades the Designated Uses for Hickey Run and Watts Branch tributaries in the District to primary contact recreation Class-A use, to achieve the goals of CWA section 101(a)(2), and to provide protection to downstream waters. DDOE is also revising Section 1105.9 to clarify that it is within DDOE's discretion to determine whether or not a compliance scheduled is placed in a permit.

In addition, the rulemaking removes two sections of the water quality standards that were not approved by the Environmental Protection Agency (EPA), as published in the *D.C. Register* on October 28, 2005, at 52 DCR 9621. First, deleted is the first sentence of Note 1, Table 1 in section 1104.8 ("This criterion shall apply to *E. coli* bacteria determined by the Director to be of non-wildlife origin based on best scientific judgment using available information."). EPA determined that given the potential for risk from bacteria from nonhuman sources, and the limited knowledge in this area, the Agency does not exclude any source of fecal bacteria from the application of its recommended criteria. Second, deleted is the sentence in the definition of "primary contact recreation" in section 1199 ("Such uses are not expected during times of high current velocity, floods, electrical storms, hurricanes, tornadoes, winter temperature, heavy ice conditions, and other adverse natural conditions"). EPA determined that the definition could permit broad exemptions in the application of the designated use (primary contact recreation), and such limitation of a designated use should be supported by a Use Attainability Analysis, as required by 40 C.F.R. § 131.10(j). EPA's disapproval of these two provisions limited or restricted the application of the provisions for the purpose of the federal Clean Water Act. Therefore, DDOE is removing these two provisions to comply with the federal Clean Water Act. DDOE is also deleting the definition for "adverse natural conditions" previously used in the primary contact definition.

Water quality standards are being added for dissolved oxygen criterion for nontidal waters, and Nonylphenol, an organic chemical found to be toxic to aquatic life. The standards for Phenol and Acrolein are being updated based on EPA's recommended federal water quality criteria (Section 1104.8, Table 3). A definition for "nontidal waters" is also included (Section 1199.1).

DDOE is also updating the guidelines incorporated into the District's water quality standards, documented in the 2003 EPA publication: *Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll a for the Chesapeake Bay and its Tidal Tributaries*, EPA-903-R-03-002, April 2003, to include addenda by EPA in coordination with and on behalf of the Chesapeake Bay Program watershed jurisdictional partners (Section 1104.8, Table 1). This rulemaking incorporates the April 2010 addendum.

Proposed rulemaking was published on August 13, 2010, in the *DC Register* at 57 DCR 7409. Written comments were received in connection with this notice during the public comment period and public hearing from the Environmental Protection Agency, Earthjustice, and the Anacostia Riverkeeper. After review of these comments, the Director has concluded that no further changes should be made to the proposed rulemaking. No changes have been made to the final rulemaking from the proposed rulemaking notice published on August 13, 2010. A summary of the comments and DDOE's responses may be viewed on DDOE's website at www.ddoe.dc.gov, Regulatory and Legislative Affairs. These rules shall become effective on the date of publication of this notice in the *D.C. Register*.

Title 21 of the District of Columbia Municipal Regulations, Chapter 11, Water Quality Standards, is amended as follows:

Sections 1100 to 1106 are amended to read as follows:

1100 PURPOSE AND SCOPE

1100.1 This chapter establishes the Water Quality Standards (WQS) for the waters of the District of Columbia, as authorized by section 5 of the Water Pollution Control Act of 1984, effective March 16, 1985 (D.C. Law 5-188; D.C. Official Code § 8-103.04).

1101 SURFACE WATERS

1101.1 For the purposes of the water quality standards, the surface waters of the District shall be classified on the basis of their (i) current uses, and (ii) future uses to which the waters will be restored. The categories of beneficial uses for the surface waters of the District shall be as follows:

Categories of Uses that Determine Water Quality Standards	Classes of Water
Primary contact recreation	A
Secondary contact recreation and aesthetic enjoyment	B
Protection and propagation of fish, shellfish, and wildlife	C
Protection of human health related to consumption of fish and shellfish	D
Navigation	E

1101.2 The surface waters of the District are designated for beneficial use classes according to the categories delineated in subsection 1101.1 as follows:

CLASSIFICATION OF THE DISTRICT'S WATERS

	USE CLASSES	
Surface Waters of the District	**Current Use**	**Designated Use**
Potomac River	B, C, D, E	A, B, C, D, E
Potomac River tributaries (except as listed below)	B, C, D	A, B, C, D
Battery Kemble Creek	B, C, D	A, B, C, D
C & O Canal	B, C, D, E	A, B, C, D, E
Rock Creek	B, C, D, E	A, B, C, D, E
Rock Creek tributaries	B, C, D, E	A, B, C, D, E
Tidal Basin	B, C, D, E	A, B, C, D, E
Washington Ship Channel	B, C, D, E	A, B, C, D, E
Oxon Run	B, C, D	A, B, C, D
Anacostia River	B, C, D, E	A, B, C, D, E
Anacostia River tributaries (except as listed below)	B, C, D	A, B, C, D
Hickey Run	B, C, D	A, B, C, D
Watts Branch	B, C, D	A, B, C, D
Wetlands	C, D	C, D

1101.3 The Director may remove a designated use, establish a partial use, or establish sub-categories of a use for a particular surface water segment or body if a use attainability analysis can demonstrate that attaining the designated use is not feasible because:

(a) Naturally occurring pollutant concentrations prevent the attainment of the

use;

(b) Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating the District's water conservation requirements to enable uses to be met;

(c) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place;

(d) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the waterbody to its original condition or, to operate the modification in a way that would result in the attainment of the use;

(e) Physical conditions related to the natural features of the waterbody, such as the lack of proper substrate, cover, flow, depth, pools, riffles, and the like unrelated to water quality, preclude attainment of aquatic life protection uses; or

(f) Controls more stringent than those required by sections 301(b) and 306 of the federal Clean Water Act would result in substantial and widespread economic and social impact.

1101.4 A designated use specified in section 1101 may not be removed, and a partial use that involves the removal of the designated use, may not be established if:

(a) The use is actually attained in the surface water segment or body on or after November 28, 1975, unless a use requiring more stringent criteria is added; or

(b) The uses will be attained by implementing effluent limits required under sections 301(b) and 306 of the federal Clean Water Act and by implementing cost-effective and reasonable best management practices for nonpoint source control.

1101.5 If a permittee requests the Director to conduct a use attainability analysis and provides a reasonable basis for the need, the Director shall:

(a) Conduct a public meeting in the watershed of the affected segment or waterbody to inform the public of the nature of the use change requested and the basis of the request, and solicit the opinions and views of the public prior to determining whether to conduct a use attainability analysis;

(b) Inform the permittee and the public of the decision;

(c) Inform the permittee of the approximate costs of the analysis and the schedule. The permittee shall pay the costs of performing the analysis, in the amount specified by the Director;

(d) Not allow the permittee to perform the analysis;

(e) Form an advisory group of citizens and affected parties who will meet periodically during the course of the study;

(f) Hold a public hearing concerning the preliminary finding of the use attainability analysis prior to concluding the study;

(g) Submit the analysis to the United States Environmental Protection Agency (EPA) for review and approval, if the Director determines that a modification or change in the uses of the segment or waterbody is justified; and

(h) Modify or remove the use in accordance with federal and District procedures for revising water quality standards upon receipt of approval by the EPA.

1102 ANTIDEGRADATION POLICY

1102.1 **TIER I**: Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.

1102.2 **TIER II**: If the water quality of the surface waters of the District exceeds the water quality criteria necessary to sustain the existing uses, those waters shall be maintained at that quality. The water quality will not be allowed to degrade unless the District finds, after full satisfaction of the inter-governmental coordination and public participation of the District's continuing planning process as required in 40 CFR Part 130, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing the degradation to lower water quality, the District shall ensure water quality adequate to protect existing uses fully. Further, the District shall ensure that the highest statutory and regulatory requirements for all new and existing point sources and all cost effective and reasonable best management practices for nonpoint source control.

1102.3 **TIER III**: Where high quality waters constitute an outstanding national resource, such as waters of the national and District parks and wildlife refuges and waters of exceptional recreational or ecological significance, those waters shall be

designated Outstanding National Resource Waters (ONRW) and the water quality in the ONRW shall be maintained, protected and designated as below:

(a) New point and nonpoint source discharges, treated or otherwise, shall be prohibited in these segments;

(b) Increases in loadings or new pollutants from existing point and nonpoint source discharges shall be prohibited in these segments;

(c) Short-term degradation of the water quality shall be permitted after the permittee provides an opportunity for public participation; and submits to the Department a report that describes the matter on which the public was consulted; summarizes the views, significant comments, criticisms and suggestions of the public and other local and federal government agencies; and sets forth the specific responses in terms of modifications of the proposed action or an explanation for rejection of proposals made by the public and other local and federal government agencies. However, all practical means of minimizing the degradation shall be implemented; and

(d) Designation of ONRWs shall be adopted after full satisfaction of the intergovernmental coordination of the District's agencies and public participation provisions of the District's continuing planning process as required in 40 CFR Part 130.

1102.4 **SPECIAL WATERS OF THE DISTRICT OF COLUMBIA (SWDC):** Any segment or segments of the surface waters of the District that are of water quality better than needed for the current use or have scenic or aesthetic importance shall be designated as Special Waters of the District of Columbia (SWDC). The water quality in SWDC designated segments of the District's surface waters shall be maintained at or above the current level by implementing the following:

(a) Existing nonpoint source discharges, storm water discharges and storm sewer discharges to SWDC segments shall be controlled through implementation of best management practices and regulatory programs;

(b) Construction or development projects, such as roads, bridges, and bank stabilization of the streams in which a SWDC designated segment is located, which may lead to pollution of the water, shall be permitted on a case-by-case basis to ensure that there are no long-term adverse water quality effects and that no impairment of the designated uses of the segment occurs; or

(c) Short term degradation of water quality in a SWDC segment due to construction projects may be permitted provided that prior notice is given to the public and other local and federal government agencies, and

provided that the builder of the construction project submits a report to the Department which summarizes the views, significant comments, criticisms and suggestions of the public and other local and federal government agencies; and sets forth the specific responses in terms of modifications of the proposed action or an explanation for rejection of proposals made by the public and other local and federal government agencies.

1102.5 The following waters of the District shall be designated as SWDC segments:

(a) Rock Creek and its tributaries, and

(b) Battery Kemble Creek and its tributaries.

1103 WETLANDS

1103.1 In a wetland, the numerical and the narrative criteria shall be applied to the column of water above the wetland in accordance with the designated use.

1103.2 Wetlands with rooted vascular aquatic vegetation, except those specifically constructed or created as waste water treatment devices and except as provided in D.C. Official Code §§ 8-103.03(d) and 8-103.06(a)(3), shall be protected from significant adverse hydrologic modifications, excessive sedimentation, deposition of toxic substances in toxic amounts, nutrient imbalances, and other adverse anthropogenic impacts.

1104 STANDARDS

1104.1 The surface waters of the District shall be free from substances in amounts or combinations that do any one of the following:

(a) Settle to form objectionable deposits;

(b) Float as debris, scum, oil, or other matter to create a nuisance;

(c) Produce objectionable odor, color, taste, or turbidity;

(d) Cause injury to, are toxic to, or produce adverse physiological or behavioral changes in humans, plants, or animals;

(e) Produce undesirable or nuisance aquatic life or result in the dominance of nuisance species; or

(f) Impair the biological community that naturally occurs in the waters or depends upon the waters for its survival and propagation.

1104.2 For the waters of the District with multiple designated uses, the most stringent standards or criteria shall govern.

1104.3 Class A waters shall be free of discharges of untreated sewage, litter and unmarked submerged or partially submerged man-made structures that would constitute a hazard to the users of Class A waters.

1104.4 The aesthetic qualities of Class B waters shall be maintained. Construction, placement or mooring of facilities not primarily and directly water oriented is prohibited in, on, or over Class B waters unless:

(a) The facility is for the general public benefit and service, and

(b) Land based alternatives are not available.

1104.5 Class C streams shall be maintained to support aquatic life and shall not be placed in pipes.

1104.6 Within tidally influenced Class C waters, concentrations of chlorophyll *a* in free-floating microscopic aquatic plants (algae) shall not exceed levels that result in ecologically undesirable consequences such as reduced water clarity, low dissolved oxygen, food supply imbalances, proliferation of species deemed potentially harmful to aquatic life or humans or aesthetically objectionable conditions or otherwise render tidal waters unsuitable for designated uses.

1104.7 Class E waters shall be free of unmarked submerged or partially submerged man-made objects that pose a hazard to users of these waters.

1104.8 Unless otherwise stated, the numeric criteria that shall be met to attain and maintain designated uses are as follows (Tables 1 through 3):

Table 1

Constituent	Criteria for Classes		
	A	B	C
Bacteriological (MPN/100 mL)			
E. coli[1]			
Geometric Mean (Maximum 30 day	126		
geometric mean for 5 samples)			
Single Sample Value	410		
Physical			
Dissolved Oxygen (mg/L) Instantaneous minimum (Year-round)[2]			5.0

February 1 through May 31 [3,5]			
7-day mean			6.0
Instantaneous minimum			5.0
June 1 through January 31 [3,5]			
30-day mean			5.5
7-day mean			4.0
Instantaneous minimum [4]			3.2
Temperature (°C)			
Maximum			32.2
Maximum change above ambient			2.8
pH			
Greater than	6.0	6.0	6.0
And less than	8.5	8.5	8.5
Turbidity increase above ambient (NTU)	20	20	20
Secchi Depth [3,5] (m)(seasonal segment average)			
April 1 through October 31			0.8
Total dissolved gases (maximum % saturation)			110
Hydrogen Sulfide (maximum μg/L)			2.0
Oil & grease (mg/L)			10.0
Biological			
Chlorophyll a [3,5] (μg/L)(seasonal segment average)			
July 1 through September 30			25

Notes:

[1] The geometric mean criterion shall be used for assessing water quality trends and for permitting. The single sample value criterion shall be used for assessing water quality trends only.

[2] This criterion applies to nontidal waters.

[3] Attainment of the dissolved oxygen, water clarity and chlorophyll *a* water quality criteria that apply to tidal influenced Class C waters will be determined following the guidelines documented in the 2003 United States Environmental Protection Agency publication: Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll *a* for the Chesapeake Bay and its Tidal Tributaries, EPA-903-R-03-002, April 2003, Region III Chesapeake Bay Program Office, Annapolis, Maryland; 2004 Addendum, EPA-903-R-04-005, October 2004; 2007 Addendum, EPA 903-R-07-003 CBP/TRS 285/07, July 2007; 2007 Chlorophyll Criterion Addendum, EPA 903-R-07-005 CBP/TRS 288-07, November 2007; 2008 Addendum, EPA 903-R-08-001 CBP/TRS 290-08, June 2008; and 2010 Criterion Addendum EPA 903-R-10-002 CBP/TRS-301-10, April 2010.

[4] At temperatures greater than 29°C, in tidally influenced waters, an instantaneous minimum dissolved oxygen concentration of 4.3 mg/L shall apply.

[5] Shall apply to tidally influenced waters only.

Table 2

Constituent[1]	Criteria for Classes		
	C		D[2]
Trace metals and inorganics in μg/L, except where stated otherwise (see Notes below)	CCC 4-Day Avg	CMC 1-Hour Avg	30-Day Avg
Ammonia, total mg N/L	See Note 7	See Note 8	
Antimony, dissolved			640
Arsenic[3], dissolved	150	340	0.14c
Cadmium[4,5], dissolved	[I]^{CF}	[I.A]^{CF}	
Chlorine, total residual	11	19	
Chromium[4], hexavalent, dissolved	11^{CF}	16^{CF}	
Chromium[4,5], trivalent, dissolved	[II]^{CF}	[II.A]^{CF}	
Copper[4,5], dissolved	[III]^{CF}	[III.A]^{CF}	
Cyanide, free	5.2	22	140
Iron, dissolved	1000		
Lead[4,5], dissolved	[IV]^{CF}	[IV.A]^{CF}	
Mercury[4], total recoverable	0.77	1.4	0.15
Methylmercury (mg/kg, fish tissue residue)			0.3
Nickel[4,5], dissolved	[V]^{CF}	[V.A]^{CF}	4600
Selenium, total recoverable	5	20	4200
Silver[4,5], dissolved		[VI]^{CF}	65000
Thallium, dissolved			0.47
Zinc[4,5], dissolved	[VII]^{CF}	[VII]^{CF}	26000

Notes:

[1] For constituents without numerical criteria, standards have not been developed at this time. However, the National Pollutant Discharge Elimination System (NPDES) permitting authority shall address constituents without numerical standards in NPDES permit actions by using the narrative criteria for toxics contained in these water quality standards.

[2] The Class D Human Health Criteria for metals will be based on Total Recoverable metals.

[3] The letter "c" after the Class D Human Health Criteria numeric value means that the criteria is based on carcinogenicity of 10^{-6} risk level.

[4] The superscript "CF" means that the criterion derived from the formula under Note 5 is multiplied by the conversion factor in **Table 2a** as specified in subsection 1105.10:

Table 2a. Conversion Factors

Constituent	CCC	CMC
Cadmium	1.101672-[(ln hardness)(0.041838)]	1.136672-[(ln hardness)(0.041838)]
Chromium III	0.860	0.316
Chromium VI	0.962	0.982
Copper	0.960	0.960
Lead	1.46203-[(ln hardness)(0.145712)]	1.46203-[(ln hardness)(0.145712)]
Mercury	0.85	0.85
Nickel	0.997	0.998
Silver	--	0.85
Zinc	0.986	0.978

[5] The formulas for calculating the criterion for the hardness dependent constituents indicated above are as follows:

[I] The numerical CCC criterion for cadmium in μg/L shall be given by:

$$e^{(0.7409[\ln(hardness)]-4.719)}$$

[I.A] The numerical CMC criterion for cadmium in μg/L shall be given by:

$$e^{(1.0166[\ln(hardness)]-3.924)}$$

[II] The numerical CCC criterion for trivalent chromium in μg/L shall be given by:

$$e^{(0.8190[\ln(hardness)]+0.6848)}$$

[II.A] The numerical CMC criterion for trivalent chromium in μg/L shall be given by:

$$e^{(0.8190[\ln(hardness)]+3.7256)}$$

[III] The numerical CCC criterion for copper in μg/L shall be given by:

$$e^{(0.8545[\ln(hardness)]-1.702)}$$

[III.A] The numerical CMC criterion for copper in μg/L shall be given by:

$$e^{(0.9422[\ln(hardness)]-1.700)}$$

[IV] The numerical CCC criterion for lead in μg/L shall be given by:

$$e^{(1.2730[\ln(hardness)]-4.705)}$$

[IV.A] The numerical CMC criterion for lead in μg/L shall be given by:

$$e^{(1.2730[\ln(hardness)]-1.460)}$$

[V] The numerical CCC criterion for nickel in μg/L shall be given by:

$$e^{(0.8460[\ln(hardness)]+0.0584)}$$

[V.A] The numerical CMC criterion for nickel in μg/L shall be given by:

$$e^{(0.8460[\ln(hardness)]+2.255)}$$

[VI] The numerical CMC criterion for silver in μg/L shall be given by:

$$e^{(1.7200[\ln(hardness)]-6.590)}$$

[VII] The numerical CCC criterion for zinc in μg/L shall be given by:

$$e^{(0.8473[\ln(hardness)]+0.884)}$$

[VII.A] The numerical CMC criterion for zinc in μg/L shall be given by:

$$e^{(0.8473[\ln(hardness)]+0.884)}$$

[6] Hardness in the equations (I) through (VII.A) in Note 5 above shall be measured as mg/L of Calcium Carbonate ($CaCO_3$). The minimum hardness allowed for use in those equations shall not be less than 25 mg/L, as $CaCO_3$, even if the actual ambient hardness is less than 25 mg/L as $CaCO_3$. The maximum hardness value allowed for use in those equations shall not exceed 400 mg/L, as $CaCO_3$, even if the actual ambient hardness is greater than 400 mg/L as $CaCO_3$.

[7]Criterion Continuous Concentration (CCC) for Total Ammonia:

(a) The CCC criterion for ammonia (in mg N/L) (i) shall be the thirty (30)-day average concentration for total ammonia computed for a design flow specified in subsection 1105.5; and (ii) shall account for the influence of the pH and temperature as shown in Table 2b and Table 2c. The highest four (4)-day average within the thirty (30)-day period shall not exceed 2.5 times the CCC.

(b) The CCC criterion in **Table 2b** for the period March 1st through June 30th was calculated using the following formula, which shall be used to calculate unlisted values: $CCC = [(0.0577/(1+10^{7.688-pH})) + (2.487/(1+10^{pH-7.688}))] \times MIN(2.85, 1.45 \times 10^{0.028 \times (25-T)})]$, where MIN indicates the lesser of the two values $(2.85, 1.45 \times 10^{0.028 \times (25-T)})$ separated by a comma.

(c) The CCC criterion in **Table 2c** for the period July 1st through February 28/29th, was calculated using the following formula, which shall be used to calculate unlisted values: $CCC = [(0.0577/(1+10^{7.688-pH})) + (2.487/(1+10^{pH-7.688}))] \times [1.45 \times 10^{0.028 \times (25-MAX(T,7)}]$, where MAX indicates the greater of the two values (T,7) separated by a comma.

Table 2b. Total Ammonia (in milligrams of Nitrogen per liter) CCC criterion for various pH and temperatures for March 1st through June 30th:

	Temperature (°C)									
pH	**0**	**14**	**16**	**18**	**20**	**22**	**24**	**26**	**28**	**30**
6.50	6. 67	6.67	6.06	5.33	4.68	4.12	3.62	3.18	2.80	2.46
6.60	6.57	6.57	5.97	5.25	4.61	4.05	3.56	3.13	2.75	2.42

6.70	6.44	6.44	5.86	5.15	4.52	3.98	3.42	3.00	2.64	2.32
6.80	6.29	6.29	5.72	5.03	4.42	3.89	3.42	3.00	2.64	2.32
6.90	6.12	6.12	5.56	4.89	4.30	3.78	3.32	2.92	2.57	2.25
7.00	5.91	5.91	5.37	4.72	4.15	3.65	3.21	2.82	2.48	2.18
7.10	5.67	5.67	5.15	4.53	3.98	3.50	3.08	2.70	2.38	2.09
7.20	5.39	5.39	4.90	4.31	3.78	3.33	2.92	2.57	2.26	1.99
7.30	5.08	5.08	4.61	4.06	3.57	3.13	2.76	2.42	2.13	1.87
7.40	4.73	4.73	4.30	3.97	3.49	3.06	2.69	2.37	2.08	1.83
7.50	4.36	4.36	3.97	3.49	3.06	2.69	2.37	2.08	1.83	1.61
7.60	3.98	3.98	3.61	3.18	2.79	2.45	2.16	1.90	1.67	1.47
7.70	3.58	3.58	3.25	2.86	2.51	2.21	1.94	1.71	1.50	1.32
7.80	3.18	3.18	2.89	2.54	2.23	1.96	1.73	1.52	1.33	1.17
7.90	2.80	2.80	2.54	2.24	1.96	1.73	1.52	1.33	1.17	1.03
8.00	2.43	2.43	2.21	1.94	1.71	1.50	1.32	1.16	1.02	0.897
8.10	2.10	2.10	1.91	1.68	1.47	1.29	1.14	1.00	0.879	0.773
8.20	1.79	1.79	1.63	1.43	1.26	1.11	0.973	0.855	0.752	0.661
8.30	1.52	1.52	1.39	1.22	1.07	0.941	0.827	0.727	0.639	0.562
8.40	1.29	1.29	1.17	1.03	0.906	0.796	0.700	0.615	0.541	0.475
8.50	1.09	1.09	0.990	0.870	0.765	0.672	0.591	0.520	0.457	0.401
8.60	0.920	0.920	0.836	0.735	0.646	0.568	0.499	0.439	0.386	0.339
8.70	0.778	0.778	0.707	0.622	0.547	0.480	0.422	0.371	0.326	0.287
8.80	0.661	0.661	0.601	0.528	0.464	0.408	0.359	0.315	0.277	0.208
8.90	0.565	0.565	0.513	0.451	0.397	0.349	0.306	0.269	0.237	0.208
9.00	0.486	0.486	0.442	0.389	0.342	0.300	0.264	0.232	0.204	0.179

Table 2c. Total Ammonia (in milligrams of Nitrogen per liter) CCC criterion for various pH and temperatures for July 1st through February 28th/29th:

	Temperature (°C)									
pH	**0-7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15***	**16***
6.50	10.8	10.1	9.51	8.92	8.36	7.84	7.35	6.89	6.46	6.06
6.60	10.7	9.99	9.37	8.79	8.24	7.72	7.24	6.79	6.36	5.97
6.70	10.5	9.81	9.20	8.62	8.08	7.58	7.11	6.66	6.25	5.86
6.80	10.2	9.58	8.98	8.42	7.90	7.40	6.94	6.51	6.10	5.72
6.90	9.93	9.31	8.73	8.19	7.68	7.20	6.75	6.33	5.93	5.56
7.00	9.60	9.00	8.43	7.91	7.41	6.95	6.52	6.11	5.73	5.37
7.10	9.20	8.63	8.09	7.58	7.11	6.67	6.25	5.86	5.49	5.15
7.20	8.75	8.20	7.69	7.21	6.76	6.34	5.94	5.57	5.22	4.90
7.30	8.24	7.73	7.25	6.79	6.37	5.97	5.60	5.25	4.92	4.61
7.40	7.69	7.21	6.76	6.33	5.94	5.57	5.22	4.89	4.59	4.30
7.50	7.09	6.64	6.23	5.84	5.48	5.13	4.81	4.51	4.23	3.97

7.60	6.46	6.05	5.67	5.32	4.99	4.68	4.38	4.11	3.85	3.61
7.70	5.81	5.45	5.11	4.79	4.49	4.21	3.95	3.70	3.47	3.25
7.80	5.17	4.84	4.54	4.26	3.99	3.74	3.51	3.29	3.09	2.89
7.90	4.54	4.26	3.99	3.74	3.51	3.29	3.09	2.89	2.71	2.54
8.00	3.95	3.70	3.47	3.26	3.05	2.86	2.68	2.52	2.36	2.21
8.10	3.41	3.19	2.99	2.81	2.63	2.47	2.31	2.17	2.03	1.91
8.20	2.91	2.73	2.56	2.4	2.25	2.11	1.98	1.85	1.74	1.63
8.30	2.47	2.32	2.18	2.04	1.91	1.79	1.68	1.58	1.48	1.39
8.40	2.09	1.96	1.84	1.73	1.62	1.52	1.42	1.33	1.25	1.17
8.50	1.77	1.66	1.55	1.46	1.37	1.28	1.20	1.13	1.06	0.990
8.60	1.49	1.40	1.31	1.23	1.15	1.08	1.01	0.951	0.892	0.836
8.70	1.26	1.18	1.11	1.04	0.976	0.915	0.858	0.805	0.754	0.707
8.80	1.07	1.01	0.944	0.885	0.829	0.778	0.729	0.684	0.641	0.601
8.90	0.917	0.860	0.806	0.756	0.709	0.664	0.623	0.584	0.548	0.513
9.00	0.790	0.740	0.694	0.651	0.610	0.572	0.536	0.503	0.471	0.442

*At 15°C and above, the criterion for July 1st through February 28th/29th is the same as the criterion for March 1st through June 30th.

[8] Criterion Maximum Concentration (CMC) for Total Ammonia:

(a) The CMC criterion for total ammonia (in mg N/L) (i) shall be the one (1)-hour average concentration for total ammonia, computed for a design flow specified in subsection 1105.5; and (ii) shall account for the influence of the pH as shown in Table 2d.

(b) The CMC criterion was calculated using the following formula, which shall be used to calculate unlisted values: $CMC = [(0.411/(1+10^{7.204-pH})] + [58.4/(1+10^{pH-7.204})]$.

