WASTELOAD ANALYSIS [WLA]
Addendum: Statement of Basis
SUMMARY

Date: 9/13/2012 Time: 1:39 PM

Discharging Facility: **EA Miller**

UPDES No:	UT00000281	
Current Flow:	2.00	MGD
Design Flow	2.00	MGD

Irrigation Season (April - September) ✓

Receiving Water: **Ditch to So. Fork of Spring Creek**

Stream Classification: 2B, 3A, 3B, 4 Controlling: 3A

Stream Flows [cfs]:	0.10	Summer (July-Sept)	Critical Low Flow
	-	Fall (Oct-Dec)	Critical Low Flow
	0.12	Winter (Jan-Mar)	Critical Low Flow
	-	Spring (Apr-June)	Critical Low Flow

Stream TDS Values	-	Summer (July-Sept)
[mg/l as CaCO3]	-	Fall (Oct-Dec)
	-	Winter (Jan-Mar)
	-	Spring (Apr-June)

Parameter:	**Effluent Limits:**		**WQ Standard:**	
Summer Flow, MGD:	2.00	MGD		
BOD, mg/l:	25.00	Summer	5.0	Indicator
Dissolved Oxygen, mg/l:	4.00	Summer	6.5	30 Day Average
NH4	3.00	Summer	Varies with pH and Temperature	
TDS, mg/l:	3,000.00	Summer	1450.00	mg/l

Modeling Parameters:

Acute River Width:	50.0%
Chronic River Width:	100.0%

Antidegradation Review: An Antidegradation Level I Review was completed.
Antidegradation Level II Review is NOT Required

Permit Writer: ______________________ ____________

WLA by: David M. Allen (signature) 9-14-12

WQM Sec. Approval: ______________________ ____________

TMDL Sec. Approval: ______________________ ____________

WASTELOAD ANALYSIS [WLA]
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Date: 9/13/2012
Time: 1:39 PM

Facilities: EA Miller
Discharging to: **Ditch to So. Fork of Spring Creek**

UPDES No: UT00000281

I. Introduction

Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses [R317-2-8, UAC]. Projected concentrations are compared to numeric water quality standards to determine acceptability. The anti-degradation policy and procedures are also considered. The primary in-stream parameters of concern may include metals (as a function of hardness), total dissolved solids (TDS), total residual chlorine (TRC), un-ionized ammonia (as a function of pH and temperature, measured and evaluated interms of total ammonia), and dissolved oxygen.

Mathematical water quality modeling is employed to determine stream quality response to point source discharges. Models aid in the effort of anticipating stream quality at future effluent flows at critical environmental conditions (e.g., low stream flow, high temperature, high pH, etc).

The numeric criteria in this wasteload analysis may always be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

II. Receiving Water and Stream Classification

Ditch to So. Fork of Spring Creek	2B, 3A, 3B, 4
Antidegradation Review:	Antidegradation Level II Review is NOT Required

III. Numeric Stream Standards for Protection of Aquatic Wildlife

Total Ammonia (TNH3)	Varies as a function of Temperature and pH Rebound. See Water Quality Standards
Chronic Total Residual Chlorine (TRC)	0.011 mg/l (4 Day Average) 0.019 mg/l (1 Hour Average)
Chronic Dissolved Oxygen (DO)	6.50 mg/l (30 Day Average) N/A mg/l (7Day Average) 3.00 mg/l (1 Day Average
Maximum Total Dissolved Solids	1200.0 mg/l

Acute and Chronic Heavy Metals (Dissolved)

Parameter	4 Day Average (Chronic) Standard Concentration	Load*	1 Hour Average (Acute) Standard Concentration	Load*
Aluminum	87.00 ug/l**	0.047 lbs/day	750.00 ug/l	0.404 lbs/day
Arsenic	190.00 ug/l	0.102 lbs/day	340.00 ug/l	0.183 lbs/day
Cadmium	0.75 ug/l	0.000 lbs/day	8.66 ug/l	0.005 lbs/day
Chromium III	266.50 ug/l	0.144 lbs/day	5575.67 ug/l	3.005 lbs/day
ChromiumVI	11.00 ug/l	0.006 lbs/day	16.00 ug/l	0.009 lbs/day
Copper	30.30 ug/l	0.016 lbs/day	51.30 ug/l	0.028 lbs/day
Iron			1000.00 ug/l	0.539 lbs/day
Lead	18.40 ug/l	0.010 lbs/day	472.07 ug/l	0.254 lbs/day
Mercury	0.012 ug/l	0.000 lbs/day	2.40 ug/l	0.001 lbs/day
Nickel	167.42 ug/l	0.090 lbs/day	1505.87 ug/l	0.812 lbs/day

Selenium	4.60	ug/l	0.002	lbs/day	20.00	ug/l	0.011	lbs/day
Silver	N/A	ug/l	N/A	lbs/day	40.52	ug/l	0.022	lbs/day
Zinc	385.26	ug/l	0.208	lbs/day	385.26	ug/l	0.208	lbs/day

* Allowed below discharge

**Chronic Aluminum standard applies only to waters with a pH < 7.0 and a Hardness < 50 mg/l as CaCO3

Metals Standards based upon a hardness of 396.869129618034 mg/l as CaCO3 where applicable.

Organics [Pesticides]

	4 Day Average (Chronic) Standard				1 Hour Average (Acute) Standard			
Parameter	**Concentration**		**Load***		**Concentration**		**Load***	
Aldrin		ug/l			1.5000	ug/l	8.085E-04	lbs/day
Chlordane	0.0043	ug/l	2.318E-06	lbs/day	1.2000	ug/l	6.468E-04	lbs/day
DDT, DDE	0.0010	ug/l	5.390E-07	lbs/day	0.5500	ug/l	2.965E-04	lbs/day
Dieldrin	0.0019	ug/l	1.024E-06	lbs/day	1.2500	ug/l	6.738E-04	lbs/day
Endosulfan	0.0560	ug/l	3.018E-05	lbs/day	0.1100	ug/l	5.929E-05	lbs/day
Endrin	0.0023	ug/l	1.240E-06	lbs/day	0.0900	ug/l	4.851E-05	lbs/day
Guthion					0.0100			
Heptachlor	0.0038	ug/l	2.048E-06	lbs/day	0.2600	ug/l	1.401E-04	lbs/day
Lindane	0.0800	ug/l	4.312E-05	lbs/day	1.0000	ug/l	5.390E-04	lbs/day
Methoxychlor					0.0300			
Mirex					0.0100			
Parathion					0.0400			
PCB's	0.0140	ug/l	7.546E-06	lbs/day	2.0000	ug/l	1.078E-03	lbs/day
Pentachlorophenol	13.0000	ug/l	7.007E-03	lbs/day	20.0000	ug/l	1.078E-02	lbs/day
Toxephene	0.0002	ug/l	1.078E-07	lbs/day	0.7300	ug/l	3.935E-04	lbs/day

