

Region SCK County IDWA Report Date 2/1988 Classification LFF

Water Body: Smith-Conley Creek

Discharger: Ridgeway WWTP

**If stream is classified as Limited Forage Fish (LFF) or Limited Aquatic Life (LAL), check any of the following Use Attainability Analysis factors that are identified in the classification report:**

- Naturally occurring pollutant concentrations prevent the attainment of use
- Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met
- Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place
- Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or operate such modification in a way that would result in the attainment of the use
- Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses habitat, lack of
- Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact

**Supporting Evidence in the report (include comments on how complete/thorough data is)**

- Biological Data (fish/invert)
- Chemical Data (temp, D.O., etc.)
- Physical Data (flow, depth, etc.)
- Habitat Description
- Site Description/Map
- Other: Slides/photos

**Historical Reports in file:**

- 2/1988 - Roger Schlessel
- 1/1980 - WLA Report
- 10/24/70 - Tom Bainbridge

**Additional Comments/How to improve report:**

- good report -
- check in w/ region to see if lack of flow & lack of habitat has changed since 1988.

**SMITH-CONLEY CREEK**

**AT RIDGEWAY**

**TRIENNIAL STANDARDS REVIEW**

**RIDGEWAY WWTP**

**FEBRUARY, 1988**

**ROGER SCHLESSER, SD**

**BUREAU OF WATER RESOURCES MANAGEMENT**

**WISCONSIN DEPARTMENT OF NATURAL RESOURCES**

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## **SUMMARY**

Smith-Conley Creek below the Ridgeway WWTP was originally classified as intermediate fish and aquatic life (D) due to low natural stream flow and lack of habitat. The intermediate section extends to the south boundary of Section 14, T6N, R4E. From this point extending downstream and for the remainder of Smith-Conley Creek, the classification is continuous fish and aquatic life (A). This review indicates the existing classification is correct and should remain the same.

## **INTRODUCTION**

This paper presents the results of an evaluation of the stream classification for Smith-Conley Creek which is the receiving stream for the Ridgeway Municipal WWTP. The evaluation was conducted as part of the Triennial Standards Review.

The sites reviewed are listed in NR104.05 (Appendix VII). These sites received a variance due to one or more of the following criteria:

- (a) The presence of in-place pollutants
- (b) Low natural stream flow
- (c) Natural background conditions, and
- (d) Irretrievable cultural alterations

## **GENERAL DESCRIPTION**

Smith-Conley Creek is a spring and seepage fed stream flowing southeasterly to enter the East Branch of the Pecatonica River. The Village of Ridgeway is located in the headwater area of Smith-Conley Creek. Runoff from streets and

residences may be an additional source of nutrients. Most of the remainder of the watershed is farmed with runoff coming from fields and barnyards. The stream fringe area which isn't cultivated is used as pasture.

The reach included in this evaluation is a 3.9 mile stretch which extends from approximately 0.1 mile above the outfall downstream to Prairie Road (Map #1). Smith-Conley Creek below the classification change is presently managed as trout water. Also, fish management has much of the stream thread in the fishing easement program.

The stream in the vicinity of the wastewater plant is generally dry or has a very low flow during the summer. Flow below the outfall consists of mostly effluent from the WWTP. The USGS computed  $Q_{72}$  and  $Q_{710}$  of the stream is 0.0 cfs. The USGS survey site was located a short distance above the outfall. Table 1 contains the actual flows at the site taken from the publication "Low-Flow Characteristics of Wisconsin Streams at Sewage Treatment Plants and Industrial Plants".

Table 1: Low-Flow Characteristics, Smith-Conley Creek

<u>Drainage Area</u> <u>(Mi<sup>2</sup>)</u>	<u>Date</u>	<u>Discharge</u> <u>(ft<sup>3</sup>/s)</u>
0.74	October 9, 1975	0
	July 27, 1976	0
	September 15, 1976	0

#### **STREAM HABITAT**

The intermediate section of Smith-Conley Creek is best characterized as having low flow and a lack of pools; mostly flat water and poor habitat. Some bank erosion has occurred in this section due to pasturing. The substrate consists

GEOLOGICAL SURVEY

MADISON (CAPITOL) 36 MI., 257  
BARNEVELD 5 MI.

256 000m E.]

258

R. 4 E. 57'30" 259

R. 5 E.

260

Map #1  
Ridgeway

Ridgeway

Ridgeway  
WWTP  
Outfall

Smith-Conley Creek  
Classification: Change

Smith-Conley Creek  
Anderson Road

Smith-Conley Creek

R I D G E W A Y

Smith-Conley Creek  
Prairie Road

90°00'  
00'  
18  
15  
PLATTEVILLE (VIA U.S. 151) 37 MI.  
8 MI. TO JUNC. U.S. 18 & 151

000m N.

4761

30"

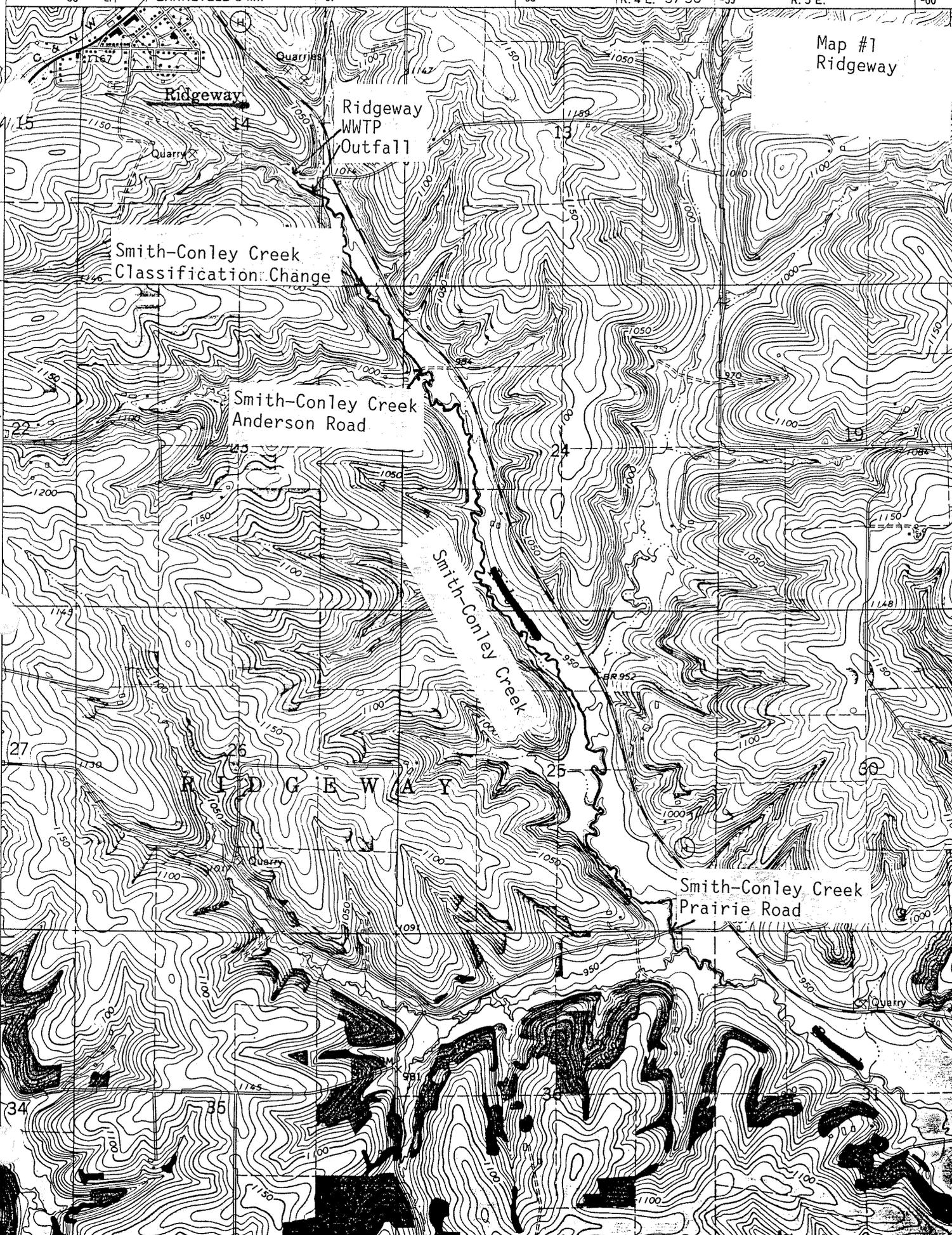
4760

34

4759

6 N.

5 N.



of mostly silt and sand with some areas of gravel or rubble. Below this section flow significantly increases due to the influx of numerous springs. Watercress has, at times, totally covered the stream bed where groundwater enters. A good pool to riffle ratio also develops in this section. Bank erosion is a problem on parts of the stream due to heavy pasturing. The substrate is one of gravel-rubble in the riffles but the runs and pools consist of clay hardpan or silt-sand. The stream historically has had good spring flow but carries a heavy bed load of silt-sand. Some of the runs are nearly impossible to walk through due to the sedimentation.

#### **WATER QUALITY**

The most recent study conducted was a wasteload allocation survey done in 1984. The wasteload was done July 31 - August 1, 1984, and August 13-14, 1984. The survey is contained in a report titled "The Wasteload Allocation Report for Smith-Conley Creek Near Ridgeway" (Appendix I).

Stream flows were similar for both surveys with upstream flow being 0.25 cfs. During the first survey the flow at the end segment (7E) was 5.25 cfs and during the second survey it was 4.5 cfs. Upstream water quality was good during both surveys with a BOD<sub>5</sub> of 1.5 mg/l and 1.2 mg/l. The NH<sub>3</sub>-N was 0.04 mg/l and 0.02 mg/l. The effluent BOD<sub>5</sub> was 7.8 mg/l and 9.2 mg/l with the NH<sub>3</sub>-N being 0.19 mg/l and 0.16 mg/l. Ammonia levels are low in the summer but become much higher during the winter when nitrification is low, especially in a lagoon system such as Ridgeway's.

The sampling site from the WLA's which is located just below the classification change had the same BOD<sub>5</sub> and NH<sub>3</sub>-N as the upstream site. This is due to the

assimilation of the wastewater and increased stream flow. Groundwater inflow greatly affects the Q<sub>710</sub> along the stream. At the outfall, the stream's Q<sub>710</sub> is 0.0 cfs, at the beginning of the trout classification the Q<sub>710</sub> is 0.15 cfs, and at 1.75 miles downstream the Q<sub>710</sub> is 0.8 cfs. Groundwater entered the stream at a rate of 0.77 cfs/mile for the August 1 survey and 0.66 cfs/mile for the August 13 survey. Stream diel DO monitoring was also conducted at several of the sampling stations. All sites maintained a 6+ mg/l dissolved oxygen level.

## BIOLOGY

A backpack fish shocker was used to survey the downstream portion of the intermediate section to determine fish species present. Creek chubs and brook stickleback were the only fish captured (Table II). Both species are considered to be tolerant.

Macroinvertebrate samples were collected several times a short distance downstream of the classification change (Table III). In the fall of 1984, the HBI indicated the stream had good water quality; or some organic pollution. In the spring of 1985 the HBI indicated fair water quality; or fairly significant organic pollution. The difference between fall and spring HBI results may be the difference between poor winter wastewater treatment and better summer wastewater treatment. The NH<sub>3</sub>-N levels become especially high during the winter months. A follow-up sample was taken in the fall of 1987 and this HBI also indicated good water quality.

The second site that macroinvertebrate samples were collected was below Anderson Road (Table IV). This site is located approximately 0.86 mi. below

the outfall. The site would receive some pasture and field runoff, but the fall and spring HBI's indicated the site had good water quality. The tremendous influx of groundwater in this section provides a high dilution of runoff or wastewater.

Table V contains fishery data from May 1976 which was collected as part of the fish distribution study. The site is located at Prairie Road which is 3.5 miles from the mouth of Smith-Conley Creek (Map #1). Brown trout along with several other intolerant species were collected at the site.

#### **WWTP**

Appendix III contains the 1987 DMR monthly averages for flow, BOD, TSS, and NH<sub>3</sub>-N. The effluent limits generated by the WLA are 15/15 BOD/SS. Seven months during 1987 these limits were exceeded. Five months during 1987 NH<sub>3</sub>-N levels were exceeded when compared to the final effluent limits. During February 1987 the monthly average was 25 mg/l NH<sub>3</sub>-N which is exceedingly high to be discharged to the headwaters of a trout stream.

Also included is the DMR data for 1984 and 1985. This data covers the time period when the original macroinvertebrate data was collected.

#### **CLASSIFICATION**

LFP  
Based on this review of available chemical, physical, and biological data, Smith-Conley Creek is properly classified as intermediate fish and aquatic life (D) from the WWTP outfall downstream to the south boundary of Section 14, T6N, R4E. From this point extending downstream and for the remainder of Smith-Conley Creek, the classification is continuous fish and aquatic life (A).

TABLE: II List of fish for sampling site: South Boundary Section 14

DATE: 10/1/87 Twn 6N Rng 4E Sec. 14, 1/4 1/4 SESE STREAM: Smith-Conley Cr.

Station mileage: 6.9C County: 25

SOURCE OF DATA: WQ GEAR: 3 EFFORT: 04

CODE	COMMON NAME	FAMILY	GENUS/SPECIES	# FISH	TOLERANCE LEVEL
M50	CREEK CHUB	CYPRINIDAE	Semotilus atromaculatus	22	Tolerant
U01	BROOK STICKLEBACK	GASTEROSTEIDAE	Culaea inconstans	9	Tolerant

Table III Taxonomic list of macroinvertebrates for MS1

Date: 10/17/84 (Smith-Conley Cr., Classification Change) 0.42 mi. Below Outfall

ORDER	FAMILY	GENUS/SPECIES	NUMBER OF INSECTS (n)	BIOTIC INDEX VALUE (a)	a x n
DIPTERA	CHIRONOMIDAE	Tanytarsus spp.	1	6	6
DIPTERA	SIMULIIDAE	Simulium vittatum	2	7	14
EPHEMEROPTERA	BAETIDAE	Baetis brunneicolor	9	4	36
TRICHOPTERA	HYDROPSYCHIDAE	Ceratopsyche slossonae	44	4	176
TRICHOPTERA	HYDROPSYCHIDAE	Cheumatopsyche spp.	6	5	30
TRICHOPTERA	HYDROPSYCHIDAE	Hydropsyche betteni	37	6	222
Totals			99		484

Biotic Index = 484 / 99 = 4.89 Good

Table III Taxonomic list of macroinvertebrates for MS1

Date: 4/10/85 (Smith-Conley Cr., Classification Change)

ORDER	FAMILY	GENUS/SPECIES	NUMBER OF INSECTS (n)	BIOTIC INDEX VALUE (a)	a x n
DIPTERA	CHIRONOMIDAE	Diamesa spp.	22	5	110
DIPTERA	CHIRONOMIDAE	Eukiefferiella spp.	1	8	8
DIPTERA	CHIRONOMIDAE	Micropsectra spp.	5	7	35
DIPTERA	CHIRONOMIDAE	Natarsia spp.	1	8	8
DIPTERA	CHIRONOMIDAE	Orthocladius spp.	1	6	6
DIPTERA	CHIRONOMIDAE	Parametriocnemus spp.	3	5	15
DIPTERA	CHIRONOMIDAE	Tanytarsus spp.	1	6	6
DIPTERA	CHIRONOMIDAE	Thienemannimyia complex	1	6	6
DIPTERA	SIMULIIDAE	Simulium vittatum	28	7	196
TRICHOPTERA	HYDROPSYCHIDAE	Ceratopsyche slossonae	29	4	116
TRICHOPTERA	HYDROPSYCHIDAE	Cheumatopsyche spp.	1	5	5
TRICHOPTERA	HYDROPSYCHIDAE	Hydropsyche betteni	15	6	90
Totals			108		601

$$\text{Biotic Index} = 601 / 108 = 5.56 \text{ Fair}$$

Table III Taxonomic list of macroinvertebrates for MS1R (Replicate)

Date: 4/10/85 (Smith-Conley Cr., Classification Change)

ORDER	FAMILY	GENUS/SPECIES	NUMBER OF INSECTS (n)	BIOTIC INDEX VALUE (a)	a x n
DIPTERA	CHIRONOMIDAE	Diamesa spp.	33	5	165
DIPTERA	CHIRONOMIDAE	Micropsectra spp.	3	7	21
DIPTERA	CHIRONOMIDAE	Orthocladius spp.	1	6	6
DIPTERA	CHIRONOMIDAE	Parametrioctenus spp.	2	5	10
DIPTERA	CHIRONOMIDAE	Thienemannimyia complex	8	6	48
DIPTERA	SIMULIIDAE	Simulium vittatum	31	7	217
ODONATA	AESHNIDAE	Aeshna spp.	1	5	5
TRICHOPTERA	HYDROPSYCHIDAE	Ceratopsyche slossonae	13	4	52
TRICHOPTERA	HYDROPSYCHIDAE	Cheumatopsyche spp.	2	5	10
TRICHOPTERA	HYDROPSYCHIDAE	Hydropsyche betteni	7	6	42
AMPHIPODA	GAMMARIDAE	Gammarus pseudolimneus	2	4	8
Totals			103		584

$$\text{Biotic Index} = 584 / 103 = 5.67 \text{ Fair}$$



SAMPLE ID# 871001-25-07

PAGE 2

TAXA	SPECIES	TAXONOMIC TOL		ORGANISM ID	ORGANISM COUNT		
		KEY USED	VAL		REP1	REP2	REP3
EPHEMEROPTERA							
BAETIDAE							
BAETIS	BRUNNEICOLOR	*1	4.00	02010101	12	0	0
	FLAVISTRIGA	*1	4.00	02010104	5	0	0
	VAGANS	*1	2.00	02010110	2	0	0
	**POOR SPECIMEN**	*1		02010115	5	0	0
		*1		02010800	4	0	0
TRICHOPTERA							
BRACHYCENTRIDAE							
BRACHYCENTRUS	OCCIDENTALIS	*2	1.00	04010104	1	0	0
HYDROPSYCHIDAE							
HYDROPSYCHE	BETTENI	*3	6.00	04040201	11	0	0
CERATOPSYCHE	SLOSSONAE	*3	4.00	04040706	9	0	0
**POOR SPECIMEN**		*1		04041000	3	0	0
COLEOPTERA							
DRYOPIDAE							
HELICHUS	LITHOPHILUS	*4	5.00	07010101	2	0	0
ELMIDAE							
OPTIOSERVUS		*1	4.00	07020500	8	0	0
	FASTIDITUS	*1	4.00	07020501	1	0	0
DIPTERA							
CERATOPOGONIDAE							
NILOBEZZIA		*1	6.00	08030900	1	0	0
CHIRONOMIDAE							
CRICOTOPUS	NR.BICINCTUS	*5	6.00	08051301	2	0	0
LIMNOPHYES		*5	8.00	08053100	1	0	0
POLYPEDILUM	NR.CONVICTUM	*5	5.00	08055001	1	0	0
SIMULIIDAE							
SIMULIUM	VERECUNDUM	*2	6.00	08110216	1	0	0
	VITTATUM	*2	7.00	08110217	3	0	0
AMPHIPODA							
GAMMARIDAE							
GAMMARUS	PSEUDOLIMNEUS	*6	4.00	09010201	47	0	0

SAMPLE ID# 871001-25-07

***	TAXA	***	TAXONOMIC	TOL	ORGANISM	ORGANISM
		SPECIES	KEY	VAL	ID	COUNT
			USED			REP1 REP2 REP3

\*\*\* TOTALS: \*\*\* 119

0

\*\*\* BIOTIC INDEX: \*\*\* 4.364

0

Taxonomic Key Code References

- \*1 HILSENHOFF 1981,82
- \*2 HILSENHOFF 1985
- \*3 HILSENHOFF 1981,86
- \*4 BROWN 1972
- \*5 HILSENHOFF 1981,85
- \*6 HOLSINGER 1972

Table IV Taxonomic list of macroinvertebrates for MS2

Date: 10/17/84 (Smith-Conley Cr., Dwns, Anderson Rd.) 0.86 mi. Below Outfall

ORDER	FAMILY	GENUS/SPECIES	NUMBER OF INSECTS (n)	BIOTIC INDEX VALUE (a)	a x n
COLEOPTERA	ELMIDAE	Optioservus spp. (larvae)	4	4	16
DIPTERA	ATHERICIDAE	Atherix variegata	1	2	2
DIPTERA	CHIRONOMIDAE	Natarsia spp.	1	8	8
DIPTERA	SIMULIIDAE	Simulium vittatum	9	7	63
DIPTERA	TABANIDAE	Chrysops spp.	1	6	6
EPHEMEROPTERA	BAETIDAE	Baetis brunneicolor	34	4	136
TRICHOPTERA	HYDROPSYCHIDAE	Ceratopsyche slossonae	20	4	80
TRICHOPTERA	HYDROPSYCHIDAE	Cheumatopsyche spp.	3	5	15
TRICHOPTERA	HYDROPSYCHIDAE	Hydropsyche betteni	13	6	78
TRICHOPTERA	PHRYGANEIDAE	Ptilostomis spp.	1	5	5
AMPHIPODA	GAMMARIDAE	Gammarus pseudolimneus	7	4	28
ISOPODA	ASELLIDAE	Asellus intermedius	9	8	72

Totals

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103

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509

Biotic Index = 509 / 103 = 4.94 Good

Table IV Taxonomic list of macroinvertebrates for MS2

Date: 4/10/85 (Smith-Conley Cr., Dwns, Anderson Rd.)

