APPENDIX A

FACILITY INFORMATION

NPDES Permit Rating Worksheet
USGS Map
Site/Flow Diagram
Site Visit Memo
DMR Data

NPDES PERMIT RATING WORK SHEET

☐ Regular Addition
☐ DiscretionaryAddition
☐ Score change, but no status change
☐ Deletion

NPDES NO. VA0076015

Facility Name: Ronile, Incorporated

City: Rocky Mount

Receiving Water: Pigg River

Reach Number: _____

Is this facility a steam electric power plant (SIC=4911) with one or more of the following characteristics?
1. Power output 500 MW or greater (not using a cooling pond/lake)
2. A nuclear power plant
3. Cooling water discharge greater than 25% of the receiving stream's 7Q10 flow rate

☐ YES; score is 600 (stop here) X NO (continue)

Is this permit for a municipal separate storm sewer serving a population greater than 100,000?

☐ YES; score is 700 (stop here)
X NO (continue)

FACTOR 1: Toxic Pollutant Potential

PCS SIC Code: _____ Primary SIC Code: 2269 Other SIC Codes:
Industrial Subcategory Code: 002 (Code 000 if no subcategory)

Determine the Toxicity potential from Appendix A. Be sure to use the TOTAL toxicity potential column and check one)

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
☐ No process waste streams	0	0	☐ 3.	3	15	☐ 7.	7	35
☐ 1.	1	5	☐ 4.	4	20	☐ 8.	8	40
☐ 2.	2	10	☐ 5.	5	25	X 9.	9	45
			☐ 6.	6	30	☐ 10.	10	50

Code Number Checked: 9

Total Points Factor 1: 45

FACTOR 2: Flow/Stream Flow Volume (*Complete either Section A or Section B; check only one)*

Section A ☐ Wastewater Flow Only Considered

Wastewater Type (See Instructions)		Code	Points
Type I: Flow < 5 MGD	☐	11	0
Flow 5 to 10 MGD	☐	12	10
Flow > 10 to 50 MGD	☐	13	20
Flow > 50 MGD	☐	14	30
Type II: Flow < 1 MGD	☐	21	10
Flow 1 to 5 MGD	☐	22	20
Flow > 5 to 10 MGD	☐	23	30
Flow > 10 MGD	☐	24	50
Type III: Flow < 1 MGD	☐	31	0
Flow 1 to 5 MGD	☐	32	10
Flow > 5 to 10 MGD	☐	33	20
Flow > 10 MGD	☐	34	30

Section B ☐ Wastewater and Stream Flow Considered

Wastewater Type (See Instructions)	Percent of instream Wastewater Concentration at Receiving Stream Low Flow		Code	Points
Type I/III:	< 10 %	☐	41	0
	10 % to < 50 %	☐	42	10
	> 50 %	☐	43	20
Type II:	< 10 %	X	51	0
	10 % to <50 %	☐	52	20
	> 50 %	☐	53	30

Code Checked from Section A or B: 51
Total Points Factor 2: 0

FACTOR 3: Conventional Pollutants NPDES NO: VA0076015

(only when limited by the permit)

A. Oxygen Demanding Pollutant: (check one) ☐ BOD X COD ☐ Other:_____

			Code	*Points*
Permit Limits: (check one)	☐	< 100 lbs/day	1	0
	☐	100 to 1000 lbs/day	2	5
	X	> 1000 to 3000 lbs/day	3	15
	☐	> 3000 lbs/day	4	20

Code Checked: __3__

Points Scored:__15_

B. Total Suspended Solids (TSS)

			Code	*Points*
Permit Limits: (check one)	☐	< 100 lbs/day	1	0
	X	100 to 1000 lbs/day	2	5
	☐	> 1000 to 5000 lbs/day	3	15
	☐	> 5000 lbs/day	4	20

Code Checked: __2_

Points Scored: __5__

C. Nitrogen Pollutant: (check one) ☐ Ammonia ☐ Other: _____

		Nitrogen Equivalent	*Code*	*Points*
Permit Limits: (check one)	☐	< 300 lbs/day	1	0
	☐	300 to 1000 lbs/day	2	5
	☐	> 1000 to 3000 lbs/day	3	15
	☐	> 3000 lbs/day	4	20

Code Checked: __1___

Points Scored:_0____

Total Points Factor 3: _20__

FACTOR 4: Public Health Impact

Is there a public drinking water supply located within 50 miles downstream of the effluent discharge (this includes any body of water to which the receiving water is a tributary)? A public drinking water supply may include infiltration galleries, or other methods of conveyance that ultimately get water from the above referenced supply.

☐ YES (If yes, check toxicity potential number below)

X NO (If no, go to Factor 5)

Determine the *human health* toxicity potential from Appendix A. Use the same SIC code and subcategory reference as in Factor 1. (Be sure to use the human health toxicity group column ☐ check one below)

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
☐ No process waste streams	0	0	☐ 3.	3	0	☐ 7.	7	15
☐ 1.	1	0	☐ 4.	4	0	☐ 8.	8	20
☐ 2.	2	0	☐ 5.	5	5	☐ 9.	9	25
			☐ 6.	6	10	☐ 10.	10	30

Code Number Checked: __0__

Total Points Factor 4:__0__

FACTOR 5: Water Quality Factors NPDES NO VA0076015

A. *Is (or will) one or more of the effluent discharge limits based on water quality factors of the receiving stream (rather than technology-based federal effluent guidelines, or technology-based state effluent guidelines), or has a wasteload allocation been assigned to the discharge:*

		Code	Points
X	Yes	1	10
☐	No	2	0

B. *Is the receiving water in compliance with applicable water quality standards for pollutants that are water quality limited in the permit?*

		Code	Points
X	Yes	1	0
☐	No	2	5

C. *Does the effluent discharged from this facility exhibit the reasonable potential to violate water quality standards due to whole effluent toxicity?*

		Code	Points
X	Yes	1	10
☐	No	2	0

Code Number Checked: A 1 B 1 C 1

Points Factor 5: A 10 + B 0 + C 10 = 20 TOTAL

FACTOR 6: Proximity to Near Coastal Waters

A. *Base Score: Enter flow code here (from Factor 2):_____* *Enter the multiplication factor that corresponds to the flow code: _____*

Check appropriate facility HPRI Code (from PCS):

	HPRI#	*Code*	*HPRI Score*
☐	1	1	20
☐	2	2	0
☐	3	3	30
X	4	4	0
☐	5	5	20

Flow Code	*Multiplication Factor*
11, 31, or 41	0.00
12, 32, or 42	0.05
13, 33, or 43	0.10
14 or 34	0.15
21 or 51	0.10
22 or 52	0.30
23 or 53	0.60
24	1.00

HPRI code checked: 4

Base Score: (HPRI Score) 0 X (Multiplication Factor) ____ = 0 (TOTAL POINTS)

B. *Additional Points ☐ NEP Program*
For a facility that has an HPRI code of 3, does the facility discharge to one of the estuaries enrolled in the National Estuary Protection (NEP) program (see instructions) or the Chesapeake Bay?

	Code	Points
☐ Yes	1	10
☐ No	2	0

C. *Additional Points ☐ Great Lakes Area of Concern*
For a facility that has an HPRI code of 5, does the facility discharge any of the pollutants of concern into one of the Great Lakes' 31 areas of concern (see Instructions)

	Code	Points
☐ Yes	1	10
☐ No	2	0

Code Number Checked: A __ B __ C __

Points Factor 6: A __ + B __ + C __ = 0 TOTAL

SCORE SUMMARY NPDES NO. VA0076015

Factor	Description	Total Points
1	Toxic Pollutant Potential	45
2	Flows/Streamflow Volume	
3	Conventional Pollutants	20
4	Public Health Impacts	
5	Water Quality Factors	20
6	Proximity to Near Coastal Waters	
	TOTAL (Factors 1 through 6)	85

S1. Is the total score equal to or greater than 80? X Yes (Facility is a major) ☐ No

S2. If the answer to the above questions is no, would you like this facility to be discretionary major?

☐ No

☐ Yes (Add 500 points to the above score and provide reason below:

Reason:

NEW SCORE: 85

OLD SCORE: 85

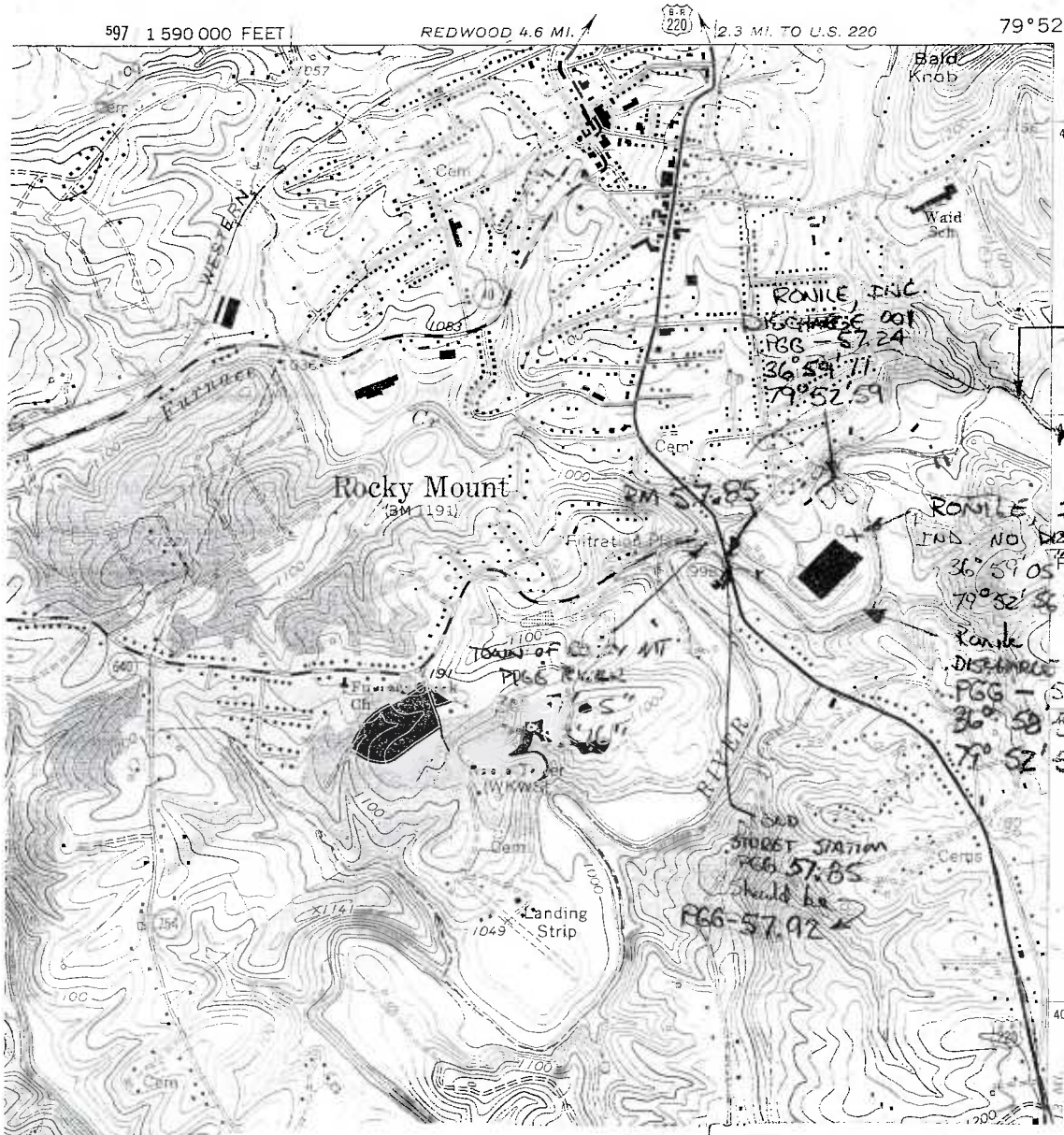
Lewis J. Pillis
Permit Reviewer's Name

(540) 562-6789
Phone Number

May 23, 2013
Date

ROCKY MOUNT QUADRANGLE
VIRGINIA—FRANKLIN CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

5058 III SE (REDWOOD)

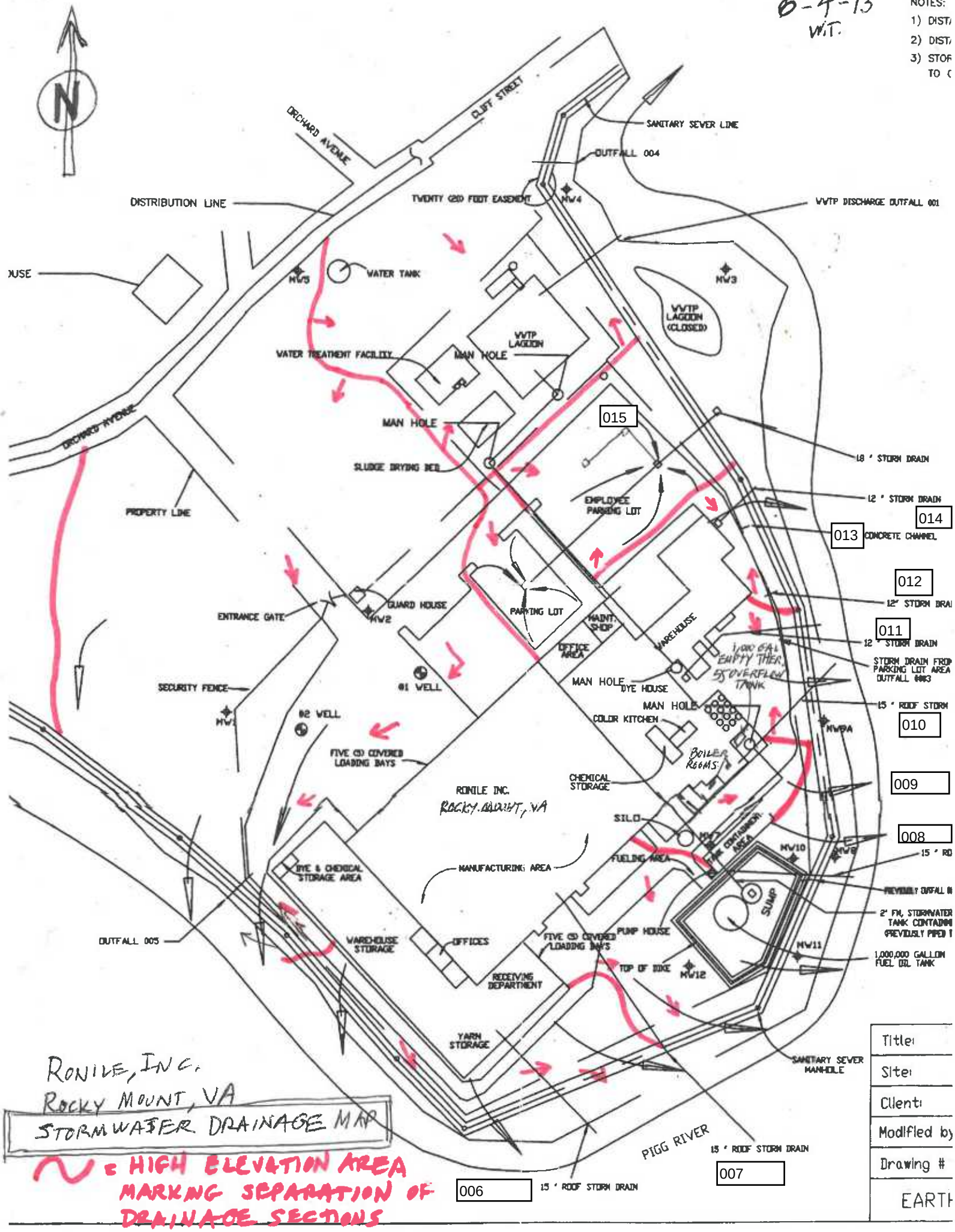


CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092
AND VIRGINIA DIVISION OF MINERAL RESOURCES, CHARLOTTESVILLE, VIRGINIA 22903
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

6-4-13
W.T.

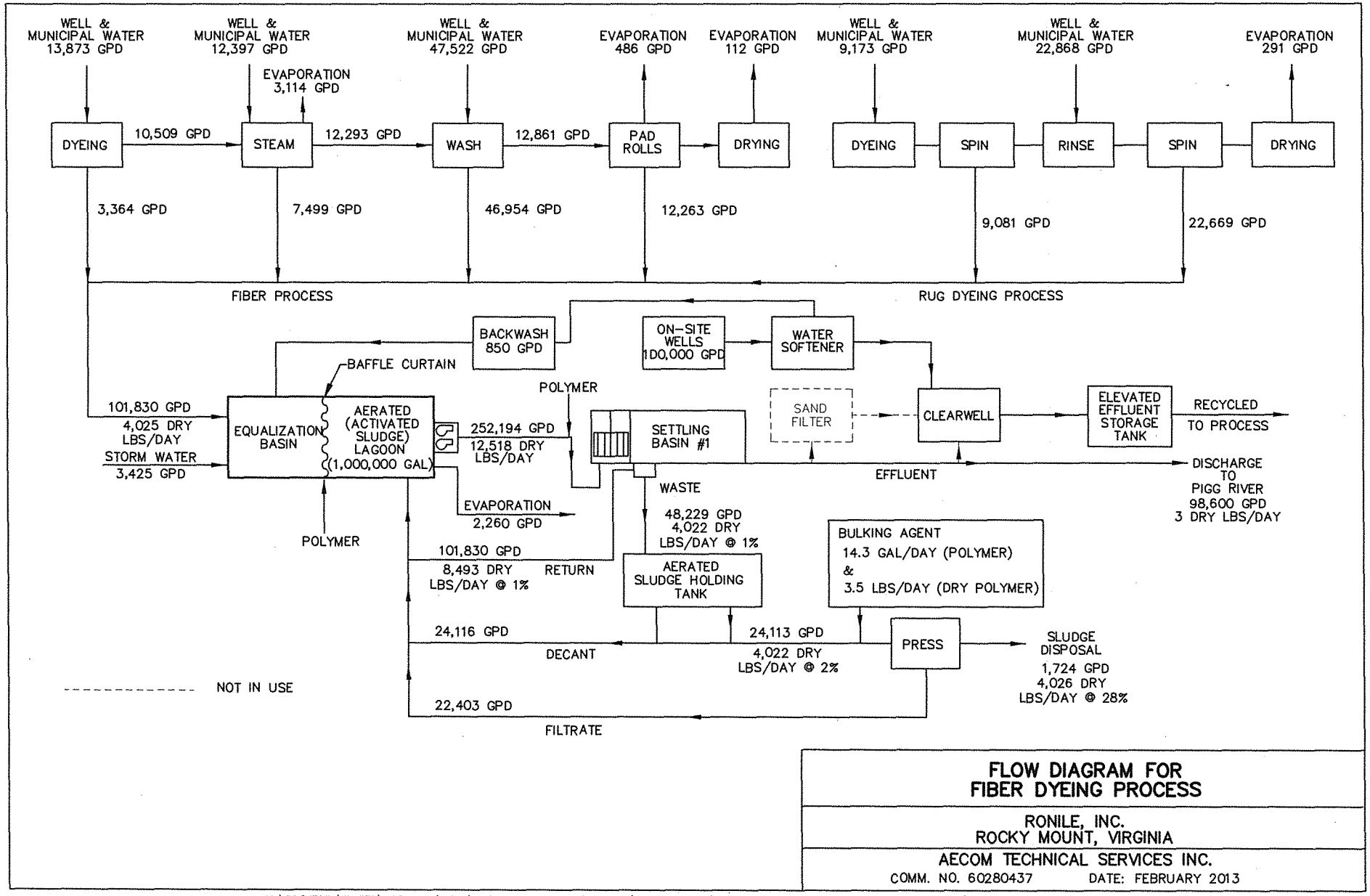
NOTES:
1) DIST
2) DIST
3) STOF
TO (



RONILE, INC.
ROCKY MOUNT, VA
STORMWATER DRAINAGE MAP

~ = HIGH ELEVATION AREA MARKING SEPARATION OF DRAINAGE SECTIONS

Title:	
Site:	
Client:	
Modified by	
Drawing #	
EARTH	



FLOW DIAGRAM FOR FIBER DYEING PROCESS

RONILE, INC.
ROCKY MOUNT, VIRGINIA

AECOM TECHNICAL SERVICES INC.
COMM. NO. 60280437 DATE: FEBRUARY 2013

M:\PROJECTS\WATER\60280437\0001\400_TECHNICAL_INFORMATION\414_PROCESS\VPDES PERMIT RENEWAL 2012\2012 DRAWINGS\FLOW DIAGRAM 2012.DWG 61002 03/19/2013 15:17:56 GEARHART, DANIEL
RF: NONE IMG: NONE

M E M O R A N D U M

DEPARTMENT OF ENVIRONMENTAL QUALITY
West Central Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Site Visit, Rōnile, Inc., VPDES Permit No. VA0076015

TO: Kip Foster

FROM: Lewis Pillis

DATE: May 29, 2013

COPIES: file

Yesterday, I visited the subject facility. Wade Thompson, Plant Superintendent, accompanied me. Rug dyeing equipment was seen and was not in use. A portion of the facility may be rented for warehouse space.

