

WATER QUALITY CALCULATIONS FOR METALS AND OTHER TOXIC SUBSTANCES
WATER QUALITY BASED EFFLUENT CALCULATIONS
OUTFALL 001

FACILITY: Covington STP **PERMIT #:** TN0020982 **DATE:** 2/9/2024 **CALC BY:** SMT

Stream (7Q10)	Stream (30Q5)	Waste Flow (MGD)	Ttl. Susp. Solids (mg/l)	Hardness (as CaCO3) (mg/l)	Margin of Safety (%)
225.88	284.18	3.62	54.45	25	50

2019 WQC
non-regulated stream worksheet (7Q10)

PARAMETER	1		2		3		4		5		6		7		8		9			10			11			12			13			14			15		
	Stream Bckgrnd.	Fish/Aqua. Life (F & AL) WQC lab conditions		Fraction dissolved		F & AL- instream allowable ambient conditions (Tot)		Calc. Effluent Concentration based on F & AL		In-Stream Criteria			Human Health Water Quality Criteria *			Calc. Effluent Concentration **			effluent limited case	PARAMETER																	
	Conc.	Chronic	Acute	Dissolved	Chronic	Acute	Chronic	Acute	Organisms	Water/Organisms	DWS	Organisms	Water/Organisms	DWS	Organisms	Water/Organisms	DWS	ug/l																			
	[ug/l]	[ug/l]	[ug/l]	[Fraction]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]		[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]		
Copper (a,b)	1.480	2.739	3.640	0.257	10.679	14.190	292.32	403.62	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	80.0	Copper (a,b)	
Chromium III	2.628	23.813	183.066	0.184	129.490	995.470	4022.64	31472.69	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Chromium III		
Chromium VI	2.628	11.000	16.000	1.000	11.000	16.000	266.70	425.20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Chromium VI		
Chromium, Total	2.628	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Chromium, Total		
Nickel (a,b)	1.634	16.096	144.918	0.269	59.757	538.014	1843.19	17003.11	4600.0	610.0	100.0	182791.00	24184.03	3970.96	180.0	Nickel (a,b)																					
Cadmium (a,b)	0.104	0.253	0.492	0.297	0.853	1.658	23.80	49.31	N/A	N/A	5.0	N/A	N/A	194.69	5.0	Cadmium (a,b)																					
Lead (a,b)	1.083	0.541	13.882	0.138	3.910	100.342	90.15	3146.87	N/A	N/A	5.0	N/A	N/A	156.23	45.0	Lead (a,b)																					
Mercury (T) (c)	0.018	0.770	1.400	1.000	0.770	1.400	23.84	43.81	0.051	0.05	2.0	1.31	1.27	78.79	0.4	Mercury (T) (c)																					
Silver (a,b,e)	0.148	N/A	0.296	1.000	N/A	0.296	N/A	4.77	N/A	N/A	N/A	N/A	N/A	N/A	5.0	Silver (a,b,e)																					
Zinc (a,b)	5.425	36.498	36.202	0.197	185.565	184.059	5712.83	5665.11	26000.0	7400.0	N/A	1033316.20	293945.37	N/A	200.0	Zinc (a,b)																					
Cyanide (d)	2.600	5.200	22.000	1.000	5.200	22.000	83.72	616.25	140.0	140.0	200.0	5463.10	5463.10	7848.17	230.0	Cyanide (d)																					
Toluene	0.000								15000.0	1300.0	1000.0	596266.80	51676.46	39751.12	15.0	Toluene																					
Benzene	0.000								510.0	22.0	5.0	20273.07	874.52	198.76	3.0	Benzene																					
1,1,1 Trichloroethane	0.000								N/A	N/A	200.0	N/A	N/A	7950.22	30.0	1,1,1 Trichloroethane																					
Ethylbenzene	0.000								2100.0	530.0	700.0	83477.35	21068.09	27825.78	4.0	Ethylbenzene																					
Carbon Tetrachloride	0.000								16.0	2.3	5.0	636.02	91.43	198.76	15.0	Carbon Tetrachloride																					
Chloroform	0.000								4700.0	57.0	N/A	186830.26	2265.81	N/A	85.0	Chloroform																					
Tetrachloroethylene	0.000								33.0	6.9	5.0	1311.79	274.28	198.76	25.0	Tetrachloroethylene																					
Trichloroethylene	0.000								300.0	25.0	5.0	11925.34	993.78	198.76	10.0	Trichloroethylene																					
1,2 trans Dichloroethylene	0.000								10000.0	140.0	100.0	N/A	5565.16	3975.11	1.5	1,2 trans Dichloroethylene																					
Methylene Chloride	0.000								5900.0	46.0	5.0	234531.61	1828.55	N/A	50.0	Methylene Chloride																					
Total Phenols	0.000								860000.0	10000.0	N/A	34185963.34	397511.20	N/A	50.0	Total Phenols																					
Naphthalene	0.000								N/A	N/A	N/A	N/A	N/A	N/A	1.0	Naphthalene																					
Total Phthalates	0.000								N/A	N/A	N/A	N/A	N/A	N/A	64.5	Total Phthalates																					
Chlorine (T. Res.)	0.000	11.000	19.000	1.000	11.000	19.000	697.36	1204.53	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Chlorine (T. Res.)																				

