

ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
WATER QUALITY MANAGEMENT PLAN UPDATE
SUMMARY SHEET

Type of Discharge: Municipal___, Industrial_x___, Other_____

Facility Name ELDORADO CHEMICAL COMPANY

Receiving Stream UNNAMED TRIBUTARY OF FLAT CREEK

Planning Segment 2E County UNION

Permit # AR0020752 Update Method _____

Effluent Limits-(CBOD5/TSS/NH3N/EFF.D.O.) Design Flow (MGD) 1.4

Critical Season 10/15/12/4 MAY-OCT

Primary Season 10/15/12/5 NOV-APR

Justification MULTISMP MODEL

Already included in WQMP Y/N N

Receiving Stream _____

EffluentLimits _____

Section, Range & Township, or Latitude and Longitude

Existing _____

New Site _____

W.Q. Standards Changed by Use Attainability Analysis Y/N N

If Yes, list changes _____

REMARKS: LIMITS FOR OUTFALLS 003 AND 004

DISCHARGE LOCATION: NE 1/4 SEC. 8, R15W, T17S

TMDL
ON
AN UNNAMED TRIBUTARY OF FLAT CREEK

OCTOBER 8, 1999

Introduction

A total mass daily load (TMDL) evaluation was performed on an unnamed tributary of Flat Creek, the present receiving stream of the Eldorado Chemical Company's contaminated stormwater discharge (outfall 004) and the sanitary wastewater discharge (outfall 003). This evaluation was performed to determine effluent limits and load that will maintain the dissolved oxygen standard of this stream. The sanitary sewage treatment system consists of an Imhoff tank system. The discharges enter the unnamed tributary of Flat Creek in the NE 1/4 Section 8, Range 15 West, Township 17 South in Union County. The Eldorado Chemical Company is operating under NPDES # AR0020752 which is presently being reviewed for modification and renewal.

The current discharge site is located in planning segment 2E of the Ouachita River basin. The design flow of the modeled discharges is 1.4 MGD (million gallons per day), with only .02 MGD of this volume being sanitary sewage.

The unnamed tributary of Flat Creek, with a drainage area of less than one mi² at the discharge site, is classified as a Gulf Coastal mid-size perennial fishery because of the discharge design flow which exceeds one cubic foot per second, and as such, has an applicable dissolved oxygen standard of 3 mg/l, with a 1 mg/l diurnal fluctuation being allowed for not more than 8 hours in any 24 hour period when the stream temperature exceeds 22°C. When the stream temperature is 22°C or less, a 5 mg/l dissolved oxygen standard applies.

The MultiSMP model, utilizing the steady state Streeter-Phelps equation, was used to determine the effluent limits necessary to protect the dissolved oxygen standard in this stream during both critical and primary season discharge periods.

Data Used in the Model

The input parameters used in the model for the Eldorado Chemical wastewater discharges are:

Q7-10 flow = 0 cfs
Primary season stream flow = 0.1 cfs
Stream depth = .75 feet
Stream velocity = 0.2 feet/second
Critical temperature = 30°C
Seasonal temperature = 22°C

The reaeration rate, Ka, was calculated using the O'Connor-Dobbins formula:

$$K_a = \frac{12.9 V^{0.5}}{H^{1.5}}$$

where V = velocity, feet/second
H = depth, feet

This resulted in Ka of 8.9/day for the stream projections. The formula used is recommended in Appendix A of Technical Guidance Manual for Performing Wasteload Allocations.

The deoxygenation rate, Kd, used was 0.2/day, which was based on the fact that a low Kd value is applied to stormwater discharges. This rate is within the range suggested by the above reference.

The EPA accepted literature value of 0.4/day was used for the ammonia removal rate, Kn.

The benthic demand, B, used in the model was 0.5 gm/m²/day for the 10/15 (CBOD5/TSS) projections. This value was temperature corrected for the critical and primary season projections.

