

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

Date: 11/6/2015

New Permit

Renewal Permit

Amended Permit

**Type of Discharge:** Domestic Wastewater

**Facility Name:** Fairfield Bay Wastewater Corporation-Hamilton Hills WWTP

**Permit No.:** AR0037303

**Design Flow Rate (MGD):** 0.1 MGD

**Receiving Stream:** an unnamed tributary of Lynn Creek, thence to Greers Ferry Lake

**HUC + Reach Code:** 11010014+032

**7Q10:** 0 cfs

**Planning Segment:** 4E

**County:** Van Buren

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

No changes are proposed from current effluent limits shown below.

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

(April): 10.0/15.0/5.3/5.0/1.0

(May-Oct): 10.0/15.0/5.0/5.0/1.0

(Nov-March): 10.0/15.0/10.0/5.0/1.0

**TMDL Limits (if any):** None

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

Reach No.	Length Miles	DO <sub>c</sub> (mg/l)	Sag <sub>c</sub> (mg/l)	Distance to Sag <sub>c</sub> (mg/l)	DO <sub>p</sub> (mg/l)	Sag <sub>p</sub> (mg/l)	Distance to Sag <sub>p</sub> (miles)
1	0.03	2.0	5.0	0.0	6.0	7.029	0.0

Values in above table are from a modeling analysis dated 11/6/2015.

**Outfall 001 Location (Lat/Long):** 35° 34' 35.4" N; 92° 16' 39.5" W

**Remarks:** This is for reissuance of the discharge permit for this existing facility. This facility discharges into a tributary which flows approximately 0.03 miles then goes into Greers Ferry Lake. Review of the files indicated no model for the tributary existed, therefore a model was created to demonstrate compliance with DO standards in tributary. The model shows that current effluent limits meet DO standards in tributary and at point where tributary enters lake.

No changes to the 208 Plan are being made with this permit renewal.

**Ammonia Calculations**

Facility Name	Fairfield Bay Wastewater Corp
Major or Minor	Minor
Permit Number	AR0037303
Receiving Stream	Unnamed tributary of Lynn Creek
Critical 7Q10, cfs	0
Primary 7Q10, cfs	0
0.25/0.67 multiplier	0.67
0.25/0.67 multiplier	0.67
Qb (Critical), cfs	0.00
Qb (Primary), cfs	0.00
Qe, MGD	0.1
Qe, cfs	0.15
Cb, mg/l	0

Ecoregion or River name	Boston Mountains
Watershed area (mi <sup>2</sup> )	2

Regulation No. 2 Chronic Toxicity Criteria (Instream Concentration)		
	AML, mg/l	DML, mg/l
April	5.3	5.3
May - October	5.3	5.3
November - March	15.8	15.8

Allowable Effluent Conc., mg/l

$(Qe * Ce) + (Qb * Cb) = (Qe + Qb) * IWC$

Qe	Effluent Flow		
Ce	Allowable Effluent Concentration		
Qb	% of Low Flow of Receiving Stream	Monthly Avg.,mg/l	Daily Max, mg/l
Cb	Background Concentration	5.30	5.30
IWC	Instream Waste Concentration Chronic Toxicity Criteria	5.30	5.30
		15.80	15.80

Allowable Effluent Conc. (Ce), mg/l

$Ce = (IWC (Qe + Qb) - Cb * Qb) / Qe$

April	5.30
May - October	5.30
November - March	15.80

**Chronic Toxicity Criteria vs. D.O. Model Limits**

Month	Monthly Average, mg/l	D.O. limit	Permit Limits
April	Toxicity limit 5.3	10	Daily Maximum,mg/l Toxicity limit 5.3
May - October	no fishery	5	no fishery
November - March	15.8	10	15.8
			D.O. limit 15
			7.5
			15
			Permit Limits 5.30
			5.00
			10.00
			15.00

## StreamStats Version 3 Beta

### Basin Characteristics Ungaged Site Report

Date: Fri Nov 6, 2015 1:07:52 PM GMT-6  
NAD 1983 Latitude: 35.5763 (35 34 35)  
NAD 1983 Longitude: -92.2771 (-92 16 38)