IV. Numeric Stream Standards for Protection of Agriculture

	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard	
	Concentration	**Load***	**Concentration**	**Load***
Arsenic	N/A		100.0 ug/l	5.39E-02 lbs/day
Boron	N/A		750.0 ug/l	4.04E-01 lbs/day
Cadmium	N/A		10.0 ug/l	5.39E-03 lbs/day
Chromium	N/A		100.0 ug/l	5.39E-02 lbs/day
Copper	N/A		200.0 ug/l	1.08E-01 lbs/day
Lead	N/A		100.0 ug/l	5.39E-02 lbs/day
Selenium	N/A		50.0 ug/l	2.70E-02 lbs/day
TDS	N/A		1200.0 mg/l	3.23E-01 tons/day

V. Numeric Stream Standards for Protection of Human Health (Class 1C Waters)

	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard		
Metals	**Concentration**	**Load***	**Concentration**		**Load***
Arsenic	N/A		50.0	ug/l	2.70E-02 lbs/day
Barium	N/A		1000.0	ug/l	5.39E-01 lbs/day
Cadmium	N/A		10.0	ug/l	5.39E-03 lbs/day
Chromium	N/A		50.0	ug/l	2.70E-02 lbs/day
Lead	N/A		50.0	ug/l	2.70E-02 lbs/day
Mercury	N/A		2.0	ug/l	1.08E-03 lbs/day
Selenium	N/A		10.0	ug/l	5.39E-03 lbs/day
Silver	N/A		50.0	ug/l	2.70E-02 lbs/day
Fluoride (3)	N/A		1.4	ug/l	7.55E-04 lbs/day
to	N/A		2.4	ug/l	1.29E-03 lbs/day
Nitrates as N	N/A		10.0	ug/l	5.39E-03 lbs/day

	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard		
Chlorophenoxy Herbicides	**Concentration**	**Load***	**Concentration**		**Load***
2,4-D	N/A		100.0	ug/l	5.39E-02 lbs/day
2,4,5-TP	N/A		10.0	ug/l	5.39E-03 lbs/day

Endrin	N/A	0.2 ug/l	1.08E-04 lbs/day
Hexachlorocyclohexane (Lindane)	N/A	4.0 ug/l	2.16E-03 lbs/day
Methoxychlor	N/A	100.0 ug/l	5.39E-02 lbs/day
Toxaphene	N/A	5.0 ug/l	2.70E-03 lbs/day

VI. Numeric Stream Standards the Protection of Human Health from Water & Fish Consumption [Toxics]

	Maximum Conc., ug/l - Acute Standards			
	Class 1C [2 Liters/Day for 70 Kg Person over 70 Yr.]		Class 3A, 3B [6.5 g for 70 Kg Person over 70 Yr.]	
Antimony	6E+00 ug/l	6E+00 lbs/day	6E+02 ug/l	6.61E+02 lbs/day
Arsenic				
Beryllium				
Cadmium				
Chromium III				
Chromium VI				
Copper	1E+03 ug/l	1E+03 lbs/day	0E+00 ug/l	0.00E+00 lbs/day
Lead				
Mercury				
Nickel	1E+02 ug/l	1E+02 lbs/day	5E+03 ug/l	4.75E+03 lbs/day
Selenium			4E+03 ug/l	4.34E+03 lbs/day
Silver				
Thallium	2E-01 ug/l	2E-01 lbs/day	5E-01 ug/l	4.81E-01 lbs/day
Zinc	7E+03 ug/l	8E+03 lbs/day	3E+04 ug/l	2.68E+04 lbs/day
Cyanide	1E+02 ug/l	1E+02 lbs/day	1E+02 ug/l	1.44E+02 lbs/day
Asbestos				
2,3,7,8-TCDD Dioxin	5E-09			
Acrolein	2E+02 ug/l	2E+02 lbs/day	3E+02 ug/l	2.96E+02 lbs/day
Acrylonitrile	5E-02 ug/l	5E-02 lbs/day	3E-01 ug/l	2.57E-01 lbs/day
Alachlor	2E+00 ug/l	2E+00 lbs/day		
Atrazine	3E+00 ug/l	3E+00 lbs/day		
Benzene	2E+00 ug/l	2E+00 lbs/day	5E+01 ug/l	5.26E+01 lbs/day
Bromoform	4E+00 ug/l	4E+00 lbs/day	1E+02 ug/l	1.44E+02 lbs/day
Carbofuran	4E+01 ug/l	4E+01 lbs/day		
Carbon Tetrachloride	2E-01 ug/l	2E-01 lbs/day	2E+00 ug/l	1.65E+00 lbs/day
Chlorobenzene	1E+02 ug/l	1E+02 lbs/day	2E+03 ug/l	1.65E+03 lbs/day
Chlorodibromomethane	4E-01 ug/l	4E-01 lbs/day	1E+01 ug/l	1.34E+01 lbs/day
Chloroethane				
2-Chloroethylvinyl Ether				
Chloroform	6E+00 ug/l	6E+00 lbs/day	5E+02 ug/l	4.85E+02 lbs/day
Dalapon	2E+02 ug/l	2E+02 lbs/day		
Di(2ethylhexl)adipate	4E+02 ug/l	4E+02 lbs/day		
Dibromochloropropane	2E-01 ug/l	2E-01 lbs/day		
Dichlorobromomethane	6E-01 ug/l	6E-01 lbs/day	2E+01 ug/l	1.75E+01 lbs/day
1,1-Dichloroethane				
1,2-Dichloroethane	4E-01 ug/l	4E-01 lbs/day	4E+01 ug/l	3.82E+01 lbs/day
1,1-Dichloroethylene	7E+00 ug/l	7E+00 lbs/day	7E+03 ug/l	7.33E+03 lbs/day
Dichloroethylene (cis-1,2	7E+01 ug/l	7E+01 lbs/day	0E+00 ug/l	
Dinose	7E+00 ug/l	7E+00 lbs/day	0E+00 ug/l	
Diquat	2E+01 ug/l	2E+01 lbs/day	0E+00 ug/l	
1,2-Dichloropropane	5E-01 ug/l	5E-01 lbs/day	2E+01 ug/l	1.55E+01 lbs/day
1,3-Dichloropropene	3E-01 ug/l	3E-01 lbs/day	2E+01 ug/l	2.17E+01 lbs/day
Endothall	1E+02 ug/l	1E+02 lbs/day		
Ethylbenzene	5E+02 ug/l	5E+02 lbs/day	2E+03 ug/l	2.16E+03 lbs/day
Ethylene Dibromide	5E-02 ug/l	5E-02 lbs/day		
Glyphosate	7E+02 ug/l	7E+02 lbs/day		
Haloacetic acids	6E+01 ug/l	6E+01 lbs/day		
Methyl Bromide	5E+01 ug/l	5E+01 lbs/day	2E+03 ug/l	1.55E+03 lbs/day

