

ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY

WATER QUALITY MANAGEMENT PLAN UPDATE

SUMMARY SHEET

Type of Discharge: Municipal X, Industrial , Other

Facility Name Mountain View

Receiving Stream Hughes Creek

Segment 4G County Stone

Permit No. AR 0020117 Update Method

Date Flow 0.73 MGD

Critical Limits CBOD5/TSS/NH3-N/EFF. D.O. 10/15/5/6 May-Oct

Seasonal Limits CBOD5/TSS/NH3-N/EFF. D.O. 10/15/10/7 Nov-Apr

Justification Desk Top Model

Already included in WQMP Y/N Y

If Yes, list the information currently in the Plan:

Receiving Stream Same

Limits 10/15/2/5 May-Oct; 10/15/10/6 Nov-Apr

Based on 0.579 MGD flow

Section, Range & Township, or Latitude and Longitude

Existing

New Site

Water Quality Standards Change by Use Attainability Analysis Y/N N

If yes, list changes

DESK TOP MODEL
FOR THE MOUNTAIN VIEW STP
DISCHARGE TO HUGHES CREEK

MAY 20, 1988

I. Introduction

A desk top model was performed on Hughes Creek, the current receiving stream of the Mountain View effluent discharge, in order to determine effluent limits that will maintain the dissolved oxygen standard of this stream. The present sewage treatment facility consists of a three-stage biofiltration system. The discharge is into Hughes Creek in the NW 1/4 Section 10, Range 11 West, Township 14 North in Stone County. Mountain View is currently operating under NPDES # AR0020117, which is being reviewed for renewal.

The present discharge site is located in planning segment 4G of the White River basin. The design flow of the present facility is 0.73 MGD (million gallons per day).

Hughes Creek, with a drainage area of approximately three mi² at the discharge site, is classified as an Ozark Highlands small watershed perennial fishery, and as such, has an applicable critical season dissolved oxygen standard of 5 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. At stream temperatures of 22°C or less, a 6 mg/l dissolved oxygen standard applies to this stream.

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

II. Data Used in the Model

The input parameters for the Mountain View STP discharge are:

Q7-10 flow = 0 cfs
Primary season stream flow = 0.1 cfs*
Primary season D.O. saturation = 90%**
Stream depth = 0.5 feet
Stream velocity = .1 feet/second
Stream slope = 50 feet/mile
Critical temperature = 28°C
Seasonal temperature = 20°C
*Based on seasonal spring flow and runoff from a 3 mi² watershed
**As determined from ecoregion studies

The reaeration rate, K_a , was calculated using the Tsvoglou formula:

$$K_a = CVS$$

where C = proportionality constant of 1.8
 V = velocity, feet/second
 S = stream slope, feet/mile

This resulted in K_a of 9.0/day. The formula used is recommended in Appendix A of Technical Guidance Manual for Performing Wasteload Allocations.

The deoxygenation rate, K_d , used was 0.7/day, which is a literature value applicable to oxygen demanding waste discharges into gravel/rock bottom streams. 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, K_n .

The benthic demand, B, used in the model was 0.5 gm/m²/day for the 10/15 (CBOD₅/TSS) projections into the receiving stream.