The outfall was viewed, but effluent was not visible since the river was turbid. Ronnie Jones, WWTP operator said that he had inspected the diffuser slots within the past year and they were all clear. I noted that this should be an annual practice that should be added to the O&M Manual. Weeds were high, so that the closed WWTP lagoon or the utility easement area could not be viewed. Mr. Jones stated that this lagoon had never been used. Storm water that fills this lagoon is pumped to the WWTP.

Outfall 004, storm water from the paved area around the wastewater plant enters the River just downstream of outfall 001. The conveyance ditch is concrete lined until it reaches the uppermost river bank. After this point, the earthen ditch begins to erode. It was noted that very large rock would be needed to slow water down enough to prevent further erosion. Sludge loading is adjacent to this ditch, but is covered and equipped with a trench drain that is routed to the WWTP. The drainage area includes a steep vegetated hillside.

Old equipment was being stored in a couple of previously unpermitted areas. One is in the employee parking lot. The other was a gravel area beside the warehouse, adjacent to the employee parking lot. This area drains to the vegetated utility easement. An area adjacent to the finished goods loading dock also contains old equipment. This equipment will be moved so that part of the manufacturing building can be rented.

Sawdust is used as fuel in the boiler. The unloading area is not covered, so that sawdust washes to a low place in the parking lot and runs into the easement area. Part of this area is bermed, but there is no berm where the sawdust collects. A spongy layer of sawdust stands at the fence line and into the vegetated area.

Previously, Roger McBride said they would divert storm water from the boiler and manufacturing areas so that they flowed to the same outfall location as 003. This has not been performed.

M E M O R A N D U M

DEPARTMENT OF ENVIRONMENTAL QUALITY
West Central Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Site Visit, Rōnile, Inc., VPDES Permit No. VA0076015

TO: Kip Foster

FROM: Lewis Pillis

DATE: June 14, 2013

COPIES: file

I visited the subject facility today to view the property line, with Wade Thompson, Plant Superintendent, along the Pigg River and storm water flow. It was decided that all storm water pipes, except the employee parking area, would be monitored at the pipe outlets. Drainage from the old equipment stored in the employee parking lot would be monitored as it enters the surface drain. Old equipment would not need to be moved and these outfalls would be included in the permit. None of these pipe outlets are at grade and localized eroded areas were visible at the pipe outlets. Outlet protection is needed at each outfall. Vegetation was present between all pipes and the River. Rip rap has been added in eroded spots in two of the drainage ways to the River, but is not being maintained.

There was evidence that sawdust has washed off the site into the easement. Vegetation was starting to grow on top of a layer of sawdust in the easement. Mr. Thompson mentioned a screening device may be built as a BMP for this area. Internet links to the DCR ESC handbook will be sent to the facility for reference. New outfall locations are:

Outfall	Description
006	15” pipe for warehouse roof drains, Southern part of site
007	15” pipe for manufacturing area roof drains, Southern part of site, east of 006
008	15” pipe for NE part of manufacturing area roof drains and southern half of dye house, Eastern part of site, N of fuel oil tank. OF032?
009	low area where sawdust washes off site [photos OF08, OF09]
010	15” pipe for northern half of roof of dye house and diesel boiler roof drain, Eastern part of site, N of 009 [photo OF35]
011	12” storm drain from yard drain adjacent to dye house, just N of 003 [photo OF36]
012	12” storm drain adjacent to warehouse and roadway across from E corner of warehouse, just N of 011 *Not shown on roof drain drawing*
013	concrete channel draining roadway on eastern part of warehouse, N of 012[photo OF37]
014	12” storm drain from yard drain adjacent to warehouse, just N of 013.
015	equipment storage area in employee parking lot, NE part of site

Roofs were not inspected and drain to outfalls 006, 007, 008, and 010. Drainage areas for 006, 007 and 008 appear to be similar and areas draining to 012, 013 and 014, the roadway to the east, appear to be similar.

Ronile Inc VA0076015 Data reported on DMRs

		Flow, MGD		pH	pH	O&G	Copper
		mo ave	max	min	max	mg/L	ug/L
2010	1	0.1	0.116	7.22	7.78	5	5
	2	0.105	0.138	7.4	7.78	5	5
	3	0.105	0.125	7	7.67	5	5
	4	0.093	0.143	7.02	7.4	<QL	<QL
	5	0.133	0.148	7.02	7.4	<QL	<QL
	6	0.105	0.155	6.82	7.12	<QL	6.1
	7	0.11	0.144	6.67	7.4	<QL	<QL
	8	0.1	0.134	7.02	7.33	<QL	6.4
	9	0.083	0.141	7.03	7.37	<QL	5.7
	10	0.103	0.147	7	7.41	<QL	<QL
	11	0.075	0.107	6.79	7.63	<QL	<QL
	12	0.093	0.107	7	7.58	<QL	5.2
2011	1	0.093	0.124	6.86	7.38	<QL	11
	2	0.081	0.107	6.86	7.33	<QL	<QL
	3	0.078	0.092	6.88	7.28	<QL	<QL
	4	0.086	0.092	6.7	7.42	<QL	<QL
	5	0.067	0.082	6.65	7.56	<QL	<QL
	6	0.065	0.073	6.6	7.36	<QL	8.7
	7	0.086	0.128	6.72	7.42	<QL	6
	8	0.088	0.099	6.77	7.28	<QL	5.7
	9	0.088	0.1	6.72	7.42	<QL	<QL
	10	0.084	0.118	6.72	7.28	<QL	<QL
	11	0.098	0.115	6.72	7.63	<QL	<QL
	12	0.099	0.127	6.65	7.56	<QL	<QL
2012	1	0.121	0.164	6.56	8.05	<QL	<QL
	2	**0.155**	0.17	6.58	8.25	<QL	<QL
	3	0.111	0.149	6.51	8.12	<QL	<QL
	4	0.109	0.159	6.51	8.61	<QL	<QL
	5	0.125	0.144	6.58	7.14	<QL	<QL
	6	0.113	0.141	6.58	7.14	<QL	<QL
	7	0.094	0.132	6.51	7.7	<QL	<QL
	8	0.077	0.107	6.72	7.87	<QL	<QL
	9	0.077	0.093	6.58	7.77	<QL	<QL
	10	0.072	0.101	6.58	7.26	<QL	<QL
	11	0.066	0.088	6.72	7.6	<QL	<QL
	12	0.067	0.105	6.79	7.7	<QL	<QL
2013	1	0.091	0.136	6.72	7.7	<QL	<QL
	2	0.097	0.133	6.79	7.72	<QL	<QL
	3	0.094	0.144	7.14	7.44	<QL	<QL
	4	0.132	0.144	7	7.67	<QL	<QL

long term ave 0.095

Ronile Inc VA0076015

Daily maximum pH data from daily logs

		number of days at given max pH														total days
		<7.4	**7.4**	8	8	8	7.8	7.9	8	8.1	8.2	8.3	8.4	8.5	8.6	
2012	4	12								2				1	1	16
	5	15														15
	6	19														19
	7	12	**6**			1										19
	8	21	**6**			1										28
	9	20					1									21
	10	20														20
	11	24			2											26
	12	16	**1**	1		1										19
2013	1	10	**6**	1		1										18
	2	12	**2**	1	3											18
	3	9	**10**													19
# days =>		190	31	3	5	4	1	0	0	2	0	0	0	1	1	238
			90%													

Ronile Inc VA0076015

DMR Data Federal Effluent Guideline parameters

		BOD, kg/D		BOD, mg/L		TSS, kg/D		TSS, mg/L		COD		Chromium, Total		PHENOLICS, TOTAL RECOVERABLE				SULFIDE, TOTAL (AS S)			
										kg/D	mg/L	kg/D	mg/L	kg/D	kg/D	mg/L	mg/L	kg/D	kg/D	mg/L	mg/L
		ave	max	ave	max	ave	max	ave	max					ave	max	ave	max	ave	max	ave	max
permit limit =>		*14.8*	*29.6*			*34*	*51*			*600/929*		*1.6/3.3*		*1.6*	*3.3*			*3.3*	*6.6*		
2010	1	2.7	3.4	7.1	9.5	1	2	2	5	76	192	<QL	0.011	0.01	0.01	0.01	0.01	<QL	<QL	<QL	<QL
	2	4.4	6.4	10.8	14	6	10	13	21	211	465	0.0173	0.038	0.0099	0.0099	0.0153	0.0153	0.0408	0.0454	0.1	0.1
	3	2.9	3.8	7.1	9.4	3	5	6	12	104	267	0.0113	0.029	0.0101	0.0101	0.0157	0.0157	0.0424	0.0462	0.1025	0.11
	4	1.6	2.8	3.7	6.3	2	3	4	6	459	1020	<QL	<QL	<QL	<QL	0.014	0.014	<QL	<QL	<QL	<QL
	5	2.6	3.2	4.9	5.8	4	4	7	8	683	1220	<QL	<QL	0.01	0.01	0.019	0.019	<QL	<QL	<QL	<QL
	6	1.6	2.6	3.7	4.7	1	2	3	5	98	178	<QL	0.044	<QL	<QL	0.012	0.12	<QL	<QL	<QL	<QL
	7	1.5	3.3	3.5	7.7	3	3	6	7	53	121	<QL	<QL	0.009	0.009	0.022	0.022	<QL	<QL	<QL	<QL
	8	0.6	1.2	1.5	3	1	2	3	4	53	127	<QL	<QL	0.008	0.008	0.019	0.019	<QL	<QL	<QL	<QL
	9	1.4	1.9	4.1	5.1	1	2	2	6	40	106	<QL	<QL	0.008	0.008	0.0019	0.0019	<QL	<QL	<QL	<QL
	10	0.5	1.2	1.4	3.4	0	0	0	0	22	71	<QL	<QL	0.006	0.006	0.018	0.018	<QL	<QL	<QL	<QL
	11	0.2	0.8	<QL	<QL	1	1	3	3	19	68	0.003	<QL	0.003	0.003	0.01	0.01	<QL	<QL	<QL	<QL
	12	2.9	7	8.9	20.3	1	1	1	4	61	162	0.008	0.022	0.004	0.004	0.01	0.01	<QL	<QL	<QL	<QL
2011	1	4.3	7	12.8	19.4	1	1	2	4	80	256	0.005	0.016	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL
	2	2.2	3.2	6.8	8.4	1	3	4	10	67	236	0.003	0.012	0.009	0.009	0.033	0.033	<QL	<QL	<QL	<QL
	3	1.6	3.1	5.1	9.6	1	2	5	9	32	109	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL
	4	1	1.6	3.2	4.9	1	1	2	3	18	54	0.009	0.028	0.006	0.006	0.018	0.018	<QL	<QL	<QL	<QL
	5	<QL	<QL	<QL	<QL	1	1	2	5	17	62	<QL	<QL	0.004	0.004	0.014	0.014	<QL	<QL	<QL	<QL
	6	<QL	<QL	<QL	<QL	0.3	1	1.3	3.5	19	72	<QL	<QL	0.006	0.006	0.025	0.025	<QL	<QL	<QL	<QL
	7	1.2	1.6	3.6	5.1	<QL	<QL	<QL	<QL	39	128	<QL	<QL	0.014	0.014	0.045	0.055	<QL	<QL	<QL	<QL
	8	<QL	<QL	<QL	<QL	1	1.4	2.9	4.2	23	69	<QL	<QL	0.006	0.009	0.017	0.023	<QL	<QL	<QL	<QL
	9	<QL	<QL	<QL	<QL	1.8	3	5	8.6	24	71	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL
	10	<QL	<QL	<QL	<QL	1.1	2.1	3.3	4.9	26	65	<QL	<QL	0.004	0.004	0.011	0.012	<QL	<QL	<QL	<QL
	11	<QL	<QL	<QL	<QL	2.6	5	6.5	11.6	31	72	<QL	<QL	0.01	0.01	0.027	0.045	<QL	<QL	<QL	<QL
	12	2	2.3	4.9	5.2	1.1	1.2	2.7	2.7	39	101	<QL	<QL	0.01	0.011	0.025	0.029	<QL	<QL	<QL	<QL
2012	1	1.8	3	3.3	5.5	0.4	1.3	0.8	2.5	57	113	<QL	<QL	0.008	0.009	0.015	0.017	<QL	<QL	<QL	<QL
	2	2.9	3.2	5	5.6	0.4	2	0.7	3.7	19	33	<QL	<QL	0.011	0.013	0.02	0.022	<QL	<QL	<QL	<QL
	3	<QL	<QL	<QL	<QL	2.7	3.6	5	6.3	53	98	<QL	<QL	0.014	0.018	0.03	0.033	<QL	<QL	<QL	<QL
	4	4.5	6	8.2	10.8	11.5	30	21	54	33	69	<QL	<QL	0.005	0.008	0.014	0.017	<QL	<QL	<QL	<QL
	5	1.5	2.6	2.8	5	2.3	3.4	4.4	6.2	42	77	<QL	<QL	0.004	0.007	0.008	0.012	<QL	<QL	<QL	<QL
	6	<QL	<QL	<QL	<QL	2.5	5.9	4.7	11.3	49	89	<QL	<QL	0.008	0.01	0.015	0.019	<QL	<QL	<QL	<QL
	7	3	5.3	7	12.7	0.8	2.3	1.8	5.4	46	93	<QL	<QL	0.013	0.023	0.3	0.61	<QL	<QL	<QL	<QL
	8	1.3	2	3.8	5.4	0.9	1.6	2.5	4.1	27	72	<QL	<QL	0.011	0.023	0.03	0.06	<QL	<QL	<QL	<QL
	9	1.7	2.7	4.3	6.8	<QL	<QL	<QL	<QL	46	117	<QL	<QL	0.003	0.004	0.01	0.011	<QL	<QL	<QL	<QL
	10	<QL	<QL	<QL	<QL	0.7	1.3	1.9	3.9	24	69	<QL	<QL	0.038	0.047	0.113	0.14	<QL	<QL	<QL	<QL
	11	1.4	1.7	4.3	5.1	0.2	0.8	0.6	2.5	26	98	<QL	<QL	0.008	0.01	0.028	0.038	<QL	<QL	<QL	<QL
	12	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL	73	220	<QL	<QL	0.021	0.021	0.064	0.071	<QL	<QL	<QL	<QL
2013	1	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL	62	152	<QL	<QL	0.003	0.005	0.009	0.012	<QL	<QL	<QL	<QL
	2	2.2	2.5	4.7	5.1	12.7	35.9	26.8	72.5	95	191	<QL	<QL	0.042	0.109	0.085	0.22	<QL	<QL	<QL	<QL
	3	2.9	3.3	6.4	7.4	0.5	2.1	1.2	4.6	80	174	<QL	<QL	0.08	0.094	0.16	0.19	<QL	<QL	<QL	<QL

Ronile Inc VA0076015

Data reported on DMRs

		ZINC, TOTAL RECOVERABLE ug/L
2012	10	inc
	11	230
	12	210
2013	1	150
	2	160
	3	240
	4	180

APPENDIX B

RECEIVING WATERS INFORMATION

Flow Frequency Memo
STOReT Data

M E M O R A N D U M

DEPARTMENT OF ENVIRONMENTAL QUALITY
West Central Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Flow Frequency Determination, Rōnile, Inc. WWTP
VPDES Permit No. VA0076015

TO: File

FROM: Lewis Pillis

DATE: April 29, 2013

COPIES:

Critical flows for the gages used in preparing the referenced permit have changed since development of the last permit. In 2011, USGS calculated low flows from the gages previously used. These gage flows were used to find resulting critical flows at the Ronile facility and then averaged. The two gages used previously are:

Blackwater River gage # 02056900 at Rocky Mount
Pigg River gage # 02058400 near Sandy Level

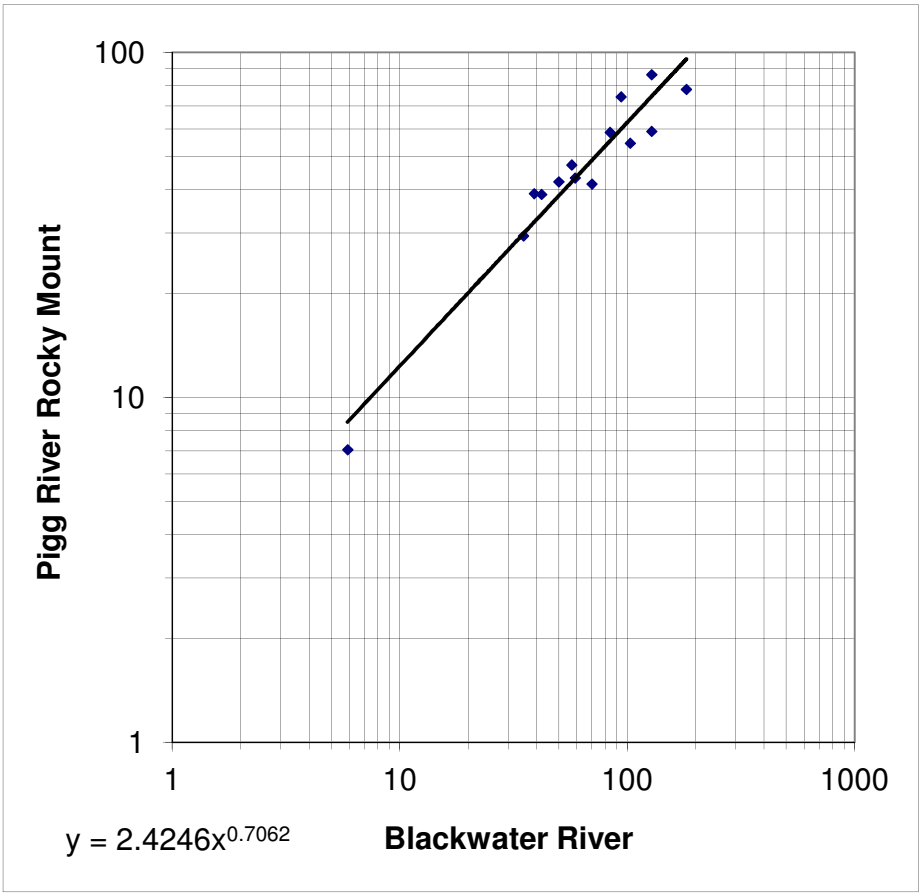
The Surface Water Investigations Office in Charlottesville performed 14 site specific flow measurements on the Pigg River, near Ronile at Latitude 36 59'02", Longitude 79 52'52", NAD 83, between 1993 and 2005. Mean daily flows, on the same days, at the gages above were found in the USGS web-interface. The same correlation, using standard Agency regression analysis in 2008 was maintained and new critical flows determined at Ronile were calculated by inserting each gage's critical flows into the relationship [regression equation] and then averaged. Regression curves are shown on the following pages.

