ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY

WATER QUALITY MANAGEMENT PLAN UPDATE

SUMMARY SHEET

Type of Discharge: Municipal X , Industrial ___ , Other _____

Facility Name Pottsville

Receiving Stream Galla Creek

Segment 3F County Pope

Permit No. AR0048011 Update Method _____

Date _____ Flow 0.14 MGD

Critical Limits CBOD5/TSS/NH3-N/EFF. D.O.

10/15/5/4 May-Oct

Seasonal Limits BOD5/TSS

20/20 Nov-Apr

Justification Desk Top Model

Already included in WQMP Y/N N

If Yes, list the information currently in the Plan:

Receiving Stream _____

Limits _____

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 POTTSVILLE STP
DISCHARGE TO GALLA CREEK

OCTOBER 21, 1992

I. Introduction

A desk top model was performed on Galla Creek, the proposed receiving stream of the Pottsville STP effluent discharge, in order to determine effluent limits that will maintain the dissolved oxygen standard of this stream. At present, no centralized sewage treatment facility exists for the city of Pottsville. The proposed system will consist of an activated sludge system. The proposed discharge is into Galla Creek in the NE 1/4 Section 32, Range 19 West, Township 7 North in Pope County. Pottsville is currently unpermitted, and is in the initial stages of planning.

The proposed discharge site is located in planning segment 3F of the Arkansas River basin. The design flow of the proposed facility is 0.14 MGD (million gallons per day).

Galla Creek, with a drainage area of approximately 30 mi^2 at the discharge site, is classified as an Arkansas River Valley mid-size watershed fishery, 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. At stream temperatures of 22°C or less, a 5 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 both critical and primary season discharge periods.

II. Data Used in the Model

The input parameters used in the model for the Pottsville STP discharge are:

Q7-10 flow = 0 cfs
Primary season stream flow = 0.5 cfs*
Stream depth = ..8 feet
Stream velocity = .1 feet/second
Critical temperature = 30°C
Seasonal temperature = 20°C
D.O. saturation = 85%**
*Based on seasonal runoff from a 30 mi^2 watershed
**As determined by ecoregion studies

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

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

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

This resulted in Ka of 5.4/day. The formula used is recommended in Appendix A of Technical Guidance Manual for Performing Wasteload Allocations.

The deoxygenation rate, Kd, used was 0.5/day, which is a literature value applicable to oxygen demanding waste discharges into rock/gravel 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, Kn.

The benthal demand, B, used in the model was 0.5 gm/m²/day for the 10/15 (CBOD5/TSS) projection, and 0.7 gm/m²/day for the 20/20 projection into the receiving stream.

III. Results

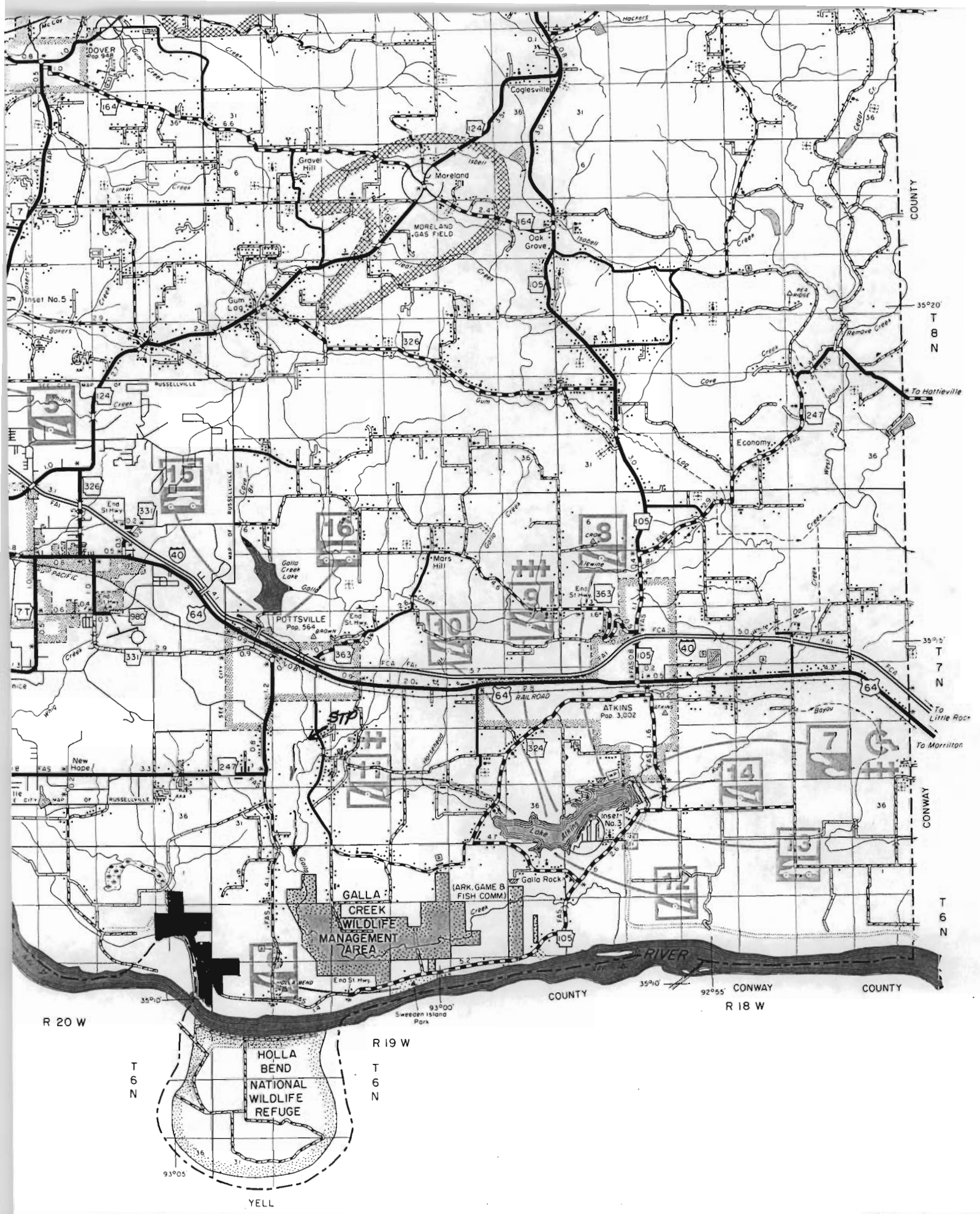
The results of the computer runs applicable to the Pottsville STP discharge are tabulated below.