Label	Value	Units	Definition
DRNAREA	0.35	square miles	Area that drains to a point on a stream

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U.S. Department of the Interior | U.S. Geological Survey  
URL: [http://streamstatsags.cr.usgs.gov/v3\\_beta/BCreport.htm](http://streamstatsags.cr.usgs.gov/v3_beta/BCreport.htm)  
Page Contact Information: StreamStats Help  
Page Last Modified: 08/24/2015 14:42:48 (Web1)

Streamstats Status



## Model Input Data

Facility Name: Fairfield Bay Wastewater Corp. – Hamilton Hills WWTP

Permit Number: AR0037303

Outfall Lat./Long.: 35° 34' 35.4" N; 92° 16' 39.5" W

W.S. Drainage Area (mi<sup>2</sup>): 0.35 (at outfall)    Ecoregion: Boston Mountains

	Critical Season (May-Oct.)	Primary Season (Nov.-Apr.)
D.O. Standard (mg/L)	2.0	6.0
Temp. Standard (°C)	31	22
Q upstream (cfs)	0	1.0
Velocity stream (fps)	0.035	0.089
Depth stream (ft)	0.234	0.493

Q<sub>DESIGN</sub> (MGD): 0.1

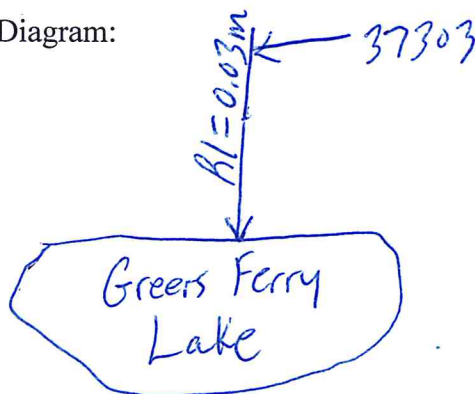
Planning Segment: 4E

Receiving Stream: tributary of Lynn Creek, thence to Greers Ferry Lake

HUC + reach code: 11010014+032

Permit type: Domestic

Model Diagram:



Engineer: SB

Date: 11-6-2015

## Input Model Coefficients

### Reach 1

Coefficient – at 20° C	Input value	Justification
BOD <sub>ult.</sub> /BOD <sub>5</sub>	2.3	EPA Guidance
K <sub>d</sub> (1/day)	0.4	Draft EPA MOA
K <sub>n</sub> (1/day)	0.4	Draft EPA MOA
SOD (g/m <sup>2</sup> /day)	0.5	Draft EPA MOA, based on projected effluent TSS
K <sub>a</sub> (1/day)	21.3 (critical season) 11.1 (primary season)	O'Conner Dobbins

Engineer: SB

Date: 11-6-2015

# Critical Season

## Quick Calculator

## Texas Original Default values about 80th percent values

<input type="text" value="0"/> Headwater in CFS		0.088886	0.5	0.492814	0.4	22.82883	0.1
			FPS		Feet		Feet
<input type="text" value="0.1"/> Discharger 1 in MGD	_____ Reach 1 Velocity	<input type="text" value="0.035"/>		Depth	<input type="text" value="0.234"/>	Width	<input type="text" value="18.943"/>
<input type="text" value=""/> Discharger 2 in MGD	_____ Reach 2 Velocity	<input type="text" value="0.035"/>		Depth	<input type="text" value="0.234"/>	Width	<input type="text" value="18.943"/>
<input type="text" value=""/> Discharger 3 in MGD	_____ Reach 3 Velocity	<input type="text" value="0.035"/>		Depth	<input type="text" value="0.234"/>	Width	<input type="text" value="18.943"/>
<input type="text" value=""/> Discharger 4 in MGD	_____ Reach 4 Velocity	<input type="text" value="0.035"/>		Depth	<input type="text" value="0.234"/>	Width	<input type="text" value="18.943"/>
<input type="text" value=""/> Discharger 5 in MGD	_____ Reach 5 Velocity	<input type="text" value="0.035"/>		Depth	<input type="text" value="0.234"/>	Width	<input type="text" value="18.943"/>
<input type="text" value=""/> Discharger 6 in MGD	_____ Reach 6 Velocity	<input type="text" value="0.035"/>		Depth	<input type="text" value="0.234"/>	Width	<input type="text" value="18.943"/>
<input type="text" value=""/> Discharger 7 in MGD	_____ Reach 7 Velocity	<input type="text" value="0.035"/>		Depth	<input type="text" value="0.234"/>	Width	<input type="text" value="18.943"/>
<input type="text" value=""/> Discharger 8 in MGD	_____ Reach 8 Velocity	<input type="text" value="0.035"/>		Depth	<input type="text" value="0.234"/>	Width	<input type="text" value="18.943"/>
<input type="text" value=""/> Discharger 9 in MGD	_____ Reach 9 Velocity	<input type="text" value="0.035"/>		Depth	<input type="text" value="0.234"/>	Width	<input type="text" value="18.943"/>
<input type="text" value=""/> Discharger 10 in MGD	_____ Reach 10 Velocity	<input type="text" value="0.035"/>		Depth	<input type="text" value="0.234"/>	Width	<input type="text" value="18.943"/>

