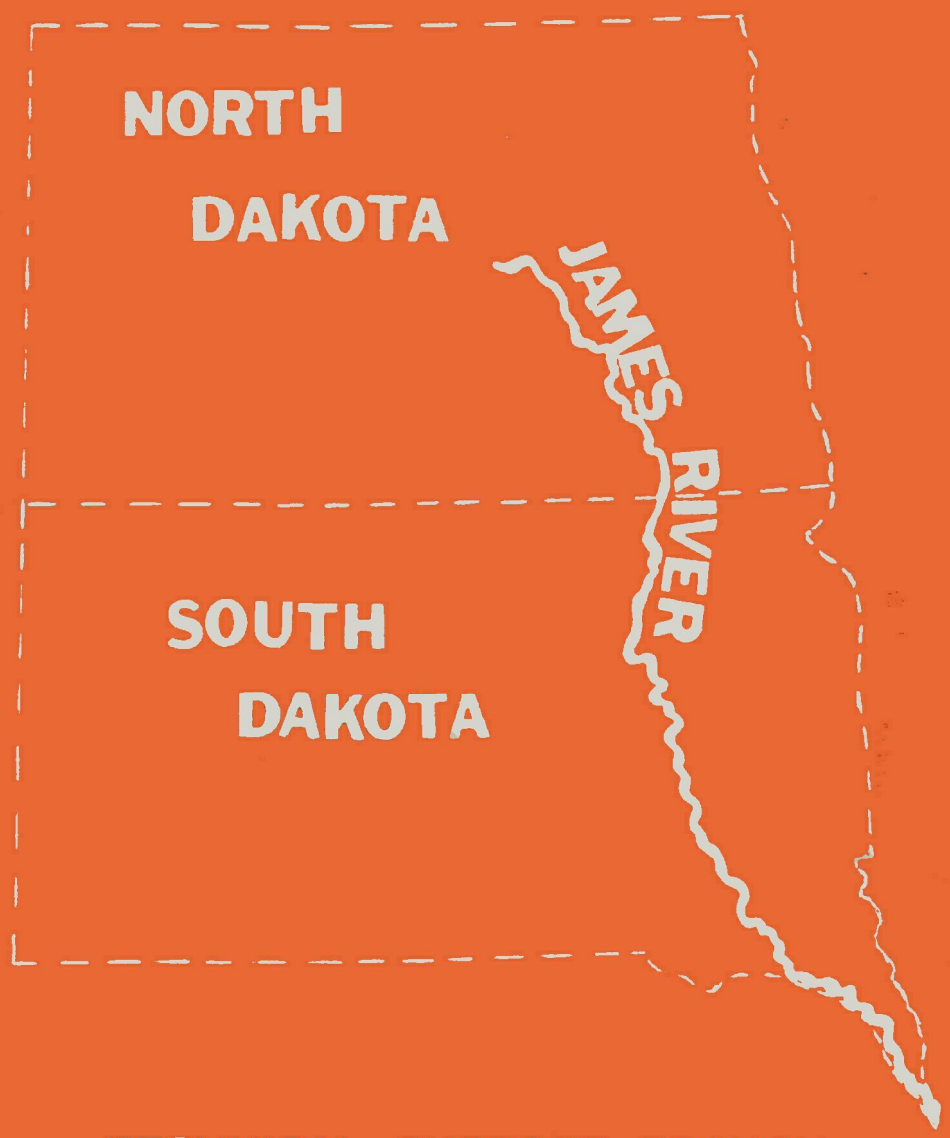
S&A-TSB-10

REPORT ON THE QUALITY OF THE WATER OF THE JAMES RIVER SOUTH DAKOTA 1970



TECHNICAL SUPPORT BRANCH
SURVEILLANCE AND ANALYSIS DIVISION

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION VIII

NOVEMBER, 1972

REPORT ON THE QUALITY OF THE WATER OF THE JAMES RIVER SOUTH DAKOTA

TECHNICAL SUPPORT BRANCH
SURVEILLANCE AND ANALYSIS DIVISION

ENVIRONMENTAL PROTECTION AGENCY
REGION VIII

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INTRODUCTION

At the request of the South Dakota State Department of Health, the Environmental Protection Agency provided assistance in the form of field investigations to determine the pollutional contributions of the Sand Lake Migratory Waterfowl Refuge and to determine the effect of agricultural practices on the water quality of the James River in South Dakota.

The description of river water quality is based on the results of a two-phase field investigation. The first phase involved an intensive two-week stream study during the period April 4-19, 1970 with a delay caused by inclement weather. The second phase of the field work was conducted during the period August 24-31, 1970.

The spring study was initiated to determine the water quality during a spring run-off period and the follow-up summer study was initiated to provide supplemental information during low flow conditions.

This report on the quality of the waters of the James River in South Dakota is based on the results of the spring and summer 1970 field investigations conducted jointly by personnel of the National Field Investigations Center - Cincinnati and the Engineering and Sciences Branch of the Division of Applied Technology, Environmental Protection Agency, Cincinnati, Ohio.

The generous cooperation and active participation provided by the South Dakota Department of Health; the City of Huron, South Dakota for

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mobile laboratory accommodations and storage space; the Southeast Water Laboratory, EPA, and the U.S. Geological Survey for pesticide analysis; the Advanced Waste Treatment Research Laboratory - Cincinnati, for fecal streptococci identification; and other Federal, State, and municipal agencies is appreciated and gratefully acknowledged.

BACKGROUND

The James River has its origin near Fessenden, North Dakota, and meanders in a general southerly direction for about 710 miles through South Dakota to its confluence with the Missouri River east of Yankton, South Dakota. (Figure 1).

The river flow is normally intermittent in the headwater regions and becomes a constantly flowing stream in the vicinity of Huron, South Dakota.

The greatest flow in the James occurs usually in March and April when melting snow affects the flow. Peak discharges are also frequently sustained through May and June by heavy rainfall. Annual low flows occur in late summer, autumn and winter.

Two dams, operated and maintained by the U.S. Fish and Wildlife Service, form the Sand Lake National Wildlife Refuge near the North Dakota-South Dakota State Line. Numerous other dams have been constructed across the James and tributary streams to provide for municipal water supplies, livestock, and recreation.

The remainder of the discussions on the area and the water quality will be confined to the reach of the James River in South Dakota.

The largest municipalities in this predominately agricultural basin are Aberdeen, Huron, and Mitchell, South Dakota. All these communities use surface water as a source of municipal supply.

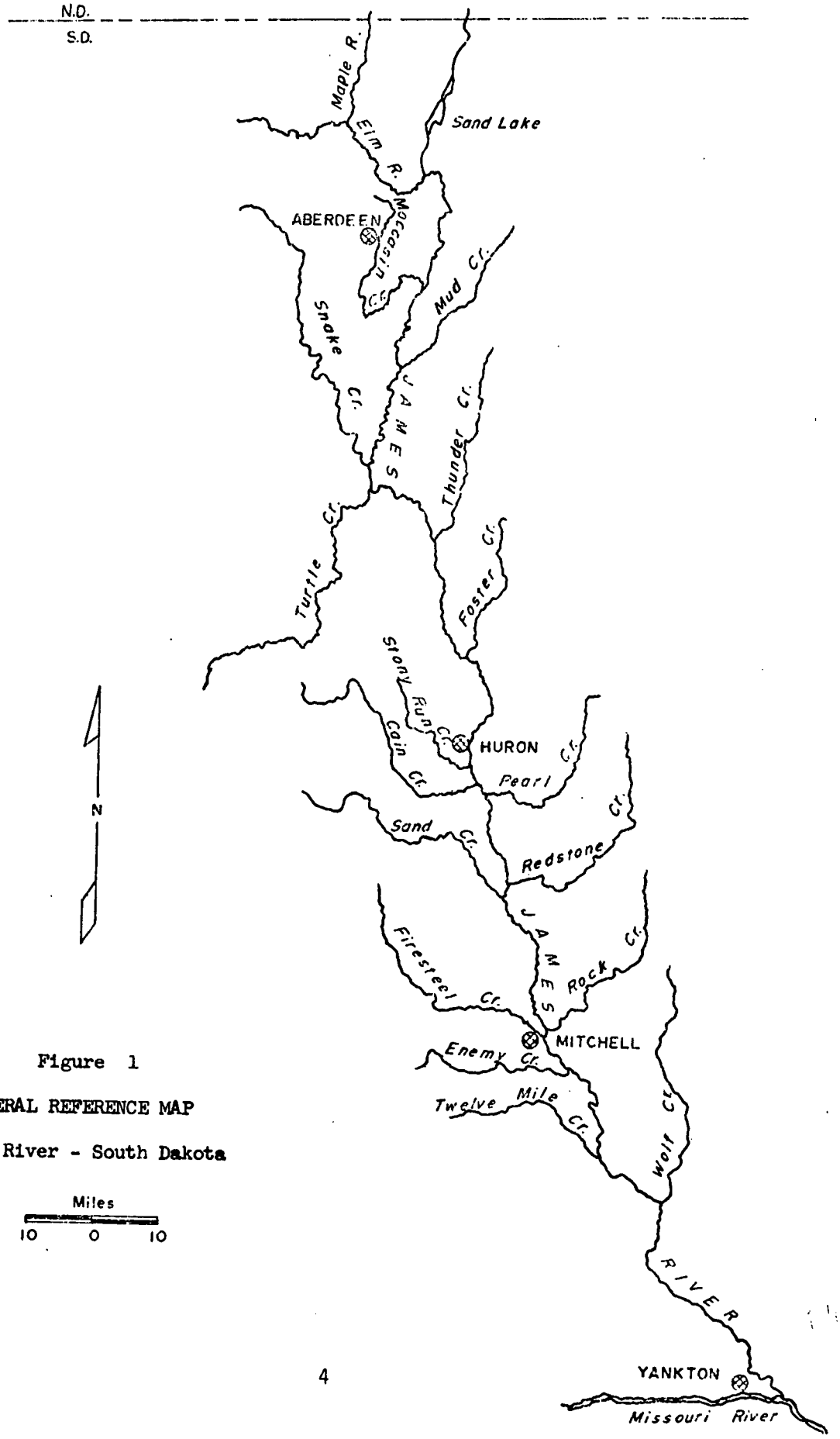

Figure 1

GENERAL REFERENCE MAP

James River - South Dakota

The Elm River, principal tributary to the James in South Dakota, enters at approximately river mile 429. Other tributaries to the James are listed in Table 1.

Table 1

Tributaries to the James River in South Dakota

Tributary Stream	Approximate River Mile
Moccasin Creek	378
Mud Creek	338
Snake Creek	300
Turtle Creek	290
Thunder Creek	248
Foster Creek	248
Cain Creek	214
Pearl Creek	212
Redstone Creek	188
Firesteel Creek	131
Enemy Creek	131
Twelve Mile Creek	97
Wolf Creek	83

SURVEY METHODS

The field effort was divided into two phases for the James River investigation, a spring or run-off study (Phase I), and a summer or low flow study (Phase II).

Phase I was divided into two five-day sampling periods. Period 1 involved sampling the reach of river from Yankton, South Dakota, upstream to Huron, including the intercepted tributaries. Period 2 involved sampling the river and tributaries from Huron upstream to the North Dakota-South Dakota State Line.

The mobile field laboratories were established at the sewage treatment plant pumping station in Huron. The location was about midway between the reaches of the James examined in this study.

All samples collected were "grab" type samples. Stations were sampled at staggered times throughout the day to document any changes that might occur during the day. A detailed map and description of each station sampled during the studies are outlined in the Appendix.

Samplers made field determinations for dissolved oxygen, temperature and pH, and collected water samples required for the laboratories for all other determinations.

The laboratory determinations included the following:

5-day Biochemical Oxygen Demand
Dissolved oxygen
pH
Conductivity
Turbidity
Settleable solids
Suspended solids
Dissolved solids
Total volatile solids
Volatile suspended solids
Volatile dissolved solids
Total solids
Alkalinity
Total coliform
Fecal coliform
Fecal strep

Samples for nutrients (nitrogen and phosphorus) and samples for fecal strep typing were prepared in the field laboratories and shipped to the NFIC laboratory in Cincinnati.

In addition to these determinations, pesticide samples were collected at selected stations to be analyzed by the U.S. Geological

Survey and the Southeast Water Laboratory.

NFIC personnel also made stream discharge measurements at main stem and tributary locations where flow determinations were required.

The Phase II or summer study was essentially identical to the Phase I study with two exceptions. First, the study period was reduced to eight consecutive days, and second, the total number of sampling stations was reduced from 29 to 20.

Unforeseen weather and stream conditions created special problems during both the spring and summer studies.

Sampling during the spring phase commenced upon ice break-up in the reach of the James from Huron downstream to Yankton. Usually ice break-up of the upper reach from Huron to the North Dakota-South Dakota State Line follows downstream break-up. During this study, upstream ice break-up did not occur as expected. Following downstream break-up, cold weather moved into the area causing the river to refreeze. A delay of a week was necessary until ice break-up again occurred. This thaw-freeze-thaw cycle did not provide the conditions for the run-off that was expected, making it difficult to impossible to assess agricultural run-off contributions to water quality. Local rains toward the end of the study did create some localized run-off conditions. Data at these locations reflect the effects of such rains.

The summer study was to supplement the earlier study with water quality information during low flow conditions. Unfortunately, the time

period selected for the study was again not the usual condition. Instead of a low flow regime, a virtually no-flow condition occurred.

The study during this phase consisted primarily of sampling a series of pools. Many of the tributary streams sampled during the spring study were dry during the summer study.

Although the primary objectives of the study, that of determining the contributions of the Sand Lake Migratory Waterfowl Refuge and agricultural practices to the water quality during periods of run-off and low flow, could not be adequately assessed, the water quality data for the weather conditions that did occur can serve as background information for future studies.

RESULTS OF STUDY

The results of all bacteriological, chemical, and physical determinations are tabulated in the Appendix.

DISSOLVED OXYGEN

Municipal and many industrial wastes contain organic matter that, when introduced into a stream, is biochemically degraded and exerts an oxygen demand on the receiving waters. In this process of biochemical degradation of organic matter the dissolved oxygen (DO) derived from the atmosphere and photosynthetic activity is reduced. High concentrations of the oxygen-demanding material can cause excessive

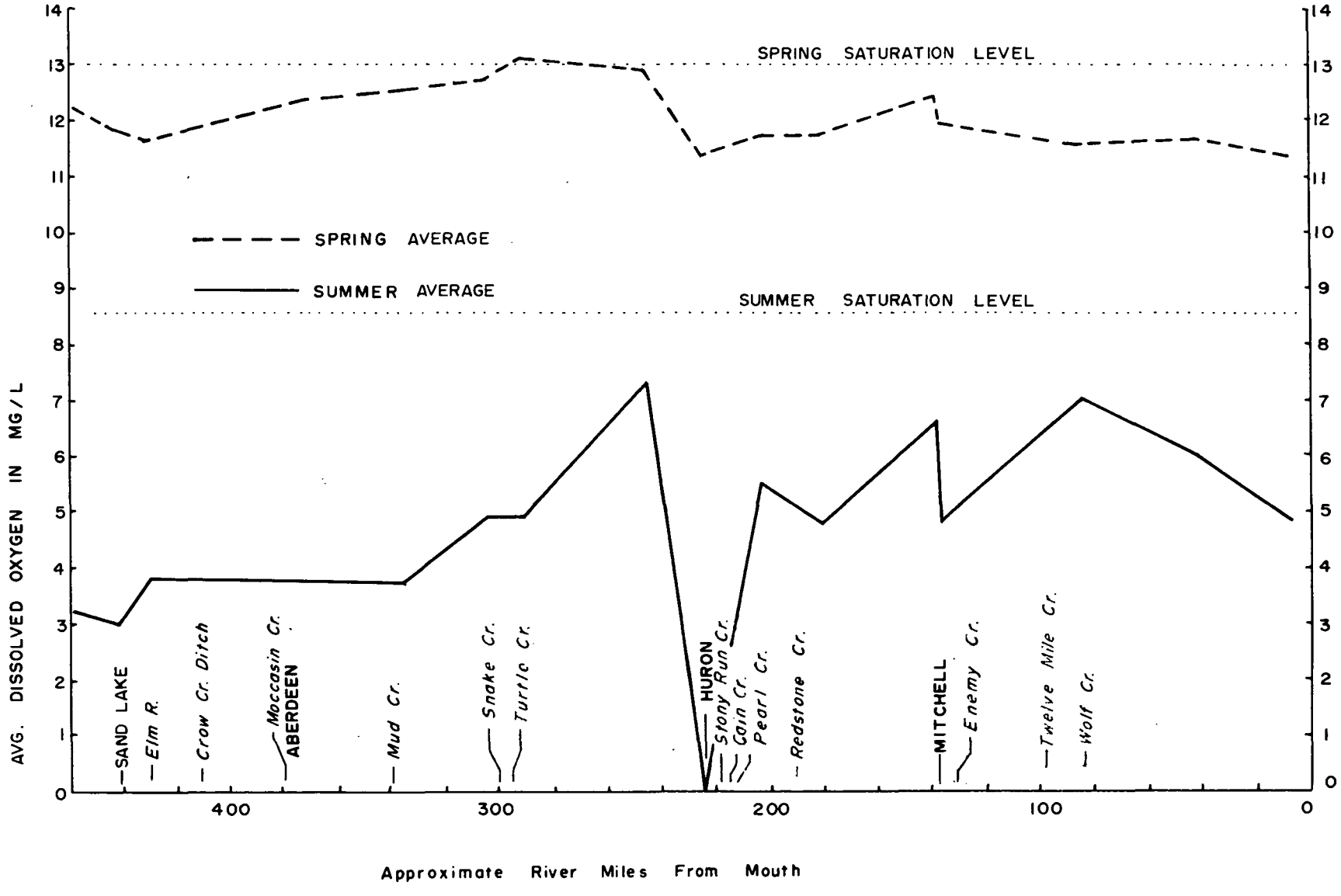

Figure 2

DISSOLVED OXYGEN

James River - South Dakota

dissolved oxygen demand, depleting the oxygen in the receiving waters and, as a result, cause a reduction of desirable aquatic life, including fish. When wastes are of sufficient quantity and strength for the creation of an anaerobic condition, offensive odors result.

In the spring study, after ice break-up, dissolved oxygen concentrations were near saturation levels in the entire South Dakota reach of the James River from Yankton, South Dakota to the North Dakota-South Dakota State Line (Figure 2). Samples taken in the early morning and compared with samples taken after noon showed a definite oxygen build-up during this daylight interval, between four and five hours (Appendix Tables 2-30). These results indicate photosynthetic activity.