Methyl Chloride				
Methylene Chloride	5E+00 ug/l	5E+00 lbs/day	6E+02 ug/l	6.09E+02 lbs/day
Ocamyl (vidate)	2E+02 ug/l	2E+02 lbs/day		
Picloram	5E+02 ug/l	5E+02 lbs/day		
Simazine	4E+00 ug/l	4E+00 lbs/day		
Styrene	1E+02 ug/l	1E+02 lbs/day		
1,1,2,2-Tetrachloroethane	2E-01 ug/l	2E-01 lbs/day	4E+00 ug/l	4.13E+00 lbs/day
Tetrachloroethylene	7E-01 ug/l	7E-01 lbs/day	3E+00 ug/l	3.40E+00 lbs/day
Toluene	1E+03 ug/l	1E+03 lbs/day	2E+04 ug/l	1.55E+04 lbs/day
1,2 -Trans-Dichloroethyle	1E+02 ug/l	1E+02 lbs/day	1E+04 ug/l	1.03E+04 lbs/day
1,1,1-Trichloroethane	2E+02 ug/l	2E+02 lbs/day		
1,1,2-Trichloroethane	6E-01 ug/l	6E-01 lbs/day	2E+01 ug/l	1.65E+01 lbs/day
Trichloroethylene	3E+00 ug/l	3E+00 lbs/day	3E+01 ug/l	3.09E+01 lbs/day
Vinyl Chloride	3E-02 ug/l	3E-02 lbs/day	2E+00 ug/l	2.48E+00 lbs/day
Xylenes	1E+04 ug/l	1E+04 lbs/day		
2-Chlorophenol	8E+01 ug/l	8E+01 lbs/day	2E+02 ug/l	1.54E+02 lbs/day
2,4-Dichlorophenol	8E+01 ug/l	8E+01 lbs/day	3E+02 ug/l	2.98E+02 lbs/day
2,4-Dimethylphenol	4E+02 ug/l	4E+02 lbs/day	9E+02 ug/l	8.71E+02 lbs/day
2-Methyl-4,6-Dinitrophenol	1E+01 ug/l	1E+01 lbs/day	3E+02 ug/l	2.89E+02 lbs/day
2,4-Dinitrophenol	7E+01 ug/l	7E+01 lbs/day	5E+03 ug/l	5.47E+03 lbs/day
2-Nitrophenol				
4-Nitrophenol				
3-Methyl-4-Chlorophenol				
Penetachlorophenol	3E-01 ug/l	3E-01 lbs/day	3E+00 ug/l	3.09E+00 lbs/day
Phenol	2E+04 ug/l	2E+04 lbs/day	2E+06 ug/l	1.75E+06 lbs/day
2,4,6-Trichlorophenol	1E+00 ug/l	1E+00 lbs/day	2E+00 ug/l	2.45E+00 lbs/day
Acenaphthene	7E+02 ug/l	7E+02 lbs/day	1E+03 ug/l	1.01E+03 lbs/day
Acenaphthylene				
Anthracene	8E+03 ug/l	8E+03 lbs/day	4E+04 ug/l	4.12E+04 lbs/day
Benzidine	9E-05 ug/l	9E-05 lbs/day	2E-04 ug/l	2.05E-04 lbs/day
BenzoaAnthracene	4E-03 ug/l	4E-03 lbs/day	2E-02 ug/l	1.85E-02 lbs/day
BenzoaPyrene	4E-03 ug/l	4E-03 lbs/day	2E-02 ug/l	1.85E-02 lbs/day
BenzobFluoranthene	4E-03 ug/l	4E-03 lbs/day	2E-02 ug/l	1.85E-02 lbs/day
BenzoghiPerylene	0E+00 ug/l	0E+00 lbs/day	0E+00 ug/l	0.00E+00 lbs/day
BenzokFluoranthene	4E-03 ug/l	4E-03 lbs/day	2E-02 ug/l	1.85E-02 lbs/day
Bis2-ChloroethoxyMethane	0E+00 ug/l	0E+00 lbs/day	0E+00 ug/l	0.00E+00 lbs/day
Bis2-ChloroethylEther	3E-02 ug/l	3E-02 lbs/day	5E-01 ug/l	5.47E-01 lbs/day
Bis2-Chloroisopropy1Ether	1E+03 ug/l	1E+03 lbs/day	7E+04 ug/l	6.71E+04 lbs/day
Bis2-EthylhexylPhthalate	1E+00 ug/l	1E+00 lbs/day	2E+00 ug/l	2.25E+00 lbs/day
4-Bromophenyl Phenyl Ether	0E+00			
Butylbenzyl Phthalate	2E+03 ug/l	2E+03 lbs/day	2E+03 ug/l	1.94E+03 lbs/day
2-Chloronaphthalene	1E+03 ug/l	1E+03 lbs/day	2E+03 ug/l	1.64E+03 lbs/day
4-Chlorophenyl Phenyl Ether				
Chrysene	4E-03 ug/l	4E-03 lbs/day	2E-02 ug/l	1.85E-02 lbs/day
Dibenzoa, (h)Anthracene	4E-03 ug/l	4E-03 lbs/day	2E-02 ug/l	1.85E-02 lbs/day
1,2-Dichlorobenzene	4E+02 ug/l	4E+02 lbs/day	1E+03 ug/l	1.34E+03 lbs/day
1,3-Dichlorobenzene	3E+02 ug/l	3E+02 lbs/day	1E+03 ug/l	9.86E+02 lbs/day
1,4-Dichlorobenzene	6E+01 ug/l	6E+01 lbs/day	2E+02 ug/l	1.95E+02 lbs/day
3,3-Dichlorobenzidine	2E-02 ug/l	2E-02 lbs/day	3E-02 ug/l	2.86E-02 lbs/day
Diethyl Phthalate	2E+03 ug/l	2E+03 lbs/day	4E+04 ug/l	4.54E+04 lbs/day
Dimethyl Phthalate	3E+05 ug/l	3E+05 lbs/day	1E+06 ug/l	1.13E+06 lbs/day
Di-n-Butyl Phthalate	2E+03 ug/l	2E+03 lbs/day	5E+03 ug/l	4.61E+03 lbs/day
2,4-Dinitrotoluene	1E-01 ug/l	1E-01 lbs/day	3E+00 ug/l	3.51E+00 lbs/day
2,6-Dinitrotoluene				
Di-n-Octyl Phthalate				
1,2-Diphenylhydrazine	4E-02 ug/l	4E-02 lbs/day	2E-01 ug/l	2.06E-01 lbs/day
Fluoranthene	1E+02 ug/l	1E+02 lbs/day		
Fluorene	1E+03 ug/l	1E+03 lbs/day	5E+03 ug/l	5.45E+03 lbs/day
Hexachlorobenzene	3E-04 ug/l	3E-04 lbs/day	3E-04 ug/l	2.95E-04 lbs/day
Hexachlorobutedine	4E-01 ug/l	4E-01 lbs/day	2E+01 ug/l	1.86E+01 lbs/day