Table 2d. Total Ammonia (in milligrams of Nitrogen per liter) CMC criterion for various pH:

pH	CMC	pH	CMC	pH	CMC	pH	CMC
6.50	48.8	7.20	29.5	7.90	10.1	8.60	2.65
6.60	46.8	7.30	26.2	8.00	8.40	8.70	2.20
6.70	44.6	7.40	23.0	8.10	6.95	8.80	1.84
6.80	42.0	7.50	19.9	8.20	5.72	8.90	1.56
6.90	39.1	7.60	17.0	8.30	4.71	9.00	1.32
7.00	36.1	7.70	14.4	8.40	3.88		
7.10	32.8	7.80	12.1	8.50	3.20		

Table 3

Constituent[1] Organics (μg/L)	CAS Number	Criteria for Classes		
		C		D[2]
		CCC 4-Day Avg	CMC 1-Hour Avg	30-Day Avg
Acrolein	107028	10.0		9
Acrylonitrile	107131	700.0		0.25,c
Aldrin	309002	0.4	3.0	0.000050,c
Benzene	71432	1000		51.0,c
Carbon Tetrachloride	56235	1000		1.6,c
Chlordane	57749	0.0043	2.4	0.00081,c
Chlorinated benzenes (except Di)		25.0		
Chlorobenzene	108907			1600
1,2-Dichlorobenzene	95501	200		1300
1,3-Dichlorobenzene	541731	200		960
1,4-Dichlorobenzene	106467	200		190
Hexachlorobenzene	118741			0.00029,c
Pentachlorobenzene	608935			1.5
1,2,4,5-Tertrachlorobenzene	95943			1.1
1,2,4-Trichlorobenzene	120821			70
Chlorinated ethanes		50		
1,2-Dichloroethane	107062			37.0,c
Hexachloroethane	67721			3.3,c
1,1,2,2-Tetrachloroethane	79345			4.0,c
1,1,2-Trichloroethane	79005			16.0,c
Chlorinated naphthalene				
2-Chloronaphthalene	91587	200		1600
Chlorinated phenols				
2-Chlorophenol	95578	100		150
2,4-Dichlorophenol	120832	200		290.0
Pentachlorophenol[3]	87865	[I]	[I.A]	3.0,c
2,4,5-Trichlorophenol	95954			3600
2,4,6-Trichlorophenol	88062			2.4,c
Chloroalkyl ethers		1000		
Bis(2-Chloroethyl)Ether	111444			0.53,c
Bis(2-Chloroisopropyl)Ether	108601			65,000
Bis(Chloromethyl)Ether	542881			0.00029
3,3-Dichlorobenzidine	91941	10		0.028,c
Dichloroethylenes		1000		
1,1-Dichloroethylene	75354			7,100,c
1,2-Trans-Dichloroethylene	156605			10,000
1,2-Dichloropropane	78875	2000		15,c
Dichloropropenes		400		

Constituent[1] Organics (μg/L)	CAS Number	Criteria for Classes		
		C		D[2]
		CCC 4-Day Avg	CMC 1-Hour Avg	30-Day Avg
1,3-Dichloropropene	542756			21
Dieldrin	60571	0.056	0.24	0.000054,c
2,4-Dimethylphenol	105679	200		850
2,4-Dinitrotoluene	121142	33		3.4,c
Dioxin (2,3,7,8-TCDD)	1746016			0.0000000051,c (5.1 E-8)
1,2-Diphenylhydrazine	122667	30		0.20,c
Endosulfan		0.056	0.22	89
Alpha-Endosulfan	959988	0.056	0.22	89
Beta-Endosulfan	33213659	0.056	0.22	89
Endosulfan sulfate	1031078			89
Endrin	72208	0.036	0.086	0.060
Endrin aldehyde	7421934			0.30
Ethylbenzene	100414	40		2,100
Halomethanes		1000		
Bromoform	75252			140,c
Chloroform	67663	3000		470.0,c
Chlorodibromomethane	124481			13.0,c
Dichlorobromomethane	75274			17.0,c
Methyl Bromide	74839			1,500
Methyl Chloride	74873			
Methylene chloride	75092			590,c
Heptachlor	76448	0.0038	0.52	0.000079,c
Heptachlor epoxide	1024573	0.0038	0.52	0.000039,c
Hexachlorobutadiene	87683	10		18.0,c
Hexachlorocyclohexane				
alpha-BHC	319846			0.0049,c
beta-BHC	319857			0.017,c
gamma-BHC (Lindane)	58899	0.08	0.95	1.8,c
Hexachlorocyclopentadiene	77474	0.5		1,100
Isophorone	78591	1000		960,c
Manganese	7439965			100
Methoxychlor	72435	0.03		
Mirex	2385855	0.001		
Naphthalene	91203	600		
Nitrobenzene	98953	1000		690
Nitrophenols		20		
2-Methyl-4,6- Dinitrophenol	534521			280

Constituent[1] Organics (μg/L)	CAS Number	Criteria for Classes C CCC 4-Day Avg	C CMC 1-Hour Avg	D[2] 30-Day Avg
2,4-Dinitrophenol	51285			5,300
Dinitrophenols	25550587			5,300
Nitrosamines		600		1.24
N-Nitrosodibutylamine	924163			0.22
N-Nitrosodiethylamine	55185			1.24
N-Nitrosodimethylamine	62759			3.0,c
N-Nitrosodi-n-Propylamine	621647			0.51,c
N-Nitrosodiphenylamine	86306			6.0,c
N-Nitrosopyrrolidine	930552			34,c
Nonylphenol	84852153	6.6	28	
Organochlorides				
4,4'-DDD	72548	0.001	1.1	0.00031,c
4,4'-DDE	72559	0.001	1.1	0.00022,c
4,4'-DDT	50293	0.001	1.1	0.00022,c
Organophosphates				
Guthion	86500	0.01		
Malathion	121755	0.1		
Parathion	56382	0.013	0.065	
Phenol	108952			860,000
Phthalate esters		100		
Bis(2-Ethylhexyl) Phthalate	117817			2.2,c
Butylbenzyl Phthalate	85687			1,900
Diethyl Phthalate	84662			44,000
Dimethyl Phthalate	131113			1,100,000
Di-n-Butyl Phthalate	84742			4,500
Polychlorinated biphenyls[4]		0.014		0.000064,c
Polynuclear aromatic hydrocarbons				
Acenaphthene	83329	50		990
Acenaphthylene	208968			
Anthracene	120127			40,000
Benzidine	92875	250		0.00020,c
Benzo(a)Anthracene	56553			0.018,c
Benzo(a)Pyrene	50328			0.018,c
Benzo(b)Fluoranthene	205992			0.018,c
Benzo(k)Fluoranthene	207089			0.018,c
Chrysene	218019			0.018,c
Dibenzo(a,h) Anthracene	53703			0.018,c
Fluoranthene	206440	400		140.0

Constituent[1] Organics (μg/L)	CAS Number	Criteria for Classes		
		C		D[2]
		CCC 4-Day Avg	CMC 1-Hour Avg	30-Day Avg
Fluorene	86737			5,300
Indeno(1,2,3-cd) Pyrene	193395			0.018,c
Phenanthrene	85018			
Pyrene	129000			4,000
Tetrachloroethylene	127184	800		3.3,c
Toluene	108883	600		15000
Toxaphene	8001352	0.0002	0.73	0.00028,c
Tributyltin (TBT)	--	0.072	0.46	
Trichloroethylene	79016	1000		30.0,c
Vinyl chloride	75014			2.4,c

Notes:

[1] For constituents without numerical criteria, standards have not been developed at this time. However, permit writers shall address these constituents in NPDES permit actions using the narrative criteria for toxics contained in these water quality standards.

[2] The letter "c" after the Class D Human Health Criteria numeric value means that the criterion is based on carcinogenicity of 10^{-6} risk level.

[3] The formulas for calculating the concentrations of substances indicated above are as follows:

[I] The numerical CCC criterion for pentachlorophenol in μg/L shall be given by:

$$e^{(1.005(pH) - 5.134)}$$

[I.A] The numerical CMC criterion for pentachlorophenol in μg/L shall be given by:

$$e^{(1.005(pH) - 4.869)}$$

[4] The polychlorinated biphenyls (PCB) criterion applies to total PCBs (e.g., the sum of all congener or all isomer or homolog or Aroclor analyses.)

1105 IMPLEMENTATION AND APPLICABILITY

1105.1 Where the discharge of pollutants in quantities that prevent the attainment of, or violates, the surface water quality standards, the Director may grant a variance from a water quality standard that is the basis of a water quality-based effluent limitation included in a National Pollutant Discharge Elimination System (NPDES) permit. A water quality standard variance applies only to the permittee requesting the variance and only to the pollutant or pollutants specified in the

variance. A variance does not affect, or require the Director to modify, the corresponding water quality standard for the waterbody as a whole. A variance may be granted only if the discharger can justify every three (3) years through a public hearing process that attaining the water quality standard is not feasible because at least one (1) of the following conditions exists:

(a) Irretrievable and irreversible conditions that prevent the attainment of the standards;

(b) The application of technology sufficient to attain the standards is more stringent than that required by sections 301(b) and 306 of the federal Clean Water Act, and the application of the technology would result in substantial and widespread adverse economic and social impacts; or

(c) One or more of the reasons specified in subsection 1101.3.

1105.2 The Director shall not grant a variance from the water quality standards if:

(a) The variance will result in loss of protection for an existing use, or

(b) The permittee fails to make the demonstrations required under subsection 1105.1.

1105.3 Variances approved by the Director shall include all permit conditions needed to implement those parts of the variance so approved. The permit conditions shall, at a minimum, require:

(a) Compliance with an initial effluent limitation that, at the time the variance is granted, represents the level currently achievable by the permittee, and that is no less stringent than that achieved under the previous permit;

(b) That reasonable progress be made toward attaining the water quality standards for the waterbody as a whole through appropriate conditions; and

(c) A provision that allows the permitting authority to reopen and modify the permit based upon any triennial water quality standards revisions to the variance.

1105.4 The Director shall establish and incorporate into the water quality certification of the permittee's discharge permit, all conditions needed to implement the variance as determined pursuant to this section. A variance may be renewed, subject to the requirements of this section. As part of any renewal application, the permittee shall again demonstrate that attaining water quality standards is not feasible based on the requirements of subsection 1105.1. The permittee's application shall also

contain information concerning the permittee's compliance with the conditions incorporated into its permit as part of the previous variance pursuant to this section. The Director may deny renewal of a variance if the permittee did not substantively comply with the conditions of the previous variance.

1105.5 The design flow to be used for establishing permit limitations for discharges to the District waters shall be as follows:

(a) The numerical criteria for classes A, B, and C(CCC), as delineated in subsection 1104.8, shall not apply at flows less than the average seven-day (7-day) low flow, which has a probability of occurrence of once in ten (10) years;

(b) The numerical criteria for class C(CMC), as delineated in subsection 1104.8, shall not apply at flows less than the average one-day (1-day) low flow, which has a probability of occurrence of once in ten (10) years;

(c) For carcinogenic pollutants under class D, as delineated in subsection 1104.8, the design flow shall be the harmonic mean flow, and for noncarcinogenic pollutants under class D the design flow shall be the average thirty-day (30-day) low flow, which has the probability of occurrence of once in five (5) years. The categorization of pollutants to be carcinogenic or noncarcinogenic is shown under the Class D column for Human Health Criteria;

(d) The numerical criteria for clarity shall not apply at flows greater than the long-term seasonal average flow; and

(e) For chlorophyll *a*, the design flow shall be the average seasonal flow for July 1 through September 30.

1105.6 High flow conditions in the District of Columbia waters are defined as follows:

(a) For the Potomac River, the following conditions shall be considered a high flow:

(1) A flow that may result due to a rainfall with an average intensity greater than two-tenths of an inch (0.2") per hour for a period of one (1) hour in the portion of the District of Columbia contributory to the Potomac River, or

(2) A flow equivalent to a three hundred percent (300%) increase in flow during a twenty-four (24) hour period.

(b) For the Anacostia River, the following conditions shall be considered a

high flow:

(1) A flow that may result due to a rainfall with an average intensity greater than two-tenths of an inch (0.2") per hour for a period of one (1) hour in the portion of the District of Columbia contributory to the Anacostia River, or

(2) A flow equivalent to a three hundred percent (300%) increase in flow during a twenty-four (24) hour period.

(c) For Rock Creek and tributaries, the following conditions shall be considered a high flow:

(1) A flow that may result due to a rainfall with an average intensity greater than two-tenths of an inch (0.2") per hour for a period of one (1) hour in the portion of the District of Columbia contributory to Rock Creek, or

(2) A flow equivalent to a three hundred percent (300%) increase in flow during a twenty-four (24) hour period.

(d) For other tributaries to the Potomac and Anacostia Rivers, a flow equivalent to a five hundred percent (500%) increase in flow during a twenty-four (24) hour period, shall be considered a high flow.

1105.7 The Director may allow mixing zones for point source discharges of pollutants on a case-by-case basis, where it is demonstrated that allowing a small area impact will not adversely affect the waterbody as a whole. The following conditions shall apply:

(a) In the nontidal waters, the permissible size of the mixing zone shall be determined by the ability of organisms to pass through the mixing zone and the size of the receiving waterbody;

(b) Mixing zones shall be free from discharged substances that will settle to form objectionable deposits; float to form unsightly masses; or produce objectionable color, odor, or turbidity;

(c) A mixing zone, or two (2) or more mixing zones, shall not form a barrier to the movements of aquatic life, nor cause significant adverse impact on aquatic life in shallow areas that serve as a nursery;

(d) The concentration of a substance in the mixing zone shall not be lethal to passing organisms, as determined by the appropriate EPA method;

(e) Mixing zones shall be positioned in a manner that provides the greatest protection to aquatic life and the designated uses of the water;

(f) Within the estuary, the cross-sectional area occupied by a mixing zone shall not exceed ten percent (10%) of the numerical value of the cross-sectional area of the waterway, and the width of the mixing zone shall not occupy more than one third (1/3) of the width of the waterway;

(g) Within the estuary, mixing zones may move with the prevailing hydraulic and meteorological conditions;

(h) The numerical standards for Criterion Continuous Concentration (CCC) in subsection 1104.8 must be met at the edge of the mixing zone and therefore the CMC criteria will be met within some portions of the mixing zone;

(i) The mixing zone shall be implemented in accordance with the EPA Technical Support Document for Water Quality-Based Toxics Control, EPA-505-2-90-001, March 1991; and

(j) The mixing zone shall be approved by the Director.

1105.8 Any permit issued pursuant to section 7 of the Water Pollution Control Act of 1984 (D.C. Official Code § 8-103.06) shall be based on the designated uses and other provisions of these water quality standards.

1105.9 When the Director requires a new water quality standard-based effluent limitation in a discharge permit, the permit may, when appropriate, specify a schedule of compliance. The schedule shall require compliance as soon as possible. The permittee shall have no more than three (3) years to achieve compliance with the limitation, unless the permittee can demonstrate, and the record reflects, that a longer compliance period is warranted.

1105.10 The numerical criteria for dissolved cadmium, hexavalent chromium, trivalent chromium, copper, lead, nickel, silver, and zinc shall be calculated by multiplying the criteria for these metals as specified in Table 2 of subsection 1104.8 by the EPA Conversion Factors specified in Appendix B of the EPA National Recommended Water Quality Criteria: 2002, EPA-822-R-02-047, November 2002. This conversion is required because the numerical values for these metals in Table 2 of this Chapter were established for total recoverable metals, but are being used for dissolved metals.

1106 SITE-SPECIFIC STANDARDS

1106.1 If requested, the Director may allow a person to conduct a site-specific study to

change the numerical criteria when at least one (1) of the following conditions exists:

(a) The species, or endangered species, at the site are more or less sensitive than those included in the national criteria data set; or

(b) Physical or chemical characteristics of the site alter the biological availability or toxicity of the chemical.

1106.2 If the criteria in subsection 1104.8 are found to be unsuitable for the District waters based upon the conditions described in subsection 1106.1, when requested to do so, the Director may adopt site-specific criterion for Class C waters, except for mercury and selenium, or for Class D waters, only when a site-specific study necessitates.

1106.3 When requested to do so, based upon the conditions described in subsection 1106.1 and, if warranted, the Director shall allow site-specific studies to generate scientific information regarding:

(a) The Water Effect Ratio for metals specific to the District waters;

(b) The sensitivities of the aquatic organisms prevalent in the District;

(c) The toxicity of chemicals to the fish in the District waters and related human health effects; and

(d) Any other compelling factors that merit consideration for changing the numerical standards in subsection 1104.8.

1106.4 A person or persons planning to conduct a site-specific study shall submit a complete plan of study to the Director for approval, and the site-specific study shall be carried out only after the Director approves the study in writing, subject to the requirements set forth in this section.

1106.5 The Director shall provide advance notice to all discharge permittees and applicants for discharge permits prior to the initiation of any site-specific study.

1106.6 All site-specific studies and adoption of site-specific criteria shall be subject to the following requirements:

(a) Once the Director has approved the study, it shall be concluded in accordance with the approved plan;

(b) A person or persons conducting a site-specific study subject to subsection 1106.3 shall submit to the Director for review and approval all data,

analyses, findings, reports, and other information the Director deems necessary;

(c) The Director shall seek review of the findings of the site-specific studies and other relevant information by the public, as well as by appropriate local and federal government agencies and consider their concerns before adopting any less stringent site-specific criterion based on those findings; and

(d) If the study concludes that a more stringent criterion is needed for Class C or D waters than provided in subsection 1104.8, then the Director shall modify the standards to reflect the more stringent level of protection.

1106.7 If a study is conducted to determine the Water Effect Ratio (WER) for metals and the criteria are in the dissolved form, the WER must be based on the dissolved fraction of the metals. If the study is conducted to determine the WER for metals and the criteria are in the total recoverable form, the WER must be based on the total recoverable fraction of the metals. If WERs are to be developed, EPA guidance Interim Guidance on Determination and Use of Water Effect Ratios for Metals, EPA-823-B-94-001, February 1994, shall be used and at a minimum, the following conditions shall be met unless the Director approves a deviation or alternate method:

(a) If a WER study concludes that an existing criterion is not stringent enough, then the criterion shall be made more stringent;

(b) At least two (2) sensitive indicator species, a fish and at least one (1) invertebrate, shall be used to determine toxicity in laboratory water and water collected from the site;

(c) The LC_{50} in the laboratory water must be comparable to the LC_{50} data developed by EPA;

(d) Water samples collected from the site shall be representative of critical low flow. A minimum of eight (8) samples per location per season shall be evaluated;

(e) Samples shall be taken at the edge of the mixing zone unless multiple discharges are involved. At least one (1) sample shall be reasonably well mixed with the flow of the receiving water, or the sample shall be well outside the regulatory mixing zone;

(f) Laboratory water shall be the same as the water used by EPA and adjusted for site water characteristics and hardness;

(g) The trace metal shall be added in the form of a highly soluble inorganic salt;

(h) The chemical and physical characteristics, both dissolved and total recoverable metal concentrations, hardness, pH, alkalinity, suspended solids, organic carbon, temperature, and specific metal binding ligands (where known to be important), and any other water quality characteristic that affects bioavailability and toxicity of the water should be monitored during the toxicity tests;

(i) A WER that is large or that is based on highly variable tests may be rejected;

(j) The WER shall be the geometric mean of the two (2) species; and

(k) All chemical, biochemical, biological, and other appropriate analyses shall be conducted using EPA-approved methods.

1106.8 If a site-specific study is conducted to determine the Class D Human Health Criteria and related human health effects, at a minimum, the study shall incorporate the following information:

(a) Bioconcentration factors of the substances in the commonly consumed fish in the District;

(b) Percent lipids in the commonly consumed fish in the District; and

(c) Information regarding the consumption by the public of fish caught from the District waters.

1106.9 The determination of subsection 1106.8 (a) and (b) shall be made using EPA-approved methods.

1106.10 The criteria, based upon a site-specific study and information collected through the study, shall be calculated using relations developed by EPA Technical Support Document for Water Quality-Based Toxics Control, EPA-505-2-90-001, March 1991, minus the component for drinking water, as follows:

(a) For noncarcinogens:

NEW CRITERIA = (RfD x WT)/(FC x L x FM x BCF)

where RfD is the reference dose from the EPA Integrated Risk Information System (IRIS) database, WT is seventy (70) kilograms, FC is the daily fish consumption by the exposed population in kilograms per day, L is the ratio of lipid fraction of fish tissue consumed to three percent (3%), FM is the

food chain multiplier and BCF is the bioconcentration factor for fish with three percent (3%) lipid.

(b) For carcinogens:

NEW CRITERIA = (RL x WT)/($q1^*$ x FC x L x FM x BCF)

where WT, FC, L, FM, and BCF are as stated above; RL is 10^{-6} and $q1^*$ is the carcinogenic potency factor from the EPA IRIS database.

1106.11 If the effluent limitation for a metal in a discharge permit is specified as "total recoverable", and the criterion for it in subsection 1104.8 is specified as "dissolved", either of the following two (2) approaches based on The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit From a Dissolved Criterion, EPA-823-B-96-007, June 1996, may be used, subject to prior review and approval by the Director:

(a) The criterion may be used as total recoverable for the purpose of establishing effluent limitations; or

(b) A site-specific ratio between the dissolved and total recoverable metal may be developed by systematic monitoring and analysis of the effluent and of the receiving water at the edge of the mixing zone during periods that reflect the environmental conditions upon which the permit was issued. This ratio shall incorporate considerations to avoid toxicity to aquatic organisms from deposition to the sediment outside of the mixing zone. The ratio of dissolved to total recoverable metal shall then be used to determine the total recoverable effluent limits based on the dissolved metal criterion.

1106.12 The Director may establish additional requirements for adopting site-specific water quality standards.

Section 1199 is amended to read as follows:

1199 DEFINITIONS

1199.1 When used in this chapter, the following terms shall have the meanings ascribed:

Acute toxic - the concentration of a substance that is lethal to fifty percent (50%) of the test organisms within ninety-six (96) hours, also referred to as the LC_{50}.

Ambient - those conditions existing before or upstream of a source or incidence of pollution.

Anadromous fish - fish that spend most of their lives in saltwater but migrate into freshwater tributaries to spawn.

Aquatic Life - all animal and plant life including, but not limited to, rooted underwater grasses found in the District waters.

Background water quality - the levels of chemical, physical, biological, and radiological constituents or parameters in the water upgradient of a facility, practice, or activity and which have not been affected by that facility, practice, or activity.

Best management practices (BMPs) - schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to the waters of the District. BMPs also include practices found to be the most effective and practical means of preventing or reducing point and non-point source pollution to levels that are compatible with water quality goals.

Contamination - an impairment of water quality by biological, chemical, physical, or radiological materials which lowers the water quality to a degree that creates a potential hazard to the environment or public health or interferes with a designated use.

Criteria - any of the group of physical, chemical, biological, and radiological water quality parameters and the associated numerical concentrations or levels that compose the numerical standards of the water quality standards and that define a component of the quality of the water needed for a designated use.

CCC or Criterion Continuous Concentration - the highest concentration of a pollutant to which aquatic life can be exposed for an extended period of time (four-day (4-day) average) without deleterious effects at a frequency that does not exceed more than once every three (3) years.

CMC or Criterion Maximum Concentration - the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time (one-hour (1-hour) average) without deleterious effects at a frequency that does not exceed more than once every three (3) years.

Consumption of fish and shellfish - the human ingestion of fish and shellfish, that are not chemically contaminated at a level that will cause a significant adverse health impact, caught from the District's waters.

Current use - the use that is generally and usually attained based upon the water quality in the waterbody.

Department - the District Department of the Environment, or a successor agency.

Designated use - the use specified for the waterbody in these water quality standards whether or not they are being attained.

Director - the Director of the Department, or his or her designee.

Early warning value - a concentration that is a percentage of or practical quantitation limit, for a ground water quality criterion or enforcement standard.

EPA -United States Environmental Protection Agency.

Enforcement standard - the value assigned to a contaminant for the purpose of regulating an activity, which may be the same as the criterion for that contaminant.

Existing use - the use actually attained in the waterbody on or after November 28, 1975.

Federal Clean Water Act - the Water Pollution Control Act, approved October 18, 1972 (86 Stat. 816; 33 U.S.C. § 1251 *et seq.*), as amended.

Ground water - underground water, excluding water in pipes, tanks, and other containers created or set up by people.

Harmonic mean flow - the number of daily flow measurements divided by the sum of the reciprocals of the flows. It is the reciprocal of the mean of the reciprocals.

High quality waters - waters of a quality that is better than needed to protect fishable and swimmable streams.

Landfill - a disposal facility or part of a facility at which solid waste is permanently placed in or on land and which is not a landspreading facility.

Landspreading disposal facility - a facility that applies sludge or other solid wastes onto the land or incorporates solid waste in the soil surface at greater than vegetative utilization and soil conditioners/immobilization rates.

LC_{50} or lethal concentration - the numerical limit or concentration of a test material mixed in water that is lethal to fifty percent (50%) of the aquatic organisms exposed to the test material for a period of ninety-six (96) hours.

Load or loading - the total quantity of a pollutant in a given period of time.

Mixing zone - a limited area or a volume of water where initial dilution of a discharge takes place and where numerical water quality criteria may be exceeded but acute toxic conditions are prevented from occurring.

MPN - a statistically derived estimate of the "Most Probable Number" of bacteria colonies in a volume of one hundred milliliters (100 mL) water sample.

Narrative criteria - a condition that should not be attained in a specific medium to maintain a given designated use and that is generally expressed in a "free from" format.

Navigation - the designated use for certain District waters. This designation applies to waters that are subject to the ebb and flow of the tides, or waters that are presently used, may have been used, or may be used for shipping, travel, and transportation of interstate or foreign commerce by vessel.

Nonpoint source - any source from which pollutants are or may be discharged other than a point source.

Nontidal waters - waters in the streams not subject to regular and periodic tidal action.

Numerical criteria - the maximum level of a contaminant, or the minimum level of a constituent, or the acceptable range of a parameter in water to maintain a given designated use.

Permit or permitted - a written authorization issued or certified by the Director under pertinent laws and regulations for an activity, facility, or entity to discharge, treat, store, or dispose of materials or wastes.

Point of compliance - the point or points where the water quality enforcement standard or criterion must not be exceeded.

Point source - any discrete source of quantifiable pollutants, including a municipal treatment facility discharge, residential, commercial or industrial waste discharge, a combined sewer overflow; or any discernible, confined, and discrete conveyance, including any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, or concentrated animal feeding operation from which contaminants are or may be discharged.

Pollution - the man-made or man-induced alteration of the chemical, physical, biological, or radiological integrity of water.

Pollutant - any substance that may alter or interfere with the restoration or maintenance of the chemical, physical, radiological, or biological integrity of the

waters of the District, including dredged soil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, hazardous wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, oil, gasoline and related petroleum products, and industrial, municipal, and agricultural wastes.

Practical quantitation limit - the lowest concentration of a substance that generally can be determined by qualified laboratories within specified limits of precision and accuracy under routine laboratory operating conditions in the matrix of concern.

Primary contact recreation - those water contact sports or activities that result in frequent whole body immersion or involve significant risks of ingestion of the water. (Class A)

Responsible party - any person who has caused or is causing pollution or has created or is creating a condition from which pollution is likely to occur.

Secondary contact recreation - those water contact sports or activities that seldom result in whole body immersion or do not involve significant risks of ingestion of the water. (Class B)

Semi-anadromous fish - fish that spend most of their lives in tidally influenced low to medium salinity waters but migrate into freshwater tributaries to spawn.

Short term degradation - the period during which the waterbody may be degraded based on the nature of the pollutant and the degree of its environmental or human health impact, as determined by the Director on a case-by-case basis.

Solid waste - all putrescible and non-putrescible solid and semisolid wastes, including garbage, rubbish, ashes, industrial wastes, swill, demolition and construction wastes, abandoned vehicles or parts thereof, and discarded commodities. This term also includes all liquid, solid, and semisolid materials that are not the primary products of public, private, industrial or commercial mining, and agricultural operations.

Standards - those regulations, in the form of numerical, narrative, or enforcement standards, that specify a level of quality of the waters of the District necessary to sustain the designated uses.

Surface impoundment - a facility or part of a facility that is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), and that is designed to hold an accumulation of liquids or sludge.

Surface waters - all rivers, lakes, ponds, wetlands, inland waters, streams, and all other water and water courses within the jurisdiction of the District of Columbia.

Tidally influenced waters - surface waters within the Potomac River, the Anacostia River and all embayments and tributaries to these rivers under the influence of tidal exchange.

Toxic substance - any substance or combination of substances that, after discharge and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, may cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformities, in the organism or its offspring.

Trend analysis - a statistical methodology used to detect net changes or trends in contaminant levels over time.

Water Effect Ratio or WER - the ratio of the site water LC_{50} value to the laboratory water LC_{50} value.

Waters of the District or District waters - flowing and still bodies of water, whether artificial or natural, whether underground or on land, so long as in the District of Columbia, but excludes water on private property prevented from reaching underground or land watercourses, and also excludes water in closed collection or distribution systems.

Wetland - a marsh, swamp, bog, or other area periodically inundated by tides or having saturated soil conditions for prolonged periods of time and capable of supporting aquatic vegetation.

Wildlife - all animal life whether indigenous or migratory regardless of life stage including, but not limited to, birds, anadromous and semi-anadromous fish, shellfish, and mammals including sensitive species, that are found in or use the District waters.