ORDER	FAMILY	GENUS/SPECIES	NUMBER OF INSECTS (n)	BIOTIC INDEX VALUE (a)	a x n
DIPTERA	CHIRONOMIDAE	Diamesa spp.	77	5	385
DIPTERA	CHIRONOMIDAE	Micropsectra spp.	2	7	14
DIPTERA	CHIRONOMIDAE	Orthocladius spp.	2	6	12
DIPTERA	CHIRONOMIDAE	Parametriocnemus spp.	3	5	15
DIPTERA	SIMULIIDAE	Simulium vittatum	7	7	49
DIPTERA	TABANIDAE	Chrysops spp.	4	6	24
EPHEMEROPTERA	BAETIDAE	Baetis brunneicolor	3	4	12
TRICHOPTERA	HYDROPSYCHIDAE	Ceratopsyche slossonae	2	4	8
TRICHOPTERA	HYDROPSYCHIDAE	Hydropsyche betteni	4	6	24
AMPHIPODA	GAMMARIDAE	Gammarus pseudolimneus	8	4	32
ISOPODA	ASELLIDAE	Asellus intermedius	8	8	64
Totals			120		639

$$\text{Biotic Index} = 639 / 120 = 5.33 \text{ Good}$$

TABLE: V List of fish for sampling site: Prairie Rd.

DATE: 5/24/76

Twn 6N, Rng 4E, Sec. 36 1/4 1/4 NENE

STREAM: Smith-Conley Cr.

Station mileage: 3.5B

County: 25

SOURCE OF DATA: 11

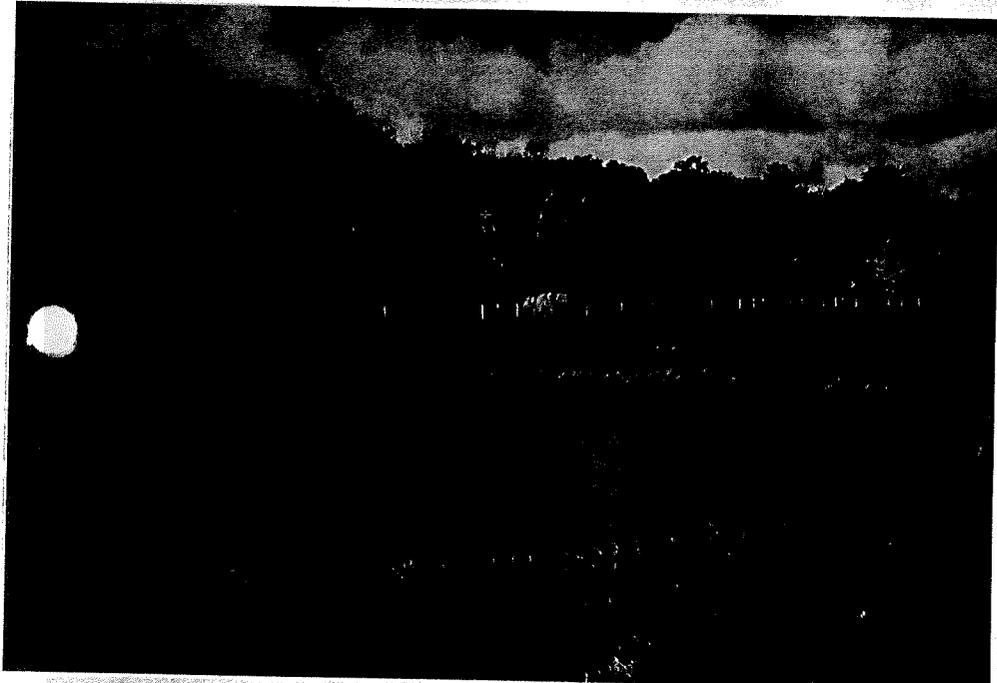
GEAR: B

EFFORT: 05

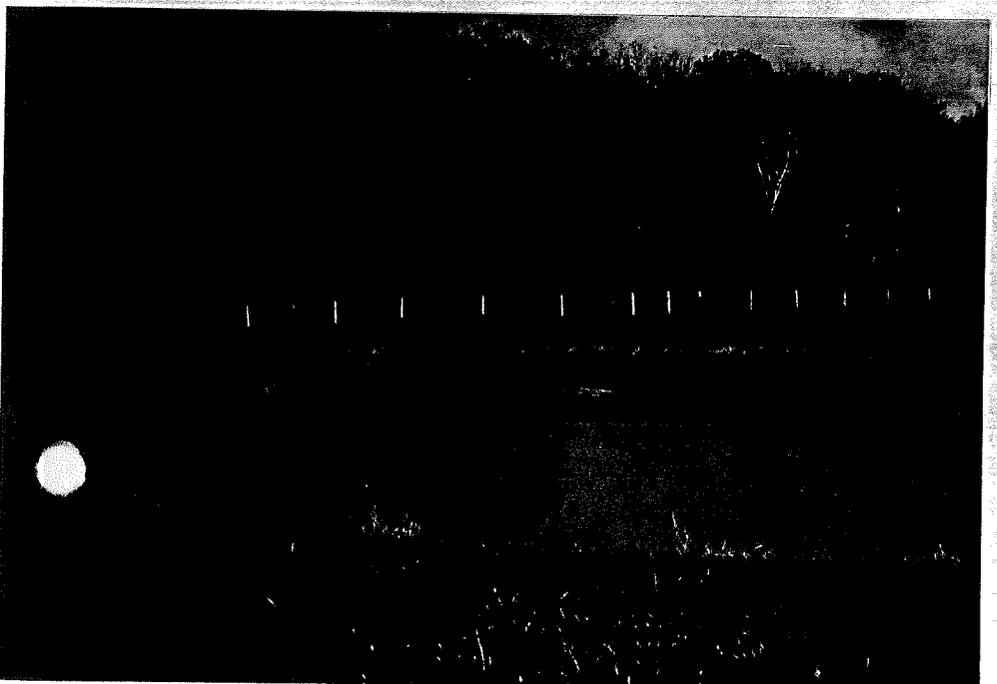
CODE	COMMON NAME	FAMILY	GENUS/SPECIES	# FISH	TOLERANCE LEVEL
I21	BROWN TROUT	SALMONIDAE	Salmo trutta	10	Sport fish
M06	CENTRAL STONEROLLER	CYPRINIDAE	Campostoma anomalum	2	Intolerant
M43	SOUTHERN REDBELLY DACE	CYPRINIDAE	Phoxinus erythrogaster	8	Intolerant
M50	CREEK CHUB	CYPRINIDAE	Semotilus atromaculatus	14	Tolerant
N09	WHITE SUCKER	CATOSTOMIDAE	Catostomus commersoni	52	Tolerant
X12	JOHNNY DARTER	PERCIDAE	Etheostoma nigrum	3	Tolerant
Z01	MOTTLED SCULPIN	COTTIDAE	Cottus bairdi	3	Intolerant



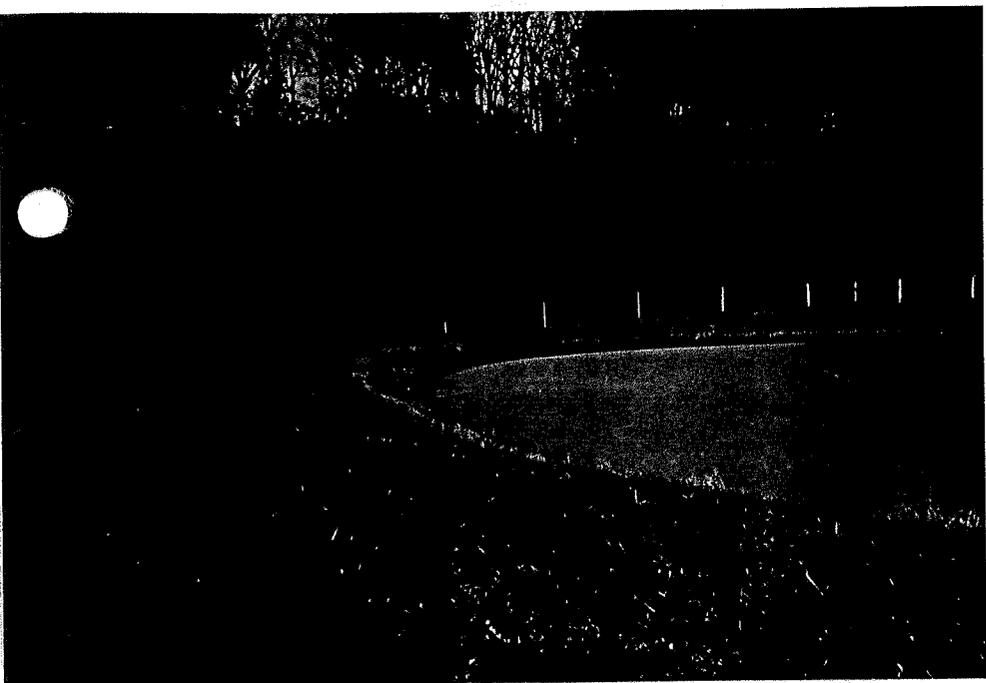
Ridgeway WWTP



Ridgeway WWTP  
Note duckweed accumulation  
on surface.



Ridgeway WWTP



Ridgeway WWTP



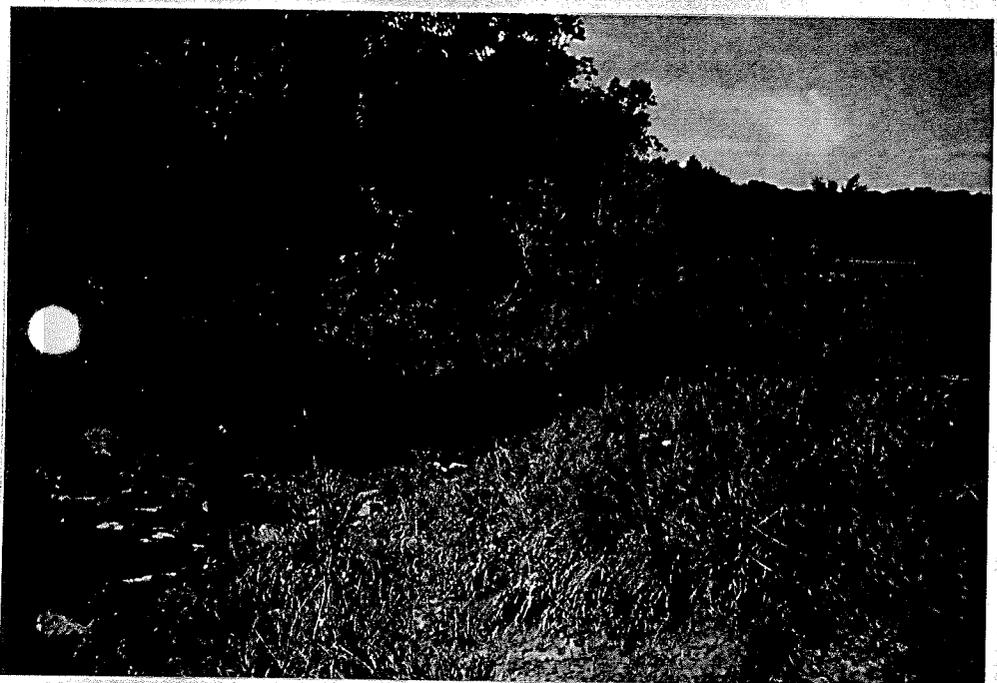
Ridgeway WWTP  
Smith-Conley Creek  
outfall location.



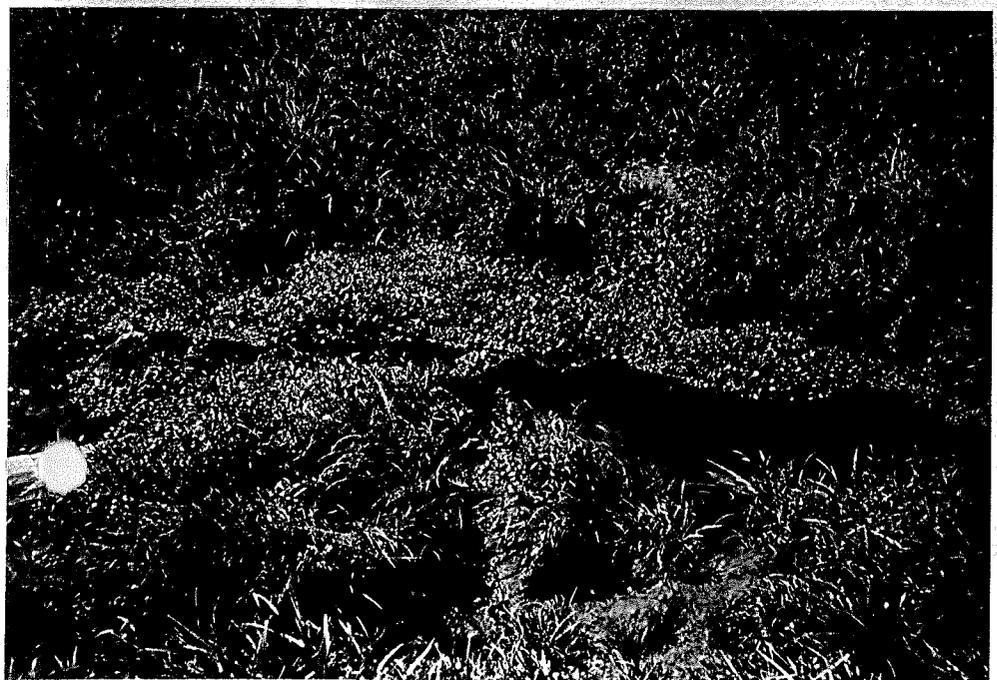
Ridgeway WWTP  
Smith-Conley Creek  
outfall location.



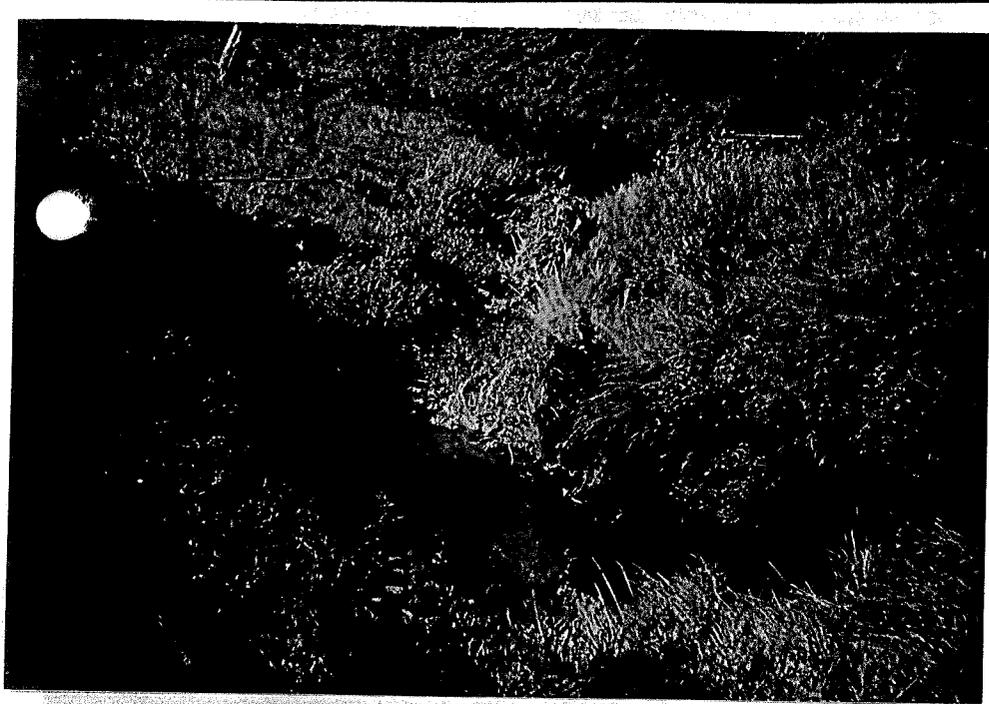
Ridgeway WWTP  
Smith-Conley Creek  
outfall.



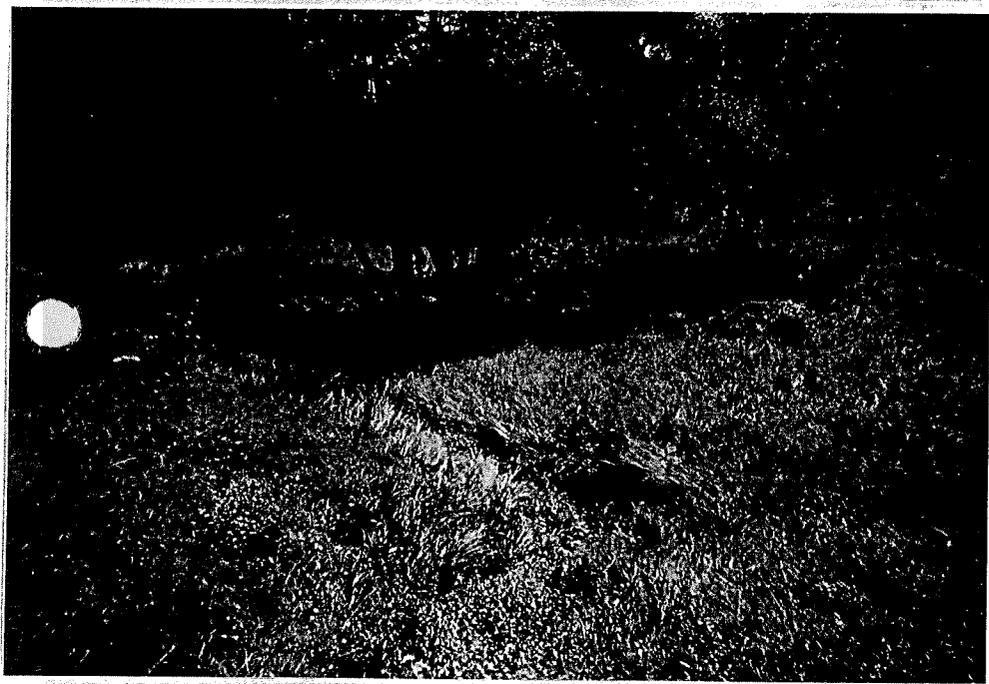
Smith-Conley Creek  
At classification change.



Smith-Conley Creek  
At classification change.  
Note the water cress in  
stream.



Smith-Conley Creek  
At classification change.



Smith Conley Creek  
At classification change.



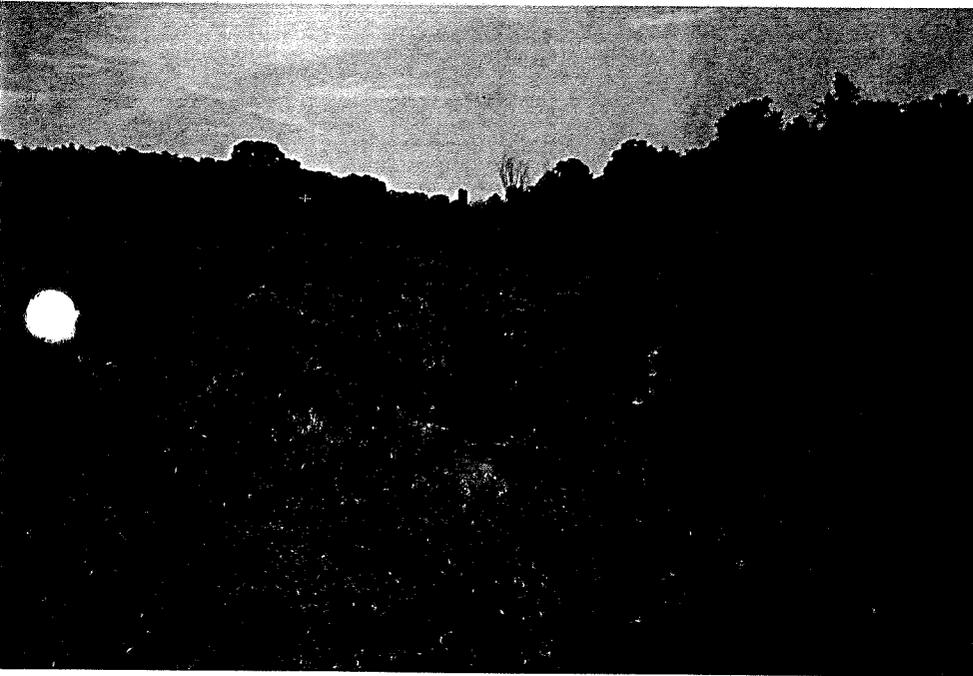
Smith-Conley Creek  
At classification change.



Smith-Conley Creek

At classification change.

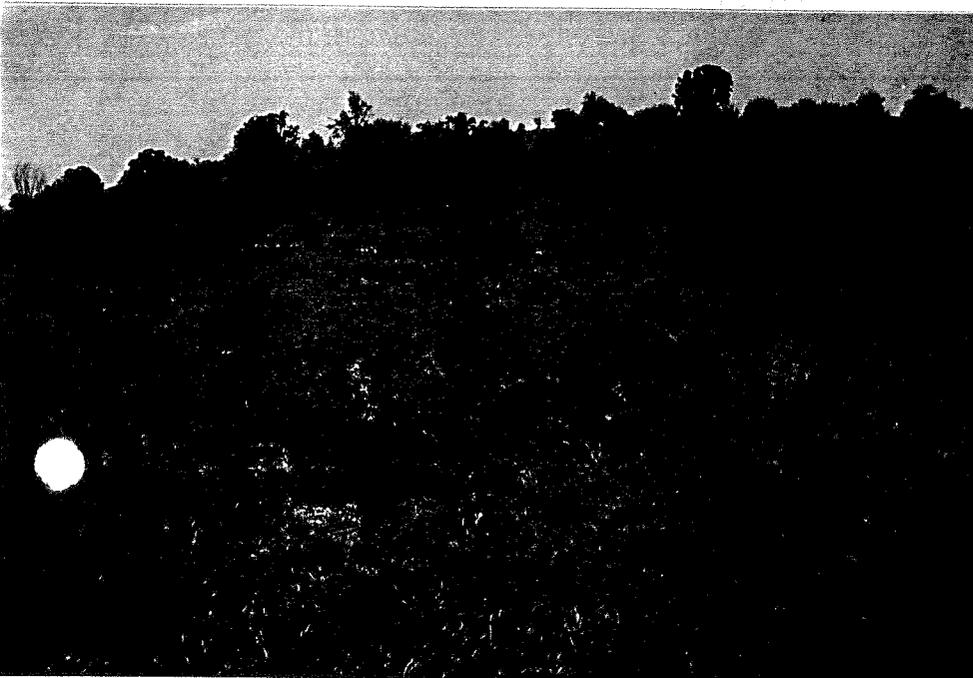
Note watercress in stream.



