

**Arkansas Department of Environmental Quality
Water Quality Management Plan Update Summary Sheet**

Date: 12/11/2014

New Permit

Renewal Permit

Amended Permit

Type of Discharge: Municipal Wastewater

Facility Name: City of Yellville

Permit No.: AR0034037

Design Flow Rate (MGD): 0.75

Receiving Stream: Crooked Creek, thence to the White River

HUC + Reach Code: 11010003+048

7Q10: 0 cfs¹

Planning Segment: 4I

County: Marion

Proposed Effluent Limits in mg/L (CBOD/TSS/NH3N/DO):

(April): 10.0/15.0/3.9/6.0

(May-Oct): 10.0/15.0/1.0/6.0

(Nov-March): 10.0/15.0/5.0/6.0

TMDL Limits (if any): None

Justification (Sag=Minimum Modeled Value ≠ Difference in Value):

Reach No.	Length Miles	DO _c (mg/l)	Sag _c (mg/l)	Distance to Sag _c (mg/l)	DO _p (mg/l)	Sag _p (mg/l)	Distance to Sag _p (miles)
1	2.0	6.0	5.9	0.2	6.0	6.0	0.0

Values above are from a modeling analysis dated 11/5/2009 and reviewed on 12/11/2014.

Current Effluent Limits in mg/L (CBOD/TSS/NH3N/DO):

(April): 10.0/15.0/3.9/6.0

(May-Oct): 10.0/15.0/1.0/6.0

(Nov-March): 10.0/15.0/5.0/6.0

Outfall 001 Location (Lat/Long): 36° 13' 15" N; 92° 39' 50" W

Remarks: There are no changes being made to 208 Plan with this permit renewal.

¹ The entire surface flow in Crooked Creek is diverted underground at Yellville at river mile 23 during low-flow conditions, based on a USGS report entitled, "Streamflow Gain and Loss of Selected Streams in Northern Arkansas", 1987, Freiwald, David A., USGS Scientific Investigations Report No. 86-4185. Therefore, this stream segment is considered a losing stream based on Reg. 6.301(B), and the 7Q10 of Crooked Creek at Yellville is considered to be zero at this discharge location.

Ammonia Calculations

Facility Name City of Yellville
 Major or Minor Minor
 Permit Number AR0034037
 Receiving Stream Crooked Creek
 7Q10, cfs 0
 0.25/0.67 multiplier 0.67
 Qb, cfs 0.00
 Qe, MGD 0.75
 Qe, cfs 1.16
 Cb, mg/l 0

Ecoregion or River name Ozark Highlands
 Watershed area (mi²) 425
 Regulation No. 2 Chronic Toxicity Criteria (Instream Concentration)
 AML, mg/l DML, mg/l
 April 3.9 3.9
 May - October 3.9 3.9
 November - March 10.3 10.3

Allowable Effluent Conc., mg/l

$$(Q_e * C_e) + (Q_b * C_b) = (Q_e + Q_b) * IWC$$

Qe Effluent Flow
 Ce Allowable Effluent Concentration
 Qb % of Low Flow of Receiving Stream
 Cb Background Concentration
 IWC Instream Waste Concentration Chronic Toxicity Criteria

Allowable Effluent Conc. (Ce), mg/l

$$C_e = (IWC (Q_e + Q_b) - C_b \times Q_b) / Q_e$$

	Monthly Avg.,mg/l	Daily Max, mg/l
April	3.90	3.90
May - October	3.90	3.90
November - March	10.30	10.30

Chronic Toxicity Criteria vs. D.O. Model Limits

Month	Monthly Average, mg/l		Permit Limits	Daily Maximum,mg/l		Permit Limits
	Toxicity limit	D.O. limit		Toxicity limit	D.O. limit	
April	3.90	5	3.90	3.90	7.5	3.90
May - October	3.90	1	1.00	3.90	1.5	1.50
November - March	10.30	5	5.00	10.30	7.5	7.50