1199.2 When used in this chapter, the following abbreviations shall have the meaning ascribed:

°C	-	degrees centigrade
$CaCO_3$	-	Calcium Carbonate
CF	-	Conversion Factor
ln	-	natural logarithm
m	-	meter
mg/L	-	milligrams per liter
μg/L	-	microgram per liter

mg N/L	-	milligrams of Nitrogen per liter
mL	-	milliliter
MPN	-	Most Probable Number
NPDES	-	National Pollutant Discharge Elimination System
NTU	-	nephelometric turbidity units
WQS	-	water quality standards

Arlington County WPCP (VA0025143)
Total Recoverable Copper Data
(4th Quarter 2008 -- 4th Quarter 2012)

Due	CONC AVG	Lim Avg	CONC MAX	Lim Max
10-Jan-13	<QL	NL	<QL	NL
10-Oct-12	<QL	NL	<QL	NL
10-Jul-12	<QL	NL	<QL	NL
10-Apr-12	<QL	NL	<QL	NL
10-Jan-12	0.0022	NL	0.0022	NL
10-Oct-11	<QL	NL	<QL	NL
10-Jul-11	<QL	NL	<QL	NL
10-Apr-11	0.0027	NL	0.0027	NL
10-Jan-11	<QL	NL	<QL	NL
10-Oct-10	<QL	NL	<QL	NL
10-Jul-10	0.0038	NL	0.0038	NL
10-Apr-10	0.0035	NL	0.0035	NL
10-Jan-10	<QL	NL	<QL	NL
10-Oct-09	3.8	NL	4.5	NL
10-Jul-09	<QL	NL	<QL	NL
10-Apr-09	<QL	NL	<QL	NL
10-Jan-09	<QL	NL	<QL	NL

Martel Monitoring Data Submitted with the VPDES Permit Application for the Arlington WPCP (VA0025143)

Hardness (mg/L)

Date Sampled	Test Value	DL
11/1/2010	140	1
5/23/2011	140	1
12/6/2011	100	1
10/17/2012	160	1
10/18/2012	160	1
Average	**140**	

Martel Monitoring Data Submitted with the VPDES Permit Application for the Arlington WPCP (VA0025143)

Molybdenum (µg/L)

Date Sampled	Test Value	DL
11/1/2010	3.9	2
5/23/2011	3.4	2
12/5/2011	3.9	2
12/6/2011	3.6	2
12/7/2011	2.9	2
10/17/2012	4	2
10/18/2012	4	2

Martel Monitoring Data Submitted with the VPDES Permit Application for the Arlington WPCP (VA0025143)

Nickel (µg/L)

Date Sampled	Test Value	DL
11/1/2010	2.3	2
12/5/2011	2.2	2
12/6/2011	2.1	2
10/17/2012	2	2
10/18/2012	2	2

Martel Monitoring Data Submitted with the VPDES Permit Application for the Arlington WPCP (VA0025143)

Zinc (µg/L)

Date Sampled	Test Value	DL
11/1/2010	18	10
5/23/2011	24	10
12/5/2011	27	10
12/6/2011	22	10
12/7/2011	27	10
10/17/2012	20	10
10/18/2012	30	10

Martel Monitoring Data Submitted with the VPDES Permit Application for the Arlington WPCP (VA0025143)

bis(2-Ethylhexyl)phthalate (µg/L)

Date Sampled	Test Value	DL
12/8/2010	56.5	20
12/5/2011	5.8	5.3
12/7/2011	6	5.4
11/10/2012	<QL	6.5

Martel Monitoring Data Submitted with the VPDES Permit Application for the Arlington WPCP (VA0025143)

Bromodichloromethane (µg/L)

Date Sampled	Test Value	DL
10/9/2012	6	5

Martel Monitoring Data Submitted with the VPDES Permit Application for the Arlington WPCP (VA0025143)

Chloroform (µg/L)

Date Sampled	Test Value	DL
11/3/2010	7.6	5
12/6/2011	6.8	5
12/6/2011	7.5	5
10/9/2012	12	5

Martel Monitoring Data Submitted with the VPDES Permit Application for the Arlington WPCP (VA0025143)

Dichloromethane (µg/L)

Date Sampled	Test Value	DL
3/19/2012	16	5

VA0025134 90th Percentile pH Data

Jul 1, 2011 -- Oct 31, 2012

1-Jul-11	7.1	1-Nov-11	7.1
2-Jul-11	6.8	2-Nov-11	6.8
3-Jul-11	6.7	3-Nov-11	7
4-Jul-11	6.7	4-Nov-11	7.1
5-Jul-11	6.7	5-Nov-11	7.2
6-Jul-11	6.9	6-Nov-11	6.6
7-Jul-11	6.6	7-Nov-11	6.5
8-Jul-11	6.8	8-Nov-11	6.6
9-Jul-11	6.8	9-Nov-11	6.9
10-Jul-11	7	10-Nov-11	7.1
11-Jul-11	6.8	11-Nov-11	6.7
12-Jul-11	6.8	12-Nov-11	6.6
13-Jul-11	6.9	13-Nov-11	6.8
14-Jul-11	6.9	14-Nov-11	7.2
15-Jul-11	7	15-Nov-11	6.8
16-Jul-11	7.1	16-Nov-11	6.6
17-Jul-11	7	17-Nov-11	6.6
18-Jul-11	7	18-Nov-11	7
19-Jul-11	7	19-Nov-11	7
20-Jul-11	7	20-Nov-11	6.9
21-Jul-11	6.9	21-Nov-11	6.7
22-Jul-11	7.1	22-Nov-11	6.6
23-Jul-11	6.9	23-Nov-11	6.8
24-Jul-11	7	24-Nov-11	6.8
26-Jul-11	6.8	25-Nov-11	6.6
27-Jul-11	7.2	26-Nov-11	6.7
28-Jul-11	7	27-Nov-11	6.6
29-Jul-11	7.1	28-Nov-11	6.5
30-Jul-11	6.9	29-Nov-11	6.6
31-Jul-11	6.8	30-Nov-11	6.6
1-Aug-11	7	1-Dec-11	7
2-Aug-11	7	2-Dec-11	6.4
3-Aug-11	6.8	3-Dec-11	6.8
4-Aug-11	6.9	4-Dec-11	7
5-Aug-11	7	5-Dec-11	6.6
6-Aug-11	7	6-Dec-11	7
7-Aug-11	7.1	7-Dec-11	6.6
8-Aug-11	7	8-Dec-11	7.1
9-Aug-11	6.8	9-Dec-11	6.6
10-Aug-11	7.1	10-Dec-11	6.5
11-Aug-11	6.9	11-Dec-11	6.6
12-Aug-11	7	12-Dec-11	6.6
13-Aug-11	7	13-Dec-11	6.8
14-Aug-11	6.8	14-Dec-11	6.8
15-Aug-11	7	15-Dec-11	6.6
16-Aug-11	7	16-Dec-11	6.9
17-Aug-11	7.2	17-Dec-11	6.6
18-Aug-11	6.8	18-Dec-11	6.5
19-Aug-11	7.1	19-Dec-11	6.6
20-Aug-11	7	20-Dec-11	6.6
21-Aug-11	6.7	21-Dec-11	6.8
22-Aug-11	7.1	22-Dec-11	6.6
23-Aug-11	7.1	23-Dec-11	6.5
24-Aug-11	7.1	24-Dec-11	6.7
25-Aug-11	7	25-Dec-11	6.8
26-Aug-11	6.8	26-Dec-11	7.2
27-Aug-11	6.8	27-Dec-11	7.2
28-Aug-11	6.7	28-Dec-11	6.6

Attachment 10

VA0025134 90th Percentile pH Data

Jul 1, 2011 -- Oct 31, 2012

29-Aug-11	7	29-Dec-11	6.6
30-Aug-11	6.7	30-Dec-11	6.8
31-Aug-11	6.8	31-Dec-11	6.9
1-Sep-11	6.8	1-Jan-12	6.9
4-Sep-11	6.9	2-Jan-12	6.8
5-Sep-11	7.1	3-Jan-12	6.6
6-Sep-11	6.7	4-Jan-12	6.7
7-Sep-11	6.8	5-Jan-12	6.8
8-Sep-11	6.4	6-Jan-12	6.7
9-Sep-11	6.4	7-Jan-12	6.6
10-Sep-11	6.6	8-Jan-12	6.6
11-Sep-11	6.7	9-Jan-12	6.8
12-Sep-11	6.6	10-Jan-12	6.9
13-Sep-11	6.6	11-Jan-12	6.6
14-Sep-11	7.1	12-Jan-12	6.6
15-Sep-11	6.8	13-Jan-12	6.9
16-Sep-11	6.7	14-Jan-12	6.8
17-Sep-11	6.6	15-Jan-12	6.7
18-Sep-11	6.7	16-Jan-12	6.6
19-Sep-11	6.7	17-Jan-12	6.6
20-Sep-11	6.6	18-Jan-12	6.5
21-Sep-11	6.9	19-Jan-12	6.6
22-Sep-11	6.7	20-Jan-12	6.5
23-Sep-11	6.6	21-Jan-12	6.5
24-Sep-11	6.8	22-Jan-12	6.6
25-Sep-11	6.6	23-Jan-12	6.6
26-Sep-11	6.7	24-Jan-12	6.7
27-Sep-11	6.6	25-Jan-12	6.7
28-Sep-11	6.8	26-Jan-12	6.6
29-Sep-11	6.6	27-Jan-12	6.7
1-Oct-11	6.8	28-Jan-12	6.6
2-Oct-11	6.6	30-Jan-12	6.6
3-Oct-11	6.6	31-Jan-12	6.7
4-Oct-11	6.7	1-Feb-12	6.7
5-Oct-11	6.6	2-Feb-12	6.6
6-Oct-11	6.7	3-Feb-12	6.7
7-Oct-11	6.6	4-Feb-12	6.7
8-Oct-11	6.7	5-Feb-12	6.7
9-Oct-11	6.7	6-Feb-12	6.6
10-Oct-11	6.6	7-Feb-12	6.6
11-Oct-11	6.9	8-Feb-12	7.1
12-Oct-11	6.9	9-Feb-12	7.1
13-Oct-11	6.7	10-Feb-12	7.4
14-Oct-11	6.6	11-Feb-12	7
15-Oct-11	6.8	12-Feb-12	7.2
16-Oct-11	6.8	13-Feb-12	7
17-Oct-11	6.7	14-Feb-12	7
18-Oct-11	7.3	15-Feb-12	7.1
19-Oct-11	6.6	16-Feb-12	7.2
20-Oct-11	6.7	17-Feb-12	7.1
21-Oct-11	6.9	18-Feb-12	6.9
22-Oct-11	6.9	19-Feb-12	7
23-Oct-11	6.7	20-Feb-12	7.1
24-Oct-11	6.6	21-Feb-12	7.2
25-Oct-11	6.6	22-Feb-12	7.2
26-Oct-11	6.8	23-Feb-12	7.1
27-Oct-11	6.9	24-Feb-12	7
28-Oct-11	6.6	25-Feb-12	7.1

VA0025134 90th Percentile pH Data

Jul 1, 2011 -- Oct 31, 2012

29-Oct-11	6.8
30-Oct-11	6.7
31-Oct-11	6.8
1-Apr-12	6.9
2-Apr-12	6.9
4-Apr-12	6.7
5-Apr-12	6.7
6-Apr-12	7.2
7-Apr-12	7
8-Apr-12	6.9
9-Apr-12	6.9
10-Apr-12	7
11-Apr-12	6.6
12-Apr-12	6.9
13-Apr-12	6.7
14-Apr-12	6.6
15-Apr-12	6.6
16-Apr-12	6.6
17-Apr-12	6.8
18-Apr-12	7
19-Apr-12	6.8
20-Apr-12	6.8
21-Apr-12	6.9
22-Apr-12	6.9
23-Apr-12	6.6
24-Apr-12	6.8
25-Apr-12	6.9
26-Apr-12	8
27-Apr-12	6.8
28-Apr-12	6.7
29-Apr-12	6.7
30-Apr-12	6.8
1-May-12	6.7
2-May-12	7.1
3-May-12	6.9
4-May-12	7.2
5-May-12	7.2
6-May-12	7.2
7-May-12	6.9
8-May-12	6.8
9-May-12	6.9
10-May-12	7.2
11-May-12	6.8
12-May-12	6.7
13-May-12	6.7
14-May-12	6.7
15-May-12	7.3
16-May-12	6.8
17-May-12	6.9
18-May-12	7.3
19-May-12	7.3
20-May-12	7.1
21-May-12	6.6
22-May-12	6.8
23-May-12	7.2
24-May-12	7
25-May-12	6.8
26-May-12	6.8

26-Feb-12	7.1
27-Feb-12	6.8
28-Feb-12	7
29-Feb-12	7.2
1-Mar-12	7.2
2-Mar-12	7.1
3-Mar-12	6.8
4-Mar-12	6.9
5-Mar-12	7.1
6-Mar-12	7.2
7-Mar-12	7.1
8-Mar-12	7
9-Mar-12	7.2
10-Mar-12	7.3
11-Mar-12	7
12-Mar-12	6.9
13-Mar-12	6.9
14-Mar-12	7.2
15-Mar-12	7
16-Mar-12	7
17-Mar-12	6.9
18-Mar-12	7
19-Mar-12	7.1
20-Mar-12	7.6
21-Mar-12	6.9
22-Mar-12	7.1
23-Mar-12	7.2
24-Mar-12	7
25-Mar-12	7.1
26-Mar-12	6.7
27-Mar-12	6.9
28-Mar-12	7
29-Mar-12	7.1
30-Mar-12	6.9
31-Mar-12	6.8
90th Percentile pH (Nov -Mar)	**7.2**
10th Percentile pH (Nov -Mar)	**6.6**

VA0025134 90th Percentile pH Data
Jul 1, 2011 -- Oct 31, 2012

27-May-12	6.8
28-May-12	6.8
29-May-12	6.9
30-May-12	6.7
31-May-12	6.8
1-Jun-12	6.9
2-Jun-12	6.6
3-Jun-12	6.5
4-Jun-12	6.6
5-Jun-12	6.6
6-Jun-12	6.6
7-Jun-12	7.1
8-Jun-12	6.7
9-Jun-12	6.8
10-Jun-12	6.8
11-Jun-12	6.7
12-Jun-12	7.1
13-Jun-12	6.7
14-Jun-12	6.7
15-Jun-12	7.3
16-Jun-12	7.2
17-Jun-12	6.7
18-Jun-12	6.9
19-Jun-12	6.8
20-Jun-12	6.8
21-Jun-12	6.6
22-Jun-12	6.6
23-Jun-12	6.8
24-Jun-12	6.8
25-Jun-12	7.4
26-Jun-12	7.2
27-Jun-12	7
28-Jun-12	6.9
29-Jun-12	7.2
30-Jun-12	7.1
1-Jul-12	7.4
2-Jul-12	6.9
3-Jul-12	7
4-Jul-12	7.1
5-Jul-12	7
6-Jul-12	6.8
7-Jul-12	6.8
8-Jul-12	6.7
9-Jul-12	7
10-Jul-12	7.2
11-Jul-12	6.8
12-Jul-12	6.8
13-Jul-12	7
14-Jul-12	6.9
15-Jul-12	7
16-Jul-12	6.8
17-Jul-12	6.8
18-Jul-12	7.2
19-Jul-12	7.3
20-Jul-12	6.8
21-Jul-12	6.9
22-Jul-12	6.9
23-Jul-12	6.9

VA0025134 90th Percentile pH Data

Jul 1, 2011 -- Oct 31, 2012

24-Jul-12	6.8
25-Jul-12	6.7
26-Jul-12	6.7
27-Jul-12	6.8
28-Jul-12	6.8
29-Jul-12	7
30-Jul-12	6.9
31-Jul-12	6.7
1-Aug-12	7
2-Aug-12	6.8
3-Aug-12	6.8
4-Aug-12	6.6
5-Aug-12	6.7
6-Aug-12	6.7
7-Aug-12	6.8
8-Aug-12	6.8
9-Aug-12	6.8
10-Aug-12	6.8
11-Aug-12	7.2
12-Aug-12	7.1
13-Aug-12	6.7
14-Aug-12	6.9
15-Aug-12	7.4
16-Aug-12	6.8
17-Aug-12	6.8
18-Aug-12	6.9
19-Aug-12	6.8
20-Aug-12	7.4
21-Aug-12	7.5
22-Aug-12	6.8
23-Aug-12	6.8
24-Aug-12	7.2
25-Aug-12	6.9
26-Aug-12	7.4
27-Aug-12	6.8
28-Aug-12	6.8
29-Aug-12	7.3
30-Aug-12	7.3
31-Aug-12	6.9
1-Sep-12	6.8
2-Sep-12	6.7
3-Sep-12	6.8
4-Sep-12	6.8
5-Sep-12	6.7
6-Sep-12	6.8
7-Sep-12	6.9
8-Sep-12	6.8
9-Sep-12	6.6
10-Sep-12	6.7
11-Sep-12	6.8
12-Sep-12	6.9
13-Sep-12	6.9
14-Sep-12	6.8
15-Sep-12	6.9
16-Sep-12	6.9
17-Sep-12	6.9
18-Sep-12	6.7
19-Sep-12	7

VA0025134 90th Percentile pH Data

Jul 1, 2011 – Oct 31, 2012

20-Sep-12	6.9
21-Sep-12	7.1
22-Sep-12	6.9
23-Sep-12	6.9
24-Sep-12	6.9
25-Sep-12	7
26-Sep-12	6.8
27-Sep-12	6.9
28-Sep-12	6.8
29-Sep-12	7.1
30-Sep-12	7
1-Oct-12	6.9
2-Oct-12	7
3-Oct-12	6.8
4-Oct-12	6.9
5-Oct-12	7.4
6-Oct-12	7.3
7-Oct-12	7.3
8-Oct-12	6.9
9-Oct-12	7.1
10-Oct-12	7.2
11-Oct-12	7
12-Oct-12	6.8
13-Oct-12	6.8
14-Oct-12	6.8
15-Oct-12	7.4
16-Oct-12	7.4
17-Oct-12	6.9
18-Oct-12	7
19-Oct-12	7.3
20-Oct-12	7.2
21-Oct-12	7.3
22-Oct-12	7
23-Oct-12	6.8
24-Oct-12	7.2
25-Oct-12	7.1
26-Oct-12	7
27-Oct-12	6.9
28-Oct-12	6.8
29-Oct-12	7
30-Oct-12	7
31-Oct-12	7
90th Percentile pH (Apr - Oct)	**7.2**
10th Percentile pH (Apr - Oct)	**6.6**

VA0025143 90th Percentile Temperature Data
Jul 1, 2011 -- Dec 31, 2012

7/1/2011	25.80
7/2/2011	26.20
7/3/2011	26.50
7/4/2011	26.80
7/5/2011	27.30
7/6/2011	27.40
7/7/2011	26.80
7/8/2011	28.00
7/9/2011	27.40
7/10/2011	28.10
7/11/2011	27.30
7/12/2011	27.90
7/13/2011	28.80
7/14/2011	26.90
7/15/2011	26.30
7/16/2011	27.00
7/17/2011	26.50
7/18/2011	28.00
7/19/2011	28.80
7/20/2011	28.70
7/21/2011	29.20
7/22/2011	30.60
7/23/2011	30.30
7/24/2011	30.40
7/25/2011	29.70
7/26/2011	28.80
7/27/2011	29.20
7/28/2011	28.90
7/29/2011	29.50
7/30/2011	29.20
7/31/2011	29.20
8/1/2011	29.50
8/2/2011	28.80
8/3/2011	29.10
8/4/2011	28.50
8/5/2011	28.30
8/6/2011	28.30
8/7/2011	28.90
8/8/2011	28.50
8/9/2011	28.50
8/10/2011	28.60
8/11/2011	28.30
8/12/2011	27.90
8/13/2011	28.10
8/14/2011	28.00
8/15/2011	27.60
8/16/2011	27.60
8/17/2011	27.30
8/18/2011	27.80
8/19/2011	28.10
8/20/2011	27.30
8/21/2011	28.00
8/22/2011	27.50
8/23/2011	26.60
8/24/2011	27.30

VA0025143 90th Percentile Temperature Data
Jul 1, 2011 -- Dec 31, 2012

8/25/2011	27.70
8/26/2011	27.40
8/27/2011	28.00
8/28/2011	26.50
8/29/2011	25.90
8/30/2011	26.20
8/31/2011	25.40
9/1/2011	25.60
9/2/2011	26.90
9/3/2011	26.80
9/4/2011	27.40
9/5/2011	27.10
9/6/2011	25.90
9/7/2011	25.70
9/8/2011	25.10
9/9/2011	24.50
9/10/2011	24.60
9/11/2011	24.30
9/12/2011	25.80
9/13/2011	26.20
9/14/2011	25.80
9/15/2011	26.20
9/16/2011	24.50
9/17/2011	24.40
9/18/2011	23.80
9/19/2011	23.70
9/20/2011	24.70
9/21/2011	25.30
9/22/2011	26.20
9/23/2011	25.90
9/24/2011	25.00
9/25/2011	25.40
9/26/2011	26.20
9/27/2011	26.50
9/28/2011	26.00
9/29/2011	25.60
9/30/2011	25.40
10/1/2011	24.10
10/2/2011	21.90
10/3/2011	21.50
10/4/2011	21.90
10/5/2011	23.20
10/6/2011	23.20
10/7/2011	23.70
10/8/2011	23.40
10/9/2011	22.50
10/10/2011	22.50
10/11/2011	24.10
10/12/2011	24.50
10/13/2011	24.60
10/14/2011	23.80
10/15/2011	24.60
10/16/2011	23.60
10/17/2011	23.20
10/18/2011	22.70

VA0025143 90th Percentile Temperature Data
Jul 1, 2011 -- Dec 31, 2012

10/19/2011	22.30
10/20/2011	24.10
10/21/2011	23.10
10/22/2011	21.20
10/23/2011	20.90
10/24/2011	21.60
10/25/2011	23.30
10/26/2011	23.20
10/27/2011	23.10
10/28/2011	22.70
10/29/2011	22.30
10/30/2011	21.60
10/31/2011	21.10
4/1/2012	20.20
4/2/2012	20.30
4/3/2012	20.10
4/4/2012	20.50
4/5/2012	20.40
4/6/2012	20.40
4/7/2012	19.90
4/8/2012	20.10
4/9/2012	20.30
4/10/2012	20.30
4/11/2012	20.10
4/12/2012	20.00
4/13/2012	20.20
4/14/2012	20.60
4/15/2012	21.10
4/16/2012	21.60
4/17/2012	22.00
4/18/2012	21.70
4/19/2012	21.50
4/20/2012	21.70
4/21/2012	22.00
4/22/2012	21.90
4/23/2012	20.80
4/24/2012	20.40
4/25/2012	20.60
4/26/2012	21.10
4/27/2012	18.10
4/28/2012	18.10
4/29/2012	20.90
4/30/2012	21.00
5/1/2012	21.40
5/2/2012	22.10
5/3/2012	21.90
5/4/2012	22.20
5/5/2012	22.70
5/6/2012	22.10
5/7/2012	22.60
5/8/2012	22.60
5/9/2012	22.90
5/10/2012	22.10
5/11/2012	21.90
5/12/2012	22.10

VA0025143 90th Percentile Temperature Data
Jul 1, 2011 -- Dec 31, 2012

5/13/2012	22.60
5/14/2012	23.00
5/15/2012	23.10
5/16/2012	23.20
5/17/2012	22.40
5/18/2012	23.10
5/19/2012	23.10
5/20/2012	23.20
5/21/2012	23.70
5/22/2012	23.00
5/23/2012	23.90
5/24/2012	24.10
5/25/2012	24.80
5/26/2012	24.50
5/27/2012	25.20
5/28/2012	24.90
5/29/2012	25.30
5/30/2012	25.40
5/31/2012	25.00
6/1/2012	25.20
6/2/2012	24.60
6/3/2012	23.30
6/4/2012	24.40
6/5/2012	23.00
6/6/2012	24.30
6/7/2012	24.20
6/8/2012	24.40
6/9/2012	24.60
6/10/2012	26.60
6/11/2012	25.70
6/12/2012	25.40
6/13/2012	25.20
6/14/2012	25.20
6/15/2012	25.20
6/16/2012	24.40
6/17/2012	25.10
6/18/2012	25.10
6/19/2012	25.10
6/20/2012	25.90
6/21/2012	26.20
6/22/2012	26.60
6/23/2012	26.60
6/24/2012	26.30
6/25/2012	26.50
6/26/2012	25.90
6/27/2012	25.70
6/28/2012	26.20
6/29/2012	26.50
6/30/2012	26.90
7/1/2012	26.90
7/2/2012	27.10
7/3/2012	27.20
7/4/2012	27.30
7/5/2012	27.50
7/6/2012	27.80

VA0025143 90th Percentile Temperature Data
Jul 1, 2011 -- Dec 31, 2012

7/7/2012	28.10
7/8/2012	23.20
7/9/2012	28.30
7/10/2012	27.90
7/11/2012	27.80
7/12/2012	27.60
7/13/2012	27.50
7/14/2012	27.50
7/15/2012	27.60
7/16/2012	27.70
7/17/2012	28.00
7/18/2012	28.00
7/19/2012	28.20
7/20/2012	28.20
7/21/2012	27.50
7/22/2012	27.20
7/23/2012	27.60
7/24/2012	27.70
7/25/2012	27.40
7/26/2012	27.40
7/27/2012	27.70
7/28/2012	27.90
7/29/2012	27.80
7/30/2012	27.30
7/31/2012	27.60
8/1/2012	27.80
8/2/2012	27.90
8/3/2012	28.00
8/4/2012	28.20
8/5/2012	29.00
8/6/2012	28.30
8/7/2012	28.20
8/8/2012	28.30
8/9/2012	28.10
8/10/2012	27.80
8/11/2012	28.00
8/12/2012	27.50
8/13/2012	27.80
8/14/2012	27.90
8/15/2012	28.00
8/16/2012	27.80
8/17/2012	27.30
8/18/2012	27.70
8/19/2012	27.60
8/20/2012	27.40
8/21/2012	27.30
8/22/2012	27.30
8/23/2012	27.30
8/24/2012	27.60
8/25/2012	27.70
8/26/2012	27.40
8/27/2012	27.60
8/28/2012	27.90
8/29/2012	27.90
8/30/2012	27.70

VA0025143 90th Percentile Temperature Data
Jul 1, 2011 -- Dec 31, 2012

8/31/2012	27.90
9/1/2012	27.30
9/2/2012	28.00
9/3/2012	26.40
9/4/2012	27.80
9/5/2012	27.90
9/6/2012	28.00
9/7/2012	27.60
9/8/2012	27.80
9/9/2012	27.10
9/10/2012	26.80
9/11/2012	26.60
9/12/2012	26.50
9/13/2012	26.50
9/14/2012	26.60
9/15/2012	26.70
9/16/2012	26.30
9/17/2012	26.20
9/18/2012	26.40
9/19/2012	26.20
9/20/2012	25.80
9/21/2012	24.90
9/22/2012	25.80
9/23/2012	21.50
9/24/2012	25.60
9/25/2012	25.30
9/26/2012	25.40
9/27/2012	25.90
9/28/2012	26.10
9/29/2012	25.70
9/30/2012	23.50
10/1/2012	25.20
10/2/2012	25.10
10/3/2012	25.70
10/4/2012	26.20
10/5/2012	25.80
10/6/2012	27.60
10/7/2012	23.40
10/8/2012	24.40
10/9/2012	24.20
10/10/2012	24.40
10/11/2012	19.30
10/12/2012	23.90
10/13/2012	23.40
10/14/2012	23.60
10/15/2012	24.10
10/16/2012	24.00
10/17/2012	23.80
10/18/2012	23.80
10/19/2012	24.20
10/20/2012	23.80
10/21/2012	23.20
10/22/2012	23.50
10/23/2012	23.60
10/24/2012	24.10

VA0025143 90th Percentile Temperature Data
Jul 1, 2011 -- Dec 31, 2012

10/25/2012	24.30
10/26/2012	24.40
10/27/2012	22.20
10/28/2012	23.40
10/29/2012	23.40
10/30/2012	20.20
10/31/2012	20.80
90th Percentile Temp. (Apr - Oct)	**28.10**
10th Percentile Temp. (Apr-Oct)	**21.60**

VA0025143 90th Percentile Temperature Data
Jul 1, 2011 -- Dec 31, 2012

11/1/2011	20.7
11/2/2011	21.9
11/3/2011	22.2
11/4/2011	21.8
11/5/2011	19.9
11/6/2011	20.4
11/7/2011	21.9
11/8/2011	22
11/9/2011	21
11/10/2011	21.3
11/11/2011	22.3
11/12/2011	22.5
11/13/2011	21.8
11/14/2011	21.3
11/15/2011	22
11/16/2011	22.5
11/17/2011	21.9
11/18/2011	20
11/19/2011	20.7
11/20/2011	20.8
11/21/2011	22.6
11/22/2011	22.1
11/23/2011	21.4
11/24/2011	19.8
11/25/2011	21.4
11/26/2011	22
11/27/2011	21.2
11/28/2011	21.2
11/29/2011	22.1
11/30/2011	21.1
12/1/2011	24.7
12/2/2011	19.1
12/3/2011	19.7
12/4/2011	20.3
12/5/2011	20.8
12/6/2011	22.3
12/7/2011	21.9
12/8/2011	17.9
12/9/2011	19.5
12/10/2011	20.4
12/11/2011	20
12/12/2011	19.4
12/13/2011	18
12/14/2011	20
12/15/2011	20
12/16/2011	19.5
12/17/2011	19.1
12/18/2011	19
12/19/2011	19.2
12/20/2011	19.7
12/21/2011	19.7
12/22/2011	19.6
12/23/2011	20.3
12/24/2011	19.6
12/25/2011	18.5

VA0025143 90th Percentile Temperature Data
Nov 1, 2011 -- Dec 31, 2012

11/1/2011	20.7
11/2/2011	21.9
11/3/2011	22.2
11/4/2011	21.8
11/5/2011	19.9
11/6/2011	20.4
11/7/2011	21.9
11/8/2011	22
11/9/2011	21
11/10/2011	21.3
11/11/2011	22.3
11/12/2011	22.5
11/13/2011	21.8
11/14/2011	21.3
11/15/2011	22
11/16/2011	22.5
11/17/2011	21.9
11/18/2011	20
11/19/2011	20.7
11/20/2011	20.8
11/21/2011	22.6
11/22/2011	22.1
11/23/2011	21.4
11/24/2011	19.8
11/25/2011	21.4
11/26/2011	22
11/27/2011	21.2
11/28/2011	21.2
11/29/2011	22.1
11/30/2011	21.1
12/1/2011	24.7
12/2/2011	19.1
12/3/2011	19.7
12/4/2011	20.3
12/5/2011	20.8
12/6/2011	22.3
12/7/2011	21.9
12/8/2011	17.9
12/9/2011	19.5
12/10/2011	20.4
12/11/2011	20
12/12/2011	19.4
12/13/2011	18
12/14/2011	20
12/15/2011	20
12/16/2011	19.5