Application Reported ug/L

2.56

< 1.00

1.35

<0.1

0.5

<0.2

<0.1

20.6

<5

<5

3.6

<5

a Denotes metals for which Fish & Aquatic Life Criteria are expressed as a function of total hardness.
b The criteria for this metal is in the dissolved form at lab conditions. The calculated effluent concentration is in the total recoverable form.
c The chronic criteria for mercury is not converted to dissolved, since it is based on fish tissue data rather than toxicity.
d The criteria for this parameter is in the total form.
e Silver limit is daily max if column 8 is most stringent.
f When columns 7 or 8 result in a negative number, use results from columns 5 or 6, respectively.
g When columns 12, 13 or 14 result in a negative number, use results from columns 9, 10 or 11, respectively, as applicable.

* Domestic supply included in river use so pick from columns 7,8,12,13,14,15 or Domestic supply not included in river use so pick from columns 7, 8, 12 or 15.
** Water Quality criteria for stream use classifications other than Fish & Aquatic Life are based on the 30Q5 flow.

TN 0020982	PTL 1/29/2019	85% PTL	PTL 2/20/2024	Oct-23	Apr-23	Oct-22	Apr-22	Oct-21	Apr-21	Oct-20	Apr-20	Oct-19	Apr-19
COPPER	0.08000	0.06800	0.08000	0.00082	0.00233	0.00159	0.00376	0.00355	0.00172	0.00276	0.00242	0.00287	0.00266
CHROMIUM, III	report	n/a	report	0.01000	0.01000	0.01000	0.01000	0.01000	0.00100	0.01000	0.01000	0.01000	0.01000
CHROMIUM, VI	report	n/a	report	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000
CHROMIUM, TOTAL	0.06000	0.05100	0.06000	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
NICKEL	0.18000	0.15300	0.18000	0.00098	0.00074	0.00195	0.00135	0.00178	0.00125	0.00205	0.00132	0.00181	0.00078
CADMIUM	0.00500	0.00425	0.00500	0.00010	0.00010	0.00010	0.00010	0.00010	0.00100	0.00010	0.00010	0.00010	0.00010
LEAD	0.04500	0.03825	0.04500	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
MERCURY	0.00040	0.00034	0.00040	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020
SILVER	0.00498	0.00405	0.00477	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
ZINC	0.20000	0.17000	0.20000	0.03220	0.02180	0.02000	0.02000	0.02000	0.02000	0.03800	0.02340	0.02520	0.02100
CYANIDE	0.15036	0.07116	0.08372	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500
TOLUENE	0.01500	0.01275	0.01500		0.00500	0.00500							
BENZENE	0.00300	0.00255	0.00300		0.00100	0.00100							
1,1,1 TRICHLOROETHANE	0.03000	0.02550	0.03000		0.00100	0.00100							
ETHYLBENZENE	0.00400	0.00340	0.00400		0.00100	0.00100							
CARBON TETRACHLORIDE	0.01500	0.01275	0.01500		0.00100	0.00100							
CHLOROFORM	0.08500	0.07225	0.08500		0.00100	0.00898							
TETRACHLOROETHYLENE	0.02500	0.02125	0.02500		0.00100	0.00100							
TRICHLOROETHYLENE	0.01000	0.00850	0.01000		0.00100	0.00100							
1,2 TRANS-DICHLOROETHYLENE	0.00150	0.00128	0.00150		0.00100	0.00100							
METHYLENE CHLORIDE	0.05000	0.04250	0.05000		0.01000	0.01000							
TOTAL PHENOLS	0.05000	0.04250	0.05000	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00640
NAPHTHALENE	0.00100	0.00085	0.00100		0.00200	0.00200							
TOTAL PHTHALATES	0.06450	0.05483	0.06450		0.00500	0.00500							