Model Input Data

Facility Name: City of Yellville

Permit Number: AR0034037

Outfall Lat./Long.: 36° 13' 15" N; 92° 39' 50" W

W.S. Drainage Area (mi²):¹ 400 Ecoregion: Ozark Highlands

	Critical Season (May-Oct.)	Primary Season (Nov.-Apr.)
D.O. Standard (mg/L)	6.0	6.0
Temp. Standard (°C)	29	22
Q stream (cfs)	1.16	1.16
Velocity stream (fps)	0.1	0.1
Depth stream (ft)	0.6	0.6

Q_{DESIGN} (MGD): 0.75 Planning Seg.: 41

Receiving Stream: Crooked Creek, & thence to the White River

HUC + Reach Code: 11010003+048 Permit Type: Municipal

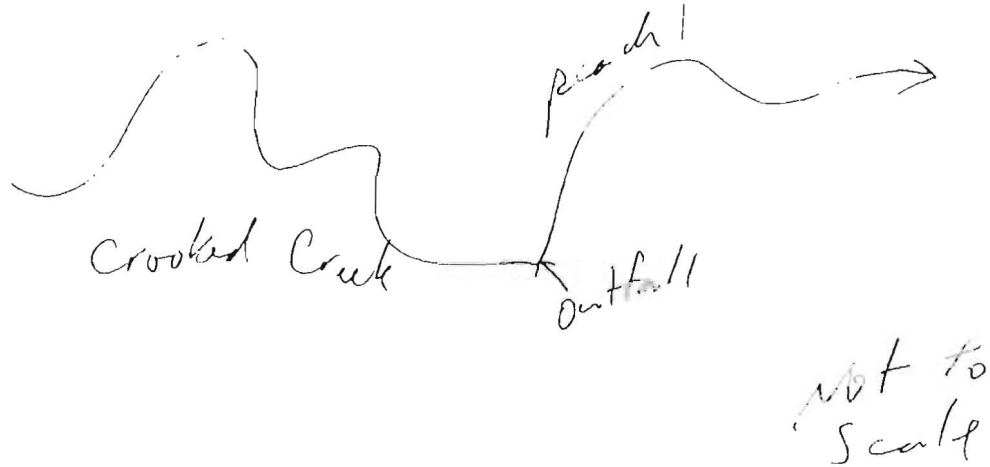
Other Facilities: 7Q10: 0 cfs

Name	Permit#	Outfall Coordinates	Q (MGD)	Limits (CBOD5/TSS/NH3-N/DO)
None				

¹ From the modeling analysis report dated February 9, 1989.

Engineer: cur
Date: 11/5/09

Flow Diagram:



Input Model Coefficients

Reach 1

Coefficient – at 20° C	Input Value	Justification
BOD _{ult} /BOD ₅	2.3	EPA Guidance
K _d (1/day)	0.3	Draft EPA MOA
K _n (1/day)	0.4	Draft EPA MOA
SOD (g/m ² /day)	0.5	Draft EPA MOA
K _a (1/day)	from Model	O'Connor-Dobbins

Recommendations:

Based on Reg. 6.301(C)(2), the previous permit, the attached models, and the attached toxicity spreadsheet, the following are the proposed monthly average treated effluent limits in mg/L (CBOD5/NH3-N/DO):

May – October:² 10/15/1.0/6.0
 November – March: 10/15/5.0/6.0
 April: 10/15/3.9/6.0

² Per Reg. 2.106, the Critical Season is temperature dependent and tends to be from mid-May to mid-September.

Engineer: CPK
 Date: 11/5/09

BVC

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*                               SIMPLIFIED METHOD PROGRAM                               *
*                               COMPLETE INPUT LISTING                               *
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34037_C.SMP

----*--*--* Run Information *--*--*--*--*

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Name of receiving stream ----- Crooked Creek
Number of discharges ----- 1
Number of reaches ----- 1
Reaeration type ----- O'Connor-Dobbins
Run title ----- Yellville_Critical

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----*--*--* Upstream Parameters *--*--*--*--*

Parameter	Value	Comment
Flow (cfs)	0.000	7Q10
Temperature (°C)	29.000	Reg. 2 Critical
Dissolved Oxygen (mg/l)	-0.000	
5-Day BOD (mg/l)	-0.000	
Ult. CBOD / 5-Day BOD	2.300	EPA Guidance
pH (su)	-0.000	
Ammonia (mg/l)	-0.000	
Alkalinity (mg/l)	-0.000	