Results

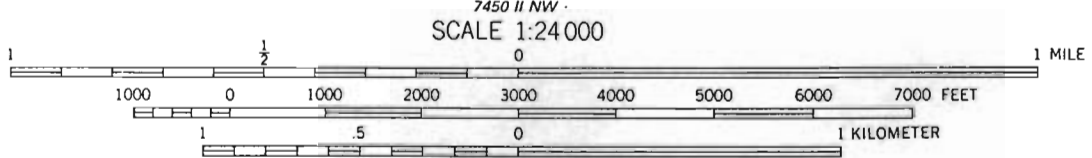
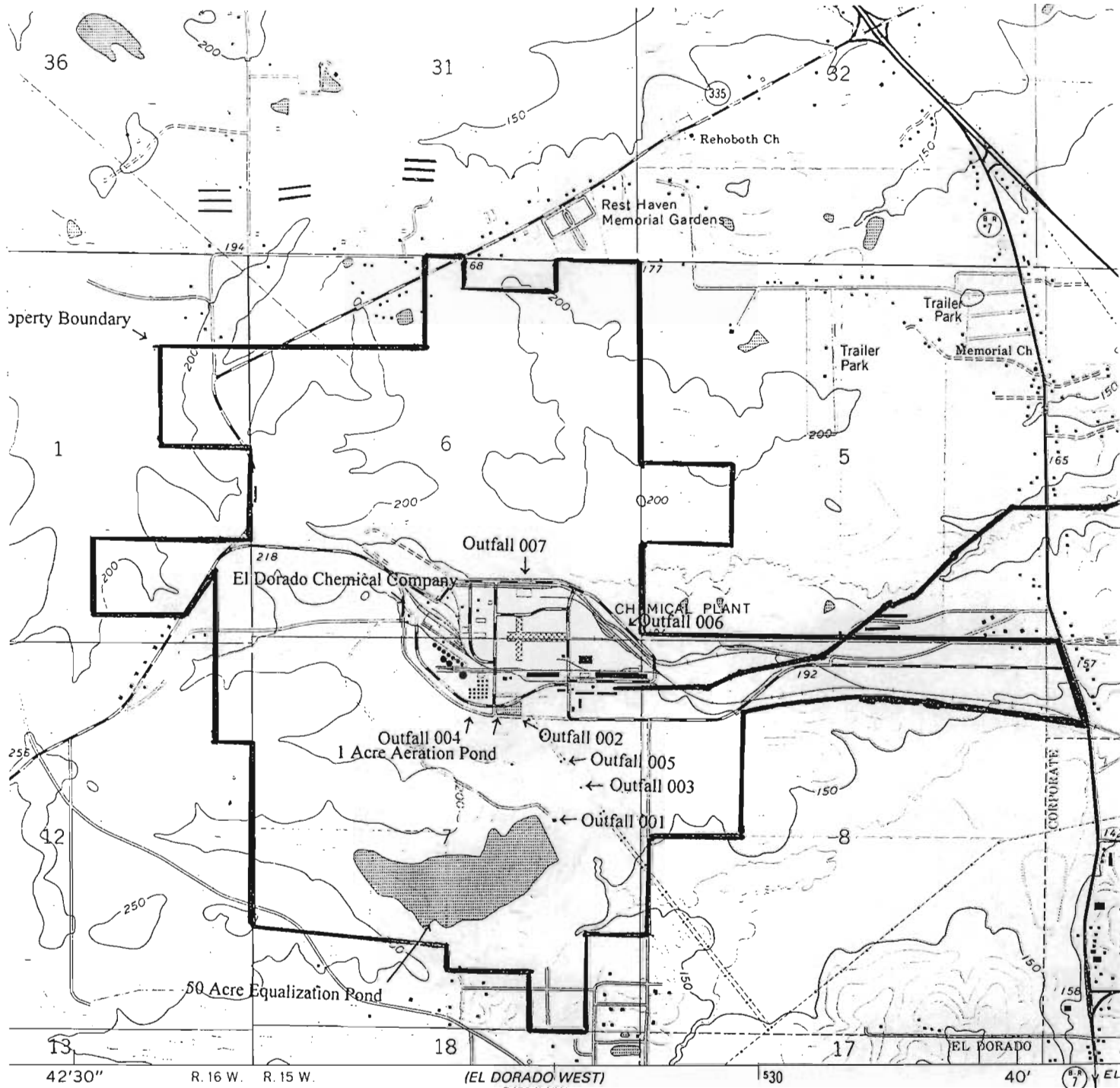
The results of the computer runs applicable to the ElDorado Chemical Company Outfall 003 and 004 discharges are tabulated below.