Critical flows at the Ronile outfall 001 on the Pigg River are determined to be:

	cfs in 2008;	cfs in 2011	MGD in 2008;	MGD in 2011
1Q10	8.96	9.42	5.79	6.1
7Q10	10.0	10.5	6.49	6.8
30Q5	18.1	18.4	11.7	11.9
30Q10	14.2	14.8	9.2	9.5
HF 1Q10	25.2	*	16.3	*
HF 7Q10	28.1	*	18.1	*
Harmonic Mean	41.9	*	27.1	*

High flow months are Jan – May
* Flow not recalculated by USGS

Pigg River above Ronile STP, at Rocky Mount, VA #02057650
vs Blackwater River near Rocky Mount, VA #02056900



Flow Data (cfs)

Date	Blackwatr	Pigg RM
9/1/1993	39	39
6/22/1994	57	47.2
11/9/1994	50	42.2
11/19/1996	128	86.3
5/22/1997	94	74.4
6/24/1997	84	58.7
9/17/1997	35	29.4
8/17/1999	5.9	7.06
7/8/2004	70	41.6
7/29/2004	59	43.3
8/26/2004	42	38.8
9/21/2004	128	59.1
11/1/2004	103	54.6
12/8/2004	182	78.2

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.985115
R Square	0.970452
Adjusted R Square	0.965527
Standard Error	4.66325
Observations	14

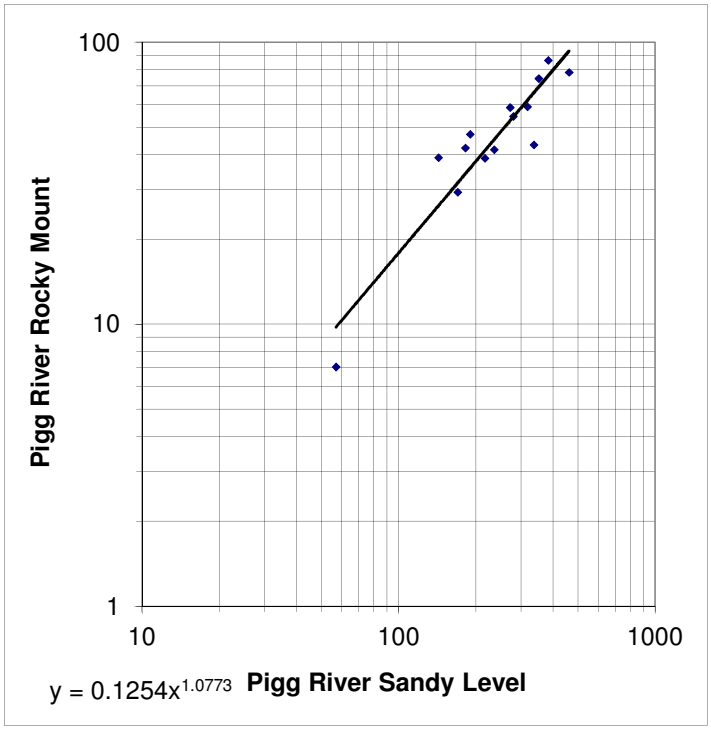
Flow Frequencies (cfs)

Blackwatr		Pigg RM
8.4	1Q10	10.898
9.8	7Q10	12.152
22	30Q5	21.511
32	HF 1Q10	28.027
38	HF 7Q10	31.643
61	HM	44.202
16	30Q10	17.179
115 mi2	DA	68.8 mi2
	Jan-May	
85	4/25/2008	55.872

2011 USGS flow frequencies (cfs)

Blackwatr		Pigg RM
8.84	1Q10	11.299
10.3	7Q10	12.587
22.1	30Q5	21.580
32	HF 1Q10	28.027
38	HF 7Q10	31.643
61	HM	44.202
17	30Q10	17.930
115 mi2	DA	68.8 mi2
	Jan-May	

Pigg River above Ronile STP, at Rocky Mount, VA #02057650
vs Pigg River near Sandy Level, VA #02058400



Flow Data (cfs)

Date	Pigg SL	Pigg RM
9/1/1993	143	39
6/22/1994	190	47.2
11/9/1994	182	42.2
11/19/1996	383	86.3
5/22/1997	352	74.4
6/24/1997	272	58.7
9/17/1997	170	29.4
8/17/1999	57	7.06
7/8/2004	236	41.6
7/29/2004	337	43.3
8/26/2004	217	38.8
9/21/2004	318	59.1
11/1/2004	280	54.6
12/8/2004	462	78.2

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.977322
R Square	0.955159
Adjusted R Square	0.947686
Standard Error	5.744595
Observations	8

Flow Frequencies (cfs)

Pigg SL		Pigg RM
42	1Q10	7.031
47	7Q10	7.937
83	30Q5	14.646
123	HF 1Q10	22.374
134	HF 7Q10	24.537
209	HM	39.609
65	30Q10	11.255
350 mi2	DA	68.8 mi2
	Jan-May	
353	4/25/2008	69.665
	date cross section was measured	

2008 FLOWS:

Blackwater Pigg RM	Ave, cfs	Ave, MGD
10.898	8.964798	5.79
12.152	10.04438	6.49
21.511	18.07848	11.68
28.027	25.20074	16.29
31.643	28.09038	18.15
44.202	41.90528	27.08
17.179	14.21688	9.19

River/Diffuser measurements made on 4/25/8 by Roger McBride of Ronile:

flow at Pigg River gage was 353 cfs on 4/25/8
flow at Blackwater River gage was 85 cfs on 4/25/8

Average of calculated flows at Ronile = (86.659+64.559)/2
75.609 cfs
48.8661 MGD

2011 USGS Flow Frequencies (cfs)

Pigg SL		Pigg RM
44.8	1Q10	7.537
49.9	7Q10	8.466
86.4	30Q5	15.293
123	HF 1Q10	22.374
134	HF 7Q10	24.537
209	HM	39.609
66.7	30Q10	11.573
350 mi2	DA	68.8 mi2
	Jan-May	

Blackwater/ Pigg RM	Ave, cfs	Ave, MGD	% change
11.2986	9.417981	6.09	5.06%
12.58652	10.5261	6.80	4.80%
21.57992	18.43666	11.92	1.98%
28.02703	25.20074	16.29	0.00%
31.64341	28.09038	18.15	0.00%
44.20181	41.90528	27.08	0.00%
17.93012	14.75132	9.53	3.76%

2011 USGS gage flows shown in italics

Pigg River Data Upstream of Ronile

Station ID 4APGG057.85

Collection Date Time	Temp Celcius	Field pH		Date	Temp C	Date	Field pH
02/27/2007 11:30	6.1	7.4	1	08/14/2007 1	23.5	04/05/2007 :	7.5
04/05/2007 12:00	12.5	7.5	2	08/07/2008 1	22.7	02/27/2007 :	7.4
06/05/2007 12:00	19.2	5.9	3	06/02/2008 1	21.6	02/05/2008 :	7.2
08/14/2007 14:00	23.5	6.1	4	06/05/2007 1	19.2	10/09/2008 :	7.2
10/02/2007 12:00	15.2	6.1	5	10/09/2008 1	16.8	08/07/2008 :	7.1
12/05/2007 12:00	3.4	6.6	6	10/02/2007 1	15.2	12/16/2008 :	7
02/05/2008 12:00	9.3	7.2	7	04/05/2007 1	12.5	12/05/2007 :	6.6
04/07/2008 12:30	10.4	6.6	8	04/07/2008 1	10.4	04/07/2008 :	6.6
06/02/2008 12:30	21.6	6.5	9	02/05/2008 1	9.3	06/02/2008 :	6.5
08/07/2008 13:00	22.7	7.1	10	12/16/2008 1	8.1	08/14/2007 :	6.1
10/09/2008 14:00	16.8	7.2	11	02/27/2007 1	6.1	10/02/2007 :	6.1
12/16/2008 11:00	8.1	7	12	12/05/2007 1	3.4	06/05/2007 :	5.9

PIGG RIVER DATA
Station 4APGG057.84 upstream of Ronile

Collection_Date_Time = 2002-06-25 12:15:00.0

	Value	
ALUMINUM AL,DISS UG/L	10.6	--
ANTIMONY SB,DISS UG/L	0.1	Material Analyzed for, but not detected. Value stored is the limit of detection.
ARSENIC AS,DISS UG/L	0.28	--
BARIUM BA,DISS UG/L	19	--
BERYLIUM BE,DISS UG/L	0.1	Material Analyzed for, but not detected. Value stored is the limit of detection.
CADMIUM CD,DISS UG/L	0.1	Material Analyzed for, but not detected. Value stored is the limit of detection.
CALCIUM CA,DISS MG/L	9.2	--
CHROMIUM CR,DISS UG/L	0.12	--
COPPER CU,DISS UG/L	0.68	--
IRON FE,DISS UG/L	144	--
LEAD PB,DISS UG/L	0.1	Material Analyzed for, but not detected. Value stored is the limit of detection.
MANGNESE MN,DISS UG/L	28	--
MGNSIUM MG,DISS MG/L	4.8	--
NICKEL NI,DISS UG/L	0.38	--
SELENIUM SE,DISS UG/L	0.5	Material Analyzed for, but not detected. Value stored is the limit of detection.
SILVER AG,DISS UG/L	0.1	Material Analyzed for, but not detected. Value stored is the limit of detection.
THALLIUM TL,DISS UG/L	0.2	Material Analyzed for, but not detected. Value stored is the limit of detection.
ZINC ZN,DISS UG/L	2.55	--

APPENDIX C

PERMIT LIMIT DEVELOPMENT

Waste Load Allocation Spreadsheet
STATS printouts

Ronile Inc. VA0076015

Federal Effluent Guidelines - 40 CFR Part 410, Subpart G, NSPS

Parameter	Effluent Guidelines Average (kg/Kkg)	Effluent Guidelines Maximum (kg/Kkg)	Effluent Limit Average (kg/day)	Effluent Limit' Maximum (kg/day)	Equivalent concentration at max 30 day ave flow & average loading limit (mg/L)	Equivalent concentration at max 30 day ave flow & maximum loading limit (mg/L)
BOD_5	1.9	3.6	30.78	58.32		
COD	21.9	33.9	354.78	549.18		
TSS	4.4	9.8	71.28	158.76		
Sulfide	0.12	0.24	1.94	3.89	3.3	6.6
Phenols	0.06	0.12	0.97	1.94	1.7	3.3
Total Chromium	0.06	0.12	0.97	1.94	1.7	3.3
pH	6.0 - 9.0 at all times					

Notes:
1. Production rate from form 2C

Average Daily Production (kkg) = 16.2

7/9/2013 4:10:57 PM

Facility = Ronile inc
Chemical = zinc
Chronic averaging period = 4
WLAa   = 141
WLAc   = 544
Q.L.   = 10
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 7
Expected Value = 182.857
Variance   = 12037.2
C.V.   = 0.6
97th percentile daily values = 444.967
97th percentile 4 day average = 304.235
97th percentile 30 day average= 220.535
< Q.L.   = 0
Model used   = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit   = 141
Average Weekly limit = 141
Average Monthly LImit = 141

The data are:

110
230
210
150
160
240
180

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Ronile Inc 001 CORMIX DILUTIONS Permit No.: VA0076015

Receiving Stream: Pigg River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		
Mean Hardness (as CaCO3) =	113	mg/L
90% Temperature (Annual) =	22.7	deg C
90% Temperature (Wet season) =	22.7	deg C
90% Maximum pH =	7.4	SU
10% Maximum pH =	6.1	SU
Tier Designation (1 or 2) =	2	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows		
1Q10 (Annual) =	6	MGD
7Q10 (Annual) =	18.5	MGD
30Q10 (Annual) =	25	MGD
1Q10 (Wet season) =	6	MGD
30Q10 (Wet season)	18.5	MGD
30Q5 =	25	MGD
Harmonic Mean =	25	MGD

Mixing Information		
Annual - 1Q10 Mix =	100	%
- 7Q10 Mix =	100	%
- 30Q10 Mix =	100	%
Wet Season - 1Q10 Mix =	100	%
- 30Q10 Mix =	100	%