Accum  
MGD

CFS is  MGD

MGD is  CFS

# Primary Season

## Quick Calculator

## Texas Original Default values about 80th percent values

0.845	Headwater in CFS	0.088886	0.5	0.492814	0.4	22.82883	0.1	Accum	
			FPS		Feet		Feet	MGD	
0.1	Discharger 1 in MGD	_____	Reach 1 Velocity	0.089	Depth	0.493	Width	22.828	0.646
	Discharger 2 in MGD	_____	Reach 2 Velocity	0.089	Depth	0.493	Width	22.828	0.646
	Discharger 3 in MGD	_____	Reach 3 Velocity	0.089	Depth	0.493	Width	22.828	0.646
	Discharger 4 in MGD	_____	Reach 4 Velocity	0.089	Depth	0.493	Width	22.828	0.646
	Discharger 5 in MGD	_____	Reach 5 Velocity	0.089	Depth	0.493	Width	22.828	0.646
	Discharger 6 in MGD	_____	Reach 6 Velocity	0.089	Depth	0.493	Width	22.828	0.646
	Discharger 7 in MGD	_____	Reach 7 Velocity	0.089	Depth	0.493	Width	22.828	0.646
	Discharger 8 in MGD	_____	Reach 8 Velocity	0.089	Depth	0.493	Width	22.828	0.646
	Discharger 9 in MGD	_____	Reach 9 Velocity	0.089	Depth	0.493	Width	22.828	0.646
	Discharger 10 in MGD	_____	Reach 10 Velocity	0.089	Depth	0.493	Width	22.828	0.646

1 CFS is 0.64631674 MGD

1 MGD is 1.547229 CFS

BVC

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*****
*                               SIMPLIFIED METHOD PROGRAM                               *
*                               COMPLETE INPUT LISTING                               *
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37303-C                      11/16/2015

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

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Name of receiving stream ----- trib/GreersFerryLake
Number of discharges ----- 1
Number of reaches ----- 1
Reaeration type ----- O'Connor-Dobbins
Run title ----- FairfieldBayHamilton

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

Parameter	Value	Comment
Flow (cfs)	0.000	7Q10
Temperature (°C)	31.000	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 (Fairfield Bay)

Parameter	Value	Comment
Flow (MGD)	0.100	DesignFlowRate
Temperature (°C)	31.000	Reg. 2 Critical
Dissolved Oxygen (mg/l)	5.000	permit limit
5-Day BOD (mg/l)	10.000	permit limit
Ult. CBOD / 5-Day BOD	2.300	EPA Guidance
pH (su)	-0.000	
Ammonia (mg/l)	5.000	permit limit
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)	0.025	to lake
Velocity (fps)	0.035	EPA Spreadsheet
Slope (ft/mile)	-0.000	
Average Depth (ft)	0.234	EPA Spreadsheet
Temperature (°C)	31.000	Calculated