VA0025143 90th Percentile Temperature Data
Nov 1, 2011 -- Dec 31, 2012

12/17/2011	19.1
12/18/2011	19
12/19/2011	19.2
12/20/2011	19.7
12/21/2011	19.7
12/22/2011	19.6
12/23/2011	20.3
12/24/2011	19.6
12/25/2011	18.5
12/26/2011	18.5
12/27/2011	18.2
12/28/2011	18.7
12/29/2011	18.5
12/30/2011	18.5
12/31/2011	18.9
1/1/2012	18.6
1/2/2012	18.2
1/3/2012	17.6
1/4/2012	17
1/5/2012	17.3
1/6/2012	17.7
1/7/2012	18
1/8/2012	18.2
1/9/2012	18.1
1/10/2012	17.8
1/11/2012	18.9
1/12/2012	18.1
1/13/2012	17.6
1/14/2012	15.9
1/15/2012	16
1/16/2012	16.7
1/17/2012	17.3
1/18/2012	17.5
1/19/2012	17.4
1/20/2012	17.5
1/21/2012	17.3
1/22/2012	16.9
1/23/2012	16.9
1/24/2012	17.5
1/25/2012	17.4
1/26/2012	17.8
1/27/2012	18.1
1/28/2012	17.5
1/29/2012	17.3
1/30/2012	15.9
1/31/2012	17.2
2/1/2012	17.7

VA0025143 90th Percentile Temperature Data
Nov 1, 2011 -- Dec 31, 2012

2/2/2012	18.3
2/3/2012	17.7
2/4/2012	17.8
2/5/2012	17.6
2/6/2012	17.5
2/7/2012	17.6
2/8/2012	17.5
2/9/2012	17.3
2/10/2012	19.6
2/11/2012	17.5
2/12/2012	16.7
2/13/2012	16.3
2/14/2012	16.9
2/15/2012	17.4
2/16/2012	17.5
2/17/2012	17.5
2/18/2012	17.3
2/19/2012	17.3
2/20/2012	17.2
2/21/2012	17.1
2/22/2012	17.4
2/23/2012	17.8
2/24/2012	18.2
2/25/2012	17.1
2/26/2012	17.1
2/27/2012	17.3
2/28/2012	17.6
2/29/2012	17.3
3/1/2012	17.8
3/2/2012	17.4
3/3/2012	17.8
3/4/2012	17.4
3/5/2012	18
3/6/2012	18.7
3/7/2012	17.7
3/8/2012	18.5
3/9/2012	18.4
3/10/2012	17.9
3/11/2012	18.7
3/12/2012	18.3
3/13/2012	19
3/14/2012	19.4
3/15/2012	19.7
3/16/2012	19.8
3/17/2012	19.8
3/18/2012	20
3/19/2012	20.2

VA0025143 90th Percentile Temperature Data
Nov 1, 2011 -- Dec 31, 2012

3/20/2012	20.6
3/21/2012	20.7
3/22/2012	20.8
3/23/2012	21.1
3/24/2012	21.3
3/25/2012	20.9
3/26/2012	20.4
3/27/2012	20
3/28/2012	20.1
3/29/2012	20.4
3/30/2012	20.2
3/31/2012	20.1
11/1/2012	21.4
11/2/2012	21.8
11/3/2012	21.4
11/4/2012	21.3
11/5/2012	21.2
11/6/2012	21.2
11/7/2012	21.2
11/8/2012	21
11/9/2012	20.8
11/10/2012	21.2
11/11/2012	21.4
11/12/2012	21.7
11/13/2012	21.8
11/14/2012	21.2
11/15/2012	21
11/16/2012	20.9
11/17/2012	20.7
11/18/2012	20.5
11/19/2012	20.9
11/20/2012	20.8
11/21/2012	20.8
11/22/2012	20.5
11/23/2012	20.4
11/24/2012	18.2
11/25/2012	22.7
11/26/2012	19.6
11/27/2012	19.9
11/28/2012	19.8
11/29/2012	19.4
11/30/2012	19.5
12/1/2012	20.1
12/2/2012	18.9
12/3/2012	19.6
12/4/2012	20.7
12/5/2012	20.7

VA0025143 90th Percentile Temperature Data
Nov 1, 2011 -- Dec 31, 2012

12/6/2012	20.1
12/7/2012	19.8
12/8/2012	20.1
12/9/2012	21.4
12/10/2012	20.5
12/11/2012	20.4
12/12/2012	19
12/13/2012	19.6
12/14/2012	19.4
12/15/2012	19.4
12/16/2012	19.8
12/17/2012	20
12/18/2012	20.8
12/19/2012	19.6
12/20/2012	19.5
12/21/2012	19.6
12/22/2012	19.4
12/23/2012	19
12/24/2012	19.6
12/25/2012	17.4
12/26/2012	17.7
12/27/2012	17
12/28/2012	17
12/29/2012	17
12/30/2012	17.4
12/31/2012	17.6
90th Percentile Temperature	**21.64**

4/17/2013 11:19:07 AM

Facility = Arlington Co WPCP
Chemical = Ammonia (Nov - Mar)
Chronic averaging period = 30
WLAa = 30
WLAc = 3.4
Q.L. = 0.2
# samples/mo. = 4
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 6.86007831761546
Average Weekly limit = 6.86007831761546
Average Monthly LImit = 4.69041199972293

The data are:

9

7/15/03 2:51:28 PM

Facility = Arlington WPCP
Chemical = Ammonia (Nov - Mar)
Chronic averaging period = 30
WLAa = 32.8
WLAc = 3.51
Q.L. = 0.2
# samples/mo. = 30
# samples/wk. = 8

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 7.08202202789125
Average Weekly limit = 4.22446215810869
Average Monthly Limit = 3.51

The data are:

9

6/14/2013 3:58:49 PM

Facility = Arlington County WPCP
Chemical = Copper
Chronic averaging period = 4
WLAa = 18
WLAc = 12
Q.L. = 2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 5
Expected Value = 3.34
Variance = 4.01601
C.V. = 0.6
97th percentile daily values = 8.12761
97th percentile 4 day average = 5.55705
97th percentile 30 day average= 4.02821
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

2.2
2.7
3.8
3.5
4.5

4/2/2013 10:37:51 AM

Facility = Arlington WPCP
Chemical = Nickel
Chronic averaging period = 4
WLAa = 240
WLAc = 27
Q.L. = 2.0
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 5
Expected Value = 2.12
Variance = 1.61798
C.V. = 0.6
97th percentile daily values = 5.15884
97th percentile 4 day average = 3.52723
97th percentile 30 day average= 2.55683
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

2.3
2.2
2.1
2
2

6/14/2013 1:55:17 PM

Facility = Arlington County WPCP
Chemical = TRC
Chronic averaging period = 4
WLAa = 19
WLAc = 11
Q.L. = 100
# samples/mo. = 360
# samples/wk. = 90

Summary of Statistics:

observations = 1
Expected Value = 200
Variance = 14400
C.V. = 0.6
97th percentile daily values = 486.683
97th percentile 4 day average = 332.758
97th percentile 30 day average= 241.210
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 16.0883226245855
Average Weekly limit = 7.43090172993184
Average Monthly LImit = 7.00467354100592

The data are:

200

4/2/2013 10:35:33 AM

Facility = Arlington WPCP
Chemical = Zinc
Chronic averaging period = 4
WLAa = 160
WLAc = 160
Q.L. = 10
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 7
Expected Value = 24
Variance = 207.36
C.V. = 0.6
97th percentile daily values = 58.4020
97th percentile 4 day average = 39.9309
97th percentile 30 day average= 28.9452
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

18
24
27
22
27
20
30

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
NORTHERN REGIONAL OFFICE
13901 Crown Court, Woodbridge, Virginia 22193
(703) 583-3800 Fax (703) 583-3821
www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

Thomas A. Faha
Regional Director

September 13, 2011

Mr. Lawrence Slattery
Chief – Water Pollution Control Bureau
Department of Environmental Services
Arlington County
3402 South Glebe Road
Arlington, VA 22202

Re: Approval of the Chlorine Reduction Study Proposal
Arlington County WPCP, VPDES Permit No. VA0025143

Dear Mr. Slattery:

The Chlorine Reduction Study Proposal submitted to the Department of Environmental Quality, Northern Regional Office (DEQ-NRO) has been determined to be satisfactory. Please be reminded that all conditions outlined in Part I.B.1 of the VPDES Permit reissued on September 23, 2008 must be followed. If it is found that the level of chlorine feed proposed in this study is not adequate as shown by three violations of the monthly average for *E. coli* (see Part I.B.1.f of the VPDES permit), the chlorine disinfection requirements shall be changed to of a minimum of 1.0 mg/L of total residual chlorine with 36 exceptions and no total residual chlorine sample below 0.6 mg/L.

Please contact Anna Westernik at 703-583-3837 or via email at anna.westernik@deq.virginia.gov if you have any questions regarding this approval.

Respectfully,

Bryant Thomas
Water Permits Manager

Enclosure

Attachment 12

ARLINGTON
VIRGINIA

DEPARTMENT OF ENVIRONMENTAL SERVICES
Water Pollution Control Bureau
3402 South Glebe Rd., Arlington, VA 22202
TEL (703) 228-6820 FAX (703) 228-6875 www.arlingtonva.us

September 2, 2011

Anna Westernick
Department of Environmental Quality
Northern Virginia Office
13901 Crown Court
Woodbridge, VA 22193

RE: VA0025143
Chlorine Reduction Study Proposal

Dear Ms. Westernick:

As required by permit condition part I.B.1e, the Arlington County Water Pollution Control Bureau (WPCB) is submitting a proposed Chlorine Reduction Study for review and approval by Virginia DEQ.

WPCB staff has evaluated the benefits, risks, and costs associated with reducing the sodium hypochlorite use for disinfection. The evaluation concluded that reducing sodium hypochlorite usage does not present tangible environmental or cost benefits, but does present significant operational difficulties and exposes the County to increased legal risk. The evaluation also found that the current feed rate of sodium hypochlorite is achieving acceptable disinfection while best protecting the public health and the environment. Therefore, the WPCB proposes to continue the current sodium hypochlorite feed rate. The results of the evaluation are outlined below.

Because the evaluation

Operational Difficulties

The WPCB disinfection chlorination system, which was substantially completed November of 2009, is set to deliver sufficient sodium hypochlorite to achieve 0.7 mg/L residual chlorine after the chlorine contact tank based on flow. At flows greater than 36 MGD[1] the time between sodium hypochlorite feed and the measurement of residual chlorine at the end of the chlorine contact tank deceases. As the lag time decreases, there is an increased fluctuation in the sodium hypochlorite feed rate as the chlorinators try to keep up with the changing flows, as well as other influencing factors such as operation control and chlorine demand. This results in a significant amount of variation in the residual chlorine after the chlorine contact tank. Table 1 shows the variation in residual chlorine (TRC) at flows within 0.3 MGD within each other. The raw data is contained in Table 3.

[1] 90% of CTO capacity

Table 1

Flow Range (MGD)	TRC Statistics				
	Average (mg/L)	Minimum (mg/L)	Maximum (mg/L)	Standard Deviation (mg/L)	Coefficient of Variation (%)
43.3 - 43	0.74	0.61	1.01	0.18	24.6%
41.3 - 41	0.87	0.36	1.51	0.48	55.5%
40.1 - 39.9	0.57	0.50	0.58	0.06	9.9%
36.3 - 36.1	0.76	0.66	0.90	0.11	14.7%
35.1 - 34.9	0.64	0.59	0.77	0.08	12.0%

Since each of these flow ranges incorporates only 4 data points, the variation in residual chlorine is potentially underestimated. If the sodium hypochlorite set-point is reduced to maintain an average of 0.5 mg/L residual chlorine after the chlorine contact tank, and using the conservatively estimated variability (1 σ), the WPCB would be close to at least one violation of the regulatory minimum of 0.2 mg/L during high flow events and have very frequent excursions below 0.5 mg/L (Table 2). The WPCB permit allows only 36 excursions below 0.5 mg/L per month.

Table 2

Flow Range (MGD)	Average TRC at Set-point 0.7 mg/L	Expected Average TRC at Set-point 0.5 mg/L	Expected Minimum TRC at Set-point 0.5 mg/L (1 σ)	Expected Minimum TRC at Set-point 0.5 mg/L (2 σ)
43.3 - 43	0.74	0.53	0.40	0.27
41.3 - 41	0.87	0.62	0.28	0.0
40.1 - 39.9	0.57	0.39	0.35	0.31
36.3 - 36.1	0.76	0.54	0.46	0.38
35.1 - 34.9	0.64	0.45	0.40	0.34

Red Regulatory Violation (<0.2 mg/L)
Orange Close to Regulatory Violation
Yellow Permit Exceedance (<0.5 mg/L)

Installing a secondary sodium hypochlorite feed point and residual monitoring was discussed but deemed impractical due to the inability to ensure adequate chlorine contact time before dechlorination as required by the SCAT regulations[2] without extensive build-out of the Post Aeration System.

Legal Exposure

Because the statistical evaluation of reducing the sodium hypochlorite feed rate indicated a high probability of violating the WPCB permit for minimal residual concentrations prior to dechlorination, the WPCB would be unable to reduce sodium hypochlorite feed rate without violating its VPDES permit. If the DEQ requires the WPCB to reduce sodium hypochlorite use, the WPCB will require written authorization. However, WPCB staff is concerned that even with approval from DEQ for permit excursions, the County, as well as the State, would be open to enforcement actions by the EPA or third party environmental organizations for permit violations.

[2] 9 VAC25-790-750

Environmental Benefits

The purpose of reducing sodium hypochlorite use in disinfection is to reduce the formation of chlorinated organic by-products through the reaction of chlorine with organic materials. While this is primarily an issue with drinking water disinfection, there is some concern with by-products from the disinfection of wastewater particularly with older plant that do not have advanced treatment that removes nutrients. Because the WPCB has advanced treatment removing nutrients, there is minimal organic material present in the effluent[3].

WPCB monitoring data was reviewed following substantial completion of the sodium hypochlorite feed system at the Filtration and Disinfection Facility (FADF) in September of 2009, where the disinfection process begins. A surrogate for the effluent is collected at the chlorine contact tank effluent, prior to dechlorination. A review of the samples collected at the effluent and the surrogate, indicate the absence of chlorinated by-products of disinfection with the exception of chloroform. Chloroform was detected at less than the quantification level (10 μg/L) in 1 out of 3 outfall samples, and in 4 out of 17 surrogate samples, in the range of 7.5 μg/L to 5.1 μg/L[4]. While there is no chronic or acute water quality standard for chloroform, the standard for public water supply (water to be used for drinking) is 340 μg/L. The highest concentration of chloroform found in the WPCP effluent is 2.2% of the most conservative water quality standard. To compare plant effluent with drinking water, drinking water may not contain more than 75 μg/L of chloroform or 80 μg/L for total trihalomethanes (THM). Maximum WPCB effluent concentration of chloroform is only 11% of the drinking water maximum containment level goal[5] for chloroform in drinking water.

Reducing the amount of sodium hypochlorite used for disinfection will not provide a significant environmental benefit.

Current Feed Rate Achieves Acceptable Disinfection

The WPCB Post Aeration Facility and associated structures were substantially completed in November of 2009. Flow, residual chlorine, and E. *coli* data were reviewed for treatment plant flows greater than 36 MGD[6] and are contained in Table 3. At 10 am weekdays, grab samples are collected from the plant effluent and analyzed for E. *coli* , and the instrument reading for chlorine residue for the chlorine contact tank effluent is recorded.

As this data indicates, even at a maximum daily average flow of 58.6, the WPCB is achieving excellent disinfection rates.

Please contact me if there are any questions.

Sincerely,

L. Slattery 9/2/11

Larry Slattery, Chief
Water Pollution Control Bureau, DES

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[3] Typically total suspended solids is <3 mg/L

[4] Detection Level is 5 μg/L

[5] EPA Stage 2 Disinfection By Products Rule, 12/15/05

[6] 90% of CTO capacity

Table 3

	Average Plant Flow (MGD)	Average Plant Effluent (MGD)	Data Collected at 10 am		
			Plant Flow (MGD)	Post-CCT TRC (mg/L)	E. coli (#/100 mL)
01/07/2010	40.4	35.1	41.1	0.74	<1
01/25/2010	49.8	42.5	41.2	1.51	15
02/08/2010	58.6	53.2	37.9	0.99	5
02/15/2010	44.5	39.7	37.9	0.63	1
02/22/2010	42	37.5	48.8	0.64	<1
02/23/2010	47.9	42.4	43.2	0.65	19
02/24/2010	48.9	41.9	55.5	0.61	1
02/25/2010	43.4	38.7	46.7	0.54	1
03/01/2010	44.7	38.6	47.6	0.61	1
03/02/2010	40.9	34.8	46.3	0.52	2
03/15/2010	49.6	44.7	37.6	0.75	3
03/16/2010	40.4	35.6	43	0.7	<1
05/03/2010	44.4	42	38.4	0.62	5
09/30/2010	44.9	31.6	46.6	0.81	1
10/01/2010	42	44.9	41.3	1.97	2
02/02/2011	40.1	38.6	39.9	0.71	1
03/09/2011	41.5	37.4	39.3	0.72	1
03/10/2011	44.6	41.5	44.1	0.90	1
03/11/2011	50.9	44.6	50.1	0.89	1
05/25/2011	44	39.5	40.2	0.63	1
01/01/2010	37.5	33.0	34.1	1.01	1
01/04/2010	37.7	32.3	35.4	0.92	2
01/05/2010	37.4	32.0	35.1	0.63	2
01/06/2010	37.7	32.4	32.4	0.51	10
01/11/2010	74.2	69.2	46.6	0.52	<1
01/12/2010	38.0	32.7	40	0.58	<1
01/14/2010	39.4	33.8	44.2	1.00	<1
01/20/2010	37.6	31.8	40.1	0.63	1
01/26/2010	37.7	31.6	44.2	0.65	1
01/27/2010	37.3	31.1	36.2	0.89	1
01/28/2010	37.2	30.9	41.3	0.36	1
01/29/2010	37.2	30.9	43	1.01	2
02/17/2010	37.8	32.2	39.9	0.50	70
02/18/2010	38.1	32.1	45.2	0.70	12
02/19/2010	39.6	33.6	43.5	0.69	1
03/03/2010	37.7	31.9	30.7	0.60	1
03/04/2010	37.9	32.3	40.3	0.96	1
03/05/2010	38.3	32.8	41.6	0.60	<1
03/11/2010	37.9	32.7	36.9	0.66	2
03/22/2010	38.3	33.2	41.5	0.88	3
03/26/2010	38.4	33.4	40.7	0.74	<1
04/09/2010	37.7	32.7	38.5	0.82	1
08/18/2010	37.2	31.7	34.9	0.64	1
09/27/2010	39.2	33.6	44	1.06	1

	Average Plant Flow (MGD)	Average Plant Effluent (MGD)	Data Collected at 10 am		
			Plant Flow (MGD)	Post-CCT TRC (mg/L)	E. coli (#/100 mL)
10/04/2010	37.5	34.2	37.6	1.64	1
11/04/2010	39.9	35.1	38.3	1.11	1
02/01/2011	38.6	34.4	37.9	0.80	1
02/03/2011	39.6	35.3	35	0.68	1
02/04/2011	37.3	33.4	34.5	0.77	1
02/16/2011	37.9	33.5	31.9	0.73	1
02/24/2011	38.9	34.3	37.7	0.67	1
03/07/2011	39.8	35.2	44.5	0.74	2
03/08/2011	37.4	33.8	36.1	0.90	1
05/03/2011	37.2	33.2	35.6	0.84	3
05/17/2011	39.9	30.9	43.3	0.61	1
05/18/2011	37.4	29.0	34.2	0.71	1
05/19/2011	38.7	30.2	38.5	0.89	1
05/20/2011	39.7	31.4	36.3	0.58	1
05/23/2011	38.3	30.4	35.2	0.64	1
05/24/2011	39.5	29.6	36.1	0.66	1
05/26/2011	38.7	29.6	35	0.59	1
05/31/2011	38.4	30.0	36.5	0.78	1
06/08/2011	37.9	30.3	34.4	0.69	1
06/09/2011	38.7	30.5	37.6	0.75	1

Number/count	64		
Average	39.9	0.75	3.5
Min	30.7	0.36	1.0
Max	55.5	1.64	70.0
Std Dev	4.8	0.22	11.2
Median	39.6	0.69	1.0

Public Notice – Environmental Permit

PURPOSE OF NOTICE: To seek public comment on a draft permit from the Department of Environmental Quality that will allow the release of treated wastewater into a water body into Arlington County, Virginia.

PUBLIC COMMENT PERIOD: December 4, 2013 to January 7, 2014

PERMIT NAME: Virginia Pollutant Discharge Elimination System Permit –Wastewater issued by DEQ under the authority of the State Water Control Board

APPLICANT NAME, ADDRESS AND PERMIT NUMBER: Arlington Board, #1 Courthouse Plaza, Arlington, VA 22201, VA0025143

NAME AND ADDRESS OF FACILITY: Arlington County Water Pollution Control Facility, 3402 South Glebe Road, Arlington, VA 22202

PROJECT DESCRIPTION: The Arlington Board has applied for reissuance of a permit for the public Arlington County Water Pollution Control Facility. The applicant proposes to release sewage wastewaters from residential, commercial, and industrial areas at a rate of 40 million gallons per day into a water body. Sludge from the treatment process will be disposed of by land application by a contractor. The facility proposes to release the treated sewage into Four Mile Run in Arlington County in the Potomac River Watershed. A watershed is the land area drained by a river and its incoming streams. The permit will limit the following pollutants to amounts that protect water quality: pH, Carbonaceous Biochemical Oxygen Demand-5 day ($cBOD_5$), Total Suspended Solids (TSS), Total Kjeldahl Nitrogen (TKN), Ammonia as Nitrogen, Nitrate and Nitrite as Nitrogen, Total Nitrogen, Total Phosphorus, *E. coli* Bacteria, Total Residual Chlorine, and Dissolved Oxygen. The permit will monitor for Total Recoverable Copper.

This facility is subject to the requirements of 9VAC 25-820 and has registered for coverage under the General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Watershed in Virginia.

HOW TO COMMENT AND/OR REQUEST A PUBLIC HEARING: DEQ accepts comments and requests for public hearing by hand-delivery, e-mail, fax or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. A public hearing may be held, including another comment period, if public response is significant, based on individual requests for a public hearing, and there are substantial, disputed issues relevant to the permit.

CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS AND ADDITIONAL INFORMATION: The public may review the draft permit and application at the DEQ-Northern Regional Office by appointment, or may request electronic copies of the draft permit and fact sheet.
Name: Anna Westernik
Address: DEQ-Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193
Phone: (703) 583-3837 E-mail: anna.westernik@deq.virginia.gov Fax: (703) 583-3821

Attachment 13

POTOMAC EMBAYMENTS WASTELOAD ALLOCATION STUDY

FINAL REPORT, VOLUME III:

SENSITIVITY STUDIES AND FINAL ANALYSES FOR THE FOUR MILE RUN, HUNTING CREEK AND NEABSCO CREEK EMBAYMENTS

A Staff Technical Analysis

Prepared for

STATE WATER CONTROL BOARD

Prepared by

NORTHERN VIRGINIA PLANNING DISTRICT COMMISSION

with Technical Assistance Provided by

CAMP DRESSER & McKEE

JUNE 30, 1988

Attachment 14

ABSTRACT

TITLE: Potomac Embayments Wasteload Allocation Study -- Final Report, Volume III

AUTHOR: Northern Virginia Planning District Commission

SUBJECT: The sensitivity studies and final analyses conducted for the Four Mile Run, Hunting Creek, and Neabsco Creek embayments, culminating in recommended effluent limits for treatment plant discharges to those embayments.

DATE: June 30, 1988

SOURCE OF COPIES: Northern Virginia Planning District Commission
7630 Little River Turnpike
Annandale, VA 22003

NUMBER OF PAGES:

ABSTRACT: Results of the sensitivity studies and final analyses conducted for the Four Mile Run, Hunting Creek, and Neabsco Creek embayments are presented. The sensitivity studies determine the sensitivity of embayment water quality to changes in parameters such as treatment plant wasteloads, Potomac main stem boundary conditions, benthic flux rates, and treatment plant discharge locations. Water quality projections from the sensitivity studies are compared to the water quality goals determined earlier in the study, in order to identify wasteload allocation alternatives to be studied in the final analyses. The final analyses include a comparison of costs and of pollutant flux into the Potomac mainstem for the selected alternatives, and an analysis of seasonal treatment plant effluent limits. The results of a recently completed study of dissolved oxygen in the upper Potomac Estuary are incorporated into the detailed studies for the Four Mile Run and Hunting Creek embayments. Based on the results of the final analyses, treatment plant effluent limits are recommended for the discharges to the embayments.

POTOMAC EMBAYMENTS WASTELOAD ALLOCATION STUDY
FINAL REPORT, VOLUME III:

Sensitivity Studies and Final Analyses for the
Four Mile Run, Hunting Creek, and Neabsco Creek Embayments

EXECUTIVE SUMMARY

In accordance with the regionally consistent methodology presented in the Volume I final report, NVPDC and CDM conduct sensitivity studies and final analyses for the Four Mile Run, Hunting Creek, and Neabsco Creek embayments. Modeling tools developed by the Virginia Institute of Marine Science are used to predict the embayment water quality impacts of alternative treatment plant wasteloads. The modeling results are compared to water quality goals developed and presented in the Volume I final report to determine appropriate treatment plant effluent limits.

The sensitivity studies predict the extent to which embayment water quality would be affected by changes in parameters such as treatment plant loading, Potomac main stem boundary conditions, benthic flux rates, and treatment plant discharge location. After comparing the modeling results to the appropriate water quality goals, several different wasteload allocation alternatives for each embayment are selected for further analysis.

For the alternatives selected in the sensitivity studies, the final analyses include a comparison of wastewater treatment costs and of pollutant exchange between the embayment and the Potomac main stem. In addition, analyses of seasonal treatment limits for phosphorus and unoxidized nitrogen are conducted. The analysis of seasonal phosphorus removal is limited by a lack of data; as a result, no recommendations are made regarding the feasibility of seasonal phosphorus limits. The analyses for the Hunting Creek and Four Mile Run embayments incorporate the results of a recently completed Metropolitan Washington Council of Governments study of dissolved oxygen in the upper Potomac Estuary.

Based on the sensitivity studies and final analyses, the following effluent limits for dissolved oxygen (DO), 5-day carbonaceous biochemical oxygen demand (CBOD5), total Kjeldahl nitrogen (TKN), and total phosphorus (TP) are recommended for protection of embayment water quality:

EMBAYMENT	TREATMENT PLANT	PLANT FLOW (MGD)	RECOMMENDED EFFLUENT CONCENTRATION (mg/l)			
			DO	CBOD5	TKN	TP
Four Mile Run	Arlington	40.0	6.0	10.0	---	1.00
Hunting Creek	Alexandria	54.0	7.6*	3.0	---	1.00
				-or-		
			7.6*	10.0	1.0**	1.00
Neabsco Creek	Dale City #1	4.0	6.0	10.0	---	1.00
	Dale City #8	2.0	6.0	10.0	---	1.00
	Mooney	20.0	6.0	10.0	---	1.00

*April 1 through October 31 only; limit of 6.0 mg/L November 1 through March 31

**April 1 through October 31 only; no TKN limit November 1 through March 31

To protect the main stem of the Potomac Estuary, an interim total phosphorus limit of 0.18 mg/l is regionally accepted as presented in the Interim Control Policy of the 1986 Supplement to the Metropolitan Washington 208 Plan. Therefore, at the present time, the more restrictive constraint on total phosphorus is the 0.18 mg/l limit for protection of the main stem of the Potomac. As indicated in the 208 Plan Supplement, long-term Potomac studies now under way will better define the total phosphorus limits required for protection of the Potomac main stem.

1.0 INTRODUCTION

1.1 BACKGROUND

In the late 1960's and early 1970's, it became clear that water quality in the tidal Potomac River was in a state of eutrophication. This condition was characterized by large concentrations of nutrients (such as nitrogen and phosphorus), excessive algal productivity, occasional episodes of oxygen depletion brought on by decomposition of biomass, and a reduction in the number of plant and animal species present in the river. Eutrophication was generally brought on by the wasteloads contributed by wastewater treatment plants, combined sewer overflows, and nonpoint source runoff, both in the local area and in upstream locations.

In response to deteriorating water quality, particularly in the Potomac Embayments, Virginia's State Water Control Board (SWCB) adopted the Potomac Embayment Standards in 1971. These standards were applied as permit limits to the Virginia plants in operation near the embayments, some of which have since been closed. The Potomac Embayment Standards, which were developed based on the limited analytical techniques available at the time, necessitated the use of advanced wastewater treatment processes.

As wastewater treatment plant operators moved toward meeting these standards, it became apparent that compliance would be very costly, yet water quality conditions had already improved significantly. In 1979, Northern Virginia localities questioned the need for such stringent standards. The SWCB immediately embarked on a program of reevaluating the Potomac Embayment Standards, based on a process for determining the river's capacity to assimilate effluent wasteloads.

Working closely with the SWCB, the Virginia Institute of Marine Science (VIMS) studied the tidal circulation and water quality processes taking place in each embayment in order to develop computer simulation models of each. Each of these models was calibrated and verified by VIMS and has

been thoroughly reviewed by the SWCB, the Environmental Protection Agency, and others, in order to ensure its validity.

In early 1985, the SWCB made a public request for proposals to conduct a wasteload allocation study of seven Virginia embayments using the models developed by VIMS. This was to be the final stage in the technical studies needed for the Board's reevaluation of the Potomac Embayment standards. The Northern Virginia Planning District Commission and its consultant, Camp Dresser & McKee, were chosen to conduct the study.