Smith-Conley Creek

Downstream of Anderson

Road.



Smith-Conley Creek

Downstream of Anderson

Road.

APPENDIX I

The Wasteload Allocation Report for  
Smith-Conley Creek Near Ridgeway

Prepared by

Water Resources Planning and Policy Section  
Wisconsin Department of Natural Resources  
January, 1986

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## SUMMARY

Two field surveys were conducted to provide the information for calibrating and verifying a water quality model. The calibrated model was generally within 0.5 mg/l of the DO observations and the verification model was generally within 0.7 mg/l.

The first 1/2 mile of the stream below the outfall is classified as an intermediate stream. The next 7 miles is classified as a Class II trout stream. The intermediate classification is to maintain a minimum DO of 3 mg/l and a maximum ammonia concentration of 3 mg/l. The trout stream's standards are a minimum DO of 6 mg/l and a maximum un-ionized ammonia concentration of 0.016 mg/l  $\text{NH}_3\text{-N}$ .

The recommended ammonia limit of 2.0 mg/l is controlled by the trout stream standards. Through the trout stream classification controls, the intermediate stream requirements are very close. The intermediate stream classification would require an ammonia limit of 3.0 mg/l.

The model was run with various effluent  $\text{BOD}_5$  concentrations until the minimum stream DO met the stream standards of 3.0 mg/l in the intermediate segment and 6.0 mg/l in the trout stream. These model runs showed that the stream DO was sensitive to the effluent DO. Due to the sensitivity, the effluent DO was increased to 7 mg/l. An effluent  $\text{BOD}_5$  of 30 mg/l was able to meet the stream standards in subsequent model runs. Winter, suspended solids and other limits may be proposed by the Surface Water Standards and Monitoring Section, Bureau of Water Resources Management.

Table 1. Recommended Summer Effluent Limits

<u>Parameter</u>	<u>Limit</u>
BOD (weekly average)	30
$\text{NH}_3\text{-N}$ (weekly average)	2
DO (minimum)	7
pH (standard units)	6-9

## INTRODUCTION

Water quality based effluent limits have never been established for the Ridgeway wastewater facility. During facility planning for the present facility, the Department expressed concerns that the permit limits may not meet water quality standards. This report evaluates the Department's concerns.

### Smith-Conley Creek Near Ridgeway

The Smith-Conley Creek is classified as an intermediate stream (NR 104 of the Wisconsin Administrative Code) from the Ridgeway outfall to the south boundary of Section 14, T6N, R4E (Figure 1). As an intermediate stream, it will not support a fully balanced aquatic life community. Downstream of this point, for seven miles, the stream is a Class II trout stream. Brown, rainbow and brook trout are stocked with brown trout successfully reproducing.

The Department has adopted water quality standards for both of the stream classifications. The intermediate classification maintains a minimum dissolved oxygen (DO) concentration of 3 mg/l and maximum instream ammonia concentrations of 3 mg/l summer and 6 mg/l winter. The trout classification standards are a minimum DO of 6 mg/l and a maximum un-ionized ammonia concentration of 0.02 mg/l.

### Ridgeway

The Village of Ridgeway is located in the northeastern part of Iowa County. The village is on the basin divide separating the Wisconsin and Pecatonica River basins.

The village's size is expected to remain nearly constant. The 1980 population was 750 and the projected 1995 population is 700 (DNR, 1980). The facility is near its projected design flow. The two cell aerated lagoon wastewater facility, completed in February, 1978, has a design flow of 0.068 mgd. The average flow from August, 1984, to July, 1985, was 0.066 mgd.

Since construction was completed, the facility has had difficulty in meeting the above limits. The facility was designed to meet the following WPDES permit limits:

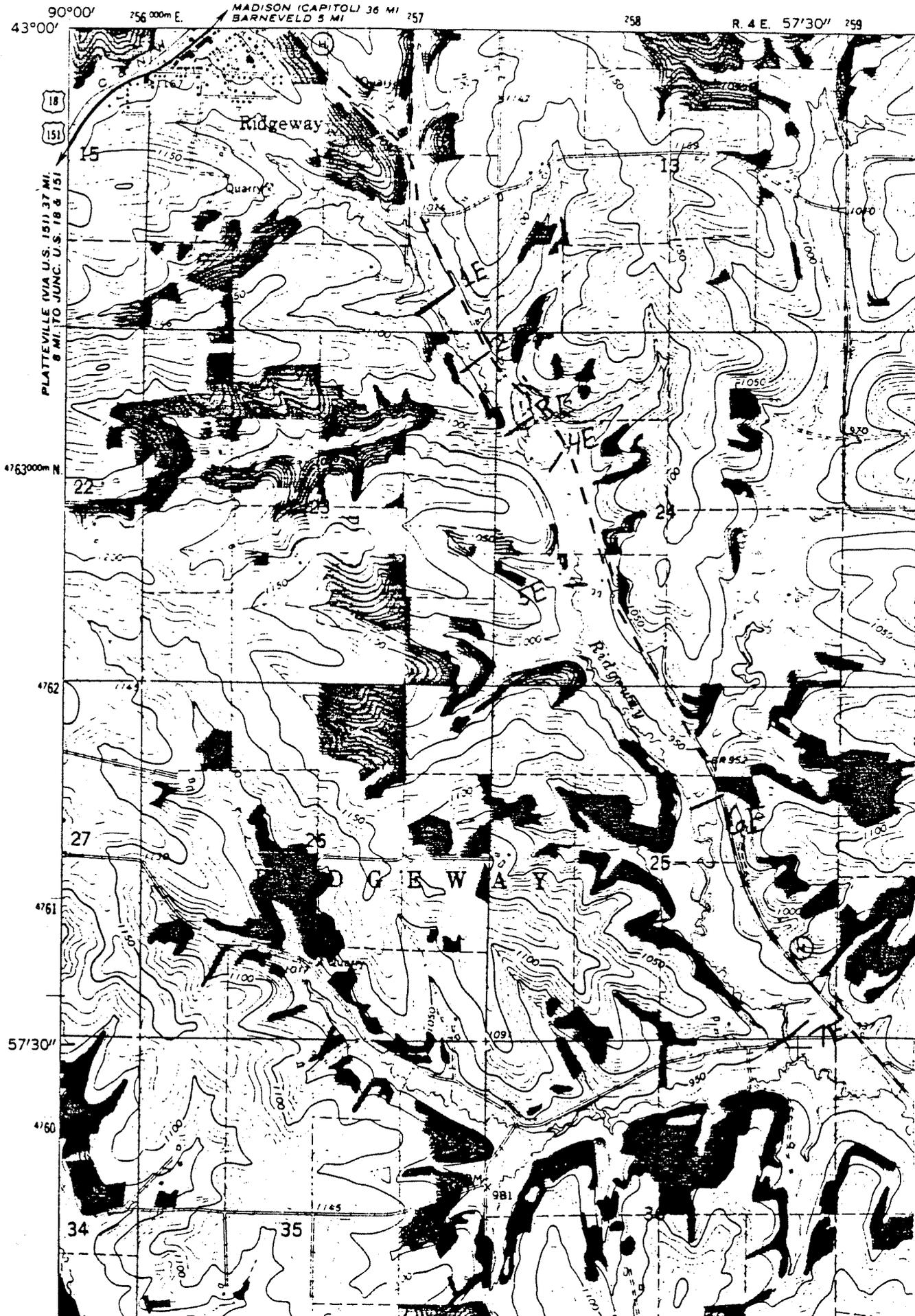
Table 2. Ridgeway WPDES Effluent Limits

<u>Parameter</u>	<u>Limit (mg/l)</u>
BOD (weekly average)	15
SS (weekly average)	15
DO (minimum)	6

2910 II GREEN  
(SPRING GREEN)  
1:62,500

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

FIGURE 1



BOD and SS weekly averages for 1984 and 1985 are summarized in Figures 2 and 3. The figures show periodic upsets. During the spring of each year, both the BOD and SS show the upsets. 1984 shows a large upset that occurred in conjunction with high influent flows (0.14 mgd). 1985 did not show the same magnitude of influent flow nor subsequent upset.

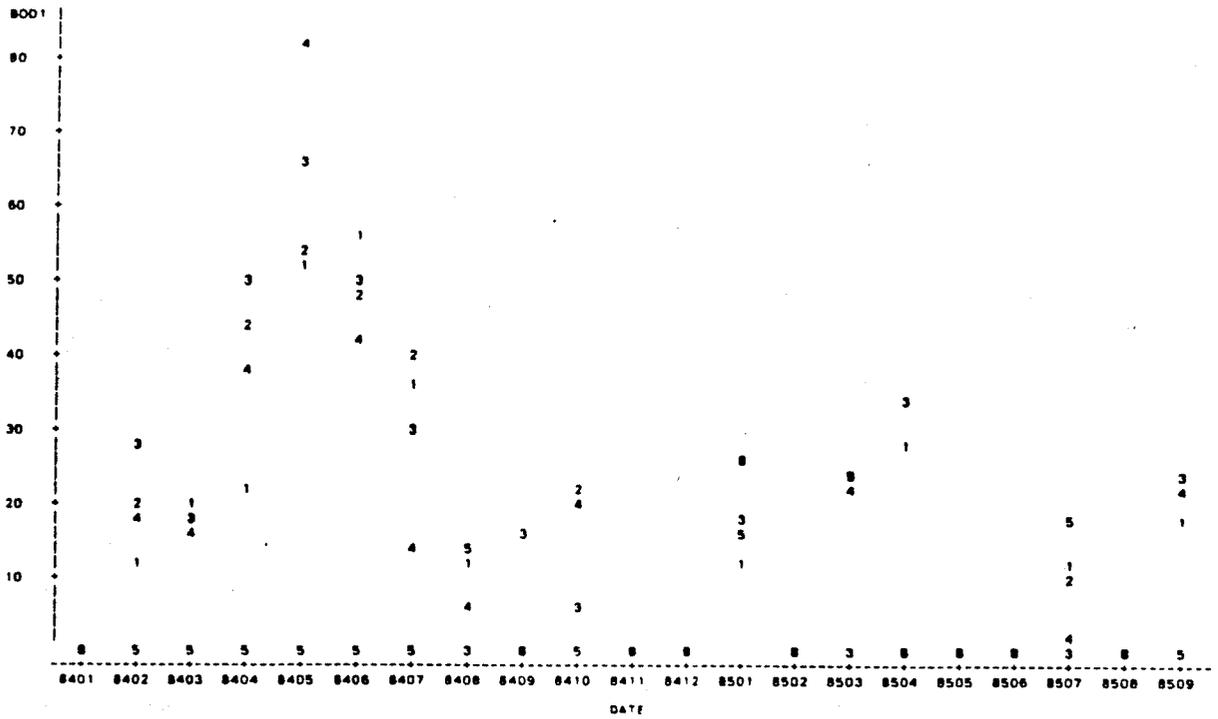
The facility's problems are not limited to periods of upset. Since the beginning of 1984, the facility has been in compliance with its BOD limit 25% of the time and its SS limit 35% of the time. The effluent DO occasionally does not meet the 6 mg/l minimum. About 5% of the reported DO measurements were below the minimum.

FIGURE 2

WEEKLY AVERAGE BOD DMR DATA FOR RIDGEWAY

12:34 WEDNESDAY, DECEMBER 4, 1985 3

PLOT OF BOD1\*DATE SYMBOL USED IS 1  
 PLOT OF BOD2\*DATE SYMBOL USED IS 2  
 PLOT OF BOD3\*DATE SYMBOL USED IS 3  
 PLOT OF BOD4\*DATE SYMBOL USED IS 4  
 PLOT OF BOD5\*DATE SYMBOL USED IS 5



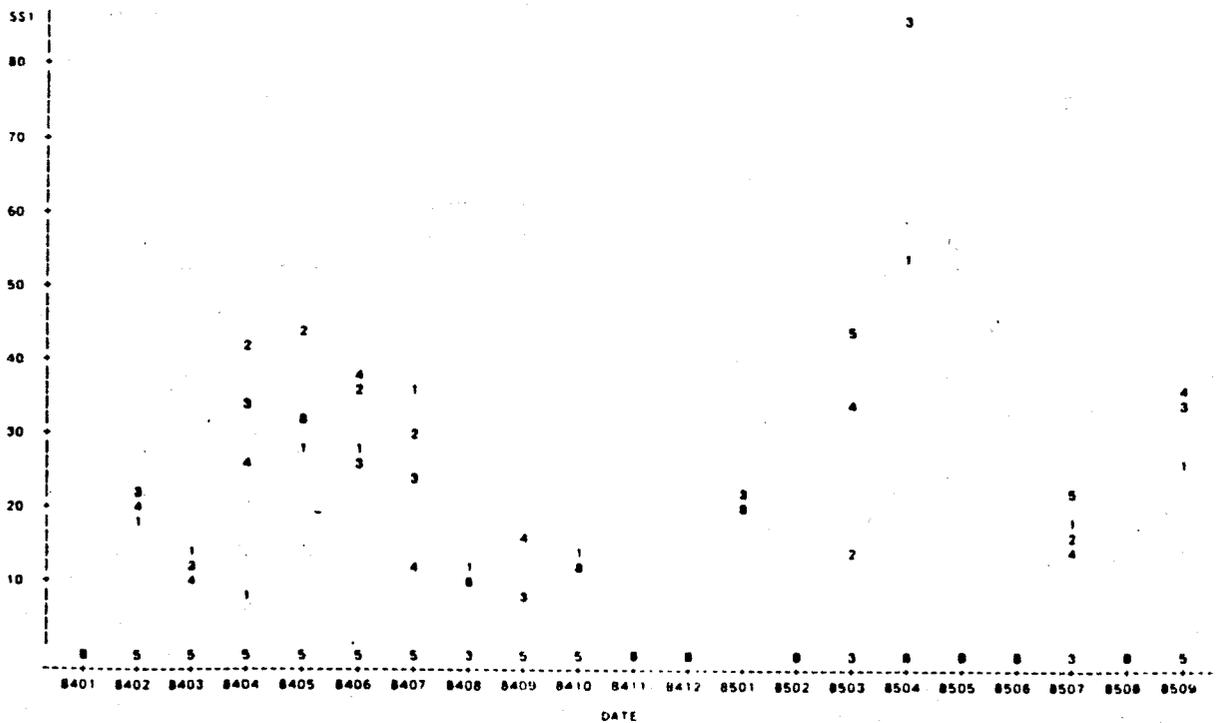
NOTE: 585 OBS HAD MISSING VALUES

FIGURE 3

WEEKLY AVERAGE SS DMR DATA FOR RIDGEWAY

12:34 WEDNESDAY, DECEMBER 4, 1985 4

PLOT OF SS1\*DATE SYMBOL USED IS 1  
 PLOT OF SS2\*DATE SYMBOL USED IS 2  
 PLOT OF SS3\*DATE SYMBOL USED IS 3  
 PLOT OF SS4\*DATE SYMBOL USED IS 4  
 PLOT OF SS5\*DATE SYMBOL USED IS 5



NOTE: 585 OBS HAD MISSING VALUES

## FIELD WORK AND CALIBRATION MODEL

Two field surveys provide the information to calibrate and verify the water quality model. The Department conducted surveys on 7/31-8/1/84 and 8/13-14/84. The surveys divided the stream into seven segments (Figure 1). Physical characteristics (average velocity, flow and average top width) were measured for each of the segments. Sampling stations were established at the end of each of the segments.

Water chemistry sampling was coordinated by dye travel times. A dye slug (about 250 ml of Rhodamine WT dye) was injected into the effluent. Dye sampling at each of the sampling station gave the travel time from the outfall to each of the stations. This travel time was used to schedule water chemistry sampling at each of the stations. Water samples were analyzed by the State Laboratory of Hygiene for:

- BOD<sub>LT</sub>
- BOD<sub>5</sub>
- Total Kjeldahl - Nitrogen
- Ammonia - Nitrogen
- NO<sub>2</sub>+NO<sub>3</sub> - Nitrogen
- Chloride

BOD<sub>LT</sub> is a special long-term BOD test used to approximate the ultimate BOD. The sample is incubated for a long period (about 100 days), DO is monitored and the sample is periodically reaerated. The sample's cumulative DO depletion is the BOD<sub>LT</sub>.

The water quality model divides BOD into nitrogenous and carbonaceous fractions. BOD<sub>LT</sub> results are adjusted to calculate the sample's carbonaceous BOD<sub>LT</sub> (CBOD<sub>LT</sub>). The BOD<sub>LT</sub> test approximates the total ultimate BOD. The sample also analyzed for nitrate before and after the test to account for the amount of nitrification occurring during this test. The nitrate results are used to translate the BOD<sub>LT</sub> values to CBOD<sub>LT</sub> values by the following equation:

$$CBOD_{LT} = BOD_{LT} - 4.57 (NO_3-N_f - NO_3-N_i)$$

Where:

NO<sub>3</sub>-N<sub>f</sub> = NO<sub>3</sub>-N after BOD<sub>LT</sub> test

NO<sub>3</sub>-N<sub>i</sub> = NO<sub>3</sub>-N before BOD<sub>LT</sub> test

Periodic (diel) DO monitoring is used to quantify the effects of photosynthesis and sediment oxygen demand. Diel DO monitoring was conducted at several of the sampling stations. Diel DO monitoring involves measuring

the DO over a period of about 24 hours. During the August 1 survey, the DO was measured at a 3-hour interval. During the August 13 survey, continuous DO recorders replaced the periodic monitoring.

Both surveys observed a rapid inflow of groundwater. Groundwater entered the stream at a rate of 0.77 cfs/mile for the August 1 survey and 0.66 cfs/mile for the August 13 survey.

In addition to providing sample timing, the dye travel times provides average velocity of each of the segments. Segment velocities ranged from 0.17 ft/sec to 0.51 ft/sec.

Segment depths are determined from the segment flows, velocities and top widths (depth = flow/(velocity\* top width)). These calculations give depths ranging from 0.42 to 2.1 feet.

Segment slopes are measured from a USGS 7 1/2 minute topographic map. The slope varied from 30 feet per mile near the discharge to 10 feet per mile at the end of the survey (segment 7).

The ultimate nitrogenous BOD (NBOD<sub>ult</sub>) is calculated by the potential of ammonia to consume oxygen. One mg/l of ammonia (NH<sub>3</sub>-N) will consume 4.57 mg/l of oxygen thus NBOD is the produce of 4.57 and the ammonia concentration.

Pollutant decay rates are usually determined by plotting CBOD and NBOD instream loadings versus travel time. However, rapid groundwater dilution, high effluent quality and natural variability of the loading calculation makes it impossible to measure the decay rate. In lieu of direct measurement, rates from another model are used. A water quality model has been completed for Barneveld. Barneveld's situation is very similar to Ridgeway. Located 5 miles to the east, the Barneveld lagoons discharge near the headwaters of East Branch of the Pecatonica River (also a Class II trout stream). The Barneveld model decay rates of 0.9 and 1.6 days<sup>-1</sup> for CBOD and NBOD, respectively, are used for the Ridgeway model.

In conjunction with the DNR study, USGS conducted a gas tracer study to estimate the reaeration rate. Based on their study, the average reaeration rate over segments 1, 2 and 3 was 11.4 days<sup>-1</sup>. After examining a number of reaeration equations, the Thackston-Krenkel equation (below) was selected.

#### Thackston Krenkel Reaeration Equation

$$K_2 \text{ (days}^{-1}\text{)} = 28.08 (1 + F^{0.5}) U_s / H \quad (1)$$

Where:

- F = Froude number =  $V / \sqrt{gh}$
- V = stream velocity (ft/s) =  $\sqrt{gHs}$
- U<sub>s</sub> = average shear velocity (ft/s)
- H = average depth (ft)
- g = gravitation constant (ft/s<sup>2</sup>)
- s = stream slope (ft/ft)

The last step of data analysis to develop the photosynthesis (P), and community respiration (R) terms. This is done by analyzing the data from the diel stations. The relationship between DO and average  $K_2$ , P, and R terms is shown below:

$$\frac{\Delta DO}{\Delta t} = K_2 \times (C_s - C) - K_1 \times CBOD - K_3 \times NBOD + \alpha P - R \quad (2)$$

Where:

$\frac{\Delta DO}{\Delta t}$  = time rate of change of DO (mg/l/hr.)