In the tributary streams, the dissolved oxygen concentrations averaged near saturation at all sampling locations with one exception. Scattered rains during the spring study caused run-off in isolated areas. The area of Stony Run Creek (Station 23 - River Mile 2) experienced such run-off. Without run-off, the dissolved oxygen concentrations averaged 10.8 mg/l at this location. With run-off, however, organic wastes from feed lot operations entered the stream in such quantities as to reduce the DO level to an average of 1.7 mg/l with a minimum concentration of 0.3 mg/l. This run-off condition did not occur during Period 1, the routine sampling period of the section of the James River that would be affected by this tributary; therefore the effect of this run-off affected tributary on the James was not assessed directly. The James River immediately upstream was sampled however during this run-off period. In reviewing the data at this station the BOD_5 and DO during the run-off period averaged 10.4 mg/l and 11.7 mg/l respectively. Likewise, the BOD_5 and DO during the run-off at the Stony Run station averaged greater than 4320 mg/l and 1.7 mg/l

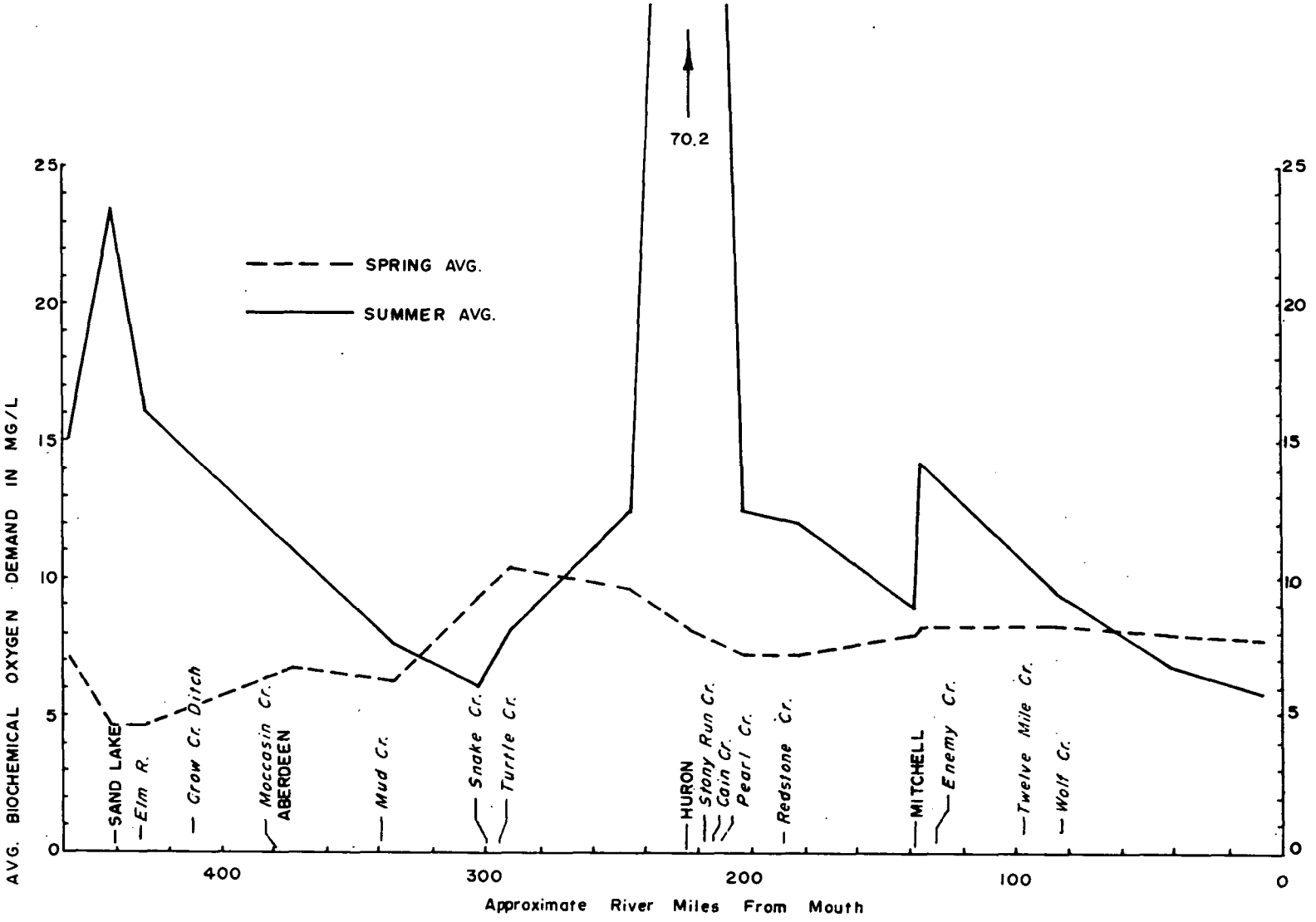

Figure 3

BIOCHEMICAL OXYGEN DEMAND

James River - South Dakota

respectively. It is therefore conceivable that wastes of this concentration would have a significant effect on the James River downstream.

During the low flow conditions of the summer study, the dissolved oxygen concentrations were considerably reduced throughout the entire reach of the river and tributaries in South Dakota. At Huron, the DO level was reduced to zero (Figure 2). Samples taken over the same daylight time interval as in the earlier study also indicated photosynthetic activity, but to a lesser extent (Appendix Tables 2-30).

BIOCHEMICAL OXYGEN DEMAND

The biochemical oxygen demand (BOD) concentrations in the James River during the spring study were fairly uniform over a range of 4.6-10.4 mg/l (Figure 3). The BOD concentrations in the tributaries were also fairly uniform with three exceptions. The BOD in Moccasin Creek and Turtle Creek averaged 10.2 mg/l and 11.0 mg/l, respectively, during the study. Moccasin Creek receives wastes from Aberdeen, South Dakota and Turtle Creek receives wastes from Redfield, South Dakota. The BOD concentration in Stony Run Creek, which normally averaged 2.4 mg/l, increased to an average of greater than 4320 mg/l after rainfall affected the area.

In the summer study, BOD concentrations showed marked increases at several main stem stations. At the sampling stations in the vicinity of the Sand Lake Migratory Waterfowl Refuge, the BOD concentrations increased two to four times those measured in the spring. At Huron, South Dakota, the BOD concentration increased to an average of 70 mg/l with a maximum of 102 mg/l.

The increased BOD levels during both the spring and summer studies were accompanied by correspondingly decreased DO concentrations. As discussed earlier, the DO in the river at Huron was completely depleted. These results indicate effects from organic wastes rather than respiration and decomposition of plankton organisms.

BACTERIAL DATA

During the spring study, geometric mean total coliform densities exceeded 1000/100 ml at several locations along the main stem of the James River (Figure 4). Notable densities occurred at the outlet of the Sand Lake Migratory Waterfowl Refuge, downstream from the confluence with Turtle Creek (which receives wastes from Redfield, South Dakota), downstream from Huron, and downstream from Mitchell. Fecal coliform densities likewise were higher at these locations (Figure 5). At the station on Turtle Creek, prior to the confluence with the James, the mean total coliform density was 12,900/100 ml. At the Stony Run Creek sampling location the mean total coliform density prior to run-off was 2,500/100 ml. After run-off was experienced in the area, a mean total density of 270,000/100 ml occurred. Stony Run Creek enters the James River about six miles downstream from Huron.

Fecal streptococcus determinations were made during the study (Appendix Tables 2-30) and strep typing was performed at selected stations (Table 2). Fecal streptococcus typing determinations indicated that human types predominated at the Sand Lake and Turtle Creek sites. An interesting situation occurred in the Huron area, however. At the lowhead dam in Huron, strep typing indicated an equal predominance of animal and human types. At the Stony Run Creek Station, human types predominated

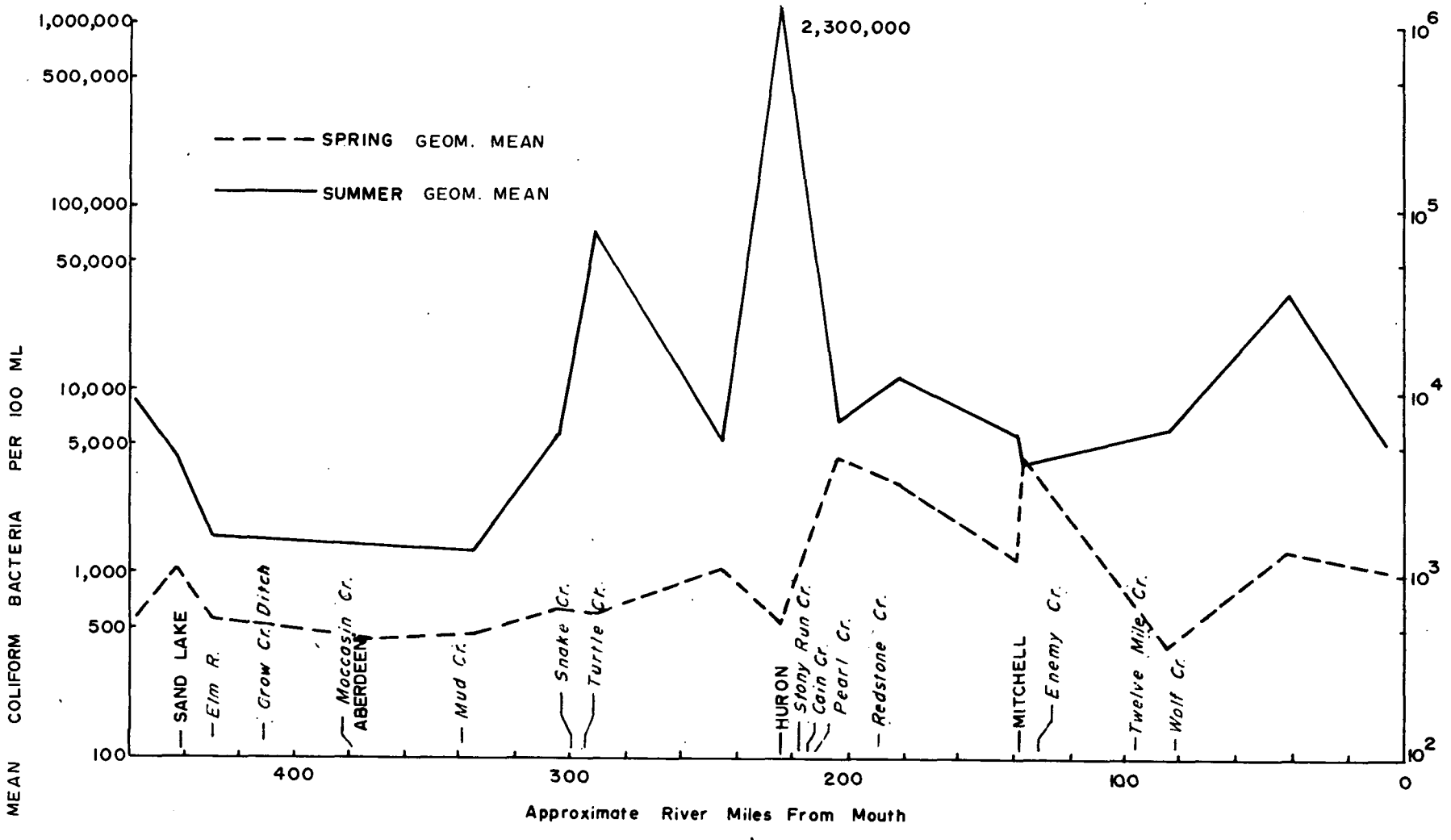

Figure 4

TOTAL COLIFORM BACTERIA

James River - South Dakota

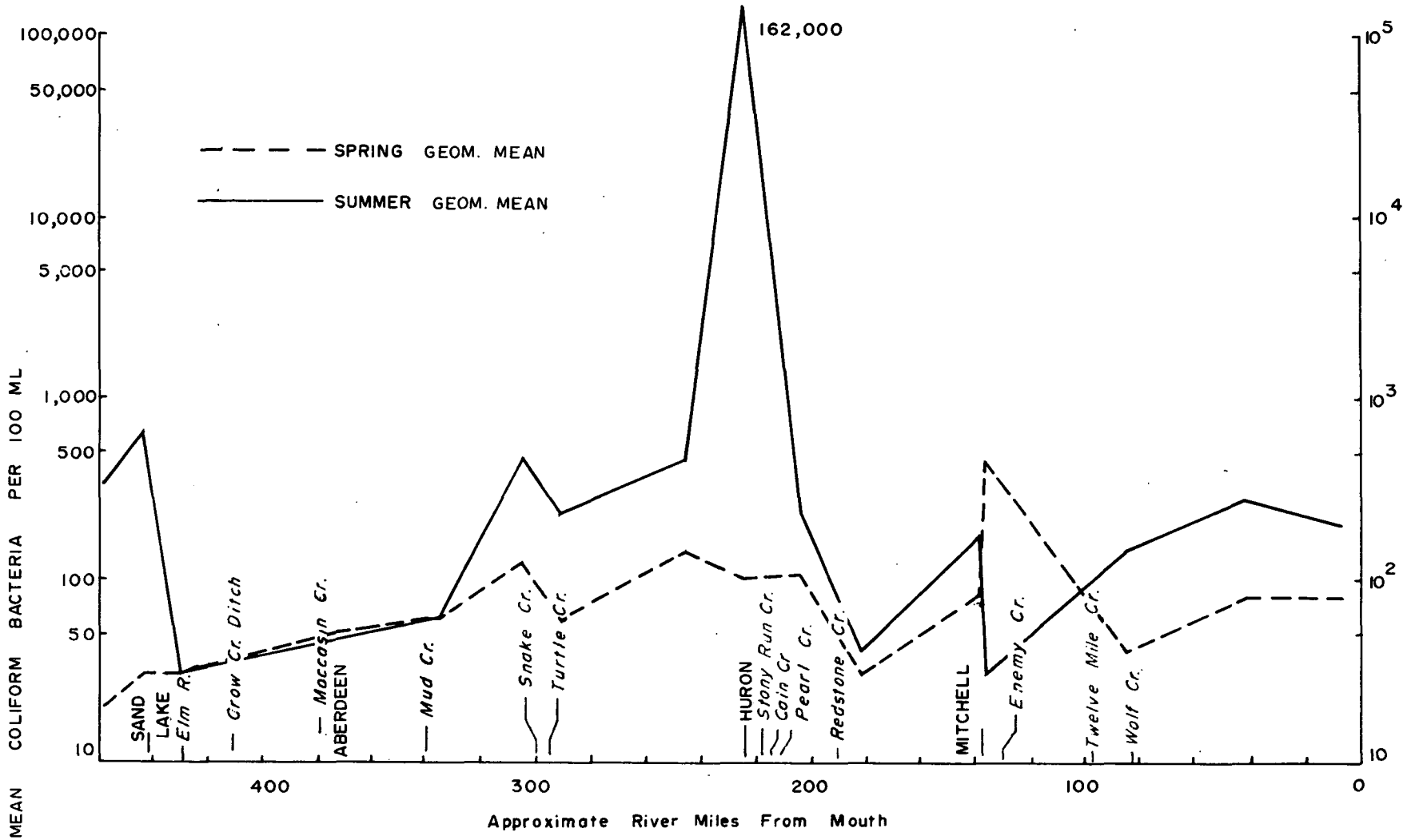

Figure 5

FECAL COLIFORM BACTERIA

James River - South Dakota

Table 2

Identification of Fecal Streptococcus Types

for the James River and Tributaries, State of South Dakota - Month of April 1970

Sampling Station Number	Approx. James River Mile	Location*	Number of strains and percent of total				Tot. No. strains picked	Comment***
			S. fecalis var.**	S. fecalis biotypes	S. bovis-equinus	S. fecalis atypical		
1	6	Northeast of Yankton, South Dakota	15 (60%)	10 (40%)	0	0	25	Human 60% Animal types 40%
7	203	Southeast of Huron, S.D., No. 34 bridge	8 (32%)	17 (68%)	0	0	25	Human 32% Animal types 68%
8	223	Lowhead dam, at Huron, S.D., USGS gaging sta. and water quality sta.	11 (44%)	4 (16%)	7 (28%)	3 (12%)	25	Human 44% Animal types 44% Rotting vegetation types 12%
15	442	Outlet of Columbia Rd. reservoir (Sand Lake Wildlife Refuge) bridge and dam	45 (90%)	0	0	5 (10%)	50	Human 90% Rotting vegetation types 10%
16	459	At N.D.-S.D. State Line bridge on gravel road	25 (100%)	0	0	0	25	Human 100%

(continued)

Table 2 (continued)

Identification of Fecal Streptococcus Types

for the James River and Tributaries, State of South Dakota - Month of April 1970

Sampling Station Number	Approx. James River Mile	Location*	Number of strains and percent of total				Tot. No. strains picked	Comment***
			S. fecalis var.**	S. fecalis biotypes	S. bovis-equinus	S. fecalis atypical		
18	97-0.5	Twelve Mile Creek* bridge on gravel road at Milltown	31 (94%)	1 (3%)	0	1 (3%)	33	Human 94% Animal types 3% Rotting vegetation types 3%
19	131-0.5	Enemy Creek* bridge on gravel road, 11 miles southeast of Mitchell	28 (100%)	0	0	0	28	Human 100%
23	217-2	Stony Run Creek* S.D. 37 bridge, south of Huron	35 (70%)	15 (30%)	0	0	50	Human 70% Animal types 30%
24	296-2	Turtle Creek* bridge on gravel road, one mile northeast of Redfield	25 (100%)	0	0	0	25	Human 100%

(continued)

Table 2 (continued)

Identification of Fecal Streptococcus Types

for the James River and Tributaries, State of South Dakota - Month of April 1970

Sampling Station Number	Approx. James River Mile	Location*	Number of strains and percent of total				Tot. No. strains picked	Comment***
			S. fecalis var.**	S. fecalis biotypes	S. bovis-equinus	S. fecalis atypical		
28	410-0.5	Crow Creek* drainage ditch. County Road bridge one mile east of Tacoma Park	24 (100%)	0	0	0	24	Human 100%

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* In James River unless followed by asterisk

** Low numbers of S.fecalis var. liquefaciens found in all samples, less than percent usually found in human feces.

*** S.fecalis var. are predominately from human sources; S.bovis-equinus and S.fecalis biotypes are predominately from animal fecal sources; and S.fecalis atypical are from rotting vegetation.

70 to 30 per cent. However, in the James River, downstream from both Huron and the confluence with Stony Run Creek, animal types were predominant 68 to 32 per cent.

Summer mean total coliform densities were erratic and generally higher than those observed in the spring study (Figure 4). The most significant increase occurred at the station in Huron where mean total and fecal coliform densities were 2,300,000/100 ml and 162,000/100 ml, respectively (Figures 4 and 5).

HYDROGEN ION CONCENTRATION

The pH for both the spring and summer studies throughout the South Dakota reach of the James River was generally high with values being 8.0 or greater. The values were generally higher in the reach from Huron upstream to the North Dakota-South Dakota State Line (8.5-9.0) as compared to the reach from Huron downstream to Yankton (8.0-8.5). The pH values greater than 7 are also indicative of photosynthetic activity.

No real distinction could be noted between values measured in the spring and those measured in the summer at any given sampling location.

TOTAL SOLIDS

Total solids include dissolved and suspended matter in the water which is normally derived from the strata through which the water passes or the surface over which it flows.

During the spring study, the total solids concentrations in the James River exhibited a gradual increase from around 330 mg/l at the North Dakota-South Dakota border to around 800 mg/l near the mouth at Yankton (Figure 6).