Effluent Information		
Mean Hardness (as CaCO3) =	130	mg/L
90% Temp (Annual) =	28	deg C
90% Temp (Wet season) =	18	deg C
90% Maximum pH =	7.4	SU
10% Maximum pH =	7	SU
Discharge Flow =	1	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	2.6E+04	--	--	na	9.9E+01	--	--	na	2.6E+03	**--**	**--**	**na**	**2.6E+03**
Acrolein	0	--	--	na	9.3E+00	--	--	na	2.4E+02	--	--	na	9.3E-01	--	--	na	2.4E+01	**--**	**--**	**na**	**2.4E+01**
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	6.5E+01	--	--	na	2.5E-01	--	--	na	6.5E+00	**--**	**--**	**na**	**6.5E+00**
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	2.1E+01	--	na	1.3E-02	7.5E-01	--	na	5.0E-05	5.3E+00	--	na	1.3E-03	**5.3E+00**	**--**	**na**	**1.3E-03**
Ammonia-N (mg/l) (Yearly)	0	2.30E+01	2.76E+00	na	--	1.61E+02	7.17E+01	na	--	5.74E+00	6.89E-01	na	--	4.02E+01	1.79E+01	na	--	**4.02E+01**	**1.79E+01**	**na**	**--**
Ammonia-N (mg/l) (High Flow)	0	2.30E+01	2.84E+00	na	--	1.61E+02	5.53E+01	na	--	5.74E+00	7.09E-01	na	--	4.02E+01	1.38E+01	na	--	**4.02E+01**	**1.38E+01**	**na**	**--**
Anthracene	0	--	--	na	4.0E+04	--	--	na	1.0E+06	--	--	na	4.0E+03	--	--	na	1.0E+05	**--**	**--**	**na**	**1.0E+05**
Antimony	0	--	--	na	6.4E+02	--	--	na	1.7E+04	--	--	na	6.4E+01	--	--	na	1.7E+03	**--**	**--**	**na**	**1.7E+03**
Arsenic	0.28	3.4E+02	1.5E+02	na	--	2.4E+03	2.9E+03	na	--	8.5E+01	3.8E+01	na	--	5.9E+02	7.3E+02	na	--	**5.9E+02**	**7.3E+02**	**na**	**--**
Barium	19	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	1.3E+04	--	--	na	5.1E+01	--	--	na	1.3E+03	**--**	**--**	**na**	**1.3E+03**
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	5.2E-02	--	--	na	2.0E-04	--	--	na	5.2E-03	**--**	**--**	**na**	**5.2E-03**
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	4.7E+00	--	--	na	1.8E-02	--	--	na	4.7E-01	**--**	**--**	**na**	**4.7E-01**
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	4.7E+00	--	--	na	1.8E-02	--	--	na	4.7E-01	**--**	**--**	**na**	**4.7E-01**
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	4.7E+00	--	--	na	1.8E-02	--	--	na	4.7E-01	**--**	**--**	**na**	**4.7E-01**
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	4.7E+00	--	--	na	1.8E-02	--	--	na	4.7E-01	**--**	**--**	**na**	**4.7E-01**
Bis2-Chloroethyl Ether [C]	0	--	--	na	5.3E+00	--	--	na	1.4E+02	--	--	na	5.3E-01	--	--	na	1.4E+01	**--**	**--**	**na**	**1.4E+01**
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	1.7E+06	--	--	na	6.5E+03	--	--	na	1.7E+05	**--**	**--**	**na**	**1.7E+05**
Bis 2-Ethylhexyl Phthalate [C]	0	--	--	na	2.2E+01	--	--	na	5.7E+02	--	--	na	2.2E+00	--	--	na	5.7E+01	**--**	**--**	**na**	**5.7E+01**
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	3.6E+04	--	--	na	1.4E+02	--	--	na	3.6E+03	**--**	**--**	**na**	**3.6E+03**
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	4.9E+04	--	--	na	1.9E+02	--	--	na	4.9E+03	**--**	**--**	**na**	**4.9E+03**
Cadmium	0	4.6E+00	1.3E+00	na	--	3.2E+01	2.4E+01	na	--	1.2E+00	3.1E-01	na	--	8.1E+00	6.1E+00	na	--	**8.1E+00**	**6.1E+00**	**na**	**--**
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	4.2E+02	--	--	na	1.6E+00	--	--	na	4.2E+01	**--**	**--**	**na**	**4.2E+01**
Chlordane [C]	0	2.4E+00	4.3E-03	na	8.1E-03	1.7E+01	8.4E-02	na	2.1E-01	6.0E-01	1.1E-03	na	8.1E-04	4.2E+00	2.1E-02	na	2.1E-02	**4.2E+00**	**2.1E-02**	**na**	**2.1E-02**
Chloride	0	8.6E+05	2.3E+05	na	--	6.0E+06	4.5E+06	na	--	2.2E+05	5.8E+04	na	--	1.5E+06	1.1E+06	na	--	**1.5E+06**	**1.1E+06**	**na**	**--**
TRC	0	1.9E+01	1.1E+01	na	--	1.3E+02	2.1E+02	na	--	4.8E+00	2.8E+00	na	--	3.3E+01	5.4E+01	na	--	**3.3E+01**	**5.4E+01**	**na**	**--**
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	4.2E+04	--	--	na	1.6E+02	--	--	na	4.2E+03	**--**	**--**	**na**	**4.2E+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	3.4E+03	--	--	na	1.3E+01	--	--	na	3.4E+02	**--**	**--**	**na**	**3.4E+02**
Chloroform	0	--	--	na	1.1E+04	--	--	na	2.9E+05	--	--	na	1.1E+03	--	--	na	2.9E+04	**--**	**--**	**na**	**2.9E+04**
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	4.2E+04	--	--	na	1.6E+02	--	--	na	4.2E+03	**--**	**--**	**na**	**4.2E+03**
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	3.9E+03	--	--	na	1.5E+01	--	--	na	3.9E+02	**--**	**--**	**na**	**3.9E+02**
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	5.8E-01	8.0E-01	na	--	2.1E-02	1.0E-02	na	--	1.5E-01	2.0E-01	na	--	**1.5E-01**	**2.0E-01**	**na**	**--**
Chromium III	0.12	6.4E+02	8.2E+01	na	--	4.5E+03	1.6E+03	na	--	1.6E+02	2.1E+01	na	--	1.1E+03	4.0E+02	na	--	**1.1E+03**	**4.0E+02**	**na**	**--**
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.1E+02	2.1E+02	na	--	4.0E+00	2.8E+00	na	--	2.8E+01	5.4E+01	na	--	**2.8E+01**	**5.4E+01**	**na**	**--**
Chromium, Total	0.12	--	--	1.0E+02	--	--	--	na	--	--	--	1.0E+01	--	--	--	2.6E+02	--	**--**	**--**	**na**	**--**
Chrysene [C]	0	--	--	na	1.8E-02	--	--	na	4.7E-01	--	--	na	1.8E-03	--	--	na	4.7E-02	**--**	**--**	**na**	**4.7E-02**
Copper	0.68	1.5E+01	1.0E+01	na	--	1.0E+02	1.8E+02	na	--	4.4E+00	3.0E+00	na	--	2.6E+01	4.6E+01	na	--	**2.6E+01**	**4.6E+01**	**na**	**--**
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	1.5E+02	1.0E+02	na	4.2E+05	5.5E+00	1.3E+00	na	1.6E+03	3.9E+01	2.5E+01	na	4.2E+04	**3.9E+01**	**2.5E+01**	**na**	**4.2E+04**
DDD [C]	0	--	--	na	3.1E-03	--	--	na	8.1E-02	--	--	na	3.1E-04	--	--	na	8.1E-03	**--**	**--**	**na**	**8.1E-03**
DDE [C]	0	--	--	na	2.2E-03	--	--	na	5.7E-02	--	--	na	2.2E-04	--	--	na	5.7E-03	**--**	**--**	**na**	**5.7E-03**
DDT [C]	0	1.1E+00	1.0E-03	na	2.2E-03	7.7E+00	2.0E-02	na	5.7E-02	2.8E-01	2.5E-04	na	2.2E-04	1.9E+00	4.9E-03	na	5.7E-03	**1.9E+00**	**4.9E-03**	**na**	**5.7E-03**
Demeton	0	--	1.0E-01	na	--	--	2.0E+00	na	--	--	2.5E-02	na	--	--	4.9E-01	na	--	**--**	**4.9E-01**	**na**	**--**
Diazinon	0	1.7E-01	1.7E-01	na	--	1.2E+00	3.3E+00	na	--	4.3E-02	4.3E-02	na	--	3.0E-01	8.3E-01	na	--	**3.0E-01**	**8.3E-01**	**na**	**--**
Dibenz(a,h)anthracene [C]	0	--	--	na	1.8E-01	--	--	na	4.7E+00	--	--	na	1.8E-02	--	--	na	4.7E-01	**--**	**--**	**na**	**4.7E-01**
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	3.4E+04	--	--	na	1.3E+02	--	--	na	3.4E+03	**--**	**--**	**na**	**3.4E+03**
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	2.5E+04	--	--	na	9.6E+01	--	--	na	2.5E+03	**--**	**--**	**na**	**2.5E+03**
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	4.9E+03	--	--	na	1.9E+01	--	--	na	4.9E+02	**--**	**--**	**na**	**4.9E+02**
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	7.3E+00	--	--	na	2.8E-02	--	--	na	7.3E-01	**--**	**--**	**na**	**7.3E-01**
Dichlorobromomethane [C]	0	--	--	na	1.7E+02	--	--	na	4.4E+03	--	--	na	1.7E+01	--	--	na	4.4E+02	**--**	**--**	**na**	**4.4E+02**
1,2-Dichloroethane [C]	0	--	--	na	3.7E+02	--	--	na	9.6E+03	--	--	na	3.7E+01	--	--	na	9.6E+02	**--**	**--**	**na**	**9.6E+02**
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	1.8E+05	--	--	na	7.1E+02	--	--	na	1.8E+04	**--**	**--**	**na**	**1.8E+04**
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	2.6E+05	--	--	na	1.0E+03	--	--	na	2.6E+04	**--**	**--**	**na**	**2.6E+04**
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	7.5E+03	--	--	na	2.9E+01	--	--	na	7.5E+02	**--**	**--**	**na**	**7.5E+02**
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	3.9E+03	--	--	na	1.5E+01	--	--	na	3.9E+02	**--**	**--**	**na**	**3.9E+02**
1,3-Dichloropropene [C]	0	--	--	na	2.1E+02	--	--	na	5.5E+03	--	--	na	2.1E+01	--	--	na	5.5E+02	**--**	**--**	**na**	**5.5E+02**
Dieldrin [C]	0	2.4E-01	5.6E-02	na	5.4E-04	1.7E+00	1.1E+00	na	1.4E-02	6.0E-02	1.4E-02	na	5.4E-05	4.2E-01	2.7E-01	na	1.4E-03	**4.2E-01**	**2.7E-01**	**na**	**1.4E-03**
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	1.1E+06	--	--	na	4.4E+03	--	--	na	1.1E+05	**--**	**--**	**na**	**1.1E+05**
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	2.2E+04	--	--	na	8.5E+01	--	--	na	2.2E+03	**--**	**--**	**na**	**2.2E+03**
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	2.9E+07	--	--	na	1.1E+05	--	--	na	2.9E+06	**--**	**--**	**na**	**2.9E+06**
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	1.2E+05	--	--	na	4.5E+02	--	--	na	1.2E+04	**--**	**--**	**na**	**1.2E+04**
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	1.4E+05	--	--	na	5.3E+02	--	--	na	1.4E+04	**--**	**--**	**na**	**1.4E+04**
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	7.3E+03	--	--	na	2.8E+01	--	--	na	7.3E+02	**--**	**--**	**na**	**7.3E+02**
2,4-Dinitrotoluene [C]	0	--	--	na	3.4E+01	--	--	na	8.8E+02	--	--	na	3.4E+00	--	--	na	8.8E+01	**--**	**--**	**na**	**8.8E+01**
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	1.3E-06	--	--	na	5.1E-09	--	--	na	1.3E-07	**--**	**--**	**na**	**1.3E-07**
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	5.2E+01	--	--	na	2.0E-01	--	--	na	5.2E+00	**--**	**--**	**na**	**5.2E+00**
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	1.5E+00	1.1E+00	na	2.3E+03	5.5E-02	1.4E-02	na	8.9E+00	3.9E-01	2.7E-01	na	2.3E+02	**3.9E-01**	**2.7E-01**	**na**	**2.3E+02**
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	1.5E+00	1.1E+00	na	2.3E+03	5.5E-02	1.4E-02	na	8.9E+00	3.9E-01	2.7E-01	na	2.3E+02	**3.9E-01**	**2.7E-01**	**na**	**2.3E+02**
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	1.5E+00	1.1E+00	--	--	5.5E-02	1.4E-02	--	--	3.9E-01	2.7E-01	--	--	**3.9E-01**	**2.7E-01**	**--**	**--**
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	2.3E+03	--	--	na	8.9E+00	--	--	na	2.3E+02	**--**	**--**	**na**	**2.3E+02**
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	6.0E-01	7.0E-01	na	1.6E+00	2.2E-02	9.0E-03	na	6.0E-03	1.5E-01	1.8E-01	na	1.6E-01	**1.5E-01**	**1.8E-01**	**na**	**1.6E-01**
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	7.8E+00	--	--	na	3.0E-02	--	--	na	7.8E-01	**--**	**--**	**na**	**7.8E-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	5.5E+04	--	--	na	2.1E+02	--	--	na	5.5E+03	**--**	**--**	**na**	**5.5E+03**
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	3.6E+03	--	--	na	1.4E+01	--	--	na	3.6E+02	**--**	**--**	**na**	**3.6E+02**
Fluorene	0	--	--	na	5.3E+03	--	--	na	1.4E+05	--	--	na	5.3E+02	--	--	na	1.4E+04	**--**	**--**	**na**	**1.4E+04**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Guthion	0	--	1.0E-02	na	--	--	2.0E-01	na	--	--	2.5E-03	na	--	--	4.9E-02	na	--	**--**	**4.9E-02**	**na**	**--**
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	3.6E+00	7.4E-02	na	2.1E-02	1.3E-01	9.5E-04	na	7.9E-05	9.1E-01	1.9E-02	na	2.1E-03	**9.1E-01**	**1.9E-02**	**na**	**2.1E-03**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	3.6E+00	7.4E-02	na	1.0E-02	1.3E-01	9.5E-04	na	3.9E-05	9.1E-01	1.9E-02	na	1.0E-03	**9.1E-01**	**1.9E-02**	**na**	**1.0E-03**
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	7.5E-02	--	--	na	2.9E-04	--	--	na	7.5E-03	**--**	**--**	**na**	**7.5E-03**
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	4.7E+03	--	--	na	1.8E+01	--	--	na	4.7E+02	**--**	**--**	**na**	**4.7E+02**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	1.3E+00	--	--	na	4.9E-03	--	--	na	1.3E-01	**--**	**--**	**na**	**1.3E-01**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	4.4E+00	--	--	na	1.7E-02	--	--	na	4.4E-01	**--**	**--**	**na**	**4.4E-01**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	1.8E+00	6.7E+00	--	na	4.7E+01	2.4E-01	--	na	1.8E-01	1.7E+00	--	na	4.7E+00	**1.7E+00**	**--**	**na**	**4.7E+00**
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	2.9E+04	--	--	na	1.1E+02	--	--	na	2.9E+03	**--**	**--**	**na**	**2.9E+03**
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	8.6E+02	--	--	na	3.3E+00	--	--	na	8.6E+01	**--**	**--**	**na**	**8.6E+01**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	3.9E+01	na	--	--	5.0E-01	na	--	--	9.8E+00	na	--	**--**	**9.8E+00**	**na**	**--**
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	4.7E+00	--	--	na	1.8E-02	--	--	na	4.7E-01	**--**	**--**	**na**	**4.7E-01**
Iron	144	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	2.5E+05	--	--	na	9.6E+02	--	--	na	2.5E+04	**--**	**--**	**na**	**2.5E+04**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	**--**	**0.0E+00**	**na**	**--**
Lead	0	1.4E+02	1.6E+01	na	--	1.0E+03	3.1E+02	na	--	3.6E+01	4.0E+00	na	--	2.5E+02	7.8E+01	na	--	**2.5E+02**	**7.8E+01**	**na**	**--**
Malathion	0	--	1.0E-01	na	--	--	2.0E+00	na	--	--	2.5E-02	na	--	--	4.9E-01	na	--	**--**	**4.9E-01**	**na**	**--**
Manganese	28	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Mercury	0	1.4E+00	7.7E-01	- -	- -	9.8E+00	1.5E+01	- -	- -	3.5E-01	1.9E-01	- -	--	2.5E+00	3.8E+00	- -	--	**2.5E+00**	**3.8E+00**	**- -**	**- -**
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	3.9E+04	--	--	na	1.5E+02	--	--	na	3.9E+03	**--**	**--**	**na**	**3.9E+03**
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	1.5E+05	--	--	na	5.9E+02	--	--	na	1.5E+04	**--**	**--**	**na**	**1.5E+04**
Methoxychlor	0	--	3.0E-02	na	--	--	5.9E-01	na	--	--	7.5E-03	na	--	--	1.5E-01	na	--	**--**	**1.5E-01**	**na**	**--**
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	**--**	**0.0E+00**	**na**	**--**
Nickel	0.38	2.1E+02	2.3E+01	na	4.6E+03	1.4E+03	4.3E+02	na	1.2E+05	5.2E+01	5.9E+00	na	4.6E+02	3.6E+02	1.1E+02	na	1.2E+04	**3.6E+02**	**1.1E+02**	**na**	**1.2E+04**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	1.8E+04	--	--	na	6.9E+01	--	--	na	1.8E+03	**--**	**--**	**na**	**1.8E+03**
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	7.8E+02	--	--	na	3.0E+00	--	--	na	7.8E+01	**--**	**--**	**na**	**7.8E+01**
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	1.6E+03	--	--	na	6.0E+00	--	--	na	1.6E+02	**--**	**--**	**na**	**1.6E+02**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	1.3E+02	--	--	na	5.1E-01	--	--	na	1.3E+01	**--**	**--**	**na**	**1.3E+01**
Nonylphenol	0	2.8E+01	6.6E+00	--	--	2.0E+02	1.3E+02	na	--	7.0E+00	1.7E+00	--	--	4.9E+01	3.2E+01	--	--	**4.9E+01**	**3.2E+01**	**na**	**--**
Parathion	0	6.5E-02	1.3E-02	na	--	4.6E-01	2.5E-01	na	--	1.6E-02	3.3E-03	na	--	1.1E-01	6.3E-02	na	--	**1.1E-01**	**6.3E-02**	**na**	**--**
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	2.7E-01	na	1.7E-02	--	3.5E-03	na	6.4E-05	--	6.8E-02	na	1.7E-03	**--**	**6.8E-02**	**na**	**1.7E-03**
Pentachlorophenol [C]	0	3.7E+00	2.8E+00	na	3.0E+01	2.6E+01	5.4E+01	na	7.8E+02	9.4E-01	6.9E-01	na	3.0E+00	6.5E+00	1.3E+01	na	7.8E+01	**6.5E+00**	**1.3E+01**	**na**	**7.8E+01**
Phenol	0	--	--	na	8.6E+05	--	--	na	2.2E+07	--	--	na	8.6E+04	--	--	na	2.2E+06	**--**	**--**	**na**	**2.2E+06**
Pyrene	0	--	--	na	4.0E+03	--	--	na	1.0E+05	--	--	na	4.0E+02	--	--	na	1.0E+04	**--**	**--**	**na**	**1.0E+04**
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Beta and Photon Activity (mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	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	1.4E+02	9.8E+01	na	1.1E+05	5.0E+00	1.3E+00	na	4.2E+02	3.5E+01	2.4E+01	na	1.1E+04	**3.5E+01**	**2.4E+01**	**na**	**1.1E+04**
Silver	0	4.4E+00	--	na	--	3.1E+01	--	na	--	1.1E+00	--	na	--	7.7E+00	--	na	--	**7.7E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	1.0E+03	--	--	na	4.0E+00	--	--	na	1.0E+02	**--**	**--**	**na**	**1.0E+02**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	8.6E+02	--	--	na	3.3E+00	--	--	na	8.6E+01	**--**	**--**	**na**	**8.6E+01**
Thallium	0	--	--	na	4.7E-01	--	--	na	1.2E+01	--	--	na	4.7E-02	--	--	na	1.2E+00	**--**	**--**	**na**	**1.2E+00**
Toluene	0	--	--	na	6.0E+03	--	--	na	1.6E+05	--	--	na	6.0E+02	--	--	na	1.6E+04	**--**	**--**	**na**	**1.6E+04**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	5.1E+00	3.9E-03	na	7.3E-02	1.8E-01	5.0E-05	na	2.8E-04	1.3E+00	9.8E-04	na	7.3E-03	**1.3E+00**	**9.8E-04**	**na**	**7.3E-03**
Tributyltin	0	4.6E-01	7.2E-02	na	--	3.2E+00	1.4E+00	na	--	1.2E-01	1.8E-02	na	--	8.1E-01	3.5E-01	na	--	**8.1E-01**	**3.5E-01**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	1.8E+03	--	--	na	7.0E+00	--	--	na	1.8E+02	**--**	**--**	**na**	**1.8E+02**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	4.2E+03	--	--	na	1.6E+01	--	--	na	4.2E+02	**--**	**--**	**na**	**4.2E+02**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	7.8E+03	--	--	na	3.0E+01	--	--	na	7.8E+02	**--**	**--**	**na**	**7.8E+02**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	6.2E+02	--	--	na	2.4E+00	--	--	na	6.2E+01	**--**	**--**	**na**	**6.2E+01**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	6.2E+02	--	--	na	2.4E+00	--	--	na	6.2E+01	**--**	**--**	**na**	**6.2E+01**
Zinc	2.55	1.3E+02	1.3E+02	na	2.6E+04	9.1E+02	2.5E+03	na	6.8E+05	3.5E+01	3.5E+01	na	2.6E+03	2.3E+02	6.3E+02	na	6.8E+04	**2.3E+02**	**6.3E+02**	**na**	**6.8E+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	1.7E+03
Arsenic	2.4E+02
Barium	na
Cadmium	3.2E+00
Chromium III	2.4E+02
Chromium VI	1.1E+01
Copper	1.1E+01
Iron	na
Lead	4.7E+01
Manganese	na
Mercury	9.8E-01
Nickel	6.5E+01
Selenium	1.4E+01
Silver	3.1E+00
Zinc	9.2E+01

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

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
West Central Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: CORMIX Model Results, Ronile, Inc., Rocky Mount, Franklin County
VPDES Permit Number: VA0076015

TO: Kip Foster

FROM: Lewis Pillis

DATE: June 9, 2008

COPIES: file

Ronile recently replaced their diffuser with a different arrangement. CORMIX modeling was used to determine whether estimated dilution using the new port arrangement will change. The Technical Support Document for Water Quality-based Toxics Control, EPA/505/2-90-001, March 1991, [TSD] is currently used by DEQ to evaluate mixing zones. Decision criteria from page 72 of the TSD are used to determine dilution in the zone of initial dilution [ZID], or acute mixing zone. In this case, the critical dimension to prevent acute affects to aquatic organisms, is 10% of the regulatory mixing zone in any direction, which calculates to 0.53 meters.

Ronile measured the diffuser and river depth on April 25, 2008. The River measured 39.3 ft wide with a maximum depth of 4.6 ft. Gage flows on this date were obtained. Using the same regression analysis as in flow frequency determination, the flow of the Pigg River at the outfall on that day was determined to be 75.61 cfs [48.9 MGD]. According to the USGS web site this is about average flow for April 25th. Based on these measurement, the cross sectional area of the river at the diffuser is estimated to be 105 ft^2. The River bottom has an obtuse parabolic shape.

Since the diffuser at Ronile has two different sized ports, the average diffuser port effective diameter was determined by dividing the total diffuser port area by the number of ports and assuming a circular port shape. There are two 6 in^2 ports and three 18 in^2 ports for a total of 66 in^2, or an average port area of 13.2 in^2. The diameter of a 13.2 in^2 port would be 4.1 inches. This is used as the effective diameter [0.1041 meters].

Results from CORMIX runs at acute conditions, show that dilution at 0.53 meters downstream varies depending on the river width and depth used. An acute dilution of 7.0 resulted when the following inputs were used:

1Q10 = 5.8 MGD [0.223 m^3/s]
river width = 35 ft [10.67 m]
local river depth = 3 ft [0.914 m]
average river depth = 2.7 ft [0.823 m]
height of diffuser off bottom = .2m
river temp = 25C, effluent temp = 25.6C

Separate model runs at 7Q10 were used to estimate dilution under chronic conditions. Under chronic conditions, the critical factor is the maximum width of the plume which should not exceed half of the River's width. Dilution is evaluated when the "half-width" of the CORMIX plume is equal to 35/2 or 17.5 feet (5.33 meters). Dilution of 19.5:1 occurs when the 7Q10 = 6.5 MGD and the river dimensions are the same as above.

An attempt was made to calculate critical River dimensions using flow frequency and the measured River dimensions and known gage flow. Although, the calculated cross sectional area compares favorably with area calculated using the V-shape formula in ESC handbook p. V-133 of 91.87 ft^2 , width or depth at low flows still cannot be estimated mathematically. Output from the CORMIX model depended more on River width and depth, than other model variables.

CORMIX -- CORNELL MIXING ZONE EXPERT SYSTEM -- Version 3.00-3.20

SITE Name Ronile Date:
Design CASE Prepared by:
DOS FILE NAME (w/o extension)

AMBIENT DATA:

Water body is bounded/unbounded
Water body depth .87-1.0 m — If bounded: Width 7.6-9.1 m
Depth at discharge same m — Appearance 1/2/3
1Q10 If steady: Ambient flowrate .2541 m^3/s or: Ambient velocity m/s

If tidal: Tidal period hr — Max. tidal velocity m/s
At time hr before/at/after slack: — Tidal velocity at this time m/s

Manning's n .035-0.045 .04 or: Darcy-Weisbach f
Wind speed m/s

Density data:

UNITS: Density...kg/m^3 / Temperature...°C
Water body is fresh/salt water — If fresh: Specify as density/temp. values
If uniform: — Average density/temp. 25

If stratified: — Density/temp. at surface
Stratification type A/B/C — Density/temp. at bottom
If B/C: Pycnocline height m — If C: Density/temp. jump

DISCHARGE DATA: Specify **geometry** for CORMIX1 or 2 or 3

SUBMERGED SINGLE PORT DISCHARGE -- CORMIX1

Nearest bank is on left/right — Distance to nearest bank 3.317 m
Vertical angle THETA ° — Horizontal angle SIGMA °
Port diameter effective .1041 m or: Port area m^2
Port height .2 m

SUBMERGED MULTIPORT DIFFUSER DISCHARGE -- CORMIX2

Nearest bank is on left/right — Distance to one endpoint 3.317 m
Diffuser length 1.5621 m — to other endpoint 4.879 m
Total number of openings 5 m — Port height 0.2 m
Port diameter .1041 m with contraction ratio 1.0
Diffuser arrangement/type unidirectional / staged / alternating or vertical
Alignment angle GAMMA 90 ° — Horizontal angle SIGMA 0 °
Vertical angle THETA 0 ° — Relative orientation BETA 90 °

BUOYANT SURFACE DISCHARGE -- CORMIX3

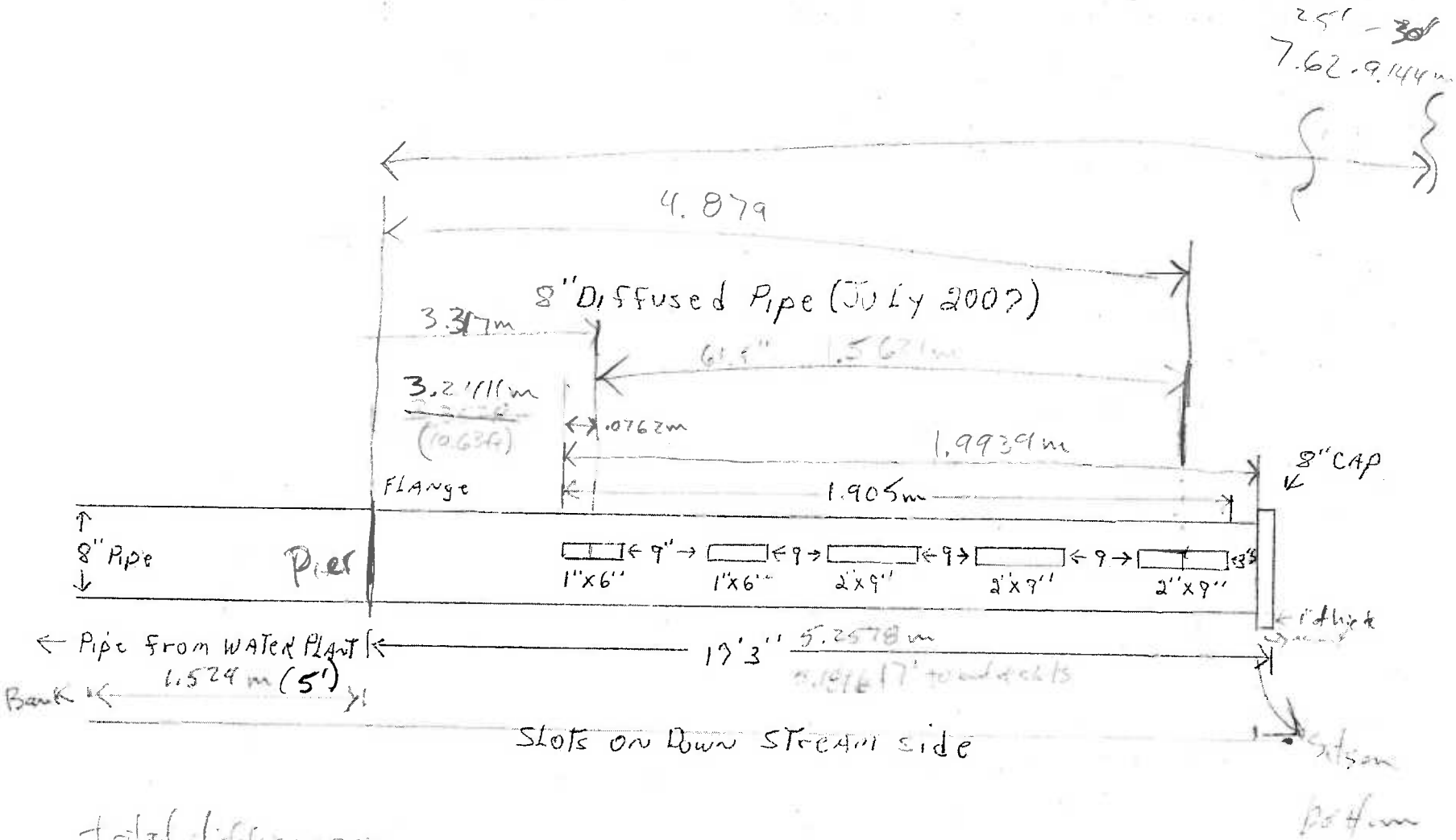
Discharge located on left/right bank — Configuration flush/protruding/co-flowing
Horizontal angle SIGMA ° — If protruding: Dist. from bank m
Depth at discharge m — Bottom slope °
If rectangular Width m or: If circular Diameter m
discharge channel: Depth m — pipe: Bottom invert depth m