CBOD = ultimate carbonaceous BOD (mg/l)

NBOD = ultimate nitrogenous BOD (mg/l)

$K_1$  = CBOD decay rate (hr.<sup>-1</sup>)

$K_2$  = reaeration rate (hr.<sup>-1</sup>)

$K_3$  = NBOD decay rate (hr.<sup>-1</sup>)

$C_s$  = DO saturation (mg/l)

C = DO concentration (mg/l)

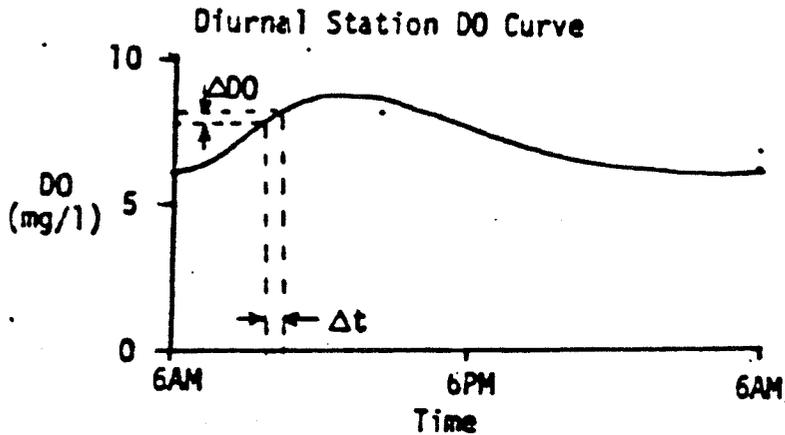
P = community photosynthetic production (mg/l/hr)

R = average community respiration (mg/l/hr)

$\alpha$  = hourly light intensity/average hourly light intensity

Community respiration is the sum of plant respiration and sediment oxygen demand (SOD). SOD is difficult to measure directly because of the shallow stream depth and rapidly changing substrate. Plant respiration is also difficult to measure directly because most of the plants are macrophytes (free standing) and periphyton (attached).

Figure 4



The above figure defines  $\frac{\Delta DO}{\Delta t}$ . The unknowns in equation 2 are P and R if we assume steady state effluent quantity and quality. A regression routine can then be used to estimate P and R from equation 2.

The respiration term (R) is assumed constant and input directly into the model (after converting it to a daily rate). The photosynthesis term (P) is further modified by dividing it by the average sunlight intensity. Hourly sunlight intensity are obtained by calculating hourly averages from the continuous record of light intensity measured during the survey. The model internally calculates time of day along with the travel time. At each time step of the model, the average P is multiplied by the hourly sunlight intensity. This results in photosynthetic oxygen production that is a function of sunlight intensity.

The calibration model was run with 4 starting times (6 P.M., midnight, 6 A.M., and noon). The model follows a packet of water as it travels downstream from the outfall. The packet travels through each segment at the average segment velocity. The packet's DO is affected by changes in the photosynthetic oxygen production due to time-of-day changes in sunlight intensity, as well as the segment's reaeration and decay rates.

DO data from the diel monitoring stations is also used to provide DO observations for each of the model runs. The observation from each station is determined as the starting time plus the travel time to that station. (e.g., the DO observation from station 3E is the DO at the model's starting time (say

midnight) plus the travel time (5:02 hours) or 5:02 A.M.). The completed calibration model (Appendix II) shows good agreement between the calculated DO and observed DO. The DO's generally match within 0.5 mg/l.

#### Verification Model

The July 31/August 1, 1984, survey is used for model verification. The information collect (Appendix I) follows the same procedures as the August 13-14 survey. Stream flows are similar to the August 13-14 survey. The flow upstream of the outfall is 0.25 cfs and the flow at the end of segment 7 (see Figure 1) is 5.25 cfs (as compared to 0.25 cfs and 4.5 cfs for the August 13-14 survey).

The dye travel time also reflected slightly higher flows. The travel time from the outfall to the end of segment 7 is 0.55 days as compared to 0.70 days during the August 13-14 survey.

New reaeration ( $K_2$ ) rates are recalculated from the Thackston-Krenkel reaeration equation based on the observed segment velocities and depths.

Water chemistry samples, collected to determine instream decay rates, again showed that rapid groundwater inflow and high quality effluent ( $BOD_5 = 7.8$  mg/l,  $NH_3-N = 0.19$  mg/l) obscured pollutant decay. As with the calibration model, decay rates are taken from the Barneveld model.

Photosynthetic oxygen production and respiration rates are taken from calibration model.

The completed verification model (Appendix III) is run with 4 starting times (6 P.M., midnight, 6 A.M., and noon). The observed DO's match well with the calculated DO and are generally within 0.7 mg/l.

#### Prediction Model

The prediction model is the objective of WLA modelling. The model predicts the effluent's water quality impact under critical conditions. Critical conditions for Smith-Conley Creek will occur during the summer low flow period. During this period, the stream temperature will vary between 18 and 23°C (depending on the time of day) and stream flow will be  $Q_{7,10}$  (the  $Q_{7,10}$  is the lowest seven day average flow that is expected to occur once every ten years).

Groundwater inflow greatly affects the  $Q_{7,10}$  along the stream. At the outfall, the stream's  $Q_{7,10}$  is 0.0 cfs. 1.75 miles downstream, the  $Q_{7,10}$  is 0.8 cfs. At the beginning of the trout classification, the  $Q_{7,10}$  is 0.15 cfs.

The stream temperatures are increased 3°C above the August 13-14 survey to reflect the stream's critical conditions. This results in stream temperatures that range from 18 to 22°C depending on time of day. These temperatures are cooler than usually observed in Southern Wisconsin streams due to the groundwater influence.

Ammonia toxicity calculations establish the effluent ammonia limit. The intermediate stream classification has an ammonia effluent limit of 3 mg/l, but the trout classification has an un-ionized ammonia criterion of 0.016 mg/l  $\text{NH}_3\text{-N}$ . Ammonia toxicity calculations (Appendix IV) account for the ammonia decay in the intermediate stream segment in deriving the 1.0 mg/l ammonia limit to meet the 0.016 mg/l un-ionized ammonia criterion. The Department has established a minimum ammonia limit of 2 mg/l due to the technological limitations in achieving ammonia limits less than 2 mg/l. The Ridgeway limit is increased from 1 mg/l to 2 mg/l because of this technological limitation.

The recommended effluent DO limit is 7 mg/l. This limit is above the 4 mg/l requirement for an intermediate stream because initial prediction model runs show that effluent DO is important in maintaining the trout DO standard.

Effluent limits for Ridgeway must meet a minimum DO of 3 mg/l in the marginal segment and 6 mg/l in the trout segment. With the effluent DO and ammonia concentrations set, effluent  $\text{CBOD}_{\text{LT}}$  is changed until the stream's minimum DO just meets the 6 mg/l standard. The prediction model (Appendix V) shows that an effluent  $\text{CBOD}_{\text{LT}}$  limit of 48 mg/l meets the stream DO standard.

The CBOD limit must be converted into a  $\text{BOD}_5$  limit. Effluent  $\text{CBOD}_{\text{LT}}$  and  $\text{BOD}_5$  sampling from the surveys is used to develop a  $\text{CBOD}_{\text{LT}}/\text{BOD}_5$  ratio. The two surveys had ratios of 1.2 and 2.0 with an average 1.6. Applying the average ratio to the effluent CBOD limit of 48 mg/l results in a  $\text{BOD}_5$  limit of 30 mg/l.

Ridgeway's recommended summer effluent limits are summarized in Table 1. Winter effluent limits will be developed by the Surface Water Standards and Monitoring Section.

6328V

Ridgeway Survey Summary  
Water Chemistry Results

7/31-8/1/84

Station	Distance from STP (ft)	Date	Time	Temp (C)	DO (mg/l)	pH (insitu)	Cumulative Travel Time (days)	Flow (cfs)	Ammonia Nitrogen (mg/l)	Total Nitrogen (mg/l)	TK-N (mg/l)	NO3-N (mg/l)	CBOD60 (mg/l)	BOD5 (mg/l)	TP (mg/l)	SP (mg/l)	CI (mg/l)
Upstream	-10	8/1/84	8:10	15.7	10.4			0.29	0.04	12.20	0.4	11.8		1.5	0.03	0.02	31
Effluent	0	8/1/84	8:11	21.9	6.7		0.00	0.06	0.19	2.90	1.5	1.2		7.8	1.90	1.60	85
1E	1756	8/1/84	9:55	16.0	8.2		0.08	0.46	0.08	8.40	0.7	7.6		2.5	0.33	0.19	35
2E	3672	8/1/84	12:26	18.0	9.8		0.18	1.06	0.04	5.00	0.5	5.3		1.5	0.18	0.11	22
3E	4472	8/1/84	13:26	17.3	9.6		0.21	1.06	0.06	5.50	0.3	5.1		1.5	0.18	0.10	20
T1	4472	8/1/84	13:42	18.1	8.60		0.21	0.70	0.05	6.10	0.6	5.5		2.5	0.14	0.03	230
4E	6970	8/1/84	14:22	18.7	9.0		0.26	2.03	0.04	5.70	0.6	5.1		1.8	0.16	0.07	15
5E	8520	8/1/84	14:44	18.4	9.8		0.32	2.46	0.04	5.20	0.5	4.7		1.8	0.14	0.07	15
T2	8520	8/1/84	14:57	18.2	11.6		0.32	1.77	0.03	3.70	0.4	3.3		1.5	0.05	0.03	188
6E	13790	8/1/84						5.02									
7E	18850	8/1/84	15:16	18.0	10.9		0.55	4.61	0.03	3.90	0.4	3.5		1.8	0.08	0.04	11

APPENDIX I DATA SUMMARY

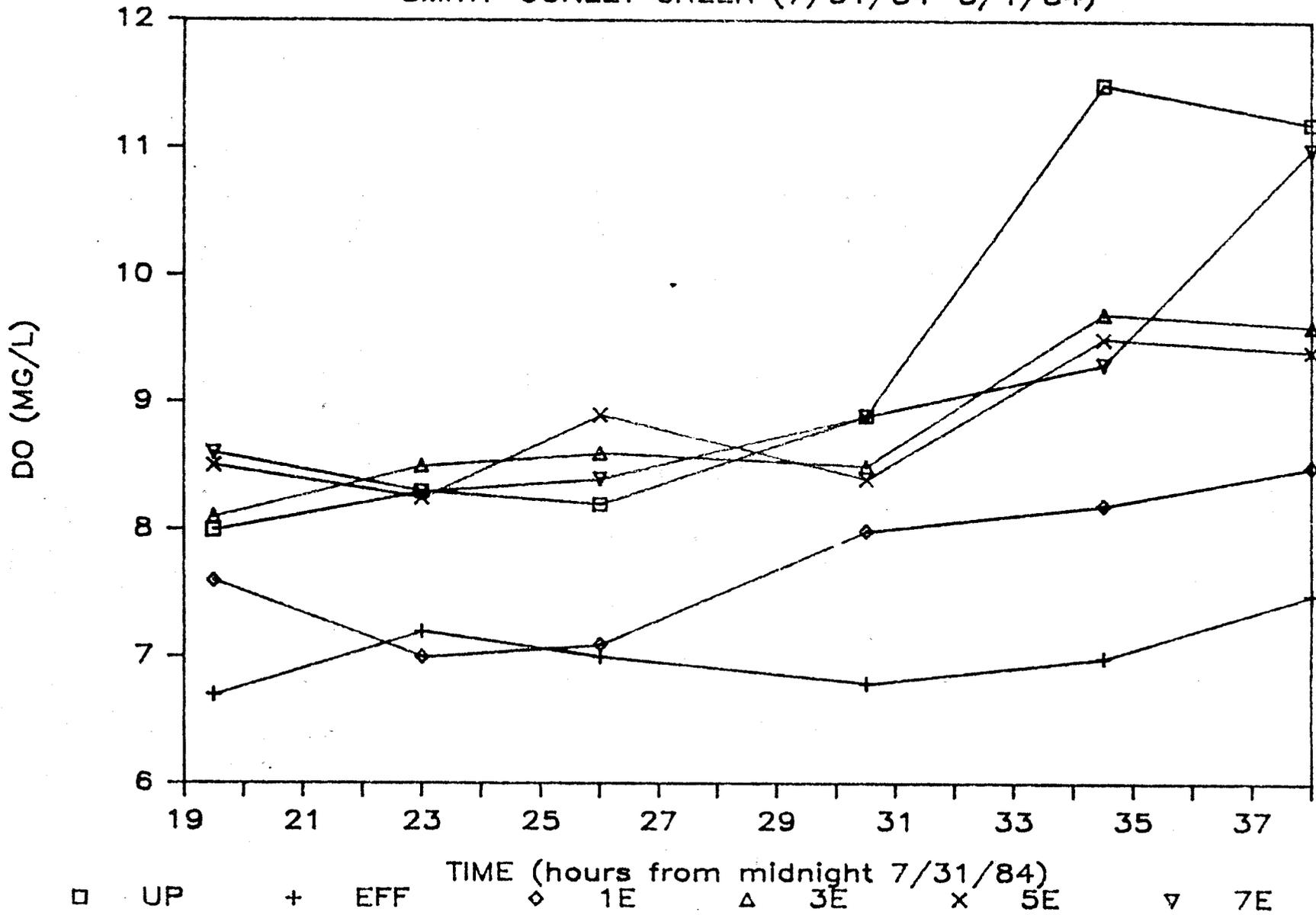
Ridgeway Survey Summary  
Water Chemistry Results

8/13-14/84

Station	Distance from STP (ft)	Date	Time	Temp (C)	DO (mg/l)	pH (insitu)	Cumulative Travel Time (days)	Flow (cfs)	Ammonia Nitrogen (mg/l)	Total Nitrogen (mg/l)	TK-N (mg/l)	NO3-N (mg/l)	CBOD60 (mg/l)	BOD5 (mg/l)	TP (mg/l)	SP (mg/l)	CI (mg/l)
Upstream	-10	8/14/84	8:09	16.5	8.7			0.09	0.02	13.00	0.2	13.0	2.0	1.2	0.04	0.03	30
Effluent	0	8/14/84	8:03	23.0	7.6		0.00		0.16	2.50	1.5	1.0	11.4	9.2	2.00	1.83	89
1E	1756	8/14/84	9:20	18.0	6.4		0.10	0.33	0.05	7.30	0.6	6.7	5.1	2.8	0.31	0.23	27
2E	3672	8/14/84	13:22	17.8	8.5		0.22	0.93	0.02	5.30	0.4	4.9	2.0	1.8	0.16	0.12	22
3E	4472	8/14/84	13:48	15.0	7.8		0.24	0.87	0.02	5.00	0.4	4.6	2.0	1.2	0.14	0.11	20
T1	4472	8/14/84	14:00	15.0			0.24	0.54	0.04	6.10	0.8	5.3		2.2	0.16	0.04	11
4E	6970	8/14/84	15:16	18.8	8.5		0.30	1.60	0.02	5.30	0.6	4.7	3.0	1.5	0.14	0.07	15
5E	8520	8/14/84	15:31	19.7	7.3		0.35	1.06	0.03	4.90	0.5	4.4	2.7	1.5	0.15	0.07	14
T2	8520	8/14/84	15:32				0.35	1.79	0.02	3.00	0.4	3.5		1.2	0.04	0.03	10
6E	13790	8/14/84	15:53	17.5	7.8		0.50	4.30	0.02	3.90	0.4	3.5	2.4	1.5	0.12	0.05	11
7E	18850	8/14/84	16:11	19.1	7.8		0.70	4.70	0.03	4.00	0.6	3.4	2.0	1.5	0.10	0.05	10

# DIEL DO

SMITH-CONLEY CREEK (7/31/84-8/1/84)



STATE OF WISCONSIN - DEPARTMENT OF NATURAL RESOURCES

WATER QUALITY EVALUATION

SEGMENTED STREAM ANALYSIS OF RIDGEWAY 8/13/84  
FOR DISSOLVED OXYGEN

NUMBER OF SEGMENTS = 7  
 NUMBER OF DAYS = 3 STARTING TIME FIRST DAY (HR.MIN) 18.000  
 VALUE FOR STARTING DISTANCE OF ANALYSIS = .000  
 DISTANCE OF EACH PRINTING INTERVAL = 400.000  
 REFERENCE TEMPERATURE (TEMPA) = 18.000

APPENDIX II  
CALIBRATION MODEL

S E G M E N T S	ADDITIONAL STREAM INPUTS FOR EACH SEGMENT				ADDITIONAL WASTE INPUTS FOR EACH SEGMENT				BOD RATE CONSTANTS AT TEMPERATURE = TEMPA				REAER. AT T=20C	T E M P .	S O D I U M	P H O S P H O R U S	V E L O C I T Y	A M P L I T U D E	S E D I M E N T	R E S P I R A T I O N
	F L O W	C O N C N T R A C T I O N	N I T R O G E N	D I S S O L V E D	F L O W	C O N C N T R A C T I O N	N I T R O G E N	D I S S O L V E D	C O D E D	C O D E D	N I T R O G E N	N I T R O G E N	K	C	W E I G H T	W E I G H T	W E I G H T	W E I G H T	W E I G H T	W E I G H T
1	.25	2.0	.1	6.70	.08	20.0	.6	5.80	.90	.90	1.80	1.80	20.00	19.00	.00	.300	.210	.42	1756.0	40.00
2	.33	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	14.00	16.00	.00	.750	.170	.76	3672.0	33.00
3	.12	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	19.00	15.00	.00	.830	.510	.43	4472.0	40.00
4	.78	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	10.00	15.00	.00	.180	.390	1.14	6970.0	20.00
5	.21	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	9.60	14.00	.00	.780	.390	1.22	8520.0	22.00
6	2.24	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	5.90	13.30	.00	.330	.390	2.10	13790.0	22.00
7	.39	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	8.20	17.50	.00	.410	.390	.98	18850.0	21.00

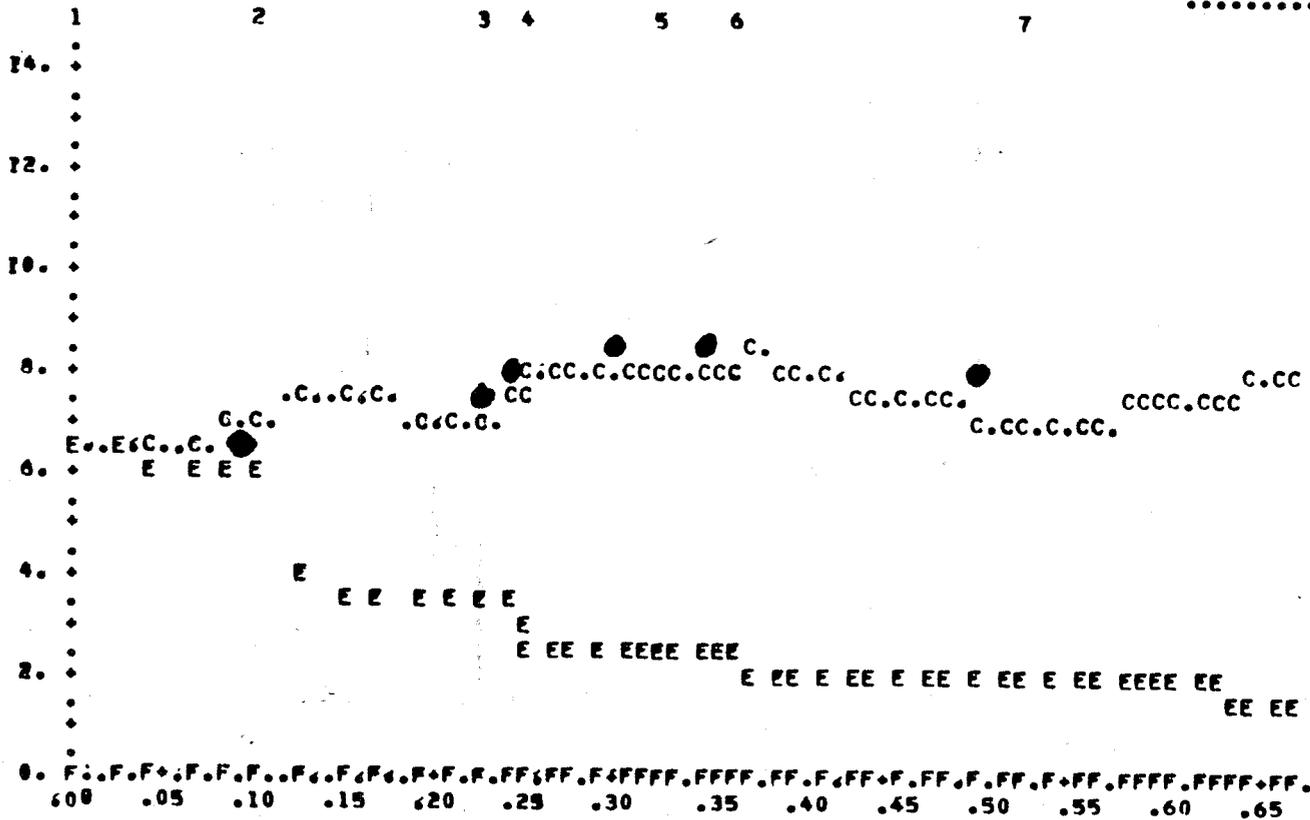
RUN COMPLETE, SEGMENTS FINISHED  
 ROOT MEAN SQUARE ERROR = .46

DO CURVE

.....  
 . KEY  
 . C = CALCULATED DO  
 . ● = OBSERVED DO  
 . E = CROD  
 . F = NR0D  
 .  
 .....

