APPENDIX- A

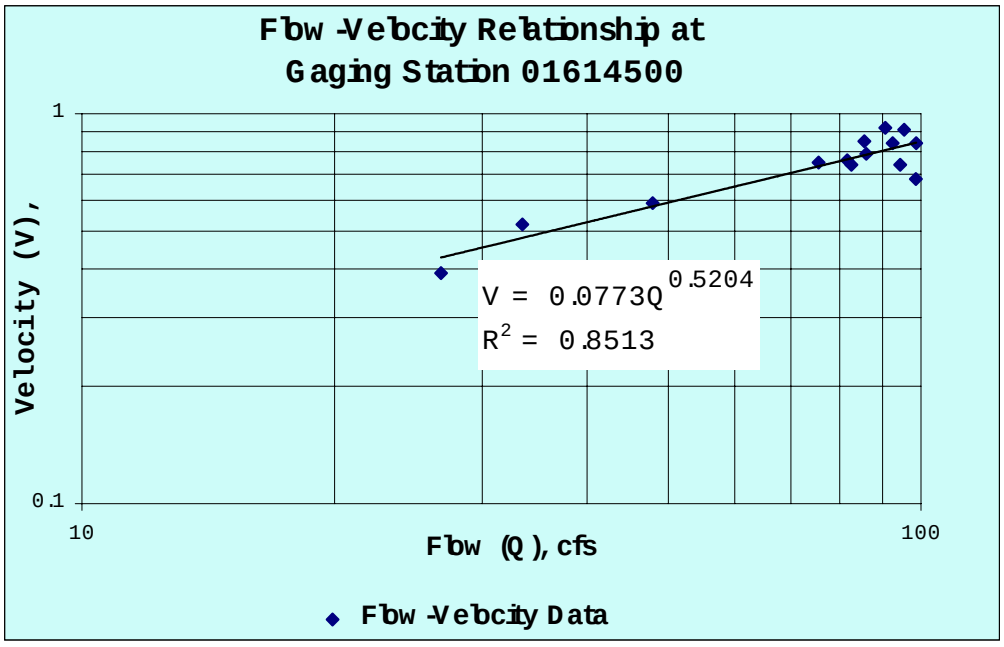
Total Maximum Daily Loads of Biological Oxygen Demand (BOD) for Conococheague Creek

1.0 Estimation of Time of Travel:

The USGS gaging station 01614500, which is located on Conococheague Creek at approximately 2 1/2 mile downstream from the PA/MD boundary line, is used for the discharge velocity regression analysis. The following data is taken from the U.S. Geological Survey (USGS) database and used to develop a relationship between flow and velocity.

Flow, cfs	Velocity, fps
86.1	0.79
75.5	0.75
47.9	0.59
98.7	0.84
33.5	0.52
26.8	0.39
95.5	0.91
81.7	0.76
92.5	0.84
82.6	0.74
90.7	0.92
85.6	0.85
94.5	0.74
98.6	0.68

A graph is plotted below for this relationship.



FINAL

1.0 Estimation of Time of Travel, Continued

The above flow-velocity relationship can be applied to estimate stream velocities for different flows at the USGS gaging station 016145000 that are translated to calculate stream velocities (V_t) for each modeling segment by applying the streambed slope correction factor of 0.5. The time of travel (t) for a particular segment is the segment length (ℓ) divided by (V_t).

2.0 Estimation of 7-Day, 10-Year Low Flow:

The USGS gaging station 01614500 is referred to obtain the stream flow data for Conococheague Creek. The 7Q10 low flow for Conococheague Creek at this gaging station is estimated as follows:

DISCHARGE DATA ANALYSIS SUMMARY
By WMA/MDE on Tuesday, Sept. 21, 1999 at 15:12:48

Station Name: Conococheague Creek at Fairview, MD
Station Number: 01614500
Latitude (dd.mm.ss) 39.42.57
Longitude (dd.mm.ss) 77.49.28
Drainage area (square miles) 494
(Time period for data: June 1,1928 to September 30,1998)

Type	Mean(Log)	Std Dev.(Log)	Skew(Log)	Discharge(cfs)
Annual Calculation (April 1 to March 31):				
30Q5	4.69	0.40	0.41	77.06
7Q10	4.51	0.38	-0.20	55.70
In Summer months (May 1 to Oct 31):				
30Q5	4.70	0.40	0.34	77.87
7Q10	4.52	0.37	-0.20	56.36
In Winter months (Nov 1 to Apr 30):				
30Q5	5.42	0.63	-0.09	134.09
7Q10	4.97	0.52	0.06	74.16

7Q10 low flow runoff rate = 55.70 ÷ 494 = 0.1128 cfs/sq. mile.

The INPRG program computes 7Q10 flow for each modeling segment using the above calculated runoff rate and the drainage area for the modeling segment.

3.0 Elevation (H) above Mean Sea Level At Modeling Points:

The elevations are obtained from the Quadrangle USGS Maps for Williamsport and Masson-Dixon. They are Summarized Below:

Station	Elevation above Mean Sea Level, Ft.
1	401.4
2	393.8
3	387.4
4	383.5
5	383.4
6	379.2
7	373.2
8	367.0
9	359.1
10	352.5
11	346.0
12	341.8
13	341.3
14	340.1
15	33.8.6
16	337.4
17	336.2
18	334.9
19	333.2
20	332.0

4.0 List of Equations for In-House Program (INPRG) Model:

The following equations are used in the INPRG Mathematical Model for Freshwater Streams:

1. Equations for Conversion of BOD to CBOD and TKN to NBOD:

   As per guidelines of the Surface Discharge Permits Division, the following equations are used to convert BOD and TKN to CBOD and NBOD, respectively:

   CBOD = 1.5 * BOD

   NBOD = 4.6 * TKN

2. Equations To Estimate Decay of CBOD and NBOD Matters:

   The following equations are used in the INPRG to characterize decay of the CBOD and NBOD matters with first order kinetics:

   k_c at temperature (T) = $k_{c20} * \{1.047^{(T-20)}\}$

   k_n at temperature (T) = $k_{n20} * \{1.08^{(T-20)}\}$

   $L_{ct} = L_{co} * e^{-(k_c * t)}$ and $L_{nt} = L_{no} * e^{-(k_n * t)}$

   Where: T is 90th Percentile Stream Temperature for Summer period, ° C
   k_{c20} is Standard CBOD Decay rate at 20° C, per day
   k_{n20} is Standard NBOD Decay rate at 20° C, per day
   k_c is temperature corrected CBOD Decay Rate, per day
   k_n is temperature corrected NBOD Decay Rate, per day
   t is time of travel, days
   L_{co} is initial ultimate CBOD concentration, mg/l
   L_{ct} is ultimate CBOD concentration downstream after time of travel (t), mg/l
   L_{no} is initial NBOD concentration, mg/l
   L_{nt} is NBOD concentration downstream after time of travel (t), mg/l

3. Reaeration Rates:

   The reaeration rates (k_a) are estimated using Tsivoglou's Formula. Refer to U.S. EPA Publication "Rates, Constants and Kinetics Formulations in Surface Water Quality Modeling, 2nd Edition, EPA/600/3-85/040, June 1985" for this formula.

   $k_a = \{0.054 * (\in H \div t)\} * \{1.022^{(T-25)}\}$

   Where: k_a is reaeration rate at temperature (T), per day
   $\in H$ is difference of elevations at two modeling points of a segment, ft.

4.0 List of Equations for INPRG Model, Continued

4. Equation for Dissolved Oxygen Sag Prediction:

   The following equation for dissolved oxygen deficit is based on the Streeter- Phelps equation:

$$D = [\{k_c * (L_{ct} - L_{co}) \div (k_a - k_c)\} * \{e^{-(k_c * t)} - e^{-(k_a * t)}\}]$$
$$+ [\{k_n * (L_{nt} - L_{no}) \div (k_a - k_n)\} * \{e^{-(k_n * t)} - e^{-(k_a * t)}\}]$$

   Where: D is dissolved oxygen deficit, mg/l
   d is stream depth, meters

5. Equation for Saturation Dissolved Oxygen:

   The INPRG program estimates the dissolved oxygen saturation (C_S) in mg/l at each modeling point using the following formula:

$$C_S = \{(14.62 - 0.3893*T) + (0.006969*T^2) - (5.897*10^{-5}*T^3)\} * \{1 - (6.97*10^{-6}*\in H)\}$$

6. Equation for Dissolved Oxygen:

   The INPRG program uses the following formula to estimate dissolved oxygen at each modeling point:

$$C = C_S - D$$

   Where: C is dissolved oxygen after time of travel (t), mg/l

5.0 TMDL Future Allocations (FA) And Margin Of Safety (MOS) Calculations

Overall BOD TMDL Loads	= 56,520 lbs/month
Combined (PS & NPS) Allocations for PA State	= 21,492 lbs/month
Load (nonpoint sources) Allocations for MD State	= 3,142 lbs/month
Wasteload (point source) Allocations for MD State	= 20,586 lbs/month
Additional Allowable BOD Loads = 56,520 – (21,492 + 3,142 + 20,586)	= 11,300 lbs/month

The additional allowable BOD loads are distributed between point sources and nonpoint sources in proportions to their load allocations.

5.0 TMDL Future Allocations And Margin Of Safety Calculations, Continued

Ratio of NPS loads to total allocations = (21,492 + 3,142)/(21,492 +3,142 + 20,586)
= 0.545

Additional Allowable BOD Loads for NPS = 0.545 * 11,300 = 6,159 lbs/month

Additional Allowable BOD Loads for PS = 11,300 – 6,159 = 5,141 lbs/month

These additional allowable loads should be distributed for FA and MOS between point sources and nonpoint sources. The FA can be estimated by deducting the MOS from the additional allowable loads.

Calculation of BOD Loads for MOS:

The MOS is calculated for NPS and PS sources. The MOS for NPS is 5% of nonpoint source load allocation including future allocations. The MOS for PS is 25% of the difference between weekly and monthly permit limits for WWTPs located in Maryland.

MOS for NPS:

MOS for NPS = 0.05*(21,492 + 4,142 + 6,159) = 1,540 lbs/month

The ratio of the respective State's drainage area to the whole watershed drainage is incorporated to distribute the MOS for NPS in proportion as follows:

PA watershed drainage area = 501 sq. miles
MD watershed drainage area = 65 sq. miles

MOS For PA	=1540 * {501/(501 + 65)}	= 1,363 lbs/month
MOS For MD	= 1540 X 1363	= 177 lbs/month
MOS for NPS	= 1,363 + 177	=1,540 lbs/month

MOS for PS:

The weekly average BOD limit, which is set in permits, is one and half times the monthly average limit. The MOS is set 25% of the difference between the monthly and weekly averages for point sources, which is considered appropriate because it is unlikely that these facilities will go above their monthly limits more than a quarter of the time. Three WWTPs located in Maryland are considered for the BOD TMDL. The permit flows and BOD limits, as listed in the main report, are considered to compute the MOS as follows:

MOS for WWTP in lbs.month = {25% ∗ (Weekly BOD limit X Monthly average BOD limit) ∗ Flow in MGD ∗ a conversion factor of 8.345 ∗ 30 day per month}

5.0 TMDL Future Allocations And Margin Of Safety Calculations, Continued

MOS for Conococheague WWTP = 25% ∗ (37.5 - 25) ∗ 4.1 ∗ 8.345 ∗ 30 = 3,207 lbs/month
For Broadfording Church =25% ∗ (45 - 30) ∗ 0.003 ∗ 8.345 ∗ 30 = 3 lbs/month
For Resh Road Landfill =25% * (45 - 30) * 0.0059 * 8.345 * 30 = 6 lbs/month

MOS for PS = 3207 + 3 + 6 = 3,216 lbs/month

Overall MOS = 3,216 + 1,540 = 4,756 lbs/month

Calculation of BOD loads for FA:

The FA for PS and NPS are the difference between the additional allowable loads and the MOS. They are summarized below:

FA for PA:

Total additional allowable BOD load for NPS is estimated to be 6,159 lbs/month. It is distributed in proportion between PA and MD States based on their watershed areas.