Effluent: Flow rate 0.006538 m^3/s or: Effluent velocity m/s
Effluent density kg/m^3 or: Effluent temperature 25.6 °C
Heated discharge? yes/no — If yes: Heat loss coefficient W/m^2,°C
Concentration units — Effluent concentration
Conservative substance? yes/no — If no: Decay coefficient /day

MIXING ZONE DATA:

Is effluent toxic? yes/no — If yes: CMC CCC
WQ stand./conventional poll.? yes/no — If yes: value of standard
Any mixing zone specified? yes/no — If yes: distance m or width % or m
or area % or m^2

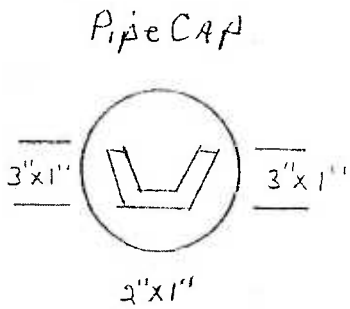
Region of interest m — Grid intervals for display



total diffusers area:

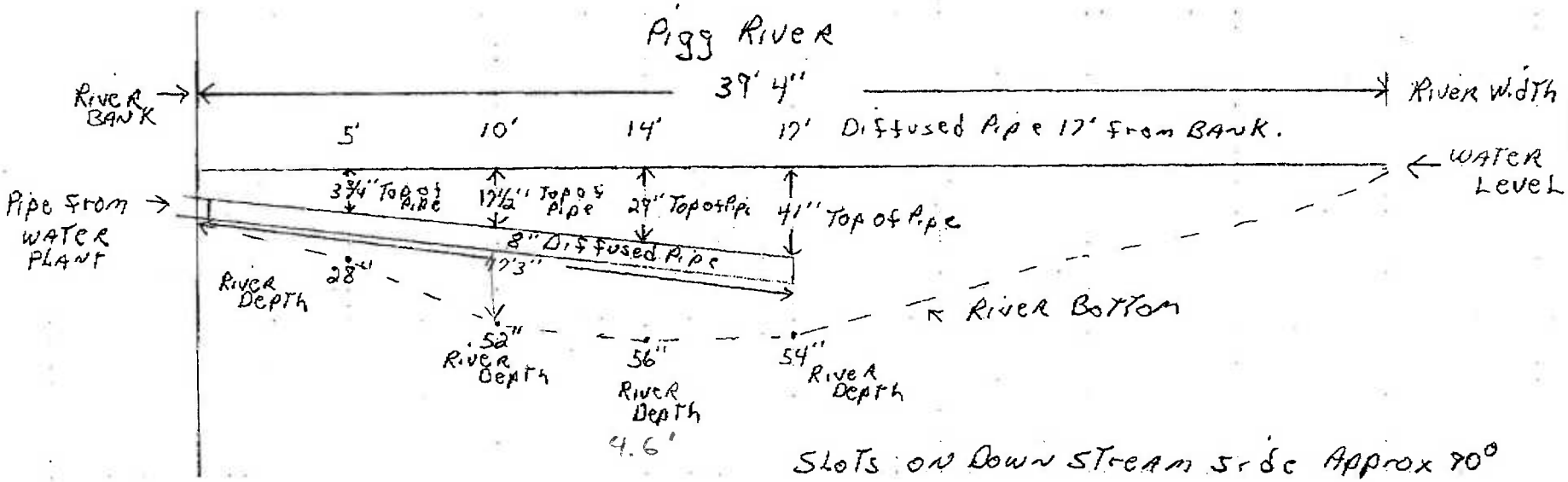
6 in²
6 in²
18 in²
18 in²
18 in²

66 in² = .04258 m²



RSMc
7-17-07

Ronile Inc.



Slots on Down Stream side Approx 70°

height above bottom

ave depth 52 − (17½ + 8) = 26.5

56 − (29 + 8) = 19"

54 − (41 + 8) = 5"

ave 16.8" (0.42672 m)

Ronile Inc
5-1-08
Roger McBride
measured 4/25/08

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CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORNELL MIXING ZONE EXPERT SYSTEM
Subsystem CORMIX2:                                          Subsystem version:
 Submerged Multiport Diffuser Discharges    CORMIX_v.3.20_____September_1996
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          Ronile
 Design case:              revised_1Q10_5.8_MGD
 FILE NAME:                cormix\sim\RONILE22.cx2
 Time of Fortran run:      06/09/08--13:32:28

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =      10.67  AS    =       8.75  QA    =        .25  ICHREG= 1
 HA    =        .82  HD    =        .91
 UA    =       .029  F     =       .134 USTAR = .3760E-02
 UW    =      2.000 UWSTAR= .2198E-02
 Uniform density environment
 STRCND=  U          RHOAM =  997.0455

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= unidirectional_perpendicular
 BANK  =  LEFT       DISTB =       4.10  YB1   =       3.32  YB2   =       4.88
 LD    =      1.56  NOPEN =    5        SPAC  =        .39
 D0    =       .104 A0    =       .009 H0    =        .20
 Nozzle/port arrangement:   unidirectional_without_fanning
 GAMMA =     90.00  THETA =        .00  SIGMA =        .00  BETA  =      90.00
 U0    =       .153 Q0    =       .007       = .6528E-02
 RHO0  =  996.8900  DRHO0 = .1555E+00  GP0   = .1529E-02
 C0    = .1000E+03  CUNITS=  %
 IPOLL =  1         KS    = .0000E+00  KD    = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    = .4179E-02  m0    = .6410E-03  j0    = .6390E-05  SIGNJ0=       1.0
 Associated 2-d length scales (meters)
 lQ=B  =       .027 lM    =      1.86  lm    =        .76
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    = .6528E-02  M0    = .1001E-02  J0    = .9981E-05
 Associated 3-d length scales (meters)
 LQ    =       .21  LM    =      1.78  Lm    =      1.09  Lb    =        .41
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =     23.75  FRD0  =     12.15  R     =      5.28
 (slot)             (port/nozzle)

FLOW CLASSIFICATION
 2222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU2    2
 2  Applicable layer depth HS =      .91  2
 2222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    = .1000E+03  CUNITS=  %
 NTOX  =  0
 NSTD  =  0
 REGMZ =  0
 XINT  =   2000.00  XMAX  =   2000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
         4.10 m  from the LEFT  bank/shore.
```

X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

BEGIN MOD201: DIFFUSER DISCHARGE MODULE

Due to complex near-field motions: EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

Profile definitions:
BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
BH = top-hat half-width, in horizontal plane normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.20	1.0	.100E+03	.02	.78

END OF MOD201: DIFFUSER DISCHARGE MODULE

BEGIN MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER

In this laterally contracting zone the diffuser plume becomes VERTICALLY FULLY MIXED over the entire layer depth (HS = .91m).
Full mixing is achieved after a plume distance of about five layer depths from the diffuser.

Profile definitions:
BV = layer depth (vertically mixed)
BH = top-hat half-width, in horizontal plane normal to trajectory
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.20	1.0	.100E+03	.02	.78
.02	.00	.21	2.0	.491E+02	.02	.77
.03	.00	.21	2.5	.406E+02	.04	.76
.05	.00	.22	2.8	.358E+02	.05	.76
.06	.00	.22	3.1	.325E+02	.07	.75
.08	.00	.23	3.3	.301E+02	.09	.74
.09	.00	.23	3.5	.283E+02	.11	.74
.11	.00	.24	3.7	.267E+02	.13	.73
.12	.00	.24	3.9	.254E+02	.15	.72
.14	.00	.25	4.1	.243E+02	.16	.72
.16	.00	.25	4.3	.234E+02	.18	.71
.17	.00	.26	4.4	.225E+02	.20	.71
.19	.00	.26	4.6	.218E+02	.22	.70
.20	.00	.27	4.7	.211E+02	.24	.70
.22	.00	.27	4.9	.205E+02	.25	.69
.23	.00	.28	5.0	.199E+02	.27	.69
.25	.00	.28	5.1	.194E+02	.29	.69
.27	.00	.29	5.3	.190E+02	.31	.68
.28	.00	.29	5.4	.185E+02	.33	.68
.30	.00	.30	5.5	.181E+02	.35	.68
.31	.00	.30	5.6	.177E+02	.36	.67
.33	.00	.31	5.8	.174E+02	.38	.67
.34	.00	.31	5.9	.171E+02	.40	.67
.36	.00	.32	6.0	.167E+02	.42	.66
.37	.00	.32	6.1	.165E+02	.44	.66
.39	.00	.33	6.2	.162E+02	.46	.66
.41	.00	.33	6.3	.159E+02	.47	.66
.42	.00	.34	6.4	.157E+02	.49	.65
.44	.00	.34	6.5	.154E+02	.51	.65
.45	.00	.35	6.6	.152E+02	.53	.65
.47	.00	.35	6.7	.150E+02	.55	.65
.48	.00	.36	6.8	.148E+02	.56	.64

.50	.00	.36	6.9	.146E+02	.58	.64
.52	.00	.37	7.0	.144E+02	.60	.64
.53	.00	.37	7.0	.142E+02	.62	.64
.55	.00	.38	7.1	.140E+02	.64	.64
.56	.00	.38	7.2	.139E+02	.66	.64
.58	.00	.39	7.3	.137E+02	.67	.64
.59	.00	.39	7.4	.135E+02	.69	.64
.61	.00	.40	7.5	.134E+02	.71	.63
.62	.00	.40	7.6	.132E+02	.73	.63
.64	.00	.41	7.6	.131E+02	.75	.63
.66	.00	.41	7.7	.130E+02	.76	.63
.67	.00	.42	7.8	.128E+02	.78	.63
.69	.00	.42	7.9	.127E+02	.80	.63
.70	.00	.43	8.0	.126E+02	.82	.63
.72	.00	.43	8.0	.125E+02	.84	.63
.73	.00	.44	8.1	.123E+02	.86	.63
.75	.00	.44	8.2	.122E+02	.87	.63
.77	.00	.45	8.3	.121E+02	.89	.63
.78	.00	.46	8.3	.120E+02	.91	.63

Cumulative travel time = 16. sec

END OF MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER

BEGIN MOD251: DIFFUSER PLUME IN CO-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

This flow region is INSIGNIFICANT in spatial extent and will be by-passed.

END OF MOD251: DIFFUSER PLUME IN CO-FLOW

** End of NEAR-FIELD REGION (NFR) **

The initial plume WIDTH values in the next far-field module will be
CORRECTED by a factor 1.59 to conserve the mass flux in the far-field!
The correction factor is quite large because of the small ambient velocity
relative to the strong mixing characteristics of the discharge!
This indicates localized RECIRCULATION REGIONS and internal hydraulic JUMPS.

BEGIN MOD241: BUOYANT AMBIENT SPREADING

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
.78	.00	.91	8.3	.120E+02	.91	1.00	.91	.00
1.10	.00	.91	8.5	.117E+02	.85	1.10	.91	.06
1.42	.00	.91	8.7	.115E+02	.80	1.19	.91	.11
1.73	.00	.91	8.9	.113E+02	.76	1.28	.91	.15
2.05	.00	.91	9.0	.111E+02	.73	1.36	.91	.18
2.37	.00	.91	9.2	.109E+02	.70	1.44	.91	.21
2.68	.00	.91	9.3	.107E+02	.67	1.52	.91	.24
3.00	.00	.91	9.5	.106E+02	.65	1.60	.91	.26
3.32	.00	.91	9.6	.104E+02	.63	1.68	.91	.28
3.64	.00	.91	9.7	.103E+02	.61	1.75	.91	.30
3.95	.00	.91	9.9	.101E+02	.59	1.83	.91	.32

4.27	.00	.91	10.0	.100E+02	.58	1.90	.91	.33
4.59	.00	.91	10.1	.989E+01	.56	1.97	.91	.35
4.91	.00	.91	10.2	.977E+01	.55	2.04	.91	.36
5.22	.00	.91	10.4	.966E+01	.54	2.10	.91	.37
5.54	.00	.91	10.5	.955E+01	.53	2.17	.91	.38
5.86	.00	.91	10.6	.944E+01	.52	2.24	.91	.39
6.17	.00	.91	10.7	.933E+01	.51	2.30	.91	.40
6.49	.00	.91	10.8	.923E+01	.50	2.36	.91	.41
6.81	.00	.91	11.0	.913E+01	.49	2.43	.91	.42
7.13	.00	.91	11.1	.903E+01	.49	2.49	.91	.42
7.44	.00	.91	11.2	.893E+01	.48	2.55	.91	.43
7.76	.00	.91	11.3	.883E+01	.48	2.61	.91	.43
8.08	.00	.91	11.4	.874E+01	.47	2.67	.91	.44
8.39	.00	.91	11.6	.864E+01	.46	2.73	.91	.45
8.71	.00	.91	11.7	.855E+01	.46	2.79	.91	.45
9.03	.00	.91	11.8	.846E+01	.46	2.85	.91	.45
9.35	.00	.91	12.0	.836E+01	.45	2.90	.91	.46
9.66	.00	.91	12.1	.827E+01	.45	2.96	.91	.46
9.98	.00	.91	12.2	.818E+01	.44	3.02	.91	.47
10.30	.00	.91	12.4	.809E+01	.44	3.07	.91	.47
10.62	.00	.91	12.5	.800E+01	.44	3.13	.91	.47
10.93	.00	.91	12.6	.792E+01	.43	3.18	.91	.48
11.25	.00	.91	12.8	.783E+01	.43	3.24	.91	.48
11.57	.00	.91	12.9	.774E+01	.43	3.29	.91	.48
11.88	.00	.91	13.1	.765E+01	.43	3.34	.91	.48
12.20	.00	.91	13.2	.757E+01	.43	3.40	.91	.48
12.52	.00	.91	13.4	.748E+01	.42	3.45	.91	.49
12.84	.00	.91	13.5	.740E+01	.42	3.50	.91	.49
13.15	.00	.91	13.7	.731E+01	.42	3.55	.91	.49
13.47	.00	.91	13.8	.723E+01	.42	3.60	.91	.49
13.79	.00	.91	14.0	.715E+01	.42	3.66	.91	.49
14.10	.00	.91	14.2	.706E+01	.42	3.71	.91	.49
14.42	.00	.91	14.3	.698E+01	.42	3.76	.91	.49
14.74	.00	.91	14.5	.690E+01	.42	3.81	.91	.49
15.06	.00	.91	14.7	.682E+01	.42	3.86	.91	.49
15.37	.00	.91	14.8	.674E+01	.42	3.91	.91	.49
15.69	.00	.91	15.0	.666E+01	.42	3.95	.91	.49
16.01	.00	.91	15.2	.658E+01	.42	4.00	.91	.49
16.33	.00	.91	15.4	.650E+01	.42	4.05	.91	.49
16.64	.00	.91	15.6	.642E+01	.42	4.10	.91	.49

Cumulative travel time = 549. sec

Plume is ATTACHED to LEFT bank/shore.
Plume width is now determined from LEFT bank/shore.

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
16.64	4.10	.91	15.6	.642E+01	.42	8.20	.91	.49
16.99	4.10	.91	15.8	.635E+01	.42	8.25	.91	.49
17.35	4.10	.91	15.9	.627E+01	.42	8.30	.91	.49
17.70	4.10	.91	16.1	.620E+01	.42	8.35	.91	.49
18.05	4.10	.91	16.3	.613E+01	.43	8.41	.91	.48
18.40	4.10	.91	16.5	.605E+01	.43	8.46	.91	.48
18.75	4.10	.91	16.7	.598E+01	.43	8.51	.91	.48
19.11	4.10	.91	16.9	.591E+01	.43	8.56	.91	.48
19.46	4.10	.91	17.1	.584E+01	.44	8.62	.91	.47
19.81	4.10	.91	17.3	.577E+01	.44	8.67	.91	.47
20.16	4.10	.91	17.5	.571E+01	.44	8.72	.91	.47
20.51	4.10	.91	17.7	.564E+01	.44	8.77	.91	.47
20.87	4.10	.91	17.9	.557E+01	.45	8.82	.91	.46
21.22	4.10	.91	18.1	.551E+01	.45	8.87	.91	.46
21.57	4.10	.91	18.4	.545E+01	.45	8.92	.91	.46
21.92	4.10	.91	18.6	.538E+01	.45	8.97	.91	.46
22.28	4.10	.91	18.8	.532E+01	.46	9.02	.91	.45
22.63	4.10	.91	19.0	.526E+01	.46	9.08	.91	.45

22.98	4.10	.91	19.2	.520E+01	.46	9.13	.91	.45
23.33	4.10	.91	19.5	.514E+01	.46	9.18	.91	.45
23.68	4.10	.91	19.7	.508E+01	.47	9.23	.91	.44
24.04	4.10	.91	19.9	.502E+01	.47	9.28	.91	.44
24.39	4.10	.91	20.2	.496E+01	.47	9.33	.91	.44
24.74	4.10	.91	20.4	.491E+01	.48	9.38	.91	.43
25.09	4.10	.91	20.6	.485E+01	.48	9.42	.91	.43
25.44	4.10	.91	20.9	.479E+01	.48	9.47	.91	.43
25.80	4.10	.91	21.1	.474E+01	.49	9.52	.91	.42
26.15	4.10	.91	21.3	.468E+01	.49	9.57	.91	.42
26.50	4.10	.91	21.6	.463E+01	.49	9.62	.91	.42
26.85	4.10	.91	21.8	.458E+01	.49	9.67	.91	.42
27.20	4.10	.91	22.1	.453E+01	.50	9.72	.91	.41
27.56	4.10	.91	22.3	.448E+01	.50	9.77	.91	.41
27.91	4.10	.91	22.6	.443E+01	.50	9.82	.91	.41
28.26	4.10	.91	22.9	.438E+01	.51	9.87	.91	.40
28.61	4.10	.91	23.1	.433E+01	.51	9.91	.91	.40
28.96	4.10	.91	23.4	.428E+01	.51	9.96	.91	.40
29.32	4.10	.91	23.6	.423E+01	.52	10.01	.91	.39
29.67	4.10	.91	23.9	.418E+01	.52	10.06	.91	.39
30.02	4.10	.91	24.2	.414E+01	.52	10.11	.91	.39
30.37	4.10	.91	24.4	.409E+01	.53	10.15	.91	.38
30.72	4.10	.91	24.7	.405E+01	.53	10.20	.91	.38
31.08	4.10	.91	25.0	.400E+01	.53	10.25	.91	.38
31.43	4.10	.91	25.3	.396E+01	.54	10.30	.91	.37
31.78	4.10	.91	25.6	.391E+01	.54	10.34	.91	.37
32.13	4.10	.91	25.8	.387E+01	.54	10.39	.91	.37
32.48	4.10	.91	26.1	.383E+01	.55	10.44	.91	.36
32.84	4.10	.91	26.4	.379E+01	.55	10.48	.91	.36
33.19	4.10	.91	26.7	.374E+01	.56	10.53	.91	.35
33.54	4.10	.91	27.0	.370E+01	.56	10.58	.91	.35
33.89	4.10	.91	27.3	.366E+01	.56	10.62	.91	.35
34.24	4.10	.91	27.6	.362E+01	.57	10.67	.91	.34

Cumulative travel time = 1140. sec
Plume is LATERALLY FULLY MIXED at the end of the buoyant spreading regime.

END OF MOD241: BUOYANT AMBIENT SPREADING

Bottom coordinate for FAR-FIELD is determined by average depth, ZFB = .09m

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BEGIN MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

Vertical diffusivity (initial value) = .728E-03 m^2/s
Horizontal diffusivity (initial value) = .909E-03 m^2/s

Profile definitions:
BV = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
= or equal to layer depth, if fully mixed
BH = Gaussian s.d.*sqrt(pi/2) (46%) half-width,
measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
34.24	4.10	.91	27.6	.362E+01	.57	10.67	.91	.34

Plume interacts with BOTTOM.
The passive diffusion plume becomes VERTICALLY FULLY MIXED within this prediction interval.

73.56	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09

Effluent is FULLY MIXED over the entire channel cross-section.
Except for possible far-field decay or reaction processes, there are NO FURTHER CHANGES with downstream direction.

112.87	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09

152.19	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
191.50	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
230.82	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
270.13	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
309.45	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
348.76	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
388.08	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
427.39	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
466.71	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
506.03	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
545.34	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
584.66	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
623.97	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
663.29	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
702.60	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
741.92	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
781.23	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
820.55	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
859.86	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
899.18	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
938.49	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
977.81	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1017.12	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1056.44	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1095.75	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1135.07	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1174.38	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1213.70	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1253.01	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1292.33	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1331.64	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1370.96	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1410.27	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1449.59	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1488.90	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1528.22	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1567.53	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1606.85	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1646.16	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1685.48	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1724.80	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1764.11	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1803.43	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1842.74	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1882.06	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1921.37	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
1960.69	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09
2000.00	4.10	.91	39.9	.250E+01	.82	10.67	.91	.09

Cumulative travel time = 67131. sec

Simulation limit based on maximum specified distance = 2000.00 m.
This is the REGION OF INTEREST limitation.

END OF MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

CORMIX2: Submerged Multiport Diffuser Discharges End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222

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CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORNELL MIXING ZONE EXPERT SYSTEM
Subsystem CORMIX2:                                          Subsystem version:
 Submerged Multiport Diffuser Discharges    CORMIX_v.3.20_____September_1996
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          Ronile
 Design case:              7Q10_6.5_MGD
 FILE NAME:                cormix\sim\ronile24.cx2
 Time of Fortran run:      06/09/08--13:41:40

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS     =      10.67  AS     =       8.75  QA     =        .28  ICHREG= 1
 HA     =        .82  HD     =        .91
 UA     =       .033  F      =       .134 USTAR = .4214E-02
 UW     =      2.000 UWSTAR= .2198E-02
 Uniform density environment
 STRCND=  U          RHOAM =  997.0455

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= unidirectional_perpendicular
 BANK   =  LEFT      DISTB =       4.10  YB1    =       3.32  YB2    =       4.88
 LD     =      1.56  NOPEN =    5        SPAC   =        .39
 D0     =      .104  A0     =       .009 H0     =        .25
 Nozzle/port arrangement:   unidirectional_without_fanning
 GAMMA =      90.00  THETA =        .00  SIGMA =        .00  BETA   =      90.00
 U0     =       .153  Q0     =       .007        = .6528E-02
 RHO0   =  996.8900  DRHO0 = .1555E+00  GP0    = .1529E-02
 C0     = .1000E+03  CUNITS=  %
 IPOLL =  1          KS     = .0000E+00  KD     = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0     = .4179E-02  m0     = .6410E-03  j0     = .6390E-05  SIGNJ0=       1.0
 Associated 2-d length scales (meters)
 lQ=B   =       .027 lM     =      1.86  lm     =        .60
 lmp    =  99999.00  lbp    =  99999.00  la     =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0     = .6528E-02  M0     = .1001E-02  J0     = .9981E-05
 Associated 3-d length scales (meters)
 LQ     =       .21  LM     =      1.78  Lm     =        .97  Lb     =        .29
                                          Lmp    =  99999.00  Lbp    =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0    =      23.75  FRD0   =     12.15  R      =       4.71
 (slot)               (port/nozzle)

FLOW CLASSIFICATION
 2222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MU2    2
 2  Applicable layer depth HS =       .91  2
 2222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0     = .1000E+03  CUNITS=  %
 NTOX   =  0
 NSTD   =  0
 REGMZ  =  0
 XINT   =   2000.00  XMAX   =   2000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
         4.10 m  from the LEFT  bank/shore.
```