Hexachloroethane	1E+00 ug/l	1E+00 lbs/day	3E+00 ug/l	3.38E+00 lbs/day
Hexachlorocyclopentadiene	4E+01 ug/l	4E+01 lbs/day	1E+03 ug/l	1.13E+03 lbs/day
Ideno 1,2,3-cdPyrene	4E-03 ug/l	4E-03 lbs/day	2E-02 ug/l	1.85E-02 lbs/day
Isophorone	4E+01 ug/l	4E+01 lbs/day	1E+03 ug/l	9.90E+02 lbs/day
Naphthalene			ug/l	
Nitrobenzene	2E+01 ug/l	2E+01 lbs/day	7E+02 ug/l	7.12E+02 lbs/day
N-Nitrosodimethylamine	7E-04 ug/l	7E-04 lbs/day	3E+00 ug/l	3.10E+00 lbs/day
N-Nitrosodi-n-Propylamine	5E-03 ug/l	5E-03 lbs/day	5E-01 ug/l	5.26E-01 lbs/day
N-Nitrosodiphenylamine	3E+00 ug/l	3E+00 lbs/day	6E+00 ug/l	6.14E+00 lbs/day
Phenanthrene				
Pyrene	8E+02 ug/l	8E+02 lbs/day	4E+03 ug/l	4.12E+03 lbs/day
1,2,4-Trichlorobenzene	4E+01 ug/l	4E+01 lbs/day	7E+01 ug/l	7.17E+01 lbs/day
Aldrin	5E-05 ug/l	5E-05 lbs/day	5E-05 ug/l	5.08E-05 lbs/day
alpha-BHC	3E-03 ug/l	3E-03 lbs/day	5E-03 ug/l	5.02E-03 lbs/day
beta-BHC	9E-03 ug/l	9E-03 lbs/day	2E-02 ug/l	1.74E-02 lbs/day
gamma-BHC (Lindane)	2E-01 ug/l	2E-01 lbs/day	2E+00 ug/l	1.85E+00 lbs/day
delta-BHC	0E+00 ug/l	0E+00 lbs/day	0E+00 ug/l	0.00E+00 lbs/day
Chlordane	8E-04 ug/l	8E-04 lbs/day	8E-04 ug/l	8.23E-04 lbs/day
4,4-DDT	2E-04 ug/l	2E-04 lbs/day	2E-04 ug/l	2.24E-04 lbs/day
4,4-DDE	2E-04 ug/l	2E-04 lbs/day	2E-04 ug/l	2.24E-04 lbs/day
4,4-DDD	3E-04 ug/l	3E-04 lbs/day	3E-04 ug/l	3.15E-04 lbs/day
Dieldrin	5E-05 ug/l	5E-05 lbs/day	5E-05 ug/l	5.49E-05 lbs/day
alpha-Endosulfan	6E+01 ug/l	6E+01 lbs/day	9E+01 ug/l	9.09E+01 lbs/day
beta-Endosulfan	6E+01 ug/l	6E+01 lbs/day	9E+01 ug/l	9.09E+01 lbs/day
Endosulfan Sulfate	6E+01 ug/l	6E+01 lbs/day	9E+01 ug/l	9.09E+01 lbs/day
Endrin	6E-02 ug/l	6E-02 lbs/day	6E-02 ug/l	6.10E-02 lbs/day
Endrin Aldehyde	3E-02 ug/l	3E-02 lbs/day	3E-01 ug/l	3.09E-01 lbs/day
Heptachlor	8E-05 ug/l	8E-05 lbs/day	8E-05 ug/l	8.03E-05 lbs/day
Heptachlor Epoxide	4E-05 ug/l	4E-05 lbs/day	4E-05 ug/l	3.96E-05 lbs/day
Polychlorinated Biphenyls PCB's	6E-05 ug/l	7E-05 lbs/day	6E-05 ug/l	6.50E-05 lbs/day
Toxaphene	3E-04 ug/l	3E-04 lbs/day	3E-04 ug/l	0.00E+00 lbs/day

There are additional standards that apply to this receiving water, but were not considered in this modeling/waste load allocation analysis.

VII. Mathematical Modeling of Stream Quality

Model configuration was accomplished utilizing standard modeling procedures. Data points were plotted and coefficients adjusted as required to match observed data as closely as possible.

The modeling approach used in this analysis included one or a combination of the following models.

(1) The Utah River Model, Utah Division of Water Quality, 1992. Based upon QUAL2kw EPA and the University of Washington.

(2) Principles of Surface Water Quality Modeling and Control. Robert V. Thomann, et.al. Harper Collins Publisher, Inc. 1987, pp. 644.

Coefficients used in the model were based, in part, upon the following references:

(1) Rates, Constants, and Kinetics Formulations in Surface Water Quality Modeling. QUAL2kw default values or as adjusted by user, as noted.

VIII. Modeling Information

The required information for the model may include the following information for both the upstream conditions at low flow and the effluent conditions:

Flow, Q, (cfs or MGD)	D.O. mg/l
Temperature, Deg. C.	Total Residual Chlorine (TRC), mg/l
pH	Total NH3-N, mg/l
BOD5, mg/l	Total Dissolved Solids (TDS), mg/l
Metals, ug/l	Toxic Organics of Concern, ug/l

Other Conditions

In addition to the upstream and effluent conditions, the models require a variety of physical and biological coefficients and other technical information. In the process of actually establishing the permit limits for an effluent, values are used based upon the available data, model calibration, literature values, site visits and best professional judgement.

Model Inputs

The following is upstream and discharge information that was utilized as inputs for the analysis. Dry washes are considered to have an upstream flow equal to the flow of the discharge.

Current Headwater/Upstream Information

	Stream Critical Low Flow cfs	**Temp. Deg. C**	**pH**	**T-NH4 mg/l as N**	**BOD5 mg/l**	**DO mg/l**	**TRC mg/l**	**TDS mg/l**
Summer	0.100	15.1	8.3	0.05	0.10	9.10	0.00	1875.0
Fall	0.000	0.0	0.0	0.00	0.00	0.00	0.00	0.0
Winter	0.120	8.0	8.2	0.31	0.10	10.70	0.00	2335.0
Spring	0.000	0.0	0.0	0.00	0.00	0.00	0.00	0.0

Dissolved	Al	As	Cd	CrIII	CrVI	Copper	Fe	Pb

Metals	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
All Seasons	15.00	2.50	0.38	133.25	5.50	5.59	0.00	9.20

Dissolved	Hg	Ni	Se	Ag	Zn	Boron	
Metals	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	
All Seasons	0.0060	3.75	1.30	1.00	41.00	375.0	* 1/2 MDL

Projected Discharge Information [See page 5 for additional information]

Season	Flow, MGD	Temp.	TDS mg/l	TDS tons/day
Summer	2.00	23.60	3,000.00	25.01
Fall	-	-	-	-
Winter	2.00	15.50	3,600.00	30.02
Spring	-	-	-	-

All model numerical inputs, intermediate calculations, outputs and graphs are available for discussion, inspection and copy at the Division of Water Quality.