III. Results

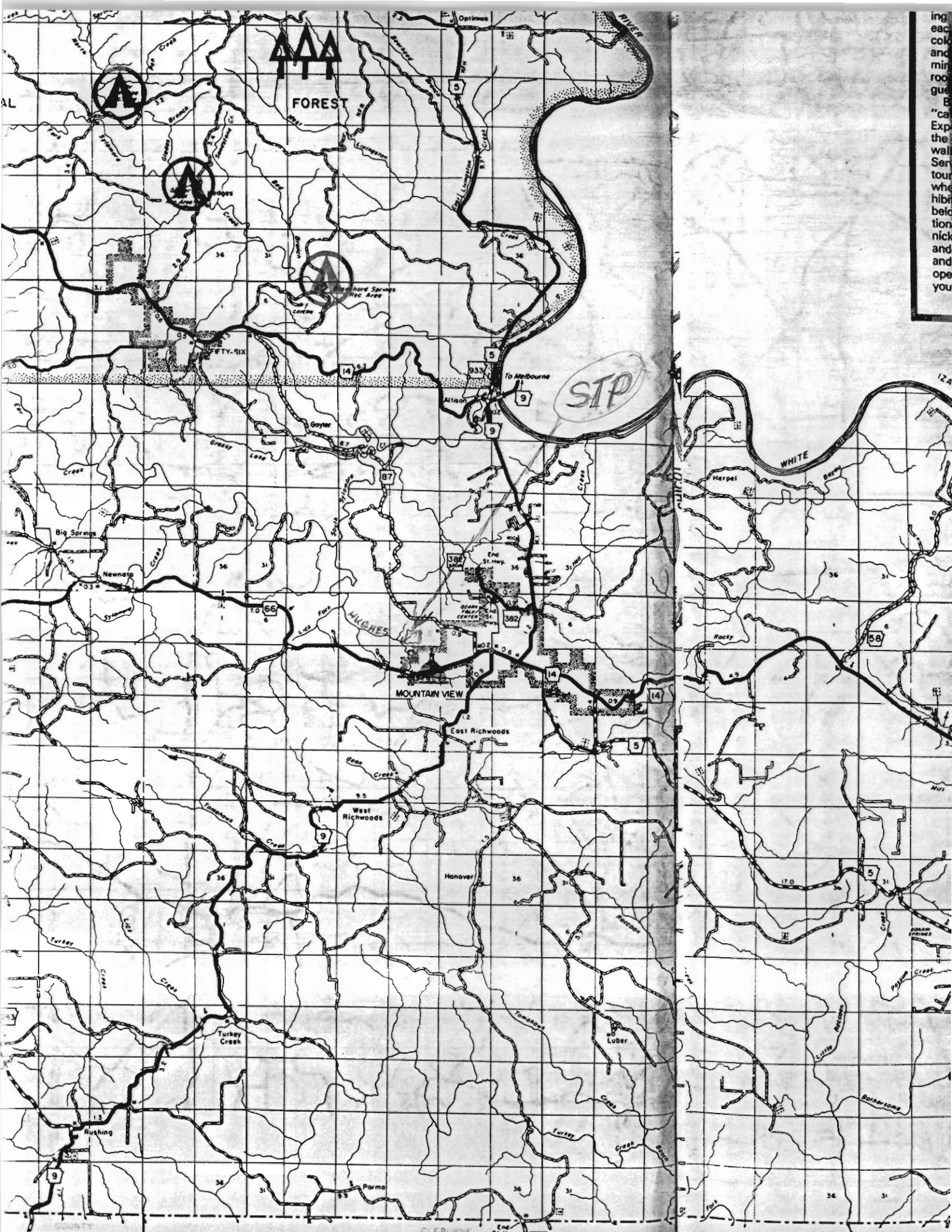
The results of the computer runs applicable to the Mountain View STP discharge are tabulated below.

EFFLUENT LIMITS-MONTHS (CBOD ₅ /TSS/NH ₃ N/EFF.DO)	Q _e MGD	Q _s CFS	TEMP. C°	RECEIVING STREAM	D.O. (MG/L)
10/15/5/6--MAY-OCT	.73	0	28	HUGHES CR.	4.5
10/15/10/7--NOV-APR	.73	.1	20	HUGHES CR.	5.8
10/15/5/6 (D.O. STD.)	.73	.1	22	HUGHES CR.	5.9

The computer modeling addressed only one discharge option. Advanced treatment will be required for discharge to the receiving stream of Hughes Creek during the critical and seasonal periods in order to maintain the dissolved oxygen standard.

IV. Recommendations

It is our recommendation that the Mountain View STP discharge a 10/15/5/6 effluent into Hughes Creek during the months of May through October, and a 10/15/10/7 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.