BOD Removal Rate	(1/day)	0.400	Draft EPA MOA
NH3 Decay Rate	(1/day)	0.400	Draft EPA MOA
Sediment Oxygen Demand	(g/m <sup>2</sup> /day)	0.950	k20 = 0.5
Photosynthesis/respiration	(mg/L/day)	-0.000	

Temperature-corrected BOD removal rate	(1/day)	0.663
Temperature-corrected NH3 decay rate	(1/day)	0.933
Calculated reaeration rate at 20° C	(1/day)	21.321
Temperature-corrected reaeration rate	(1/day)	27.705
Calculated reach-averaged width	(ft)	18.877

\*-\*-\*-\*-\* Results for trib/GreersFerryLake \*-\*-\*-\*-\*

Discharge is to -- trib/GreersFerryLake  
Run Title is -- FairfieldBayHamilton

River Mile	DO	DO	BOD	BOD	NH3	NH3
	Predicted	Observed	Predicted	Observed	Predicted	Observed
0.025	5.000		23.000		5.000	
0.005	5.314		22.474		4.840	

Dissolved Oxygen Profile  
Fairfield Bay Hamilton

DO (mg/L)

10  
8  
6  
4  
2  
0

5.3  
- 5.0 = WAS  
for lake

Predicted Instream DO

DO WAS in tributary = 2.0

1

Reach = 0.025 miles  
tributary

Max unionized ammonia = 0.0000 mg/L

Greers Ferry  
Lake

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BVC

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*****
*                               SIMPLIFIED METHOD PROGRAM                               *
*                               COMPLETE INPUT LISTING                               *
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37303-P      11/6/2015

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

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Name of receiving stream ----- trib/GreersFerryLake
Number of discharges ----- 1
Number of reaches ----- 1
Reaeration type ----- O'Connor-Dobbins
Run title ----- FairfieldBayHamilton

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

Parameter	Value	Comment
Flow (cfs)	0.845	seasonalfishery
Temperature (°C)	22.000	Reg 2
Dissolved Oxygen (mg/l)	7.400	85% sat
5-Day BOD (mg/l)	1.000	assumed
Ult. CBOD / 5-Day BOD	2.300	EPA Guidance
pH (su)	7.000	
Ammonia (mg/l)	0.100	
Alkalinity (mg/l)	-0.000	

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

Number of Discharges = 1

For Discharge Number 1 (Fairfield Bay)

Parameter	Value	Comment
Flow (MGD)	0.100	DesignFlowRate
Temperature (°C)	22.000	Reg. 2 Critical
Dissolved Oxygen (mg/l)	5.000	permit limit
5-Day BOD (mg/l)	10.000	permit limit
Ult. CBOD / 5-Day BOD	2.300	EPA Guidance
pH (su)	7.000	
Ammonia (mg/l)	10.000	permit limit
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)	0.025	to lake
Velocity (fps)	0.089	EPA Spreadsheet
Slope (ft/mile)	-0.000	
Average Depth (ft)	0.493	EPA Spreadsheet
Temperature (°C)	22.000	Calculated

BOD Removal Rate	(1/day)	0.400	Draft EPA MOA
NH3 Decay Rate	(1/day)	0.400	Draft EPA MOA
Sediment Oxygen Demand	(g/m <sup>2</sup> /day)	0.560	k20 = 0.5
Photosynthesis/respiration	(mg/L/day)	-0.000	