----*--*--* Effluent Parameters *--*--*--*--*

Number of Discharges = 1

For Discharge Number 1 (CityofYellville)

Parameter	Value	Comment
Flow (MGD)	0.750	Permit
Temperature (°C)	29.000	Reg. 2 Critical
Dissolved Oxygen (mg/l)	6.000	Permit
5-Day BOD (mg/l)	10.000	Reg. 6.301(C)
Ult. CBOD / 5-Day BOD	2.300	EPA Guidance
pH (su)	-0.000	
Ammonia (mg/l)	1.000	Permit
Alkalinity (mg/l)	-0.000	
Beginning of Reach Number	1.000	

----*--*--* Reach Information *--*--*--*--*

Number of Reaches = 1
Reaeration Type is O'Connor-Dobbins

For Reach Number 1

Parameter	Value	Comment
Length (mile)	2.000	
Velocity (fps)	0.100	EPA Spreadsheet
Slope (ft/mile)	-0.000	
Average Depth (ft)	0.600	EPA Spreadsheet
Temperature (°C)	29.000	Calculated

BOD Removal Rate	(1/day)	0.300	Draft EPA MOA
NH3 Decay Rate	(1/day)	0.400	Draft EPA MOA
Sediment Oxygen Demand	(g/m ² /day)	0.800	k20 = 0.5
Photosynthesis/respiration	(mg/L/day)	-0.000	

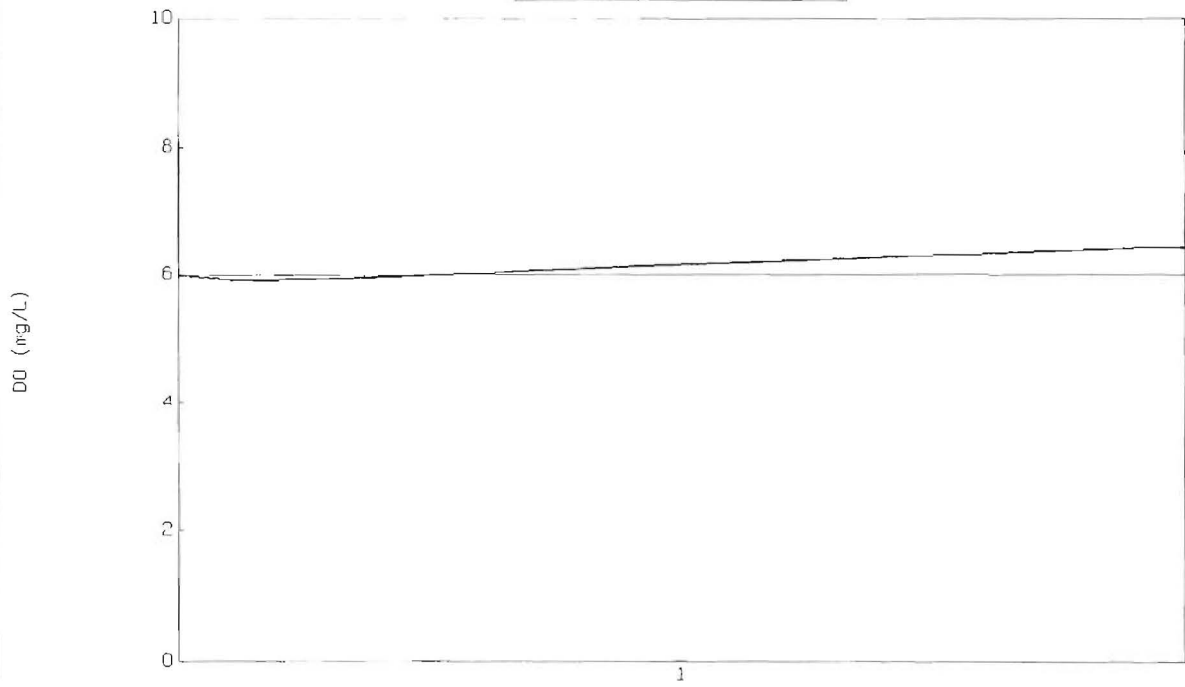
Temperature-corrected BOD removal rate	(1/day)	0.454
Temperature-corrected NH3 decay rate	(1/day)	0.800
Calculated reaeration rate at 20° C	(1/day)	8.777
Temperature-corrected reaeration rate	(1/day)	10.875
Calculated reach-averaged width	(ft)	19.325