BEGINNING OF SEGMENT

DO  
(MG/L)



TT (DAYS)

WATER QUALITY EVALUATION

SEGMENTED STREAM ANALYSIS OF RIDGEWAY 8/13/84  
FOR DISSOLVED OXYGEN

NUMBER OF SEGMENTS = 7

NUMBER OF DAYS = 3 STARTING TIME FIRST DAY (HR.MIN) 24.000

VALUE FOR STARTING DISTANCE OF ANALYSIS = .000

DISTANCE OF EACH PRINTING INTERVAL = 400.000

REFERENCE TEMPERATURE (TEMPA) = 18.000

S E G M E N T	ADDITIONAL STREAM INPUTS FOR EACH SEGMENT				ADDITIONAL WASTE INPUTS FOR EACH SEGMENT				BOD RATE CONSTANTS AT TEMPERATURE = TEMPA				REAER. AT T=20C	T E M P .	S O D I U M	P H O S P H O R U S	V E L O C I T Y	A M P L I T U D E	S E D I M E N T	R E S P I R A T I O N
	F L O W	O B D	N B D	D O	F L O W	C B D	N B D	D O	C B D	C B D	N B D	N B D	K	C	T	N M T	N R	Y	H	T
1	.25	2.0	.1	7.40	.00	20.0	.6	5.70	.90	.90	1.80	1.80	20.00	16.20	.00	.300	.210	.42	1756.0	40.00
2	.33	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	14.00	14.20	.00	.750	.170	.76	3672.0	33.00
3	.12	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	19.00	14.00	.00	.830	.510	.43	4472.0	40.00
4	.78	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	10.00	14.20	.00	.180	.390	1.14	6970.0	20.00
5	.21	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	9.60	14.20	.00	.780	.390	1.22	8520.0	22.00
6	2.24	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	5.90	16.00	.00	.330	.390	2.10	13790.0	22.00
7	.39	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	8.20	19.40	.00	.410	.390	.98	18850.0	21.00

RUN COMPLETE, SEGMENTS FINISHED  
ROOT MEAN SQUARE ERROR = .41



SEGMENTED STREAM ANALYSIS OF RIDGEWAY 8/13/84  
FOR DISSOLVED OXYGEN

NUMBER OF SEGMENTS = 7  
 NUMBER OF DAYS = 3 STARTING TIME FIRST DAY (HR.MIN) 6.000  
 VALUE FOR STARTING DISTANCE OF ANALYSIS = .000  
 DISTANCE OF EACH PRINTING INTERVAL = 400.000  
 REFERENCE TEMPERATURE (TEMPA) = 18.000

SEGMENT	ADDITIONAL STREAM INPUTS FOR EACH SEGMENT				ADDITIONAL WASTE INPUTS FOR EACH SEGMENT				BOD RATE CONSTANTS AT TEMPERATURE = TEMPA				REAER. AT T=20C	TEMP	SODIUM	PHOSPHORUS	VELOCITY	AV. DEPTH	SENDER	RESPIR.
	P	Q	N	D	F	C	N	D	C	C	N	N								
1	.25	2.0	.1	8.70	.08	20.0	.6	5.80	.90	.90	1.80	1.80	20.00	17.00	.00	.300	.210	.42	1756.0	40.00
2	.33	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	14.00	15.50	.00	.750	.170	.76	3672.0	33.00
3	.12	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	19.00	16.00	.00	.830	.510	.43	4472.0	40.00
4	.78	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	10.00	17.70	.00	.180	.390	1.14	6970.0	20.00
5	.21	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	9.60	19.00	.00	.780	.390	1.22	8520.0	22.00
6	2.24	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	5.90	17.20	.00	.330	.390	2.10	13790.0	22.00
7	.39	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	8.20	17.50	.00	.410	.390	.98	18850.0	21.00

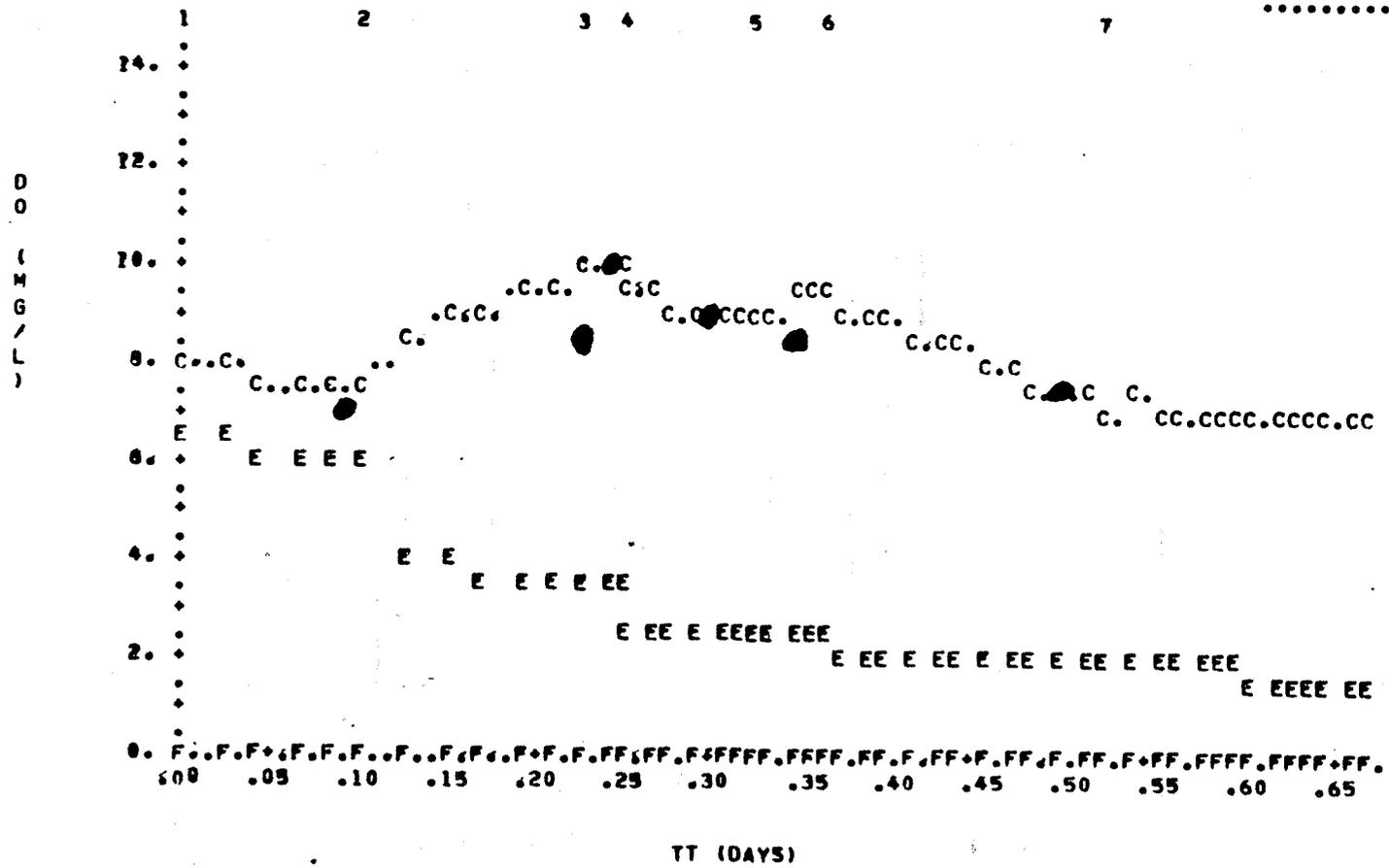
RUN COMPLETE, SEGMENTS FINISHED  
 ROOT MEAN SQUARE ERROR = .62

DO CURVE

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.....
. KEY
.C =CALCULATED DO
.● =OBSERVED DO
.E =CBOD
.F =NBOD
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BEGINNING OF SEGMENT



WATER QUALITY EVALUATION

SEGMENTED STREAM ANALYSIS OF RIDGEWAY 8/13/84  
FOR DISSOLVED OXYGEN

NUMBER OF SEGMENTS = 7

NUMBER OF DAYS = 3 STARTING TIME FIRST DAY (HR.MIN) 12.000

VALUE FOR STARTING DISTANCE OF ANALYSIS = .000

DISTANCE OF EACH PRINTING INTERVAL = 400.000

REFERENCE TEMPERATURE (TEMPA) = 18.000

S E G M E N T	ADDITIONAL STREAM INPUTS FOR EACH SEGMENT				ADDITIONAL WASTE INPUTS FOR EACH SEGMENT				BOD RATE CONSTANTS AT TEMPERATURE = TEMPA				REAER. AT T=20C	T E M P C	S O D I U M	P H O S P H O R U S	V E L O C I T Y	A V E R A G E	S E R V I C E	R E S P O N S E
	F L O W	O B D	N B D	D O	F L O W	O B D	N B D	O	C B D	C B D	N B D	N B D								
1	.25	2.0	.1	11.00	.00	20.0	.4	5.90	.90	.90	1.80	1.80	20.00	21.00	.00	.300	.210	.42	1756.0	40.00
2	.33	2.0	.1	9.00	.00	.0	.00	.00	.90	.90	1.80	1.80	14.00	17.80	.00	.750	.170	.76	3672.0	33.00
3	.12	2.0	.1	9.00	.00	.0	.00	.00	.90	.90	1.80	1.80	19.00	17.00	.00	.830	.510	.43	4472.0	40.00
4	.78	2.0	.1	9.00	.00	.0	.00	.00	.90	.90	1.80	1.80	10.00	16.80	.00	.180	.390	1.14	6970.0	20.00
5	.21	2.0	.1	9.00	.00	.0	.00	.00	.90	.90	1.80	1.80	9.60	17.30	.00	.780	.390	1.22	8520.0	22.00
6	2.24	2.0	.1	9.00	.00	.0	.00	.00	.90	.90	1.80	1.80	5.90	15.00	.00	.330	.390	2.10	13790.0	22.00
7	.39	2.0	.1	9.00	.00	.0	.00	.00	.90	.90	1.80	1.80	8.20	14.90	.00	.410	.390	.98	18850.0	21.00

RUN COMPLETE, SEGMENTS FINISHED  
ROOT MEAN SQUARE ERROR = .45



WATER QUALITY EVALUATION  
 SEGMENTED STREAM ANALYSIS OF RIDGEWAY VER  
 FOR DISSOLVED OXYGEN

APPENDIX III  
 VERIFICATION MODEL

NUMBER OF SEGMENTS = 7  
 NUMBER OF DAYS = 3 STARTING TIME FIRST DAY (HR.MIN) 18.000  
 VALUE FOR STARTING DISTANCE OF ANALYSIS = .000  
 DISTANCE OF EACH PRINTING INTERVAL = 400.000  
 REFERENCE TEMPERATURE (TEMPA) = 18.000

S E G M E N T	ADDITIONAL STREAM INPUTS FOR EACH SEGMENT				ADDITIONAL WASTE INPUTS FOR EACH SEGMENT				ROD RATE CONSTANTS AT TEMPERATURE = TEMPA				REAER. AT T=20C	T E M P	S O D I U M	P H O S P H O R U S	V E L O C I T Y	A V E R A G E D E P T H	S E R V I C E T E M P E R A T U R E	R E S P I R A T I O N
	F L O W	C O N C N	N O D E	D I S T	F L O W	C O N C N	N O D E	D I S T	C O N C N	C O N C N	N O D E	N O D E								
1	.25	.0	.2	9.00	.07	.0	1.0	7.00	.90	.90	1.80	1.80	21.30	20.00	.00	.300	.280	.57	1756.0	30.00
2	.10	.0	.0	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	12.50	19.00	.00	.750	.210	1.00	3672.0	30.00
3	.52	.0	.0	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	10.80	18.70	.00	.830	.280	1.10	4472.0	30.00
4	.11	.0	.0	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	11.70	16.50	.00	.180	.610	.93	6970.0	18.00
5	.95	.0	.0	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	6.40	15.00	.00	.730	.270	2.40	8520.0	20.00
6	.50	.0	.0	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	6.90	14.50	.00	.330	.570	1.70	13790.0	20.00
7	2.25	.0	.0	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	9.30	14.70	.00	.410	.570	.86	18850.0	19.00

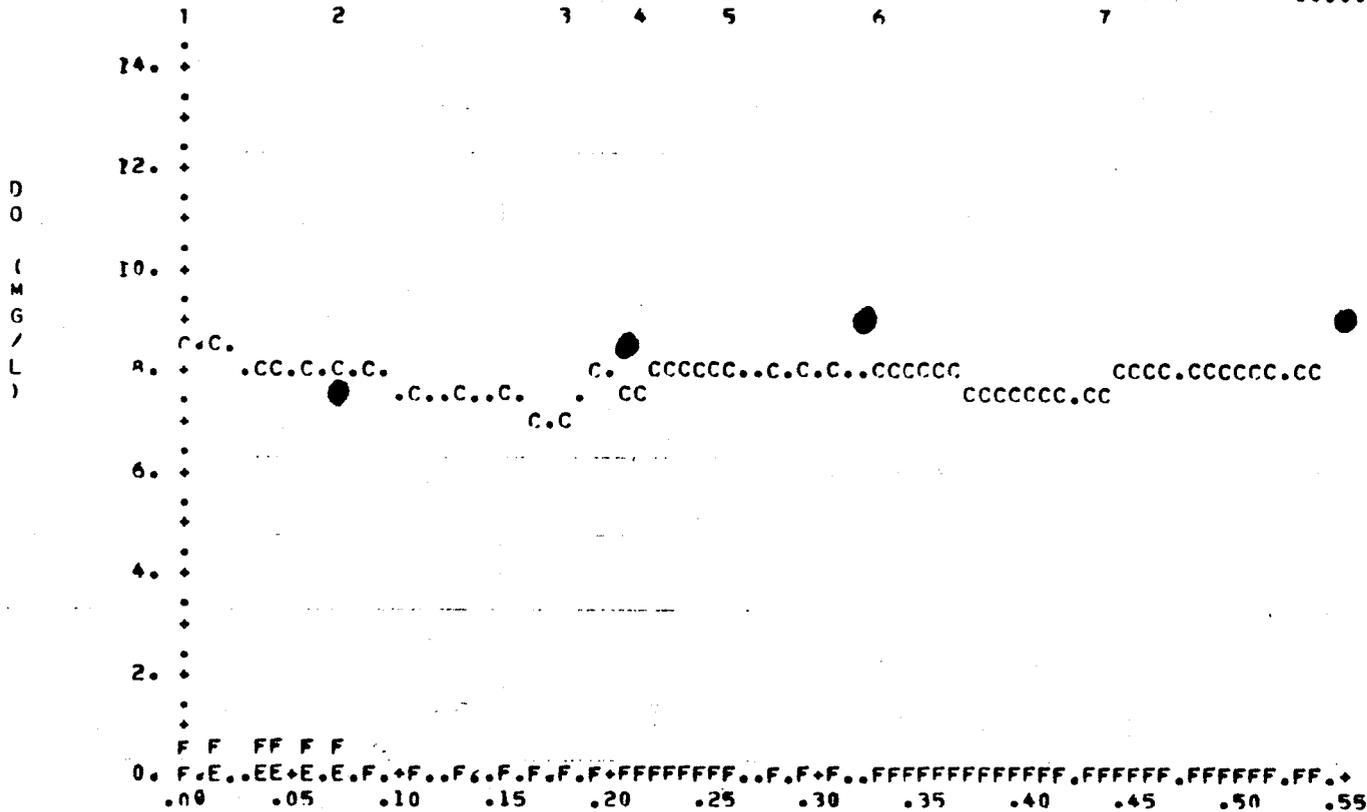
RUN COMPLETE, SEGMENTS FINISHED  
 ROOT MEAN SQUARE ERROR = .72

DO CURVE

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.....
. KEY .
.C =CALCULATED DO .
.● =OBSERVED DO .
.E =CROD .
.F =NR0D .
.....
    
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BEGINNING OF SEGMENT



TT (DAYS)





WATER QUALITY EVALUATION

SEGMENTED STREAM ANALYSIS OF RIDGEWAY VER FOR DISSOLVED OXYGEN

NUMBER OF SEGMENTS = 7.  
 NUMBER OF DAYS = 3 STARTING TIME FIRST DAY (HR.MIN) 6.000  
 VALUE FOR STARTING DISTANCE OF ANALYSIS = .000  
 DISTANCE OF EACH PRINTING INTERVAL = 400.000  
 REFERENCE TEMPERATURE (TEMPA) = 18.000

S E G M E N T	ADDITIONAL STREAM INPUTS FOR EACH SEGMENT				ADDITIONAL WASTE INPUTS FOR EACH SEGMENT				BOD RATE CONSTANTS AT TEMPERATURE = TEMPA				REAER. AT T=20C	T E M P	S O D I U M	P H O S P H O R U S	V E L O C I T Y	A V E R A G E D E P T H	S E R V I C E T E M P E R A T U R E	R E S P O N S E T I M E
	F L O W	C O N C N	N O D E	D I S T	F L O W	C O N C N	N O D E	D I S T	C O N C N	C O N C N	N O D E	N O D E								
1	.25	.0	.2	9.90	.07	.0	1.0	6.80	.90	.90	1.80	1.80	21.30	14.70	.00	.300	.280	.57	1756.0	30.00
2	.10	.0	.0	8.00	.00	.0	.0	.00	.90	.90	1.80	1.80	12.50	15.50	.00	.750	.210	1.00	3672.0	30.00
3	.52	.0	.0	8.00	.00	.0	.0	.00	.90	.90	1.80	1.80	10.80	15.00	.00	.830	.280	1.10	4472.0	30.00
4	.11	.0	.0	8.00	.00	.0	.0	.00	.90	.90	1.80	1.80	11.70	15.00	.00	.180	.610	.93	6970.0	18.00
5	.95	.0	.0	8.00	.00	.0	.0	.00	.90	.90	1.80	1.80	6.40	16.00	.00	.730	.270	2.40	8520.0	20.00
6	.50	.0	.0	8.00	.00	.0	.0	.00	.90	.90	1.80	1.80	6.90	17.90	.00	.330	.570	1.70	13790.0	20.00
7	2.25	.0	.0	8.00	.00	.0	.0	.00	.90	.90	1.80	1.80	9.30	17.90	.00	.410	.570	.86	18850.0	19.00

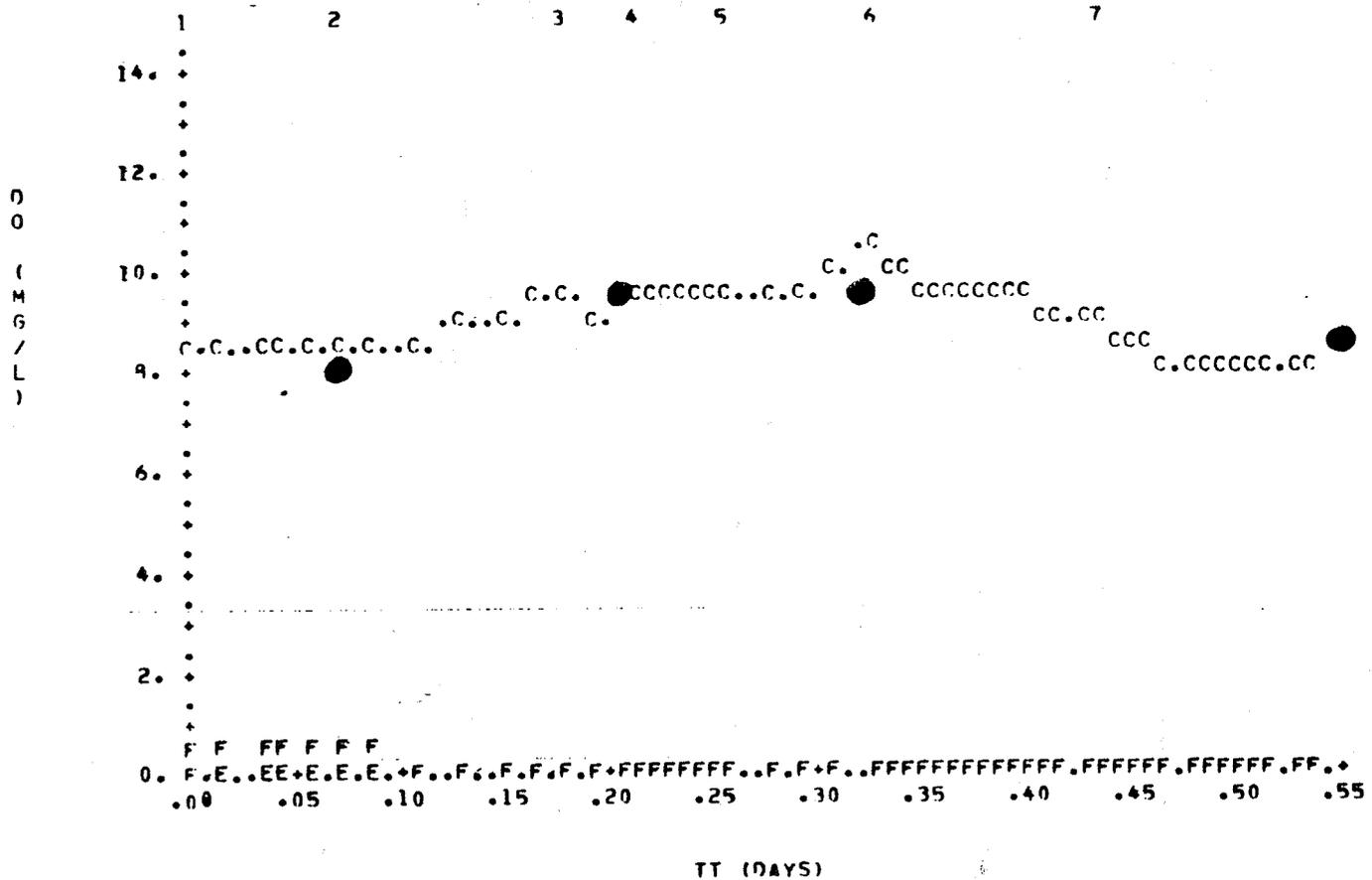
RUN COMPLETE, SEGMENTS FINISHED  
 ROOT MEAN SQUARE ERROR = .53

DO CURVE

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.....
. KEY .
. C = CALCULATED DO .
. ● = OBSERVED DO .
. E = CROD .
. F = NR0D .
.....
    