EFFLUENT LIMITS-MONTHS (CBOD5/TSS/NH3N/EFF.DO)	Qe MGD	Qs CFS	TEMP. C°	RECEIVING STREAM	D.O. (MG/L)
10/15/12/4--MAY-OCT	1.4	0	30	UN.TRIB.	2.82
10/15/12/5--NOV-APR	1.4	.1	22	UN.TRIB.	5.0

The computer modeling addressed only one discharge option. Advanced treatment with post-aeration will be required in order to maintain the existing dissolved oxygen standard of this stream on a year-round basis. A margin of safety is represented by utilizing conservatism in modeling inputs. This facility contributes the total load of the stream during the critical period of May through October. Additional seasonal loading may occur during the November through April period following extended periods of rainfall. This additional load is represented by seasonal model inputs.

Recommendations

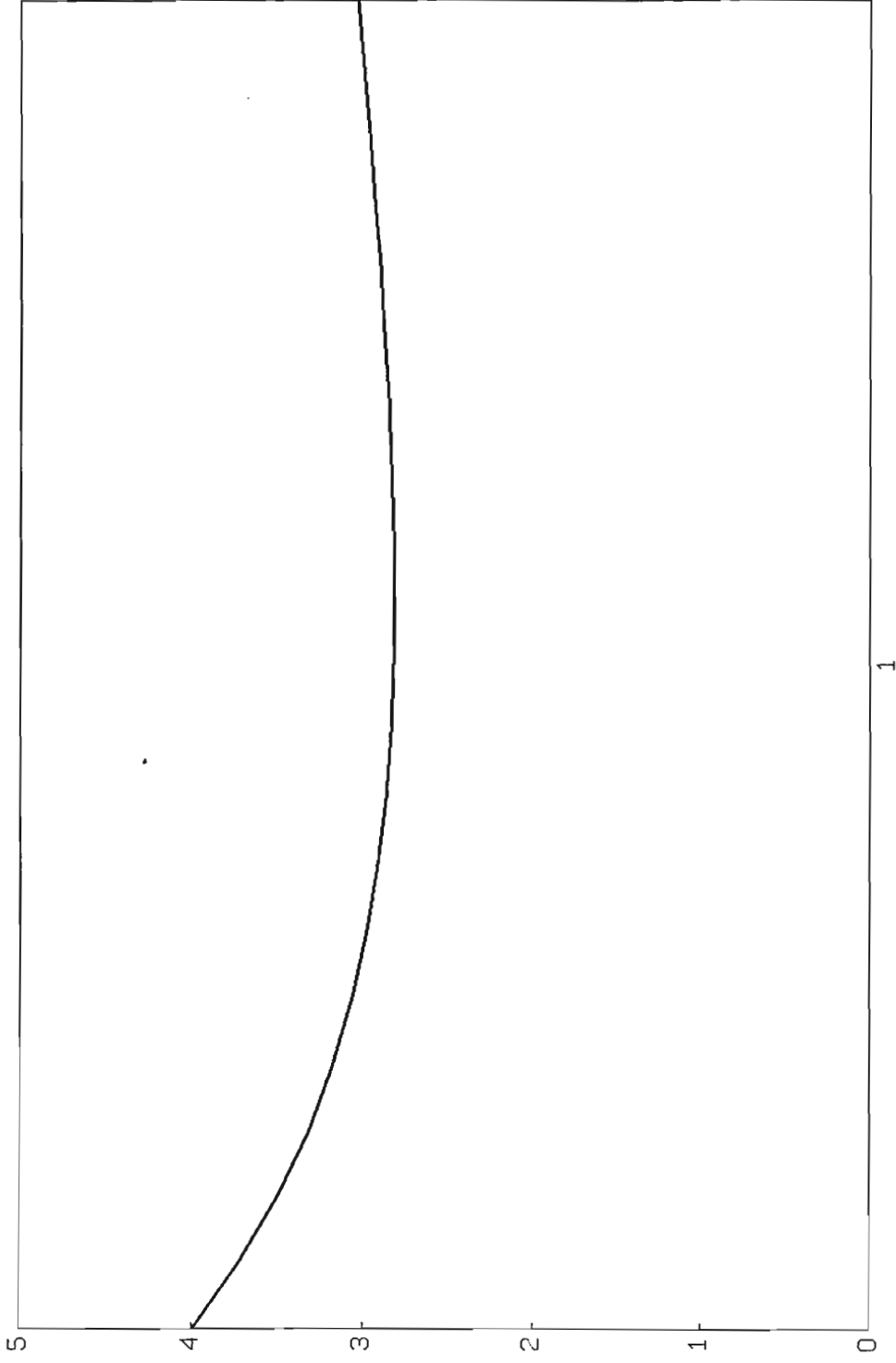
It is our recommendation that the ElDorado Chemical Company wastewater treatment facility discharge a 10/15/12/4 (CBOD5/TSS/NH3N/Eff.D.O.) effluent from outfalls 003 and 004 into the unnamed tributary of Flat Creek during the months of May through October, and a 10/15/12/5 effluent during the months of November through April in order to maintain the dissolved oxygen standard of this stream. The model input data and dissolved oxygen sag curves are attached.