X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

BEGIN MOD201: DIFFUSER DISCHARGE MODULE

Due to complex near-field motions: EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

Profile definitions:
BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
BH = top-hat half-width, in horizontal plane normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.25	1.0	.100E+03	.02	.78

END OF MOD201: DIFFUSER DISCHARGE MODULE

BEGIN MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER

In this laterally contracting zone the diffuser plume becomes VERTICALLY FULLY MIXED over the entire layer depth (HS = .91m).
Full mixing is achieved after a plume distance of about five layer depths from the diffuser.

Profile definitions:
BV = layer depth (vertically mixed)
BH = top-hat half-width, in horizontal plane normal to trajectory
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.25	1.0	.100E+03	.02	.78
.02	.00	.25	2.1	.471E+02	.02	.77
.03	.00	.26	2.6	.386E+02	.04	.77
.05	.00	.26	2.9	.339E+02	.05	.76
.06	.00	.27	3.2	.308E+02	.07	.75
.08	.00	.27	3.5	.284E+02	.09	.75
.09	.00	.27	3.8	.266E+02	.11	.74
.11	.00	.28	4.0	.252E+02	.13	.73
.12	.00	.28	4.2	.239E+02	.15	.73
.14	.00	.29	4.4	.229E+02	.16	.72
.16	.00	.29	4.6	.219E+02	.18	.72
.17	.00	.30	4.7	.211E+02	.20	.72
.19	.00	.30	4.9	.204E+02	.22	.71
.20	.00	.30	5.1	.198E+02	.24	.71
.22	.00	.31	5.2	.192E+02	.25	.70
.23	.00	.31	5.4	.187E+02	.27	.70
.25	.00	.32	5.5	.182E+02	.29	.70
.27	.00	.32	5.6	.177E+02	.31	.69
.28	.00	.32	5.8	.173E+02	.33	.69
.30	.00	.33	5.9	.169E+02	.35	.69
.31	.00	.33	6.0	.166E+02	.36	.68
.33	.00	.34	6.2	.162E+02	.38	.68
.34	.00	.34	6.3	.159E+02	.40	.68
.36	.00	.34	6.4	.156E+02	.42	.68
.37	.00	.35	6.5	.154E+02	.44	.67
.39	.00	.35	6.6	.151E+02	.46	.67
.41	.00	.36	6.7	.148E+02	.47	.67
.42	.00	.36	6.8	.146E+02	.49	.67
.44	.00	.36	7.0	.144E+02	.51	.67
.45	.00	.37	7.1	.142E+02	.53	.66
.47	.00	.37	7.2	.140E+02	.55	.66
.48	.00	.38	7.3	.138E+02	.56	.66

.50	.00	.38	7.4	.136E+02	.58	.66
.52	.00	.39	7.5	.134E+02	.60	.66
.53	.00	.39	7.6	.132E+02	.62	.66
.55	.00	.39	7.7	.131E+02	.64	.65
.56	.00	.40	7.7	.129E+02	.66	.65
.58	.00	.40	7.8	.128E+02	.67	.65
.59	.00	.41	7.9	.126E+02	.69	.65
.61	.00	.41	8.0	.125E+02	.71	.65
.62	.00	.41	8.1	.123E+02	.73	.65
.64	.00	.42	8.2	.122E+02	.75	.65
.66	.00	.42	8.3	.121E+02	.76	.65
.67	.00	.43	8.4	.119E+02	.78	.65
.69	.00	.43	8.5	.118E+02	.80	.65
.70	.00	.43	8.5	.117E+02	.82	.65
.72	.00	.44	8.6	.116E+02	.84	.65
.73	.00	.44	8.7	.115E+02	.86	.65
.75	.00	.45	8.8	.114E+02	.87	.65
.77	.00	.45	8.9	.113E+02	.89	.65
.78	.00	.46	9.0	.112E+02	.91	.65

Cumulative travel time = 16. sec

END OF MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER

BEGIN MOD251: DIFFUSER PLUME IN CO-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

This flow region is INSIGNIFICANT in spatial extent and will be by-passed.

END OF MOD251: DIFFUSER PLUME IN CO-FLOW

** End of NEAR-FIELD REGION (NFR) **

The initial plume WIDTH values in the next far-field module will be
CORRECTED by a factor 1.49 to conserve the mass flux in the far-field!

BEGIN MOD241: BUOYANT AMBIENT SPREADING

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
.78	.00	.91	9.0	.112E+02	.91	.96	.91	.00
1.16	.00	.91	9.2	.109E+02	.85	1.06	.91	.06
1.54	.00	.91	9.4	.106E+02	.80	1.16	.91	.11
1.91	.00	.91	9.6	.104E+02	.76	1.24	.91	.15
2.29	.00	.91	9.8	.102E+02	.72	1.33	.91	.19
2.67	.00	.91	10.0	.100E+02	.69	1.42	.91	.22
3.05	.00	.91	10.1	.986E+01	.66	1.50	.91	.25
3.43	.00	.91	10.3	.970E+01	.64	1.58	.91	.27
3.80	.00	.91	10.5	.955E+01	.62	1.65	.91	.29
4.18	.00	.91	10.6	.940E+01	.60	1.73	.91	.31
4.56	.00	.91	10.8	.926E+01	.59	1.80	.91	.32
4.94	.00	.91	11.0	.913E+01	.57	1.87	.91	.34
5.31	.00	.91	11.1	.900E+01	.56	1.95	.91	.35
5.69	.00	.91	11.3	.887E+01	.55	2.02	.91	.36

6.07	.00	.91	11.4	.875E+01	.54	2.08	.91	.37
6.45	.00	.91	11.6	.863E+01	.53	2.15	.91	.38
6.82	.00	.91	11.7	.851E+01	.52	2.22	.91	.39
7.20	.00	.91	11.9	.839E+01	.51	2.28	.91	.40
7.58	.00	.91	12.1	.828E+01	.50	2.35	.91	.41
7.96	.00	.91	12.2	.817E+01	.50	2.41	.91	.41
8.34	.00	.91	12.4	.806E+01	.49	2.47	.91	.42
8.71	.00	.91	12.6	.794E+01	.49	2.54	.91	.42
9.09	.00	.91	12.8	.784E+01	.48	2.60	.91	.43
9.47	.00	.91	12.9	.773E+01	.48	2.66	.91	.43
9.85	.00	.91	13.1	.762E+01	.47	2.72	.91	.44
10.22	.00	.91	13.3	.751E+01	.47	2.78	.91	.44
10.60	.00	.91	13.5	.741E+01	.47	2.83	.91	.44
10.98	.00	.91	13.7	.730E+01	.46	2.89	.91	.45
11.36	.00	.91	13.9	.720E+01	.46	2.95	.91	.45
11.74	.00	.91	14.1	.710E+01	.46	3.01	.91	.45
12.11	.00	.91	14.3	.699E+01	.46	3.06	.91	.45
12.49	.00	.91	14.5	.689E+01	.46	3.12	.91	.45
12.87	.00	.91	14.7	.679E+01	.45	3.17	.91	.46
13.25	.00	.91	14.9	.669E+01	.45	3.23	.91	.46
13.62	.00	.91	15.2	.659E+01	.45	3.28	.91	.46
14.00	.00	.91	15.4	.650E+01	.45	3.34	.91	.46
14.38	.00	.91	15.6	.640E+01	.45	3.39	.91	.46
14.76	.00	.91	15.9	.630E+01	.45	3.44	.91	.46
15.14	.00	.91	16.1	.621E+01	.45	3.50	.91	.46
15.51	.00	.91	16.4	.611E+01	.45	3.55	.91	.46
15.89	.00	.91	16.6	.602E+01	.45	3.60	.91	.46
16.27	.00	.91	16.9	.593E+01	.45	3.65	.91	.46
16.65	.00	.91	17.1	.583E+01	.45	3.70	.91	.46
17.02	.00	.91	17.4	.574E+01	.45	3.75	.91	.46
17.40	.00	.91	17.7	.565E+01	.46	3.80	.91	.45
17.78	.00	.91	18.0	.557E+01	.46	3.85	.91	.45
18.16	.00	.91	18.3	.548E+01	.46	3.90	.91	.45
18.53	.00	.91	18.5	.539E+01	.46	3.95	.91	.45
18.91	.00	.91	18.8	.531E+01	.46	4.00	.91	.45
19.29	.00	.91	19.1	.522E+01	.46	4.05	.91	.45
19.67	.00	.91 →	19.5	.514E+01	.47	4.10	.91	.44

Cumulative travel time = 583. sec

halfwidth (BH) = 5.53 in this region
S = 19.5

Plume is ATTACHED to LEFT bank/shore.
Plume width is now determined from LEFT bank/shore.

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
19.67	4.10	.91 →	19.5	.514E+01	.47	8.20	.91	.44
20.08	4.10	.91	19.8	.506E+01	.47	8.25	.91	.44
20.50	4.10	.91	20.1	.498E+01	.47	8.30	.91	.44
20.91	4.10	.91	20.4	.490E+01	.48	8.35	.91	.43
21.33	4.10	.91	20.7	.482E+01	.48	8.41	.91	.43
21.75	4.10	.91	21.1	.475E+01	.49	8.46	.91	.42
22.16	4.10	.91	21.4	.467E+01	.49	8.51	.91	.42
22.58	4.10	.91	21.7	.460E+01	.50	8.56	.91	.41
22.99	4.10	.91	22.1	.453E+01	.50	8.62	.91	.41
23.41	4.10	.91	22.4	.446E+01	.51	8.67	.91	.40
23.82	4.10	.91	22.8	.439E+01	.51	8.72	.91	.40
24.24	4.10	.91	23.1	.432E+01	.52	8.77	.91	.39
24.65	4.10	.91	23.5	.426E+01	.52	8.82	.91	.39
25.07	4.10	.91	23.8	.419E+01	.53	8.87	.91	.38
25.48	4.10	.91	24.2	.413E+01	.53	8.92	.91	.38
25.90	4.10	.91	24.6	.407E+01	.54	8.97	.91	.37
26.32	4.10	.91	25.0	.401E+01	.54	9.02	.91	.37
26.73	4.10	.91	25.3	.395E+01	.55	9.07	.91	.36
27.15	4.10	.91	25.7	.389E+01	.55	9.13	.91	.36
27.56	4.10	.91	26.1	.383E+01	.56	9.18	.91	.35
27.98	4.10	.91	26.5	.377E+01	.56	9.23	.91	.35

28.39	4.10	.91	26.9	.372E+01	.57	9.28	.91	.34
28.81	4.10	.91	27.3	.367E+01	.57	9.33	.91	.34
29.22	4.10	.91	27.7	.361E+01	.58	9.37	.91	.33
29.64	4.10	.91	28.1	.356E+01	.58	9.42	.91	.33
30.05	4.10	.91	28.5	.351E+01	.59	9.47	.91	.32
30.47	4.10	.91	28.9	.346E+01	.60	9.52	.91	.31
30.89	4.10	.91	29.3	.341E+01	.60	9.57	.91	.31
31.30	4.10	.91	29.8	.336E+01	.61	9.62	.91	.30
31.72	4.10	.91	30.2	.331E+01	.61	9.67	.91	.30
32.13	4.10	.91	30.6	.327E+01	.62	9.72	.91	.29
32.55	4.10	.91	31.1	.322E+01	.62	9.77	.91	.29
32.96	4.10	.91	31.5	.318E+01	.63	9.82	.91	.28
33.38	4.10	.91	31.9	.313E+01	.63	9.86	.91	.28
33.79	4.10	.91	32.4	.309E+01	.64	9.91	.91	.27
34.21	4.10	.91	32.8	.305E+01	.65	9.96	.91	.26
34.62	4.10	.91	33.3	.300E+01	.65	10.01	.91	.26
35.04	4.10	.91	33.8	.296E+01	.66	10.06	.91	.25
35.46	4.10	.91	34.2	.292E+01	.66	10.11	.91	.25
35.87	4.10	.91	34.7	.288E+01	.67	10.15	.91	.24
36.29	4.10	.91	35.2	.284E+01	.68	10.20	.91	.23
36.70	4.10	.91	35.6	.281E+01	.68	10.25	.91	.23
37.12	4.10	.91	36.1	.277E+01	.69	10.30	.91	.22
37.53	4.10	.91	36.6	.273E+01	.69	10.34	.91	.22
37.95	4.10	.91	37.1	.269E+01	.70	10.39	.91	.21
38.36	4.10	.91	37.6	.266E+01	.71	10.44	.91	.20
38.78	4.10	.91	38.1	.262E+01	.71	10.48	.91	.20
39.19	4.10	.91	38.6	.259E+01	.72	10.53	.91	.19
39.61	4.10	.91	39.1	.256E+01	.72	10.58	.91	.19
40.03	4.10	.91	39.6	.252E+01	.73	10.62	.91	.18
40.44	4.10	.91	40.1	.249E+01	.74	10.67	.91	.17

Cumulative travel time = 1207. sec
Plume is LATERALLY FULLY MIXED at the end of the buoyant spreading regime.

END OF MOD241: BUOYANT AMBIENT SPREADING

Bottom coordinate for FAR-FIELD is determined by average depth, ZFB = .09m

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BEGIN MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

Vertical diffusivity (initial value) = .802E-03 m^2/s
Horizontal diffusivity (initial value) = .100E-02 m^2/s

Profile definitions:
BV = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
= or equal to layer depth, if fully mixed
BH = Gaussian s.d.*sqrt(pi/2) (46%) half-width,
measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
40.44	4.10	.91	40.1	.249E+01	.74	10.67	.91	.17

Plume interacts with BOTTOM.
The passive diffusion plume becomes VERTICALLY FULLY MIXED within this prediction interval.

79.63	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09

Effluent is FULLY MIXED over the entire channel cross-section.
Except for possible far-field decay or reaction processes, there are NO FURTHER CHANGES with downstream direction.

118.82	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
158.01	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
197.21	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
236.40	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09

275.59	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
314.78	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
353.97	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
393.16	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
432.35	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
471.54	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
510.74	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
549.93	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
589.12	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
628.31	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
667.50	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
706.69	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
745.88	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
785.07	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
824.26	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
863.46	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
902.65	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
941.84	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
981.03	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1020.22	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1059.41	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1098.60	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1137.79	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1176.98	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1216.18	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1255.37	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1294.56	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1333.75	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1372.94	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1412.13	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1451.32	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1490.51	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1529.71	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1568.90	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1608.09	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1647.28	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1686.47	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1725.66	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1764.85	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1804.04	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1843.23	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1882.43	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1921.62	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
1960.81	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09
2000.00	4.10	.91	44.6	.224E+01	.82	10.67	.91	.09

Cumulative travel time = 60058. sec

Simulation limit based on maximum specified distance = 2000.00 m.
This is the REGION OF INTEREST limitation.