1.2 STUDY OBJECTIVE

A wasteload allocation study of seven Northern Virginia embayments of the Potomac Estuary was performed by the Northern Virginia Planning District Commission (NVPDC) with technical assistance provided by Camp Dresser & McKee (CDM). The objective of the study was to recommend water quality-based treatment limits for 10 wastewater treatment plants discharging into or immediately upstream of the embayments. The recommended allocations will serve as a basis for decisions to be made by the SWCB in developing permit limits for carbonaceous biochemical oxygen demand, unoxidized nitrogen, and phosphorus.

1.3 STUDY AREA

The geographic area included within the study stretches from Arlington County south to Stafford County. Each of the seven Virginia embayments being studied--Four Mile Run, Hunting Creek, Little Hunting Creek, Gunston Cove, Belmont-Occoquan Bay, Neabsco Creek, and Aquia Creek--receives discharges from one or more wastewater treatment plants. Figure 1-1 shows the location of the Virginia embayments and includes the wastewater treatment plants which are considered in the wasteload allocation study. They are: Arlington, Alexandria, Little Hunting Creek, Lower Potomac, Lorton, Harbor View, Dale City 1, Dale City 8, H.L. Mooney, and Aquia.

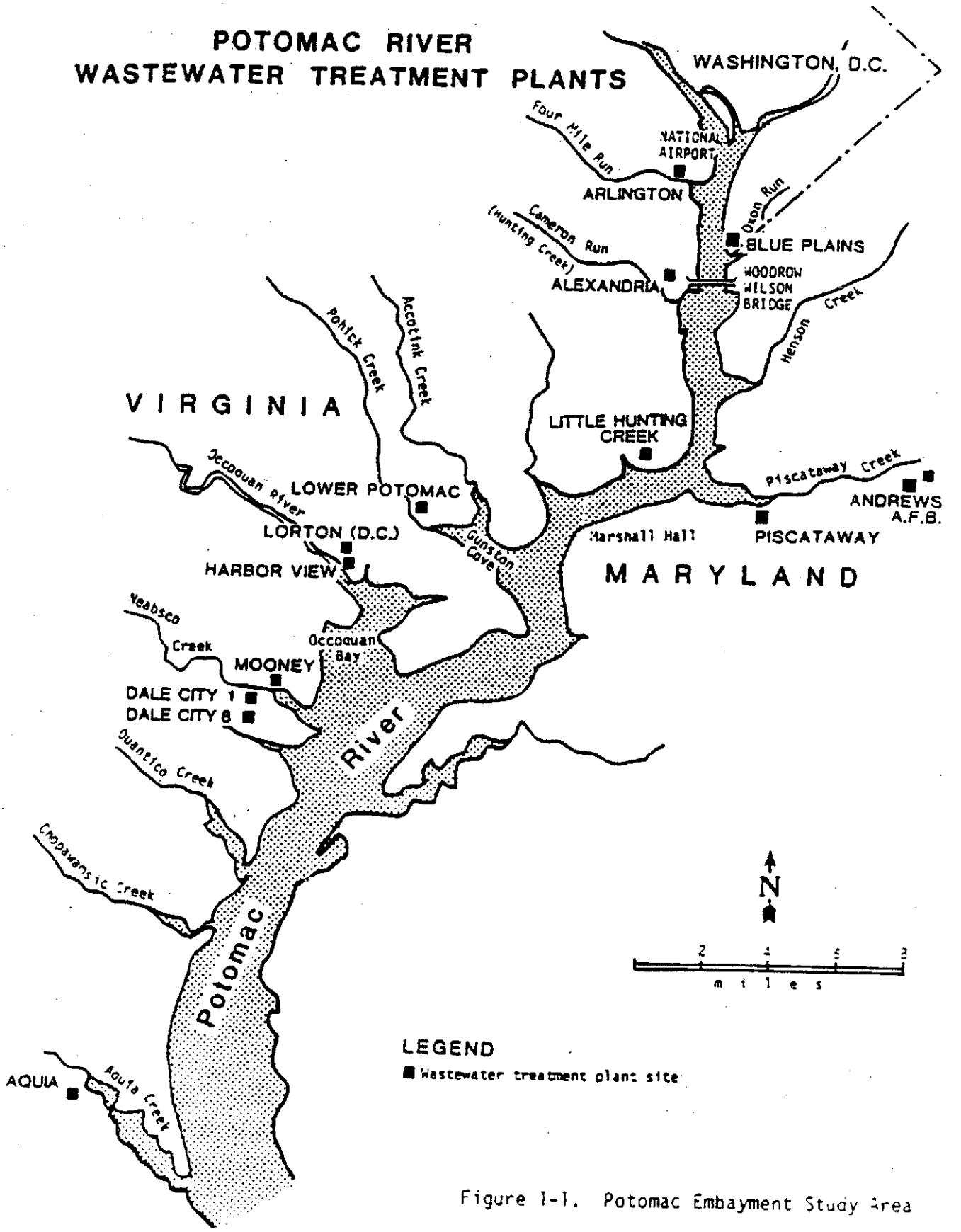


Figure 1-1. Potomac Embayment Study Area

1.4 STUDY SCOPE

In the initial phase of the study, the modeling tools to be used in performing the wasteload allocation study were obtained and tested. Embayment hydrodynamics and water quality models developed by the Virginia Institute of Marine Science (VIMS) were loaded onto the mainframe computer used by the NVPDC and these computer codes were modified as necessary for successful executions. The models were designed to simulate tidal transport and transformation of pollutants within the embayments, and exchanges with the main stem Potomac Estuary. During the course of the study, several modifications were made to the computer codes of certain models to enhance their capability and to correct minor errors.

In the next phase of the study, a regionally consistent methodology for wasteload allocation analysis was developed which set the stage for the detailed scope of work. The methodology defined the modeling approach and also the general procedures for establishing design conditions, defining water quality goals, performing sensitivity studies and completing detailed wasteload allocation analyses. As part of the methodology, specific data for computer model application were developed and included the following: nonpoint source loadings, Potomac main stem boundary conditions, and design tides, streamflows, water temperature, and solar radiation.

Water quality goals were then developed for use as evaluation criteria in screening wasteload allocation alternatives during the sensitivity analyses and the final wasteload allocation analyses. The water quality goals were focused on dissolved oxygen, and on chlorophyll-a levels required for eutrophication management, and also considered pollutant mass flux from the embayments into the Potomac Estuary main stem. The dissolved oxygen goals are consistent with the Virginia state water quality standards, and specific chlorophyll-a goals were developed for each embayment.

After the goals and methodology were established, sensitivity analyses were performed to evaluate the impacts of different parameters on water quality at critical locations within each embayment. The different parameters included various wastewater treatment plant loadings, boundary conditions,

benthic flux rates and wastewater treatment plant discharge locations. Conformance to the water quality goals was considered as part of the evaluation of impacts. The sensitivity studies were the basis for selection of the most promising wasteload allocation alternatives for final analyses.

The final analysis phase of the project used the wasteload allocation alternatives as a base and expanded the study to include analyses of year-round and seasonal effluent levels, evaluation of pollutant flux to the Potomac Estuary main channel and generalized cost comparisons of wasteload allocation alternatives. In the final analysis, treatment limits for each of the 10 wastewater treatment plants are recommended for biochemical oxygen demand, dissolved oxygen, unoxidized nitrogen, and phosphorus.

1.5 PUBLIC PARTICIPATION IN STUDY

From the onset, the NVPDC recognized that public participation would be an essential element in the success of this study. It was apparent that the determination of wasteload allocations for the dischargers to the Virginia embayments could raise complex interjurisdictional issues, and that the study would benefit from a forum for resolution of the wastewater management issues that could arise. It was determined that this forum should provide an opportunity for discussion of local, state, and metropolitan perspectives of water quality issues in the upper Potomac Estuary, as well as feedback and guidance on the study methodology and products. In addition, it was apparent that the determination of wasteload allocations would raise issues of concern to the general public and that the study would benefit from an opportunity for the public to follow the progress of the study and to express its concerns.

With the authority granted by its Commission in Resolution No. 85-55, the NVPDC staff organized and conducted a publicly advertised meeting regarding the wasteload allocation study. The meeting was held on July 17, 1985, and included 16 attendees in addition to a panel consisting of several Commissioners, representatives from the NVPDC and CDM staffs, and a

representative of the SWCB. At the meeting, the panel presented background information on water quality in the upper Potomac Estuary, outlined the objectives of the study, described how these objectives would be achieved, and answered questions from the audience.

With the authority granted by its Commission in Resolution 85-46, the NVPDC staff formed the Northern Virginia Embayment Standards Technical Advisory Committee (NVESTAC) to provide a forum for evaluating and guiding the progress of the study, and for resolving related wastewater management issues. Specifically, the resolution states that the NVESTAC's purpose is to provide input during all study phases and to review all major assumptions and procedures, including:

- The regional methodology for the wasteload allocation analysis;
- The wasteload allocation scenarios to be tested during sensitivity analysis;
- The results of the sensitivity analysis and selection of the wasteload allocation alternatives to be tested in detail;
- The water quality goals to be used in the evaluation of embayment model projections;
- The recommended permit levels for each wastewater treatment plant; and
- The draft and final reports, including interim reports.

Those invited to participate included the chief administrative officers (or their alternates) and wastewater management agency heads of Arlington, Fairfax, Prince William and Stafford Counties, the Cities of Fairfax, Alexandria, and Falls Church, and the Town of Vienna, as well as one representative each from the SWCB, the Metropolitan Washington Council of Governments, the Interstate Commission on the Potomac River Basin, the

RADCO Planning District Commission, the Washington D.C. Department of Corrections, Dale Service Corporation, and Colchester Public Service Corporation. Participating members of the committee are listed in the roster which immediately precedes the table of contents in this report.

Minutes of the October 8, 1986, February 23, 1988 and April 19, 1988 meetings of the NVESTAC are found in Appendix A of this report. These three NVESTAC meetings are particularly germane to the sensitivity studies and final analyses described in the Volume III report. At the October 8, 1986 meeting, the results of the sensitivity studies were presented, and comments were solicited from the NVESTAC. At the February 23, 1988 meeting, the results of the final analyses for Neabsco Creek were presented, and comments were solicited from the NVESTAC. The final results for Four Mile Run and Hunting Creek were presented at the April 19, 1988 meeting. Written comments submitted to NVPDC regarding the sensitivity studies and final analyses presented in the Volume III report are given in Appendices B and C.

Beyond the public meeting, involvement of interested persons was maintained throughout the course of the study through direct mailings of NVESTAC meeting notices, agendas, minutes and status reports. The list of participants includes over 80 individuals affiliated with federal and state agencies, environmental groups, and civic groups, as well as members of Congress and interested private citizens.

Throughout the study, the NVPDC staff continued to meet with local staff representatives on an individual basis. This setting was used primarily for discussing specific topics which were not of general interest to the NVESTAC membership. Individual meetings have been held with wastewater management officials from Arlington County, Fairfax County, Stafford County, the Alexandria Sanitation Authority and the Prince William County Service Authority.

1.6 FORMAT OF FINAL REPORT

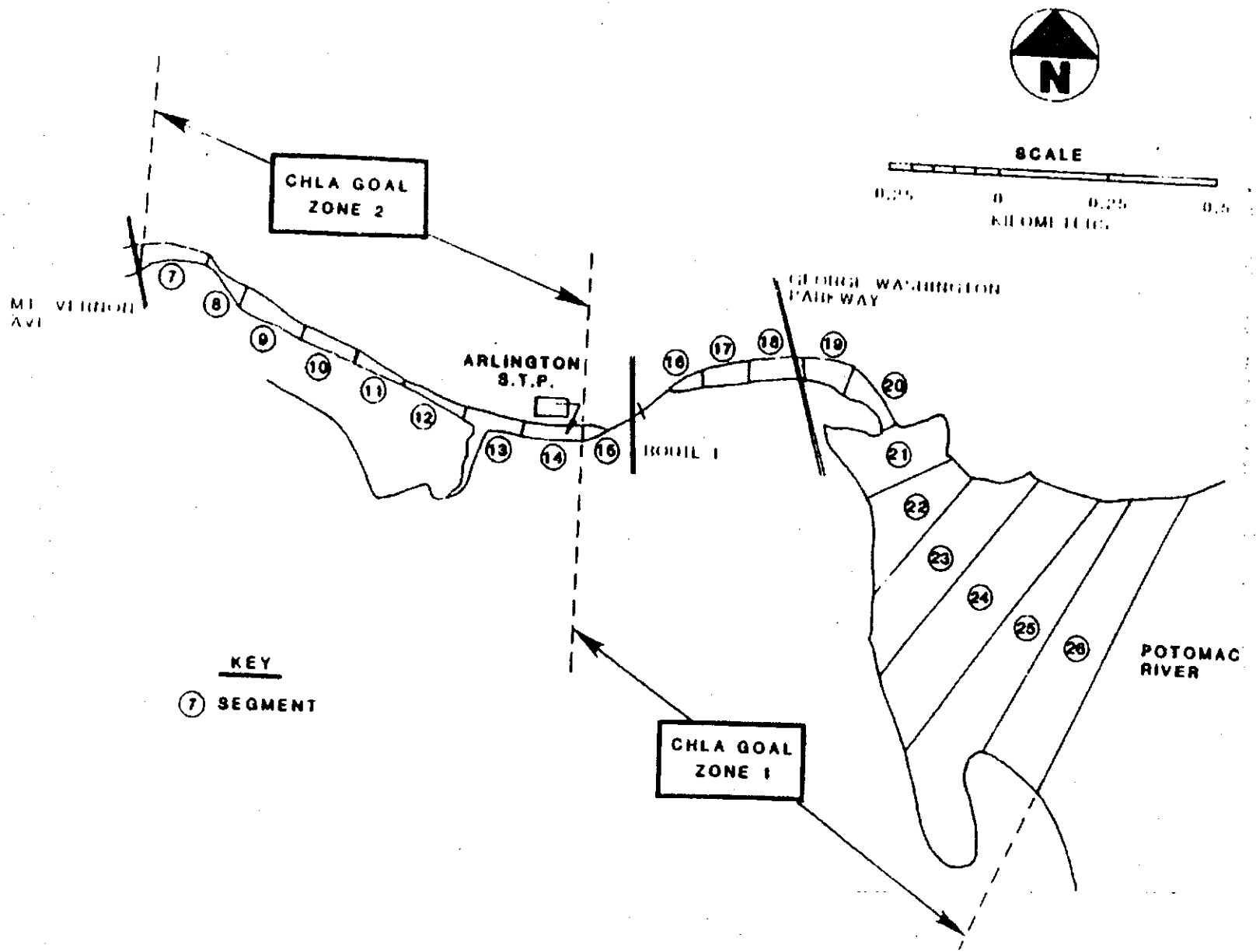
The final report for the Potomac Embayments Wasteload Allocation Study is divided into three volumes. Volume I contains a description of the overall methodology, the development of the data base required for model simulation and the water quality goals used to screen the various wasteload allocation scenarios. Volume II presents the sensitivity and final analyses for the Little Hunting Creek, Gunston Cove, Belmont-Occoquan Bay and Aquia Creek embayments. This volume, Volume III, presents the sensitivity and final analyses for the Four Mile Run, Hunting Creek and Neabsco Creek embayments. The sensitivity studies include the analysis of different wasteload scenarios, boundary conditions, benthic flux rates and treatment plant discharge locations. Several wasteload allocation scenarios, selected as a result of the sensitivity studies, are then evaluated in the final analysis which includes consideration of seasonal effluent limits, pollutant flux to the Potomac main stem and generalized cost comparisons. In Volumes II and III, specific effluent limits are recommended for each of the wastewater treatment plants discharging to the seven embayments.

5.0 SENSITIVITY RESULTS FOR FOUR MILE RUN

Four Mile Run discharges into the upper Potomac Estuary just below Washington National Airport. Figure 1-1 shows the location of Four Mile Run and the other six embayments. The portion of Four Mile Run included in the study, as developed for the VIMS model, encompasses the tidal embayment which extends from the George Washington Parkway to the Potomac and a upstream reach which is characterized as a transition segment from the free-flowing stream to the tidal embayment. Figure 5-1 presents a map of the model segmentation of Four Mile Run. The map also includes the designation of chlorophyll-a goal zones which will be discussed as part of the eutrophication analysis. The only point source to Four Mile Run is the Arlington WWTP which discharges into the Run just upstream of the Route 1 crossing.

The Arlington WWTP has a design capacity of 30 mgd. The activated sludge secondary treatment process is followed by advanced wastewater treatment with chemical addition and flocculation units. Multi-media filtration units and carbon adsorption are provided to achieve final removal of oxygen demanding materials and suspended solids followed by disinfection by sodium hypochlorite. The plant is equipped to perform breakpoint chlorination for nutrient removal, but this process is not being used. All model projections presented in the sensitivity analysis are based on the 30 mgd WWTP discharge.

The Four Mile Run model developed by VIMS has been modified for the sensitivity analysis under this present study. The original model executed under the present low flow design conditions predicted large algal growth and subsequently large DO concentrations in the upstream region of Four Mile Run. Historically such high algal concentrations are not noted to occur in that area of the Run. It appears that the original model inaccurately represented higher water depths above the WWTP discharge than would actually exist according to the Corps of Engineers' design drawings for the flood control channel in the upper reaches.


N
SCALE
0.25
0
0.25
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KILOMETERS
CHLA GOAL ZONE 2
MT. VERNON AVE
ARLINGTON S.T.P.
GEORGE WASHINGTON PARKWAY
BOOM 1
7
8
9
10
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24
25
26
POTOMAC RIVER
KEY
7 SEGMENT
CHLA GOAL ZONE 1

Changes to the hydrodynamics model were made incorporating the Corps of Engineers channel bottom elevations. This modified model eliminates the large volumes in segments 7 to 13 and produces the flushing effects in that region which would actually occur. As a check on the modified model, the calibration data set was simulated showing only minimal changes to the results. Therefore, the modified model has been acepted by the SWCB for use in the wasteload allocation analysis of the Four Mile Run embayment.

5.1 WASTELOAD SCENARIOS

The four alternative wasteload scenarios selected for analysis include the Potomac Embayment Standards, the Consent Order and the State/EPA Interim Control Decision with and without nitrification. The effluent concentrations for modeled water quality parameters are presented in Table 5-1 for each of the four alternative scenarios. The appropriate Potomac Estuary boundary condition is chosen for each scenario as discussed in Section 3.4.

The daily minimum dissolved oxygen, the minimum daily average dissolved oxygen and the maximum daily average chlorophyll-a for both chlorophyll-a management zones are given in Table 5-2 to show the embayment response to each of the four wasteload scenarios. The daily minimum concentration is the lowest DO value which occurs during the day and this value is used to compare to the State's DO standard of 4.0 mg/L. The minimum daily average DO is the lowest daily average simulated at a model segment throughout the embayment and this value is used for comparison to the State's daily average DO standard of 5.0 mg/L. The State's dissolved oxygen standard of a minimum DO of 4.0 mg/L and an average daily value of 5.0 mg/L are not violated by the four wasteload scenarios. The Potomac Embayment Standards, which reflect nitrification and a low CBOD5 of 3.0 mg/L, produce the largest dissolved oxygen concentrations within Four Mile Run.

The lowest dissolved oxygen values are produced by the Interim Control Decision without nitrification which has a CBOD5 of 10 mg/L. For Four Mile Run, dissolved oxygen concentrations do not vary significantly for discharges with or without nitrification as shown in Table 5-2 for the Interim Control Decision with and without nitrification. The difference in the

TABLE 5-1

ARLINGTON
EFFLUENT CONCENTRATION FOR ALTERNATIVE WLA SCENARIOS

Wasteload Scenario	Effluent Concentration (mg/l)						
	Org. N	NH3	NO2+ NO3	Org. P	Ortho-P	CBOD5	DO
Potomac Embayment Standards	0.0	1.0	19.0	0.02	0.18	3.0	6.0
Consent Order	1.4	7.8	11.1	0.10	0.90	8.0	6.0
Interim Contr[illegible] Decision (With Nitrifi[illegible]ion)	0.0	1.0	19.0	0.02	0.16	10.0	6.0
Interim Contr[illegible] Decision Without Nitri[illegible]cation	0.0	20.0	0.0	0.02	0.16	10.0	6.0

TABLE 5-2

FOUR MILE RUN
WATER QUALITY MODEL PROJECTIONS FOR ALTERNATIVE WLA SCENARIOS

Wasteload Scenario	DO (mg/l) Daily Minimum	DO (mg/l) Min. Daily Avg.	CHLA (ug/l) Zone 1 Max. Daily Avg.	CHLA (ug/l) Zone 2 Max. Daily Avg.
Potomac Embayment Standards	5.7 (13)[1]	6.0 (14)	70 (26)	2 (13)
Consent Order	5.1 (13)	5.6 (13)	74 (26)	2 (13)
Interim Control Decision (with Nitrification)	5.0 (13)	5.5 (13)	69 (26)	2 (13)
Interim Control Decision Without Nitrification	4.8 (13)	5.4 (13)	69 (26)	2 (13)

[1] Numbers in parenthesis denote location of constituent concentration by model segment.

minimum daily average DO is only 0.1 mg/L and the daily minimum DO only differs by 0.2 mg/L. Figure 5-2 shows the average daily dissolved oxygen profile for the four different wasteload scenarios. As indicated in Table 5-2 the minimum dissolved oxygen concentrations are located in the upper portion of the Run near the WWTP discharge. The dissolved oxygen increases towards the mouth as a function of the Potomac boundary condition and the high chlorophyll-a concentrations near the mouth of the embayment.

As developed in the Water Quality Goals report for Task 4, chlorophyll-a goals are set for two different management zones as shown in Figure 5-1. For the downstream zone 1 the goal is 80 ug/L and for the upstream zone 2 the goal is 15 ug/L. For each of the wasteload scenarios the chlorophyll-a concentration at the Potomac boundary, which is 80 ug/L, dominates the chlorophyll-a concentrations in the downstream area of the embayment. The no further deterioration goal in zone 1 is not exceeded by the wasteload scenarios which produce concentrations from 69 to 74 ug/L of chlorophyll-a. Very small concentrations of chlorophyll-a are produced in the upstream zone with a maximum chlorophyll-a concentration in zone 2 of 2 ug/L. The chlorophyll-a profile for each of the four wasteload scenarios is presented in Figure 5-3. This figure shows no change in the upstream chlorophyll-a concentrations with only a small variation in concentrations near the mouth for the different wasteload scenarios.

5.2 POTOMAC ESTUARY BOUNDARY CONDITIONS

Three chlorophyll-a Potomac boundary concentrations are studied to determine the dissolved oxygen and chlorophyll-a response in the embayment for the Interim Control Decision with nitrification (NH3=1.0 mg/L, TP=0.18 mg/L, CBOD5=10.0 mg/L, DO=6.0 mg/L) and without nitrification (NH3=20.0 mg/L others same). The chlorophyll-a concentrations at the Potomac boundary include the design condition of 80 ug/L and concentrations of 100 and 50 ug/L. Table 5-3 presents the embayment response for dissolved oxygen, and chlorophyll-a in each of the two chlorophyll-a management zones. Changes to the chlorophyll-a concentrations at the Potomac boundary do not have a significant effect on the daily minimum and minimum daily average dissolved oxygen concentrations in Four Mile Run. The dissolved

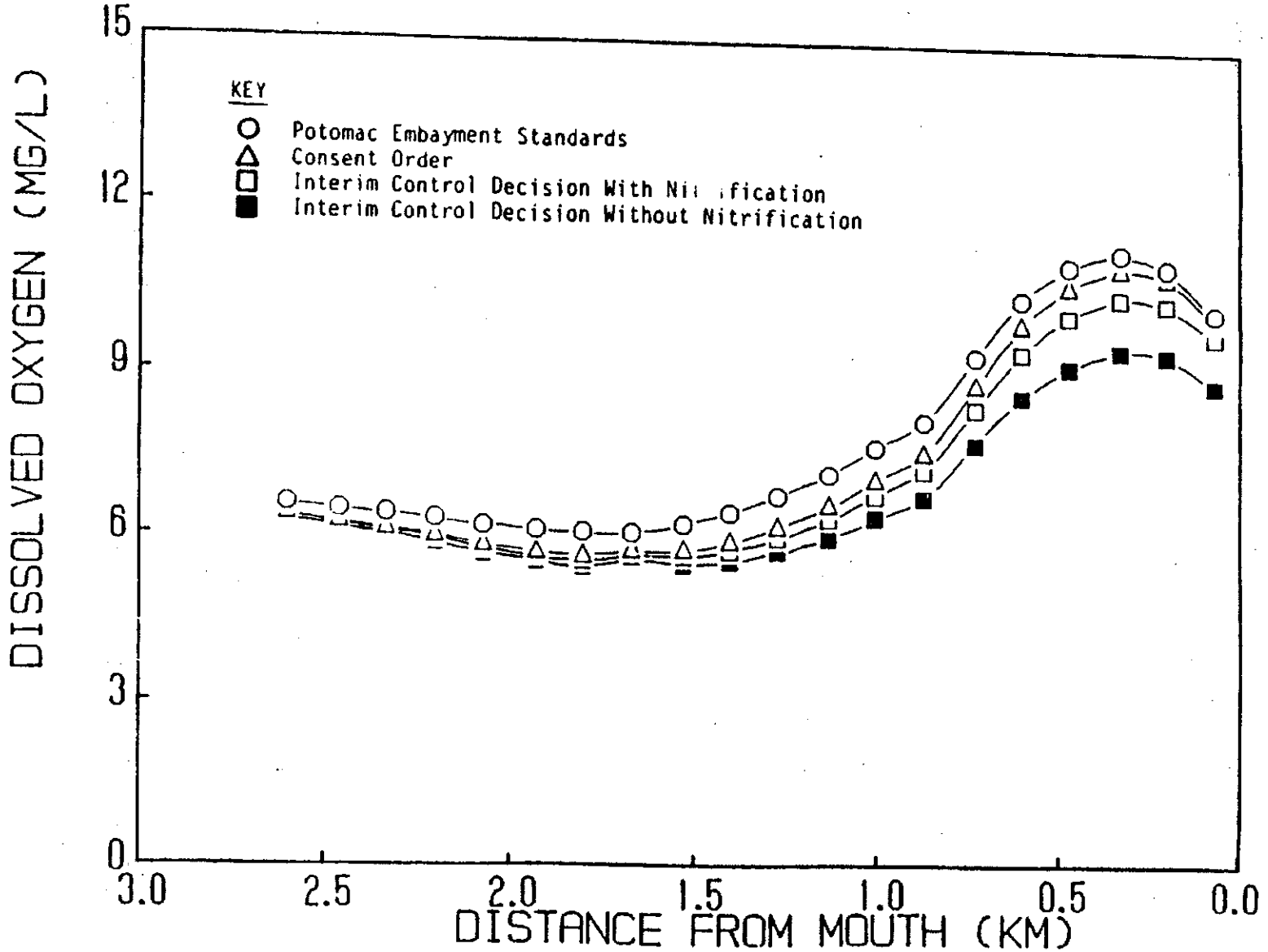

Figure 5-2. Four Mile Run, Simulated Daily Average Dissolved Oxygen for Different Wasteload Scenarios

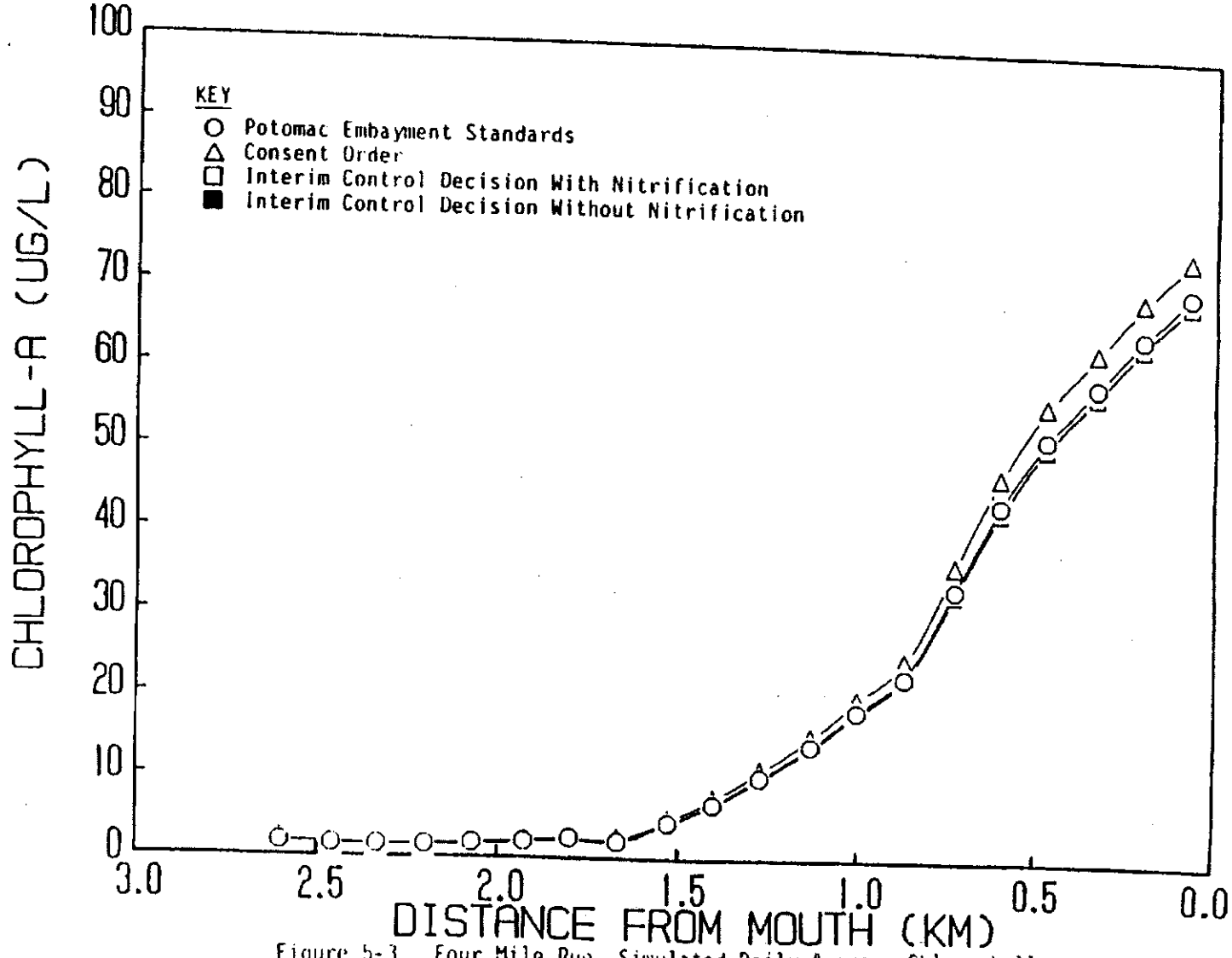

Figure 5-3. Four Mile Run, Simulated Daily Average Chlorophyll-a

TABLE 5-3

FOUR MILE RUN
WATER QUALITY MODEL PROJECTIONS FOR ALTERNATIVE
CHLOROPHYLL-A BOUNDARY CONDITIONS

Wasteload Scenario	Boundary Chla (ug/L)	DO (mg/l) Daily Minimum	DO (mg/l) Min. Daily Avg.	CHLA (ug/l) Zone 1 Max. Daily Avg.	CHLA (ug/l) Zone 2 Max. Daily Avg.
Interim Control Decision With Nitrification	100	5.0 (13)[1]	5.6 (13)	83 (26)	2 (13)
	80[2]	5.0 (13)	5.5 (13)	69 (26)	2 (13)
	50	4.9 (13)	5.5 (15)	47 (26)	2 (13)
Interim Control Decision Without Nitrification	100	4.9 (13)	5.5 (13)	83 (26)	2 (13)
	80[2]	4.8 (13)	5.4 (13)	69 (26)	2 (13)
	50	4.8 (13)	5.3 (13)	47 (26)	2 (13)

[1]Numbers in parenthesis denote location of constituent concentrations by model segment

[2]Design boundary condition.

oxygen concentrations in the upper portion of Four Mile Run do not vary significantly because the chlorophyll-a in that portion does not vary as a function of the boundary chlorophyll-a. However, dissolved oxygen concentrations do vary as a function of the boundary chlorophyll-a in the downstream reaches of the Run. The dissolved oxygen profile plots for various boundary conditions are given in Figures 5-4 and 5-5 for the Interim Control Decision with and without nitrification, respectively.