CONTOUR INTERVAL 10 FEET
 NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
 FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
 AND ARKANSAS GEOLOGICAL COMMISSION, LITTLE ROCK, ARKANSAS 72204
 A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

Dissolved Oxygen Profile
Eldorado Chemical



DO (mg/L)

1
Reach

Max unionized ammonia = 0.0000 mg/L

BVC

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*****
*                               SIMPLIFIED METHOD PROGRAM                               *
*                               COMPLETE INPUT LISTING                               *
*****

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

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Name of receiving stream ----- Un.trib.of Flat Cr.
Number of discharges ----- 1
Number of reaches ----- 1
Reaeration type ----- O'Connor-Dobbins
Run title ----- Eldorado Chemical

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

Parameter	Value	Comment
Flow (cfs)	0.000	
Temperature (1/2C)	0.000	
Dissolved Oxygen (mg/l)	0.000	
5-Day BOD (mg/l)	0.000	
Ult. CBOD / 5-Day BOD	2.300	
pH (su)	-0.000	
Ammonia (mg/l)	0.000	
Alkalinity (mg/l)	-0.000	

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

Number of Discharges = 1

For Discharge Number 1 (Eldorado Chem.)

Parameter	Value	Comment
Flow (MGD)	1.400	
Temperature (1/2C)	30.000	
Dissolved Oxygen (mg/l)	4.000	
5-Day BOD (mg/l)	10.000	
Ult. CBOD / 5-Day BOD	2.300	
pH (su)	-0.000	
Ammonia (mg/l)	12.000	
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)	1.000	
Velocity (fps)	0.200	
Slope (ft/mile)	-0.000	
Average Depth (ft)	0.750	
Temperature (1/2C)	30.000	Calculated

Sludge Rate	(1/day)	0.200
Decay Rate	(1/day)	0.400
Chemical Oxygen Demand	(g/m ³ /day)	0.900
Net Growth/Respiration	(mg/L/day)	-0.000

Temperature-corrected BOD removal rate	(1/day)	0.317
Temperature-corrected NH3 decay rate	(1/day)	0.864
Reaeration rate at 20½ C	(1/day)	8.882
Temperature-corrected reaeration rate	(1/day)	11.270
Reach-averaged width	(ft)	14.429

Results for Un.trib.of Flat Cr. *--*--*--*--*

Location is to -- Un.trib.of Flat Cr.
 Title is -- ElDorado Chemical

DO Predicted	DO Observed	BOD Predicted	BOD Observed	NH3 Predicted	NH3 Observed
4.000		23.000		12.000	
3.722		22.889		11.843	
3.497		22.779		11.687	
3.317		22.669		11.534	
3.175		22.559		11.383	
3.063		22.450		11.234	
2.978		22.342		11.087	
2.915		22.234		10.941	
2.871		22.127		10.798	
2.841		22.020		10.656	
2.825		21.914		10.517	
2.820		21.808		10.379	
2.823		21.703		10.243	
2.834		21.598		10.109	
2.851		21.494		9.976	
2.873		21.390		9.845	
2.899		21.287		9.716	
2.928		21.184		9.589	
2.961		21.082		9.463	
2.995		20.981		9.339	
3.032		20.879		9.217	