Bolded in effluent data exceeds 85% of proposed PTLs

Shaded means detection level

green indicates changed

Determining low flows on unregulated streams

Step 1: Use USGS StreamStats to find the drainage area ($A_{outfall}$) and calculate low flow at the point of discharge ($Q_{outfall_streamstats}$).

Use print > print to pdf to save this output and insert it into permit appendix

Step 2: Use USGS StreamStats to explore the watershed and determine if an appropriate gage is available.

A gage is useable when the **drainage area** (A_{gage}) and the **period of record** representative of the point of discharge.

As a rule of thumb, the A_{gage} should be 0.5 to 1.5 times the $A_{outfall}$

The period of record should be > 10 years and “not too old”

Step 3: If enough gage data is available, use SWToolbox to download gage data and calculate the low flow at the gage (Q_{gage})

$$Q_{outfall} = Q_{gage} * \frac{A_{outfall}}{A_{gage}}$$

	square miles
A_Outfall:	2298.48
A_Gage:	2310

	7Q10		30Q5	
	cfs	MGD	cfs	MGD
Q_Gage:	351.24	227.01	441.90	285.60
Q_Outfall:	349.49	225.87	439.70	284.18

Where:

- Q_Outfall = Low flow statistic at outfall location
- Q_Gage = Low flow statistic at gage location (from SWToolbox output)
- A_Outfall = Area draining to outfall
- A_Gage = Area draining to gage

		7q10	30q5	
Gage station	7030050	314.9995	396.0044	cfs
USING hydrologic:		7q10	30q5	
1992 - 2023		351.24	441.9	cfs

Notice -- Log-Pearson Type III or Pearson Type III distributions are used for these computations. Users are responsible for assessment and interpretation.

Description: 07030050 HATCHIE RIVER AT RIALTO, TN
 Year Boundaries: April 1 - March 31
 Period in report: April 1, 1992 - March 31, 2023
 Parameter: 7-day low
 Non-zero values: 19
 Zero values: 0
 Negative values: 12 (ignored)

Input time series (zero and negative values not included in listing.)

618.140	692.860	373.860	305.860	401.000	521.000	412.430	424.140
357.290	430.430	631.290	469.290	390.570	539.570	602.570	539.860
906.860	936.290	499.290					

LOG PEARSON TYPE III Frequency Curve Parameters
 (based on logs of the non-zero values)

Mean (logs)	2.704
Variance (logs)	0.017
Standard Deviation (logs)	0.131
Skewness (logs)	0.551
Standard Error of Skewness (logs)	0.524
Serial Correlation Coefficient (logs)	0.457
Coefficient of Variation (logs)	0.048

Frequency Curve - Parameter values at selected probabilities

Non-exceedance Probability	Recurrence Interval	Parameter Value	Variance of Estimate	95-Pct Confidence Intervals	
				Lower	Upper
0.1000	10.00	351.240	1.008	286.000	401.660
0.2000	5.00	390.510	1.027	335.520	450.890

Description: 07030050 HATCHIE RIVER AT RIALTO, TN
 Year Boundaries: April 1 - March 31
 Period in report: April 1, 1992 - March 31, 2023
 Parameter: 30-day low
 Non-zero values: 19
 Zero values: 0
 Negative values: 12 (ignored)

Input time series (zero and negative values not included in listing.)