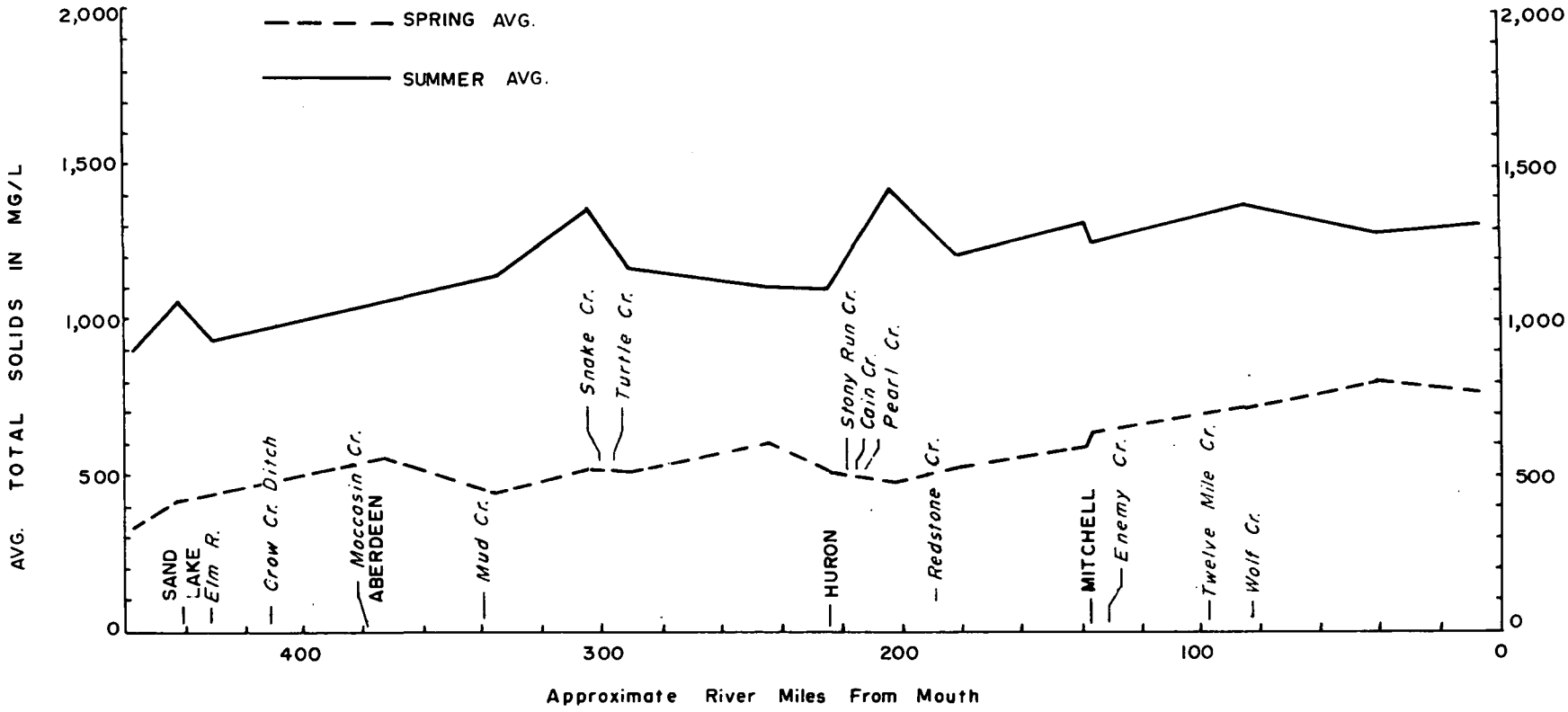

Figure 6

TOTAL SOLIDS

James River - South Dakota

In the summer, the total solids concentrations throughout the river were generally greater than those measured in the spring (more than twice as great at most sampling stations). Peak concentrations were noticeable at three locations along the main stem of the river. These concentrations occurred at the outlet of the Sand Lake Migratory Waterfowl Refuge (1064 mg/l), at River Mile 303 (1391 mg/l), and downstream from Huron (1427 mg/l).

TOTAL PHOSPHORUS

The total phosphorus concentrations in the James River during both the spring and summer studies are shown in Figure 7.

During the spring study, the total phosphorus concentrations increased from an average of around 0.2 mg/l at the North Dakota-South Dakota State Line to an average of around 0.6 mg/l near the mouth at Yankton.

In the summer, the total phosphorus concentrations decreased from an average of 0.4 mg/l at the North Dakota-South Dakota State Line to an average of 0.2 mg/l near Yankton. Significant peaks, however, occurred during this study.

Concentrations of 0.85 mg/l, 1.81 mg/l, and 1.13 mg/l were measured at the outlet of the Sand Lake Migratory Waterfowl Refuge at Huron and downstream from Mitchell, respectively.

NITROGEN (NH_3-N, NO_3-N)

In the spring study, ammonia concentrations in the James River averaged less than 0.4 mg/l. However, several peak concentrations could

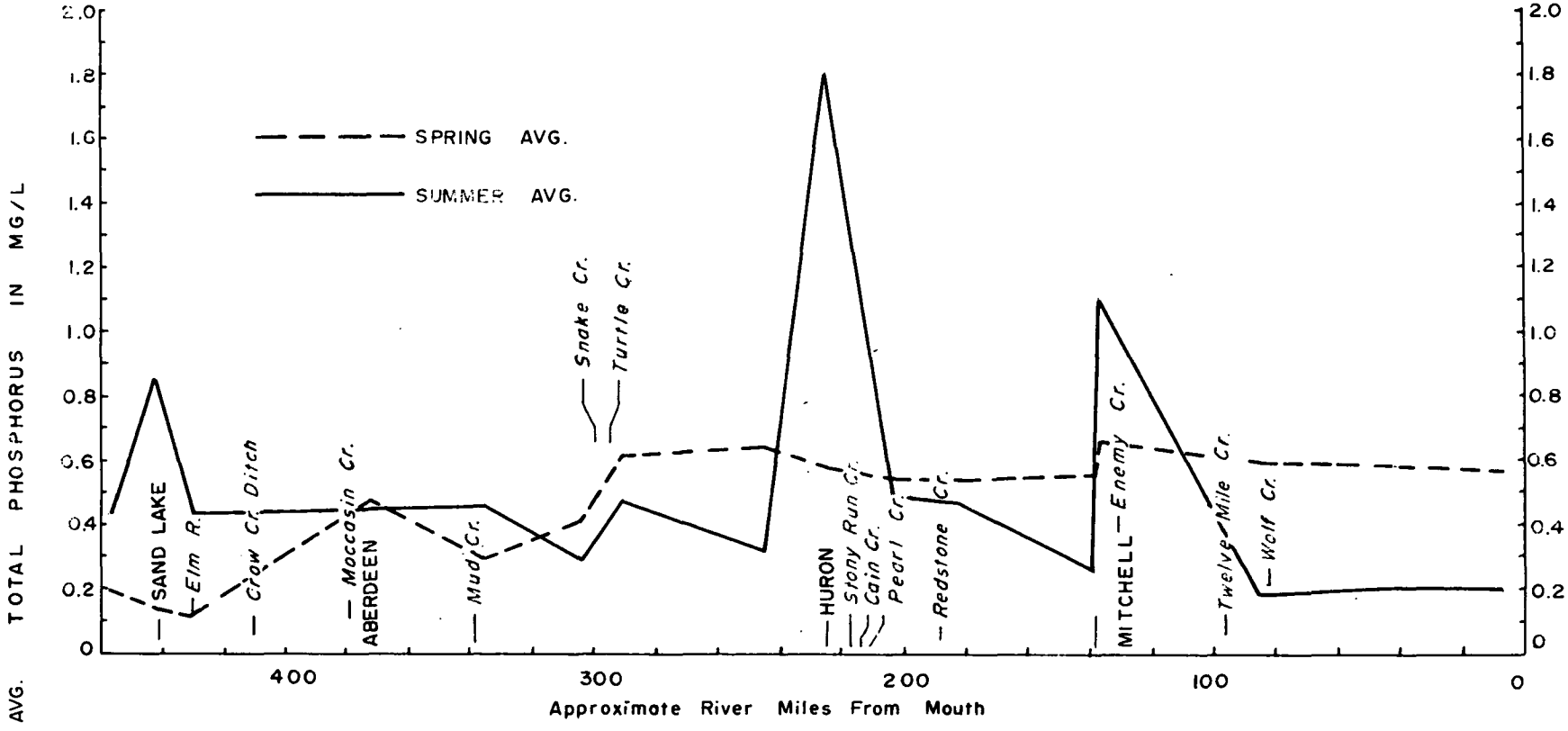

Figure 7

TOTAL PHOSPHORUS

James River - South Dakota

be observed in the data. These occurred downstream from Moccasin Creek which receives wastes from Aberdeen, at Huron, and downstream from Mitchell (Figure 8).

During the summer study, ammonia concentrations were greatly increased, with peak concentrations being measured at the outlet of the Sand Lake Migratory Waterfowl Refuge, at Huron, and downstream from Mitchell.

Nitrate concentrations during the spring study were less than 0.05 mg/l from the North Dakota-South Dakota border downstream to Huron. From Huron downstream to Yankton, the average concentrations ranged from 0.5 mg/l to 0.65 mg/l. During the summer, the nitrate concentrations remained less than 0.05 mg/l throughout the entire South Dakota reach of the river. These conditions are indicative of organic pollution.

TOTAL ALKALINITY

Total alkalinity was measured during both the spring and summer studies (Figure 9).

During the spring study, the total alkalinity was fairly uniform over a range of 150-230 mg/l from Sand Lake downstream to Yankton. One significant peak occurred at River Mile 303. Much smaller increases in concentration occurred downstream from Aberdeen and Mitchell.

Total alkalinity concentrations were generally higher during the summer study than those measured in the spring. Higher values were measured in the reach upstream from Huron to the North Dakota-South Dakota

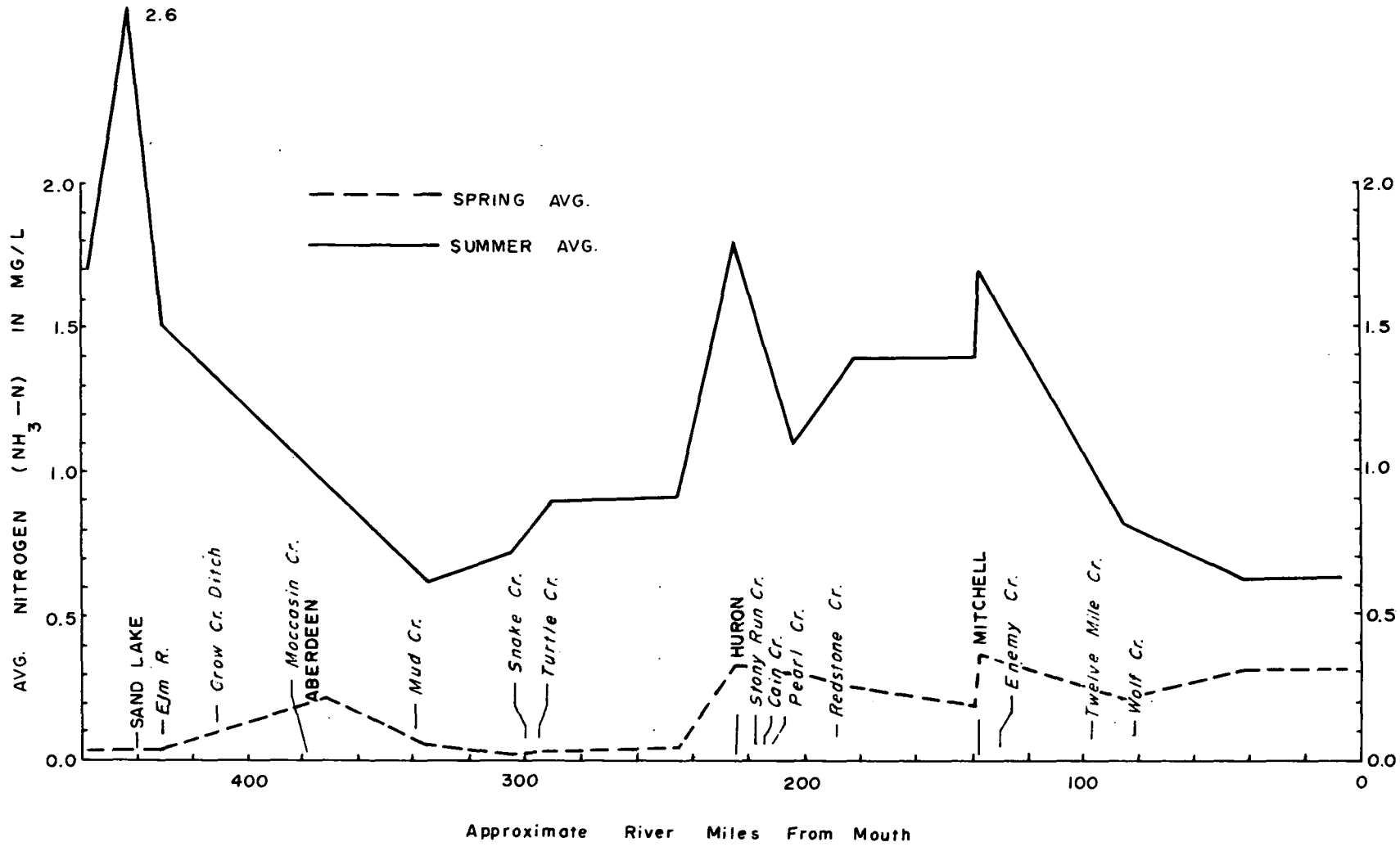

Figure 8

NITROGEN (NH_3-N)

James River - South Dakota

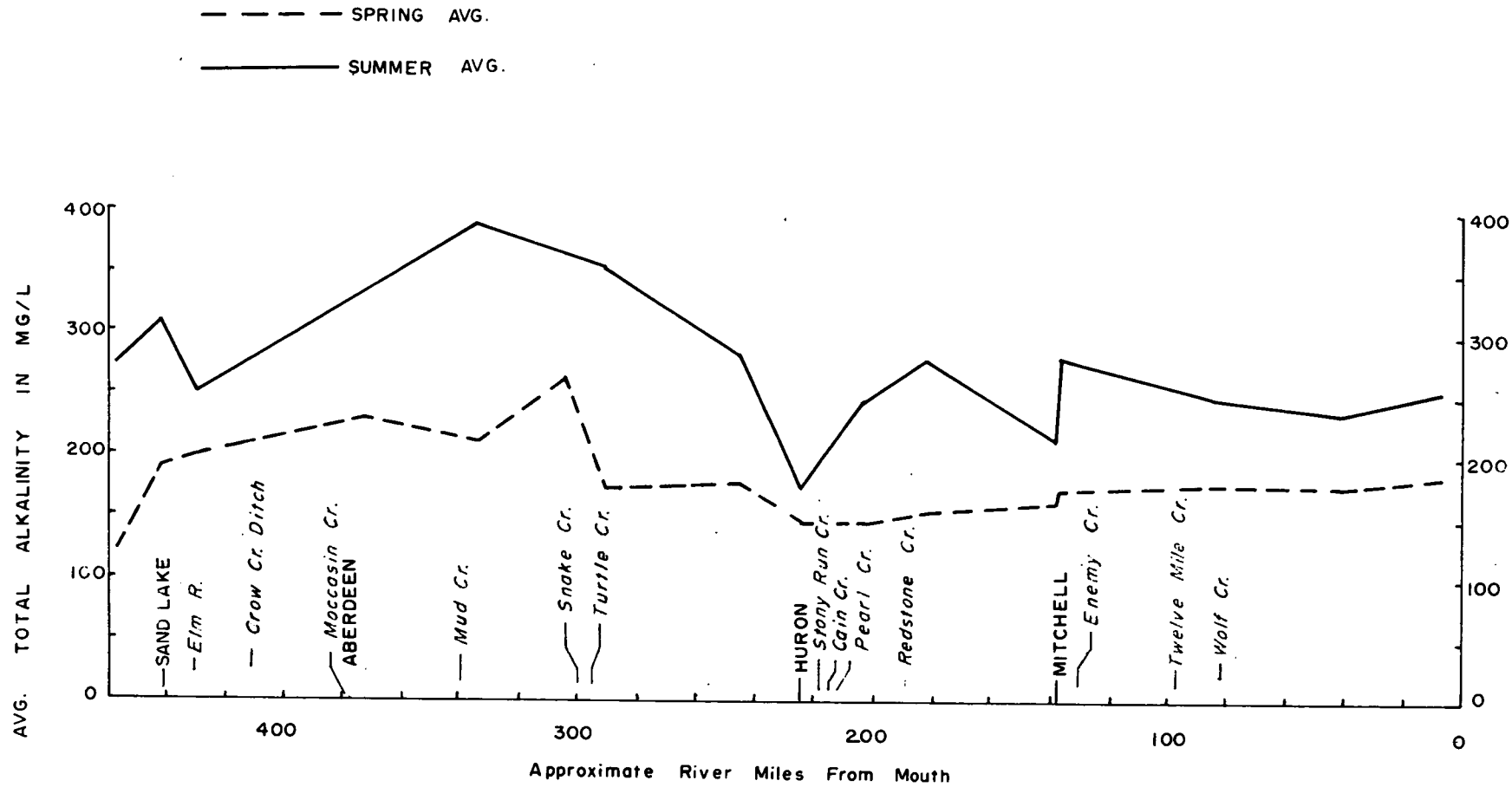

Figure 9

TOTAL ALKALINITY

James River - South Dakota

State Line. Peak concentrations were experienced downstream from Aberdeen, Huron, and Mitchell.

PESTICIDE DATA

During the spring sampling period, samples were collected from selected main stem and tributary stations for pesticide analysis. The results indicated trace concentrations of dieldrin, endrin, DDT, and 2, 4-D (Table 3).

OTHER CHEMICAL FEATURES

The individual results of the remaining chemical and physical analyses appear in outline form by station in Appendix Tables 2-30.

DISCUSSION

Contributions from the Sand Lake Migratory Waterfowl Refuge and agricultural practices to the water quality of the James River in South Dakota could not be adequately assessed, due to the unfavorable stream and weather conditions that prevailed during both the spring and summer study periods.

The data from both studies did indicate, however, some problem areas in the South Dakota reach of the James River System.

The effects of the scattered rainfall that occurred toward the end of the spring study period indicated that a problem condition exists in the Stony Run Creek tributary to the James River near Huron. Run-off

Table 3

Pesticide Analysis

James River - South Dakota

Station*	Dieldrin ppb	Endrin ppb	DDT ppb	2,4-D ppb	Note
1	.02	.04	.04	nd	1
4	nd	nd	nd	.12	2,3
6	nd	nd	nd	.11	2,3
10	.01	nd	nd	.26	2,3
12	.05	.12	.15	nd	1
14	nd	nd	nd	nd	2,3
16	nd	nd	nd	nd	1
17	.02	.04	.04	nd	1
20	nd	nd	nd	nd	1
21	nd	nd	.03	nd	1
22	nd	nd	nd	nd	1
24	nd	nd	nd	nd	1
25	nd	nd	nd	.07	2,3
27	.03	.06	.09	nd	1
29	nd	nd	nd	nd	1

Notes:

1. Analyzed by Southeast Water Laboratory

2. Analyzed by Department of the Interior USGS

3. Screened for parathion, methyl parathion and diazinon, results negative

* Station descriptions in Appendix Table A-1

nd = none detected.

during the study from feed lot operations in the area caused dissolved oxygen concentrations at the Stony Run Creek sampling site to decrease from an average of 10.8 mg/l to 1.7 mg/l. The BOD concentrations correspondingly increased from an average of 24 mg/l to 4326 mg/l. Total and fecal coliform densities also increased. Mean total coliform densities increased from 2500 to 270,000/100 ml and fecal densities increased from < 50 to 202,200/100 ml.

A definite problem existed in the Huron area during the low flow conditions of the summer study. During this study period, stream conditions resulted in complete oxygen depletion; BOD concentrations greater than 70 mg/l; and total and fecal coliform densities greater than 2,300,000 and 162,000/100 ml, respectively.

Further studies under more favorable weather conditions will be necessary to completely assess the impact of Sand Lake and agricultural practices on the water quality of the James River System in South Dakota.