The maximum daily average chlorophyll-a concentrations in zone 1 directly reflect the Potomac Estuary boundary conditions as shown in Table 5-3. The chlorophyll-a concentrations in zone 2 are minimally affected as the maximum daily averages remain at 2 ug/L for all scenarios shown in Table 5-3. In zone 2, the chlorophyll-a goals are met for all wasteload scenarios and chlorophyll-a boundary conditions. The zone 1 goal is violated only if the chlorophyll-a boundary is as high as 100 ug/L.

Figures 5-6 and 5-7 present the chlorophyll-a profiles for the three boundary conditions for the Interim Control Decision with and without nitrification, respectively. These figures show that the downstream area of Four Mile Run is very sensitive to the chlorophyll-a concentrations at the Potomac boundary and that the upstream area is insensitive to the changes in chlorophyll-a at the Potomac boundary.

5.3 BENTHIC FLUX RATES

The sensitivity of the embayment response to varying benthic flux rates is performed by comparing the calibrated rates to an increase and decrease of 30 percent of the calibrated rates. The baseline scenario for this analysis is the Interim Control Decision with nitrification (NH_3 = 1.0 mg/L, TP = 0.18 mg/L, CBOD5 = 10.0 mg/L, DO = 6.0 mg/L) and the PEM design chlorophyll-a Potomac Estuary boundary is 80 ug/L. For Four Mile Run calibration rates were established for ammonia and sediment oxygen demand but not for orthophosphorus. Table 5-4 presents the embayment response for dissolved oxygen and chlorophyll-a for the changes to the ammonia and SOD benthic flux rates.

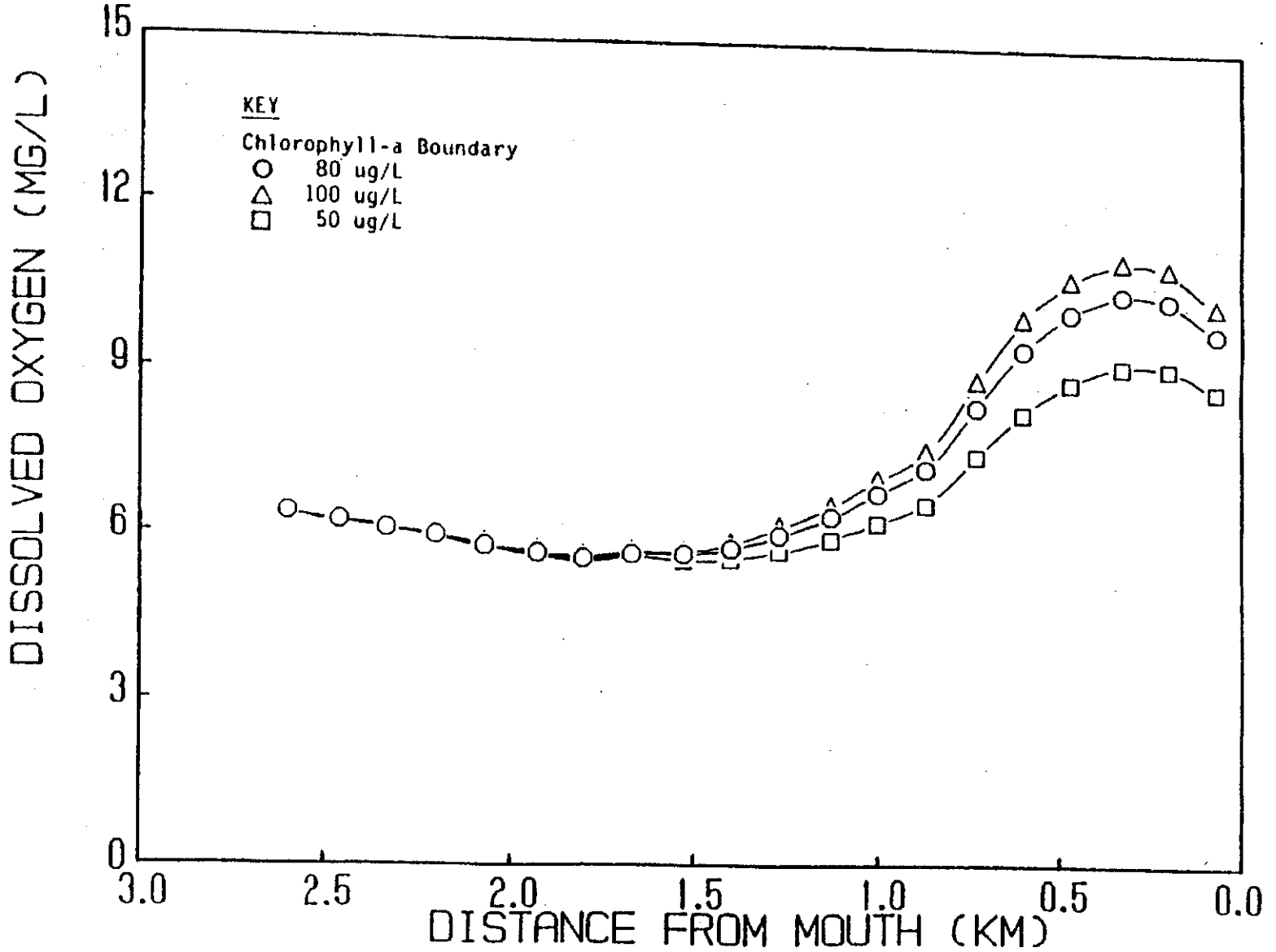

Figure 5-4. Four Mile Run, Simulated Daily Average Dissolved Oxygen for Different Boundary Conditions; Interim Control Decision with Nitrification

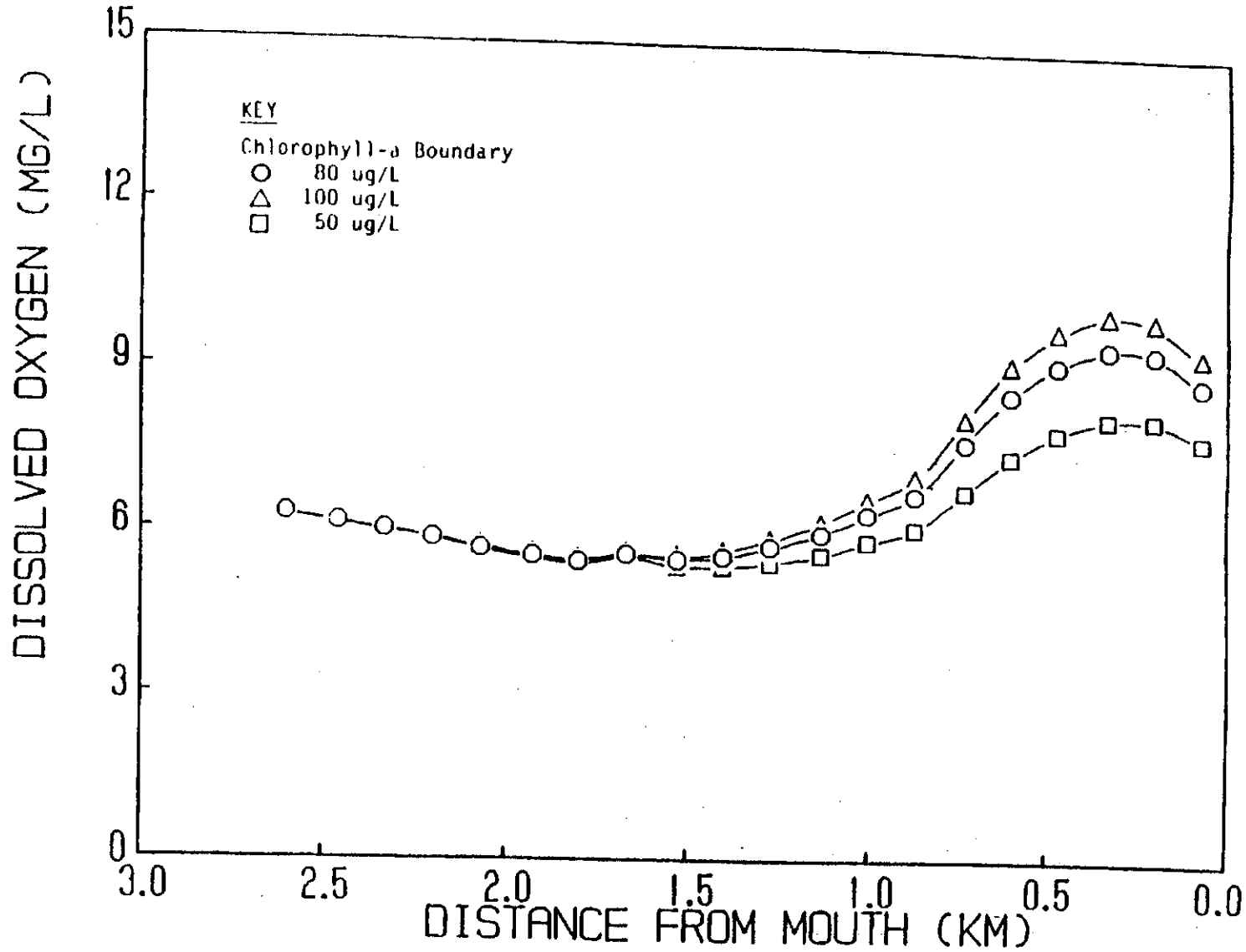

Figure 5-5. Four Mile Run, Simulated Daily Average Dissolved Oxygen for Different

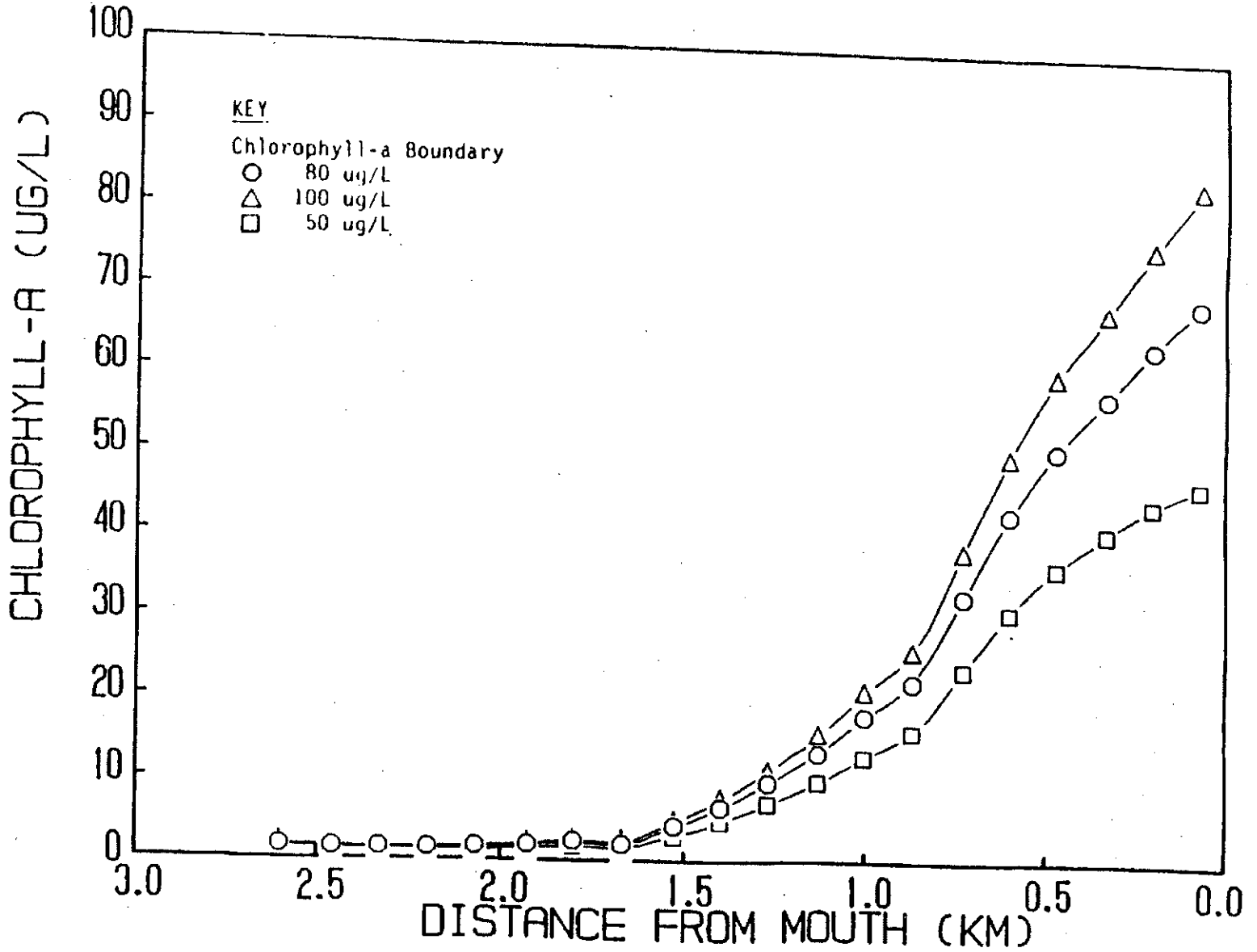

Figure 5-6. Four Mile Run, Simulated Daily Average Chlorophyll-a for Different Boundary Conditions; Interim Control Decision with Nitrification

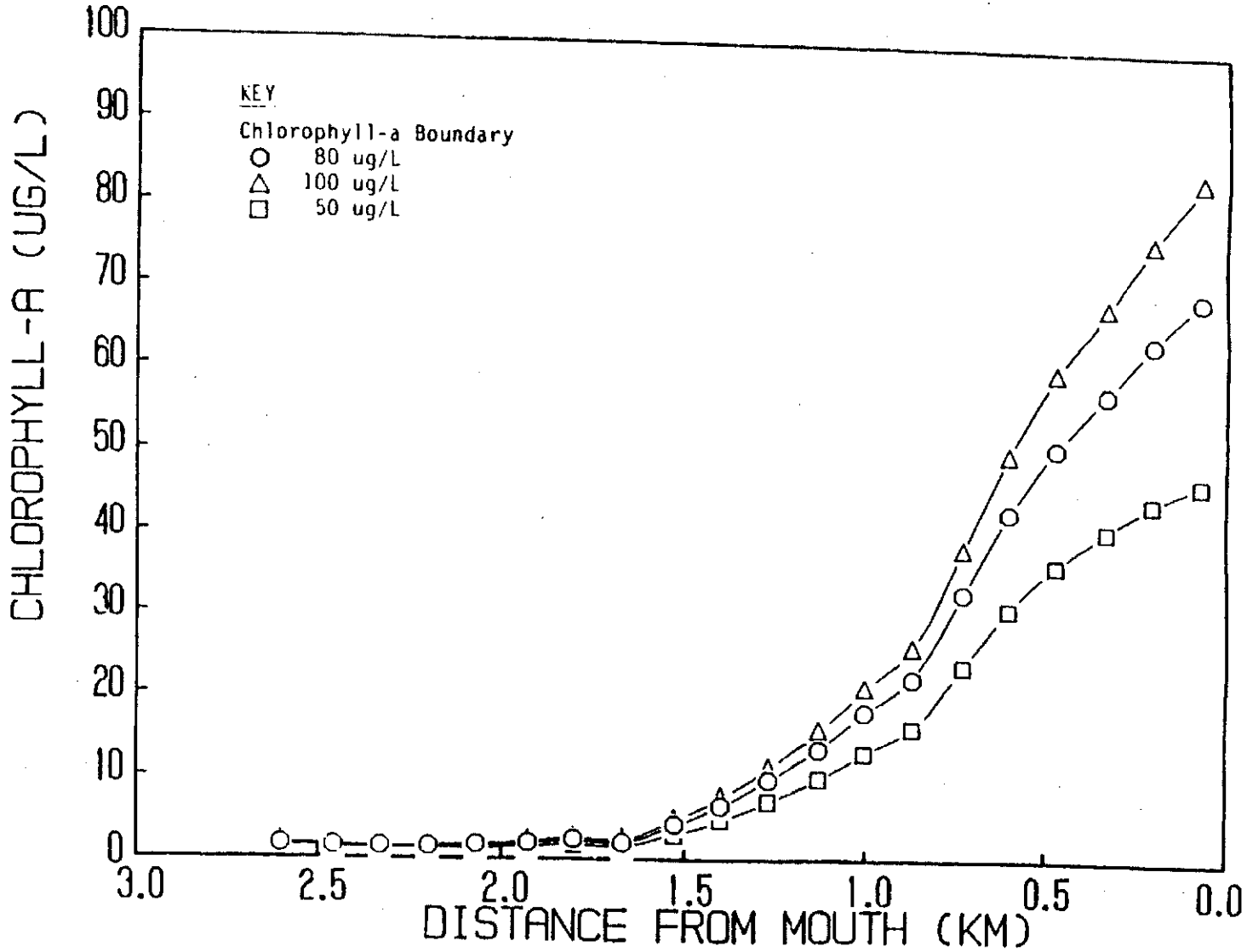

Figure 5-7. Four Mile Run, Simulated Daily Average Chlorophyll-a for Different

TABLE 5-4

FOUR MILE RUN
WATER QUALITY MODEL PROJECTIONS FOR ALTERNATIVE
BENTHIC FLUX RATES

		DO (mg/l)		CHLA (ug/l)	
				Zone 1	Zone 2
Constituent	Flux Rate	Daily Minimum	Min. Daily Avg.	Max. Daily Avg.	Max. Daily Avg.
NH3-N	Calib. + 30%	5.0 (13)[1]	5.5 (13)	69 (26)	2 (13)
	Calib.	5.0 (13)	5.5 (13)	69 (26)	2 (13)
	Calib. - 30%	5.0 (13)	5.5 (13)	69 (26)	2 (13)
SOD	Calib. + 30%	4.7 (13)	5.3 (13)	N/A[2]	N/A
	Calib.	5.0 (13)	5.5 (13)	N/A	N/A
	Calib. - 30%	5.2 (13)	5.8 (13)	N/A	N/A

[1]Numbers in parenthesis denote location of constituent concentration by model segment.

[2]Not applicable, no effect on chla from changes in SOD.

NOTE: Wasteload scenario is Interim Control Decision with nitrification (NH3 = 1.0 mg/L, TP = 0.18 mg/L, CBOD5 = 10.0 mg/L, DO = 6.0 mg/L).

The calibrated benthic flux rate for ammonia ranges from 0.0 to 0.02 gm/m^2/day at 20°C as a source of ammonia. Plus or minus 30 percent changes to these rates had no effect on the embayment minimum dissolved oxygen values nor on the maximum daily average chlorophyll-a values for the two zones. Figures 5-8 and 5-9 present for the three different ammonia benthic flux rates the average daily dissolved oxygen profile and the average daily chlorophyll-a profile, respectively.

The calibrated SOD flux rate is approximately 1.0 gm/m^2/day at 20°C for all modeled segments. As shown in Table 5-4, the dissolved oxygen response to a plus and minus 30 percent change of the calibrated SOD rate is minimal in segment 13 just upstream of the plant discharge. The daily minimum and minimum daily average DO concentrations for an increase in SOD still met the State's dissolved oxygen standards. The dissolved oxygen concentrations vary to a larger degree in the downstream segments of the embayment as shown in Figure 5-10 which presents the plots of the average daily DO concentrations for the three SOD rate cases.

5.4 EMBAYMENT RESPONSE TO WWTP PHOSPHORUS LOADS

Three levels of WWTP total phosphorus discharge, including 0.18, 0.40 and 1.0 mg/L, are investigated to determine the dissolved oxygen and chlorophyll-a response in the embayment. For this analysis, three different chlorophyll-a concentrations at the Potomac Estuary boundary are also simulated for each set of phosphorus levels from the WWTP. The boundary chlorophyll-a concentrations include 80 ug/L (the design condition), 100 ug/L and 50 ug/L. The Interim Control Decision without nitrification is used in this analysis as the baseline wasteload scenario (NH3 = 20.0 mg/L, CBOD5 = 10.0 mg/L, DO = 6.0 mg/L). The total effluent phosphorus is proportioned with 10 percent as organic phosphorus and 90 percent as orthophosphorus.

The embayment response for dissolved oxygen and chlorophyll-a to this series of effluent phosphorus loads and Potomac Estuary boundary conditions is given in Table 5-5. The table gives the daily minimum dissolved oxygen, the minimum daily average dissolved oxygen and their locations by model segment number. The maximum daily average chlorophyll-a concentrations are

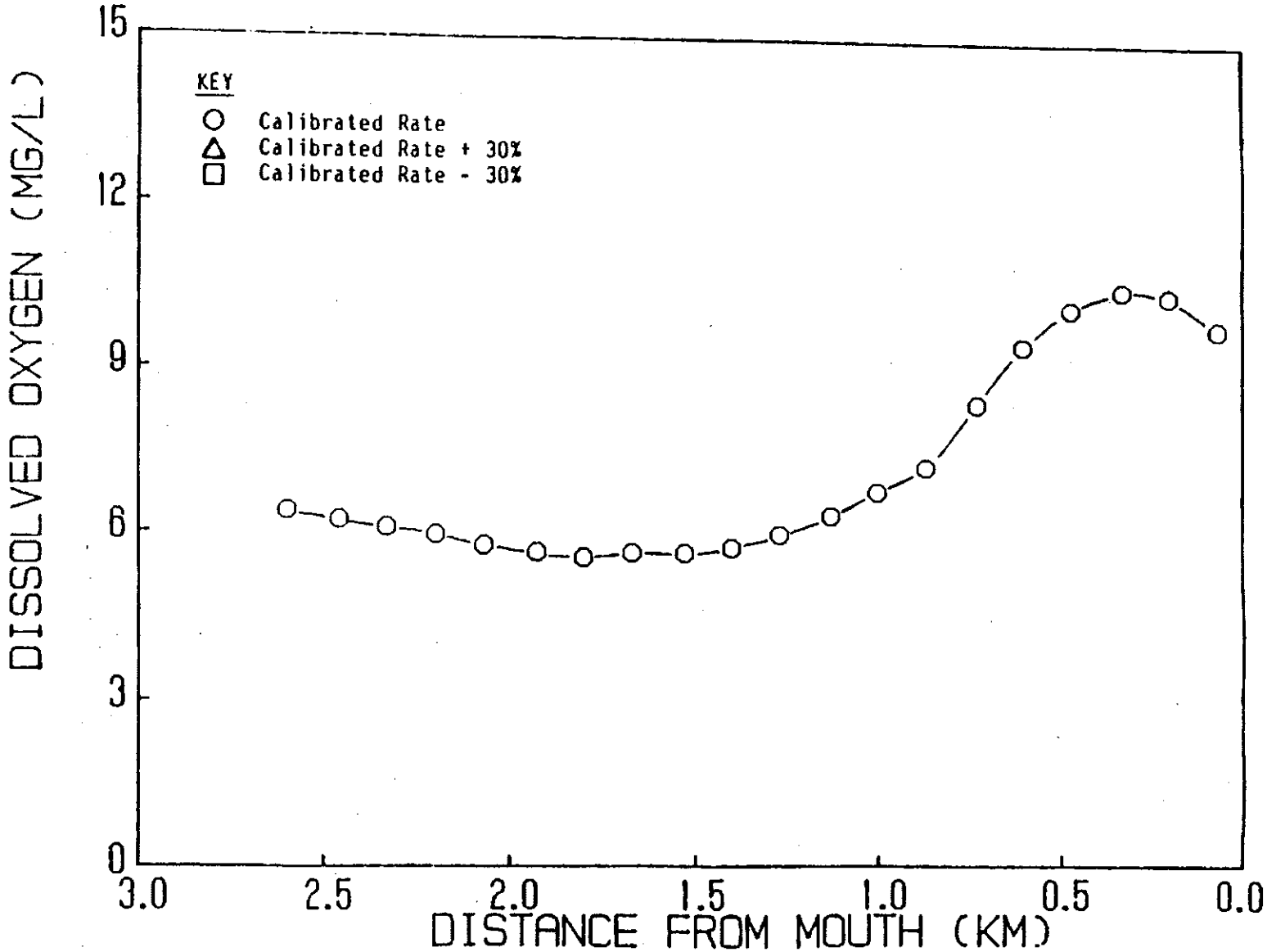

Figure 5-8. Four Mile Run, Simulated Daily Average Dissolved Oxygen for Different Ammonia-N Benthic Flux Rates; Interim Control Decision with Nitrification

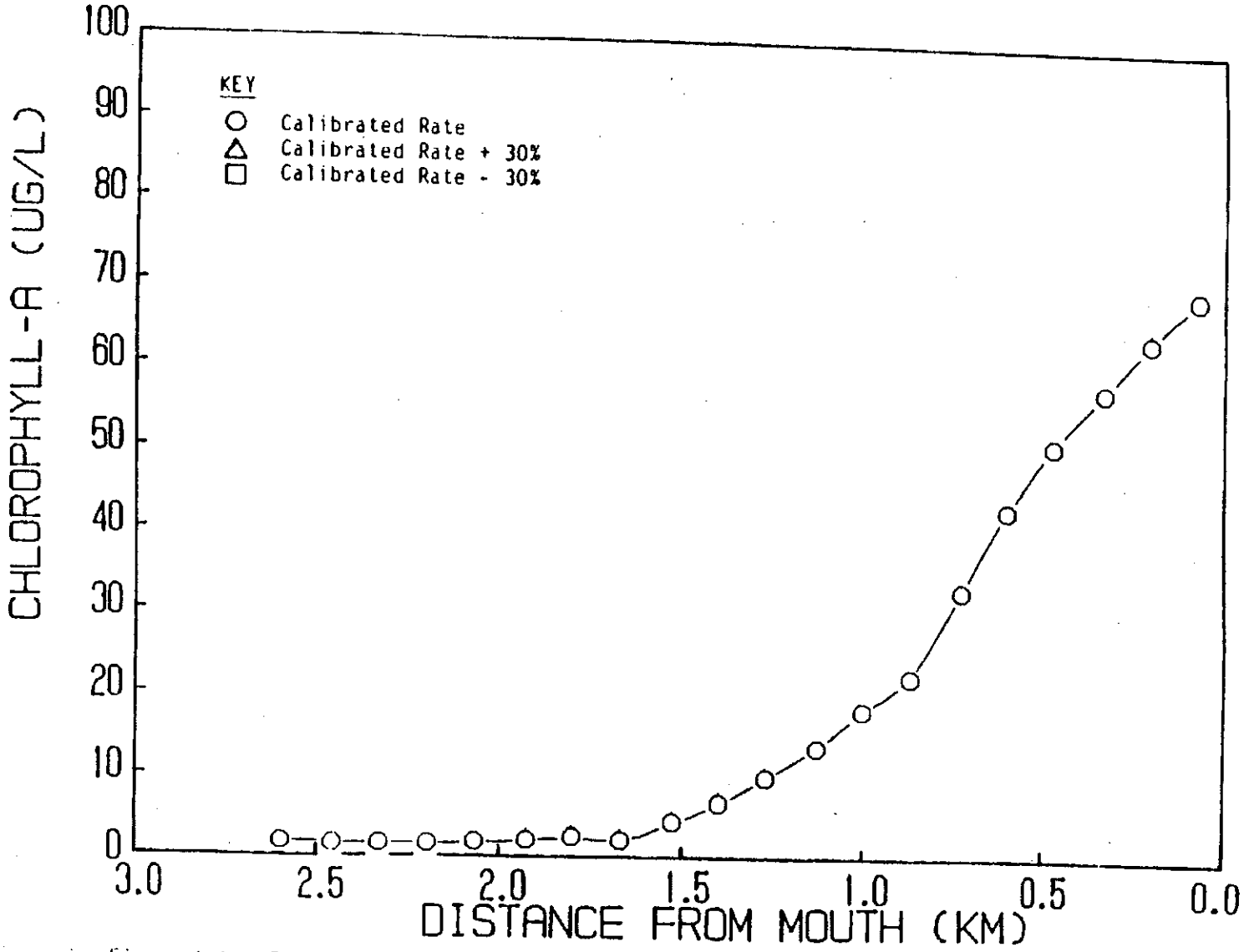

Figure 5-9. Four Mile Run, Simulated Daily Average Chlorophyll-a for Different Ammonia-N