802.500	732.630	414.800	319.270	463.870	676.100	432.530	520.530
443.630	480.770	901.500	507.670	425.930	593.300	721.500	632.830
1024.600	1038.500	556.570					

LOG PEARSON TYPE III Frequency Curve Parameters
 (based on logs of the non-zero values)

Mean (logs)	2.767
Variance (logs)	0.020
Standard Deviation (logs)	0.142
Skewness (logs)	0.250
Standard Error of Skewness (logs)	0.524
Serial Correlation Coefficient (logs)	0.340
Coefficient of Variation (logs)	0.051

Frequency Curve - Parameter values at selected probabilities

Non-exceedance Probability	Recurrence Interval	Parameter Value	Variance of Estimate	95-Pct Confidence Intervals	
				Lower	Upper
0.1000	10.00	387.550	1.006	299.770	454.620
0.2000	5.00	441.900	1.022	365.020	517.760

StreamStats Report

Region ID:
 Workspace ID:
 Clicked Point (Latitude, Longitude):
 Time:

TN
 TN20240214154011579000
 35.62458, -89.60352
 2024-02-14 09:40:47 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	2298.48	square miles
PERMGTE2IN	Percent of area underlain by soils with permeability greater than or equal to 2 inches per hour	58.324	percent
RECESS	Number of days required for streamflow to recede one order of magnitude when hydrograph is plotted on logarithmic scale	184	days per log cycle

Low-Flow Statistics

Low-Flow Statistics Parameters [Low Flow West Region 2009 5159]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	2298.48	square miles	2	2405
RECESS	Recession Index	184	days per log cycle	32	350
PERMGTE2IN	Percent permeability gte 2 in per hr	58.324	percent	2	98

Low-Flow Statistics Flow Report [Low Flow West Region 2009 5159]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	ASEp
7 Day 10 Year Low Flow	319	ft ³ /s	123
30 Day 5 Year Low Flow	400	ft ³ /s	93.5

Low-Flow Statistics Citations

[Law, G.S., Tasker, G.D., and Ladd, D.E., 2009, Streamflow-characteristic estimation methods for unregulated streams of Tennessee: U.S. Geological Survey Scientific Investigations Report 2009-5159, 212 p., 1 pl.](#)

PRETREATMENT PASS-THROUGH LIMIT (PTL) REQUEST SHEET

General

Date Requested:	2/13/2024	Planned Public Notice: *	2/27/2024
NPDES Permit:	TN0020982		
Facility:	City of Covington STP		
County:	Tipton		

* When possible, provide PTL review requests to pretreatment staff two weeks before planned public notice.

Facility Flow

Design Flow (MGD):	3.62
Total Design Flow (MGD), if different:	
Explanation, if applicable:	

Receiving Stream

Receiving Stream:	Hatchie River			
Discharge Location (River Mile):	35.2			
1Q10:		MGD		CFS
7Q10:	225.88	MGD	349.49	CFS
30Q5:	284.18	MGD	439.70	CFS
Domestic Water designated use:	<input type="checkbox"/> No – use columns 7, 8, 12, & 15 in PTL spreadsheet <input checked="" type="checkbox"/> Yes – use columns 7, 8, 12 – 15 in PTL spreadsheet			
303(d) list:	<input checked="" type="checkbox"/> No – considered fully supporting <input type="checkbox"/> Yes – list impairments:			
Other relevant dischargers within +/- 5 river miles?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes – list facility, permit #, flow, & river mile:			