IX. Effluent Limitations

Current State water quality standards are required to be met under a variety of conditions including in-stream flows targeted to the 7-day, 10-year low flow (R317-2-9).

Other conditions used in the modeling effort coincide with the environmental conditions expected at low stream flows.

Effluent Limitation for Flow based upon Water Quality Standards

In-stream criteria of downstream segments will be met with an effluent flow maximum value as follows:

Season		Daily Average	
Summer	2.00	MGD	3.094 cfs
Fall	-	MGD	0.000 cfs
Winter	2.00	MGD	3.094 cfs
Spring	-	MGD	0.000 cfs

Flow Requirement or Loading Requirement

The calculations in this wasteload analysis utilize the maximum effluent discharge flow of 2 MGD. If the discharger is allowed to have a flow greater than 2 MGD during 7Q10 conditions, and effluent limit concentrations as indicated, then water quality standards will be violated. In order to prevent this from occuring, the permit writers must include the discharge flow limititation as indicated above; or, include loading effluent limits in the permit.

Effluent Limitation for Whole Effluent Toxicity (WET) based upon WET Policy

Effluent Toxicity will not occur in downstream segements if the values below are met.

WET Requirements	LC50 >	EOP	Effluent	[Acute]
System is Totally Mixed	IC25 >	96.9%	Effluent	[Chronic]

Effluent Limitation for Biological Oxygen Demand (BOD_5) based upon Water Quality Standards or Regulations

In-stream criteria of downstream segments for Dissolved Oxygen will be met with an effluent BOD5 limitation as follows:

Season	Concentration		Load	
Summer	25.00	mg/l as CBOD5	416.92	lbs/day
Fall	-	mg/l as CBOD5	-	lbs/day
Winter	25.00	mg/l as CBOD5	416.92	lbs/day
Spring	-	mg/l as CBOD5	-	lbs/day

Effluent Limitation for Dissolved Oxygen (DO) based upon Water Quality Standards

In-stream criteria of downstream segments for Dissolved Oxygen will be met with an effluent D.O. limitation as follows:

Season	**Concentration**		**Load**	
Summer	4.00	mg/l	66.71	lbs/day
Fall	-	mg/l	-	lbs/day
Winter	4.00	mg/l	66.71	lbs/day
Spring	-	mg/l	-	lbs/day

Effluent Limitation for Total Ammonia based upon Water Quality Standards

In-stream criteria of downstream segments for Total Ammonia will be met with an effluent limitation (expressed as Total Ammonia as N) as follows:

Season		**Concentration**		**Load**	
Summer	4 Day Avg. - Chronic	3.00	mg/l as N	50.03	lbs/day
	1 Hour Avg. - Acute	14.74	mg/l as N	245.79	lbs/day
Fall	4 Day Avg. - Chronic	-	mg/l as N	-	lbs/day
	1 Hour Avg. - Acute	-	mg/l as N	-	lbs/day
Winter	4 Day Avg. - Chronic	4.50	mg/l as N	75.04	lbs/day
	1 Hour Avg. - Acute	22.11	mg/l as N	368.69	lbs/day
Spring	4 Day Avg. - Chronic	-	mg/l as N	-	lbs/day
	1 Hour Avg. - Acute	-	mg/l as N	-	lbs/day

Effluent Limitation for Total Residual Chlorine based upon Water Quality Standards

In-stream criteria of downstream segments for Total Residual Chlorine will be met with an effluent limitation as follows:

Season		**Concentration**		**Load**	
Summer	4 Day Avg. - Chronic	0.25	mg/l	4.17	lbs/day
	1 Hour Avg. - Acute	0.43	mg/l	7.20	lbs/day
Fall	4 Day Avg. - Chronic	-	mg/l	-	lbs/day
	1 Hour Avg. - Acute	-	mg/l	-	lbs/day
Winter	4 Day Avg. - Chronic	0.15	mg/l	2.50	lbs/day
	1 Hour Avg. - Acute	0.26	mg/l	4.32	lbs/day
Spring	4 Day Avg. - Chronic	-	mg/l	-	lbs/day
	1 Hour Avg. - Acute	-	mg/l	-	lbs/day

Effluent Limitations for Total Dissolved Solids based upon Water Quality Standards

Season	**Concentration**	**Load**

Summer	Maximum, Acute	3,000.0	mg/l	50,030	tons/day
Fall	Maximum, Acute	-	mg/l	-	tons/day
Winter	Maximum, Acute	3,600.0	mg/l	60,036	tons/day
Spring	Maximum, Acute	-	mg/l	-	tons/day

Colorado Salinity Form Limits — Determined by Permitting Section

Effluent Limitations for Heat/Temperature based upon Water Quality Standards

Summer	Maximum	23.60	Deg. C.	74.5	Deg. F
Fall	Maximum	-	Deg. C.	-	Deg. F
Winter	Maximum	15.50	Deg. C.	59.9	Deg. F
Spring	Maximum	-	Deg. C.	-	Deg. F

Effluent Limitation for Whole Effluent Toxicity (WET) based upon WET Policy

Effluent Toxicity will not occur in downstream segements if the values below are met.

WET Requirements	**LC50 >**	**EOP Effluent**	**[Acute]**
	IC25 >	**96.9% Effluent**	**[Chronic]**

Effluent Limitations for Organics [Pesticides] Based upon Water Quality Standards [Class 3]

In-stream criteria of downstream segments for Organics [Pesticides] will be met with an effluent limit as follows:

	4 Day Average Concentration		**Load**		**1 Hour Average Concentration**		**Load**	
Aldrin					1.5E+00	ug/l	8.15E-01	lbs/day
Chlordane	4.37E-03	ug/l	2.36E-03	lbs/day	1.2E+00	ug/l	6.57E-01	lbs/day
DDT, DDE	1.02E-03	ug/l	5.48E-04	lbs/day	5.6E-01	ug/l	3.01E-01	lbs/day
Dieldrin	1.93E-03	ug/l	1.04E-03	lbs/day	1.3E+00	ug/l	6.85E-01	lbs/day
Endosulfan	5.69E-02	ug/l	3.07E-02	lbs/day	1.1E-01	ug/l	6.00E-02	lbs/day
Endrin	2.34E-03	ug/l	1.26E-03	lbs/day	9.1E-02	ug/l	4.93E-02	lbs/day
Guthion	0.00E+00	ug/l	0.00E+00	lbs/day	1.0E-02	ug/l	5.43E-03	lbs/day
Heptachlor	3.86E-03	ug/l	2.08E-03	lbs/day	2.6E-01	ug/l	1.42E-01	lbs/day
Lindane	8.13E-02	ug/l	4.38E-02	lbs/day	1.0E+00	ug/l	5.47E-01	lbs/day
Methoxychlor	0.00E+00	ug/l	0.00E+00	lbs/day	3.0E-02	ug/l	1.63E-02	lbs/day
Mirex	0.00E+00	ug/l	0.00E+00	lbs/day	1.0E-02	ug/l	5.43E-03	lbs/day
Parathion	0.00E+00	ug/l	0.00E+00	lbs/day	4.0E-02	ug/l	2.17E-02	lbs/day
PCB's	1.42E-02	ug/l	7.67E-03	lbs/day	2.0E+00	ug/l	1.10E+00	lbs/day
Pentachlorophenol	1.32E+01	ug/l	7.12E+00	lbs/day	2.0E+01	ug/l	1.09E+01	lbs/day
Toxephene	2.03E-04	ug/l	1.10E-04	lbs/day	7.4E-01	ug/l	4.00E-01	lbs/day