--*-*-* Results for Crooked Creek *-*-*-*-*

Discharge is to -- Crooked Creek
Run Title is -- Yellville_Critical

River Mile	DO Predicted	DO Observed	BOD Predicted	BOD Observed	NH3 Predicted	NH3 Observed
2.000	6.000		23.000		1.000	
1.900	5.936		22.371		0.952	
1.800	5.923		21.760		0.907	
1.700	5.935		21.165		0.864	
1.600	5.961		20.586		0.822	
1.500	5.992		20.023		0.783	
1.400	6.025		19.476		0.746	
1.300	6.059		18.944		0.710	
1.200	6.093		18.426		0.676	
1.100	6.126		17.922		0.644	
1.000	6.158		17.432		0.613	
0.900	6.189		16.956		0.584	
0.800	6.220		16.492		0.556	
0.700	6.249		16.041		0.530	
0.600	6.277		15.603		0.505	
0.500	6.304		15.176		0.480	
0.400	6.331		14.761		0.458	
0.300	6.356		14.358		0.436	
0.200	6.381		13.965		0.415	
0.100	6.405		13.583		0.395	
-0.000						
-0.000	6.428		13.212		0.376	

Dissolved Oxygen Profile
Yellville_Critical



Max unionized ammonia = 0.0000 mg/L

BVC

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*                               SIMPLIFIED METHOD PROGRAM                               *
*                               COMPLETE INPUT LISTING                               *
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34037_P.SMP

----*--*--* Run Information *--*--*--*--*

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Name of receiving stream ----- Crooked Creek
Number of discharges ----- 1
Number of reaches ----- 1
Reaeration type ----- O'Connor-Dobbins
Run title ----- Yellville_Primary

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----*--*--* Upstream Parameters *--*--*--*--*

Parameter	Value	Comment
Flow (cfs)	0.000	7Q10
Temperature (°C)	22.000	Reg. 2 Primary
Dissolved Oxygen (mg/l)	-0.000	
5-Day BOD (mg/l)	-0.000	
Ult. CBOD / 5-Day BOD	2.300	EPA Guidance
pH (su)	-0.000	
Ammonia (mg/l)	-0.000	
Alkalinity (mg/l)	-0.000	

----*--*--* Effluent Parameters *--*--*--*--*

Number of Discharges = 1

For Discharge Number 1 (CityofYellville)

Parameter	Value	Comment
Flow (MGD)	0.750	Permit
Temperature (°C)	22.000	Reg. 2 Primary
Dissolved Oxygen (mg/l)	6.000	Proposed
5-Day BOD (mg/l)	10.000	Reg. 6.301(C)
Ult. CBOD / 5-Day BOD	2.300	EPA Guidance
pH (su)	-0.000	
Ammonia (mg/l)	5.000	Permit
Alkalinity (mg/l)	-0.000	
Beginning of Reach Number	1.000	

----*--*--* Reach Information *--*--*--*--*

Number of Reaches = 1
 Reaeration Type is O'Connor-Dobbins

For Reach Number 1

Parameter	Value	Comment
Length (mile)	2.000	
Velocity (fps)	0.100	EPA Spreadsheet
Slope (ft/mile)	-0.000	
Average Depth (ft)	0.600	EPA Spreadsheet
Temperature (°C)	22.000	Calculated

BOD Removal Rate	(1/day)	0.300	Draft EPA MOA
NH3 Decay Rate	(1/day)	0.400	Draft EPA MOA
Sediment Oxygen Demand	(g/m ² /day)	0.600	k20 = 0.5
Photosynthesis/respiration	(mg/L/day)	-0.000	