END OF MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

CORMIX2: Submerged Multiport Diffuser Discharges End of Prediction File
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Spreadsheet for determination of WET test endpoints or WET limits

Excel 97
Revision Date: 01/10/05
File: WETLIM10.xls
(MIX.EXE required also)

Acute Endpoint/Permit Limit — **Use as LC_{50} in Special Condition, as TUa on DMR**

ACUTE	2.100000051	TUa	LC_{50} =	48	% Use as	2.08	TUa

ACUTE WLAa 2.1

Note: Inform the permittee that if the mean of the data exceeds this TUa: 1.0 a limit may result using WLA.EXE

Chronic Endpoint/Permit Limit — **Use as NOEC in Special Condition, as TUc on DMR**

CHRONIC	21.00000051	TU_c	NOEC =	5	% Use as	20.00	TU_c
BOTH*	21.00000051	TU_c	NOEC =	5	% Use as	20.00	TU_c
AML	21.00000051	TU_c	NOEC =	5	% Use as	20.00	TU_c

ACUTE WLAa,c 21
CHRONIC WLAc 19.5
* Both means acute expressed as chronic

Note: Inform the permittee that if the mean of the data exceeds this TUc: 8.6298383 a limit may result using WLA.EXE

Enter data in the cells with blue type:

Entry Date:	06/28/13	
Facility Name:	Ronile Inc.	
VPDES Number:	VA0076015	
Outfall Number:	1	

			% Flow to be used from MIX.EXE		Difuser /modeling study?		
Plant Flow:	0.155	MGD			Enter Y/N	y	
Acute 1Q10:	0	MGD	100	%	Acute	7	:1
Chronic 7Q10:	0	MGD	100	%	Chronic	19.5	:1

Are data available to calculate CV? (Y/N) N (Minimum of 10 data points, same species, needed) Go to Page 2
Are data available to calculate ACR? (Y/N) N (NOEC<LC50, do not use greater/less than data) Go to Page 3

IWC_a	14.28571429	%	Plant flow/plant flow + 1Q10
IWC_c	5.128205128	%	Plant flow/plant flow + 7Q10

NOTE: If the IWCa is >33%, specify the NOAEC = 100% test/endpoint for use

Dilution, acute	7	100/IWCa
Dilution, chronic	19.5	100/IWCc

WLA_a	2.1	Instream criterion (0.3 TUa) X's Dilution, acute
WLA_c	19.5	Instream criterion (1.0 TUc) X's Dilution, chronic
$WLA_{a,c}$	21	ACR X's WLA_a - converts acute WLA to chronic units

ACR -acute/chronic ratio		10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)
CV-Coefficient of variatior		0.6	Default of 0.6 - if data are available, use tables Page 2)
Constants	eA	0.4109447	Default = 0.41
	eB	0.6010373	Default = 0.60
	eC	2.4334175	Default = 2.43
	eD	2.4334175	Default = 2.43 (1 samp)

No. of samples: 1

The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.

$LTA_{a,c}$	8.6298387	WLAa,c X's eA						
LTA_c	11.72022735	WLAc X's eB					Rounded NOEC's	%
MDL** with $LTA_{a,c}$	21.00000051	TU_c	NOEC =	4.761905	(Protects from acute/chronic toxicity)		NOEC = 5	%
MDL** with LTA_c	28.52020634	TU_c	NOEC =	3.506286	(Protects from chronic toxicity)		NOEC = 4	%
AML with lowest LTA	21.00000051	TU_c	NOEC =	4.761905	Lowest LTA X's eD		NOEC = 5	

IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a

						Rounded LC50's	%
MDL with $LTA_{a,c}$	2.100000051	TU_a	LC50 =	47.619046	%	LC50 = 48	%
MDL with LTA_c	2.852020634	TU_a	LC50 =	35.062860	%	LC50 = 36	

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.

	Vertebrate IC_{25} Data or LC_{50} Data	LN of data	Invertebrate IC_{25} Data or LC_{50} Data	LN of data
	**********		**********	
1	0		0	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Coefficient of Variation for effluent tests

CV = 0.6 (Default 0.6)

δ^2 = 0.3074847

δ = 0.554513029

Using the log variance to develop eA

(P. 100, step 2a of TSD)

Z = 1.881 (97% probability stat from table

A = -0.889296658

eA = 0.410944686

Using the log variance to develop eB

(P. 100, step 2b of TSD)

δ_4^2 = 0.086177696

δ_4 = 0.293560379

B = -0.509098225

eB = 0.601037335

St Dev	NEED DATA	NEED DATA	St Dev	NEED DATA	NEED DATA
Mean	0	0	Mean	0	0
Variance	0	0.000000	Variance	0	0.000000
CV	0		CV	0	

Using the log variance to develop eC

(P. 100, step 4a of TSD)

δ^2 = 0.3074847

δ = 0.554513029

C = 0.889296658

eC = 2.433417525

Using the log variance to develop eD

(P. 100, step 4b of TSD)

n = **1** This number will most likely stay as "1", for 1 sample/month.

δ_n^2 = 0.3074847

δ_n = 0.554513029

D = 0.889296658

eD = 2.433417525

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Table 1. Result:	Vertebrate ACR	0
Table 2. Result:	Invertebrate ACR	0
	Lowest ACR	Default to 10

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Convert LC_{50}'s and NOEC's to Chronic TU's

for use in WLA.EXE

Table 3. **ACR used: 10**

	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50,

enter it here: NO DATA %LC_{50}

NO DATA TUa

DILUTION SERIES TO RECOMMEND

Table 4.

	Monitoring % Effluent	Monitoring TUc	Limit % Effluent	Limit TUc
Dilution series based on data mean	11.6	8.6298383		
Dilution series to use for limit			5	20
Dilution factor to recommend:	0.3404071		0.2236068	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	34.0	2.94	22.4	4.47
	11.6	8.63	5.0	20.00
	3.9	25.35	1.1	89.44
	1.34	74.47	0.3	400.00
Extra dilutions if needed	0.46	218.78	0.1	1788.85
	0.16	642.70	0.0	8000.00

Cell: I9
Comment:
This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment:
If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment:
See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment:
Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment:
Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138
Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

APPENDIX D

Documentation from previous permits

Analysis of the RONIL. .NC. effluent data for
DISSOLVED COPPER - EFFLUENT CONCENTRATION

The statistics for DISSOLVED COPPER - EFFLUENT CONCENTRATION are:

Number of values	=	8
Quantification level	=	10
Number < quantification	=	7
Expected value	=	6.244643
Variance	=	14.0384
C.V.	=	.6
Statistics used	=	Reasonable potential assumptions - Type 1 data

The Standards for DISSOLVED COPPER - EFFLUENT CONCENTRATION are:

Acute Standard	=	6.66
Chronic Standard	=	4.64
Human Health Standard	=	----

The 97th percentile of daily values	=	15.19582
The 97th percentile of 4 day averages	=	10.38978
The 97th percentile of 30 day averages	=	7.531372

The Acute standard is violated
The Chronic standard is violated
The Human health standard is not violated.

DATA
13
1
<10
<10
1
1
6
7

Analysis of the RONIL .NC. effluent data for COF R
Averaging period for standard = 4 days

The statistics for COPPER are:

Number of values	=	1
Quantification level	=	10
Number < quantification	=	0
Expected value	=	12
Variance	=	51.84001
C.V.	=	.6
97th percentile	=	29.20101
Statistics used	=	Reasonable potential assumptions - Type 2 data

The WLAs for COPPER are:

Acute WLA	=	22.01
Chronic WLA	=	63.13
Human Health WLA	=	----

Limits are based on acute toxicity and 1 samples/month, 1 samples/week

Maximum daily limit	=	22.01
Average weekly limit	=	22.01
Average monthly limit	=	22.01

Note: The maximum daily limit applies to industrial dischargers
The average weekly limit applies to POTWs
The average monthly limit applies to both.

The Data are
12

6/9/2008 5:23:50 PM

Facility = Ronile
Chemical = total Recoverable Zinc
Chronic averaging period = 4
WLAa = 141
WLAc = 544
Q.L. = 10
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 899
Variance = 290952.
C.V. = 0.6
97th percentile daily values = 2187.64
97th percentile 4 day average = 1495.74
97th percentile 30 day average= 1084.24
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 141
Average Weekly limit = 141
Average Monthly LImit = 141

The data are:

899

WLA Analysis For: Ronile, Inc. ANTIDEGRADATION Date: 03/10/99

Spreadsheet for Acute AWLAs

Stream:	Pigg River	Effluent Information		Hardness:			
Mean Hardness (mg/L) =	33	Mean Hardness=	58	acute	35.403846	Mix Hardness= acute	35.40384615
Stream NH3 (mg/L)	0	NH3 (mg/L)=		chronic	35.969121	chronic	35.96912
90% Temperature	22.2	90% Temp.=	26	7Q10 Ratio	8.42	* WLAa	
90% pH	7.5	90% pH=	8	1Q10 Ratio	10.4	Coefficient =	0.1923076923
Fractional 7Q10-MGD	7.42	100% of 7Q10 Flow, MGD=	1.000			Acute IWC =	0.0961538462
Fractional 1Q10-MGD	9.4			Harmonic ratio:	34.26	Chronic IWC =	0.1187648456
Harmonic mean (carcinogen):	33.26			30Q5 ratio:	11.91		
30Q5 Flow (Non-carcinogen):	10.91						
R(iver),L(ake) or S(torm):	R						
Trout Present? (Y/N)	n						
Public Water Supply(Y/N):	n						

Parameter and Form	Carcinogen?	Sort? (Y/N)	Aquatic Protection Freshwater Criteria: Acute Criteria	Existing Quality at 1Q10	Chronic Criteria	Existing Quality at 7Q10	Human Health: All Other Surface Water Criteria	Existing Quality for HH	Back-ground concentration	Acute Baseline	Chronic Baseline	Human Health Baseline	Acute AWLA	Chronic A WLA	Human Health A WLA
Ammonia (mg/l as N)		Y	11.495	0.550	N/A		None			3.2863	N/A	N/A	34.18	N/A	N/A
Arsenic		Y	None		N/A		50			0.0000	N/A	N/A	N/A	N/A	N/A
Cadmium		Y	1.22		N/A		None			0.3039	N/A	N/A	3.16	N/A	N/A
Chloride		Y	860000	9927	N/A		None			222445.2500	N/A	N/A	2313430.60	N/A	N/A
Chlorine		Y	19		N/A		None			4.7500	N/A	N/A	49.40	N/A	N/A
Copper		Y	6.66	0.60	N/A		None			2.1159	N/A	N/A	22.01	N/A	N/A
Cr III		Y	741.91	8.00	N/A		None		8.00	191.4771	N/A	N/A	1916.16	N/A	N/A
Cr-hex		Y	16		N/A		None			4.0000	N/A	N/A	41.60	N/A	N/A
Iron		Y	None		N/A		None			0.0000	N/A	N/A	N/A	N/A	N/A
Lead		Y	31.71	0.30	N/A		None			8.1519	N/A	N/A	84.78	N/A	N/A
Manganese		Y	None		N/A		None			0.0000	N/A	N/A	N/A	N/A	N/A
Mercury		Y	2.4		N/A		0.053			0.6000	N/A	N/A	6.24	N/A	[illegible]
Nickel		Y	75.91		N/A		4600			18.9772	N/A	N/A	197.36	N/A	[illegible]
Selenium		Y	20		N/A		11000			5.0000	N/A	N/A	52.00	N/A	N/A
Silver		Y	0.68		N/A		None			0.1701	N/A	N/A	1.77	N/A	N/A
Toluene		Y	1750	1.12	N/A		200000			438.3400	N/A	N/A	4558.74	N/A	N/A
Xylene		Y	740	0.97	N/A		None			185.7275	N/A	N/A	1931.57		
Zinc		Y	48.55	1.89	N/A		None			13.5547	N/A	N/A	140.97	N/A	N/A
1,1-dichloroethylene		n	None		N/A		17000			0.0000	N/A	N/A	N/A	N/A	N/A
1,2-dichlorobenzene		n	None		N/A		17000			0.0000	N/A	N/A	N/A	N/A	N/A

1,2-dichloroethane	C	n	None		N/A		990			0.0000	N/A	N/A	N/A	N/A	N/A
1,2,4-trichlorobenzene		n	None		N/A		950			0.0000	N/A	N/A	N/A	N/A	N/A
1,3-dichlorobenzene		n	None		N/A		2600			0.0000	N/A	N/A	N/A	N/A	N/A
1,4-dichlorobenzene		n	None		N/A		2600			0.0000	N/A	N/A	N/A	N/A	N/A
2-Chlorophenol		n	None		N/A		400			0.0000	N/A	N/A	N/A	N/A	N/A
2,4-dichlorophenol		n	None		N/A		790			0.0000	N/A	N/A	N/A	N/A	N/A
2,4-dichlorophenoxy acetic acid		n	None		N/A		None			0.0000	N/A	N/A	N/A	N/A	N/A
2,4-dimethylphenol		n	None		N/A		2300			0.0000	N/A	N/A	N/A	N/A	N/A
2,4-dinitrotoluene	C	n	None		N/A		91			0.0000	N/A	N/A	N/A	N/A	N/A
2,4,6-Trichlorophenol	C	n	None		N/A		65			0.0000	N/A	N/A	N/A	N/A	N/A
Acenaphthene		n	None		N/A		2700			0.0000	N/A	N/A	N/A	N/A	N/A
Aldrin	C	n	3		N/A		0.0014			0.7500	N/A	N/A	7.80	N/A	N/A
Anthracene		n	None		N/A		110000			0.0000	N/A	N/A	N/A	N/A	N/A
Antimony		n	None		N/A		4300			0.0000	N/A	N/A	N/A	N/A	N/A
Arsenic-3		n	360		N/A		None			90.0000	N/A	N/A	936.00	N/A	N/A
Barium		n	None		N/A		None			0.0000	N/A	N/A	N/A	N/A	N/A
Benzene	C	n	530		N/A		710			132.5000	N/A	N/A	1378.00	N/A	N/A
Benzo(a)anthracene	C	n	None		N/A		0.049			0.0000	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	C	n	None		N/A		0.049			0.0000	N/A	N/A	N/A	N/A	N/A
Benzo(b)fluoranthene	C	n	None		N/A		0.049			0.0000	N/A	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	C	n	None		N/A		0.049			0.0000	N/A	N/A	N/A	N/A	N/A
Bromoform	C	n	None		N/A		3600			0.0000	N/A	N/A	N/A	N/A	N/A
Butyl benzyl phthalate		n	None		N/A		5200			0.0000	N/A	N/A	N/A	N/A	N/A
Carbon Tetrachloride	C	n	None		N/A		45			0.0000	N/A	N/A	N/A	N/A	N/A
Chlordane	C	n	2.4		N/A		0.0059			0.6000	N/A	N/A	6.24	N/A	N/A
Chlorodibromomethane		n	None		N/A		57000			0.0000	N/A	N/A	N/A	N/A	N/A
Chloroform	C	n	None		N/A		47000			0.0000	N/A	N/A	N/A	N/A	N/A
Chlorpyrifos		n	0.083		N/A		None			0.0208	N/A	N/A	0.22	N/A	N/A
Chrysene	C	n	None		N/A		0.049			0.0000	N/A	N/A	N/A	N/A	N/A
Cyanide		n	22		N/A		215000			5.5000	N/A	N/A	57.20	N/A	N/A
DDD	C	n	None		N/A		0.0084			0.0000	N/A	N/A	N/A	N/A	N/A
DDE	C	n	None		N/A		0.0059			0.0000	N/A	N/A	N/A	N/A	N/A
DDT	C	n	1.1		N/A		0.0059			0.2750	N/A	N/A	2.86	N/A	N/A
Demeton		n	None		N/A		None			0.0000	N/A	N/A	N/A	N/A	N/A
Di-2-ethylhexyl Phthalate	C	n	None		N/A		59			0.0000	N/A	N/A	N/A	N/A	N/A
Dibenz(a,h)anthracene	C	n	None		N/A		0.049			0.0000	N/A	N/A	N/A	N/A	N/A
Dibutyl phthalate		n	None		N/A		12000			0.0000	N/A	N/A	N/A	N/A	N/A
Dichlorobromomethane	C	n	None		N/A		460			0.0000	N/A	N/A	N/A	N/A	N/A
Dichloromethane	C	n	None		N/A		16000			0.0000	N/A	N/A	N/A	N/A	N/A
Dieldrin		n	2.5		N/A		0.00014			0.6250	N/A	N/A	6.50	N/A	N/A

Diethyl phthalate		n	None		N/A		120000			0.0000	N/A		N/A	N/A	N/A	N/A
Dioxin		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Dissolved Oxygen		n	4		N/A		None			1.0000	N/A		N/A	10.40	N/A	N/A
Endosulfan		n	0.22		N/A		240			0.0550	N/A		N/A	0.57	N/A	N/A
Endrin		n	0.18		N/A		0.81			0.0450	N/A		N/A	0.47	N/A	N/A
Ethylbenzene		n	3200		N/A		29000			800.0000	N/A		N/A	8320.00	N/A	N/A
Fluoranthene		n	None		N/A		370			0.0000	N/A		N/A	N/A	N/A	N/A
Fluorene		n	None		N/A		14000			0.0000	N/A		N/A	N/A	N/A	N/A
Foaming Agents (MBAS)		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Guthion		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Heptachlor	C	n	0.52		N/A		0.0021			0.1300	N/A		N/A	1.35	N/A	N/A
Hexachlorocyclohexane		n	2		N/A		25			0.5000	N/A		N/A	5.20	N/A	N/A
Hydrogen Sulfide		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	C	n	None		N/A		0.049			0.0000	N/A		N/A	N/A	N/A	N/A
Isophorone		n	None		N/A		490000			0.0000	N/A		N/A	N/A	N/A	N/A
Kepone		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Lindane		n	2		N/A		25			0.5000	N/A		N/A	5.20	N/A	N/A
Malathion		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Methoxychlor		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Mirex		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Monochlorobenzene		n	None		N/A		21000			0.0000	N/A		N/A	N/A	N/A	N/A
Nitrate(as N)		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Nitrobenzene		n	None		N/A		1900			0.0000	N/A		N/A	N/A	N/A	N/A
Parathion		n	0.065		N/A		None			0.0163	N/A		N/A	0.17	N/A	N/A
PCBs(7 species)	C	n	None		N/A		0.00045			0.0000	N/A		N/A	N/A	N/A	N/A
Pentachlorophenol		n	0.06		N/A		82			0.0151	N/A		N/A	0.16	N/A	N/A
pH		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Phenol		n	None		N/A		4600000			0.0000	N/A		N/A	N/A	N/A	N/A
Phosphorus(elemental)		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Pyrene		n	None		N/A		11000			0.0000	N/A		N/A	N/A	N/A	N/A
Radioactivity		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Silvex		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Sulfate		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Temperature		n	32		N/A		None			8.0000	N/A		N/A	83.20	N/A	N/A
Tetrachloroethylene		n	None		N/A		3500			0.0000	N/A		N/A	N/A	N/A	N/A
Total dissolved solids		n	None		N/A		None			0.0000	N/A		N/A	N/A	N/A	N/A
Toxaphene	C	n	0.73		N/A		0.0075			0.1825	N/A		N/A	1.90	N/A	N/A
Tributyltin		n	0.46		N/A		None			0.1150	N/A		N/A	1.20	N/A	N/A
Trichloroethylene	C	n	None		N/A		810			0.0000	N/A		N/A	N/A	N/A	N/A
Vinyl Chloride		n	None		N/A		5300			0.0000	N/A		N/A	N/A	N/A	N/A

Footnotes:

1. All concentrations expressed as micrograms per liter (ug/L),except Ammonia.
2. Ammonia (as mg/L) selected from separate tables,based on pH and temprature.
3. Acute-1 hour avg. concentration not to be exceeded more than 1/3years
4. Chronic-4 day avg.concentration not to be exceeded more than 1/3years.
5. Complete mix-mass balances employ 30Q5 for Non-carcinogens, and Harmonic Mean for Carcinogens
6. All flow values are expressed as Million Gallons per Day.
8. Metals measured as Dissolved, unless specified otherwise.
9. (c)-indicates carcinogenic parameter.
10. Public Water Supply-protects for fish and water consumption.
11. Other Waters-protects for fish consumption only.
12. Hardness expressed as CaCO3 (mg/L).
13. All limitations are based on EPA's TSD Statistical approach.

Freshwater Ammonia Toxicity Standards (based on 9 VAC 25-260-00 et seq)
(OK as of 3/91)
I. Perform Mass Balance for final Ammonia Concentrations and pH:

	Flow (MGD)	Total NH3-N (mg/L)	pH* SU	Temp. (C)	[H+]
Stream:	9.400	0.000	7.50	22.2	3.16E-08
POTW:	1.000	119.550	8.00	26.0	1.00E-08
Mix:	10.400	11.495	7.53	22.6	2.95E-08

Chronic/Acute Std.? (C/A)--> a <--- = 11.495 mg/l

System MEETS WQ Standard for 1-hour acute ammonia toxicity

* The pH mix does not take into account alkalinity.