Effluent Limitations for E. coli Based upon Water Quality Standards [Class 2]

E. coli — 126.0 organisms per 100 ml

Effluent Targets for Pollution Indicators Based upon Water Quality Standards

In-stream criteria of downstream segments for Pollution Indicators will be met with an effluent limit as follows:

	1 Hour Average	
	Concentration	Loading
Gross Beta (pCi/l)	50.8 pCi/L	0.00
BOD (mg/l)	5.1 mg/l	84.7 lbs/day
Nitrate as N (mg/l)	4.1 mg/l	67.8 lbs/day
Total Phosphorus as P	0.1 mg/l	0.0 lbs/day

Note: Pollution indicator targets are for information purposes only.

Effluent Limitations for Protection of Human Health [Toxics Rule]
Based upon Water Quality Standards (Most stringent of 1C or 3A & 3B as appropriate.)

In-stream criteria of downstream segments for Protection of Human Health [Toxics] will be met with an effluent limit as follows:

Toxic Organics	Effluent Limitation (30 Day Avg.) Class 1C	Maximum Concentration Concentra Effluent Limit (30 Day Avg.) Class 3	Load
Antimony	5.690E+00	6.606E+02	
Arsenic			
Beryllium			
Cadmium			
Chromium III			
Chromium VI			
Copper	1.342E+03		
Lead			
Mercury			
Nickel	1.031E+02	4.75E+03	
Selenium		4.34E+03	
Silver		0.00E+00	
Thallium	2.439E-01	4.81E-01	
Zinc	7.638E+03	2.68E+04	
Cyanide	1.444E+02	1.44E+02	
Asbestos	7.000E+06		
2,3,7,8-TCDD Dioxin		5.18E-09	
Acrolein	1.931E+02	2.96E+02	
Acrylonitrile	5.182E-02	2.57E-01	
Alachlor	2.032E+00	0.00E+00	
Atrazine	3.048E+00	0.00E+00	
Benzene	2.236E+00	5.26E+01	
Bromoform	4.369E+00	1.44E+02	
Carbofuran	4.065E+01		
Carbon Tetrachloride	2.337E-01	1.65E+00	
Chlorobenzene	1.016E+02	1.65E+03	
Chlorodibromomethane	4.065E-01	1.34E+01	
Chloroethane			
2-Chloroethylvinyl Ether			
Chloroform	5.792E+00	4.85E+02	
Dalapon	2.032E+02		
Di(2ethylhexl)adipate	4.065E+02		
Dibromochloropropane	2.032E-01		
Dichlorobromomethane	5.589E-01	1.75E+01	
1,1-Dichloroethane		0.00E+00	
1,2-Dichloroethane	3.861E-01	3.82E+01	
1,1-Dichloroethylene	7.113E+00	7.33E+03	
Dichloroethylene (cis-1,2	7.113E+01	0.00E+00	

Dinose	7.113E+00	0.00E+00
Diquat	2.032E+01	0.00E+00
1,2-Dichloropropane	5.081E-01	1.55E+01
1,3-Dichloropropene	3.455E-01	2.17E+01
Endothall	1.016E+02	0.00E+00
Ethylbenzene	5.386E+02	2.16E+03
Ethylene Dibromide	5.081E-02	0.00E+00
Glyphosate	7.113E+02	0.00E+00
Haloacetic acids	6.097E+01	0.00E+00
Methyl Bromide	4.776E+01	1.55E+03
Methyl Chloride	0.000E+00	
Methylene Chloride	4.674E+00	6.09E+02
Ocamyl (vidate)	2.032E+02	
Picloram	5.081E+02	
Simazine	4.065E+00	
Styrene	1.016E+02	
1,1,2,2-Tetrachloroethane	1.727E-01	4.13E+00
Tetrachloroethylene	7.012E-01	3.40E+00
Toluene	1.016E+03	1.55E+04
1,2 -Trans-Dichloroethyle	1.016E+02	1.03E+04
1,1,1-Trichloroethane	2.032E+02	0.00E+00
1,1,2-Trichloroethane	5.995E-01	1.65E+01
Trichloroethylene	2.540E+00	3.09E+01
Vinyl Chloride	2.540E-02	2.48E+00
Xylenes	1.016E+04	
2-Chlorophenol	8.231E+01	1.54E+02
2,4-Dichlorophenol	7.824E+01	2.98E+02
2,4-Dimethylphenol	3.861E+02	8.71E+02
2-Methyl-4,6-Dinitrophenol	1.321E+01	2.89E+02
2,4-Dinitrophenol	7.012E+01	5.47E+03
2-Nitrophenol		
4-Nitrophenol		
3-Methyl-4-Chlorophenol		
Penetachlorophenol	2.744E-01	3.09E+00
Phenol	2.134E+04	1.75E+06
2,4,6-Trichlorophenol	1.423E+00	2.45E+00
Acenaphthene	6.808E+02	1.01E+03
Acenaphthylene	0.000E+00	0.00E+00
Anthracene	8.434E+03	4.12E+04
Benzidine	8.739E-05	2.05E-04
BenzoaAnthracene	3.861E-03	1.85E-02
BenzoaPyrene	3.861E-03	1.85E-02
BenzobFluoranthene	3.861E-03	1.85E-02
BenzoghiPerylene		0.00E+00
BenzokFluoranthene	3.861E-03	1.85E-02
Bis2-ChloroethoxyMethane		0.00E+00
Bis2-ChloroethylEther	3.048E-02	5.47E-01
Bis2-Chloroisopropy1Ether	1.423E+03	6.71E+04
Bis2-EthylhexylPhthalate	1.219E+00	2.25E+00
4-Bromophenyl Phenyl Ether		0.00E+00
Butylbenzyl Phthalate	1.524E+03	1.94E+03
2-Chloronaphthalene	1.016E+03	1.64E+03
4-Chlorophenyl Phenyl Ether		
Chrysene	3.861E-03	1.85E-02
Dibenzoa, (h)Anthracene	3.861E-03	1.85E-02
1,2-Dichlorobenzene	4.268E+02	1.34E+03
1,3-Dichlorobenzene	3.252E+02	9.86E+02
1,4-Dichlorobenzene	6.402E+01	1.95E+02
3,3-Dichlorobenzidine	2.134E-02	2.86E-02
Diethyl Phthalate	1.727E+03	4.54E+04