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BEGINNING OF SEGMENT

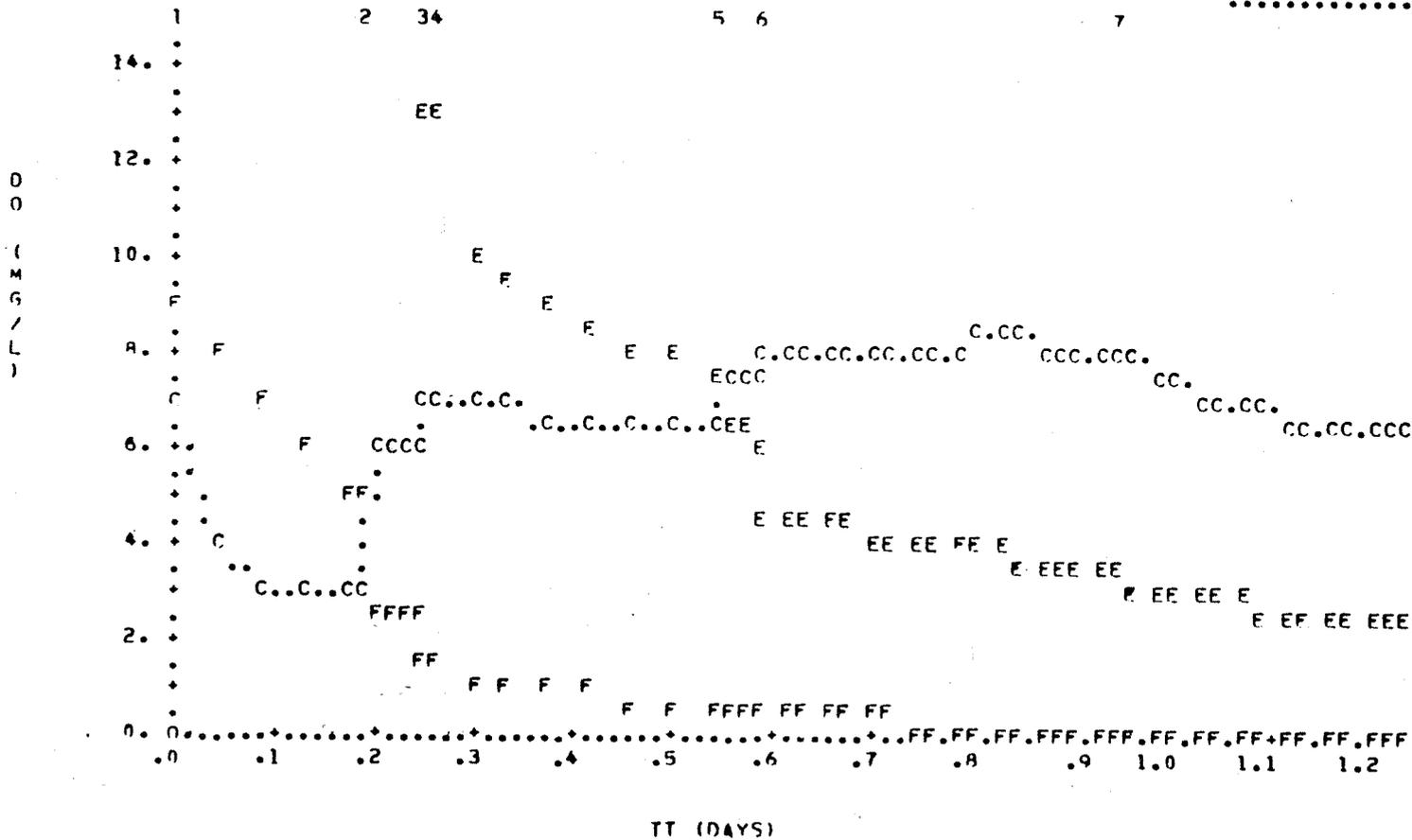


DO CURVE

```

.....
. KEY .
.C =CALCULATED DO .
.O =OBSERVED DO .
.F =CROD .
.F =NBOD .
.....
    
```

BEGINNING OF SEGMENT



WATER QUALITY EVALUATION

SEGMENTED STREAM ANALYSIS OF RIDGEWAY VER  
FOR DISSOLVED OXYGEN

NUMBER OF SEGMENTS = 7

NUMBER OF DAYS = 3 STARTING TIME FIRST DAY (HR.MIN) 12.000

VALUE FOR STARTING DISTANCE OF ANALYSIS = .000

DISTANCE OF EACH PRINTING INTERVAL = 400.000

REFERENCE TEMPERATURE (TEMPA) = 18.000

S E G M E N T	ADDITIONAL STREAM INPUTS FOR EACH SEGMENT				ADDITIONAL WASTE INPUTS FOR EACH SEGMENT				ROD RATE CONSTANTS AT TEMPERATURE = TEMPA				REAER. AT T=20C	T E M P C	S O D I U M	P H O S P H O R U S	V I T A M I N S	A M O N I A	S E D I M E N T	R E S P I R A T I O N
	F L O W	C O N C N	N I T R O G E N	P H O S P H O R U S	F L O W	C O N C N	N I T R O G E N	P H O S P H O R U S	C O N C N	C O N C N	N I T R O G E N	N I T R O G E N	K							
1	.25	.0	.2	11.50	.07	.0	1.0	7.20	.90	.90	1.80	1.80	21.30	16.00	.00	.300	.280	.57	1756.0	30.00
2	.10	.0	.0	8.00	.00	.0	.0	.00	.90	.90	1.80	1.80	12.50	16.00	.00	.750	.210	1.00	3672.0	30.00
3	.52	.0	.0	8.00	.00	.0	.0	.00	.90	.90	1.80	1.80	10.80	16.00	.00	.830	.280	1.10	4472.0	30.00
4	.11	.0	.0	8.00	.00	.0	.0	.00	.90	.90	1.80	1.80	11.70	16.00	.00	.180	.610	.93	6970.0	18.00
5	.95	.0	.0	8.00	.00	.0	.0	.00	.90	.90	1.80	1.80	6.40	16.00	.00	.730	.270	2.40	8520.0	20.00
6	.50	.0	.0	8.00	.00	.0	.0	.00	.90	.90	1.80	1.80	6.90	16.00	.00	.330	.570	1.70	13790.0	20.00
7	2.25	.0	.0	8.00	.00	.0	.0	.00	.90	.90	1.80	1.80	9.30	16.00	.00	.410	.570	.86	18850.0	19.00

RUN COMPLETE. SEGMENTS FINISHED  
ROOT MEAN SQUARE ERROR = 8.25



Appendix IV

Ammonia Toxicity Calculations

Ammonia toxicity is controlled by the un-ionized ammonia concentration. The Department's standard for cold water fish and aquatic life streams is 0.016 mg/l (as  $\text{NH}_3\text{-N}$ ). The portion of ammonia that is in the un-ionized form depends on the stream temperature and pH. The higher the temperature and/or pH, the greater the portion in the un-ionized form.

Stream temperature	= 21°C
Stream pH	= 8.1
Stream background $\text{NH}_3\text{-N}$	= 0.04 mg/l
Ammonia decay rate	= 1.8 days <sup>-1</sup>
Allowable instream $\text{NH}_3\text{-N}$	= 0.31 mg/l
$Q_{7,10}$	= 0.15 cfs
$Q_{stp}$	= 0.068 mgd
Travel time to trout classification	0.211 days

Accounting for decay in the intermediate section, the ammonia limit can be determined from the following equation:

$$N_{stp} = [(Q_{7,10} + 1.55 Q_{stp}) * \text{Allowable } \text{NH}_3\text{-N} - Q_{7,10} * \text{background}] / (1.55 Q_{sto} e^{-Kt})$$

Where:

$N_{stp}$  = effluent ammonia limit (mg/l)  
 $Q_{7,10}$  = 0.15 cfs  
 $Q_{stp}$  = 0.068 mgd  
Allowable  $\text{NH}_3\text{-N}$  = 0.31 mg/l  
Background = 0.04 mg/l  
e = exponential function  
K = ammonia decay rate  
t = travel time to trout classification

which results in an ammonia limit of 1.0 mg/l.

The Department has adopted a technological limit of 2.0 mg/l for ammonia limits. Due to this policy, the ammonia limit is raised to 2 mg/l. The 2 mg/l limit is less than the limit for the intermediate section and therefore is controlling.

STATE OF WISCONSIN - DEPARTMENT OF NATURAL RESOURCES

WATER QUALITY EVALUATION

SEGMENTED STREAM ANALYSIS OF RIDGEWAY PREDICTION  
FOR DISSOLVED OXYGEN

NUMBER OF SEGMENTS = 7  
 NUMBER OF DAYS = 3 STARTING TIME FIRST DAY (HR. MIN) 18.000  
 VALUE FOR STARTING DISTANCE OF ANALYSIS = .000  
 DISTANCE OF EACH PRINTING INTERVAL = 400.000  
 REFERENCE TEMPERATURE (TEMPA) = 18.000

APPENDIX V  
PREDICTION MODEL

S E G M E N T	ADDITIONAL STREAM INPUTS FOR EACH SEGMENT				ADDITIONAL WASTE INPUTS FOR EACH SEGMENT				R0D RATE CONSTANTS AT TEMPERATURE = TEMPA				REAER. AT T=20C	T E M P C	S O D I U M C O N C E N T	P H O S P H O R U S C O N C E N T	V E L O C I T Y	A V E R A G E D E P T H	S E D I M E N T C O N C E N T	D I S S O L V E D O X Y G E N
	F L O W	C O N C E N T	N I T R O G E N	P H O S P H O R U S	F L O W	C O N C E N T	N I T R O G E N	P H O S P H O R U S	C O N C E N T	C O N C E N T	N I T R O G E N	N I T R O G E N								
1	.00	2.0	.1	8.70	.10	48.0	9.0	7.00	.90	.90	1.80	1.80	19.30	24.00	.00	.300	.110	.42	1756.0	40.00
2	.10	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	21.40	21.00	.00	.750	.430	.43	3672.0	33.00
3	.11	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	25.50	20.00	.00	.830	.520	.27	4472.0	40.00
4	.10	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	12.40	20.00	.00	.180	.100	.60	6970.0	20.00
5	.10	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	13.30	19.00	.00	.780	.450	.70	9520.0	22.00
6	.30	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	7.90	18.30	.00	.330	.170	1.07	13790.0	22.00
7	.10	2.0	.1	9.00	.00	.0	.0	.00	.90	.90	1.80	1.80	11.10	22.50	.00	.410	.210	.51	18850.0	21.00

RUN COMPLETE, SEGMENTS FINISHED  
 ROOT MEAN SQUARE ERROR = 7.00

APPENDIX II

Stream Smith-Conley Reach Location Outfall to S. Boundary Sec. 14, T6N, R4E Reach Score/Rating 199

County Iowa Date 10/1/87 Evaluator R. Schlessor Classification Intermediate

Rating Item	Category			
	Excellent	Good	Fair	Poor
Watershed Erosion	No evidence of significant erosion. Stable forest or grass land. Little potential for future erosion. 8	Some erosion evident. No significant "raw" areas. Good land mgmt. practices in area. Low potential for significant erosion. 10	Moderate erosion evident. Erosion from heavy storm events obvious. Some "raw" areas. Potential for significant erosion. 12	Heavy erosion evident. Probable erosion from any run off. 16
Watershed Nonpoint Source	No evidence of significant source. Little potential for future problem. 8	Some potential sources (roads, urban area, farm fields). 10	Moderate sources (small wetlands, tile fields, urban area, intense agriculture). 14	Obvious sources (major wetland drainage, high use urban or industrial area, feed lots, impoundment). 16
Bank Erosion, Failure	No evidence of significant erosion or bank failure. Little potential for future problem. 4	Infrequent, small areas, mostly healed over. Some potential in extreme floods. 8	Moderate frequency and size. Some "raw" spots. Erosion potential during high flow. 12	Many eroded areas. "Raw" areas frequent along straight sections and bends. 20
Bank Vegetative Protection	90% plant density. Diverse trees, shrubs, grass. Plants healthy with apparently good root system. 6	70-90% density. Fewer plant species. A few barren or thin areas. Vegetation appears generally healthy. 9	50-70% density. Dominated by grass, sparse trees and shrubs. Plant types and conditions suggest poorer soil binding. 11	<50% density. Many raw areas. Thin grass, few if any trees and shrubs. 18
Lower Bank Channel Capacity	Ample for present peak flow plus some increase. Peak flow contained. W/D ratio <7. 8	Adequate. Overbank flows rare. W/D ratio 8-15. 10	Barely contains present peaks. Occasional overbank flow. W/D ratio 15-25. 14	Inadequate, overbank flow common. W/D ratio >25. 16
Lower Bank Deposition	Little or no enlargement of channel or point bars. 6	Some new increase in bar formation, mostly from coarse gravel. 9	Moderate deposition of new gravel and coarse sand on old and some new bars. 12	Heavy deposits of fine material, increased bar development. 18
Bottom Scouring and Deposition	Less than 5% of the bottom affected by scouring and deposition. 4	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools. 8	30-50% affected. Deposits and scour at obstructions, constrictions and bends. Some filling of pools. 13	More than 50% of the bottom changing nearly year long. Pools almost absent due to deposition. 20
Bottom Substrate/ Available Cover	Greater than 50% rubble, gravel or other stable habitat. 2	30-50% rubble, gravel or other stable habitat. Adequate habitat. 7	10-30% rubble, gravel or other stable habitat. Habitat availability less than desirable. 13	Less than 10% rubble gravel or other stable habitat. Lack of habitat is obvious. 22
Avg. Depth Riffles and Runs	Cold >1' 0 Warm >1.5' 0	6" to 1' 6 10" to 1.5' 6	3" to 6" 18 6" to 10" 18	<3" 24 <6" 24
Avg. Depth of Pools	Cold >4' 0 Warm >5' 0	3' to 4' 6 4' to 5' 6	2' to 3' 18 3' to 4' 18	<2' 24 <3' 24
Flow, at Rep. Low Flow	Cold >2 cfs 0 Warm >5 cfs 0	1-2 cfs 6 2-5 cfs 6	.5-1 cfs 18 1-2 cfs 18	<.5 cfs 24 <1 cfs 24
Pool/Riffle, Run/Bend Ratio (distance between riffles ÷ stream width)	5-7. Variety of habitat. Deep riffles and pools. 4	7-15. Adequate depth in pools and riffles. Bends provide habitat. 8	15-25. Occasional riffle or bend. Bottom contours provide some habitat. 16	>25. Essentially a straight stream. Generally all flat water or shallow riffle. Poor habitat. 16
Aesthetics	Wilderness characteristics, outstanding natural beauty. Usually wooded or un-pastured corridor. 8	High natural beauty. Trees, historic site. Some development may be visible. 10	Common setting, not offensive. Developed but uncluttered area. 14	Stream does not enhance aesthetics. Condition of stream is offensive. 16
Column Totals:	<u>0</u>	<u>10</u>	<u>117</u>	<u>72</u>

Column Scores E 0 +G 10 +F 117 +P 72 = 199 = Score

<70 = Excellent, 71-129 = Good, 130-200 = Fair, >200 = Poor

Stream Smith-Conley Reach Location S. Boundary Sec. 14, T6N, R4E, Downstream Reach Score/Rating 115

County Iowa Date 10/1/87 Evaluator R. Schlessner Classification Fish & Aquatic

Rating Item	Category			
	Excellent	Good	Fair	Poor
Watershed Erosion	No evidence of significant erosion. Stable forest or grass land. Little potential for future erosion. 8	Some erosion evident. No significant "raw" areas. Good land mgmt. practices in area. Low potential for significant erosion. 10	Moderate erosion evident. Erosion from heavy storm events obvious. Some "raw" areas. Potential for significant erosion. 12	Heavy erosion evident. Probable erosion from any run off. 16
Watershed Nonpoint Source	No evidence of significant source. Little potential for future problem. 8	Some potential sources (roads, urban area, farm fields). 10	Moderate sources (small wetlands, tile fields, urban area, intense agriculture). 12	Obvious sources (major wetland drainage, high use urban or industrial area, feed lots, impoundment). 16
Bank Erosion, Failure	No evidence of significant erosion or bank failure. Little potential for future problem. 4	Infrequent, small areas, mostly healed over. Some potential in extreme floods. 8	Moderate frequency and size. Some "raw" spots. Erosion potential during high flow. 11	Many eroded areas. "Raw" areas frequent along straight sections and bends. 20
Bank Vegetative Protection	90% plant density. Diverse trees, shrubs, grass. Plants healthy with apparently good root system. 6	70-90% density. Fewer plant species. A few barren or thin areas. Vegetation appears generally healthy. 9	50-70% density. Dominated by grass, sparse trees and shrubs. Plant types and conditions suggest poorer soil binding. 11	<50% density. Many raw areas. Thin grass, few if any trees and shrubs. 18
Lower Bank Channel Capacity	Ample for present peak flow plus some increase. Peak flow contained. W/D ratio <7. 8	Adequate. Overbank flows rare. W/D ratio 8-15. 10	Barely contains present peaks. Occasional overbank flow. W/D ratio 15-25. 14	Inadequate, overbank flow common. W/D ratio >25. 16
Lower Bank Deposition	Little or no enlargement of channel or point bars. 6	Some new increase in bar formation, mostly from coarse gravel. 9	Moderate deposition of new gravel and coarse sand on old and some new bars. 15	Heavy deposits of fine material, increased bar development. 18
Bottom Scouring and Deposition	Less than 5% of the bottom affected by scouring and deposition. 4	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools. 8	30-50% affected. Deposits and scour at obstructions, constrictions and bends. Some filling of pools. 10	More than 50% of the bottom changing nearly year long. Pools almost absent due to deposition. 20
Bottom Substrate/ Available Cover	Greater than 50% rubble, gravel or other stable habitat. 2	30-50% rubble, gravel or other stable habitat. Adequate habitat. 7	10-30% rubble, gravel or other stable habitat. Habitat availability less than desirable. 10	Less than 10% rubble gravel or other stable habitat. Lack of habitat is obvious. 22
Avg. Depth Riffles and Runs	Cold >1' 0 Warm >1.5' 0	6" to 1' 6 10" to 1.5' 6	3" to 6" 18 6" to 10" 18	<3" 24 <6" 24
Avg. Depth of Pools	Cold >4' 0 Warm >5' 0	3' to 4' 6 4' to 5' 6	2' to 3' 18 3' to 4' 18	<2' 24 <3' 24
Flow, at Rep. Low Flow	Cold >2 cfs 0 Warm >5 cfs 0	1-2 cfs 6 2-5 cfs 6	.5-1 cfs 18 1-2 cfs 18	<.5 cfs 24 <1 cfs 24
Pool/Riffle, Run/Bend Ratio (distance between riffles ÷ stream width)	5-7. Variety of habitat. Deep riffles and pools. 4	7-15. Adequate depth in pools and riffles. Bends provide habitat. 8	15-25. Occasional riffle or bend. Bottom contours provide some habitat. 16	>25. Essentially a straight stream. Generally all flat water or shallow riffle. Poor habitat. 20
Aesthetics	Wilderness characteristics, outstanding natural beauty. Usually wooded or un-pastured corridor. 8	High natural beauty. Trees, historic site. Some development may be visible. 10	Common setting, not offensive. Developed but uncluttered area. 14	Stream does not enhance aesthetics. Condition of stream is offensive. 16
Column Totals:	<u>4</u>	<u>31</u>	<u>80</u>	<u>0</u>

Column Scores E 4 +G 31 +F 80 +P 0 = 115 = Score

<70 = Excellent, 71-129 = Good, 130-200 = Fair, >200 = Poor

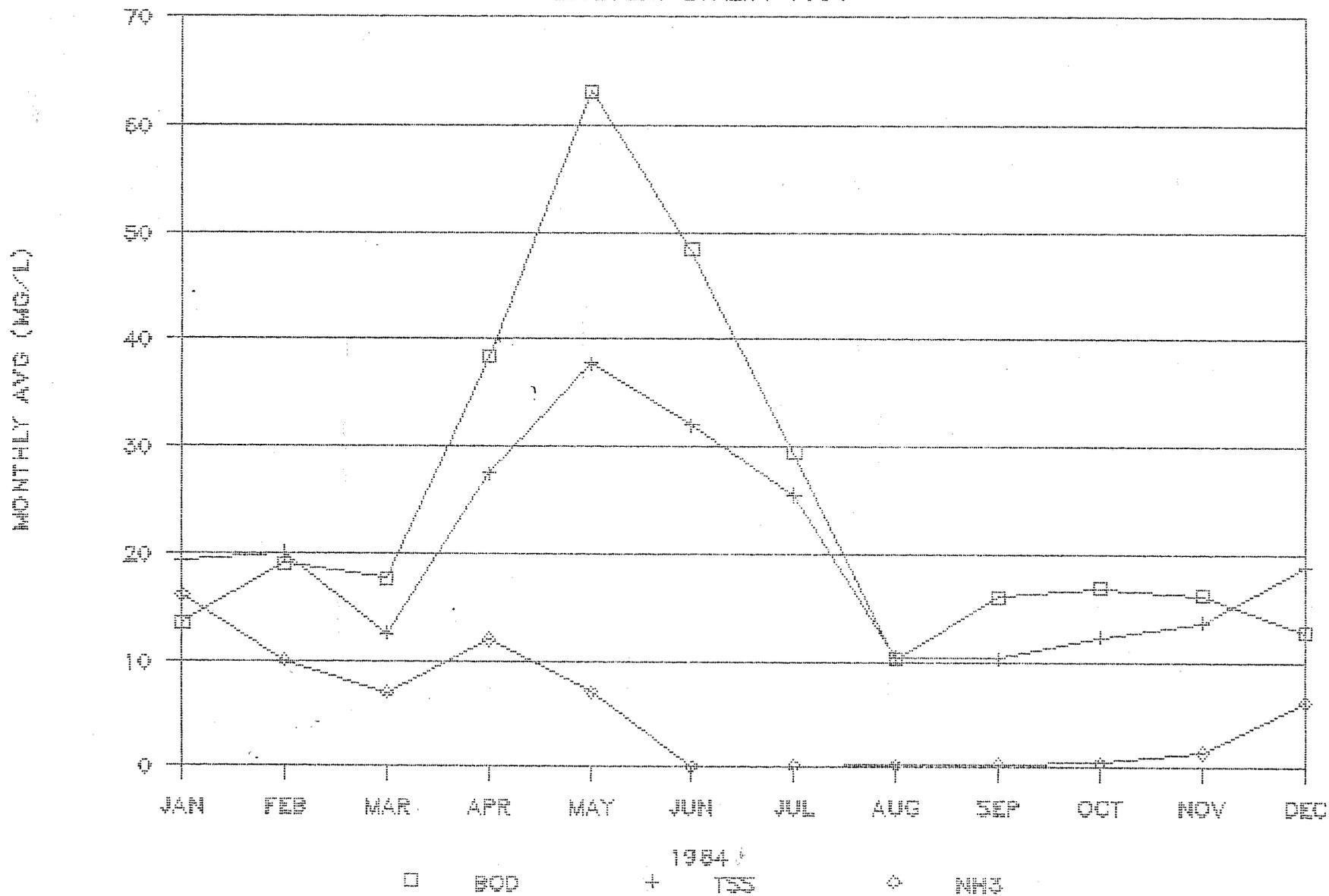
APPENDIX III

RIDGEWAY      SEWAGE      TREATMENT      PLANT  
 EFFLUENT      QUALITY      1984

	FLOW (MGD)	BOD (MG/L)	TSS (MG/L)	NH3-N (MG/L)	pH (MIN)	pH (MAX)
JAN	0.0409	13.50	19.40	16.00		
FEB	0.0609	19.00	20.00	10.00		
MAR	0.0591	17.60	12.50	7.00		
APR	0.0731	38.40	27.50	12.00		
MAY	0.1407	63.20	37.80	7.06		
JUN	0.1347	48.40	32.10	0.06		
JUL	0.1227	29.50	25.50	0.21		
AUG	0.0743	10.20	10.50	0.22		
SEP	0.0632	16.00	10.30	0.40		
OCT	0.0827	16.90	12.30	0.53		
NOV	0.0781	16.20	13.70	1.47		
DEC	0.0597	12.70	18.90	6.30		