BVC

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*****
*                               SIMPLIFIED METHOD PROGRAM                               *
*                               COMPLETE INPUT LISTING                               *
*****

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

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Name of receiving stream ----- Un.trib.of Flat Cr.
Number of discharges ----- 1
Number of reaches ----- 1
Reaeration type ----- O'Connor-Dobbins
Run title ----- Eldorado Chemical

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

Parameter	Value	Comment
Flow (cfs)	0.100	
Temperature ($\frac{1}{2}$ C)	22.000	
Dissolved Oxygen (mg/l)	6.500	
5-Day BOD (mg/l)	2.000	
Ult. CBOD / 5-Day BOD	2.300	
pH (su)	-0.000	
Ammonia (mg/l)	0.100	
Alkalinity (mg/l)	-0.000	

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

Number of Discharges = 1

For Discharge Number 1 (Eldorado Chem.)

Parameter	Value	Comment
Flow (MGD)	1.400	
Temperature ($\frac{1}{2}$ C)	22.000	
Dissolved Oxygen (mg/l)	5.000	
5-Day BOD (mg/l)	10.000	
Ult. CBOD / 5-Day BOD	2.300	
pH (su)	-0.000	
Ammonia (mg/l)	12.000	
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)	1.000	
Velocity (fps)	0.200	
Slope (ft/mile)	-0.000	
Average Depth (ft)	0.750	
Temperature ($\frac{1}{2}$ C)	22.000	Calculated

BOD Removal Rate	(1/day)	0.200
NH3 Decay Rate	(1/day)	0.400
Sediment Oxygen Demand	(g/m ² /day)	0.600
Photosynthesis/respiration	(mg/L/day)	-0.000

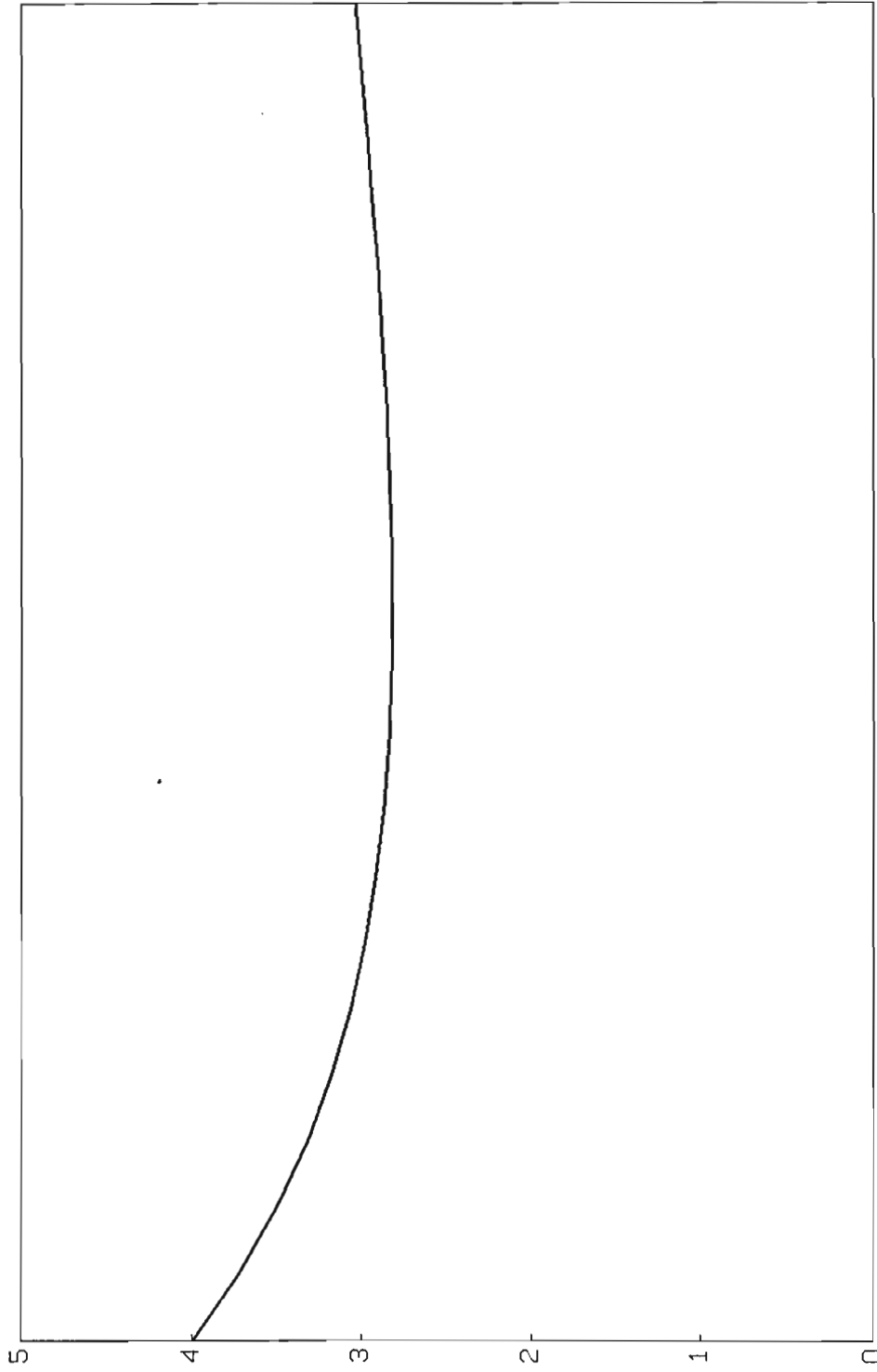
Temperature-corrected BOD removal rate	(1/day)	0.219
Temperature-corrected NH3 decay rate	(1/day)	0.467
Calculated reaeration rate at 20½ C	(1/day)	8.882
Temperature-corrected reaeration rate	(1/day)	9.315
Calculated reach-averaged width	(ft)	15.096