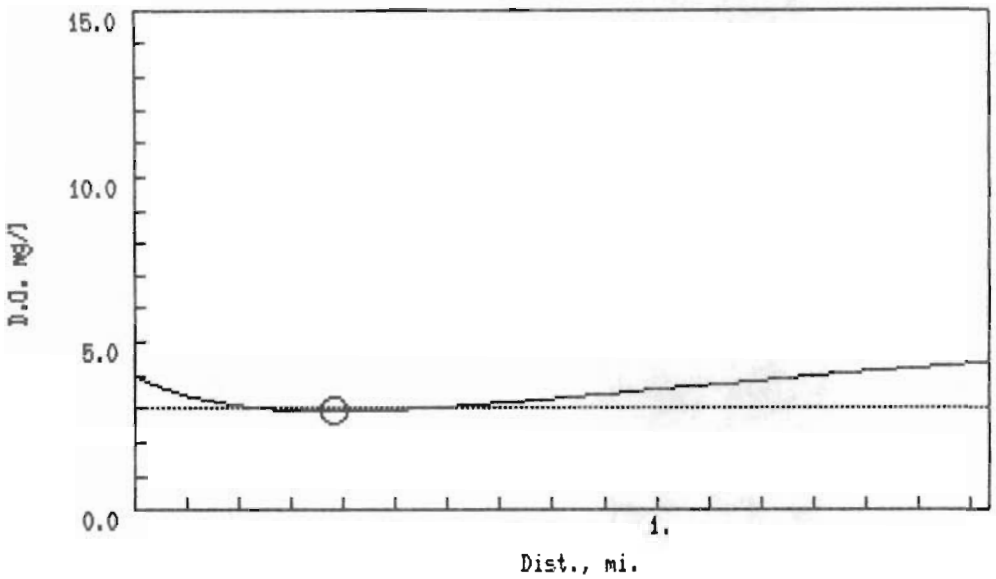
EFFLUENT LIMITS-MONTHS (CBOD5/TSS/NH3N/EFF.DO)	Qe MGD	Qs CFS	TEMP. C°	RECEIVING STREAM	D.O. (MG/L)
10/15/5/4--MAY-OCT	.14	0	30	GALLA CR.	2.9
20/20/15/2--NOV-APR	.14	.5	22	GALLA CR.	5.4

Due to the absence of a perennial stream within a reasonable distance from the STP facility, the computer modeling addressed only one discharge option. Advanced treatment will be required in order to maintain the dissolved oxygen standard.

IV. Recommendations

It is our recommendation that the proposed Pottsville STP discharge a 10/15/5/4 (CBOD5/TSS/NH3N/EFF.D.O.) effluent into Galla Creek during the months of May through October, and a 20/20 (BOD5/TSS) effluent during the months of November through April in order to maintain the dissolved oxygen standard. The input data and oxygen sag curves are attached.