# RIDGEWAY WWTP

EFFLUENT QUALITY 1984

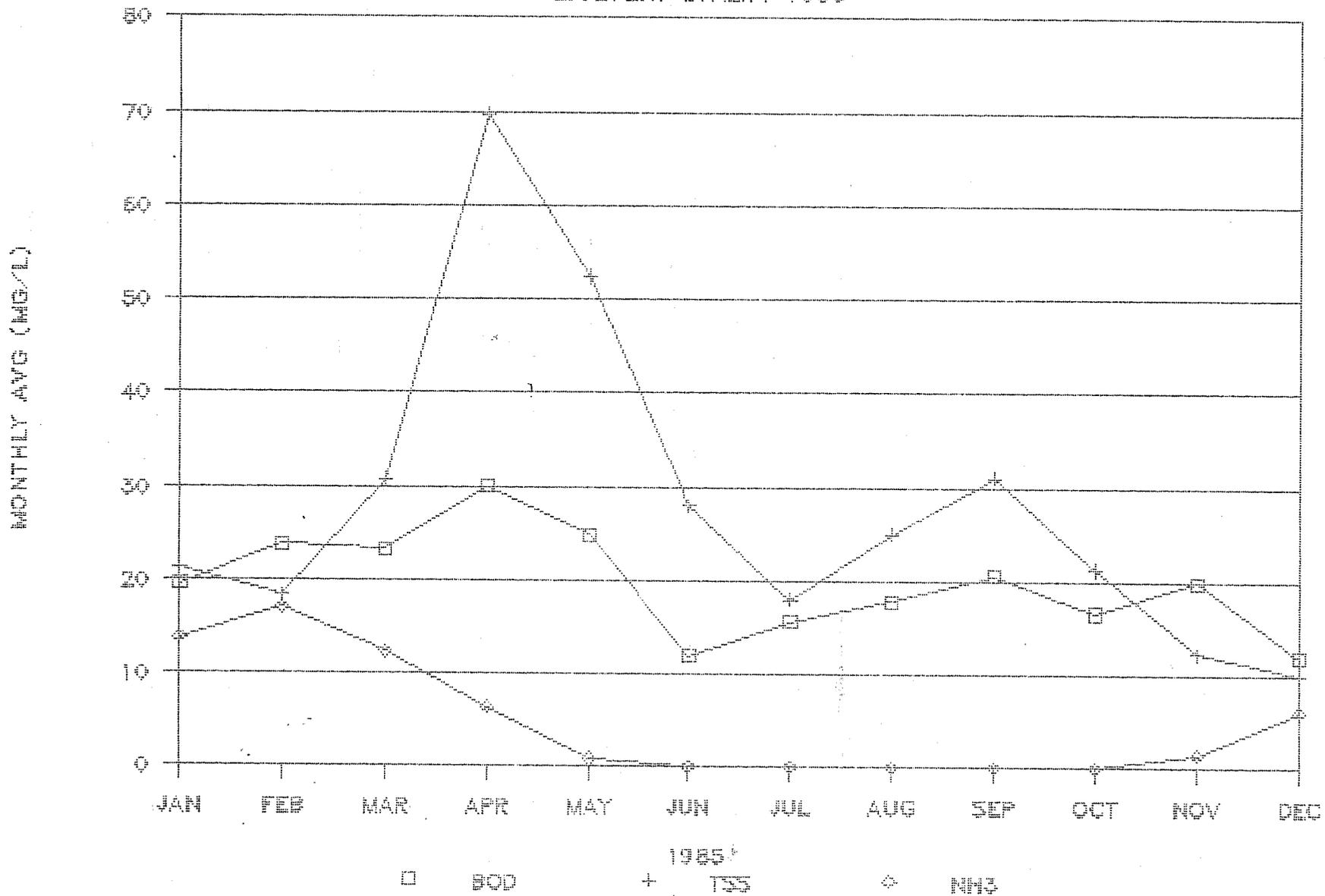


RIDGEWAY SEWAGE TREATMENT PLANT  
EFFLUENT QUALITY 1985

	FLOW (MGD)	BOD (MG/L)	TSS (MG/L)	NH3-N (MG/L)	pH (MIN)	pH (MAX)
JAN	0.0522	19.50	21.20	13.80		
FEB	0.0694	23.80	18.40	17.00		
MAR	0.0740	23.30	30.80	12.30		
APR	0.0724	30.00	69.80	6.50		
MAY	0.0551	24.90	52.40	0.90		
JUN	0.0551	12.00	28.00	0.00		
JUL	0.0574	15.60	18.00	0.02		
AUG	0.0000	17.80	25.10	0.04		
SEP	0.0415	20.60	31.00	0.00		
OCT	0.0459	16.60	21.30	0.00		
NOV	0.0833	19.90	12.30	1.52		
DEC	0.0314	12.00	10.00	6.20		

# RIDGEWAY WWTP

EFFLUENT QUALITY 1985

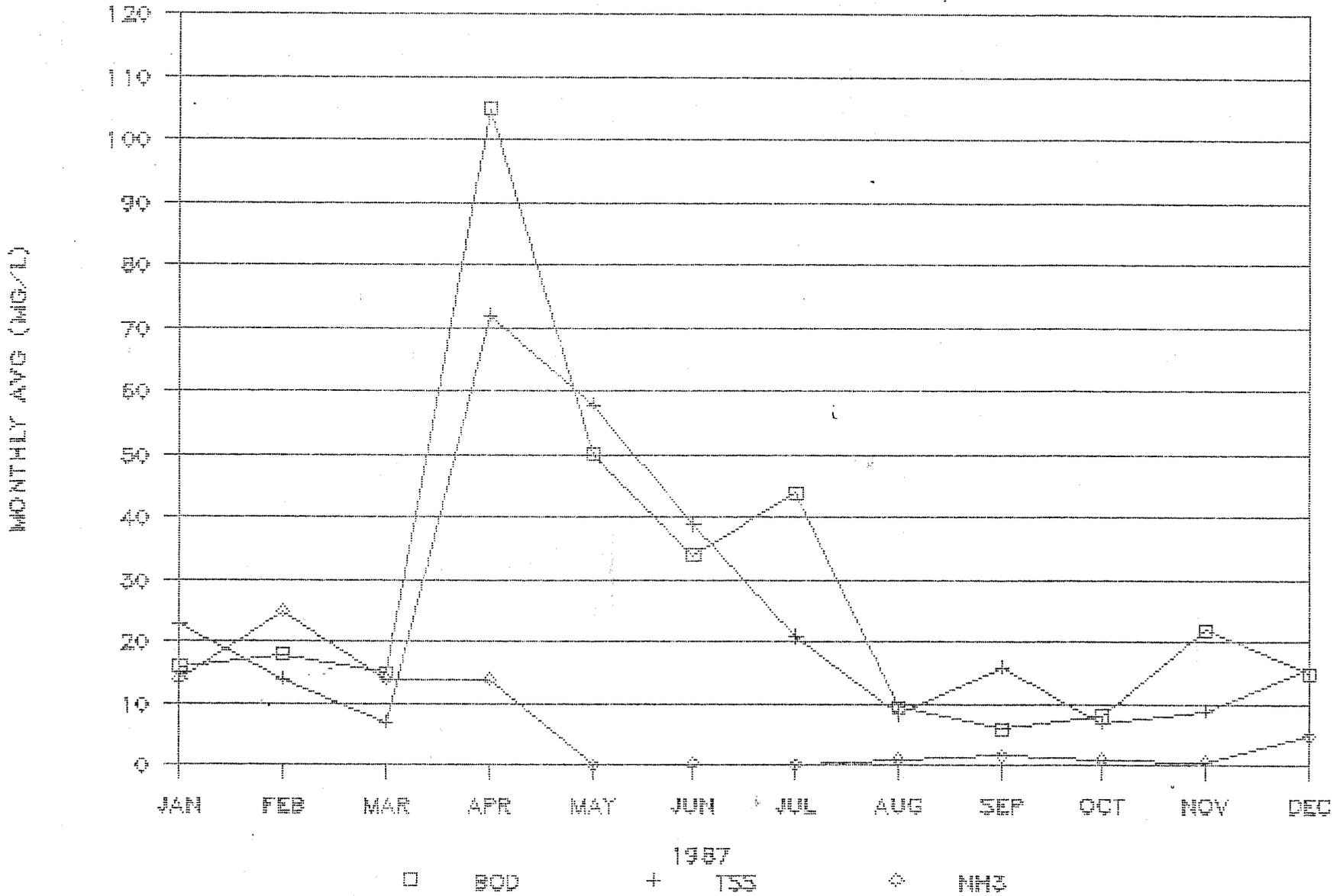


RIDGEWAY SEWAGE TREATMENT PLANT  
EFFLUENT QUALITY 1987

	FLOW (MGD)	BOD (MG/L)	TSS (MG/L)	NH3-N (MG/L)	pH (MIN)	pH (MAX)
JAN	0.0269	16	23	14.00		
FEB	0.0270	18	14	25.00		
MAR	0.0321	15	7	14.00		
APR	0.0350	105	72	14.00		
MAY	0.0433	50	58	0.10		
JUN	0.0287	34	39	0.36		
JUL	0.0378	44	21	0.30		
AUG	0.0467	10	8	1.00		
SEP	0.0329	6	16	1.70		
OCT	0.0286	8	7	1.00		
NOV	0.0389	22	9	0.70		
DEC	0.0450	15	16	4.70		

# RIDGEWAY WWTP

EFFLUENT QUALITY 1987



**APPENDIX IV**

Village of Ridgeway  
Iowa County

October 26, 1976

  
Conley-Smith Creek (Ridgeway Branch)

Surface area = 3.7 acres, Length = 6.1 miles, Gradient = 32.8 feet per mile.

  
Conley-Smith Creek (Ridgeway Branch) the vale of the Galena-Black River cuesta begins as warmwater seepage but shortly after receives most of its water from springs. Generally, it flows in a southeasterly direction and enters the East Branch of the Pecatonica River (Adamsville Branch) as one of its principle tributaries. Although its gradient is not extremely steep, bank erosion is heavy in the lower sections due to flooding. About 88 percent of its watershed is cleared for farming. The sport fishery consists of brook, brown and rainbow trout in the upper sections and smallmouth bass near its mouth. All three species of trout are stocked and brown trout show good natural reproduction. Forage fish species present include common shiners, creek chubs and sculpins. Aquatic game assets include muskrats which are common throughout most of its length and some puddle ducks which utilize the larger sections near the mouth.

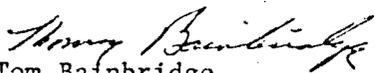
Recommendations

From the Ridgeway lagoon outfall downstream to the south boundary of (SE $\frac{1}{4}$ , SE $\frac{1}{4}$ ) Section 14, T6N, R4E, the classification should be noncontinuous surface waters not supporting a balanced aquatic community. From this point and for the remainder of Conley-Smith Creek the classification should be continuous fish and aquatic life.

The above recommendations represent a concurrence of opinion of the stream classification team who are as follows:

Dennis Iverson, District Engineer  
Gene Van Dyck, Area Fish Manager  
Tom Bainbridge, District Biologist  
Roger Schlessler, Natural Resources Technician

Respectfully submitted,

  
Tom Bainbridge  
Stream Classification Coordinator

TB:cb

**APPENDIX V**

DATE: June 26, 1986

File Ref: 3200

TO: Bob Weber - SD

FROM: Duane Schuettpelz + WR/2

SUBJECT: Revised Effluent Limitations for the Ridgeway WWTP

The Water Resources Management Bureau has completed its review of the effluent limitations for the Ridgeway wastewater treatment facility discharging to the Smith-Conley Creek. The results from this review indicate that advanced treatment with nitrification will be required on an annual basis. The specific effluent limits for a continuous discharge would be:

<u>Parameter</u>	<u>Summer</u>	<u>Winter</u>
BOD/SS (mg/l)	15.0	15.0
NH <sub>3</sub> -N (mg/l)	2.0	4.0
pH	6-8	6-8
D.O.	7.0	7.0
Residual Chlorine ( mg/l)	Dechlorinate	Dechlorinate

These limitations are based on meeting intermediate limits (NR 104) for BOD and SS, and full fish and aquatic life limits (trout) for ammonia, pH, D.O., and residual chlorine. The reason for this combination is to assure that standards are maintained for each particular stream section. These limitations will serve as final limits and should be incorporated into the permit along with a compliance schedule as soon as possible. If you have any questions with these limits, feel free to contact me or Tom Bennwitz at 266-3484.

DHS:tb:bm/S0300386

cc: → Lloyd Eagan - SD  
MWW

APPENDIX VI

B. Interim. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on the effective date of this permit and Tasting until August 31, 1990, the permittee is authorized to discharge from outfall serial number 001.

Samples taken in compliance with the monitoring requirements specified below shall be taken at a representative location.

There shall be no discharge of visible or floating solids in other than trace amounts.

During any 30 consecutive days, the average effluent concentrations of BOD<sub>5</sub> and of total suspended solids shall not exceed 15% of the average influent concentrations, respectively.

EFFLUENT PARAMETERS	EFFLUENT LIMITATIONS					MONITORING REQUIREMENTS	
	Quantity-kg/day(lbs/day)		Other Limitations (Specify Units)			Sample Frequency	Sample Type
	Average	Maximum	Minimum	Average	Maximum		
Flow	-	-	-	-	-	Daily	Total Daily
BOD <sub>5</sub> (Monthly)	7.7(17.0) <sup>1</sup>	-	-	30 mg/l	-	1x weekly	Grab
Suspended Solids (Monthly)	15.4(34.0) <sup>1</sup>	-	-	30 mg/l	-	1x weekly	Grab
pH (Daily)	-	-	6.0 s.u.	-	9.0 s.u.	Daily	Grab
Dissolved Oxygen	-	-	4.0 mg/l	-	-	Daily	Grab
Fecal Coliform	-	-	-	#/100 mg/l	-	Weekly	Grab
Total Residual Chlorine	-	-	-	-	0.5 mg/l	Daily	Grab
Ammonia Nitrogen	-	-	-	mg/l	-	1x Weekly	Grab

<sup>1</sup>Based on a design flow of 0.068 MGD.

C. Final. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: SMITH-COWLEY CREEK

During the period beginning on August 31, 1990 and lasting until September 30, 1990, the permittee is authorized to discharge from outfall serial number 001.

Samples taken in compliance with the monitoring requirements specified below shall be taken at a representative location.

There shall be no discharge of visible or floating solids in other than trace amounts.

During any 30 consecutive days, the average effluent concentrations of BOD<sub>5</sub> and of total suspended solids shall not exceed 15% of the average influent concentrations, respectively.

EFFLUENT PARAMETERS	EFFLUENT LIMITATIONS					MONITORING REQUIREMENTS	
	Quantity-kg/day(lbs/day)		Other Limitations (Specify Units)			Sample Frequency	Sample Type
	Average	Maximum	Minimum	Average	Maximum		
Flow	-	-	-	-	-	Daily	Total Daily
BOD <sub>5</sub> (Monthly)	3.85(8.51) <sup>1</sup>	-	-	15 mg/l	-	2x Weekly	24 Hour <sup>2</sup> Composite
Suspended Solids (Monthly)	3.85(8.51) <sup>1</sup>	-	-	15 mg/l	-	2x Weekly	24 Hour <sup>2</sup> Composite
pH (Daily)	-	-	6.0 s.u.	-	8.0 s.u.	Daily	Grab
Dissolved Oxygen (Daily)	-	-	7.0 mg/l	-	-	Daily	Grab
Fecal Coliform <sup>3</sup>	-	-	-	#/100 mg/l	-	Weekly	Grab
Total Residual <sup>3</sup> Chlorine	-	-	-	-	0.5 mg/l	Daily	Grab
Ammonia Nitrogen (May - October)	-	0.51(1.13) <sup>1</sup>	-	-	2.0 mg/l	2x Weekly	24 Hour <sup>2</sup> Composite
Ammonia Nitrogen (November - April)	-	1.03(2.27) <sup>1</sup>	-	-	4.0 mg/l	2x Weekly	24 Hour <sup>2</sup> Composite

<sup>1</sup>Based on a design flow of 0.068 MGD.

<sup>2</sup>Samples shall be composited on a flow proportional basis.

<sup>3</sup>At such time as effluent limitations for fecal coliform and residual chlorine are established in the Pecatonica River Basin Plan or by special study, this permit may be modified to incorporate either the final limitations or interim limitations and a compliance schedule to achieve the final limitations. In the interim, continuous disinfection shall be provided.

APPENDIX VII

## Chapter NR 104

INTRASTATE WATERS — USES AND  
DESIGNATED STANDARDS

NR 104.01	General (p. 33)	NR 104.07	Variances and additions applicable in the Lake Michigan district (p. 44)
NR 104.02	Surface water classifications and effluent limitations (p. 34)	NR 104.08	Variances and additions applicable in the north central district (p. 48)
NR 104.03	Classification of surface waters and antidegradation (p. 37)	NR 104.09	Variances and additions applicable in the west central district (p. 49)
NR 104.04	Provision for changes (p. 38)	NR 104.10	Variances and additions applicable in the northwest district (p. 52)
NR 104.05	Variances and additions applicable in the southern district (p. 38)		
NR 104.06	Variances and additions applicable in the southeast district (p. 41)		

Note: Chapter NR 104 as it existed on September 30, 1976 was repealed and a new chapter NR 104 was created effective October 1, 1976.

NR 104.01 General. (1) "It is . . . the goal of the state of Wisconsin that, wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water be achieved by 1983. . . ." s. 147.01(1)(b), Stats. The long-range goal of Wisconsin water quality standards is, therefore, to permit the use of water resources for all lawful purposes. Surface waters which because of natural conditions are not conducive to the establishment and support of the complete hierarchy of aquatic organisms shall not be degraded below present levels, but shall be upgraded as necessary to support assigned uses. Most surface waters within the state of Wisconsin already meet or exceed the goals specified above. However, certain waters of the state may not meet these goals for the following reasons:

- (a) The presence of in-place pollutants,
- (b) Low natural streamflow,
- (c) Natural background conditions, and
- (d) Irretrievable cultural alterations.

(1m) Where it is determined that one or more of these factors may interfere with the attainment of the statutory objectives, a variance from the criteria necessary to achieve those objectives is provided.

(2) Surface waters within the boundaries of the state shall meet the standards for fish and aquatic life and recreational use with the variances and additions listed below in ss. NR 104.05 to 104.10. A system is provided within which small streams and other surface waters which cannot support high quality uses are granted a variance from the high quality criteria.

(3) Effluent limitations specified in this chapter shall be achieved by industrial, private and municipal dischargers by July 1, 1983 unless an earlier date is otherwise provided in a permit issued under s. 147.02, Stats. Municipal dischargers eligible for state or federal grant-in-aid

shall achieve the specified effluent limitations upon completion of construction or modification of facilities approved by the department of natural resources subsequent to adoption of this chapter unless otherwise provided in a permit issued under s. 147.02, Stats.

**History:** Cr. Register, September, 1976, No. 249, eff. 10-1-76; am. (1), Register, December, 1977, No. 264, eff. 1-1-78.

**NR 104.02 Surface water classifications and effluent limitations.** (1) **HYDROLOGIC CLASSIFICATION.** "Surface waters" as defined in s. NR 102.01(7), may be classified according to their hydraulic or hydrologic characteristics. For purposes of this chapter, surface waters will be classified by the department into one of the following categories:

(a) *Lakes or flowages.* This classification includes bodies of water whose current is more or less stagnant or which lacks a unidirectional current.

(b) *Diffused surface waters.* This classification includes any water from rains, intermittent springs or melting snow which flows on the land surface, through ravines, etc., which are usually dry except in times of runoff. This category does not include waters at the land surface in the vicinity of agricultural or wastewater irrigation disposal systems.

(c) *Wetlands.* This classification includes areas where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which have soils indicative of wet conditions.