--*-*-* Results for Un.trib.of Flat Cr. *-*-*-*-*

Discharge is to -- Un.trib.of Flat Cr.
Run Title is -- Eldorado Chemical

River Mile	DO Predicted	DO Observed	BOD Predicted	BOD Observed	NH3 Predicted	NH3 Observed
1.000	5.066		22.187		11.474	
0.950	5.078		22.113		11.393	
0.900	5.091		22.039		11.312	
0.850	5.105		21.966		11.232	
0.800	5.120		21.892		11.152	
0.750	5.135		21.819		11.073	
0.700	5.151		21.746		10.994	
0.650	5.168		21.673		10.916	
0.600	5.185		21.601		10.838	
0.550	5.202		21.529		10.761	
0.500	5.219		21.457		10.685	
0.450	5.237		21.385		10.609	
0.400	5.255		21.313		10.534	
0.350	5.273		21.242		10.459	
0.300	5.291		21.171		10.385	
0.250	5.309		21.100		10.311	
0.200	5.327		21.030		10.238	
0.150	5.346		20.959		10.165	
0.100	5.364		20.889		10.093	
0.050	5.382		20.819		10.021	
-0.000						
-0.000	5.400		20.750		9.950	

Dissolved Oxygen Profile
ElDorado Chemical



DO (mg/L)

1

Reach

Max unionized ammonia = 0.0000 mg/L

SANITARY WASTEWATER

BOD Removal Rate	(1/day)	0.200
NH3 Decay Rate	(1/day)	0.400
Sediment Oxygen Demand	(g/m ² /day)	0.900
Photosynthesis/respiration	(mg/L/day)	-0.000