Special considerations

<p>Any concerns or special considerations? (ex: gage stations, chosen periods of record, background data, etc...)</p>	<p><input type="checkbox"/> No <input checked="" type="checkbox"/> Yes – describe below: <i>Technically, this discharges to mile 0.02 of an unnamed tributary before it discharges to the Hatchie itself. However, all permit calculations in this and previous permit issuances utilize the full flow of the Hatchie at the point where the unnamed tributary enters the Hatchie at RM 35.2. The permittee confirmed the discharge is about 100 ft from the Hatchie. EFO staff have confirmed that the discharge is so close to the main channel that the Hatchie flows up into the unnamed trib, and the discharge pipe is routinely submerged by the Hatchie. This permit continues this practice, to use the 7Q10/30Q5 of the Hatchie.</i></p> <p><i>Gage station 07030050 is used with a period of record of 1992 – 2023.</i></p> <p><i>When available, 10 years of ambient data was used for stream bkg. For Hg, data from 2010 was used to provide a larger dataset. Only 3 data points from 2009 & 2010 for CN, so I chose to use default of 1/2 WQC</i></p>
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	Staff	Date
PTLs calculated by:	Sarah Terpstra	2/13/2024
PTLs reviewed by:	Gordon Holcomb	2/14/2024

FACILITY DISCHARGES AND RECEIVING WATERS

OUTFALL 001	
LONGITUDE	LATITUDE
-89.6034	35.62394

FLOW (MGD)	DISCHARGE SOURCE
3.6200	Treated municipal wastewater
3.6200	TOTAL DISCHARGE

RECEIVING STREAM DISCHARGE ROUTE			
Mile 35.2 of Hatchie River (via unnamed tributary)			
STREAM LOW FLOW (CFS) *	7Q10	1Q10	30Q5
	349.49	N/A	439.70
(MGD)	225.88	N/A	284.18

STREAM USE CLASSIFICATIONS (WATER QUALITY)				
FISH & AQUATIC LIFE	RECREATION	IRRIGATION	LIVESTOCK & WILDLIFE	DOMESTIC WATER SUPPLY
X	X	X	X	X
INDUSTRIAL	NAVIGATION			
X				

Treatment: Grit screening (including FOG removal), oxidation ditch, UV disinfection, biosolids centrifuge & landfill

USE CLASSIFICATIONS FOR SURFACE WATERS

CHAPTER 0400-40-04

0400-40-04-.02 HATCHIE RIVER BASIN.

STREAM	DESCRIPTION	DOM	IWS	FAL	REC	LWW	IRR	NAV	TS	NRTS
Mississippi River	Mile 741.0 to 820.0	X	X	X	X	X	X	X		
Hatchie River	Mile 0.0 to Mile 129.0	X	X	X	X	X	X			

PASS THROUGH LIMITATIONS

Covington STP 2/20/2024 Tipton County
Design Flow: 3.62 MGD TN0020982 7Q10: 225.88 MGD

Parameter	Concentration (µg/l)
Copper	80.00
Chromium, III	Report only
Chromium, VI	Report only
Chromium, Total	60.00
Nickel	180.00
Cadmium	5.00
Lead	45.00
Mercury	0.40
Silver, Daily Maximum	4.77
Zinc	200.00
Cyanide	83.72
Toluene	15.00
Benzene	3.00
1,1,1 Trichloroethane	30.00
Ethylbenzene	4.00
Carbon Tetrachloride	15.00
Chloroform	85.00
Tetrachloroethylene	25.00
Trichloroethylene	10.00
1,2 trans Dichloroethylene	1.50
Methylene Chloride	50.00
Phenols, Total	50.00
Naphthalene	1.00
Phthalates, Total ¹	64.50

¹ Total Phthalates is the sum of Bis (2-ethylhexyl) phthalate, Butyl benzylphthalate, Di-n-butylphthalate and Diethyl phthalate.

Note: These limits are monthly averages, except for silver, which is a daily maximum. All sampling and analysis must be in accordance with 40 CFR 136 unless explicitly allowed by the NPDES permit. See Part 3.2. of the NPDES permit for sample type requirements. References include T.C.A. 0400-40-14-.12(7)(c), 40 CFR 136, and EPA Form 3510-2C (8/90 version).