Dimethyl Phthalate	2.744E+05	1.13E+06
Di-n-Butyl Phthalate	2.032E+03	4.61E+03
2,4-Dinitrotoluene	1.118E-01	3.51E+00
2,6-Dinitrotoluene		0.00E+00
Di-n-Octyl Phthalate		0.00E+00
1,2-Diphenylhydrazine	3.658E-02	2.06E-01
Fluoranthene	1.321E+02	
Fluorene	1.118E+03	5.45E+03
Hexachlorobenzene	2.845E-04	2.95E-04
Hexachlorobutedine	4.471E-01	1.86E+01
Hexachloroethane	1.423E+00	3.38E+00
Hexachlorocyclopentadiene	4.065E+01	1.13E+03
Ideno 1,2,3-cdPyrene	3.861E-03	1.85E-02
Isophorone	3.557E+01	9.90E+02
Naphthalene		
Nitrobenzene	1.727E+01	7.12E+02
N-Nitrosodimethylamine	7.012E-04	3.10E+00
N-Nitrosodi-n-Propylamine	5.081E-03	5.26E-01
N-Nitrosodiphenylamine	3.353E+00	6.14E+00
Phenanthrene		
Pyrene	8.434E+02	4.12E+03
1,2,4-Trichlorobenzene	3.557E+01	7.17E+01
Aldrin	4.979E-05	5.08E-05
alpha-BHC	2.642E-03	5.02E-03
beta-BHC	9.247E-03	1.74E-02
gamma-BHC (Lindane)	2.032E-01	1.85E+00
delta-BHC		0.00E+00
Chlordane	8.129E-04	8.23E-04
4,4-DDT	2.236E-04	2.24E-04
4,4-DDE	2.236E-04	2.24E-04
4,4-DDD	3.150E-04	3.15E-04
Dieldrin	5.284E-05	5.49E-05
alpha-Endosulfan	6.300E+01	9.09E+01
beta-Endosulfan	6.300E+01	9.09E+01
Endosulfan Sulfate	6.300E+01	9.09E+01
Endrin	5.995E-02	6.10E-02
Endrin Aldehyde	2.947E-02	3.09E-01
Heptachlor	8.028E-05	8.03E-05
Heptachlor Epoxide	3.963E-05	3.96E-05
PCBs	6.503E-05	6.50E-05
Toxaphene	2.845E-04	

Metals Effluent Limitations for Protection of All Beneficial Uses Based upon Water Quality Standards and Toxics Rule

	Class 3 Chronic Aquatic Wildlife ug/l	Class 3: Acute Aquatic Wildlife ug/l	Class 1C: Drinking Water Supply	Class 1C: Acute Toxics Drinking Water Source ug/l	Class 3: Acute Toxics Drinking & Consumption Criteria ug/l	Class 4: Acute Agricultural ug/l	Acute Most Stringent ug/l
Aluminum	N/A	761.9					761.9
Antimony				5.7			5.7
Arsenic	196.1	345.5	51.5			103.2	51.5
Asbestos				7.00E+06			7000000.0
Barium			1016.2				1016.2
Beryllium							0.0
Cadmium	0.8	8.8	10.3			10.3	0.8
Chromium (III)	270.8	5663.6	47.3				47.3
Chromium (VI)	11.18	16.2				98.9	11.2
Copper	31.1	52.0		1341.8		206.3	31.1
Cyanide	5.3	22.3		144.4			5.3
Iron		1016.2					1016.2
Lead	18.7	479.6	51.3			102.9	18.7
Mercury	0.012	2.44	2.06				0.0
Nickel	172.7	1530.1		103.1			103.1
Selenium	4.7	20.3	10.3		4335.5	51.6	4.7
Silver		41.2	51.6				41.2
Thallium							0.0
Zinc	396.4	390.8			26839.0		390.8
Boron						762.1	762.1

Summary Effluent Limitations for Metals [Wasteload Allocation, TMDL]
[If Acute is more stringent than Chronic, then the Chronic takes on the Acute value.]

	WLA Acute ug/l	WLA Chronic ug/l	
Aluminum	761.9	N/A	
Antimony	5.69		
Arsenic	51.5	196.1	Acute Controls
Asbestos	7.00E+06		
Barium	1016.2		
Beryllium			
Cadmium	0.8	0.8	
Chromium (III)	47.3	271	Acute Controls
Chromium (VI)	11.2	11.2	
Copper	31.1	31.1	
Cyanide	5.3	5.3	
Iron	1016.2		
Lead	18.7	18.7	
Mercury	0.012	0.012	
Nickel	103.1	173	Acute Controls
Selenium	4.7	4.7	
Silver	41.2	N/A	
Thallium	0.0		
Zinc	390.8	396.4	Acute Controls
Boron	762.12		

Other Effluent Limitations are based upon R317-1.

X. Antidegradation Considerations

The Utah Antidegradation Policy allows for degradation of existing quality where it is determined that such lowering of water quality is necessary to accommodate important economic or social development in the area in which the waters are protected [R317-2-3]. It has been determined that certain chemical parameters introduced by this discharge will cause an increase of the concentration of said parameters in the receiving waters. Under no conditions will the increase in concentration be allowed to interfere with existing instream water uses.

The antidegradation rules and procedures allow for modification of effluent limits less than those based strictly upon mass balance equations utilizing 100% of the assimilative capacity of the receiving water. Additional factors include considerations for "Blue-ribbon" fisheries, special recreational areas, threatened and endangered species, and drinking water sources.

An Antidegradation Level I Review was conducted on this discharge and its effect on the receiving water. Based upon that review, it has been determined that an **Antidegradation Level II Review is NOT Required.**

XI. Colorado River Salinity Forum Considerations

Discharges in the Colorado River Basin are required to have their discharge at a TDS loading of less than 1.00 tons/day unless certain exemptions apply. Refer to the Forum's Guidelines for additional information allowing for an exceedence of this value.

XII. Summary Comments

The mathematical modeling and best professional judgement indicate that violations of receiving water beneficial uses with their associated water quality standards, including important down-stream segments, will not occur for the evaluated parameters of concern as discussed above if the effluent limitations indicated above are met.

XIII. Notice of UPDES Requirement

This Addendum to the Statement of Basis does not authorize any entity or party to discharge to the waters of the State of Utah. That authority is granted through a UPDES permit issued by the Utah Division of Water Quality. The numbers presented here may be changed as a function of other factors. Dischargers are strongly urged to contact the Permits Section for further information. Permit writers may utilize other information to adjust these limits and/or to determine other limits based upon best available technology and other considerations provided that the values in this wasteload analysis [TMDL] are not compromised. See special provisions in Utah Water Quality Standards for adjustments in the Total Dissolved Solids values based upon background concentration.