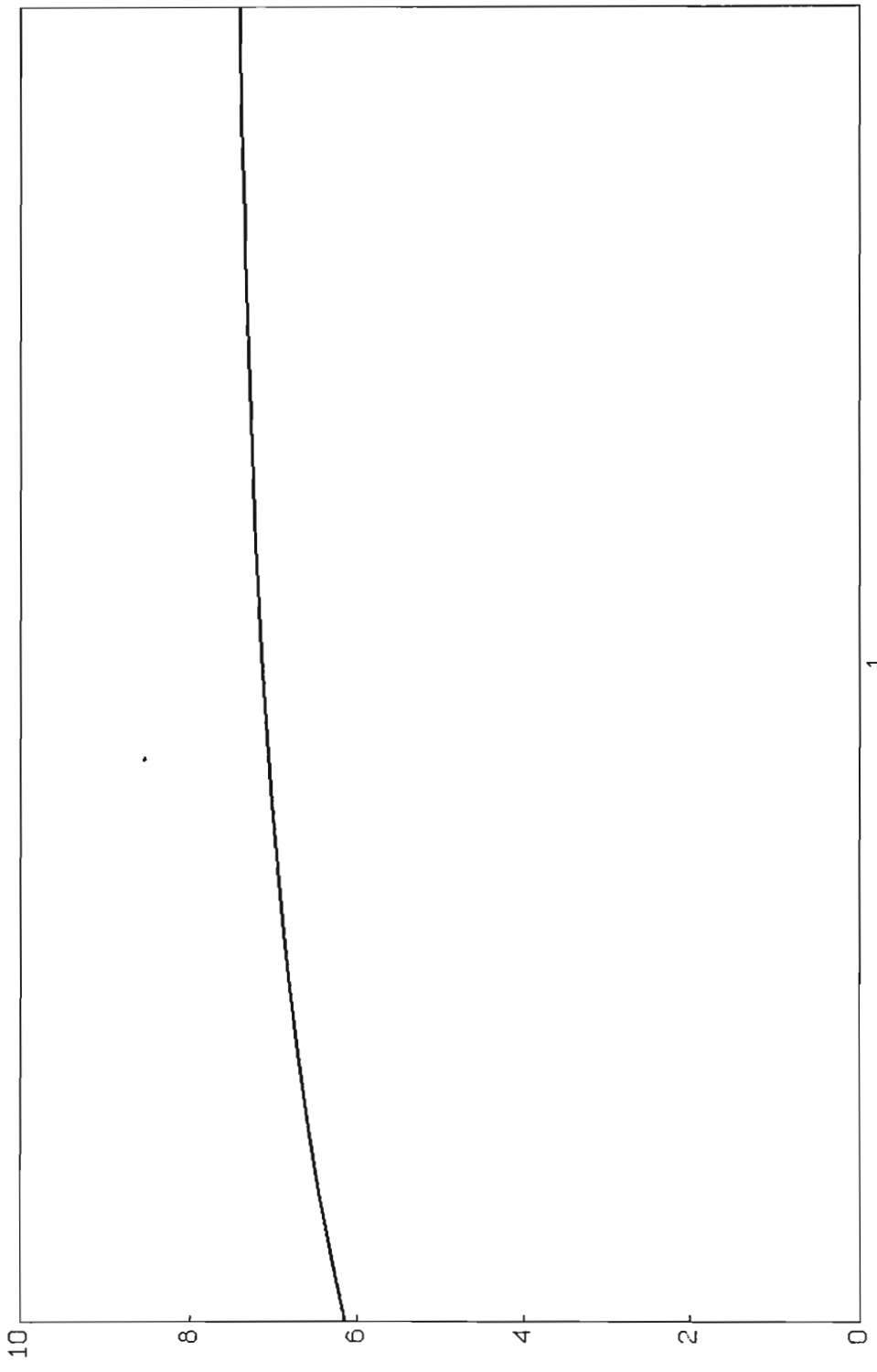
Temperature-corrected BOD removal rate	(1/day)	0.317
Temperature-corrected NH3 decay rate	(1/day)	0.864
Calculated reaeration rate at 20½ C	(1/day)	8.882
Temperature-corrected reaeration rate	(1/day)	11.270
Calculated reach-averaged width	(ft)	0.206