APPENDIX

Table A-1

Reference Point Locations

James River

Station Number	Description	Approximate Mileage from Mouth
	Mouth James River	0
1	North of Yankton, S.D.; old S.D. 50 bridge	6
2	East of Scotland, S.D.	41
	Wolf Creek enters	83
3	East of Parkston, S.D.; S.D. 44 bridge	84
	Twelve Mile Creek enters	97
	Enemy Creek enters	131
4	Southeast of Mitchell, S.D.; I-90 bridge	138
5	Southeast of Mitchell, S.D.; U.S. 16 bridge	139
6	Near Forestburg, S.D.; S.D. 34 bridge	182
	Redstone Creek enters	188
7	Southeast of Huron, S.D.; S.D. 14 bridge	203
	Pearl Creek enters	212
	Cain Creek enters	214
	Stony Run Creek enters	217
8	At Huron, S.D.; low head dam	223
9	At Lake Byron	245
10	Northeast of Redfield, S.D.	292

(continued)

Table A-1 (continued)

Reference Point Locations

James River

Station Number	Description	Approximate Mileage from Mouth
	Turtle Creek enters	296
	Snake Creek enters	300
11	At Ashton, S.D.	303
12	East of Mellette, S.D.; S.D. 20 bridge	336
	Mud Creek enters	338
13	Northwest of Stratford, S.D.	372
	Moccasin Creek enters	378
	Crow Creek drainage ditch enters	410
	Elm River enters	429
14	At Columbia, S.D.	430
15	Outlet - Columbia Rd. Reservoir (Sand Lake)	442
16	West of Hecla, S.D.	458
	North Dakota-South Dakota State Line	459
17	Wolf Creek at Wolf Creek Colony	83-1
18	Twelve Mile Creek northwest of Milltown, S.D.	97-0.5
19	Enemy Creek southeast of Mitchell, S.D.	131-0.5
20	Redstone Creek southeast of Forestburg, S.D.	188-1
21	Pearl Creek southeast of Huron, S.D.	212-2

(continued)

Table A-1 (continued)

Reference Point Locations

James River

Station Number	Description	Approximate Mileage from Mouth
22	Cain Creek; S.D. 37 bridge	214-5
23	Stony Run Creek; S.D. 37 bridge	217-2
24	Turtle Creek northeast of Redfield, S.D.	296-2
25	Snake Creek; U.S. 281 bridge	300-2
26	Mud Creek northwest of Brentford	338-0.5
27	Moccasin Creek south of Bath, S.D.	378-4
28	Crow Creek drainage ditch east of Tacoma Park	410-0.5
29	Elm River south of Columbia, S.D.	429-0.5

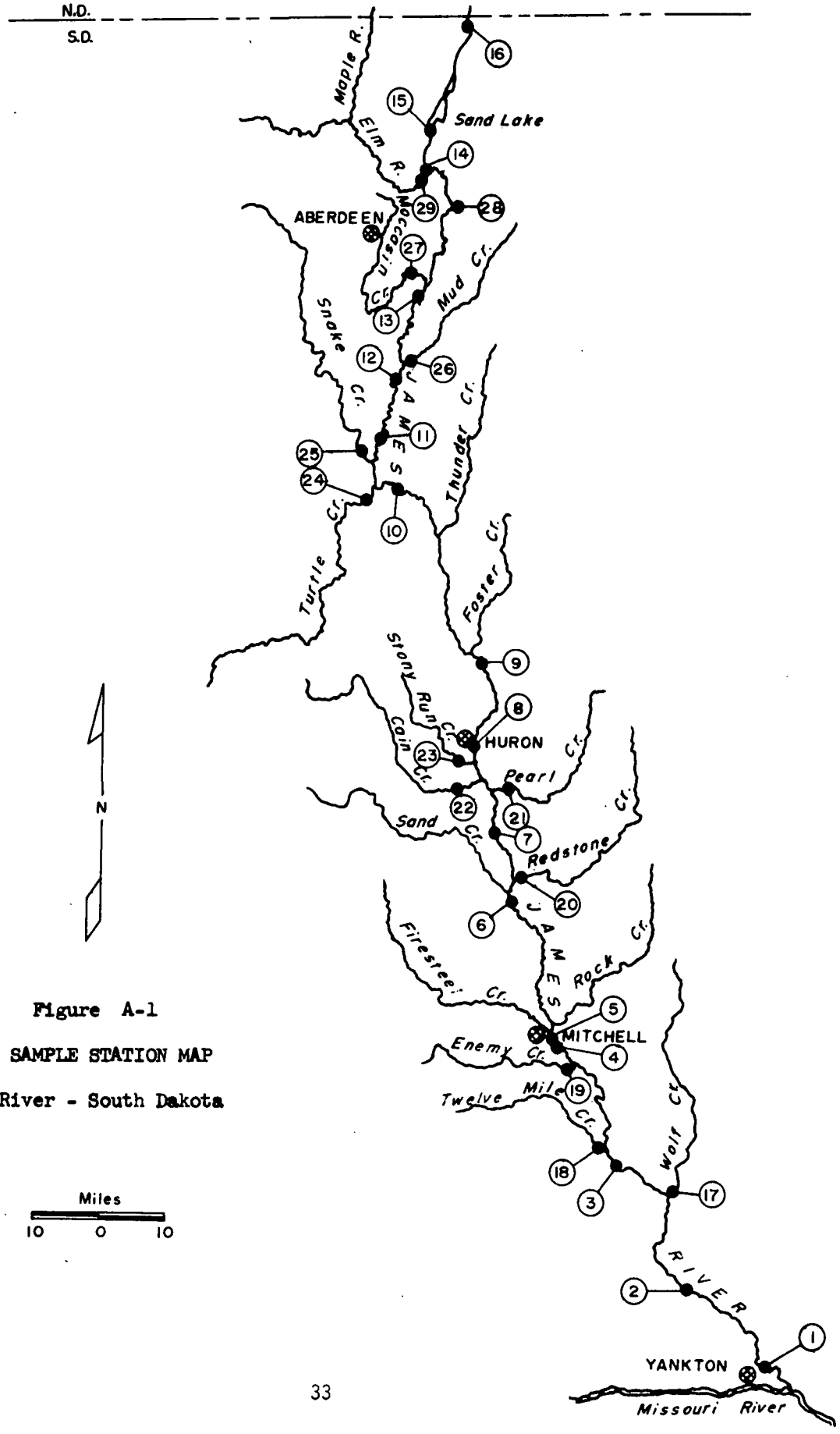

Figure A-1

DETAIL SAMPLE STATION MAP

James River - South Dakota

Table A-2

Survey Data - Station 1

James River - South Dakota

Date Yr.Mo.Day	Time Mlty	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/01	0845	340	4.0	8.2	10.0	6.4	0.60	0.62	1.7	0.57	0.38	860	194	38	0.10	753	77	676	155	18	137	1,700	80	2,000	
70/04/01	1325		6.0	7.9	10.4	6.6	0.60	0.58	1.7	0.62	0.36	865	168	38	0.15	750	84	666	132	23	109	330	130	3,100	
70/04/02	0840		4.5	8.0	10.2	8.3	0.60	0.48	1.8	0.56	0.37	910	180	35	0.15	746	68	678	119	14	105	1,100	80	1,500	
70/04/02	1230		5.0	8.1	10.8	7.1	0.60	0.45	1.9	0.61	0.36	940	182	35	0.15	758	79	679	140	17	123	840	50	1,200	
70/04/03	0850		5.0	8.2	10.6	8.6	0.60	0.35	1.8	0.54	0.36	960	184	36	0.10	787	79	708	173	18	155	310	50	1,700	
70/04/03	1205		5.0	8.3	11.0	7.6	0.60	0.33	2.0	0.58	0.36	1030	186	33	< 0.10	734	70	664	117	14	103	1,300	110	3,000	
70/04/04	0820		6.0	8.1	11.6	7.8	0.60	0.13	1.9	0.56	0.36	1035	190	34	< 0.10	738	66	672	105	12	93	2,200	20	2,400	
70/04/04	1200		5.5	8.4	13.7	7.8	0.65	0.15	2.0	0.58	0.37	1030	194	34	< 0.10	755	72	683	86	16	70	2,300	130	1,300	0.5
70/04/05	0830		6.0	8.3	11.6	8.2	0.55	0.09	2.3	0.56	0.34	975	194	35	0.10	827	88	739	181	18	163	1,100	80	3,900	
70/04/05	1258	340	8.5	8.4	12.7	8.4	0.50	0.09	2.4	0.59	0.31	905	186	41	0.15	853	104	749	189	23	166	2,200	220	3,100	0.5
SUMMER STUDY																									
70/08/24	0900		23.0	8.6	-	5.1	< 0.05	0.5	1.0	0.23	0.05	1916	250	43	< 0.10	1308	53	1255	119	21	98	-	-	-	
70/08/25	0955		23.0	8.0	-	5.3	< 0.05	1.5	< 0.1	0.20	0.07	1798	244	45	< 0.10	1286	64	1222	262	9	253	-	-	-	
70/08/26	0845		23.5	8.8	4.8	6.3	< 0.05	0.6	1.4	0.20	0.05	1668	260	48	< 0.10	1274	73	1201	204	24	180	-	-	-	
70/08/27	1030		25.0	8.4	4.6	6.6	< 0.05	0.8	1.9	0.20	0.06	1684	256	42	< 0.10	1293	59	1234	135	42	93	-	-	-	
70/08/28	0840		24.4	8.3	4.2	5.8	< 0.05	0.5	1.7	0.20	0.10	1598	256	51	< 0.10	1326	81	1245	227	23	204	-	-	-	
70/08/29	1120		23.9	8.2	5.3	-	< 0.05	0.3	1.8	0.20	0.08	1717	256	47	< 0.10	1285	102	1183	174	59	115	3,300	80	740	
70/08/30	0850		22.8	8.9	4.4	-	< 0.05	0.4	1.4	0.20	0.10	1776	260	54	< 0.10	1424	102	1409	113	48	152	13,000	2,200	1,200	
70/08/31	0950		22.8	7.9	5.6	-	< 0.05	0.5	1.2	0.20	0.07	1656	248	49	< 0.10	1317	73	1325	144	18	126	3,300	50	670	

Table A-3

Survey Data - Station 2

James River - South Dakota

Date Yr.Mo.Day	Time Mlty	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/01	0935		4.0	8.3	10.2	7.0	0.65	0.55	1.5	0.59	0.39	915	130	35	< 0.10	760	75	685	145	19	126	1,400	50		
70/04/01	1350		6.0	8.1	10.6	7.2	0.65	0.45	1.7	0.62	0.37	930	174	35	0.10	768	74	694	141	22	119	940	20		
70/04/02	0900		4.5	8.1	10.3	8.1	0.65	0.46	1.7	0.56	0.36	935	176	35	0.10	753	65	688	166	13	153	490	130		
70/04/02	1258		5.5	8.2	11.1	7.2	0.65	0.35	1.9	0.54	0.32	970	176	34	< 0.10	760	70	690	143	18	125	3,300	70		
70/04/03	0915		5.0	8.3	10.3	8.5	0.65	0.39	1.9	0.63	0.43	1015	190	35	0.10	779	66	713	98	15	83	1,700	170		
70/04/03	1230		4.5	8.3	11.6	8.2	0.65	0.41	2.1	0.64	0.40	1020	184	34	< 0.10	741	68	673	136	20	116	1,700	110		
70/04/04	0845		4.0	8.2	12.6	8.1	0.60	0.22	2.0	0.60	0.35	990	184	34	< 0.10	752	48	704	126	8	118	2,200	80		
70/04/04	1225		5.5	8.3	13.9	8.3	0.60	0.12	2.3	0.61	0.34	1000	180	34	< 0.10	738	61	677	85	11	74	2,800	110		
70/04/05	0850		6.0	8.4	11.9	8.4	0.50	0.18	2.3	0.54	0.34	1000	188	33	< 0.10	1130	81	1049	497	17	480	1,700	170		0.5
70/04/05	1321		8.0	8.6	13.4	8.4	0.35	0.08	2.5	0.58	0.30	1020	184	37	0.15	839	101	738	154	26	128	410	80		12
SUMMER STUDY																									
70/08/24	0930		20.5	8.5	-	5.6	< 0.05	0.8	1.8	0.23	0.05	1993	250	39	0.15	1252	69	1183	190	25	165	-	-	-	
70/08/25	0935		21.5	8.0	-	6.4	< 0.05	0.6	0.8	0.27	0.04	1763	234	42	< 0.10	1294	74	1220	235	11	224	-	-	-	
70/08/26	0905		23.5	8.8	5.3	7.1	< 0.05	0.6	1.9	0.25	0.03	1656	226	45	< 0.10	1255	79	1176	410	29	381	-	-	-	
70/08/27	0955		24.0	8.7	6.0	7.3	< 0.05	1.0	1.3	0.20	0.05	1639	238	36	< 0.10	1284	63	1221	232	42	190	-	-	-	
70/08/28	0905		22.2	8.4	5.5	7.7	< 0.05	0.5	1.2	0.20	0.06	1565	234	41	< 0.10	1295	64	1231	111	27	84	-	-	-	
70/08/29	1100		22.8	8.2	6.6	-	< 0.05	0.3	1.5	0.15	0.05	1717	240	36	< 0.10	1275	75	1200	86	40	46	14,000	210	590	
70/08/30	0910		21.1	8.8	6.0	-	< 0.05	0.3	1.1	0.20	0.05	1710	226	39	< 0.10	1278	54	1224	176	25	151	92,000	790	1,400	
70/08/31	0925		21.1	8.3	6.4	-	< 0.05	1.0	0.9	0.20	0.05	1728	230	46	< 0.10	1343	70	1273	158	26	132	22,000	130	1,100	

Table A-4

Survey Data - Station 3

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
												SPRING STUDY													
70/04/01	1055	290	5.0	8.3	10.6	8.4	0.60	0.46	1.6	0.61	0.42	880	172	34	0.10	688	81	607	147	23	124	1,100	50		
70/04/01	1445		6.0	8.1	10.8	7.8	0.60	0.46	2.0	0.64	0.41	900	178	34	0.10	738	70	668	140	18	122	1,700	110		
70/04/02	0940		5.0	8.1	11.0	8.9	0.60	0.32	1.8	0.59	0.37	916	176	37	0.15	730	69	661	140	16	124	1,100	40		
70/04/02	1353		5.5	8.3	11.6	8.1	0.60	0.15	2.0	0.57	0.40	945	178	32	0.10	726	75	651	169	14	155	170	20		
70/04/03	1000		3.5	8.3	11.0	8.8	0.60	0.21	1.9	0.59	0.36	970	186	34	< 0.10	646	75	571	119	23	96	790	< 20		
70/04/03	1325		4.0	8.3	9.8	8.4	0.60	0.16	2.0	0.58	0.34	985	174	32	< 0.10	724	68	656	143	17	126	490	20		
70/04/04	0925		4.5	8.3	13.1	7.9	0.60	0.11	1.9	0.58	0.36	950	176	33	< 0.10	720	66	654	132	13	119	170	50		
70/04/04	1318		6.0	8.3	14.1	8.2	0.60	0.10	2.1	0.60	0.35	950	172	33	< 0.10	722	68	654	114	22	92	170	20		
70/04/05	0930		6.5	8.3	11.7	8.1	0.50	0.17	2.5	0.58	0.34	950	186	36	0.10	756	92	664	159	26	133	220	130		
70/04/05	1402	290	8.5	8.5	11.2	8.5	0.40	0.10	2.2	0.64	0.32	950	182	36	< 0.10	762	87	675	166	25	141	110	< 20		8
												SUMMER STUDY													
70/08/24	1000		22.0	8.5	-	7.2	< 0.05	0.8	1.2	0.20	0.03	2112	246	39	< 0.10	1327	50	1277	195	27	168	-	-	-	
70/08/25	0910		21.0	7.9	-	10.0	< 0.05	0.6	0.8	0.27	0.03	1910	244	46	< 0.10	1413	73	1340	232	17	215	-	-	-	
70/08/26	0935		24.5	8.6	9.0	8.4	< 0.05	1.1	2.1	0.20	0.01	1754	244	46	< 0.10	1393	164	1229	239	27	212	-	-	-	
70/08/27	0925		24.0	8.5	5.4	10.0	< 0.05	1.0	3.0	0.20	0.02	1780	250	53	< 0.10	1440	357	1083	232	53	179	-	-	-	
70/08/28	0940		22.2	8.2	6.3	12.0	< 0.05	0.8	1.3	0.30	0.10	1721	254	45	< 0.10	1444	70	1374	130	44	86	-	-	-	
70/08/29	1030		23.3	7.7	7.4	-	< 0.05	0.3	1.1	0.15	0.06	1885	266	32	< 0.10	1275	32	1200	86	30	62	13,000	170	220	
70/08/30	0945		21.1	8.7	6.4	-	< 0.05	0.6	< 0.1	0.15	-	1860	256	49	< 0.10	1278	83	1224	176	35	163	2,200	80	610	
70/08/31	0900		21.1	8.1	7.5	-	< 0.05	1.5	0.9	0.05	0.03	1884	246	50	< 0.10	1473	73	1400	238	35	203	7,900	230	500	

Table A-5

Survey Data - Station 4

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/01	1230		5.0	8.2	10.8	8.0	0.55	0.56	1.7	0.70	0.49	895	174	37	< 0.10	647	76	571	131	15	116	4,900	1,700		
70/04/01	1608		5.0	8.0	10.8	7.6	0.55	0.44	1.8	0.66	0.47	820	160	33	0.10	646	73	573	100	20	80	4,900	500		
70/04/02	1045		5.0	8.1	10.8	8.4	0.55	0.50	2.0	0.67	0.44	820	166	38	0.10	639	77	562	108	16	92	840	330		
70/04/02	1610		6.0	8.1	11.3	7.8	0.55	0.44	2.1	0.64	0.42	830	160	34	< 0.10	672	102	570	106	26	80	7,900	490		
70/04/03	1110		5.0	8.2	10.8	8.8	0.50	0.59	1.8	0.68	0.44	875	162	35	< 0.10	641	76	565	144	18	126	7,900	400		
70/04/03	1440		5.0	8.2	10.8	8.5	0.50	0.42	2.0	0.66	0.43	853	170	35	< 0.10	654	83	571	138	22	116	3,500	700		
70/04/04	1035		4.5	8.2	13.3	7.8	0.50	0.24	2.1	0.63	0.40	840	168	33	< 0.10	622	68	554	116	17	99	4,900	230		
70/04/04	1435		6.0	8.3	14.3	8.5	0.50	0.30	2.2	0.68	0.42	845	222	32	< 0.10	591	69	522	101	18	83	7,900	460		
70/04/05	1025		6.0	8.4	12.7	8.0	0.40	0.16	2.3	0.62	0.35	840	168	36	< 0.10	677	92	585	157	22	135	2,800	230		4
70/04/05	1507		7.5	8.4	13.1	8.6	0.40	0.17	2.4	0.66	0.38	855	174	38	0.10	679	105	574	108	26	82	4,900	330		0.5
SUMMER STUDY																									
70/08/24	1100		22.5	7.5	-	16.0	< 0.05	1.5	1.8	1.55	0.65	1934	280	43	< 0.10	1193	71	1122	177	32	145	-	-	-	
70/08/25	0815		22.0	8.4	-	14.0	< 0.05	1.0	< 0.1	1.53	0.63	1763	276	51	< 0.10	1268	88	1180	239	18	221	-	-	-	
70/08/26	1035		24.5	9.0	5.6	13.0	< 0.05	2.0	2.9	1.10	0.55	1737	284	53	< 0.10	1286	94	1192	232	42	190	-	-	-	
70/08/27	0825		24.0	9.0	4.9	14.0	< 0.05	1.1	2.0	0.60	0.20	1695	290	55	< 0.10	1312	106	1206	233	86	147	-	-	-	
70/08/28	1040		23.3	8.6	4.2	14.0	< 0.05	1.4	1.7	1.50	0.80	1587	278	51	< 0.10	1281	70	1211	178	54	124	-	-	-	
70/08/29	0935		22.2	8.0	2.6	-	< 0.05	1.8	1.4	0.80	0.55	1769	294	43	< 0.10	1193	72	1121	203	72	131	2,800	< 20	600	
70/08/30	1040		22.2	9.1	6.1	-	< 0.05	2.5	1.6	1.00	0.40	1734	272	59	< 0.10	1294	108	1186	105	50	55	2,800	50	350	
70/08/31	0800		22.2	8.0	5.2	-	< 0.05	2.0	2.2	1.00	0.60	1662	280	50	< 0.10	1216	56	1196	145	40	150	7,900	20	220	