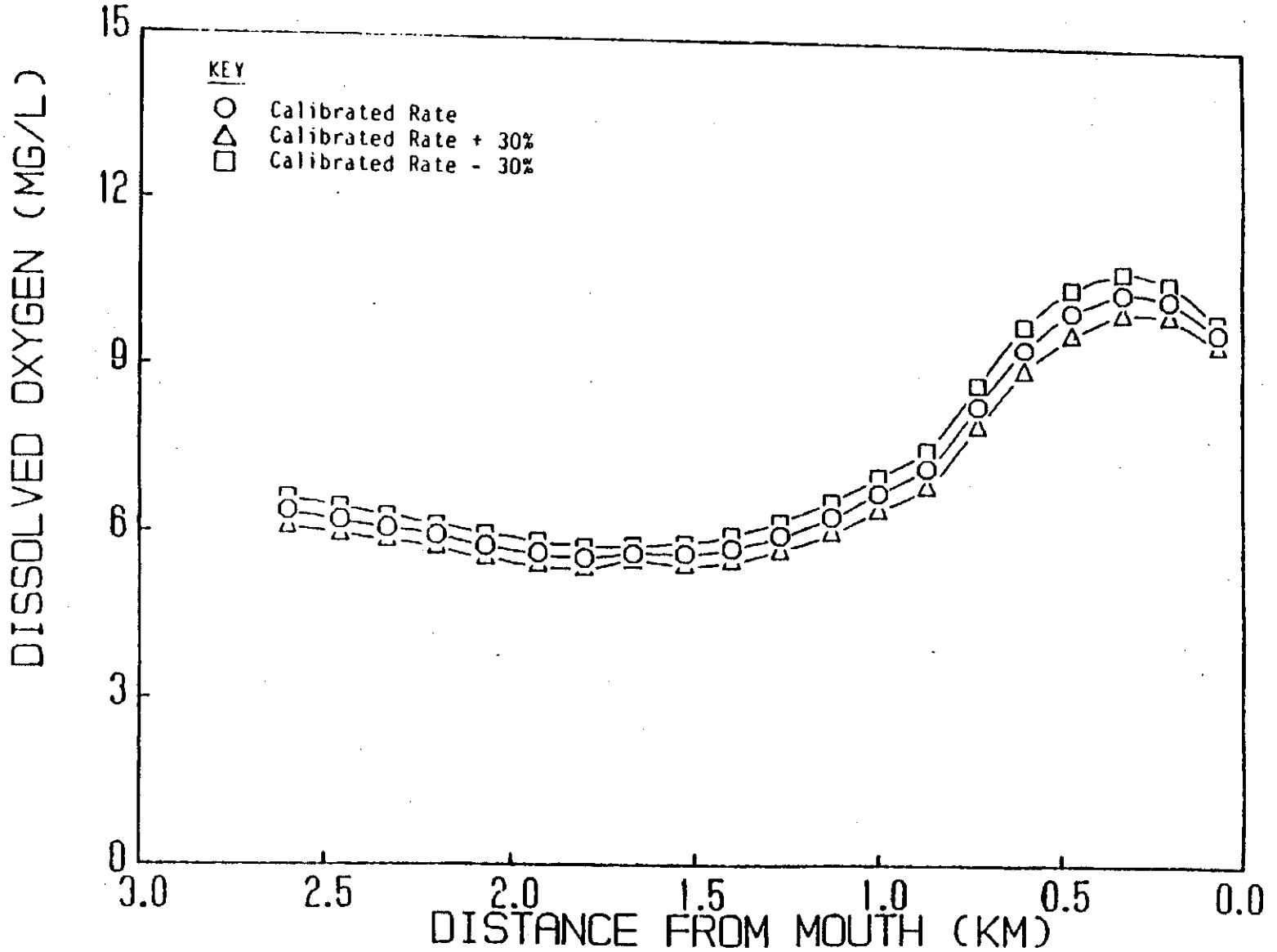

Figure 5-10. Four Mile Run, Simulated Daily Average Dissolved Oxygen for Different Sediment Oxygen Demands; Interim Control Decision with Nitrification

TABLE 5-5

FOUR MILE RUN
WATER QUALITY MODEL PROJECTIONS FOR ALTERNATIVE
WWTP TOTAL PHOSPHORUS LOADS AND CHLOROPHYLL-A BOUNDARY CONDITIONS

Boundary chla (ug/L)	TP Effluent Conc. (mg/L)	DO (mg/l) Daily Minimum	DO (mg/l) Min. Daily Avg.	CHLA (ug/l) Zone 1 Max. Daily Avg.	CHLA (ug/l) Zone 2 Max. Daily Avg.
80[1]	0.18	4.8 (13)[2]	5.4 (13)	69 (26)	2 (13)
	0.40	4.9 (13)	5.5 (13)	73 (26)	2 (13)
	1.00	4.9 (13)	5.5 (13)	74 (26)	2 (13)
100	0.18	4.9 (13)	5.5 (13)	83 (26)	2 (13)
	0.40	4.9 (13)	5.5 (13)	88 (26)	3 (13)
	1.00	4.9 (13)	5.5 (13)	90 (26)	3 (13)
50	0.18	4.8 (13)	5.3 (16)	47 (26)	2 (13)
	0.40	4.8 (13)	5.4 (15)	49 (26)	2 (13)
	1.00	4.8 (13)	5.4 (15)	50 (26)	2 (13)

[1]Design boundary condition.

[2]Numbers in parenthesis denote location of constituent concentration by model segm

NOTE: Wasteload scenario is Interim Control Decision without nitrification (NH3 = 20.0 mg/L, CBOD5 = 10.0 mg/L, DO = 6.0 mg/L).

also given for the two chlorophyll-a management zones for which chlorophyll-a goals have been established. The effects of the various total phosphorus effluent concentrations on the chlorophyll-a concentrations in the embayment are only minimal in the downstream zone 1 and are negligible in the upstream zone 2. In zone 1, the maximum daily average chlorophyll-a concentrations range from 69 ug/L to 74 ug/L with a boundary chlorophyll-a of 80 ug/L; from 83 ug/L to 90 ug/L with a boundary of 100 ug/L; and from 47 ug/L to 50 ug/L with a boundary of 50 ug/L. In zone 2 the maximum daily average chlorophyll-a remains at 2 ug/L in all cases except for total phosphorus concentrations of 0.40 mg/L and 1.0 mg/L with a boundary of 100 ug/L which only increases the concentration to 3 ug/L. Figures 5-11, 5-12 and 5-13 give the chlorophyll-a profiles for the three phosphorus alternatives for the boundary condition of 80 ug/L, 100 ug/L and 50 ug/L, respectively. The chlorophyll-a goal for zone 2 is not violated, and the zone 1 goal is violated only for a boundary of 100 ug/L of chlorophyll-a.

Changes to the chlorophyll-a and dissolved oxygen in the upper reaches of Four Mile Run are minimized due to the hydrodynamic response of the embayment from the WWTP discharge and the small volumes of water which characterize these upper reaches. The WWTP discharge tends to limit the propogation of algae to the upstream reaches by decreasing the velocities in the upstream direction during flood tide. Also the upstream segments of Four Mile Run have relatively small volumes which are mostly flushed out during the ebb tide prohibiting a quiescent condition in which algal growth is more likely to occur.

The minimal changes in the dissolved oxygen concentrations reflect the minimal changes in the chlorophyll-a concentrations. Table 5-5 presents the daily minimum and minimum daily average DO concentrations which occur in the vicinity of the treatment plant discharge. These values do not vary by more than 0.1 mg/L dissolved oxygen for all cases analyzed.

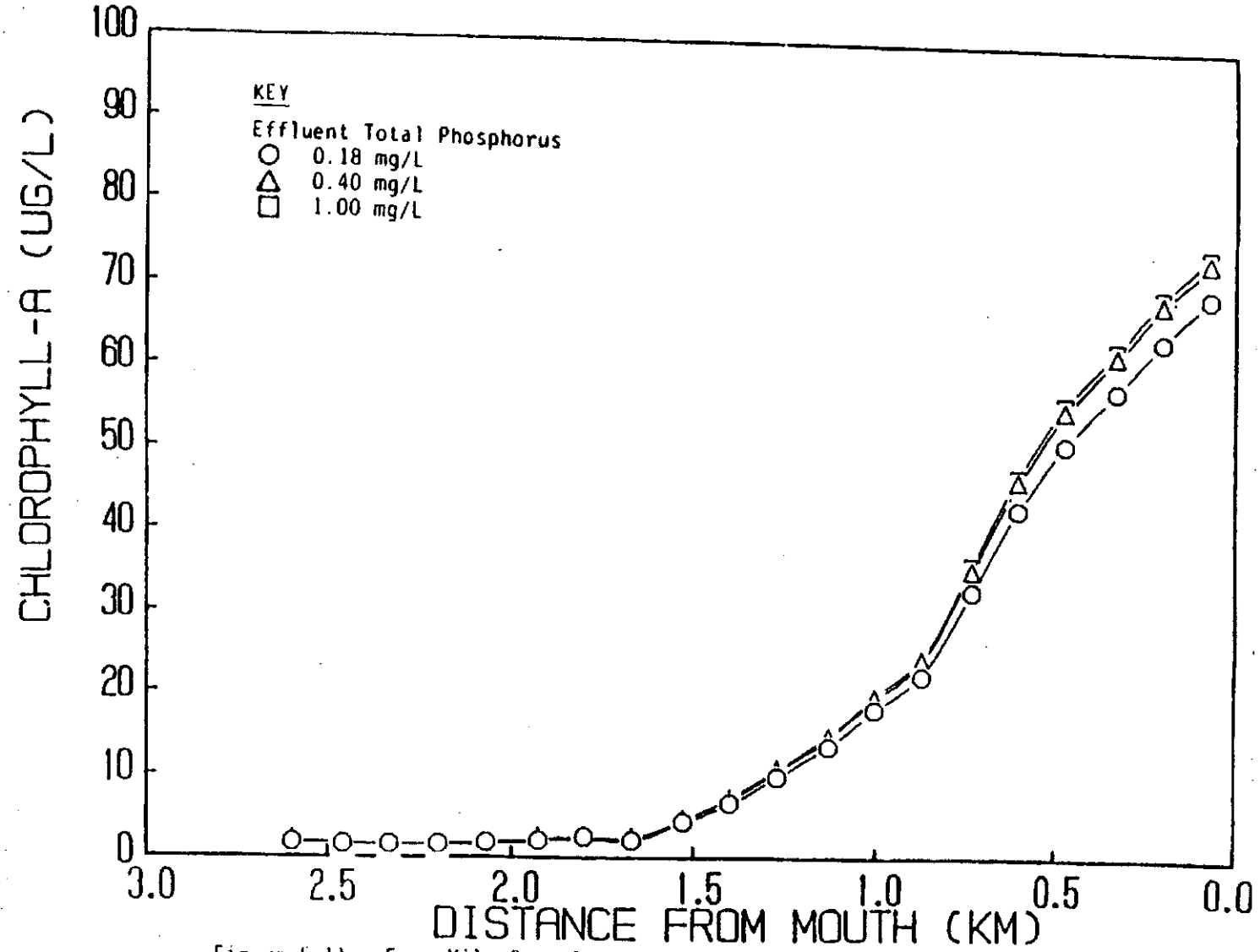

Figure 5-11. Four Mile Run, Simulated Daily Average Chlorophyll-a for Chlorophyll-a Boundary of 80 ug/L

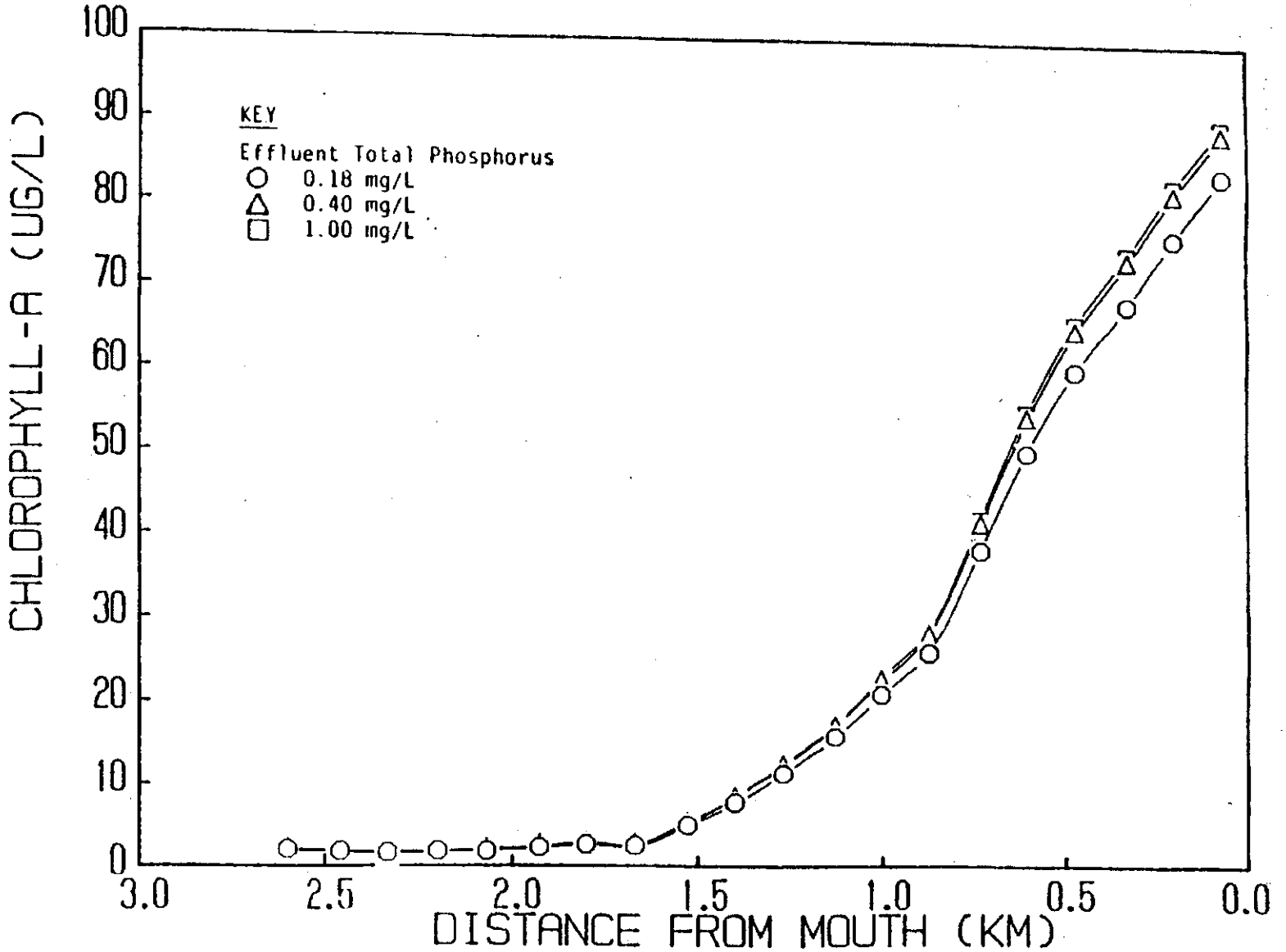

Figure 5-12. Four Mile Run, Simulated Daily Average Chlorophyll-a for Chlorophyll-a Boundary of 100 ug/L; Interim Control Decision without Nitrification

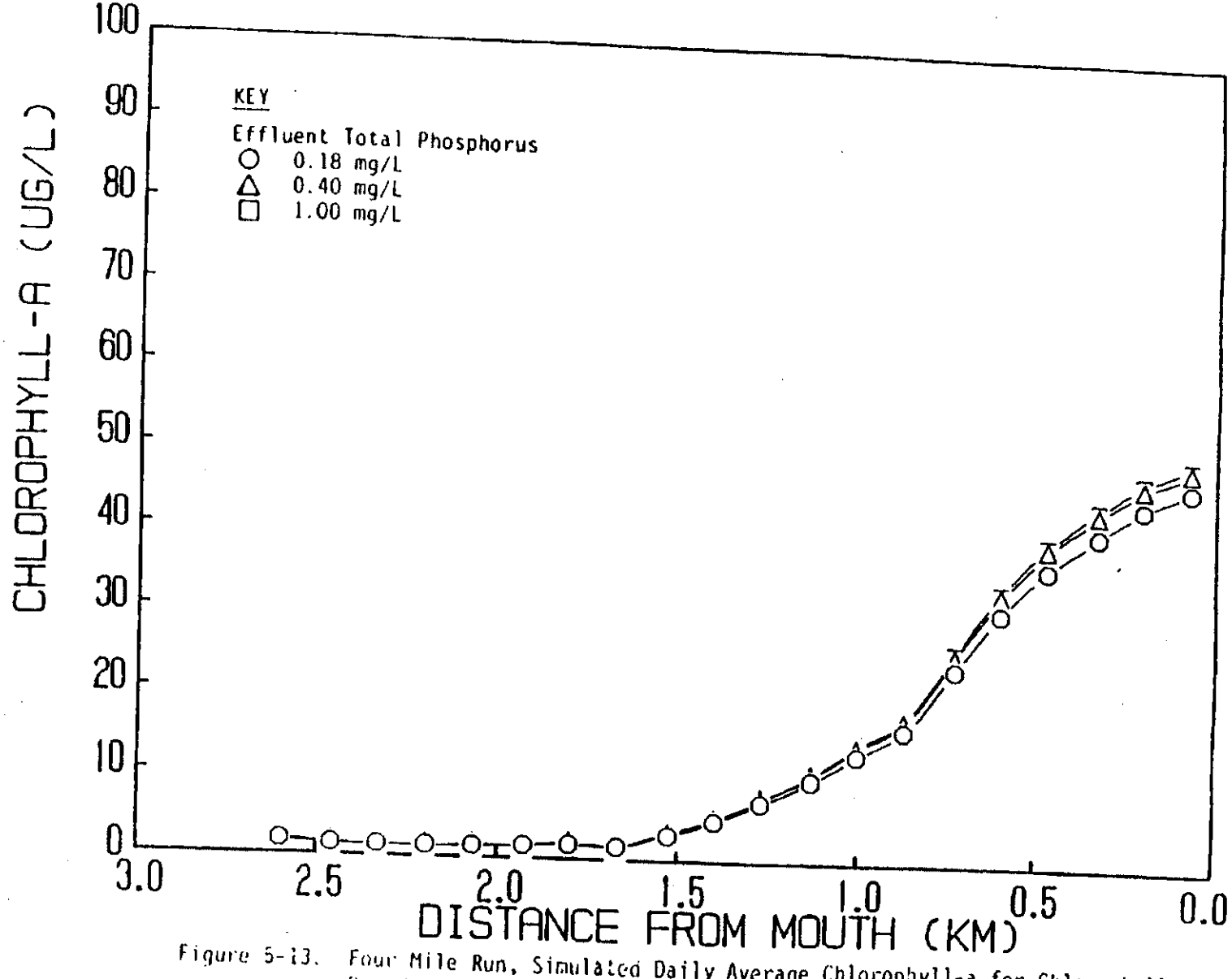

Figure 5-13. Four Mile Run, Simulated Daily Average Chlorophyll-a for Chlorophyll-a Boundary of 50 ug/L

5.5 NITROGEN REMOVAL

By considering biological nutrient removal processes, nitrogen removal is investigated as part of the sensitivity analysis to determine the effect on the chlorophyll-a response in the embayment. An effluent total nitrogen of 6.0 mg/L (0.0 mg/L organic, 2.4 mg/L ammonia and 3.6 mg/L nitrite plus nitrate) is simulated with a total phosphorus of 0.18 mg/L and 1.0 mg/L with the design boundary condition.

For Four Mile Run, these two cases are compared to the two Interim Control Decision without nitrification (TN=20.0 mg/L) cases for a TP of 0.18 mg/L and TP of 1.0 mg/L. The results for the Interim Control Decision without nitrification, under the design boundary condition, are given in Table 5-5. (For all four cases considered the CBOD5 = 10.0 mg/L and the DO = 6.0 mg/L.) For both a TP of 0.18 and 1.0 mg/L the reduction in total nitrogen, from 20.0 to 6.0 mg/L, did not change the maximum daily average chlorophyll-a for the two chlorophyll-a management zones. For a TP of 0.18 mg/L the chlorophyll-a concentrations are 69 ug/L (segment 26) for zone 1, and 2 ug/L (segment 13) for zone 2. For a TP of 1.0 mg/L the chlorophyll-a concentrations are 74 ug/L (segment 26) for zone 1, and 2 ug/L (segment 13) for zone 2.

5.6 NITROGEN:PHOSPHORUS RATIO

The ratio of total nitrogen to total phosphorus (N/P) is considered as part of the sensitivity study. The N/P ratio within the embayment should be greater than or equal to 10. This ratio is set to minimize the proliferation of nuisance blue-green algae which tend to predominate when the N/P ratio falls below 10. In Four Mile Run, the minimum N/P ratios within the embayment are determined for several wasteload scenarios. The minimum ratios and their segment locations are given in Table 5-6 for different wasteload scenarios. Without nitrogen removal, the N/P ratios are all above 10 for each of the scenarios investigated. The Consent Order (total phosphorus equal to 1.0 mg/L) and the Interim Control Decision with a total phosphorus of 1.0 mg/L produced the lowest N/P ratios with values near 20. The other scenarios which produce higher N/P ratios have smaller total phosphorus effluent concentrations. With nitrogen removal the low TP of

TABLE 5-6

FOUR MILE RUN
TOTAL NITROGEN TO TOTAL PHOSPHORUS RATIOS
FOR SELECTED WASTELOAD SCENARIOS

Scenario	Minimum N/P Ratio	Segment Location
Potomac Embayment Standards	96	7
Consent Order	22	14
Interim Control Decision with Nitrification	104	7
Interim Control Decision Without Nitrification for		
TP = 0.18 mg/L	128	14
TP = 0.40 mg/L	58	14
TP = 1.00 mg/L	23	14
Nitrogen Removal (TN = 6.0 mg/L)		
TP = 0.18 mg/L	36	14
TP = 1.00 mg/L	6.5	14

0.18 mg/L gives a ratio of 36. However for a TP = 1.0 mg/L with nitrogen removal the ratio falls below 10 with a value of 6.5.

5.7 TREATMENT PLANT DISCHARGE LOCATIONS

In addition to the analysis of the existing treatment plant location, two alternative discharge locations are investigated to determine the response in the embayment and the pollutant flux to the Potomac main stem. The present discharge location is at segment number 14 as shown in Figure 5-1. The alternative locations include one upstream at segment 10 and one downstream at segment 16. The downstream location was restricted to Virginia waters and no analyses were performed on a discharge to D.C. waters which include model segments 19 to 26. The baseline wasteload scenario for this analysis is the Interim Control Decision without nitrification (NH3 = 20.0 mg/L, TP = 0.18 mg/L, CBOD5 = 10.0 mg/L, DO = 6.0 mg/L). The design chlorophyll-a concentration of 80 ug/L is also used in the analysis.

For the different treatment plant locations no adjustments are made to the ammonia and SOD benthic flux rates. The embayment response to variations in the ammonia flux rate are negligible and the SOD benthic rate is the same for all modeled segments.

5.7.1 FOUR MILE RUN

Table 5-7 presents the dissolved oxygen and chlorophyll-a embayment response to the three treatment plant discharge locations. In comparison to the present location the upstream location at segment 10 (see Figure 5-1) does not affect the daily minimum and the minimum daily average dissolved oxygen concentrations. The maximum daily average chlorophyll-a concentrations in zone 1 and zone 2 remain the same. However, the downstream location has a slight effect on the dissolved oxygen by increasing the concentrations of the daily minimum and the minimum daily average. Chlorophyll-a concentrations are not increased in the downstream segments for the downstream WWTP location. However, the chlorophyll-a is allowed to propagate further upstream and shows a slight increase in concentration in zone 2 with a maximum daily average of 8 ug/L in segment 14. Figures 5-14 and 5-15 present

TABLE 5-7

FOUR MILE RUN
WATER QUALITY MODEL PROJECTIONS FOR ALTERNATIVE
TREATMENT PLANT DISCHARGE LOCATIONS

Discharge Location (Model Segment)	DO (mg/l)		CHLA (ug/l)	
	Daily Minimum	Min. Daily Avg.	Zone 1 Max. Daily Avg.	Zone 2 Max. Daily Avg.
14 (present)	4.8 (13)[1]	5.4 (13)	69 (26)	2 (13)
10 (upstream)	4.9 (20)	5.4 (15)	69 (26)	2 (14)
16 (downstream)	5.2 (20)	5.9 (16)	69 (26)	8 (14)

[1]Numbers in parentheses denote location of constituent concentration by model segment.

NOTE: Wasteload scenario is Interim Control Decision without nitrification (NH_3 = 20.0 mg/L, TP = 0.18 mg/L, CBOD5 = 10.0 mg/L, DO = 6.0 mg/L).