--*-*-* Results for Un.trib.of Flat Cr. *-*-*-*-*

Discharge is to -- Un.trib.of Flat Cr.
Run Title is -- Eldorado Chemical

River Mile	DO		BOD		NH3	
	Predicted	Observed	Predicted	Observed	Predicted	Observed
1.000	4.000		23.000		12.000	
0.950	3.722		22.889		11.843	
0.900	3.497		22.779		11.687	
0.850	3.317		22.669		11.534	
0.800	3.175		22.559		11.383	
0.750	3.063		22.450		11.234	
0.700	2.978		22.342		11.087	
0.650	2.915		22.234		10.941	
0.600	2.871		22.127		10.798	
0.550	2.841		22.020		10.656	
0.500	2.825		21.914		10.517	
0.450	2.820		21.808		10.379	
0.400	2.823		21.703		10.243	
0.350	2.834		21.598		10.109	
0.300	2.851		21.494		9.976	
0.250	2.873		21.390		9.845	
0.200	2.899		21.287		9.716	
0.150	2.928		21.184		9.589	
0.100	2.961		21.082		9.463	
0.050	2.995		20.981		9.339	
-0.000						
-0.000	3.032		20.879		9.217	

Dissolved Oxygen Profile
Eldorado Chemical



1
Reach

Max unionized ammonia = 0.0000 mg/L

DO (mg/L)

BVC

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*                               SIMPLIFIED METHOD PROGRAM                               *
*                               COMPLETE INPUT LISTING                               *
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----*--*--* Run Information *--*--*--*--*

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Name of receiving stream ----- Un.trib.of Flat Cr.
Number of discharges ----- 1
Number of reaches ----- 1
Reaeration type ----- O'Connor-Dobbins
Run title ----- Eldorado Chemical

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

Parameter	Value	Comment
Flow (cfs)	0.100	
Temperature (1/2C)	22.000	
Dissolved Oxygen (mg/l)	6.500	
5-Day BOD (mg/l)	2.000	
Ult. CBOD / 5-Day BOD	2.300	
pH (su)	-0.000	
Ammonia (mg/l)	0.100	
Alkalinity (mg/l)	-0.000	

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

Number of Discharges = 1

For Discharge Number 1 (Eldorado Chem.)

Parameter	Value	Comment
Flow (MGD)	0.020	
Temperature (1/2C)	22.000	
Dissolved Oxygen (mg/l)	5.000	
5-Day BOD (mg/l)	10.000	
Ult. CBOD / 5-Day BOD	2.300	
pH (su)	-0.000	
Ammonia (mg/l)	12.000	
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)	1.000	
Velocity (fps)	0.200	
Slope (ft/mile)	-0.000	
Average Depth (ft)	0.750	
Temperature (1/2C)	22.000	Calculated

BOD Removal Rate	(1/day)	0.200
NH3 Decay Rate	(1/day)	0.400
Sediment Oxygen Demand	(g/m ² /day)	0.600
Photosynthesis/respiration	(mg/L/day)	-0.000

Temperature-corrected BOD removal rate	(1/day)	0.219
Temperature-corrected NH3 decay rate	(1/day)	0.467
Calculated reaeration rate at 20½ C	(1/day)	8.882
Temperature-corrected reaeration rate	(1/day)	9.315
Calculated reach-averaged width	(ft)	0.873

--*-*-* Results for Un.trib.of Flat Cr. *-*-*-*-*

Discharge is to -- Un.trib.of Flat Cr.
Run Title is -- Eldorado Chemical

River Mile	DO Predicted	DO Observed	BOD Predicted	BOD Observed	NH3 Predicted	NH3 Observed
1.000	6.146		8.946		2.910	
0.950	6.315		8.916		2.890	
0.900	6.462		8.886		2.869	
0.850	6.591		8.856		2.849	
0.800	6.703		8.827		2.829	
0.750	6.801		8.797		2.809	
0.700	6.886		8.768		2.789	
0.650	6.961		8.738		2.769	
0.600	7.027		8.709		2.749	
0.550	7.085		8.680		2.730	
0.500	7.136		8.651		2.710	
0.450	7.180		8.622		2.691	
0.400	7.220		8.593		2.672	
0.350	7.255		8.564		2.653	
0.300	7.285		8.536		2.634	
0.250	7.313		8.507		2.615	
0.200	7.337		8.479		2.597	
0.150	7.359		8.450		2.578	
0.100	7.379		8.422		2.560	
0.050	7.397		8.394		2.542	
-0.000						
-0.000	7.413		8.366		2.524	