	Acute (1-Hr)
90th Percentile Temp., C:	22.6
90th Percentile pH:	7.53
FT (final temperature):	0.8376
FPH	1.3937
RATIO	NA
pKa	9.32
Un-ionized Ammonia, mg/L as NH3:	0.22
Fraction of Un-ionized Ammonia:	0.0159
Total Ammonia, mg/L as NH3:	13.98
Total Ammonia, mg/L as N:	11.50
Standard Selected	11.495

Freshwater Ammonia Toxicity Standards (based on 9 VAC 25-260-00 et seq)
(OK as of 3/91)
I. Perform Mass Balance for final Ammonia Concentrations and pH:

	Flow (MGD)	Total NH3-N (mg/L)	pH* SU	Temp. (C)	[H+]
Stream	7.420	0.000	7.50	22.2	3.16E-08
POTW:	1.000	17.306	8.00	26.0	1.00E-08
Mix:	8.420	2.055	7.54	22.7	2.91E-08

Chronic/Acute Std.? (C/A)--> c <--- = 2.055 mg/l

System MEETS WQ Standard for 4-day chronic ammonia toxicity

* The pH mix does not take into account alkalinity.

	Chronic (4-Day)
90th Percentile Temp., C:	22.7
90th Percentile pH:	7.54
FT (final temperature):	0.832647
FPH	1.383858
RATIO	17.04671
pKa	9.3175
Un-ionized Ammonia, mg/L -NH3:	0.0407
Fraction of Un-ionized Ammonia:	0.01630
Total Ammonia, mg/L as NH3:	2.50
Total Ammonia, mg/L as N:	2.06
Standard Selected	2.055

WLA Analysis For: Ronile, Inc. ANTIDEGRADATION Date: 03/10/99

Spreadsheet for Chronic and Human Health AWLAs

Stream:	Pigg River	Effluent Information		Hardness:			
Mean Hardness (mg/L) =	33	Mean Hardness=	58	acute	58	Mix Hardness= acute	5
Stream NH3 (mg/L)	0	NH3 (mg/L)=		chronic	33.495376	chronic	33.4953764
90% Temperature	22.2	90% Temp.=	26	7Q10 Ratio	50.466667	* WLAa	
90% pH	7.5	90% pH=	8	1Q10 Ratio	1	Coefficient =	0.99
Fractional 7Q10-MGD	7.42	100% of 7Q10 Flow, MGD=	0.150			Acute IWC =	1
Fractional 1Q10-MGD	N/A			Harmonic ratio:	222.73333	Chronic IWC =	0.0198150594
Harmonic mean (carcinogen):	33.26			30Q5 ratio:	73.733333		
30Q5 Flow (Non-carcinogen):	10.91						
R(iver),L(ake) or S(torm):	R						
Trout Present? (Y/N)	n						
Public Water Supply(Y/N):	n						

Parameter and Form	Carcinogen?	Sort? (Y/N)	Aquatic Protection Freshwater Criteria: Acute Criteria	Existing Quality at 1Q10	Chronic Criteria	Existing Quality at 7Q10	Human Health: All Other Surface Water Criteria	Existing Quality for HH	Back-ground concentration	Acute Baseline	Chronic Baseline	Human Health Baseline	Acute AWLA	Chronic A WLA	Human Health A WLA
Ammonia (mg/l as N)		Y	N/A		2.054	0.11	None			0.0000	0.5961	0	N/A	30.08	N/A
Arsenic		Y	N/A		None		50			0.0000	0.0000	5	N/A	N/A	368.67
Cadmium		Y	N/A		0.48		None			0.0000	0.1201	0	N/A	6.06	N/A
Chloride		Y	N/A		230000	2050	None			0.0000	59037.5000	0	N/A	2979425.83	N/A
Chlorine		Y	N/A		11		None			0.0000	2.7500	0	N/A	138.78	N/A
Copper		Y	N/A		4.64	0.12	None			0.0000	1.2509	0	N/A	63.13	N/A
Cr III		Y	N/A		84.51	8.00	None		8.00	8.0000	27.1269	0	N/A	1369.01	N/A
Cr-hex		Y	N/A		11		None			0.0000	2.7500	0	N/A	138.78	N/A
Iron		Y	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/A
Lead		Y	N/A		3.36	0.06	None			0.0000	0.8842	0	N/A	44.62	N/A
Manganese		Y	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/
Mercury		Y	N/A		0.012		0.053			0.0000	0.0030	0.0053	N/A	0.15	0.
Nickel		Y	N/A		8.06		4600			0.0000	2.0145	460	N/A	101.66	33917.3
Selenium		Y	N/A		5		11000			0.0000	1.2500	1100	N/A	63.08	81106.67
Silver		Y	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/A
Toluene		Y	N/A		175	0.23	200000	0.20		0.0000	43.9225	20000.18	N/A	2216.62	1474679.94
Xylenes, Total		Y	N/A		74	0.2				0.0000	18.6500	0	N/A	941.20	N/A
Zinc		Y	N/A		41.96	0.39	None			0.0000	10.7814	0	N/A	544.10	N/A
1,1-dichloroethylene		n	N/A		None		17000			0.0000	0.0000	1700	N/A	N/A	378646.67
1,2-dichlorobenzene		n	N/A		None		17000			0.0000	0.0000	1700	N/A	N/A	125346.67

1,2-dichloroethane	C	n	N/A		None		990			0.0000	0.0000	99	N/A	N/A	22050.60
1,2,4-trichlorobenzene		n	N/A		None		950			0.0000	0.0000	95	N/A	N/A	21159.67
1,3-dichlorobenzene		n	N/A		None		2600			0.0000	0.0000	260	N/A	N/A	19170.67
1,4-dichlorobenzene		n	N/A		None		2600			0.0000	0.0000	260	N/A	N/A	19170.67
2-Chlorophenol		n	N/A		None		400			0.0000	0.0000	40	N/A	N/A	8909.3
2,4-dichlorophenol		n	N/A		None		790			0.0000	0.0000	79	N/A	N/A	17595.93
2,4-dichlorophenoxy acetic acid		n	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/A
2,4-dimethylphenol		n	N/A		None		2300			0.0000	0.0000	230	N/A	N/A	51228.67
2,4-dinitrotoluene	C	n	N/A		None		91			0.0000	0.0000	9.1	N/A	N/A	2026.87
2,4,6-Trichlorophenol	C	n	N/A		None		65			0.0000	0.0000	6.5	N/A	N/A	1447.77
Acenaphthene		n	N/A		None		2700			0.0000	0.0000	270	N/A	N/A	60138.00
Aldrin	C	n	N/A		0.3		0.0014			0.0000	0.0750	0.00014	N/A	3.79	0.03
Anthracene		n	N/A		None		110000			0.0000	0.0000	11000	N/A	N/A	811066.67
Antimony		n	N/A		None		4300			0.0000	0.0000	430	N/A	N/A	95775.33
Arsenic-3		n	N/A		190		None			0.0000	47.5000	0	N/A	2397.17	N/A
Barium		n	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/A
Benzene	C	n	N/A		53		710			0.0000	13.2500	71	N/A	668.68	15814.07
Benzo(a)anthracene	C	n	N/A		None		0.049			0.0000	0.0000	0.0049	N/A	N/A	1.09
Benzo(a)pyrene	C	n	N/A		None		0.049			0.0000	0.0000	0.0049	N/A	N/A	1.09
Benzo(b)fluoranthene	C	n	N/A		None		0.049			0.0000	0.0000	0.0049	N/A	N/A	1.09
Benzo(k)fluoranthene	C	n	N/A		None		0.049			0.0000	0.0000	0.0049	N/A	N/A	1.09
Bromoform	C	n	N/A		None		3600			0.0000	0.0000	360	N/A	N/A	80184.00
Butyl benzyl phthalate		n	N/A		None		5200			0.0000	0.0000	520	N/A	N/A	115821.33
Carbon Tetrachloride	C	n	N/A		None		45			0.0000	0.0000	4.5	N/A	N/A	1002.30
Chlordane	C	n	N/A		0.0043		0.0059			0.0000	0.0011	0.00059	N/A	0.05	0.13
Chlorodibromomethane		n	N/A		None		57000			0.0000	0.0000	5700	N/A	N/A	420280.00
Chloroform	C	n	N/A		None		47000			0.0000	0.0000	4700	N/A	N/A	1046846.67
Chlorpyrifos		n	N/A		0.041		None			0.0000	0.0103	0	N/A	0.52	N/A
Chrysene	C	n	N/A		None		0.049			0.0000	0.0000	0.0049	N/A	N/A	1.09
Cyanide		n	N/A		5.2		215000			0.0000	1.3000	21500	N/A	65.61	1585266.67
DDD	C	n	N/A		None		0.0084			0.0000	0.0000	0.00084	N/A	N/A	0.0
DDE	C	n	N/A		None		0.0059			0.0000	0.0000	0.00059	N/A	N/A	0.0
DDT	C	n	N/A		0.001		0.0059			0.0000	0.0003	0.00059	N/A	0.01	0.13
Demeton		n	N/A		0.1		None			0.0000	0.0250	0	N/A	1.26	N/A
Di-2-ethylhexyl Phthalate	C	n	N/A		None		59			0.0000	0.0000	5.9	N/A	N/A	1314.13
Dibenz(a,h)anthracene	C	n	N/A		None		0.049			0.0000	0.0000	0.0049	N/A	N/A	1.09
Dibutyl phthalate		n	N/A		None		12000			0.0000	0.0000	1200	N/A	N/A	267280.00
Dichlorobromomethane	C	n	N/A		None		460			0.0000	0.0000	46	N/A	N/A	10245.73
Dichloromethane	C	n	N/A		None		16000			0.0000	0.0000	1600	N/A	N/A	356373.33
Dieldrin		n	N/A		0.0019		0.00014			0.0000	0.0005	0.000014	N/A	0.02	0.00

Diethyl phthalate		n	N/A		None		120000			0.0000	0.0000	12000	N/A	N/A	2672800.00
Dioxin		n	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/A
Dissolved Oxygen		n	N/A		5		None			0.0000	1.2500	0	N/A	63.08	N/A
Endosulfan		n	N/A		0.056		240			0.0000	0.0140	24	N/A	0.71	1769.60
Endrin		n	N/A		0.0023		0.81			0.0000	0.0006	0.081	N/A	0.03	5.97
Ethylbenzene		n	N/A		320		29000			0.0000	80.0000	2900	N/A	4037.33	213826.67
Fluoranthene		n	N/A		None		370			0.0000	0.0000	37	N/A	N/A	2728.13
Fluorene		n	N/A		None		14000			0.0000	0.0000	1400	N/A	N/A	103226.67
Foaming Agents (MBAS)		n	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/
Guthion		n	N/A		0.01		None			0.0000	0.0025	0	N/A	0.13	N/
Heptachlor	C	n	N/A		0.0038		0.0021			0.0000	0.0010	0.00021	N/A	0.05	0.05
Hexachlorocyclohexane		n	N/A		0.08		25			0.0000	0.0200		N/A		
Hydrogen Sulfide		n	N/A		2		None			0.0000	0.5000	0	N/A	25.23	N/A
Indeno(1,2,3-cd)pyrene	C	n	N/A		None		0.049			0.0000	0.0000	0.0049	N/A	N/A	1.09
Isophorone		n	N/A		None		490000			0.0000	0.0000	49000	N/A	N/A	3612933.33
Kepone		n	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/A
Lindane		n	N/A		0.08		25			0.0000	0.0200	2.5	N/A	1.01	184.33
Malathion		n	N/A		0.1		None			0.0000	0.0250	0	N/A	1.26	N/A
Methoxychlor		n	N/A		0.03		None			0.0000	0.0075	0	N/A	0.38	N/A
Mirex		n	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/A
Monochlorobenzene		n	N/A		None		21000			0.0000	0.0000	2100	N/A	N/A	154840.00
Nitrate(as N)		n	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/A
Nitrobenzene		n	N/A		None		1900			0.0000	0.0000	190	N/A	N/A	42319.33
Parathion		n	N/A		0.013		None			0.0000	0.0033	0	N/A	0.16	N/A
PCBs(7 species)	C	n	N/A		None		0.00C45			0.0000	0.0000	0.000045	N/A	N/A	0.01
Pentachlorophenol		n	N/A		0.04		82			0.0000	0.0095	8.2	N/A	0.48	604.61
pH		n	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/A
Phenol		n	N/A		None		4600000			0.0000	0.0000	460000	N/A	N/A	33917333.33
Phosphorus(elemental)		n	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/A
Pyrene		n	N/A		None		11000			0.0000	0.0000	1100	N/A	N/A	81106.67
Radioactivity		n	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/A
Silvex		n	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/A
Sulfate		n	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N/A
Temperature		n	N/A		32		None			0.0000	8.0000	0	N/A	403.73	N/A
Tetrachloroethylene		n	N/A		None		3500			0.0000	0.0000	350	N/A	N/A	25806.6
Total dissolved solids		n	N/A		None		None			0.0000	0.0000	0	N/A	N/A	N
Toxaphene	C	n	N/A		0.0002		0.0075			0.0000	0.0001	0.00075	N/A	0.00	0.17
Tributyltin		n	N/A		0.026		None			0.0000	0.0065	0	N/A	0.33	N/A
Trichloroethylene	C	n	N/A		None		810			0.0000	0.0000	81	N/A	N/A	18041.40
Vinyl Chloride		n	N/A		None		5300			0.0000	0.0000	530	N/A	N/A	118048.67

Footnotes:

1. All concentrations expressed as micrograms per liter (ug/L),except Ammonia.
2. Ammonia (as mg/L) selected from separate tables,based on pH and temprature.
3. Acute-1 hour avg. concentration not to be exceeded more than 1/3years
4. Chronic-4 day avg.concentration not to be exceeded more than 1/3years.
5. Complete mix-mass balances employ 30Q5 for Non-carcinogens, and Harmonic Mean for Carcinogens
6. All flow values are expressed as Million Gallons per Day.
8. Metals measured as Dissolved, unless specified otherwise.
9. (c)-indicates carcinogenic parameter.
10. Public Water Supply-protects for fish and water consumption.
11. Other Waters-protects for fish consumption only.
12. Hardness expressed as CaCO3 (mg/L).
13. All limitations are based on EPA's TSD Statistical approach.

Freshwater Ammonia Toxicity Standards (based on 9 VAC 25-260-00 et seq)
(OK as of 3/91)
I. Perform Mass Balance for final Ammonia Concentrations and pH:

	Flow (MGD)	Total NH3-N (mg/L)	pH* SU	Temp. (C)	[H+]
Stream:	N/A	0.000	7.50	22.2	3.16E-08
POTW:	0.150	5.624	8.00	26.0	1.00E-08
Mix:	0.150	5.624	8.00	26.0	1.00E-08

Chronic/Acute Std.? (C/A)--> a <--- = 5.624 mg/l

System MEETS WQ Standard for 1-hour acute ammonia toxicity

* The pH mix does not take into account alkalinity.

	Acute (1-Hr)
90th Percentile Temp., C:	26.0
90th Percentile pH:	8.00
FT (final temperature):	0.6607
FPH	1
RATIO	NA
pKa	9.21
Un-ionized Ammonia, mg/L as NH3:	0.39
Fraction of Un-ionized Ammonia:	0.0575
Total Ammonia, mg/L as NH3:	6.84
Total Ammonia, mg/L as N:	5.62
Standard Selected	5.624

Freshwater Ammonia Toxicity Standards (based on 9 VAC 25-260-00 et seq)
(OK as of 3/91)
I. Perform Mass Balance for final Ammonia Concentrations and pH:

	Flow (MGD)	Total NH3-N (mg/L)	pH* SU	Temp. (C)	[H+]
Stream	7.420	0.000	7.50	22.2	3.16E-08
POTW:	0.150	103.676	8.00	26.0	1.00E-08
Mix:	7.570	2.054	7.51	22.3	3.12E-08

Chronic/Acute Std.? (C/A)--> c <--- = 2.054 mg/l

System MEETS WQ Standard for 4-day chronic ammonia toxicity

* The pH mix does not take into account alkalinity.

	Chronic (4-Day)
90th Percentile Temp., C:	22.3
90th Percentile pH:	7.51
FT (final temperature):	0.854557
FPH	1.426853
RATIO	17.75053
pKa	9.3293
Un-ionized Ammonia, mg/L -NH3:	0.0370
Fraction of Un-ionized Ammonia:	0.01480
Total Ammonia, mg/L as NH3:	2.50
Total Ammonia, mg/L as N:	2.05
Standard Selected	2.054

APPENDIX E

TMDL documentation

		Development					
27.	Falling River	Roanoke River PCB TMDL Development	Appomattox, Campbell	L32R	tPCB	0.0	MG/YR
28.	Childrey Creek	Roanoke River PCB TMDL Development	Halifax	L30R	tPCB	0.0	MG/YR
29.	Catawba Creek	Roanoke River PCB TMDL Development	Halifax	L36R	tPCB	0.0	MG/YR
30.	Turnip Creek	Roanoke River PCB TMDL Development	Charlotte	L36R	tPCB	0.0	MG/YR
31.	Hunting Creek	Roanoke River PCB TMDL Development	Halifax	L38R	tPCB	0.0	MG/YR
32.	Cub Creek	Roanoke River PCB TMDL Development	Appomattox, Charlotte	L37R	tPCB	0.0	MG/YR
33.	Black Walnut Creek	Roanoke River PCB TMDL Development	Halifax	L38R	tPCB	0.8	MG/YR
34.	Roanoke Creek	Roanoke River PCB TMDL Development	Charlotte	L39R	tPCB	0.0	MG/YR
35.	Difficult Creek	Roanoke River PCB TMDL Development	Halifax	L41R	tPCB	0.0	MG/YR
36.	Roanoke River	Roanoke River PCB TMDL Development	Appomattox, Campbell, Charlotte, Pittsylvania, Halifax	L19R	tPCB	1,931.8	MG/YR

B. Non-TMDL waste load allocations.

Water Body	Permit No.	Facility Name	Outfall No.	Receiving Stream	River Mile	Parameter Description	WLA	Units WLA
VAW-L04R	VA0072389	Oak Ridge Mobile Home Park	001	Falling Creek UT	0.32	BOD_5	0.85	KG/D
VAW-L04R	VA0025020	Roanoke City Regional Water Pollution Control Plant	001	Roanoke River	201.81	BOD_5	1173	KG/D
						TKN, APR-SEP	318	KG/D
						TKN, OCT-MAR	636	KG/D
			001	Roanoke River	201.81	BOD_5	1173	KG/D
						TKN, APR-SEP	416	KG/D
						TKN, OCT-MAR	832	KG/D

			001	Roanoke River	201.81	BOD_5 TKN, APR-SEP TKN, OCT-MAR	1173 469 939	KG/D KG/D KG/D
VAW-L04R	VA0077895	Roanoke Moose Lodge	001	Mason Creek	7.79	BOD_5, JUN-SEP TKN, JUN-SEP	0.24 0.09	KG/D KG/D
VAW-L07R	VA0020842	Bedford County School Board-Stewartsville Elementary School	001	Nat Branch, UT	0.59	BOD_5	0.5	KG/D
VAW-L14R	VA0029254	Ferrum Water and Sewage Auth. - Ferrum Sewage Treatment Plant	001	Storey Creek	9.78	BOD_5	14.2	KG/D
VAW-L14R	VA0085952	Rocky Mount Town Sewage Treatment Plant	001	Pigg River	52	BOD_5	133	KG/D
VAW-L14R	VA0076015	Ronile Incorporated	001	Pigg River	57.24	BOD_5	14.8	KG/D
VAW-L21R	VA0063738	Bedford County School Board - Staunton River High School	001	Shoulder Run, UT	0.95	BOD_5	1.8	KG/D
VAW-L21R	VA0020869	Bedford County School Board - Thaxton Elementary School	001	Wolf Creek, UT	0.35	BOD_5	0.31	KG/D
VAW-L22R	VA0023515	Blue Ridge Regional Jail Auth. - Moneta Adult Detention Facility STP	001	Mattox Creek, UT	3.76	BOD_5	1.66	KG/D
VAW-L25R	VA0020851	Bedford County School Board - Otter River	001	Big Otter River, UT	1.15	BOD_5	0.4	KG/D