Additional Allowable BOD Total Loads = 6159 * (PA drainage area/Total drainage area)
= 6159* (501/566) = 5,451 lbs/month

FA for PA = 5,451 – 1,363 = 4,088 lbs/month

FA for MD:

Additional Allowable NPS BOD loads in MD = 6,159 – 5,451 = 708 lbs/month

NPS FA for in MD watershed =708 – 177 = 531 lbs/month

PS FA in MD watershed = 5,141 – 3,216 = 1,925 lbs/month

FA for BOD TMDL = 4,088 + 531 + 1,925 =6,544 lbs/month

6.0 Facilities Performance Based on DMRs

1. ***For Conococheague Wastewater Treatment Plant***

DMR MONITORING PERIOD_END_DATE	Parameter	Ave. Flow, mgd
01/31/1998	FLOW	1.673
02/28/1998	FLOW	1.789
03/31/1998	FLOW	2.026
04/30/1998	FLOW	1.545
05/31/1998	FLOW	1.64
06/30/1998	FLOW	1.209
07/31/1998	FLOW	0.85
08/31/1998	FLOW	0.778
09/30/1998	FLOW	0.638
10/31/1998	FLOW	0.62
11/30/1998	FLOW	0.573
12/31/1998	FLOW	0.539
01/31/1999	FLOW	0.719
02/28/1999	FLOW	0.642
03/31/1999	FLOW	0.806
04/30/1999	FLOW	0.921
05/31/1999	FLOW	0.686
06/30/1999	FLOW	0.736
07/31/1999	FLOW	0.664
08/31/1999	FLOW	0.595
	Average	0.982

DMR MONITORING PERIOD_END_DATE	Parameter	Ave. Conc., mg/l	Max. Conc., mg/l	QTY_AVG, lbs/day	QTY_MAX, lbs/day
01/31/1998	BOD5	6	11	70	129
02/28/1998	BOD5	3	5	47	73
03/31/1998	BOD5	2	2	31	40
04/30/1998	BOD5	2	2	20	25
05/31/1998	BOD5	3	5	32	52
06/30/1998	BOD5	3	7	23	81
07/31/1998	BOD5	3	4	23	26
08/31/1998	BOD5	3	7	22	45
09/30/1998	BOD5	4	4	19	26

10/31/1998	BOD5	5	11	26	59
11/30/1998	BOD5	4	9	18	47
12/31/1998	BOD5	2	4	9	14
01/31/1999	BOD5	3	4	16	27
02/28/1999	BOD5	4	5	23	30
03/31/1999	BOD5	7	10	60	93
04/30/1999	BOD5	4	9	32	74
05/31/1999	BOD5	3	3	16	21
06/30/1999	BOD5	2	3	14	20
07/31/1999	BOD5	1	2	7	10
08/31/1999	BOD5	2	3	13	18
	Average	3.3	5.5	26.1	45.5
	Maximum	7	11	70	129

DMR MONITORING PERIOD_END_DATE	Parameter	Ave. Conc., mg/l	Max. Conc., mg/l	QTY_AVG, lbs/day	QTY_MAX, lbs/day
04/30/1998	TKN	2	2	19	25
05/31/1998	TKN	1	2	18	23
06/30/1998	TKN	2	4	24	45
07/31/1998	TKN	2	2	14	20
08/31/1998	TKN	2	3	15	24
09/30/1998	TKN	3	3	17	27
10/31/1998	TKN	4	11	21	53
04/30/1999	TKN	2	3	16	21
05/31/1999	TKN	2	3	13	15
06/30/1999	TKN	3	4	20	23
07/31/1999	TKN	3	3	15	18
08/31/1999	TKN	3	3	14	18
	Average	2.4	3.6	17.2	26.0
	Maximum	4	11	24	53

DMR MONITORING PERIOD_END_DATE	Parameter	Min.Conc., mg/l
01/31/1998	Dissolved Oxygen	7.4
02/28/1998	Dissolved Oxygen	7.5
03/31/1998	Dissolved Oxygen	6.8
04/30/1998	Dissolved Oxygen	6.8
05/31/1998	Dissolved Oxygen	7.1

06/30/1998	Dissolved Oxygen	6.5
07/31/1998	Dissolved Oxygen	6.3
08/31/1998	Dissolved Oxygen	6.9
09/30/1998	Dissolved Oxygen	6
10/31/1998	Dissolved Oxygen	7
11/30/1998	Dissolved Oxygen	7.9
12/31/1998	Dissolved Oxygen	7
01/31/1999	Dissolved Oxygen	8.1
02/28/1999	Dissolved Oxygen	7.3
03/31/1999	Dissolved Oxygen	7.9
04/30/1999	Dissolved Oxygen	7.6
05/31/1999	Dissolved Oxygen	6.9
06/30/1999	Dissolved Oxygen	5.7
07/31/1999	Dissolved Oxygen	5.8
08/31/1999	Dissolved Oxygen	5.4
	Average	6.9
	Minimum	5.4

2. ***For Broadfording Brethern Church Wastewater Treatment Plant***

DMR MONITORING PERIOD_END_DATE	PARAMETER	QTY_AVG, mgd	QTY_MAX, mgd
01/31/1998	FLOW	0.004	0.008
02/28/1998	FLOW	0.004	0.01
03/31/1998	FLOW	0.003	0.009
04/30/1998	FLOW	0.002	0.008
05/31/1998	FLOW	0.003	0.007
06/30/1998	FLOW	0.001	0.003
07/31/1998	FLOW	0.001	0.004
08/31/1998	FLOW	0.001	0.002
09/30/1998	FLOW	0.001	0.007
10/31/1998	FLOW	0.001	0.003
11/30/1998	FLOW	0.001	0.002
12/31/1998	FLOW	0	0.001
01/31/1999	FLOW	0.002	0.005
02/28/1999	FLOW	0.001	0.002
03/31/1999	FLOW	0.002	0.005
04/30/1999	FLOW	0.002	0.005
05/31/1999	FLOW	0.001	0.003