Table A-6

Survey Data - Station 5

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
												SPRING STUDY													
70/04/01	1300		5.0	8.3	11.2	7.6	0.50	0.29	1.8	0.57	0.36	785	174	38	< 0.10	645	91	554	138	21	117	1,800	270		
70/04/01	1628		5.0	8.2	11.1	7.4	0.50	0.29	1.8	0.57	0.36	780	160	35	< 0.10	636	71	565	117	23	94	480	170		
70/04/02	1110		4.5	8.1	11.1	8.6	0.50	0.30	1.9	0.59	0.35	800	166	41	< 0.10	629	87	542	134	20	114	1,800	130		
70/04/02	1530		5.5	8.2	11.7	8.0	0.50	0.30	1.8	0.57	0.33	835	156	35	< 0.10	618	83	535	129	20	109	LA	LA		
70/04/03	1130		3.5	8.2	11.2	8.7	0.50	0.15	1.9	0.56	0.53	840	160	35	< 0.10	290	72	218	78	9	69	1,300	230		
70/04/03	1508		4.5	8.2	12.5	8.2	0.50	0.15	2.0	0.57	0.32	805	162	32	< 0.10	578	57	521	155	11	144	3,300	110		
70/04/04	1050		5.0	8.4	13.9	8.2	0.40	0.13	2.1	0.56	0.31	840	168	32	< 0.10	594	63	531	114	14	100	340	< 20		0.5
70/04/04	1500		6.0	8.4	14.9	5.7	0.40	0.14	2.1	0.53	0.27	805	168	33	< 0.10	618	64	554	63	18	45	4,900	20		0.5
70/04/05	1045		7.0	8.6	12.8	8.4	0.20	0.15	2.3	0.51	0.30	795	170	37	< 0.10	670	98	572	110	17	93	490	50		6
70/04/05	1525		8.0	8.6	13.8	8.4	0.15	0.11	2.1	0.56	0.29	815	172	35	< 0.10	651	93	558	153	23	130	1,100	70		10
												SUMMER STUDY													
70/08/24	1120		22.5	8.5	-	12.0	< 0.05	1.4	1.4	0.37	0.07	1916	222	48	< 0.10	1245	95	1150	115	45	70	-	-	-	
70/08/25	0755		20.5	8.2	-	6.8	< 0.05	1.7	1.0	0.35	0.07	1797	218	58	< 0.10	1326	124	1202	201	28	173	-	-	-	
70/08/26	1100		24.0	8.9	8.4	8.4	< 0.05	1.2	1.8	0.25	0.03	1811	218	49	< 0.10	1319	68	1251	222	20	202	-	-	-	
70/08/27	0810		22.0	8.7	4.1	7.8	< 0.05	1.4	2.4	0.23	0.08	1763	216	51	< 0.10	1240	78	1162	124	78	46	-	-	-	
70/08/28	1100		22.2	8.3	6.6	9.6	< 0.05	0.8	1.5	0.25	0.20	1665	216	52	< 0.10	1364	86	1278	200	54	146	-	-	-	
70/08/29	0920		22.2	7.8	6.1	-	< 0.05	1.4	2.0	0.20	0.06	1868	212	43	< 0.10	1338	54	1284	146	52	94	7,900	210	230	
70/08/30	1055		20.6	9.0	7.5	-	< 0.05	1.5	< 0.1	0.20	0.10	1788	202	44	< 0.10	1323	66	1257	108	38	70	4,900	230	150	
70/08/31	0745		21.7	8.4	7.1	-	< 0.05	1.4	1.2	0.27	0.07	1782	216	52	< 0.10	1338	58	1280	211	34	177	4,900	130	170	

Table A-7

Survey Data - Station 6

James River - SouthDakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
												SPRING STUDY													
70/04/01	0655		2.0	7.8	10.4	5.7	0.50	0.36	1.6	0.54	0.44	660	147	26	< 0.10	507	52	455	118	16	102	3,500	20		
70/04/01	1540		5.0	8.0	11.2	7.0	0.50	0.39	1.8	0.60	0.37	671	164	25	< 0.10	519	47	472	104	15	89	2,800	20		
70/04/02	0640		2.0	7.9	11.2	7.4	0.50	0.29	1.8	0.55	0.36	620	154	20	0.10	532	46	486	145	14	131	2,800	50		
70/04/02	1420		5.5	8.1	11.2	7.4	0.50	0.39	1.8	0.55	0.36	680	150	25	< 0.10	543	36	507	138	11	127	14,000	330		
70/04/03	0643		1.5	8.1	9.4	6.7	0.50	0.26	1.8	0.52	0.36	750	156	27	< 0.10	524	46	478	131	8	123	11,000	50		
70/04/03	1425		5.0	8.3	11.6	7.6	0.50	0.32	1.7	0.53	0.37	700	156	24	< 0.10	517	37	480	126	5	121	17,000	80		
70/04/04	0643		1.5	7.9	13.1	6.8	0.50	0.22	1.8	0.52	0.34	740	156	26	< 0.10	508	72	436	107	23	84	2,800	20		
70/04/04	1355		5.5	8.3	14.0	7.5	0.50	0.17	2.0	0.53	0.35	710	156	24	< 0.10	494	43	451	72	11	61	7,000	20		
70/04/05	0655		5.0	8.2	11.9	7.7	0.50	0.12	2.0	0.53	0.33	705	154	29	< 0.10	548	61	487	133	16	117	390	20		
70/04/05	1300		8.0	8.3	13.1	8.2	0.50	0.07	2.2	0.52	0.34	695	158	28	< 0.10	562	59	503	94	10	84	210	< 20		
												SUMMER STUDY													
70/08/24	1200		22.0	8.6	-	13.0	< 0.05	1.3	1.7	0.50	0.24	1880	286	53	< 0.10	1134	92	1042	100	52	48	-	-	-	
70/08/25	0710		21.0	8.4	-	9.2	< 0.05	1.3	3.4	0.60	0.24	1808	274	62	< 0.10	1064	108	956	213	20	193	-	-	-	
70/08/26	1135		25.0	9.0	8.2	12.0	< 0.05	1.5	2.0	0.50	0.20	1783	278	52	< 0.10	1258	56	1202	177	20	157	-	-	-	
70/08/27	0655		23.0	9.1	3.8	15.0	< 0.05	1.4	2.9	0.46	0.24	1740	280	60	< 0.10	1208	102	1106	199	84	115	-	-	-	
70/08/28	1155		22.2	7.8	4.0	11.0	< 0.05	1.2	0.8	0.45	0.25	1643	284	55	< 0.10	1281	76	1205	208	36	172	-	-	-	
70/08/29	0800		21.1	8.5	2.8	-	< 0.05	1.5	3.0	0.37	0.20	1856	286	60	< 0.10	1290	120	1170	200	88	112	7,000	20	1,100	
70/08/30	1140		21.7	9.0	4.7	-	< 0.05	1.8	0.9	0.40	0.25	1776	272	66	< 0.10	1286	100	1186	194	46	148	7,900	130	120	
70/08/31	0625		21.1	8.4	5.2	-	< 0.05	1.4	2.5	0.55	0.27	1704	280	55	< 0.10	1213	14	1199	197	8	189	35,000	40	210	

Table A-8

Survey Data - Station 7

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/01	0820	130	1.0	7.8	10.1	6.1	0.55	0.40	1.7	0.54	0.49	635	142	22	< 0.10	477	32	445	109	9	100	1,300	200	590	
70/04/01	1630		5.0	7.9	11.0	5.8	0.55	0.39	1.6	0.55	0.42	645	138	23	< 0.10	497	38	459	74	16	58	3,100	800	470	
70/04/02	0733		2.5	7.9	10.8	6.7	0.55	0.38	1.7	0.53	0.38	665	148	22	< 0.10	470	31	439	102	18	84	4,900	230	3,600	
70/04/02	1500		4.0	8.1	11.4	7.8	0.55	0.37	1.7	0.53	0.37	635	136	22	< 0.10	462	32	430	133	12	121	7,900	50	520	
70/04/03	0730		0.5	8.1	11.3	7.0	0.55	0.35	1.8	0.55	0.38	705	146	23	< 0.10	476	37	439	98	12	86	49,000	< 200	4,700	
70/04/03	1505		3.5	8.2	11.7	8.2	0.55	0.35	1.8	0.50	0.38	670	164	24	< 0.10	492	42	450	122	12	110	17,000	130	2,300	
70/04/04	0723		1.0	8.0	13.0	6.6	0.55	0.31	1.8	0.51	0.39	675	144	24	< 0.10	471	38	433	92	10	82	2,200	80	800	
70/04/04	1440		5.0	8.3	13.9	7.6	0.55	0.30	1.9	0.59	0.36	665	140	23	< 0.10	460	37	423	66	10	56	3,300	20	1,800	
70/04/05	0735		4.0	8.2	11.3	7.5	0.50	0.22	2.0	0.56	0.36	680	142	24	< 0.10	505	40	465	131	14	117	2,800	130	740	
70/04/05	1340	130	7.5	8.3	12.4	8.3	0.50	0.12	2.0	0.53	0.34	695	148	23	< 0.10	513	50	463	128	15	113	940	< 20	570	
SUMMER STUDY																									
70/08/24	0635		20.0	9.5	-	11.0	< 0.05	0.8	1.4	1.56	0.40	1820	256	48	< 0.10	1413	60	1353	276	27	249	-	-	-	
70/08/25	1210		23.0	8.1	-	13.0	< 0.05	1.2	1.4	0.45	0.10	1859	256	59	< 0.10	1448	94	1354	332	52	280	-	-	-	
70/08/26	0640		22.5	8.0	4.5	-	< 0.05	1.4	2.4	0.45	0.05	1841	240	45	< 0.10	1368	72	1196	177	27	150	-	-	-	
70/08/27	0640		21.0	8.9	2.8	-	< 0.05	1.2	1.6	0.30	0.10	1829	242	44	< 0.10	1441	82	1359	277	82	195	-	-	-	
70/08/28	0655		22.0	8.8	3.5	14.0	< 0.05	1.2	2.5	0.35	0.10	1748	246	53	< 0.10	1428	86	1342	257	10	247	-	-	-	
70/08/29	0815		20.0	8.5	4.4	12.0	< 0.05	0.3	2.8	0.27	0.08	1811	246	57	< 0.10	1494	100	1394	259	42	217	4,900	210	290	
70/08/30	1155		21.0	8.8	7.7	-	< 0.05	1.5	2.0	0.35	0.05	1860	244	62	< 0.10	1437	102	1335	189	46	143	9,400	700	190	
70/08/31	0625		21.0	8.5	5.4	-	< 0.05	1.5	1.8	0.33	0.10	1830	234	55	< 0.10	1390	82	1308	245	52	193	7,000	110	230	

Table A-9

Survey Data - Station 8

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/01	1000		1.0	8.0	8.7	5.4	0.55	0.41	1.6	0.54	0.45	580	126	18	< 0.10	424	21	403	107	9	98	200	< 200	640	
70/04/01	1800		1.0	7.7	9.6	5.9	0.55	0.41	1.6	0.51	0.42	595	132	18	< 0.10	425	24	401	101	13	88	500	200	390	
70/04/02	0858		0.5	7.7	9.0	5.2	0.55	0.43	1.7	0.56	0.42	700	132	26	< 0.10	450	29	421	115	3	112	330	50	980	
70/04/02	1605		1.0	7.9	9.6	6.4	0.55	0.41	1.6	0.57	0.45	595	130	19	< 0.10	429	20	409	124	10	114	80	< 20	630	
70/04/03	0835		0.5	7.9	10.0	6.6	0.50	0.35	1.6	0.53	0.43	650	134	17	< 0.10	357	25	332	113	1	112	800	< 200	950	
70/04/03	1615		3.0	7.9	10.2	6.8	0.50	0.37	1.7	0.55	0.40	610	112	17	< 0.10	368	12	356	113	3	110	330	20	580	
70/04/04	0823		0.5	7.8	12.4	6.4	0.50	0.27	1.6	0.56	0.39	620	130	16	< 0.10	416	20	396	60	6	54	130	< 20	520	
70/04/04	1545		1.5	8.2	12.5	6.3	0.50	0.31	1.7	0.52	0.39	615	110	17	< 0.10	428	20	408	85	6	79	330	20	420	
70/04/05	0832		1.0	8.1	11.7	7.1	0.50	0.20	1.7	0.54	0.36	620	128	16	< 0.10	434	20	414	129	9	120	220	50	870	
70/04/05	1445		3.0	8.3	11.8	7.3	0.50	0.13	1.7	0.52	0.34	600	128	16	< 0.10	425	24	401	117	12	105	330	< 20	480	
70/04/14	1605		5.5	9.1	14.2	10	< 0.05	0.03	1.8	0.42	0.18	770	156	17	< 0.10	530	48	482	99	20	79	490	50	740	19
70/04/15	0910		5.5	8.9	12.4	6.8	< 0.05	0.02	1.7	0.47	0.23	840	150	18	< 0.10	595	47	548	147	19	128	460	230	3,900	10
70/04/15	1520		6.0	9.1	11.6	10	< 0.05	0.10	1.8	0.48	0.23	860	150	18	< 0.10	591	50	541	134	22	112	790	230	860	20
70/04/16	0850		5.5	9.0	11.1	11	< 0.05	0.02	2.0	0.62	0.38	905	162	22	< 0.10	596	60	536	124	18	106	2,300	490	840	16
70/04/16	1510		7.0	9.2	13.6	11	< 0.05	0.03	2.2	0.69	0.45	920	164	25	< 0.10	646	69	577	111	23	88	340	80	260	28
70/04/17	0835		6.0	9.2	10.8	15	< 0.05	0.03	2.5	0.82	0.54	950	162	22	< 0.10	665	67	598	127	29	98	1,100	330	6,000	24
70/04/17	1450		6.5	9.1	13.1	8.0	< 0.05	0.03	2.5	0.89	0.49	905	167	23	< 0.10	678	75	603	143	35	108	2,200	310	8,800	26
70/04/18	0900		5.0	9.3	11.6	5.9	< 0.05	0.02	2.4	0.69	0.44	925	173	22	< 0.10	651	59	592	103	26	77	3,300	130	10,000	30
70/04/18	1440		6.0	9.1	11.9	13	< 0.05	0.02	2.1	0.66	0.38	935	176	23	< 0.10	727	53	674	201	17	184	1,300	330	5,900	30
70/04/19	1100		5.5	8.9	10.6	8.8	< 0.05	0.10	1.8	0.48	0.30	880	179	20	< 0.10	597	41	556	54	36	18	1,300	330	4,800	26
SUMMER STUDY																									
70/08/24	1345		24.0	8.9	-	19.0	< 0.05	1.5	1.1	3.00	0.14	2035	210	26	< 0.10	1233	44	1189	129	33	96	-	-	-	
70/08/25	1235		25.0	7.4	-	-	< 0.05	1.2	1.6	2.00	1.00	1752	174	28	< 0.10	1271	57	1214	374	27	347	-	-	-	
70/08/26	1235		25.0	7.4	0.0	102.0	< 0.05	2.1	3.2	1.50	1.00	1679	168	28	< 0.10	1200	45	1155	208	30	178	-	-	-	
70/08/27	1240		24.0	8.2	0.0	88.0	< 0.05	2.2	2.9	2.00	1.55	1780	200	28	< 0.10	1117	46	1071	198	42	156	-	-	-	
70/08/28	1255		20.5	7.8	0.0	72.0	< 0.05	2.0	1.9	1.50	0.60	1143	126	49	< 0.10	802	60	742	169	56	113	-	-	-	
70/08/29	1330		26.7	7.8	0.0	-	< 0.05	0.8	1.7	0.77	0.55	1427	140	22	< 0.10	919	16	903	157	0	157	> 1,600,000	920,000	41,000	
70/08/30	1225		21.1	8.7	0.0	-	< 0.05	2.5	1.9	1.56	1.50	1566	158	34	< 0.10	1057	-	-	157	-	-	3,300,000	330,000	72,000	
70/08/31	1210		21.1	8.0	0.0	-	0.2	2.5	1.3	2.20	1.50	1896	208	32	< 0.10	1216	20	1196	145	20	125	2,300,000	14,000	39,000	

Table A-10

Survey Data - Station 9

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-H mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100 ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/14	1525	270	6.0	9.4	> 15	13	< 0.05	0.07	2.1	0.93	0.67	880	168	17	< 0.10	620	50	570	105	25	80	270	20		40
70/04/15	0840	310*	6.0	9.3	> 15	13	< 0.05	0.12	2.3	0.86	0.53	880	164	19	< 0.10	594	56	538	107	24	83	3,300	790		30
70/04/15	1455	310*	6.5	9.4	14.5	15	< 0.05	0.06	2.4	0.83	0.52	885	167	20	< 0.10	619	68	551	115	26	89	4,900	790		35
70/04/16	0825	-	4.5	9.3	11.3	5.6	< 0.05	0.05	1.9	0.59	0.37	935	181	16	< 0.10	620	45	575	77	17	60	1,300	1,300		31
70/04/16	1440	-	5.5	9.3	13.5	8.2	< 0.05	0.02	2.0	0.59	0.34	915	184	21	0.10	643	57	586	103	23	80	700	170		28
70/04/17	0750	370	6.0	9.3	11.0	5.8	< 0.05	0.02	1.8	0.53	0.24	920	178	18	< 0.10	595	60	535	104	21	83	2,800	330		34
70/04/17	1430	350	5.0	9.1	12.8	7.8	< 0.05	0.02	1.8	0.52	0.20	865	183	18	< 0.10	626	52	574	131	20	111	700	80		26
70/04/18	0755	-	6.0	9.2	12.3	10	< 0.05	0.02	1.7	0.48	0.18	865	183	17	< 0.10	567	40	527	96	23	73	330	20		29
70/04/18	1420	-	6.0	9.3	12.1	9.6	< 0.05	0.02	1.4	0.53	0.20	860	183	18	< 0.10	632	50	582	138	27	111	490	20		30
70/04/19	1015	530	5.5	8.8	11.1	9.3	< 0.05	0.02	1.7	0.53	0.22	855	185	20	< 0.10	619	43	576	124	36	88	2,300	490		7
		* est.																							
SUMMER STUDY																									
70/08/24	1455		23.0	8.6	-	16.0	< 0.05	0.8	1.5	0.40	0.20	1785	284	43	< 0.10	1084	102	982	-	40	-	-	-	-	
70/08/25	0830		20.5	8.6	-	7.0	< 0.05	2.1	1.3	0.30	0.10	1661	286	46	< 0.10	1147	83	1064	241	9	232	-	-	-	
70/08/26	1345		24.0	8.2	9.2	13.0	< 0.05	1.0	1.6	0.30	0.08	1691	286	43	< 0.10	1389	90	1299	393	20	373	-	-	-	
70/08/27	0740		22.5	9.1	5.4	12.0	< 0.05	0.8	1.2	0.25	0.08	1684	272	48	< 0.10	1184	122	1062	207	56	151	-	-	-	
70/08/28	1230		22.0	8.9	8.0	14.0	< 0.05	0.6	1.8	0.28	0.12	1421	284	39	< 0.10	1111	80	1031	178	30	148	-	-	-	
70/08/29	0910		21.0	8.6	6.0	-	< 0.05	0.4	1.2	0.53	0.25	1462	288	38	< 0.10	1017	90	927	121	55	66	4,000	1,700	500	
70/08/30	1055		21.0	9.0	8.0	-	< 0.05	0.8	1.6	0.20	0.05	1416	274	40	< 0.10	1008	69	939	165	36	129	3,500	490	360	
70/08/31	0720		21.0	8.8	7.2	-	< 0.05	1.0	1.0	0.32	0.11	1392	286	44	< 0.10	1002	54	948	159	30	129	9,400	130	230	