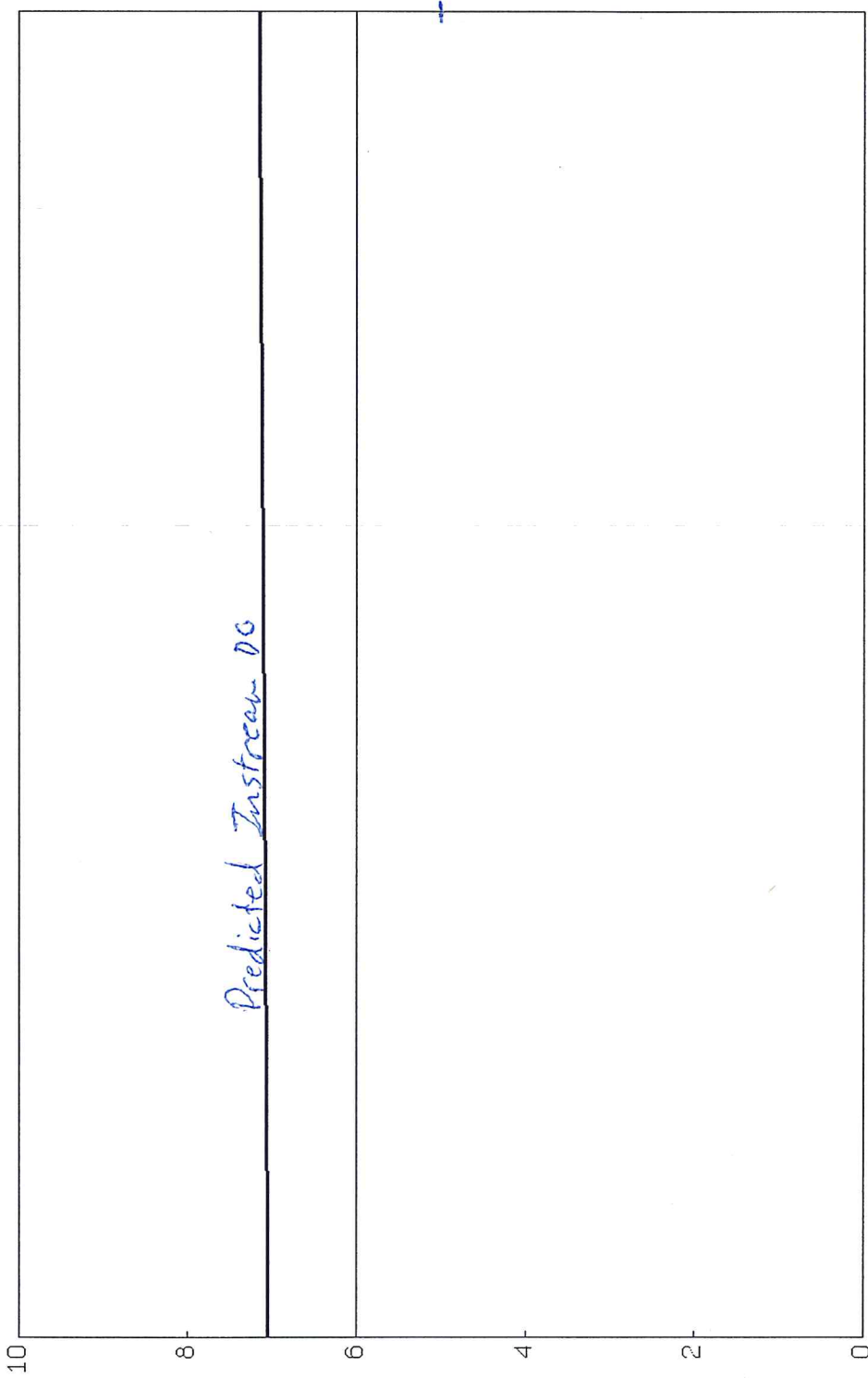
Temperature-corrected BOD removal rate	(1/day)	0.438
Temperature-corrected NH3 decay rate	(1/day)	0.467
Calculated reaeration rate at 20° C	(1/day)	11.118
Temperature-corrected reaeration rate	(1/day)	11.660
Calculated reach-averaged width	(ft)	22.782

\*-\*-\*-\*-\* Results for trib/GreersFerryLake \*-\*-\*-\*-\*

Discharge is to -- trib/GreersFerryLake  
Run Title is -- FairfieldBayHamilton

River Mile	DO	DO	BOD	BOD	NH3	NH3
	Predicted	Observed	Predicted	Observed	Predicted	Observed
0.025	7.029		5.502		1.631	
0.005	7.136		5.468		1.621	

Dissolved Oxygen Profile  
Fairfield Bay Hamilton



Greens Ferry  
Lake

Tributary  
R1 = 0.025 miles

Max unionized ammonia = 0.0074 mg/L

DO (mg/L)