06/30/1999	FLOW	0	0.001
07/31/1999	FLOW	0	0.002
09/29/1999	FLOW	0.0006	0.005
		0.0018	0.0046
		0.004	0.01

DMR MONITORING PERIOD_END_DATE	Parameter	Ave. Conc., mg/l	Max. Conc., mg/l	Ave. Qty., lbs/day	Max. Qty., lbs/day
01/31/1998	BOD5	1	1	0.02	0.02
02/28/1998	BOD5	1	1	0.01	0.01
03/31/1998	BOD5	1	1	0.04	0.04
04/30/1998	BOD5	2	2	0.01	0.01
05/31/1998	BOD5	5	5	0.24	0.24
06/30/1998	BOD5	2	2	0.01	0.01
07/31/1998	BOD5	1	1	0.01	0.01
08/31/1998	BOD5	2	2	0.01	0.01
09/30/1998	BOD5	1	1	0	0
10/31/1998	BOD5	1	1	0	0
11/30/1998	BOD5	2	2	0.01	0.01
12/31/1998	BOD5	1	1	0.01	0.01
01/31/1999	BOD5	2	2	0.09	0.09
02/28/1999	BOD5	2	2	0.02	0.02
03/31/1999	BOD5	1	1	0.01	0.01
04/30/1999	BOD5	1	1	0.02	0.02
05/31/1999	BOD5	3	3	0.02	0.02
06/30/1999	BOD5	0	0	0	0
07/31/1999	BOD5	0	0	0	0
09/29/1999	BOD5	0	0	0	0
	Average	1.71	1.71	0.04	0.04
	Maximum	5	5	0.24	0.24

DMR PERIOD_END_DATE	PARAMETER	Ave. Conc., mg/l	Max. Conc., mg/l	Ave. Qty., lbs/day	Max. Qty., lbs/day
04/30/1998	TKN AS N				
05/31/1998	TKN AS N				
06/30/1998	TKN AS N	1	1	0.002	0.002
07/31/1998	TKN AS N	1	1	0.012	0.012
08/31/1998	TKN AS N	2	2	0.007	0.007
09/30/1998	TKN AS N	1	1	0.008	0.008

10/31/1998	TKN AS N	1	1	0.004	0.004
11/30/1998	TKN AS N	1	1	0.009	0.009
04/30/1999	TKN AS N	2	2	0.03	0.03
05/31/1999	TKN AS N	2	2	0.01	0.01
06/30/1999	TKN AS N	0	0	0	0
07/31/1999	TKN AS N	1	1	0	0
09/29/1999	TKN AS N	0	0	0	0
	Average	1.33	1.33	0.010	0.010
	Maximum	2	2	0.03	0.03

DMR PERIOD_END_DATE	Parameter	Min. Conc., mg/l
01/31/1998	Dissolved Oxygen	7.4
02/28/1998	Dissolved Oxygen	8.9
03/31/1998	Dissolved Oxygen	8.1
04/30/1998	Dissolved Oxygen	6.2
05/31/1998	Dissolved Oxygen	6
06/30/1998	Dissolved Oxygen	6.4
07/31/1998	Dissolved Oxygen	7.4
08/31/1998	Dissolved Oxygen	6.6
09/30/1998	Dissolved Oxygen	6.4
10/31/1998	Dissolved Oxygen	7.2
11/30/1998	Dissolved Oxygen	8.1
12/31/1998	Dissolved Oxygen	7
01/31/1999	Dissolved Oxygen	7.7
02/28/1999	Dissolved Oxygen	6.6
03/31/1999	Dissolved Oxygen	5.3
04/30/1999	Dissolved Oxygen	7.2
05/31/1999	Dissolved Oxygen	6
06/30/1999	Dissolved Oxygen	6
07/31/1999	Dissolved Oxygen	5.5
09/29/1999	Dissolved Oxygen	5.5
	Average	6.8
	Minimum	5.3

7.0 Discharge Permits Limits For Wastewater Treatment Plant (WWTP)

1. ***For Conococheague Wastewater Treatment Plant***

Effluent Limitations, Outfall 001 (1)

The quality of the effluent discharged by the facility shall be limited at all times as shown below. (2)

Effluent Characteristics	Monthly Loading Rate kg/d (lbs/d)	Weekly Loading Rate kg/d (lbs/d)	Monthly Average mg/l	Weekly Average mg/l
BOD_5 (4/1- 10/31)	189 (417)	284 (626)	20	30
(11/1- 3/31)	284 (626)	426 (939)	30	45
TSS	284 (626)	426 (939)	30	45
Total Kjeldahl Nitrogen (4/1- 10/31)	161 (355)	241 (532)	17	26
Total Phosphorus	19 (42)	28 (63)	2.0	3.0
Total Nitrogen (3)	---------- Not applicable ----------			

Effluent Characteristics	Maximum	Minimum
Fecal Coliforms	200 MPN/100 ml monthly log mean value	Not applicable
Total Residual Chlorine(4)	---------- Not applicable ----------	
Dissolved Oxygen	Not applicable	5.0 mg/l at anytime
pH	8.5	6.5

(1) When this permit is renewed or replaced, the new limitations may not be equal to the above limitations. The discharge of pollutants not shown shall be illegal.

(2) There shall be no discharge of floating solids or visible foam other than trace amount.