Table A-11

Survey Data - Station 10

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
												SPRING STUDY													
70/04/14	1355		4.5	9.3	> 15	10	< 0.05	0.07	1.8	0.76	0.47	680	149	17	< 0.10	467	50	417	86	22	64	460	20		26
70/04/15	0800		4.5	9.4	> 15	15	< 0.05	0.03	1.6	0.84	0.51	815	164	15	< 0.10	497	48	449	102	27	75	330	< 20		30
70/04/15	1420		5.0	9.4	15.1	15	< 0.05	0.03	1.8	0.78	0.44	710	146	16	< 0.10	460	44	416	72	26	46	330	20		36
70/04/16	0750		3.5	9.3	12.6	13	< 0.05	0.02	1.8	0.69	0.38	700	143	18	< 0.10	439	49	390	87	17	70	220	20		20
70/04/16	1415		5.0	9.2	15.2	9.6	< 0.05	0.01	1.9	0.59	0.33	670	150	18	< 0.10	450	47	403	100	18	82	330	50		28
70/04/17	0720		6.0	9.1	10.9	8.6	< 0.05	0.03	2.5	0.53	0.28	715	156	18	< 0.10	455	53	402	78	26	52	1300	80		17
70/04/17	1400		6.0	8.8	13.5	5.3	< 0.05	0.05	1.6	0.52	0.25	745	172	16	< 0.10	512	43	469	123	23	100	1300	20		15
70/04/18	0725		6.0	8.8	11.6	LA	< 0.05	0.02	1.8	0.48	0.22	860	208	19	< 0.10	574	47	527	99	22	77	490	80		16
70/04/18	1350		6.0	8.7	10.8	8.8	< 0.05	0.02	1.8	0.49	0.22	880	215	32	< 0.10	637	77	560	162	32	130	1100	460		10
70/04/19	0940		4.5	8.3	10.8	8.2	< 0.05	0.03	2.0	0.44	0.23	970	249	23	< 0.10	690	47	643	145	31	114	2200	700		
												SUMMER STUDY													
70/08/24	1420		24.0	8.6	-	11.0	< 0.05	1.0	1.4	0.61	0.10	2011	370	43	< 0.10	1196	91	1105	224	54	170	-	-	-	
70/08/25	0905		21.0	8.5	-	6.5	< 0.05	0.8	< 0.1	0.50	0.26	1853	360	47	< 0.10	1152	101	1051	217	26	191	-	-	-	
70/08/26	1310		24.0	8.1	8.2	7.8	< 0.05	1.1	1.7	0.50	0.20	1852	354	47	< 0.10	1197	66	1131	213	6	207	-	-	-	
70/08/27	0815		22.5	9.0	4.3	8.0	< 0.05	1.4	2.1	0.40	0.20	1706	364	47	< 0.10	1190	104	1086	208	52	156	-	-	-	
70/08/28	1200		21.5	8.7	4.5	7.2	< 0.05	0.4	2.5	0.40	0.20	1654	356	42	< 0.10	1154	88	1066	163	32	131	-	-	-	
70/08/29	0945		20.5	8.4	4.4	-	< 0.05	0.5	2.2	0.40	0.20	1798	362	46	< 0.10	1169	116	1053	154	80	74	79,000	170	700	
70/08/30	1025		20.0	8.8	5.0	-	< 0.05	1.0	2.2	0.50	0.25	1776	344	57	< 0.10	1139	96	1043	119	54	65	35,000	230	720	
70/08/31	0755		20.5	8.6	3.2	-	< 0.05	1.0	1.9	0.55	0.42	1776	364	52	< 0.10	1166	80	1086	137	34	103	160,000	330	680	

Table A-12

Survey Data - Station 11

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	mg/l
SPRING STUDY																									
70/04/14	1310		4.5	9.2	> 15	8.4	< 0.05	0.01	1.6	0.50	0.29	540	157	15	< 0.10	323	43	280	31	19	12	230	20		18
70/04/15	0700		4.5	9.1	14.2	11	< 0.05	0.02	1.7	0.48	0.25	630	165	13	< 0.10	414	37	377	89	14	75	140	20		23
70/04/15	1330		4.0	9.1	13.7	10	< 0.05	0.02	1.6	0.46	0.24	680	179	14	< 0.10	467	43	424	111	19	92	790	230		43
70/04/16	0700		?	9.0	?	8.4	< 0.05	0.03	1.7	0.43	0.21	835	125	21	< 0.10	565	64	501	95	16	79	490	330		20
70/04/16	1335		5.5	8.8	14.1	7.7	< 0.05	0.03	1.6	0.43	0.20	875	257	23	< 0.10	647	76	571	151	17	134	700	210		20
70/04/17	0640		6.5	8.7	12.9	7.8	< 0.05	0.03	1.8	0.39	0.20	980	288	20	< 0.10	710	64	646	166	18	148	630	230		34
70/04/17	1310		6.5	8.5	13.3	18	< 0.05	0.02	1.8	0.40	0.18	995	280	18	< 0.10	738	53	685	134	24	110	790	170		8
70/04/18	0645		6.5	8.7	12.4	7.1	< 0.05	0.02	1.6	0.36	0.18	865	242	22	< 0.10	620	64	556	143	31	112	2300	110		11
70/04/18	1310		5.5	8.6	11.6	6.4	< 0.05	0.02	1.9	0.41	0.19	825	218	23	< 0.10	581	66	515	97	-	-	790	330		8
70/04/19	0845		4.0	8.2	?	7.5	0.14	0.02	1.6	0.35	0.19	710	184	23	< 0.10	475	50	425	75	29	46	1700	210		-
SUMMER STUDY																									
70/08/24	1235		24.0	8.5	-	6.1	< 0.05	0.8	2.0	0.32	0.28	2273	372	53	< 0.10	1365	97	1268	246	43	203	-	-	-	
70/08/25	0930		19.5	8.4	-	4.5	< 0.05	0.7	3.0	0.28	0.10	2034	362	48	< 0.10	1332	89	1243	286	16	270	-	-	-	
70/08/26	1245		25.0	8.0	7.3	7.0	< 0.05	0.8	2.0	0.40	0.13	2070	394	73	< 0.10	1451	142	1309	256	8	248	-	-	-	
70/08/27	0900		19.5	8.9	3.6	6.0	< 0.05	0.6	1.6	0.23	0.13	1949	366	46	< 0.10	1427	74	1353	195	70	125	-	-	-	
70/08/28	1100		20.5	8.6	4.3	6.3	< 0.05	0.3	2.8	0.30	0.18	1843	360	44	< 0.10	1372	56	1316	196	24	172	-	-	-	
70/08/29	1005		21.0	8.4	5.0	-	< 0.05	0.5	0.7	0.30	0.15	2030	372	56	< 0.10	1425	156	1269	126	88	38	3,200	170	570	
70/08/30	1000		18.0	8.7	6.8	-	< 0.05	1.1	2.2	0.25	0.05	1968	342	59	< 0.10	1420	86	1334	235	46	189	2,200	790	400	
70/08/31	0825		18.0	8.5	2.6	-	< 0.05	1.0	2.2	0.37	0.18	2004	356	57	< 0.10	1338	102	1236	208	38	170	28,000	790	3,200	

Table A-13

Survey Data - Station 12

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/14	1240	210	3.0	8.6	14.8	6.9	< 0.05	0.02	1.5	0.34	0.19	980	284	8.0	< 0.10	702	21	681	173	12	161	130	< 20		5
70/04/15	1030	210	4.0	8.6	11.8	6.6	< 0.05	0.19	1.4	0.38	0.28	775	211	9.0	< 0.10	471	22	449	104	15	89	330	< 20		3
70/04/15	1450	-	4.0	8.7	13.1	6.6	< 0.05	0.02	1.4	0.29	0.16	895	246	10	< 0.10	600	23	577	137	9	128	790	80		9
70/04/16	1005	-	3.0	8.7	12.7	6.1	< 0.05	0.06	1.4	0.29	0.16	795	201	13	< 0.10	490	26	464	124	10	114	1700	270		9
70/04/16	1520	235	5.0	8.5	11.5	4.2	< 0.10	0.05	1.3	0.26	0.15	780	208	12	< 0.10	456	27	429	67	19	48	460	50		2
70/04/17	1010	250	4.0	8.8	12.2	5.0	< 0.05	0.04	1.2	0.26	0.16	725	205	11	< 0.10	462	34	428	103	14	89	330	130		13
70/04/17	1330	260	5.5	8.7	12.5	7.8	< 0.05	0.03	1.3	0.25	0.16	720	182	12	< 0.10	462	30	432	111	15	96	220	< 20		9
70/04/18	0945	260	5.0	8.6	12.0	7.5	< 0.05	0.04	1.3	0.27	0.18	725	199	9.0	< 0.10	483	17	466	89	14	75	330	< 20		6
70/04/18	1350	280	5.0	8.6	12.7	5.1	< 0.05	0.03	1.4	0.30	0.18	745	203	11	< 0.10	489	17	472	84	17	67	170	50		8
70/04/19	0805	300	4.0	8.2	11.7	6.2	< 0.05	0.07	1.6	0.40	0.25	790	193	18	< 0.10	547	35	512	122	30	92	4900	1100		-
SUMMER STUDY																									
70/08/24	1210		22.5	8.6	-	7.6	< 0.05	0.6	1.8	0.46	0.10	1815	390	30	< 0.10	1154	49	1105	225	15	210	-	-	-	
70/08/25	0950		21.0	8.3	-	5.7	< 0.05	0.7	3.5	0.60	0.27	1706	380	31	< 0.10	1137	72	1065	222	19	203	-	-	-	
70/08/26	1220		23.0	7.9	6.2	9.0	< 0.05	0.8	2.2	0.47	0.26	1610	386	32	< 0.10	1146	60	1086	207	13	194	-	-	-	
70/08/27	0925		23.0	8.9	3.6	8.4	< 0.05	0.5	1.9	0.40	0.25	1582	396	41	< 0.10	1187	90	1097	257	32	225	-	-	-	
70/08/28	1040		21.5	8.6	2.7	7.2	< 0.05	0.3	2.4	0.40	0.25	1543	394	32	< 0.10	1134	45	1089	168	25	143	-	-	-	
70/08/29	1030		22.0	8.4	3.8	-	< 0.05	0.5	2.0	0.40	0.25	1636	390	30	< 0.10	1147	72	1075	291	36	255	1,700	50	270	
70/08/30	0940		21.0	8.7	2.6	-	< 0.05	0.6	2.6	0.40	0.25	1656	378	40	< 0.10	1165	64	1101	209	44	165	310	130	380	
70/08/31	0845		21.0	8.5	3.1	-	< 0.05	1.0	1.9	0.55	0.30	1584	394	40	< 0.10	1133	70	1063	202	26	176	4,600	40	660	

Table A-14

Survey Data - Station 13

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/14	1450	230	2.0	8.4	13.0	6.7	< 0.05	0.13	1.3	0.29	0.19	725	220	9.5	< 0.10	427	24	403	83	11	72	220	< 20		4
70/04/15	1010	250	3.0	8.6	11.8	5.7	< 0.05	0.06	1.5	0.29	0.17	930	263	11	< 0.10	618	23	595	90	13	77	230	130		8
70/04/15	1415	-	3.0	8.6	13.2	6.4	< 0.05	0.25	1.2	0.37	0.25	805	208	8.5	< 0.10	493	18	475	83	9	74	170	80		6
70/04/16	0950	230*	2.5	8.6	12.6	7.0	< 0.05	0.32	1.4	0.54	0.44	830	227	11	< 0.10	514	25	489	100	9	91	490	50		8
70/04/16	1435	230*	4.5	8.5	11.6	4.4	< 0.05	0.30	1.4	0.52	0.40	830	228	11	< 0.10	545	20	525	124	5	115	330	130		9
70/04/17	0955	260	4.0	8.9	11.5	7.6	0.05	0.31	1.4	0.59	0.47	885	240	10	< 0.10	553	32	521	117	16	101	3400	80		14
70/04/17	1300	270	6.0	8.7	11.7	7.1	< 0.05	0.31	1.4	0.61	0.49	900	240	9	< 0.10	593	24	569	144	18	126	1100	20		10
70/04/18	0925	270	5.5	8.6	11.9	8.0	0.05	0.18	1.5	0.54	0.40	870	245	9.4	< 0.10	622	41	581	116	41	75	230	20		7
70/04/18	1330	280	5.5	8.7	12.7	5.0	< 0.05	0.14	1.4	0.52	0.37	950	241	9.2	< 0.10	584	18	566	82	6	76	170	< 20		9
70/04/19	1135	300	4.0	8.2	13.3	7.9	0.10	0.16	1.4	0.43	0.32	805	208	8.3	< 0.10	553	11	542	96	11	85	790	110		-

* est.

Table A-15

Survey Data - Station 14

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/14	1250		1.5	8.5	12.0	4.6	< 0.05	0.03	1.0	0.12	0.03	840	202	5.5	< 0.10	535	98	437	77	77	< 1	230	< 20		6
70/04/15	0910		2.0	8.3	10.9	4.3	< 0.05	0.03	1.4	0.09	0.02	780	224	6.0	< 0.10	492	11	481	120	9	111	330	50		-
70/04/15	1315		3.0	8.4	12.6	3.2	< 0.05	0.03	1.0	0.10	0.02	775	234	7.0	< 0.10	461	16	445	104	9	95	790	< 20		3
70/04/16	0855		2.0	8.4	12.2	3.8	< 0.05	0.03	1.0	0.10	0.02	795	208	7.0	< 0.10	455	14	441	118	6	112	790	< 20		3
70/04/16	1330		4.0	8.3	11.1	5.2	< 0.05	0.03	1.1	0.11	0.02	735	198	8.0	< 0.10	447	17	430	106	6	100	1300	< 20		-
70/04/17	0905		4.0	8.5	11.2	3.8	< 0.05	0.04	1.1	0.10	0.02	725	195	6.0	< 0.10	411	22	389	89	13	76	490	50		4
70/04/17	1210		5.0	8.4	10.5	5.3	< 0.05	0.03	1.0	0.11	0.02	730	190	5.7	< 0.10	430	17	413	116	11	105	790	< 20		4
70/04/18	0830		5.0	8.4	10.8	3.5	< 0.05	0.03	1.2	0.14	0.03	685	190	7.7	< 0.10	418	11	407	43	10	33	330	< 20		3
70/04/18	1240		5.5	8.3	11.9	6.0	< 0.05	0.04	1.2	0.12	0.03	720	191	7.5	< 0.10	471	16	455	76	14	62	230	20		-
70/04/19	1030		2.0	8.0	12.4	6.1	< 0.05	0.03	1.0	0.10	0.02	625	168	9.5	< 0.10	361	11	350	44	11	33	2200	80		-
SUMMER STUDY																									
70/08/24	1120		22.5	9.1	-	18.0	< 0.05	0.6	2.6	0.40	0.15	1440	262	52	0.10	923	118	805	231	80	151	-	-	-	
70/08/25	1035		21.5	8.4	-	15.0	< 0.05	1.7	5.6	0.45	0.05	1322	252	58	< 0.10	963	162	801	199	46	153	-	-	-	
70/08/26	1130		23.5	7.7	5.8	18.0	< 0.05	1.1	4.1	0.50	0.08	1300	246	64	0.10	940	156	784	211	36	175	-	-	-	
70/08/27	1015		21.0	9.3	5.2	14.0	< 0.05	1.2	3.3	0.43	0.08	1254	252	52	< 0.10	952	76	846	197	32	165	-	-	-	
70/08/28	0950		21.0	8.9	1.4	15.0	< 0.05	1.7	3.7	0.40	0.20	1210	250	55	< 0.10	908	116	792	174	44	130	-	-	-	
70/08/29	1110		21.5	8.7	6.2	-	< 0.05	1.8	4.1	0.40	0.05	1288	254	54	< 0.10	916	186	730	128	96	32	7000	20	360	
70/08/30	0840		18.5	9.0	2.0	-	< 0.05	1.4	3.3	0.33	0.02	1272	240	63	< 0.10	938	106	832	159	56	103	940	80	270	
70/08/31	0930		20.0	8.8	2.4	-	< 0.05	2.4	3.5	0.50	0.08	1224	257	60	< 0.10	932	122	810	176	60	116	790	< 20	600	

Table A-16

Survey Data - Station 15

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Total mg/l	Sus. mg/l	Dis. mg/l	V.Tot. mg/l	V.Sus. mg/l	V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/14	1240	160	2.5	8.4	12.5	3.9	< 0.05	0.04	1.1	0.11	0.04	750	256	6.0	< 0.10	483	17	466	96	11	85	330	< 20	70	4
70/04/15	0855	160	2.0	8.2	11.4	3.7	< 0.05	0.03	1.3	0.10	0.03	660	187	6.5	< 0.10	394	12	482	110	7	103	490	20	260	-
70/04/15	1300		3.0	8.5	12.8	4.9	< 0.05	0.03	1.1	0.11	0.02	670	187	9.5	< 0.10	393	24	369	97	18	79	2300	< 20	74	4
70/04/16	0845		2.0	8.4	12.2	6.4	< 0.05	0.04	1.5	0.19	0.03	670	202	27	< 0.10	465	69	396	115	16	99	2200	50	460	3
70/04/16	1315		1.5	8.2	10.7	5.6	< 0.05	0.04	1.4	0.18	0.03	670	188	25	< 0.10	444	57	387	66	19	47	4900	20	94	-
70/04/17	0850	180	4.0	8.5	10.9	5.4	< 0.05	0.02	1.2	0.13	0.02	645	187	16	< 0.10	390	41	349	89	19	70	1700	< 20	920	2
70/04/17	1200	220	5.0	8.3	11.5	4.2	< 0.05	0.03	1.2	0.15	0.02	655	180	15	< 0.10	416	30	386	113	18	95	1300	< 20	2200	-
70/04/18	0820	200	4.0	8.3	10.9	4.9	< 0.05	0.04	1.3	0.15	0.04	600	179	17	< 0.10	404	29	375	84	22	62	130	20	580	-
70/04/18	1205		4.5	8.5	12.0	4.5	< 0.05	0.03	1.5	0.15	0.02	640	180	16	< 0.10	420	30	390	102	19	83	490	20	8500	3
70/04/19	1012	250	2.0	8.0	12.8	2.8	< 0.05	0.03	1.2	0.16	0.02	530	162	15	< 0.10	359	22	337	92	22	70	3300	230	860	-
SUMMER STUDY																									
70/08/24	1105		21.5	8.9	-	24.0	< 0.05	0.5	3.8	0.75	0.05	1476	274	64	0.10	994	12	982	253	12	241	-	-	-	
70/08/25	1045		22.0	8.7	-	21.0	< 0.05	2.3	2.8	0.80	0.20	1333	268	60	0.15	1087	182	905	268	76	192	-	-	-	
70/08/26	1115		22.5	7.9	5.6	26.0	< 0.05	2.9	4.1	1.40	0.20	1386	280	63	0.10	1050	168	882	242	40	202	-	-	-	
70/08/27	1025		20.0	9.2	2.8	24.0	< 0.05	2.2	< 0.1	0.80	0.24	1356	284	60	< 0.10	1279	138	1141	448	52	396	-	-	-	
70/08/28	0945		20.5	8.9	1.0	22.0	< 0.05	2.2	4.7	0.60	0.30	1299	482	52	< 0.10	970	112	858	146	92	54	-	-	-	
70/08/29	1130		22.0	8.4	4.8	-	< 0.05	3.4	3.7	0.68	0.35	1427	294	53	< 0.10	1043	184	859	233	104	129	2200	1300	570	
70/08/30	0835		18.0	8.9	2.5	-	< 0.05	3.0	1.2	0.90	0.32	1446	284	65	< 0.10	1068	156	912	204	116	88	7000	490	2100	
70/08/31	0940		18.0	8.4	1.5	-	< 0.05	4.0	3.4	0.90	0.10	1476	312	52	< 0.10	1019	112	907	198	50	148	4900	460	870	