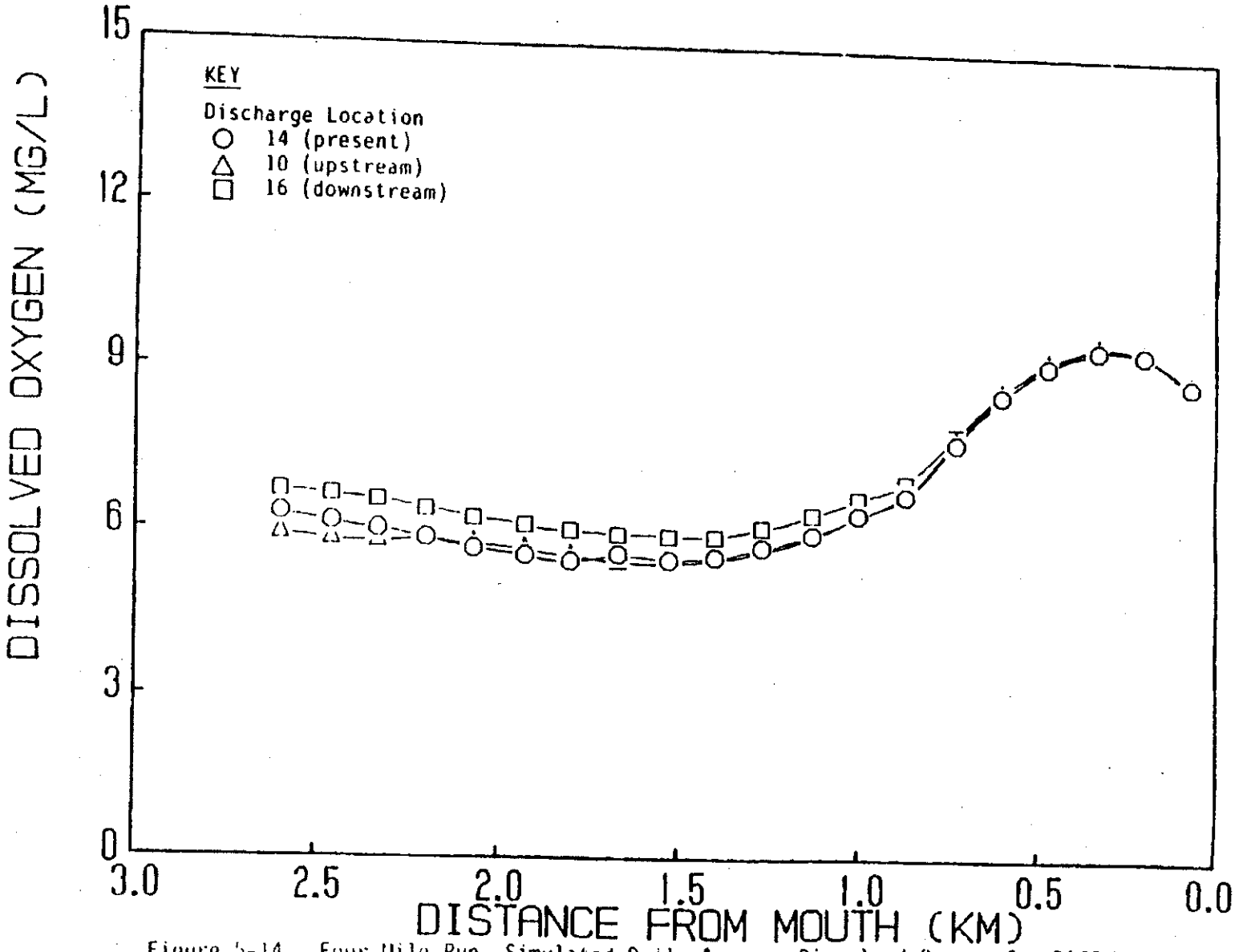

Figure 5-14. Four Mile Run, Simulated Daily Average Dissolved Oxygen for Different WWTP Locations; Interim Control Decision without Nitrification

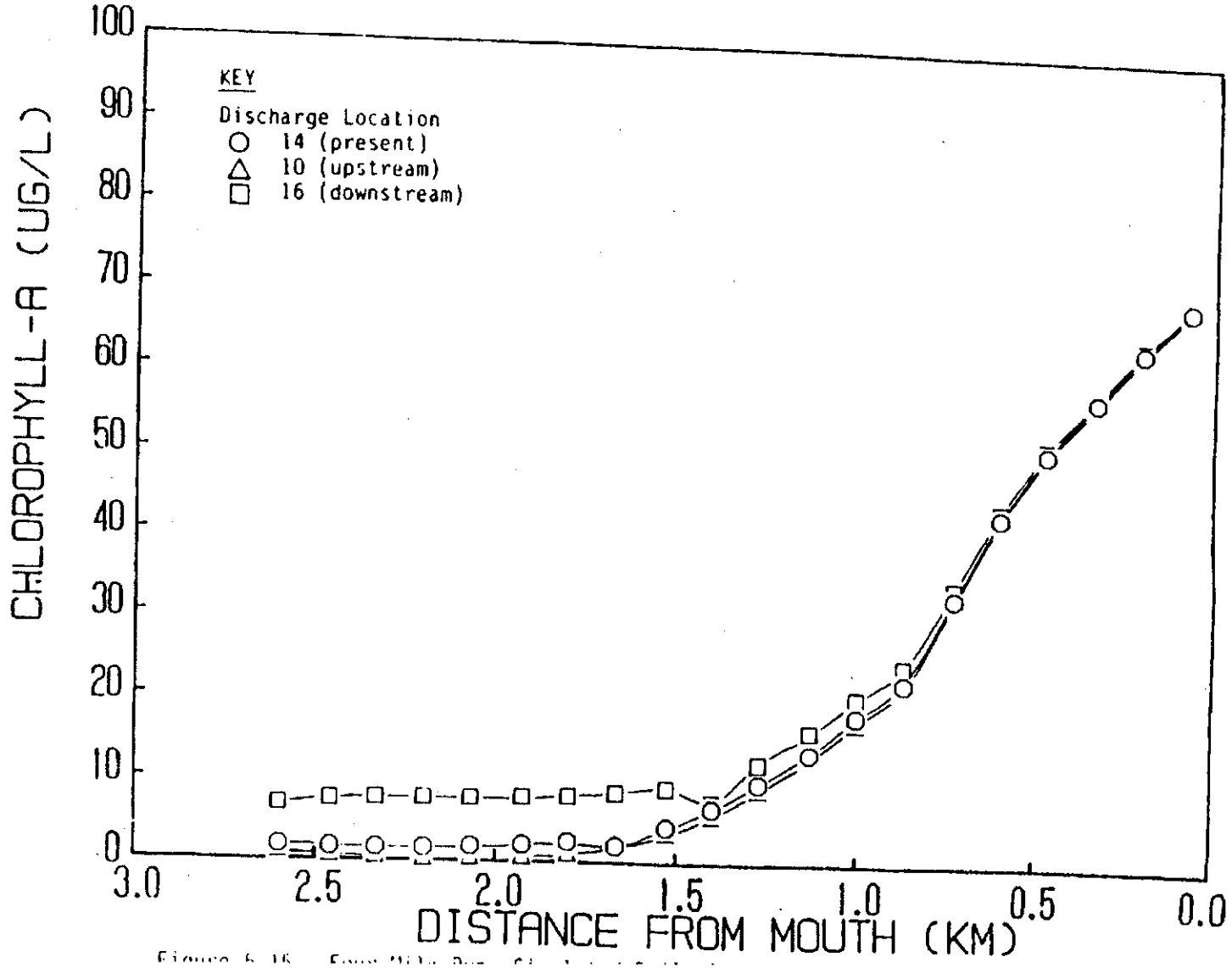
KEY
Discharge Location
14 (present)
10 (upstream)
16 (downstream)
CHLOROPHYLL-A (UG/L)
100
90
80
70
60
50
40
30
20
10
0
3.0
2.5
2.0
1.5
1.0
0.5
0.0
DISTANCE FROM MOUTH (KM)

Figure 5.16 [illegible]

for the three different WWTP locations the daily average dissolved oxygen and chlorophyll-a profiles, respectively.

5.7.2 POTOMAC MAIN STEM

The pollutant exports to the Potomac main stem for the present, upstream and downstream locations of the Arlington WWTP are analyzed by considering the net flux of ammonia, CBODU and total phosphorus due to the WWTP. The Interim Control Decision without nitrification (NH3 = 20.0 mg/L) is analyzed for all locations, and an additional analysis is performed for the wasteload scenario with nitrification (NH3 = 1.0 mg/L) at the present location only. The results of the pollutant flux analysis are presented in Table 5-8.

The WWTP's net ammonia flux from the embayment to the Potomac does not vary for the three discharge locations for an ammonia effluent concentration of 20.0 mg/L. In each case, just over 90 percent of the WWTP load is exported to the Potomac main stem. The ammonia decay rate and the ammonia interactions with organic nitrogen and chlorophyll-a act together to produce the similar results for the discharge locations. For the present location only, the flux is computed for an ammonia concentration of 1.0 mg/L to represent nitrification. Only 23 percent of this lower WWTP load is exported to the Potomac as a larger percentage of the ammonia is removed by algal uptake.

The CBODU flux analysis shows an increase in flux to the Potomac for WWTP locations closer to the mouth. The upstream and downstream differences compared to the present location only show a 3-4 percent difference in the net flux due to the WWTP. The changes in BOD flux occur because the CBODU load does not have as long a time to decay for the discharges which are closer to the mouth. The total phosphorus flux also shows a slight increase in the net flux due to the WWTP for locations which are closer to the Potomac boundary. The percentages are small, however, with only a one percent difference from present to upstream location and from present to downstream location.

TABLE 5-8

FOUR MILE RUN
WATER QUALITY MODEL POTOMAC MAIN STEM FLUX PROJECTIONS
FOR ALTERNATE TREATMENT PLANT DISCHARGE LOCATIONS

Constituent	WWTP Load (mg/L)	WWTP Load (kg/day)	Discharge Location (segment)	Net Flux due to WWTP (kg/day)	Percent of WWTP Load to Potomac
Ammonia-N (without Nitrification)	20.0	2,280	14 (present)	2,080	91
			10 (upstream)	2,080	91
			16 (downstream)	2,080	91
Ammonia-N (with Nitrification)	1.0	114	14 (present)	27	23
CBODU (CBOD5=10.0 mg/L)	27.0	3,070	14 (present)	466	15
			10 (upstream)	343	11
			16 (downstream)	545	18
Total Phosphorus	0.18	21	14 (present)	3.9	19
			10 (upstream)	3.7	18
			16 (downstream)	4.1	20

Overall, for the Four Mile Run embayment, the percentages of the WWTP loads which are exported to the Potomac main stem do not change significantly for the different locations selected for this analysis. However, for the present location and a WWTP ammonia concentration of 20.0 mg/L, a large percentage of the ammonia (91 percent) is exported to the Potomac and only 15 percent of the CBODU and 19 percent of the total phosphorus are exported to the Potomac.

6.0 FINAL WLA ALTERNATIVE ANALYSIS FOR FOUR MILE RUN

6.1 EMBAYMENT DESIGN CONDITIONS

In addition to the established low flow and high temperature design conditions, three other conditions are set for the final analysis of the wasteload allocation alternatives. They include: Potomac Estuary boundary conditions, sediment oxygen demand and discharge location.

6.1.1 POTOMAC ESTUARY BOUNDARY CONDITIONS

For the sensitivity analysis, the Potomac Estuary boundary conditions of Four Mile Run were based on PEM model runs as described in Section 3.4 and Section 4.1.2. The analysis of changes to the chlorophyll-a and DO at the Potomac Estuary boundary for the Interim Control Decision with and without nitrification showed that changes in the boundary condition did not significantly affect the minimum dissolved oxygen values, nor violate the chlorophyll-a goals for each of the two management zones.

In a recent study by the Metropolitan Washington Council of Governments (1987), an evaluation of the dissolved oxygen in the main stem Potomac was conducted. Although most of the DO study modeling was conducted using the Dynamic Estuary Model (DEM), new PEM model runs were also carried out to estimate the DO impact of wasteload scenarios which included with and without nitrification for the Arlington and Alexandria wastewater treatment plants. The Council of Governments (COG) made two major changes to the PEM model for their DO study. They include: a reduction in the algal growth rate which produced a lower and more reasonable chlorophyll-a concentration in the Upper Potomac, and a reduction in the nitrification rate which produced a more reasonable ammonia decay rate resulting in somewhat higher ammonia concentrations.

The main stem water quality conditions that were predicted by the new PEM runs were compared to the boundary conditions used during the sensitivity analysis. For the sensitivity studies, the Potomac Estuary boundary

conditions for Four Mile Run were set for different nitrification wasteload scenarios (i.e., PEM run A2 was used to reflect nitrification at the Arlington plant and PEM run D7 was used to reflect no nitrification at the Arlington plant). The Four Mile Run boundary conditions for the new PEM model runs which reflect with and without nitrification are compared in Table 6-1 to the corresponding boundary conditions of the sensitivity runs. There are no major differences for nutrients, DO and CBODU. The chlorophyll-a concentration of 60 ug/L for the DO study is 20 ug/L less than the 80 ug/L used in the sensitivity study. In order to evaluate the impact of the new PEM boundary conditions on the embayment dissolved oxygen concentrations, the Interim Control Decision with and without nitrification scenarios are simulated.

For each case, the minimum daily average DO concentration for the new PEM boundary conditions is only 0.05 mg/L less than the minimum daily average DO concentration produced with the original Potomac Estuary boundary conditions. Thus, the change in boundary conditions (as shown in the previous sensitivity study) does not have a significant impact on the upstream minimum daily average DO. Therefore the original design conditions used during the sensitivity studies are used in the final analysis.

6.1.2 SEDIMENT OXYGEN DEMAND

The sediment oxygen demand (SOD) used in the sensitivity studies was the benthic rate calibrated and verified for the Four Mile Run model. Corrected to 20 C, a rate of approximately 1.0 $gm/m^2/day$ was applied to all model segments. As part of the COG DO study, a total of three in-situ measures were taken in Four Mile Run and two laboratory measures were performed on cores in 1986. Based on an analysis of in-situ and laboratory techniques, the COG study concluded that the in-situ measures are preferred over the laboratory measures. With the temperature correction to 20 C, for comparative purposes, the 1986 average SOD rate was 4.6 $gm/m^2/day$. This value, based on three measures, is 4.6 times as great as the calibrated and verified SOD.

TABLE 6-1

FOUR MILE RUN
POTOMAC ESTUARY BOUNDARY CONDITION COMPARISON

Cases	Main Stem Concentrations							
	Org.N (mg/L)	NH3 (mg/L)	NO3 (mg/L)	Org.P (mg/L)	Ortho-P (mg/L)	Chla (ug/L)	CBODU (mg/L)	DO (mg/L)
STP Without Nitrification								
Sensitivity Study[1]	0.68	0.27	1.8	0.023	0.006	80	1.0	7.3
New DO Study[2]	0.60	0.42	1.7	0.023	0.009	60	1.0	7.3
STP With Nitrification								
Sensitivity Study	0.67	0.03	1.9	0.023	0.006	80	1.0	8.0
New DO Study	0.62	0.05	2.4	0.023	0.009	60	1.0	7.7

[1] Boundary conditions used for sensitivity studies which were developed from runs made for Blue Plains Feasibility Study (Greeley and Hansen, 1984).

[2] Boundary conditions produced by new PEM runs performed by Metropolitan Washington Council of Governments (1987).

The model SOD value was based on measures taken during July 1981 and also on small adjustments during the calibration process. The SOD value of 1.0 $gm/m^2/day$ used in the Four Mile Run model is approximately equal to the mean SOD value of 1.1 $gm/m^2/day$ measured in the main stem Potomac during the COG DO study survey of 1986 Both value are temperature corrected to 20^oC for comparative purposes.

The new 1986 Four Mile Run SOD values imply that there is a much greater oxygen demand from the sediment than there was in 1981. From recent surveys, on the main stem, indications are that the SOD has declined over the past several years. Although a very small sample of three SOD measures during 1986 showed higher SOD values than in the past, based on the trend of declining SOD values, the previously calibrated and verified SOD values are used in the detailed analysis.

6.1.3 TREATMENT PLANT LOCATION

Changes in the location of the wastewater treatment plant did not have significant impacts on the minimum dissolved oxygen values nor on the maximum daily chlorophyll-a concentrations in the embayment. The upstream and present locations produced similar results and the downstream location only increased the minimum daily average dissolved oxygen concentration by 0.5 mg/L. Therefore, the present discharge location is used in the final analysis of WLA alternatives.

6.2 WLA ALTERNATIVES

The wasteload allocation alternatives include the following:

1. Interim Control Decision with nitrification (TP=0.18 mg/L),
2. Interim Control Decision without nitrification (TP=0.18 mg/L), and
3. Interim Control Decision without nitrification (TP=1.0 mg/L).

Table 6-2 presents the effluent concentrations for the three WLA alternatives.

TABLE 6-2

EFFLUENT CONCENTRATIONS FOR WLA ALTERNATIVES

WLA Alternatives	Q (mgd)	Effluent Concentration (mg/L)						
		Org. N	NH3	NO2+ NO3	Org. P	Ortho-P	CBOD5	DO
ARLINGTON[1] (Four Mile Run)								
1. Interim Control Decision With Nitrification (TP = 0.18 mg/L)	40.0	0.0	1.0	19.0	0.02	0.16	10.0	6.0
2. Interim Control Decision Without Nitrification (TP = 0.18 mg/L)	40.0	0.0	20.0	0.0	0.02	0.16	10.0	6.0
3. Interim Control Decision Without Nitrification (TP = 1.0 mg/L)	40.0	0.0	20.0	0.0	0.10	0.90	10.0	6.0

[1]With design Potomac Estuary boundary conditions, calibrated benthic flux rates, and at existing discharge location.

The final WLA alternative analysis is performed with a discharge of 40 mgd for the Arlington County pollution control plant. The discharge is increased from the 30 mgd used during the sensitivity studies. Based on their planning report, Arlington County has proceeded to plan for a 40 mgd facility. The water quality impacts of the expanded flows from Arlington were evaluated (NVPDC, 1987) and the study showed that an increase in flow from 30 mgd to 40 mgd did not decrease the daily minimum DO or the minimum daily average DO by more than 0.1 mg/L for a range of wasteload scenarios. Following these studies, Arlington requested to have the Four Mile Run embayment study completed assuming a 40 mgd discharge. The State Water Control Board directed NVPDC to perform the final WLA analysis using the 40 mgd value.

The dissolved oxygen and chlorophyll-a responses in the embayment to the three WLA alternatives are presented in Table 6-3. The state's dissolved oxygen standards, a daily minimum of 4.0 mg/L and minimum daily average of 5.0 mg/L, are not violated for each of the three alternatives. The WLA alternatives also remain below the chlorophyll-a goals established for Zone 1 (80 ug/L) and Zone 2 (15 ug/L).

For this analysis the "without nitrification" scenario assumes that a TKN of 20 mg/L is all in the form of ammonia as shown in Table 6-2. In the COG DO study of the Potomac main stem, the ammonia concentration for this scenario was set at 15 mg/L. This reduction does not have an impact on the dissolved oxygen concentrations in the embayment. As seen in Table 6-3, alternative number 1 with nitrification (NH3=1.0 mg/L) only provides an increase of 0.1 mg/L for the daily minimum and the minimum daily average dissolved oxygen. The relatively small impact of ammonia on the DO concentrations is a result of the large quantity (93 percent) of WWTP ammonia which is exported to the main stem of the Potomac.

At the request of the State Water Control Board, the concentration of ammonia in the main stem Potomac has also been studied with respect to the District of Columbia's un-ionized ammonia standard. The D.C. standard is 0.02 mg/L for un-ionized ammonia as N, and is applicable in the Potomac main stem between Chain Bridge and Jones Point. The concentration of

TABLE 6-3

FOUR MILE RUN
WATER QUALITY MODEL PROJECTIONS FOR WLA ALTERNATIVES

WLA Alternative	DO (mg/l) Daily Minimum	DO (mg/l) Min. Daily Avg.	CHLA (ug/l) Zone 1 Max. Daily Avg.	CHLA (ug/l) Zone 2 Max. Daily Avg.
1. Interim Control Decision With Nitrification (TP = 0.18 mg/L)	4.8 (13)	5.4 (16)	69 (26)	1 (7)
2. Interim Control Decision Without Nitrification (TP = 0.18 mg/L)	4.7 (13)	5.3 (16)	69 (26)	1 (7)
3. Interim Control Decision Without Nitrification (TP = 1.0 mg/L)	4.7 (13)	5.3 (16)	71 (29)	1 (7)

[1] Numbers in parenthesis denote location of constituent concentration by model segment.

un-ionized ammonia is a function of the ammonia concentration, temperature, and pH of the water column.

In order to evaluate the un-ionized concentration at the mouth of Four Mile Run, the Potomac main stem concentrations from the COG DO study are considered. As shown in Table 6-1, without nitrification at Arlington and Alexandria, the total ammonia simulated by the PEM model at the Four Mile Run confluence was 0.42 mg/L as N. The model does not calculate the un-ionized ammonia or the pH of the system. Therefore, to determine the un-ionized ammonia concentration the design temperature for the Potomac (28°C, from the Blue Plains Feasibility Study) and historical pH values are considered. An analysis of pH values from 1982 to 1986 was conducted for Potomac main stem stations PMS-29, PMS-31, PMS-33, PMS-35 and PMS-37, which are located at the Four Mile Run confluence and just upstream and downstream of the confluence. The median pH for all stations during the months of June through September was 7.5.

At a pH of 7.5 and at a temperature of 28°C the un-ionized ammonia for a total of 0.42 mg/L ammonia is 0.009 mg/L. This value does not exceed the 0.02 mg/L un-ionized ammonia standard.

6.3 POLLUTANT FLUX TO THE POTOMAC MAIN STEM

The net fluxes of ammonia, CBODU and total phosphorus are presented in Table 6-4. The table gives the WWTP load, the net flux due to the WWTP and the percent of the WWTP load exported to the Potomac for each constituent. Without nitrification 93 percent of the WWTP ammonia is exported; however, for a much smaller load of ammonia produced with nitrification the amount of ammonia exported to the main stem is 29 percent. Only 18 percent the CBODU is exported to the Potomac. The percentage of total phosphorous exported to the main stem varies from 56 percent for TP=1.0 mg/L to 27 percent for TP=0.18 mg/L.

TABLE 6-4

FOUR MILE RUN
POTOMAC MAIN STEM FLUX PROJECTIONS FOR WLA ALTERNATIVES

Constituent	WWTP Load (mg/L)	WWTP Load (kg/day)	Net Flux Due to WWTP (kg/day)	Percent of WWTP Load to Potomac
Ammonia-N (Without Nitrification)	20.0	3,030	2,810	93
Ammonia-N (With Nitrification)	1.0	152	43	29
CBODU (CBOD5 = 10.0 mg/L)	27.0	4,090	728	18
Total Phosphorus (0.18 mg/L)	0.18	27	7.5	27
Total Phosphorus (1.0 mg/L)	1.0	151	84	56

6.4 SEASONAL NITRIFICATION

Under the summer design conditions, nitrification was not required for the Arlington water pollution control plant to meet the State's dissolved oxygen standards for Four Mile Run. Therefore, an evaluation of seasonal nitrification is not required.

6.5 SEASONAL PHOSPHORUS REMOVAL

The potential for phosphorus accumulation within the embayments during months when stringent treatment standards are not imposed is evaluated for the Arlington water pollution control plant. A specific methodology has been developed to consider winter accumulation and summer release of phosphorus from the benthos for the point source contribution only. The overall approach assumes that the WWTP phosphorus which settles out during the winter months is released back into the water column during the summer months at the same rate. Studies have shown that phosphorus can accumulate for several years and then can be released at a high rate during special conditions. To predict long term settling and periodic release is beyond the scope of this study. Therefore the daily accumulation of phosphorus is translated to a release rate which is applied to the low flow, high temperature, design conditions. The analysis is conducted using the calibrated model and does not consider extreme events such as anoxic conditions or very low pH which may release more phosphorus than under normal equilibrium conditions. The calibrated Four Mile Run model has an organic P settling rate and an Ortho-P settling rate. The model does not have a calibrated benthic Ortho-P release rate or an organic P release rate.

The design condition for this analysis includes an average annual inflow rate for the headwater and incremental flows during the winter time simulation. For this simulation the dissolved oxygen of the upstream and Potomac Estuary boundaries is set at 9.2 mg/L, one mg/L less than saturation at the design temperature of 15°C. The winter time analysis does not include the simulation of algae.

In order to determine the effect of relaxing a more stringent total phosphorus allocation to a less stringent concentration in the winter months, two wasteload scenarios are selected for the analysis which includes a TP = 0.18 mg/L and a TP = 1.0 mg/L for the Interim Control Decision without nitrification. The following approach is conducted. First, the TP = 0.18 mg/L is considered a base line case. The effluent organic phosphorus and orthophosphorus load for the TP = 0.18 mg/L case is subtracted from the corresponding loads for the TP = 1.0 mg/L case to demonstrate the differential load between the two effluent cases. The total fluxes of the organic P and ortho-P to the Potomac Estuary are calculated for the two cases and the differences are computed to produce the differential load exported to the Potomac Estuary. Now, the difference of these differential loads (treatment plant effluent and flux) is the amount of phosphorus accumulated in the embayment from settling due to the treatment plant discharge of 1.0 mg/L where 0.18 mg/L is considered the base case.

For the Arlington WWTP, the incremental organic P and ortho P are 12 kg/d and 112 kg/d, respectively. The incremental organic P and ortho-P fluxes to the Potomac are 3 kg/d and 81 kg/d, respectively. Therefore the incremental phosphorus accumulation is 9 kg/d for organic P and a 31 kg/d for ortho-P.

The accumulation rate is then applied to the model during the summer time design conditions. The benthic phosphorus release rates are distributed evenly to reaches 7 through 26. Two cases are considered. For the first, the accumulated organic P and ortho-P are both released separately as $g/m^2/day$ in the model. The organic P release rate is 0.02 $g/m^2/day$, and the ortho-P release rate is 0.06 $g/m^2/day$. The maximum average daily chlorophyll-a occurs in segment 26 with a value of 71 ug/L for zone 1, and in segment 7 with a value of 1 ug/L for zone 2. For the second and more conservative case, the accumulated organic P and ortho-P are released as all ortho-P during the summer time simulation. The release rate is 0.08 $g/m^2/day$. The maximum average daily chlorophyll-a concentrations are the same as those simulated in the first case, and do not exceed the chlorophyll-a management goals.

6.6 COST

Cost information for the Arlington WWTP was provided by the Arlington County Department of Public Works. Arlington is presently treating within the effluent limits set in scenario number 2, Interim Control Decision without nitrification with TP=0.18 mg/L. Seasonal phosphorus removal (i.e., April-October: TP = 0.18 mg/L and November-March: TP = 1.0 mg/L) would provide an annual O&M cost savings of $100,000. There would be no capital cost saving since Arlington is presently removing phosphorus to a 0.18 mg/L level. For a year-round total phosphorus effluent concentration of 1.0 mg/L (WLA alternative number 3) the annual O&M cost saving would be $300,000.

6.7 RECOMMENDED WASTELOAD ALLOCATION

The State's dissolved oxygen standards are not predicted to be violated for the Interim Control Decision with a CBOD5 of 10.0 mg/L and without nitrification. A total phosphorus concentration of 1.0 mg/L in the WWTP effluent is not predicted to violate the chlorophyll-a goal of 80 ug/L for zone 1 and 15 ug/L for zone 2.

In order to meet the State's dissolved oxygen standard and the embayment's chlorophyll-a management goals, the recommended effluent limits for a 40 mgd discharge for the Arlington County pollution control plant are as follows:

Constituent	Effluent Limit
Dissolved Oxygen (DO)	6.0 mg/L year-round
5-day Carbonaceous Biochemical Oxygen Demand (CBOD5)	10.0 mg/L year-round
Total Kjeldahl Nitrogen (TKN)	No nitrification required
Total Phosphorus (TP)	1.0 mg/L*

*The effluent limit is based on the simulation of the low-flow, high-temperature design conditions. Future studies that evaluate effluent constraints for the main stem of the Potomac will consider the feasibility of seasonal phosphorus removal standards.

To protect the main stem of the Potomac Estuary, an interim total phosphorus limit of 0.18 mg/L is regionally accepted as presented in the Interim Control Policy of the 1986 208 Plan Supplement (Wash. COG, 1986). Therefore, at the present time, the more restrictive limit on total phosphorus is the 0.18 mg/L for protection of the main stem Potomac. As indicated in the 208 Plan Supplement, future long-term Potomac Studies being mutually undertaken by COG, the states and EPA will better define the total phosphorus limits required for Potomac main stem protection.

9 VAC 25-415-10. Purpose.

This chapter provides for the control of point source discharges into the Virginia embayment waters of the Potomac River from the fall line at Chain Bridge in Arlington County to the Route 301 Bridge in King George County.

This chapter also constitutes Special Standard 'b' in the State Water Control Board's Water Quality Standards "Special Standards and Requirements" (9 VAC 25-260-310) for the Potomac River Basin's Potomac River Subbasin (9 VAC 25-260-390).

9 VAC 25-415-20. Affected waters.

This chapter shall apply to all embayments and their tidal and non-tidal tributaries, including their headwaters, of the Potomac River, from the fall line at Chain Bridge in Arlington County to the Route 301 Bridge in King George County. The Occoquan River watershed, upstream of the fall line at the Occoquan Dam, shall not be subject to the terms of this chapter, since those waters are governed by the Occoquan Policy (9 VAC 25-410-10 et seq.).

9 VAC 25-415-30. Policy requirements.

A. Existing discharges shall meet the requirements of 9 VAC 25-415-40 within five years from the effective date of this chapter, unless exempted under subsection B., C., or D of this section. New dischargers shall meet the requirements of 9 VAC 25-415-40 immediately.

B. Existing discharges with design flows less than 0.05 mgd shall be exempt from meeting the requirements of 9 VAC 25-415-40 until the completion of their next design flow expansion.

C. Failing Septic Systems - Existing residential homes, industrial and commercial operations, public facilities, and any other operation where a septic drainfield system has failed shall be exempt from the requirements of 9 VAC 25-415-40, provided that the applicant demonstrates that it is not feasible to connect to a publicly-owned treatment plant and that there is no feasible alternative except to discharge. Discharge permits shall be issued in conformance with the Virginia Permit Regulation (9 VAC 25-31-10 et seq.) and Virginia General VPDES Permit Regulation for sewage discharges less than or equal to 1,000 gallons per day (9 VAC 25-110-10 et seq.).

D. Other Exemptions - The requirements of 9 VAC 25-415-40 shall not apply to the following types of discharges: combined sewer overflows, stormwater, corrective action remediation, and industrial discharges where BOD and nutrients are not primary pollutants of concern.

9 VAC 25-415-40. Effluent limitations.

The following effluent limitations shall apply to all sewage treatment plants:

Parameter	Monthly Avg (mg/l)
$CBOD_5$	5
Total Suspended Solids	6
Total Phosphorus	0.18
NH_3 (Apr 1 - Oct 31)	1

The above limitations shall not replace or exclude the discharge from meeting the requirements of the State's Water Quality Standards (9 VAC 25-260-10 et seq.).

9 VAC 25-415-50. Water quality modeling.

Water quality models may be required to predict the effect of wastewater discharges on the water quality of the receiving waterbody, the embayment, and the Potomac River. The purpose of the modeling shall be to determine if more stringent limits than those required in 9 VAC 25-415-40 are required to meet water quality standards. If modeling demonstrates the necessity for more restrictive limits, the more restrictive limits shall apply. Where needed, modeling shall account for and address previous modeling exercises and shall include all relevant point and non-point sources. All models shall undergo a peer review process. The models and modeling results shall be considered during the public participation process to ensure proper public input into the modeling process. The models shall be documented and certified by the Virginia Department of Environmental Quality for use in preparing VPDES permits for discharges to the Potomac Embayments and the Potomac River. All changes and modifications to the models shall receive peer review and be appropriately documented. Documentation on the models shall include the basis and reasoning for the recommended models including inputs and assumptions. The rationale shall be described in non-technical language so someone who is reasonably familiar with water pollution problems can understand the inputs and the reasons behind them.

9 VAC 25-415-60. Administrative review.

Within three years after the effective date of this chapter, the department shall perform an analysis on this chapter and provide the board with a report on the results. The analysis shall include (i) the purpose and need for the chapter, (ii) alternatives which would achieve the stated

purpose of this chapter in a less burdensome and less intrusive manner, (iii) an assessment of the effectiveness of this chapter, (iv) the results of a review of current state and federal statutory and regulatory requirements, including identification and justification of requirements of this chapter which are more stringent than federal requirements, and (v) the results of a review as to whether this chapter is clearly written and easily understandable by affected entities.

Upon review of the department's analysis, the board shall confirm the need to (i) continue this chapter without amendment, (ii) repeal this chapter or (iii) amend this chapter. If the board's decision is to repeal or amend this chapter, the board shall authorize the department to initiate the applicable regulatory process to carry out the decision of the board.