DOVER
pop. 948
Coglesville
Gravel Hill
Moreland
MORELAND GAS FIELD
Oak Grove
Inset No.5
Gum Log
Economy
To Hattieville
COUNTY
35°20'
T 8 N
Mars Hill
Galla Creek Lake
POTTSVILLE
Pop. 564
ATKINS
Pop. 3,002
To Little Rock
To Morrilton
35°15'
T 7 N
RAILROAD
STP
New Hope
Inset No.3
Lake Atkins
Galla Rock
GALLA CREEK WILDLIFE MANAGEMENT AREA
(ARK. GAME & FISH COMM.)
RIVER
CONWAY
COUNTY
35°10'
92°55'
CONWAY
COUNTY
T 6 N
R 18 W
93°00'
Sweeden Island Park
R 20 W
R 19 W
T 6 N
T 6 N
HOLLA BEND NATIONAL WILDLIFE REFUGE
93°05
YELL



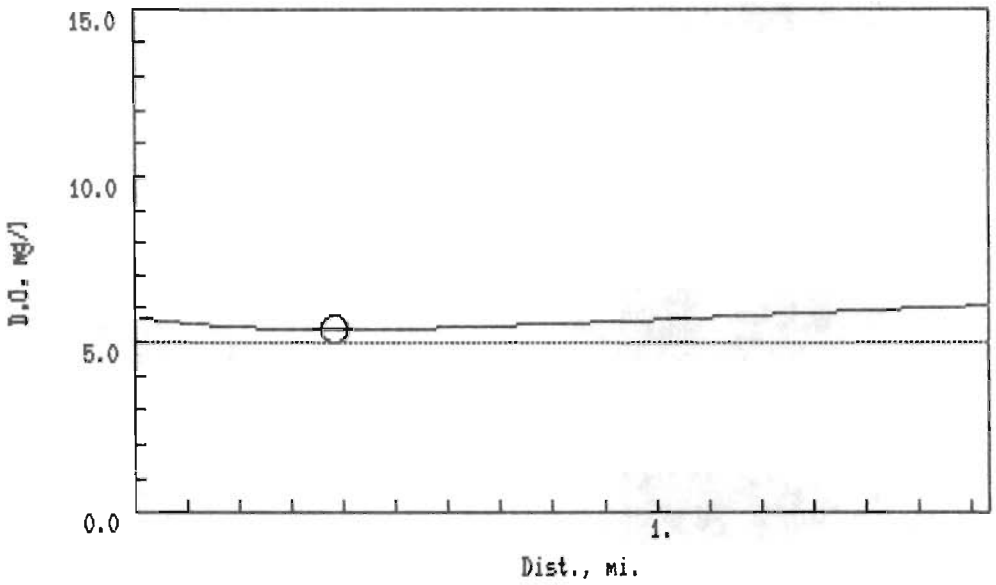
POTTSVILLE CRITICAL 10/15/5/4 TO GALLA CREEK
Date of this run: 10/21/92

Stream Temperature	=	30.0 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	=	30.0 deg C
Waste flow	=	0.14 mgd
Waste flow	=	0.2 cfs
Waste D.O.	=	4.0 mg/l
Waste BODU	=	23.0 mg/l
Benthal Demand	=	0.5 g/m**2/day
Mean Depth	=	0.8 ft.
S	=	2.1 g/m**3/day
S corrected	=	4.1 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 =	0.5	Kd corrected =	0.8
Ka =	5.4	Ka corrected =	6.8
Kn =	0.4	Kn corrected =	0.7

Temperature of MIX	=	30.0 deg C
UOD of mix	=	45.9 mg/l
D.O. of mix	=	4.0 mg/l
D.O. saturation	=	7.6 mg/l
Minimum D.O.	=	2.9 mg/l
Critical distance	=	0.4 miles



POTTSVILLE SEASONAL 20/20/15/2 TO GALLA CREEK
Date of this run: 10/21/92

Stream Temperature	=	22.0 deg C
Stream flow	=	0.50 cfs
Stream D.O.	=	7.4 mg/l
Stream UOD	=	3.0 mg/l
Stream Velocity	=	0.1 fps
Waste Temperature	=	22.0 deg C
Waste flow	=	0.14 mgd
Waste flow	=	0.2 cfs
Waste D.O.	=	2.0 mg/l
Waste BODU	=	46.0 mg/l
Benthal Demand	=	0.7 g/m**2/day
Mean Depth	=	0.8 ft.
S	=	2.9 g/m**3/day
S corrected	=	3.3 g/m**3/day
Ammonia_nitrogen	=	15.0 mg/l
NUOD	=	68.6 mg/l
Total UOD of waste	=	114.6 mg/l

Rate constants, per day, (base e)

Kd =	0.5	Kd corrected =	0.5
Ka =	5.4	Ka corrected =	5.7
Kn =	0.4	Kn corrected =	0.4

Temperature of MIX	=	22.0 deg C
UOD of mix	=	36.7 mg/l
D.O. of mix	=	5.8 mg/l
D.O. saturation	=	8.8 mg/l
Minimum D.O.	=	5.4 mg/l
Critical distance	=	0.4 miles