(3) Total Nitrogen is sum of ammonia-N, organic-N, and (nitrite and nitrate)-N. The permittee shall make every effort to meet a total nitrogen limit of 8 mg/l maximum average on year-round basis. After the nutrient control strategy for the Upper Potomac River Basin is adopted, the permit may be reopened to incorporate the nutrient (nitrogen and phosphorus) reduction requirements of the strategy.

(4) If chlorine or any chlorine compounds are used in treatment of wastewater, dechlorination shall be required to reduce total residual chlorine to the nondetectable level.
A flow of 2.5 million gallons per day is used in waste allocation calculations. Notification to be provided to the Department at least 180 days before the flow is expected to exceed this flow.

7.0 Discharge Permits Limits For WWTP, Continued

2. ***For Broadfording Brethern Church Wastewater Treatment Plant***

Effluent Limitations, Outfall 001 (1)

The quality of the effluent discharged by the facility shall be limited at all times as shown below. (2)

Effluent Characteristics	Monthly Loading Rate kg/d (lbs/d)	Weekly Loading Rate kg/d (lbs/d)	Monthly Average mg/l	Weekly Average mg/l
BOD_5 (4/1- 11/30)	0.2 (0.45)	0.3 (0.67)	20	30
(12/1- 3/31)	0.34(0.75)	0.5 (1.12)	30	45
TSS	0.34(0.75)	0.5 (1.12)	30	45
Total Kjeldahl Nitrogen (4/1- 11/30)	0.08(0.17)	0.11(0.26)	7	10

Effluent Characteristics	Maximum	Minimum
Fecal Coliforms	200 MPN/100 ml monthly log mean value	Not applicable
Total Residual Chlorine	Dechlorination of the effluent is required to nondetectable level.	
Dissolved Oxygen	Not applicable	5.0 mg/l at anytime
pH	8.5	6.5

(1) When this permit is renewed or replaced, the new limitations may not be equal to the above limitations. The discharge of pollutants not shown shall be illegal.

(2) There shall be no discharge of floating solids or visible foam other than trace amount.

A flow of 3,000 gallons per day is used in waste allocation calculations. Notification to be provided to the Department at least 180 days before the flow is expected to exceed this flow.

I. SPECIAL CONDITIONS

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the effective period of this permit, but not before the permittee fulfills the permit requirements in Special Condition K, including use of a treatment system, the permittee is authorized to discharge leachate from a sanitary landfill via Outfall 001.

As specified below, such discharge shall be limited and monitored by the permittee at the discharge from the treatment system to Conococheague Creek.

EFFLUENT CHARACTERISTICS	EFFLUENT LIMITATIONS				MONITORING REQUIREMENTS	
	lbs/day		Other Units			
	Quarterly Average	Daily Maximum	Quarterly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	N/A	N/A	[1]gpd	[1]gpd	1/Month	Measured
Biochemical Oxygen Demand (BOD)	N/A	N/A	30 mg/l	45 mg/l	1/Month	Grab
Total Suspended Solids	N/A	N/A	30 mg/l	45 mg/l	1/Month	Grab
Oil and Grease (O&G)	N/A	N/A	10 mg/l	15 mg/l	1/Month	Grab
Total Kjeldahl Nitrogen	N/A	N/A	[1]mg/l	20 mg/l	1/Month	Grab
Mercury	N/A	N/A	N/A	3 µg/l	1/Month	Grab
Cyanide-A[2]	N/A	N/A	N/A	0.1 mg/l	1/Month	Grab
DDD	N/A	N/A	N/A	373 µg/l[3]	1/Month	Grab
Endrin	N/A	N/A	6 µg/l[3]	112 µg/l[3]	1/Month	Grab
Endosulfan	N/A	N/A	N/A	137 µg/l[3]	1/Month	Grab
Heptachlor	N/A	N/A	10 µg/l[3]	323 µg/l[3]	1/Month	Grab

The pH shall not be less than 6.0 nor greater than 9.0 and shall be monitored once per month by grab sample.
There shall be no discharge of floating solids or persistent foam in other than trace amounts. Persistent foam is foam that does not dissipate within one half-hour of point of discharge.

[1] Monitoring required without limits.
[2] Cyanide amenable to chlorination (EPA Method 335.1).
[3] These limitations may be lowered as described in Special Condition K. based on the results of the mixing zone calculation. If the mixing zone and dilution calculation required in Special Condition K. differs significantly from the dilution factor assumed in development of this permit, the Department may revise these limitations based on an identical method of calculation as was used to develop the permit limitations listed here, but any revised limitations cannot exceed the existing limitations without a permit modification and associated public participation process.

8.0 Water Quality Data

A. BOD_5 Historical Data

CONOCOCHEAGUE CREEK "BOD_5 HISTORICAL DATA" RETRIEVED FROM OLD DATABASE											
STATION	DATE	TIME	BOD_5	STATION	DATE	TIME	BOD_5	STATION	DATE	TIME	BOD_5
CON0001	67/06/19	12:10	2.2	CON0005	67/06/19	12:25	2.9	CON0051	67/06/19	12:47	1.9
	67/10/09	12:10	2.7		67/10/09	13:00	2.3		67/10/09	13:25	1.8
	67/10/09	12:15	0.9		69/06/03	15:15	4.1		69/06/03	12:45	1.5
					69/06/30	16:00	2.9		69/06/30	16:20	2.2
					69/06/30	20:05	4		69/06/30	20:20	1.2
					69/07/01	0:05	3.4		69/07/01	0:30	3
					69/07/01	4:00	1.2		69/07/01	4:30	1.2
					69/07/01	8:00	1.3		69/07/01	8:10	1.2
					69/07/01	12:00	3.6		69/07/01	12:15	2.3
					69/07/01	17:30	1.2		69/07/01	17:00	1.9
Average			1.9				2.7				1.8
Maximum			2.7				4.1				3.0
Minimum			0.9				1.2				1.2
90th Percentile Value			2.6				4.0				2.4