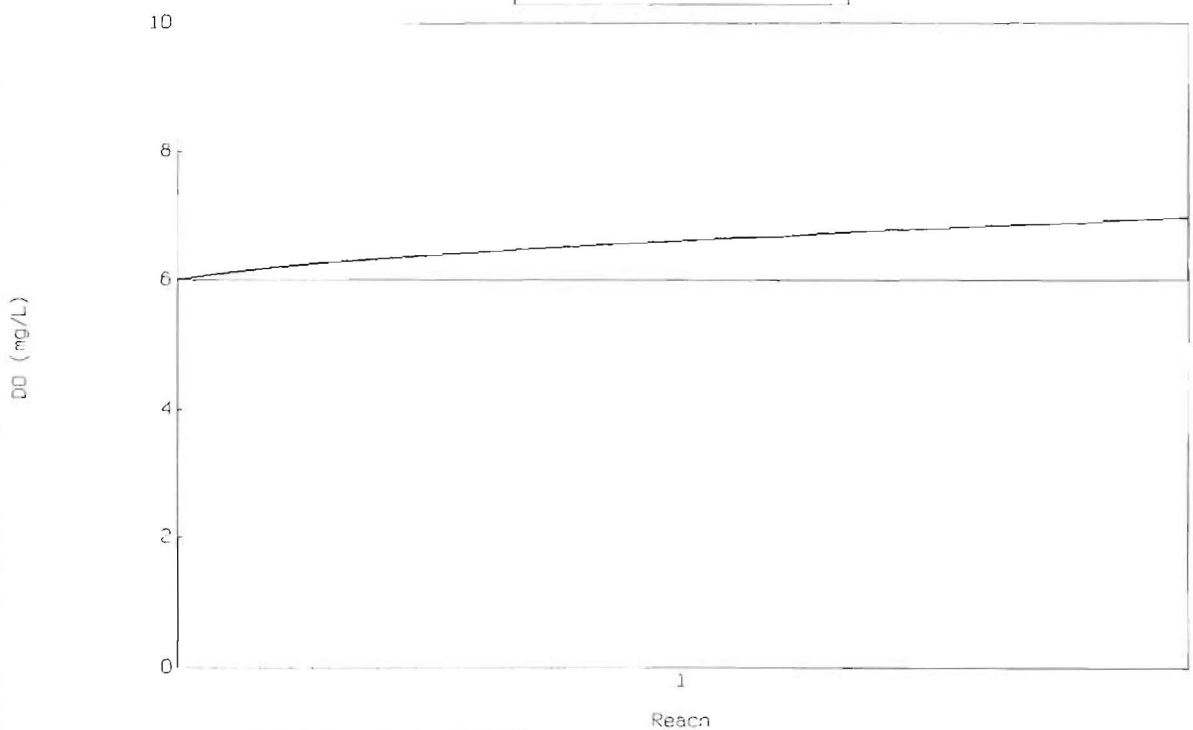
Temperature-corrected BOD removal rate	(1/day)	0.329
Temperature-corrected NH3 decay rate	(1/day)	0.467
Calculated reaeration rate at 20° C	(1/day)	8.777
Temperature-corrected reaeration rate	(1/day)	9.206
Calculated reach-averaged width	(ft)	19.325

--*-*-* Results for Crooked Creek *-*-*-*-*

Discharge is to -- Crooked Creek
Run Title is -- Yellville_Primary

River Mile	DO Predicted	DO Observed	BOD Predicted	BOD Observed	NH3 Predicted	NH3 Observed
2.000	6.000		23.000		5.000	
1.900	6.115		22.542		4.859	
1.800	6.201		22.094		4.723	
1.700	6.270		21.654		4.590	
1.600	6.329		21.223		4.461	
1.500	6.382		20.801		4.336	
1.400	6.431		20.387		4.214	
1.300	6.477		19.982		4.095	
1.200	6.521		19.584		3.980	
1.100	6.563		19.194		3.868	
1.000	6.604		18.813		3.760	
0.900	6.644		18.438		3.654	
0.800	6.683		18.071		3.551	
0.700	6.721		17.712		3.451	
0.600	6.758		17.359		3.354	
0.500	6.793		17.014		3.260	
0.400	6.828		16.675		3.168	
0.300	6.862		16.344		3.079	
0.200	6.895		16.019		2.993	
0.100	6.928		15.700		2.909	
-0.000						
-0.000	6.959		15.387		2.827	

Dissolved Oxygen Profile
Yellville_Primary



Max unionized ammonia = 0.0000 mg/L