AAA

FOREST

STP

HUGHES

MOUNTAIN VIEW

East Richwoods

West Richwoods

Hanover

Turkey Creek

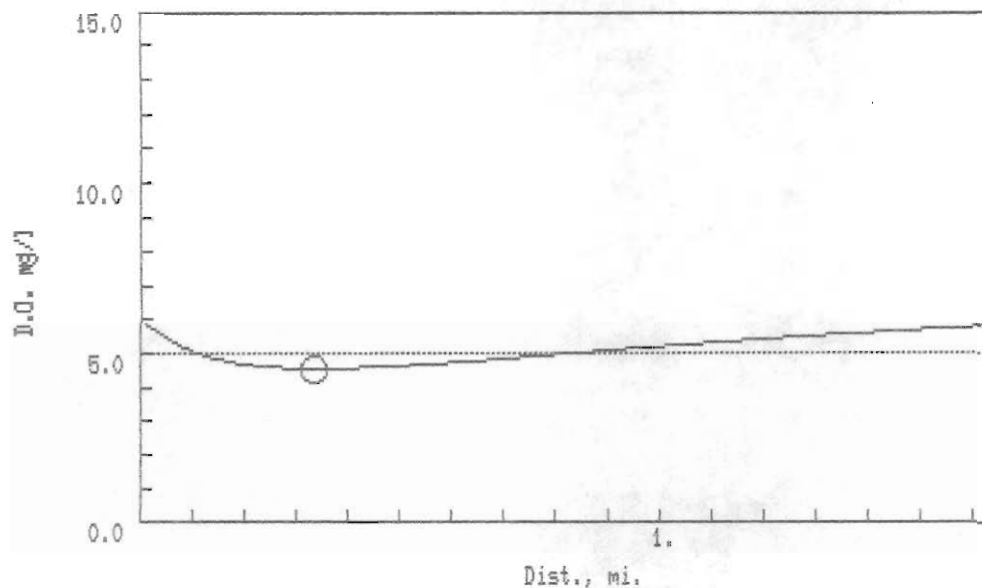
WHITE

Herpet

Rocky

Bothersome

ing
each
color
and
min
roof
que
B
"ca
Exp
the
wall
Ser
tour
wh
hib
bel
tion
nick
and
ope
you



MT. VIEW CRITICAL 10-15-5-6 TO HUGHES CREEK
 Date of this run: 05/20/88

Stream Temperature = 28.0 deg C
 Stream flow = 0.00 cfs
 Stream D.O. = 0.0 mg/l
 Stream UOD = 0.0 mg/l
 Stream Velocity = 0.1 fps

Waste Temperature = 28.0 deg C
 Waste flow = 0.73 mgd
 Waste flow = 1.1 cfs
 Waste D.O. = 6.0 mg/l
 Waste BODU = 23.0 mg/l

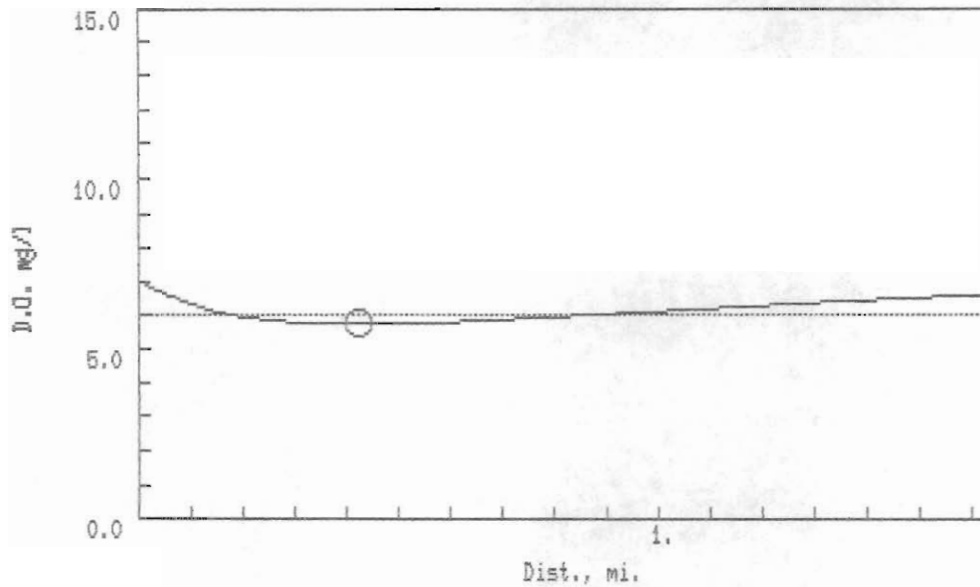
Benthall Demand = 0.5 g/m**2/day
 Mean Depth = 0.5 ft.
 S = 3.3 g/m**3/day
 S corrected = 5.7 g/m**3/day

Ammonia_nitrogen = 5.0 mg/l
 NUOD = 22.9 mg/l
 Total UOD of waste = 45.9 mg/l

Rate constants, per day, (base e)
 Kd = 0.7 Kd corrected = 1.0
 Ka = 9.0 Ka corrected = 10.9
 Kn = 0.4 Kn corrected = 0.6