b. Water Quality Data Collected at WQ Stations CON0005 & CON0180

W.Q. DATA FOR MAY THROUGH OCTOBER												
STATION	YEAR	MONTH	DAY	CHTO	TSS	NH4W	TKNW	TN	TP	WATEMP	PH_FLD	DO
CON0005	94	5	17	3.74	12.00	0.02	0.45	4.99	0.06	14.20	8.00	8.90
CON0005	94	6	20	6.47	2.00	0.04	0.49	4.50	0.19	26.60	8.20	6.69
CON0005	94	7	19	2.86	2.00	0.01	0.44	3.92	0.16	25.30	8.50	7.19
CON0005	94	8	9	1.14	6.00	0.04	0.50	5.02	0.15	22.50	8.40	8.69
CON0005	94	9	20	2.52	7.00	0.01	0.58	4.85	0.10	18.10	8.30	8.48
CON0005	94	10	19	1.75	3.00	0.01	0.36	5.01	0.11	11.70	9.10	10.78
1994	(May to October) Average			3.08	5.33	0.02	0.47	4.71	0.13	19.73	8.42	6.69
CON0005	95	5	30	8.74	2.00	0.03	0.49	3.40	0.24	20.40	8.10	7.50
CON0005	95	6	12	4.90	15.00	0.05	.	.	.	22.90	8.50	6.70
CON0005	95	7	18	2.64	50.00	0.03	0.76	5.07	0.17	24.30	7.73	6.95

CON0005	95	8	15	2.29	12.00	0.03	0.36	4.42	0.17	28.00	8.40	6.90
CON0005	95	9	25	1.26	2.00	0.02	0.65	4.96	0.25	14.60	8.60	9.00
CON0005	95	10	24	4.03	21.00	0.05	1.00	6.35	0.10	11.60	7.80	10.00
1995	(May to October) Average			3.98	17.00	0.03	0.65	4.84	0.18	20.30	8.19	6.70
CON0005	96	5	1	38.89	15.00	0.03	0.58	4.87	0.09	13.20	8.20	8.80
CON0005	96	6	17	3.70	33.00	0.03	0.59	5.27	0.12	21.80	8.00	7.60
CON0005	96	7	29	2.28	15.00	0.00	0.46	5.92	0.10	20.90	8.30	7.90
CON0005	96	8	12	1.96	16.00	0.02	0.41	5.28	0.07	19.80	8.30	8.00
CON0005	96	9	16	2.27	42.00	0.03	0.57	3.62	0.11	15.50	8.00	8.80
CON0005	96	10	28	2.24	9.00	0.01	0.29	4.25	0.06	14.10	8.10	9.00
1996	(May to October) Average			8.56	21.67	0.02	0.49	4.87	0.09	17.55	8.15	7.60
CON0005	97	5	19	4.66	4.00	0.03	.	.	0.14	19.40	8.40	8.60
CON0005	97	6	16	1.68	10.00	0.02	0.53	3.64	0.12	22.20	8.40	8.80
CON0005	97	7	21	5.38	17.00	0.03	0.72	3.41	0.16	25.10	8.50	6.60
CON0005	97	8	18	2.46	16.00	0.04	0.70	3.60	0.17	25.80	8.30	6.40
CON0005	97	9	15	.	50.00	0.03	0.63	3.75	0.21	19.30	8.20	7.50
CON0005	97	10	7	.	5.00	0.02	0.64	3.54	0.13	19.60	8.70	8.70
1997	(May to October) Average			3.55	17.00	0.03	0.64	3.59	0.15	21.90	8.42	6.40
CON0005	98	5	11	5.88	29.00	0.03	0.55	3.18	0.09	14.30	7.80	9.40
CON0005	98	6	22	5.04	34.00	0.07	0.78	5.01	0.13	23.20	7.90	7.00
CON0005	98	7	27	1.91	5.00	0.02	0.37	4.48	0.07	24.00	8.50	7.90
CON0005	98	8	10	1.68	8.00	0.03	0.64	4.84	0.12	25.30	8.40	7.80
CON0005	98	9	28	1.30	5.50	0.06	0.61	2.00	0.14	22.20	8.60	8.70
CON0005	98	10	19	1.89	1.00	0.01	0.47	4.23	0.10	15.30	8.60	9.40
1998	(May to October) Average			2.95	13.75	0.04	0.57	3.96	0.11	20.72	8.30	7.00
CON0180	94	5	17	3.53	2.00	0.02	0.29	4.72	0.05	13.90	8.10	9.30
CON0180	94	6	20	5.71	6.00	0.04	0.54	4.88	0.19	24.70	8.10	7.29
CON0180	94	7	19	1.90	4.00	0.03	0.34	4.84	0.21	23.90	8.10	7.69
CON0180	94	8	9	1.24	2.00	0.03	0.52	5.29	0.16	21.60	8.10	9.09
CON0180	94	9	20	3.28	7.00	0.01	0.54	5.10	0.15	18.00	8.40	11.18
CON0180	94	10	19	2.33	2.00	0.01	0.41	5.69	0.20	11.50	8.70	10.38
1994	(May to October) Average			3.00	3.83	0.02	0.44	5.09	0.16	18.93	8.25	7.29
CON0180	95	5	30	4.62	9.00	0.04	0.55	3.22	0.21	18.80	7.90	7.80
CON0180	95	6	12	7.28	36.00	0.10	0.66	3.56	0.27	20.90	7.90	5.90
CON0180	95	7	18	3.84	53.00	0.04	0.76	4.55	0.18	23.20	7.73	6.87
CON0180	95	8	15	1.34	9.00	0.03	0.45	4.92	0.21	25.30	7.70	5.90