Table A-17

Survey Data - Station 16

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	P-ALK /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/14	1210	160	3.5	9.1	13.4	6.1	< 0.05	0.03	1.1	0.17	0.03	470	124	11	< 0.10	337	35	302	65	18	47	130	< 20	28	16
70/04/15	0830	160	5.0	9.1	10.3	8.2	< 0.05	0.03	1.2	0.20	0.03	490	126	19	< 0.10	324	51	273	53	17	36	110	< 20	30	17
70/04/15	1215	180	5.0	9.2	13.4	7.2	< 0.05	0.03	1.1	0.21	0.02	475	124	20	< 0.10	320	61	259	51	27	24	2300	80	32	20
70/04/16	0820	310	3.5	9.0	12.6	6.6	< 0.05	0.03	1.4	0.21	0.02	490	129	24	< 0.10	350	57	293	88	18	70	2300	20	230	13
70/04/16	1235	310	2.5	8.8	10.5	6.8	< 0.05	0.03	1.4	0.23	0.02	500	126	27	< 0.10	358	62	296	94	19	75	3300	< 20	140	13
70/04/17	0825	210	3.5	9.1	10.9	7.3	< 0.05	0.04	1.3	0.21	0.02	495	128	25	< 0.10	348	76	272	88	29	59	790	20	350	13
70/04/17	1120	210	5.0	8.9	11.3	7.5	< 0.05	0.03	1.3	0.20	0.04	520	122	23	< 0.10	347	65	282	99	29	70	330	< 20	370	14
70/04/18	0755	190	3.5	9.2	12.5	7.8	< 0.05	0.02	1.3	0.20	0.03	455	127	15	< 0.10	297	40	257	50	19	31	330	< 20	860	26
70/04/18	1115	200	4.0	9.2	13.7	5.0	< 0.05	0.03	1.5	0.19	0.03	460	125	16	< 0.10	341	46	295	109	22	87	220	< 20	360	21
70/04/19	0930	200	2.0	8.8	13.5	8.2	< 0.05	0.04	1.2	0.18	0.02	425	107	13	< 0.10	297	29	268	67	29	38	790	< 20	130	10
SUMMER STUDY																									
70/08/24	1040		21.0	8.6	-	13.0	< 0.05	2.1	1.8	0.40	0.16	1428	282	51	< 0.10	885	108	777	221	82	139	-	-	-	
70/08/25	1115		23.5	8.5	-	21.0	< 0.05	2.4	2.5	0.50	0.04	1288	278	44	< 0.10	906	134	772	204	48	156	-	-	-	
70/08/26	1050		23.0	8.5	3.0	12.0	< 0.05	1.2	3.5	0.40	0.07	1277	280	53	< 0.10	895	114	781	178	30	148	-	-	-	
70/08/27	1045		21.5	9.1	5.0	16.0	0.30	1.4	1.8	0.40	0.08	1752	272	48	< 0.10	905	138	867	209	64	145	-	-	-	
70/08/28	0915		22.0	9.1	1.7	13.0	< 0.05	1.2	2.6	0.40	0.07	1166	276	56	< 0.10	1040	104	936	308	34	274	-	-	-	
70/08/29	1150		22.0	8.4	3.2	-	< 0.05	1.7	2.2	0.35	0.05	1264	294	53	< 0.10	913	146	767	178	86	92	46,000	170	720	
70/08/30	0810		19.5	9.4	4.6	-	< 0.05	1.8	0.8	0.40	0.10	1200	240	57	< 0.10	874	116	758	144	82	62	1,100	500	790	
70/08/31	1000		19.0	8.8	1.4	-	< 0.05	2.0	0.8	0.60	0.05	1254	264	65	< 0.10	805	154	651	142	74	68	13,000	490	13,000	

Table A-18

Survey Data - Station 17

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/01	1020	28	3.0	8.4	10.3	6.8	0.50	0.19	2.1	0.41	0.18	1280	226	41	0.15	1060	103	957	193	22	171	4,900	170		0.5
70/04/01	1420		7.5	8.2	10.6	7.8	0.55	0.17	2.2	0.49	0.19	1215	218	45	0.15	1080	115	965	188	25	163	2,800	330		
70/04/02	0925		4.0	8.2	10.1	8.2	0.55	0.20	2.1	0.40	0.18	1170	218	45	0.10	1040	89	951	143	21	122	24,000	140		
70/04/02	1330		6.0	8.1	11.0	7.8	0.60	0.25	2.1	0.40	0.18	1165	212	45	0.10	1020	107	913	209	25	184	17,000	3,300		
70/04/03	0945		4.0	8.2	10.6	7.9	0.50	0.18	2.1	0.39	0.16	1200	218	42	< 0.10	1030	90	940	136	17	119	2,200	330		
70/04/03	1300		3.5	8.3	11.6	8.1	0.50	0.18	2.1	0.36	0.15	1180	224	43	< 0.10	969	90	879	163	16	147	4,900	260		
70/04/04	0910		2.0	8.2	12.1	6.8	0.45	0.17	2.0	0.33	0.16	1225	234	39	< 0.10	998	79	919	160	18	142	7,900	230		
70/04/04	1255		6.0	8.1	12.6	6.3	0.50	0.17	2.0	0.37	0.16	1200	230	41	< 0.10	1040	74	966	200	13	187	1,500	230		
70/04/05	0915		5.5	8.2	9.7	6.4	0.45	0.15	1.8	0.34	0.14	1225	230	36	< 0.10	1080	78	1002	179	18	161	3,300	330		
70/04/05	1345	28	10.0	8.3	10.5	6.7	0.45	0.14	1.9	0.34	0.15	1245	232	33	< 0.10	1080	77	1003	228	13	215	2,800	80		

Table A-19

Survey Data - Station 18

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/01	1125	6.9	4.0	8.4	11.8	1.6	< 0.05	0.04	0.8	0.08	0.02	2050	270	9.5	< 0.10	1960	24	1936	316	7	309	1300	20	570	0.5
70/04/01	1508		9.2	8.3	12.0	1.9	< 0.05	0.06	0.8	0.09	0.02	2100	260	9.0	< 0.10	1860	15	1845	245	1	244	1300	20	350	
70/04/02	1000		4.0	8.3	10.8	2.5	< 0.05	0.04	0.9	0.10	0.02	2035	276	10	< 0.10	1890	11	1879	305	5	300	790	70	730	
70/04/02	1413		7.0	8.3	12.2	2.8	< 0.05	0.03	0.8	0.09	0.02	2035	268	9.0	< 0.10	1850	10	1840	309	2	307	940	< 20	560	
70/04/03	1025		3.0	8.3	11.1	2.6	< 0.05	0.05	0.8	0.08	0.03	2100	280	8.2	< 0.10	1930	17	1913	318	9	309	3300	80	720	
70/04/03	1350		5.0	8.3	12.8	2.2	< 0.05	0.04	0.8	0.08	0.03	2120	288	8.0	< 0.10	1910	18	1892	297	1	297	1300	40	370	
70/04/04	0950		3.5	8.3	12.8	1.4	< 0.05	0.03	0.9	0.07	0.03	2220	290	8.1	< 0.10	2130	14	2116	310	2	308	490	20	400	
70/04/04	1338		9.0	8.2	14.0	1.5	< 0.05	0.06	0.9	0.08	0.03	2120	296	7.0	< 0.10	2100	6	2094	343	5	338	1300	20	160	
70/04/05	0945		7.0	8.2	10.1	2.2	< 0.05	0.06	0.9	0.08	0.03	2070	288	8.0	< 0.10	1960	15	1945	327	11	316	2300	130	300	
70/04/05	1422	6.9	13.0	8.3	11.7	1.8	< 0.05	0.06	0.9	0.09	0.03	2040	284	7.0	< 0.10	1930	11	1919	420	10	410	490	< 20	150	

Table A-20

Survey Data - Station 19

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/1	BOD_5 mg/1	NO_3-N mg/1	NH_3-N mg/1	ORG-N mg/1	PHOS-T mg/1	PHOS-D mg/1	Conductivity micro-mho	T-ALK mg/1	TURB JU	Solids Set. mg/1	Solids Total mg/1	Solids Sus. mg/1	Solids Dis. mg/1	Solids V.Tot. mg/1	Solids V.Sus. mg/1	Solids V.Dis. mg/1	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/1
SPRING STUDY																									
70/04/01	1210	3.1	6.0	8.2	10.2	1.7	0.15	0.38	0.6	0.07	0.01	1880	186	9.0	< 0.10	1630	19	1611	253	8	245	1,100	< 20	400	
70/04/01	1551		8.0	8.2	10.3	2.4	0.20	0.31	0.7	0.09	0.02	1880	212	9.0	< 0.10	1600	19	1581	230	5	225	790	< 20	570	
70/04/02	1030		5.5	8.1	10.6	4.4	0.05	0.18	0.8	0.08	0.02	1505	210	12	< 0.10	1220	22	1198	209	11	198	2,300	20	380	
70/04/02	1453		6.5	8.1	10.6	2.7	0.05	0.20	0.8	0.08	0.02	1535	210	8.0	< 0.10	1220	23	1197	165	12	153	2,300	< 20	350	
70/04/03	1100		4.0	8.3	9.6	3.4	0.10	0.18	0.8	0.08	0.01	1615	220	16	< 0.10	1250	22	1228	212	9	203	2,800	20	340	
70/04/03	1425		6.0	8.1	11.0	3.0	0.05	0.17	0.8	0.08	0.02	1450	204	8.0	< 0.10	1180	20	1160	184	1	183	1,300	20	120	
70/04/04	1020		5.0	8.0	11.5	2.0	0.05	0.18	0.8	0.07	0.02	1580	202	8.0	< 0.10	1420	8	1412	76	5	71	330	20	98	
70/04/04	1420		9.0	8.1	12.1	2.6	0.05	0.24	0.7	0.07	0.02	1530	198	7.3	< 0.10	1230	9	1221	196	9	187	490	< 20	76	
70/04/05	1015		8.0	8.0	8.9	3.2	0.05	0.16	0.8	0.09	0.02	1510	204	9.0	< 0.10	1190	21	1169	204	14	190	940	80	220	
70/04/05	1455	3.1	11.5	8.1	10.2	3.0	< 0.05	0.16	0.8	0.08	0.02	1590	208	8.0	< 0.10	1210	12	1198	223	4	219	700	< 20	74	
SUMMER STUDY																									
70/08/24	1050		18.5	8.1	-	1.6	0.5	1.5	0.3	0.05	0.03	2797	122	9	< 0.10	2135	3	2132	217	2	215	-	-	-	
70/08/25	0825		19.5	7.7	-	1.6	0.4	2.1	1.1	0.40	0.10	2627	118	9	< 0.10	2290	12	2278	298	0	298	-	-	-	
70/08/26	1020		22.0	8.2	4.8	1.2	0.4	1.0	0.9	0.04	0.02	2691	122	8	< 0.10	2190	1	2189	290	0	290	-	-	-	
70/08/27	0840		21.5	8.4	4.3	1.2	0.2	0.3	0.5	0.03	0.02	2684	118	12	< 0.10	2305	16	2289	265	16	249	-	-	-	
70/08/28	1025		20.6	8.1	4.8	1.0	0.3	0.5	0.9	0.04	0.02	2498	120	11	< 0.10	2257	3	2254	193	3	190	-	-	-	
70/08/29	0950		20.0	8.1	5.2	-	0.3	0.2	0.2	0.05	0.03	2714	146	9	< 0.10	2269	15	2254	251	13	238	3,300	790	980	
70/08/30	1030		20.6	8.0	4.7	-	0.4	0.5	1.0	0.10	0.05	2556	118	12	< 0.10	2314	11	2303	277	5	272	3,300	230	2,000	
70/08/31	0815		19.4	7.8	5.5	-	0.4	1.4	2.5	0.02	0.01	2694	126	10	< 0.10	2254	15	2239	242	8	234	17,000	790	3,000	

Table A-21

Survey Data - Station 20

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/01	0735	8.7	2.1	8.3	9.8	4.7	< 0.05	0.07	1.4	0.27	0.23	685	128	10	< 0.10	532	28	504	123	10	113	790	< 20	390	
70/04/01	1555		7.0	8.1	10.7	5.7	< 0.05	0.12	1.5	0.27	0.20	820	114	10	< 0.10	558	16	542	113	6	107	1,100	110		
70/04/02	0700		2.8	8.0	10.3	3.9	< 0.05	0.11	1.4	0.29	0.19	760	128	11	< 0.10	568	-	-	110	-	-	330	< 20		
70/04/02	1435		6.0	8.1	10.3	5.9	< 0.05	0.11	1.4	0.27	0.21	815	130	12	< 0.10	541	21	520	107	10	97	2,300	20		
70/04/03	0700		1.8	8.1	10.4	5.5	< 0.05	0.08	1.5	0.26	0.18	785	130	11	< 0.10	555	19	536	145	7	138	1,400	20		
70/04/03	1435		5.0	8.2	10.6	5.5	< 0.05	0.10	1.4	0.26	0.18	775	134	11	< 0.10	557	30	527	81	9	72	790	50		
70/04/04	0655		2.0	8.0	11.7	4.7	< 0.05	0.10	1.6	0.29	0.19	795	138	12	< 0.10	703	23	680	98	8	90	330	< 20		
70/04/04	1410		7.5	8.2	12.0	5.0	< 0.05	0.13	1.4	0.26	0.18	950	152	11	< 0.10	623	8	615	141	2	139	330	< 20		
70/04/05	0710		5.5	8.1	10.2	5.0	< 0.05	0.10	1.4	0.26	0.17	835	138	11	< 0.10	619	27	592	93	22	71	490	80		
70/04/05	1315	8.7	9.5	8.1	11.1	5.8	< 0.05	0.10	1.4	0.25	0.17	795	136	12	< 0.10	642	19	623	126	9	117	220	20		
SUMMER STUDY																									
70/08/24	1215		22.0	8.7	-	7.4	0.2	0.4	< 0.1	0.30	0.07	3570	172	18	0.10	2177	33	2144	135	31	104	-	-	-	
70/08/25	0655		19.5	8.2	-	7.0	0.2	1.5	1.7	0.17	0.02	3051	172	14	< 0.10	2177	30	2147	159	10	149	-	-	-	
70/08/26	1150		25.5	8.8	4.6	9.2	0.2	1.4	1.3	0.30	0.10	3128	168	16	< 0.10	2182	10	2172	139	9	130	-	-	-	
70/08/27	0640		22.0	8.7	2.2	8.4	< 0.05	0.6	1.6	0.24	0.12	2995	174	10	< 0.10	2181	17	2164	120	17	103	-	-	-	
70/08/28	1215		20.6	8.4	1.6	6.2	0.1	0.5	1.1	0.20	0.16	2858	174	13	< 0.10	2062	9	2053	49	9	40	-	-	-	
70/08/29	0750		20.0	7.9	2.0	-	0.1	0.3	0.2	0.20	0.10	3016	176	16	< 0.10	2147	29	2118	100	21	79	12,000	40	530	
70/08/30	1150		21.7	8.7	2.4	-	0.2	1.5	1.4	0.25	0.20	3012	168	12	< 0.10	2154	13	2141	128	13	115	4,800	330	200	
70/08/31	0615		19.4	8.4	2.2	-	0.2	0.8	1.6	0.25	0.15	3168	179	17	< 0.10	2168	31	2137	75	16	59	22,000	170	310	

Table A-22

Survey Data - Station 21

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/01	0845	7.8	2.5	8.2	10.7	6.5	< 0.05	0.10	1.6	0.36	0.13	915	184	21	< 0.10	704	39	665	108	19	89	700	20		
70/04/01	1645		8.0	8.2	13.0	6.6	< 0.05	0.17	1.9	0.42	0.07	910	178	20	< 0.10	700	37	663	100	18	82	490	< 20		
70/04/02	0755		3.0	8.0	11.0	7.0	< 0.05	0.17	1.7	0.37	0.08	955	184	21	< 0.10	716	33	683	159	15	144	1,300	20		
70/04/02	1515		5.0	8.2	12.3	8.3	< 0.05	0.13	1.8	0.37	0.06	940	182	23	< 0.10	725	35	690	135	14	121	790	20		
70/04/03	0746		1.5	8.1	10.8	7.5	< 0.05	0.18	1.6	0.35	0.07	960	190	21	< 0.10	686	33	653	82	16	66	2,200	< 20		
70/04/03	1525		6.0	8.3	12.5	8.3	< 0.05	0.13	1.7	0.35	0.08	940	188	21	< 0.10	677	35	642	100	13	87	1,100	20		
70/04/04	0740		2.5	8.0	12.4	6.6	< 0.05	0.16	1.6	0.35	0.09	916	180	19	< 0.10	766	29	737	103	10	93	3,300	40		
70/04/04	1450		7.5	8.2	14.3	8.5	< 0.05	0.20	1.7	0.35	0.10	935	180	20	< 0.10	697	34	663	142	18	124	1,300	20		
70/04/05	0750		6.0	8.1	11.3	7.7	< 0.05	0.17	1.7	0.37	0.08	940	186	21	< 0.10	711	32	679	160	16	144	490	130		
70/04/05	1400	7.8	11.0	8.2	11.6	8.1	< 0.05	0.26	1.7	0.34	0.08	950	184	23	< 0.10	741	48	693	174	20	154	490	20		
SUMMER STUDY																									
70/08/24	0700		20.0	8.8	-	5.2	< 0.05	1.5	0.6	0.15	0.02	1833	316	32	< 0.10	1408	54	1354	232	22	210	-	-	-	
70/08/25	0700		20.5	8.0	-	6.4	< 0.05	1.0	1.9	0.10	0.01	1918	312	30	< 0.10	1398	44	1354	254	25	229	-	-	-	
70/08/26	0700		22.0	7.7	5.8	6.8	< 0.05	0.8	0.8	0.10	0.02	1859	300	29	< 0.10	1376	46	1330	111	18	93	-	-	-	
70/08/27	0655		22.5	8.5	4.2	7.9	< 0.05	0.5	0.9	0.13	0.03	1754	306	29	< 0.10	1398	52	1346	242	52	190	-	-	-	
70/08/28	0710		21.0	8.5	5.1	6.5	< 0.05	0.2	1.5	0.12	0.03	1748	330	32	< 0.10	-	43	-	234	7	227	-	-	-	
70/08/29	0830		18.0	8.2	5.5	-	< 0.05	0.1	1.0	0.15	0.10	1771	290	28	< 0.10	1409	54	1355	230	17	213	79,000	1,300	850	
70/08/30	1140		21.0	8.5	7.0	-	< 0.05	0.8	1.3	0.15	0.05	1854	296	29	< 0.10	1160	44	1116	50	34	16	21,000	490	1,500	
70/08/31	0610		19.5	8.2	5.3	-	< 0.05	1.0	1.2	0.13	0.02	1704	294	30	< 0.10	1348	36	1312	243	24	219	160,000	790	410	