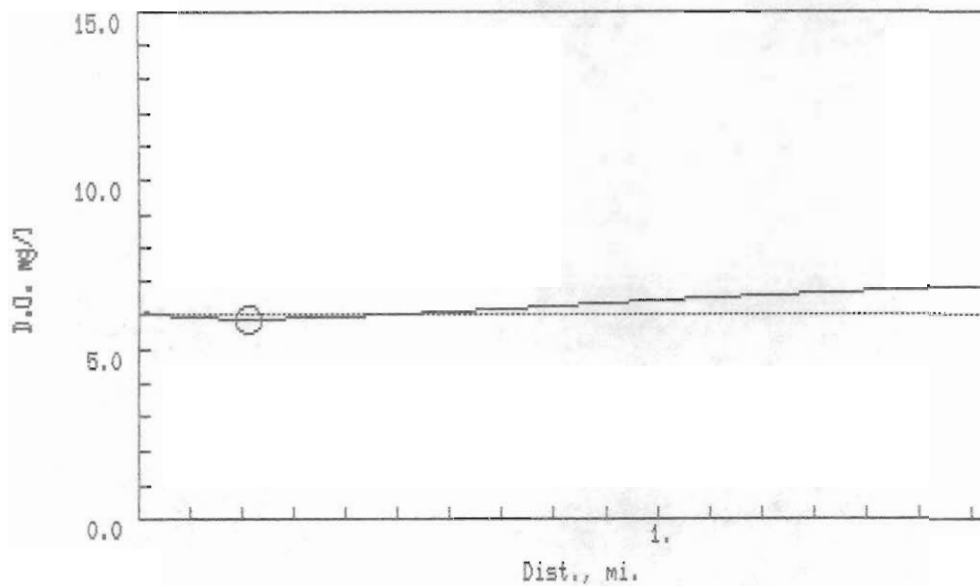
Temperature of MIX = 28.0 deg C
 UOD of mix = 45.9 mg/l
 D.O. of mix = 6.0 mg/l

D.O. saturation = 7.9 mg/l
 Minimum D.O. = 4.5 mg/l
 Critical distance = 0.3 miles



MT. VIEW SEASONAL 10-15-10-7 TO HUGHES CREEK
 Date of this run: 05/20/88

Stream Temperature	=	20.0 deg C
Stream flow	=	0.10 cfs
Stream D.O.	=	7.9 mg/l
Stream UOD	=	3.0 mg/l
Stream Velocity	=	0.1 fps
Waste Temperature	=	20.0 deg C
Waste flow	=	0.73 mgd
Waste flow	=	1.1 cfs
Waste D.O.	=	7.0 mg/l
Waste BODU	=	23.0 mg/l
Benthil Demand	=	0.5 g/m**2/day
Mean Depth	=	0.5 ft.
S	=	3.3 g/m**3/day
S corrected	=	3.3 g/m**3/day
Ammonia_nitrogen	=	10.0 mg/l
NUOD	=	45.7 mg/l
Total UOD of waste	=	68.7 mg/l
Rate constants, per day, (base e)		
Kd	=	0.7
Kd corrected	=	0.7
Ka	=	9.0
Ka corrected	=	9.0
Kn	=	0.4
Kn corrected	=	0.4
Temperature of MIX	=	20.0 deg C
UOD of mix	=	63.4 mg/l
D.O. of mix	=	7.1 mg/l
D.O. saturation	=	9.2 mg/l
Minimum D.O.	=	5.8 mg/l
Critical distance	=	0.4 miles



MT. VIEW 10-15-5-6 AT 22 DEGREES
Date of this run: 05/20/88

Stream Temperature = 22.0 deg C
Stream flow = 0.10 cfs
Stream D.O. = 7.5 mg/l
Stream UOD = 3.0 mg/l
Stream Velocity = 0.1 fps

Waste Temperature = 22.0 deg C
Waste flow = 0.73 mgd
Waste flow = 1.1 cfs
Waste D.O. = 6.0 mg/l
Waste BODU = 23.0 mg/l

Benthall Demand = 0.5 g/m**2/day
Mean Depth = 0.5 ft.
S = 3.3 g/m**3/day
S corrected = 3.8 g/m**3/day

Ammonia_nitrogen = 5.0 mg/l
NUOD = 22.9 mg/l
Total UOD of waste = 45.9 mg/l

Rate constants, per day, (base e)

Kd = 0.7 Kd corrected = 0.8
Ka = 9.0 Ka corrected = 9.4
Kn = 0.4 Kn corrected = 0.4

Temperature of MIX = 22.0 deg C
UOD of mix = 42.4 mg/l
D.O. of mix = 6.1 mg/l

D.O. saturation = 8.8 mg/l
Minimum D.O. = 5.9 mg/l
Critical distance = 0.2 miles