CON0180	95	9	25	1.26	4.00	0.01	0.77	5.76	0.34	14.10	8.20	8.40
CON0180	95	10	24	2.17	16.00	0.04	0.76	6.25	0.10	12.00	7.80	10.00
1995	(May to October) Average			3.42	21.17	0.04	0.66	4.71	0.22	19.05	7.87	5.90
CON0180	96	5	1	30.74	22.00	0.05	0.62	3.94	0.10	13.20	8.30	10.00
CON0180	96	6	17	3.78	40.00	0.03	0.67	5.27	0.12	20.60	8.10	7.80
CON0180	96	7	29	2.21	9.00	0.02	0.44	5.82	0.09	19.50	8.20	7.70
CON0180	96	8	12	1.96	11.00	0.02	0.43	5.26	0.08	18.20	8.20	8.00
CON0180	96	9	16	1.60	36.00	0.03	0.54	2.92	0.09	15.20	7.90	8.80
CON0180	96	10	28	2.04	10.00	0.01	0.28	4.07	0.05	14.10	8.10	8.90
1996	(May to October) Average			7.05	21.33	0.02	0.50	4.55	0.09	16.80	8.13	7.70
CON0180	97	5	19	5.66	5.00	0.03	.	.	0.12	17.20	8.20	7.70
CON0180	97	6	16	3.11	17.00	0.03	0.38	3.70	0.14	19.80	8.20	7.70
CON0180	97	7	21	2.18	14.00	0.05	0.48	4.46	0.20	22.80	8.10	6.90
CON0180	97	8	18	1.85	10.00	0.03	0.57	4.39	0.20	23.70	8.00	6.10
CON0180	97	9	15	.	42.00	0.02	0.55	4.23	0.19	18.40	8.10	8.00
CON0180	97	10	7	.	3.00	0.01	0.60	4.10	0.22	17.40	7.90	7.10
1997	(May to October) Average			3.20	15.17	0.03	0.52	4.18	0.18	19.88	8.08	6.10
CON0180	98	5	11	6.07	27.00	0.04	0.50	3.23	0.09	13.70	7.70	9.40
CON0180	98	6	22	5.21	28.00	0.06	0.70	4.86	0.11	22.00	7.80	7.20
CON0180	98	7	27	1.96	5.00	0.02	0.36	5.24	0.10	21.10	8.30	7.40
CON0180	98	8	10	1.68	5.00	0.03	0.51	5.21	0.16	23.30	8.20	7.80
CON0180	98	9	28	1.05	3.00	0.04	0.50	2.52	0.19	20.40	8.20	7.90
CON0180	98	10	19	1.34	1.00	0.05	0.52	4.64	0.11	14.20	8.20	7.30
1998	(May to October) Average			2.88	11.50	0.04	0.52	4.28	0.13	19.12	8.07	7.20
Overall Average				4.23	14.82	0.03	0.54	4.49	0.14	19.40	8.19	7.94
Overall Maximum				38.89	53.00	0.10	1.00	6.35	0.34	28.00	9.10	11.18
Overall Minimum				1.05	1.00	0.00	0.28	2.00	0.05	11.50	7.70	5.90
Overall 90th Percentile Value				6.31	36.00	0.05	0.71	5.28	0.21	24.78	8.50	9.40
Overall 10th Percentile Value				1.34	2.00	0.01	0.37	3.41	0.08	13.86	7.80	6.56

9.0 Summary of Model Runs Results

A. For Preliminary Model Run:

Station	Distance (Downstream from MD/PA Boundary Line), miles	Upstream Just Before mixing					Downstream Just After Mixing				
		CBOD, mg/l	BOD5, mg/l	NBOD, mg/l	TKN, mg/l	D.O., mg/l	CBOD, mg/l	BOD5, mg/l	NBOD, mg/l	TKN, mg/l	D.O., mg/l
1	0.00	3.60	2.40	4.20	0.91	7.00	3.60	2.40	4.20	0.91	7.00
2	2.47	3.29	2.19	3.66	0.80	6.72	3.29	2.19	3.66	0.80	6.72
3	4.42	3.08	2.05	3.30	0.72	6.67	3.09	2.06	3.33	0.72	6.68
4	5.75	2.95	1.97	3.09	0.67	6.63	2.95	1.97	3.09	0.67	6.63
5	5.80	2.94	1.96	3.08	0.67	6.62	2.94	1.96	3.08	0.67	6.62
6	7.05	2.82	1.88	2.89	0.63	6.66	2.82	1.88	2.89	0.63	6.66
7	8.69	2.68	1.79	2.66	0.58	6.78	2.70	1.80	2.70	0.59	6.78
8	10.18	2.58	1.72	2.52	0.55	6.95	2.58	1.72	2.52	0.55	6.95
9	12.16	2.43	1.62	2.29	0.50	7.09	2.44	1.63	2.31	0.50	7.09
10	14.33	2.26	1.51	2.06	0.45	7.07	2.26	1.51	2.06	0.45	7.07
11	16.58	2.09	1.39	1.82	0.40	7.07	2.12	1.41	1.87	0.41	7.06
12	17.92	2.03	1.35	1.74	0.38	7.11	2.05	1.37	1.78	0.39	7.11
13	18.07	2.04	1.36	1.77	0.38	7.11	2.11	1.41	1.99	0.43	7.11
14	18.56	2.07	1.38	1.93	0.42	7.09	2.08	1.39	1.94	0.42	7.09
15	19.06	2.04	1.36	1.89	0.41	7.10	2.04	1.36	1.89	0.41	7.10
16	19.50	2.01	1.34	1.84	0.40	7.09	2.01	1.34	1.84	0.40	7.09
17	19.90	1.98	1.32	1.81	0.39	7.10	1.98	1.32	1.81	0.39	7.10
18	20.34	1.95	1.30	1.76	0.38	7.11	1.97	1.31	1.79	0.39	7.11
19	20.94	1.93	1.29	1.73	0.38	7.12	1.93	1.29	1.74	0.38	7.12
20	21.35	1.91	1.27	1.70	0.37	7.13	1.91	1.27	1.70	0.37	7.13