XIV. Special Considerations

EA Miller discharges to a tributary of Spring Creek which is listed on the Utah 303(d) listed for total phosphorous (TP), ammonia and dissolved oxygen (DO). A TMDL was completed for Spring Creek on September 9th, 2002. The TMDL set the load allocation for EA Miller at 170 kg/yr TP based on the anticipated capacity of the plant (2 mgd) and an average total phosphorus concentration of 0.10 mg/l (30 day average).

Prepared by:
David Wham
Utah Division of Water Quality

File Name: EA Miller & Hyrum WWTP_Irrigation_limits.xls

Level I Antidegradation Review for: EA Miller

Level II Antidegradation Review is NOT required. Basic permit renewal. No increase in load or concentration over last issued permit.

APPENDIX - Coefficients and Other Model Information

Parameter	***Value***	Units
Stoichiometry:		
Carbon	**40**	gC
Nitrogen	**7.2**	gN
Phosphorus	**1**	gP
Dry weight	**100**	gD
Chlorophyll	**1**	gA
Inorganic suspended solids:		
Settling velocity	**0.06128**	m/d
Oxygen:		
Reaeration model	**Internal**	
Temp correction	**1.024**	
Reaeration wind effect	**None**	
O2 for carbon oxidation	**2.69**	gO2/gC
O2 for NH4 nitrification	**4.57**	gO2/gN
Oxygen inhib model CBOD oxidation	**Exponential**	
Oxygen inhib parameter CBOD oxidation	**0.60**	L/mgO2
Oxygen inhib model nitrification	**Exponential**	
Oxygen inhib parameter nitrification	**0.60**	L/mgO2
Oxygen enhance model denitrification	**Exponential**	
Oxygen enhance parameter denitrification	**0.60**	L/mgO2
Oxygen inhib model phyto resp	**Exponential**	
Oxygen inhib parameter phyto resp	**0.60**	L/mgO2
Oxygen enhance model bot alg resp	**Exponential**	
Oxygen enhance parameter bot alg resp	**0.60**	L/mgO2
Slow CBOD:		
Hydrolysis rate	**1.93545**	/d
Temp correction	**1.047**	
Oxidation rate	**1.18385**	/d
Temp correction	**1.047**	
Fast CBOD:		
Oxidation rate	**0.5447**	/d
Temp correction	**1.047**	
Organic N:		
Hydrolysis	**0.8365**	/d
Temp correction	**1.07**	
Settling velocity	**0.24964**	m/d
Ammonium:		
Nitrification	**2.1554**	/d
Temp correction	**1.07**	
Nitrate:		
Denitrification	**1.02986**	/d
Temp correction	**1.07**	
Sed denitrification transfer coeff	**0.05126**	m/d
Temp correction	**1.07**	

Organic P:		
Hydrolysis	3.4361	/d
Temp correction	1.07	
Settling velocity	0.62926	m/d
Inorganic P:		
Settling velocity	0.01384	m/d
Sed P oxygen attenuation half sat constant	1.69154	mgO2/L
Phytoplankton:		
Max Growth rate	2.5	/d
Temp correction	1.07	
Respiration rate	0.1	/d
Temp correction	1.07	
Death rate	0	/d
Temp correction	1	
Nitrogen half sat constant	15	ugN/L
Phosphorus half sat constant	2	ugP/L
Inorganic carbon half sat constant	1.30E-05	moles/L
Phytoplankton use HCO3- as substrate	Yes	
Light model	Half saturation	
Light constant	57.6	langleys/d
Ammonia preference	25	ugN/L
Settling velocity	0.15	m/d
Bottom Plants:		
Growth model	Zero-order	
Max Growth rate	49.3845	gD/m2/d or /d
Temp correction	1.07	
First-order model carrying capacity	100	gD/m2
Basal respiration rate	0.48434	/d
Photo-respiration rate parameter	0	unitless
Temp correction	1.07	
Excretion rate	0.46367	/d
Temp correction	1.07	
Death rate	0.40579	/d
Temp correction	1.07	
External nitrogen half sat constant	163.368	ugN/L
External phosphorus half sat constant	47.556	ugP/L
Inorganic carbon half sat constant	1.05E-05	moles/L
Bottom algae use HCO3- as substrate	Yes	
Light model	Half saturation	
Light constant	2.09098	langleys/d
Ammonia preference	1.48807	ugN/L
Subsistence quota for nitrogen	29.957365	mgN/gD
Subsistence quota for phosphorus	0.3928168	mgP/gD
Maximum uptake rate for nitrogen	446.5885	mgN/gD/d
Maximum uptake rate for phosphorus	114.4235	mgP/gD/d
Internal nitrogen half sat ratio	2.856177	
Internal phosphorus half sat ratio	1.752547	
Nitrogen uptake water column fraction	1	
Phosphorus uptake water column fraction	1	
Detritus (POM):		
Dissolution rate	2.7754	/d
Temp correction	1.07	
Settling velocity	3.89475	m/d
Pathogens:		
Decay rate	0.8	/d
Temp correction	1.07	
Settling velocity	1	m/d
alpha constant for light mortality	1	/d per ly/hr
pH:		
Partial pressure of carbon dioxide	347	ppm

Hyporheic metabolism		
Model for biofilm oxidation of fast CBOD	**Zero-order**	
Max biofilm growth rate	**5**	gO2/m^2/d or /d
Temp correction	**1.047**	
Fast CBOD half-saturation	**0.5**	mgO2/L
Oxygen inhib model	**Exponential**	
Oxygen inhib parameter	**0.60**	L/mgO2
Respiration rate	**0.2**	/d
Temp correction	**1.07**	
Death rate	**0.05**	/d
Temp correction	**1.07**	
External nitrogen half sat constant	**15**	ugN/L
External phosphorus half sat constant	**2**	ugP/L
Ammonia preference	**25**	ugN/L
First-order model carrying capacity	100.0	gD/m2
Generic constituent		
Decay rate	30.0	/d
Temp correction	1.1	
Settling velocity	1.0	m/d

Atmospheric Inputs:	**Summer**	Summer	Fall	Winter	Spring
Air Temperature, F	**65.0**	**65.0**	**45.0**	**30.0**	**45.0**
Dew Point, Temp., F	**44.0**	**44.0**	**35.0**	**32.0**	**35.0**
Wind, ft./sec. @ 21 ft.	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
Cloud Cover, %	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**
Shade, %	**5.0%**	**5.0%**	**5.0%**	**5.0%**	**5.0%**

Other Inputs:		
Manning Coeffecient	**0.04**	Default
Side Slope	**10.0%**	
Bottom Algae Coverage	**50.0%**	