(d) *Wastewater effluent channels.* This classification includes discharge conveyances constructed primarily for the purpose of transporting wastes from a facility to a point of discharge. Drainage ditches (including those established under ch. 88, Stats.) constructed primarily for the purposes of relieving excess waters on agricultural lands shall not be construed as effluent channels. Modifications made to natural watercourses receiving wastewater effluents for the purpose of increasing or enhancing the natural flow characteristics of the stream shall not be classified as effluent channels.

(e) *Noncontinuous streams.* This classification includes watercourses which have a defined stream channel, but have a natural 7-day  $Q_{\cong}$  flow of less than 0.1 cfs and do not exhibit characteristics of being perpetually wet without wastewater discharges.

(f) *Continuous streams.* This classification includes watercourses which have a natural 7-day  $Q_{\cong}$  flow of greater than 0.1 cfs or which exhibit characteristics of a perpetually wet environment, are generally capable of supporting a diverse aquatic biota and flow in a defined stream channel.

**Note:** The application of this classification system is not dependent on the the navigability properties of the watercourse, but is dependent upon the quantity-quality relationships of the surface water.

(2) **WATER QUALITY CLASSIFICATION.** (a) Whenever the goals as specified in s. 147.01(1)(b), Stats., cannot be attained because of conditions enumerated in s. NR 104.01(1), a variance may be provided. Variances from a specific water quality criteria may be given in s. NR 104.05 et. seq. or a variance under one of the categories provided in this chapter may be specified.

Register, October, 1985, No. 358

(b) Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development, or other activities shall be controlled so that waters regardless of their hydrologic and water quality classifications meet the general aesthetic and acute toxicity conditions in s. NR 102.02(1).

(3) VARIANCE CATEGORIES. (a) Surface waters not supporting a balanced aquatic community (intermediate aquatic life):

1. Applicability. This category of variance may be applied to either the continuous or noncontinuous stream hydrologic classification.

2. Surface water criteria. The following water quality criteria shall be met in all surface waters included in this variance category:

a. Dissolved oxygen shall not be less than 3 mg/l.

b. Ammonia nitrogen (as N) at all points in the receiving water shall not be greater than 3 mg/l during warm temperature conditions nor greater than 6 mg/l during cold temperatures to minimize the zone of toxicity and to reduce dissolved oxygen depletion caused by oxidation of the ammonia.

c. The pH shall be within the range of 6.0 to 9.0.

d. Other substances may not exceed concentrations determined in accordance with s. NR 102.02(1).

3. Effluent criteria. a. The effluent limitations determined necessary to meet the surface water criteria listed above are enumerated in table 1.

Parameter	Monthly Average (mg/l)	Daily Maximum (mg/ l)	Weekly Average (mg/l)	Other (mg/l)
BOD <sub>5</sub>	15	30	-	-
Total Suspended Solids	20	30	-	-
NH <sub>3</sub> -N (May-October)	-	-	3	-
NH <sub>3</sub> -N (November-April)	-	-	6	-
Dissolved Oxygen	-	-	-	4 (minimum)

b. Unless otherwise specified in table 1 above, effluent limitations for sewage treatment works shall be as adopted in ch. NR 210.

c. In addition to the effluent limitations enumerated in table 1 above, effluent limitations for these and any other substance necessary to protect assigned uses shall be met.

(b) Marginal surface waters: 1. Applicability. This variance category may be applied to the continuous or noncontinuous stream hydrologic classification, except that it shall be applied to all surface waters classified as effluent channel, wetland or diffuse surface water.

2. Surface water criteria. The following surface water quality criteria shall be met in all surface waters included in this variance category:

a. Dissolved oxygen shall not be less than 1 mg/l.

b. The pH shall be within the range of 6.0 to 9.0.

c. Other substances may not exceed concentrations determined in accordance with s. NR 102.02(1).

3. Effluent criteria. a. The effluent limitations determined necessary to meet the surface water criteria listed above are enumerated in table 2.

Parameter	Monthly Average (mg/1)	Weekly Average (mg/1)	Other (mg/1)
BOD <sub>5</sub>	20	30	-
Total Suspended Solids	20	30	-
Dissolved Oxygen	-	-	4 (minimum)

b. Unless otherwise specified in table 2 above, effluent limitations for sewage treatment works shall be as adopted in ch. NR 210.

c. In addition to the effluent limitations enumerated in table 2 above, effluent limitations for these and any other substance necessary to protect assigned uses shall be met.

(4) OTHER CLASSIFICATIONS AND EFFLUENT CRITERIA. (a) *Surface waters significant to the environmental integrity of the state or region.* Under all hydrologic categories, the department reserves the right to require other effluent limitations, including allocation of wasteloads for organic material, toxicants and chlorine residuals if it is determined that the specified surface water is important to the overall environmental integrity of the area. In waters identified as trout streams, located in scientific areas or wild and scenic areas, providing endangered species habitat or of high recreational potential, effluent criteria will be evaluated on a case-by-case basis.

(b) *Surface waters classified for fish and aquatic life.* 1. Streams. Where flowing streams or rivers are specified to achieve fish and aquatic life criteria, wasteload allocation for organic material, toxicants and chlorine residuals shall determine effluent criteria necessary to achieve that standard.

2. Lakes and flowages. Effluent characteristics for discharges to lakes or flowages shall be based upon an evaluation of water quality necessary to protect fish and aquatic life taking into account mixing zone and nutrient removal criteria.

3. Minimum effluent criteria. If it can be reasonably demonstrated that the quality of the surface water is independent of a wastewater discharge, effluent limitations established under ss. 147.04 and 147.06, Stats., shall apply.

(c) *Wastewater treatment lagoons.* Effluents from fill-and-draw wastewater treatment lagoons or domestic waste stabilization ponds discharging to waters receiving a variance in this chapter may be permitted to vary from the limitations specified in table 1 or 2 provided the following conditions are met:

1. The discharge occurs only during the spring and fall of the year when the flow in the receiving water is normally high, and the temperature is low. The rate of discharge shall not exceed that specified in a permit under s. 147.02, Stats., or where no rate is indicated, the allowable discharge quantities shall be determined by the department based upon current evaluation of the receiving water.

2. In lieu of the previous conditions, the discharge from a fill-and-draw lagoon may occur at any time provided the rate does not exceed the assimilative capacity of the receiving water as specified in a permit under s. 147.02, Stats.

3. The dissolved oxygen in the effluent is maintained at a level greater than or equal to 4 mg/l, and the permitted rate of discharge shall be such that the dissolved oxygen and ammonia nitrogen criteria necessary to sustain fish and aquatic life are maintained in the stream during the period of discharge.

4. The effluent limitations do not exceed those established under ss. 147.04 and 147.06, Stats.

(5) CHANGES IN CLASSIFICATION. Surface waters which exhibit changing hydrologic and quality characteristics shall be classified accordingly. Effluent criteria for upstream discharges shall be based upon the most critical downstream classification and shall be specified by the department either on the basis of justified inference or by the application of a wasteload allocation analysis. Any subsequent changes in a stream's morphology or potential may necessitate the reevaluation of the classification.

History: Cr. Register, September, 1976, No. 249, eff. 10-1-76; am. Tables 1 and 2, (2), (3) (a) 2a and d, (3) (b) 2a and c, (4) (c), Register, December, 1977, No. 264, eff. 1-1-78; am. (3) (a) 2a, Register, June, 1978, No. 270, eff. 7-1-78; am. (1) (c), Register, June, 1984, No. 342, eff. 2-1-84; r. (3) (a) 2. b. to d., (b) 2. b. and c., renum. (3) (a) 2. e. to g. and (3) (b) 2. d. and e. to be (3) (a) 2. b. to d. and (3) (b) 2. b. and c. and am (3) (a) 2. g. and (3) (b) 2. c., am. (3) (a) 3. a. and (3) (b) 3. a., Register, October, 1986, No. 370, eff. 11-1-86.

NR 104.03 Classification of surface waters and antidegradation. In no case shall the effluent criteria specified herein cause degradation of surface water quality below present levels. Surface waters which, be reason of their hydrologic classification, are permitted to receive a new effluent of a quality specified in NR 104.02 shall not receive such effluent unless it has been affirmatively demonstrated to the department that such degradation is necessary to protect the public health or to maintain or restore the environmental integrity of a higher value resource. In no case shall a new effluent interfere with or become injurious to any assigned uses made of or presently possible in any surface water.

History: Cr. Register, September, 1976, No. 249, eff. 10-1-76; am. Register, December, 1977, No. 264, eff. 1-1-78.

NR 104.04 Provision for changes. The surface waters specified in this chapter are not intended to be an exclusive listing nor do the specified effluent criteria purport to meet the 1983 water quality goals set forth in ch. 147, Stats. Additions to or deletions from these listings may be made based upon the accumulation of information necessary to make such determination and in accordance with the requirements of ch. 227, Stats.

History: Cr. Register, September, 1976, No. 249, eff. 10-1-76.

NR 104.05 Variances and additions applicable in the southern district. Subject to the provision of NR 104.04, intrastate surface waters in the southern district counties of Columbia, Dane, Dodge, Grant, Green, Iowa, Jefferson, Lafayette, Richland, Rock and Sauk shall meet the criteria for fish and aquatic life and recreational use with exceptions and additions as follows:

Register, October, 1986, No. 370

(1) ADDITION. The public water supply standard shall be met on the Wisconsin river in section 8, township 10 north, range 7 east.

(2) VARIANCE. Surface waters in the southern district subject to a variance under NR 104.02(3) are listed in table 3.

TABLE 3  
SOUTHERN DISTRICT

Surface Water (Facility Affected)	Reach Description	Hydrologic Classification	Applicable Criteria (1)	Effluent Limitations (2) Effluent limitations to be determined
1. Goose Lake Tributary (Arlington)	Tributary upstream from Goose Lake	Noncontinuous	II	B
2. Tributary - East Branch Pecatonica River (Barneveld)	From the Barneveld STP downstream to the East Branch Pecatonica River	Noncontinuous	II	B
3. Williams Creek (Blue Mounds)	From the Blue Mounds STP downstream to the east line of Sec. 14, T6N, R5E	Noncontinuous	I	A
4. Sanders Creek (Boscobel)	From the Boscobel STP downstream to the Wisconsin River	Continuous	I	A
5. Allen Creek (Brooklyn)	Upstream from Butts Corner Road	Continuous	I	A
6. Kummel Creek (Brownsville)	From Brownsville STP downstream to CTH "HH"	Noncontinuous	I	A
7. Spring Brook and Tributary (Clinton)	Tributary from the Clinton STP to Spring Brook	Effluent ditch	II	B
8. Tributary - Dead Creek (Clyman)	Spring Brook in Clinton Township	Continuous	II	NA
9. West Branch Pecatonica River (Cobb)	Tributary from Clyman STP downstream to Dead Creek	Noncontinuous	II	B
10. Door Creek (Cottage Grove)	From the Cobb STP downstream to confluence with an unnamed tributary NE¼, NW¼, Sec. 2, T5N, R1E.	Continuous	I	A
11. Coon Branch (Cuba City)	Door Creek upstream from STH 12 & 18	Noncontinuous	I	A
	From STH 12 & 18 downstream to Lake Kegonsa	Continuous	I	NA
	Upstream from westerly tributary approximately 1 mile above STH "11"	Noncontinuous	II	B
	Downstream from above tributary to confluence with Galena River	Continuous	I	NA
12. Mud Creek and Tributary (Deerfield)	Tributary from Deerfield STP to confluence with Mud Creek	Effluent ditch	II	B
	Mud Creek from above tributary downstream to confluence with Koshkonong Creek	Continuous	I	

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13. Indian Creek and Tributary (Dickeyville)	Tributary from Dickeyville STP to confluence with Indian Creek Indian Creek from above tributary downstream to confluence with Platte River	Noncontinuous Continuous	II I	NA A
14. Dodge Branch (Dodgeville)	Upstream from a point approximately 3,500 feet downstream from STH "191"	Noncontinuous	I	A
15. Tributary - North Branch Crawfish River (Fall River)	Tributary from the Fall River STP downstream to the North Branch Crawfish River	Noncontinuous	II	Effluent limitations to be determined
16. Gregory Branch (Fennimore)	Upstream from STH "61"	Continuous	I	A
17. Tributary - Rock River (Hidden Meadows Mobile Home Park)	Tributary from the Hidden Meadows Mobile Park STP discharge downstream to the Rock River	Noncontinuous	II	B
18. Big Spring Branch (Highland)	Upstream from the North line of Sec. 19, T7N, R1E	Noncontinuous	I	A
19. Pedler Creek (Iowa Co. Nursing Home)	From the Iowa Co. Nursing Home STP downstream to the confluence with an unnamed tributary, SE¼, SE¼, Sec. 34, T6N, R2E	Noncontinuous	I	A
20. Tributary - Wildcat Creek (Iron Ridge)	From the Iron Ridge STP downstream to Wildcat Creek	Noncontinuous	II	B
21. Tributary & Rock River Tributary (Ixonian San. Dist.)	From the Ixonian San. Dist. STP downstream to the juncture with the Rock River Tributary Rock River Tributary from above tributary to confluence with Rock River	Noncontinuous Continuous	II II	B NA
22. Tributary - Menominee River (Jamestown San. Dist. #2)	From Jamestown San. Dist. #2 STP to the Menominee River	Diffused surface water	II	B
23. Dead Creek (Juneau)	Upstream from CTH "M" From CHT "M" to St. Helena Rd.	Effluent ditch Continuous	II I	B NA
24. Sinnipee Creek (Kieler San. Dist. #1)	From Kieler lagoon outfall to Bluff Road	Continuous	I	A
25. Rock Creek (Lake Mills)	From the Lake Mills STP downstream to CTH "V" From CTH "V" to Harper's Mill Pond	Noncontinuous Continuous	I I	A NA
26. Tributary - Pigeon Creek (Lancaster)	Tributary from Lancaster STP downstream to south line of section 10 Tributary from above point downstream to confluence with Pigeon Creek	Continuous Continuous	II I	Effluent limitations to be determined
27. Tributary - Baker Creek (Lebanon San. Dist.)	From Lebanon STP downstream to Baker Creek	Noncontinuous	II	B
28. Little Platte River (Livingston)	From Livingston STP downstream to New California Road	Noncontinuous	I	A
29. Tributary-East Branch Rock River (Lomira)	Tributary upstream from confluence with East Branch Rock River.	Noncontinuous	I	A
30. (Madison Metro Sewerage Commission)	From the STP outfall aerator to the Oregon Branch	Effluent ditch	II	Effluent limitations to be determined

31. Brewery (Furnance) Creek (Mineral Point)	Brewery Creek upstream from confluence with Mineral Point Branch	Continuous	II	B (Note: the above limitation shall remain in effect until significant nonpoint source problems can be corrected)
32. Tributary - Blue River (Montfort)	From the Montfort STP downstream to the Blue River	Continuous	I	A
33. Little Grant River (Mount Hope)	From the Mt. Hope STP downstream to the west boundary of Sec. 10, T5N, R4W	Noncontinuous	I	A
34. West Branch Sugar River (Mt. Horeb)	From Mt. Horeb STP downstream to CTH "JG".	Continuous	I	A
35. Tributary - Austin Branch (Orchard Manor)	Drainage from Orchard Manor outfall to Austin Branch	Diffused surface waters	II	Effluent limitations to be determined
36. Oregon Branch - Badfish Creek (Oregon)	From the Oregon outfall downstream to juncture with the Madison Met effluent ditch	Noncontinuous	II	Effluent limitations to be determined
	From this point downstream to CTH "A"	Continuous	I	
37. Swan Creek and Tributary (Orfordville)	Tributary from Orfordville STP outfall to Swan Creek.	Effluent ditch	II	NA
	Swan Creek from confluence with above tributary to Dicky Road.	Noncontinuous	I	A
38. Tributary - Blake Fork (Patch Grove)	Tributary from the Patch Grove STP downstream to Blake Fork	Noncontinuous	I	A
39. Tributary - Honey Creek (Plain)	From the Plain STP downstream to Honey Creek	Continuous	I	Effluent limitations to be determined
40. Randolph Branch - Tributary Beaver Creek (Randolph)	From the Randolph STP downstream to Beaver Creek Tributary	Noncontinuous	II	Effluent limitations to be determined
	Tributary to Beaver Creek upstream from Beaver Creek	Noncontinuous	I	A
41. Tributary-Beaver Dam River (Reeseville)	Tributary from Reeseville STP to confluence with Beaver Dam River	Noncontinuous	I	A
42. Conley - Smith Creek (Ridgeway)	From the Ridgeway STP downstream to the south boundary of Sec. 14, T6N, R4E	Noncontinuous	I	Effluent limitations to be determined
43. Tributary - Rocky Run Creek (Rio)	From the Rio STP downstream to Rocky Run Creek	Noncontinuous	II	B
44. Tributary - Narrows Creek (Sauk Co. Health Care Center)	From the Sauk County Health Care Center STP downstream to Narrows Creek	Noncontinuous	I	A
45. Duck Creek and Tributary (Sullivan)	Tributary from the Sullivan STP to Duck Creek	Effluent channel	II	Effluent limitations to be determined
	Duck Creek from the effluent ditch downstream juncture with northerly drainage ditch in Sec. 5, T6N, R16E	Noncontinuous	I	
46. Koshkonong Creek (Sun Prairie)	Koshkonong Creek upstream from first bridge above Sun Prairie STP	Noncontinuous	II	Effluent limitations to be determined
	Koshkonong Creek from above location to CTH "T".	Continuous	I	
47. Badger Mill Creek (Verona)	Badger Mill Creek from road at Verona STP downstream to STH "69".	Continuous	I	A

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48. Tributary - Murphy Creek (Wisconsin Department of Health & Social Services - Oakwood State Camp) Tributary from Oakwood State Camp STP downstream to Murphy Creek Noncontinuous II B

- (1) Criteria I requires the maintenance of surface water criteria specified in NR 104.02(3)(a)2.  
 Criteria II requires the maintenance of surface water criteria specified in NR 104.02(3)(b)2.  
 (2) Effluent limitation A requires those limits specified in NR 104.02(3)(a)3.  
 Effluent limitation B requires those limits specified in NR 104.02(3)(b)3.  
 NA—Not applicable

History: Cr. Register, September, 1976, No. 249, eff. 10-1-76; am. table 3, r. (3), Register, December, 1977, No. 264, eff. 1-1-78.

NR 104.06 Variances and additions applicable in the southeast district. Subject to the provisions of NR 104.04, intrastate surface waters in the southeast district counties of Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington and Waukesha shall meet the criteria for fish and aquatic life and recreational use with exceptions and additions as follows.

(1) VARIANCE. Surface waters in the southeast district subject to a variance under NR 104.02(3) are listed in table 4.

(2) OTHER VARIANCES. (a) The following surface waters in the southeast district shall meet the standards for fish and aquatic life except that the dissolved oxygen shall not be lowered to less than 2 mg/l at any time, nor shall the membrane filter fecal coliform count exceed 1,000 per 100 ml as a monthly geometric mean based on not less than 5 samples per month nor exceed 2,000 per 100 ml in more than 10% of all samples during any month:

1. Underwood creek in Milwaukee and Waukesha counties below Ju-neau boulevard.
2. Barnes creek in Kenosha county.
3. Pike creek, a tributary of Pike river, in Kenosha county.
4. Pike river in Racine county.
5. Indian creek in Milwaukee county.
6. Honey creek in Milwaukee county.
7. Menomonee river in Milwaukee county below the confluence with Honey creek.
8. Kinnickinnic river in Milwaukee county.
9. Lincoln creek in Milwaukee county.

(b) The following surface waters in the southeast district shall meet the standards for fish and aquatic life except that the dissolved oxygen shall not be lowered to less than 2 mg/l at any time, nor shall the membrane filter fecal coliform count exceed 1,000 per 100 ml as a monthly geometric mean based on not less than 5 samples per month nor exceed 89DF at any time at the edge of the mixing zones established by the department under s. NR 102.03 (4):

Village of Ridgeway  
Iowa County

October 26, 1976

Conley-Smith Creek (Ridgeway Branch)

Surface area = 3.7 acres, Length = 6.1 miles, Gradient = 32.8 feet per mile.

Conley-Smith Creek (Ridgeway Branch) the vale of the Galena-Black River cuesta begins as warmwater seepage but shortly after receives most of its water from springs. Generally, it flows in a southeasterly direction and enters the East Branch of the Pecatonica River (Adamsville Branch) as one of its principle tributaries. Although its gradient is not extremely steep, bank erosion is heavy in the lower sections due to flooding. About 88 percent of its watershed is cleared for farming. The sport fishery consists of brook, brown and rainbow trout in the upper sections and smallmouth bass near its mouth. All three species of trout are stocked and brown trout show good natural reproduction. Forage fish species present include common shiners, creek chubs and sculpins. Aquatic game assets include muskrats which are common throughout most of its length and some puddle ducks which utilize the larger sections near the mouth.

Recommendations

From the Ridgeway lagoon outfall downstream to the south boundary of (SE $\frac{1}{4}$ , SE $\frac{1}{4}$ ) Section 14, T6N, R4E, the classification should be noncontinuous surface waters not supporting a balanced aquatic community. From this point and for the remainder of Conley-Smith Creek the classification should be continuous fish and aquatic life.

The above recommendations represent a concurrence of opinion of the stream classification team who are as follows:

Dennis Iverson, District Engineer  
Gene Van Dyck, Area Fish Manager  
Tom Bainbridge, District Biologist  
Roger Schlessler, Natural Resources Technician

Respectfully submitted,

  
Tom Bainbridge  
Stream Classification Coordinator

TB:cb

43°00' 90°00' 256 000m E. MADISON (CAPITOL) 36 MI. S77  
BARNESFIELD 5 MI. 258 R. 4 E. 5730' 259 R. 5 E. 260 3070 III SW  
(BARNESFIELD) 261

PLATTEVILLE (VIA U.S. 151) 37 MI.  
8 MI. TO JUNC. U.S. 18 & 151

4763000m N

4762

4761

5730'