B. For Model Run 1 for TMDL Load Allocations

FOR MODEL RUN 1: FOR 'PS', USING PERMITTED THREE WWTPs (LOCATED IN MARYLAND) LOADS OF CBOD =1029 & NBOD =2682 lbs/day, AND FOR 'NPS', KEEPING SAME LOADS AS PRELIMINARY RUN

Station	Distance (Downstream from MD/PA Boundary Line), miles	Upstream Just Before mixing					Downstream Just After Mixing				
		CBOD, mg/l	BOD5, mg/l	NBOD, mg/l	TKN, mg/l	D.O., mg/l	CBOD, mg/l	BOD5, mg/l	NBOD, mg/l	TKN, mg/l	D.O., mg/l
1	0.00	3.60	2.40	4.20	0.91	7.00	3.60	2.40	4.20	0.91	7.00
2	2.47	3.29	2.19	3.66	0.80	6.72	3.29	2.19	3.66	0.80	6.72
3	4.42	3.08	2.05	3.30	0.72	6.67	3.09	2.06	3.33	0.72	6.68
4	5.75	2.95	1.97	3.09	0.67	6.63	2.95	1.97	3.09	0.67	6.63
5	5.80	2.94	1.96	3.08	0.67	6.62	2.95	1.97	3.08	0.67	6.62
6	7.05	2.82	1.88	2.89	0.63	6.66	2.82	1.88	2.89	0.63	6.66
7	8.69	2.68	1.79	2.66	0.58	6.78	2.70	1.80	2.70	0.59	6.78
8	10.18	2.58	1.72	2.52	0.55	6.95	2.95	1.97	2.53	0.55	6.95
9	12.16	2.43	1.62	2.31	0.50	7.09	2.45	1.63	2.33	0.51	7.09
10	14.33	2.27	1.51	2.07	0.45	7.07	2.27	1.51	2.08	0.45	7.06
11	16.58	2.10	1.40	1.83	0.40	7.06	2.13	1.42	1.88	0.41	7.06
12	17.92	2.03	1.35	1.75	0.38	7.10	2.06	1.37	1.79	0.39	7.10
13	18.07	2.05	1.37	1.78	0.39	7.11	4.63	3.09	8.83	1.92	6.91
14	18.56	4.54	3.03	8.59	1.87	6.68	4.54	3.03	8.58	1.87	6.69
15	19.06	4.47	2.98	8.37	1.82	6.53	4.47	2.98	8.37	1.82	6.53
16	19.50	4.40	2.93	8.17	1.78	6.38	4.40	2.93	8.17	1.78	6.38
17	19.90	4.34	2.89	8.01	1.74	6.29	4.34	2.89	8.01	1.74	6.29
18	20.34	4.28	2.85	7.83	1.70	6.19	4.27	2.85	7.80	1.70	6.19
19	20.94	4.19	2.79	7.56	1.64	6.06	4.19	2.79	7.55	1.64	6.07
20	21.35	4.13	2.75	7.39	1.61	6.00	4.13	2.75	7.39	1.61	6.00

C. For Model Run 2 for Overall BOD TMDS Loads

FOR MODEL RUN 2: INCREASED LOADS IN PROPORTIONS (FOR PS, CBOD LOADS TO 1286 lbs/day AND NBOD LOADS TO 3312 LBS/DAY; AND FOR NPS, CBOD LOADS TO 1540 lbs/day AND NBOD LOADS TO 1796 lbs/day)

Station	Distance (Downstream from MD/PA Boundary Line), miles	Upstream Just Before mixing					Downstream Just After Mixing				
		CBOD, mg/l	BOD5, mg/l	NBOD, mg/l	TKN, mg/l	D.O., mg/l	CBOD, mg/l	BOD5, mg/l	NBOD, mg/l	TKN, mg/l	D.O., mg/l
1	0.00	4.50	3.00	5.25	1.14	7.00	4.50	3.00	5.25	1.14	7.00
2	2.47	4.11	2.74	4.57	0.99	6.54	4.12	2.75	4.57	0.99	6.54
3	4.42	3.84	2.56	4.12	0.90	6.42	3.87	2.58	4.16	0.90	6.44
4	5.75	3.68	2.45	3.86	0.84	6.35	3.69	2.46	3.86	0.84	6.35
5	5.80	3.68	2.45	3.85	0.84	6.34	3.68	2.45	3.86	0.84	6.34
6	7.05	3.53	2.35	3.61	0.78	6.37	3.53	2.35	3.62	0.79	6.37
7	8.69	3.35	2.23	3.33	0.72	6.48	3.37	2.25	3.37	0.73	6.50
8	10.18	3.23	2.15	3.15	0.68	6.68	3.23	2.15	3.16	0.69	6.68
9	12.16	3.04	2.03	2.88	0.63	6.83	3.06	2.04	2.91	0.63	6.83
10	14.33	2.83	1.89	2.58	0.56	6.80	2.84	1.89	2.59	0.56	6.80
11	16.58	2.62	1.75	2.29	0.50	6.79	2.65	1.77	2.35	0.51	6.79
12	17.92	2.54	1.69	2.19	0.48	6.84	2.57	1.71	2.24	0.49	6.84
13	18.07	2.56	1.71	2.22	0.48	6.85	5.78	3.85	10.93	2.38	6.68
14	18.56	5.68	3.79	10.63	2.31	6.39	5.67	3.78	10.62	2.31	6.39
15	19.06	5.58	3.72	10.36	2.25	6.19	5.58	3.72	10.36	2.25	6.19
16	19.50	5.50	3.67	10.11	2.20	6.00	5.50	3.67	10.11	2.20	6.00
17	19.90	5.43	3.62	9.91	2.15	5.88	5.43	3.62	9.91	2.15	5.88
18	20.34	5.35	3.57	9.69	2.11	5.75	5.34	3.56	9.65	2.10	5.76
19	20.94	5.23	3.49	9.36	2.03	5.60	5.23	3.49	9.34	2.03	5.60
20	21.35	5.16	3.44	9.15	1.99	5.51	5.16	3.44	9.15	1.99	5.51