Table A-23

Survey Data - Station 22

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
												SPRING STUDY													
70/04/01	0915	0.06	4.5	7.9	7.0	2.5	0.10	0.69	0.7	0.12	0.02	1730	438	18	< 0.10	1350	23	1327	102	9	9	700	< 20	190	
70/04/01	1710		8.0	7.6	8.4	4.5	0.10	0.60	0.6	0.10	0.03	1825	436	14	< 0.10	1360	13	1347	204	6	198	270	50		
70/04/02	0823		5.7	7.8	7.4	1.9	0.10	0.80	0.6	0.11	0.02	1820	424	21	< 0.10	1380	22	1358	195	6	189	790	20		
70/04/02	1535		7.0	7.8	8.1	3.0	0.10	0.71	0.5	0.10	0.02	765	424	19	< 0.10	1350	24	1326	185	11	174	700	< 20		
70/04/03	0805		3.5	8.0	7.9	2.8	0.10	0.63	0.7	0.11	0.05	1775	402	17	< 0.10	1350	16	1334	231	7	224	490	< 20		
70/04/03	1545		6.5	7.9	8.5	2.9	0.05	0.64	0.6	0.10	0.02	1785	420	15	< 0.10	1260	19	1241	167	1	166	940	< 20		
70/04/04	0755		4.0	7.8	8.5	2.1	0.05	0.66	0.6	0.10	0.02	1785	216	18	< 0.10	1340	13	1327	150	4	146	1,700	< 20		
70/04/04	1510		9.0	7.9	9.6	2.4	0.05	0.72	0.6	0.12	0.01	1730	424	16	< 0.10	1360	12	1348	211	11	200	330	20		
70/04/05	0805		7.5	8.0	11.2	2.6	0.05	0.72	0.7	0.11	0.05	1820	212	22	< 0.10	1380	22	1358	230	10	220	490	< 20		
70/04/05	1415	0.06	10.5	7.9	7.7	3.0	0.05	0.63	0.7	0.10	0.02	1610	420	18	< 0.10	1380	25	1355	149	12	137	490	< 20		
												SUMMER STUDY													
70/08/24	0720		17.5	9.0	-	5.5	< 0.05	0.4	1.1	0.15	0.01	2091	530	22	< 0.10	1544	37	1507	241	24	217	-	-	-	
70/08/25	0715		18.0	8.0	-	4.4	< 0.05	0.8	0.8	0.60	0.30	2154	486	18	< 0.10	1455	9	1446	265	5	260	-	-	-	
70/08/26	0715		19.5	7.6	3.8	4.6	< 0.05	1.0	0.8	0.08	0.01	2095	472	16	< 0.10	1462	11	1451	187	7	180	-	-	-	
70/08/27	0625		20.5	8.2	3.8	5.6	< 0.05	0.7	0.6	0.12	0.03	2013	482	18	< 0.10	1479	25	1454	148	20	128	-	-	-	
70/08/28	0645		19.5	8.2	4.0	4.4	0.07	0.3	1.1	0.10	0.02	1943	456	17	< 0.10	1382	13	1369	211	0	211	-	-	-	
70/08/29	0800		18.0	7.9	3.1	-	0.1	1.0	1.5	-	-	1966	476	18	< 0.10	1491	21	1470	204	13	191	4,900	3,300	2,400	
70/08/30	1210		20.5	8.2	4.2	-	0.1	1.4	0.8	0.10	0.05	2040	458	15	< 0.10	1424	15	1409	113	15	98	24,000	4,900	1,700	
70/08/31	0640		19.0	7.8	2.4	-	0.1	1.5	0.5	0.10	0.03	1950	456	15	< 0.10	1355	30	1325	235	18	217	7,900	3,300	5,100	

Table A-24

Survey Data - Station 23

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/01	0937	0.82	2.5	7.9	10.3	2.1	< 0.05	0.06	1.4	0.31	0.29	1030	116	2.0	< 0.10	771	16	755	128	8	120	2,700	< 200	660	
70/04/01	1730		7.0	8.1	11.0	2.7	< 0.05	0.07	1.3	0.31	0.27	1100	120	2.0	< 0.10	797	23	774	148	6	142	800	< 200	-	
70/04/02	0840		2.5	7.9	10.2	2.0	< 0.05	0.07	1.3	0.28	0.27	1105	126	2.2	< 0.10	800	15	785	130	5	125	1,700	< 20	820	
70/04/02	1550		7.0	8.1	11.2	2.2	< 0.05	0.07	1.2	0.27	0.24	1100	132	3.0	< 0.10	796	5	791	151	< 1	151	1,300	< 20	800	
70/04/03	0820		0.5	7.9	10.8	1.9	< 0.05	0.06	1.2	0.26	0.23	1176	146	2.1	< 0.10	917	10	907	152	4	148	49,000	< 200	1,600	
70/04/03	1600		5.0	8.2	11.6	2.0	< 0.05	0.05	1.1	0.25	0.23	1230	154	4.5	< 0.10	891	8	883	152	< 1	152	13,000	< 200	1,500	
70/04/04	0808		0.5	7.9	11.6	1.8	< 0.05	0.09	1.2	0.31	0.28	1285	160	3.2	< 0.10	1,100	1	1,099	129	< 1	129	1,300	< 20	3,900	
70/04/04	1525		11.0	8.2	12.4	2.2	< 0.05	0.09	1.4	0.35	0.32	1340	156	1.9	< 0.10	924	< 1	924	155	< 1	155	1,300	< 20	4,900	
70/04/05	0818		5.2	7.9	8.5	3.1	< 0.05	0.08	1.7	0.59	0.54	1220	156	3.0	< 0.10	834	10	824	116	1	115	1,300	< 20	6,800	
70/04/05	1435	0.82	13.0	8.1	10.3	3.8	< 0.05	0.10	1.7	0.62	0.58	1155	148	4.0	< 0.10	831	7	824	134	2	132	1,400	< 20	4,300	
70/04/16	1645	-	10.0	-	0.8	130										1150	180	970	434	122	312	140,000	70,000	9,000,000	
70/04/17	0825	-	4.5	7.6	0.4	> 8456	0.05	27	27.4	7.6	5.4	1420	239	125	< 0.10	1460	140	1,320	631	108	523	490,000	490,000	5,400,000	
70/04/18	0845	-	5.0	7.4	0.8	> 7800	0.05	35	40.6	7.6	5.4	1480	276	96	< 0.10	1731	116	1,615	736	104	632	230,000	230,000	20,000,000	
70/04/18	1500	-	6.0	7.6	0.3	-																1,300,000	1,300,000	17,000,000	
70/04/19	1040	-	2.5	7.2	6.4	> 920	0.80	12	9.6	2.2	1.6	785	106	58	< 0.10	712	68	644	220	68	152	70,000	33,000	3,000,000	

Table A-25

Survey Data - Station 24

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/14	1425		6.0	8.7	14.2	13	0.15	4.4	2.5	2.1	1.8	1245	229	11	< 0.10	966	23	943	100	18	82	7,900	1,700		12
70/04/15	0735		6.0	8.6	10.4	LA	0.15	3.8	2.4	1.8	1.5	1330	219	18	< 0.10	899	35	864	165	24	141	7,000	790		7
70/04/15	1400		6.0	8.6	9.7	20	0.20	3.8	2.3	2.0	1.5	1230	211	20	< 0.10	854	44	810	148	30	118	11,000	3,300	1,400	5
70/04/16	0730		3.0	8.4	9.0	7.4	0.20	3.2	2.1	1.3	1.2	1245	219	22	< 0.10	844	42	802	134	19	115	33,000	17,000	9,300	3
70/04/16	1350		6.5	8.4	12.2	17	0.25	2.3	2.6	1.1	0.85	1020	219	18	< 0.10	846	63	783	154	21	133	7,900	3,300	3,400	2
70/04/17	0705		5.5	8.4	11.0	12	0.30	1.9	2.0	0.79	0.61	1210	220	24	< 0.10	817	53	764	147	26	121	49,000	11,000	100,000	2
70/04/17	1335		8.5	8.3	12.0	7.4	0.30	1.0	2.0	0.78	0.55	1210	240	22	< 0.10	805	41	723	103	21	82	3,300	2,300	8,000	-
70/04/18	0705		6.5	8.3	9.5	5.0	0.40	0.87	2.3	0.72	0.55	1260	224	19	< 0.10	767	28	739	90	23	67	17,000	4,900	9,500	-
70/04/18	1330		6.0	8.3	9.8	7.0	0.30	0.80	2.0	0.70	0.51	1300	230	18	< 0.10	855	31	824	170	15	155	13,000	7,900	5,600	-
70/04/19	0915		4.0	8.0	9.9	10	0.25	0.65	2.1	0.59	0.42	1140	211	39	< 0.10	738	54	684	47	34	13	22,000	11,000	16,000	-

Table A-26

Survey Data - Station 25

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/14	1330	24	4.0	8.6	12.3	4.4	< 0.05	0.04	1.0	0.21	0.12	990	201	14	< 0.10	653	21	632	102	10	92	210	< 20		5
70/04/15	0720	29	5.5	8.6	11.4	4.8	< 0.05	0.04	1.0	0.22	0.13	1020	212	16	< 0.10	637	26	611	104	13	91	1,300	< 20		8
70/04/15	1345	22	4.0	8.6	9.6	4.5	< 0.05	0.03	1.1	0.22	0.13	1040	201	16	< 0.10	661	27	634	135	8	127	1,700	50		6
70/04/16	0715	-	7	8.6	10.2?	1.5	0.15	0.04	1.0	0.22	0.13	1055	193	16	< 0.10	652	25	627	101	6	95	4,600	230		5
70/04/16	1345	-	6.0	8.5	12.7	3.7	0.10	0.03	1.1	0.22	0.15	1185	193	33	< 0.10	669	29	640	130	4	126	3,300	50		6
70/04/17	0655	40	5.5	8.2	10.9	3.3	0.15	0.05	1.2	0.27	0.18	965	167	22	< 0.10	581	51	530	38	11	27	7,900	2,300		-
70/04/17	1325	42	5.0	8.1	10.9	5.0	0.20	0.16	1.7	0.37	0.24	895	163	23	< 0.10	549	50	499	84	13	71	23,000	2,300		-
70/04/18	0655	56	6.0	8.3	10.5	3.2	0.20	0.06	1.5	0.27	0.17	785	139	25	< 0.10	481	47	434	65	13	52	7,900	2,300		-
70/04/18	1320	52	6.0	8.3	10.4	2.6	0.55	0.03	1.1	0.23	0.13	810	145	23	< 0.10	482	43	439	66	15	51	1,800	460		-
70/04/19	0855	110	3.0	7.8	10.4	2.1	0.75	0.09	1.5	0.32	0.18	710	150	33	< 0.10	494	50	444	94	27	67	13,000	4,900		-

Table A-27

Survey Data - Station 26

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/14	1225	-	5.0	8.4	12.5	2.6	< 0.05	0.03	0.9	0.19	0.14	840	121	5.5	< 0.10	630	12	618	110	9	101	130	< 20		2
70/04/15	1045	-	4.0	8.3	10.8	4.2	< 0.05	0.03	1.1	0.21	0.15	918	179	7.5	< 0.10	682	15	667	122	4	118	490	< 20		-
70/04/15	1440	-	4.5	8.5	12.1	3.9	< 0.05	0.03	1.4	0.21	0.15	900	135	6.5	< 0.10	679	19	660	93	11	82	130	20		3
70/04/16	1015	-	3.0	8.6	12.7	4.7	< 0.05	0.07	1.3	0.25	0.14	785	179	12	< 0.10	537	23	514	120	8	112	1,300	80		6
70/04/16	1510	14.1	5.5	8.3	11.2	4.4	< 0.05	0.06	1.4	0.25	0.15	860	156	13	< 0.10	656	25	631	131	17	114	170	50		-
70/04/17	1020	-	5.0	8.4	11.6	3.9	< 0.05	0.03	1.2	0.22	0.13	980	135	9.0	< 0.10	751	29	728	132	16	116	2,200	80		1
70/04/17	1320	-	6.0	8.5	12.4	4.9	< 0.05	0.04	1.2	0.23	0.13	885	155	9.7	< 0.10	634	24	610	144	14	130	330	20		3
70/04/18	0955	-	6.0	8.3	11.1	3.5	< 0.05	0.04	1.3	0.21	0.12	1060	131	9.3	< 0.10	772	21	751	78	18	60	1,300	20		-
70/04/18	1400	-	6.0	8.3	11.7	1.8	< 0.05	0.03	1.4	0.21	0.12	1065	131	11	< 0.10	834	27	807	165	13	152	130	< 20		-
70/04/19	1205	-	4.5	7.8	12.5	3.5	< 0.05	0.03	1.2	0.19	0.14	995	127	7.2	< 0.10	770	19	751	116	19	97	330	< 20		-

Table A-28

Survey Data - Station 27

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. Cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/14	1440	-	2.0	8.9	> 15	10	0.10	8.7	2.0	5.8	5.4	980	155	9.0	< 0.10	689	24	665	108	19	84	210	< 20		15
70/04/15	1000	-	3.0	8.5	12.3	9.0	0.10	6.3	1.7	6.3	5.4	915	162	10	< 0.10	585	20	565	103	14	89	70	20		5
70/04/15	1405	25.7	4.0	8.8	13.8	8.9	0.10	7.0	1.7	6.3	5.4	900	144	10	< 0.10	563	20	543	82	18	64	130	< 20		8
70/04/16	0940	-	2.0	8.3	12.6	6.2	0.10	6.3	1.9	6.8	5.0	925	152	14	< 0.10	569	28	541	73	15	58	460	< 20		-
70/04/16	1420	33.5	5.0	8.3	12.1	13	0.20	6.0	2.3	5.4	5.0	930	148	16	< 0.10	616	27	589	110	15	95	220	< 20		-
70/04/17	0945	-	4.0	8.4	11.5	8.4	0.20	6.0	2.2	5.0	5.0	970	144	16	< 0.10	629	43	586	107	24	83	170	< 20		-
70/04/17	1255	-	6.0	8.4	13.5	7.8	0.25	6.3	2.2	5.0	5.0	975	145	16	< 0.10	658	41	617	89	33	56	70	20		2
70/04/18	0920	-	5.5	8.3	12.9	13	0.25	5.6	2.4	5.0	4.5	1075	154	12	< 0.10	739	28	711	121	24	97	230	< 20		-
70/04/18	1325	-	5.5	8.6	15.0	14	0.60	5.6	2.4	4.5	4.0	1115	158	12	< 0.10	784	38	746	111	29	82	330	< 20		5
70/04/19	1125	-	3.0	8.3	14.7	12	1.10	4.4	2.4	4.0	3.6	1170	151	13	< 0.10	834	35	799	114	35	79	3,300	< 20		-

Table A-29

Survey Data - Station 28

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
												SPRING STUDY													
70/04/14	1320		3.0	8.2	11.5	9.2	0.05	0.57	1.6	0.25	0.15	590	164	7.2	< 0.10	408	18	390	80	15	65	460	< 20	230	-
70/04/15	0935		5.0	8.0	10.9	7.6	0.10	0.41	1.3	0.27	0.16	580	162	7.0	< 0.10	357	15	342	99	11	88	490	< 20	50	-
70/04/15	1340		5.0	8.2	12.4	7.1	0.10	0.33	1.4	0.30	0.15	575	159	9.5	< 0.10	365	18	347	100	6	94	490	< 20	68	-
70/04/16	0920		3.0	8.5	12.6	3.4	< 0.05	0.04	1.3	0.18	0.09	820	138	8.0	< 0.10	503	13	490	102	10	92	490	< 20	120	10
70/04/16	1350		5.0	8.4	11.7	6.2	< 0.05	0.02	1.3	0.15	0.11	860	245	8.5	< 0.10	570	15	555	105	8	93	460	< 20	420	2
70/04/17	0925		4.0	8.4	12.0	2.8	0.10	0.07	1.7	0.18	0.09	750	214	7.0	< 0.10	484	28	456	136	17	119	330	50	500	3
70/04/17	1230		6.0	8.4	13.2	3.0	0.10	0.17	1.4	0.18	0.10	625	183	5.3	< 0.10	417	18	399	118	18	100	80	< 20	230	1
70/04/18	0850		5.5	8.6	13.7	5.5	< 0.05	0.19	1.7	0.19	0.08	550	162	6.2	< 0.10	397	13	384	144	13	131	80	< 20	2,300	8
70/04/18	1300		6.0	8.6	14.3	7.6	< 0.05	0.05	1.7	0.20	0.07	578	163	7.5	< 0.10	385	13	372	96	13	83	230	20	480	5
70/04/19	1100		4.0	8.1	14.2	7.0	0.05	0.20	1.5	0.17	0.06	540	154	9.0	< 0.10	353	23	330	84	23	61	240	< 20	910	-

Table A-30

Survey Data - Station 29

James River - South Dakota

Date Yr.Mo.Day	Time Mlty.	Flow cfs	Temp. cent.	pH SU	DO mg/l	BOD_5 mg/l	NO_3-N mg/l	NH_3-N mg/l	ORG-N mg/l	PHOS-T mg/l	PHOS-D mg/l	Conductivity micro-mho	T-ALK mg/l	TURB JU	Solids Set. mg/l	Solids Total mg/l	Solids Sus. mg/l	Solids Dis. mg/l	Solids V.Tot. mg/l	Solids V.Sus. mg/l	Solids V.Dis. mg/l	T-Coliform MPN/100ml	F-Coliform T/100 ml	F-Strep. /100ml	P-ALK mg/l
SPRING STUDY																									
70/04/14	1300	-	2.5	9.0	13.1	3.6	< 0.05	0.01	1.0	0.16	0.05	520	121	11	< 0.10	353	20	333	74	9	65	90	< 20		12
70/05/15	0920	-	4.0	9.1	11.5	5.2	< 0.05	0.02	1.1	0.16	0.05	685	151	11	< 0.10	429	22	407	81	8	73	230	< 20		32
70/05/15	1325	-	4.0	9.1	13.1	5.6	< 0.05	0.04	1.2	0.17	0.05	695	150	12	< 0.10	425	23	402	89	14	75	270	< 20		28
70/05/16	0905	45	3.5	8.9	12.5	3.1	< 0.05	0.06	1.3	0.18	0.03	710	159	14	< 0.10	435	25	410	81	9	72	490	< 20		15
70/05/16	1335	-	4.5	8.8	10.9	4.2	< 0.05	0.03	1.4	0.17	0.03	695	155	13	< 0.10	458	23	435	81	7	74	80	< 20		13
70/05/17	0910	-	4.0	9.0	11.2	3.2	< 0.05	0.03	1.1	0.15	0.04	655	152	15	< 0.10	401	35	366	79	23	56	400	< 20		14
70/05/17	1215	-	5.5	8.8	11.1	2.8	< 0.05	0.03	1.2	0.18	0.06	655	142	15	< 0.10	424	33	391	106	15	91	1,300	60		9
70/05/18	0840	-	5.0	8.7	10.6	6.1	< 0.05	0.04	1.8	0.27	0.11	680	158	13	< 0.10	468	21	447	135	17	118	790	130		8
70/05/18	1245	-	5.0	8.7	10.7	2.4	< 0.05	0.05	1.5	0.29	0.12	685	39	13	< 0.10	468	38	430	124	19	105	1,300	170		6
70/05/19	1040	-	4.0	8.1	12.3	6.1	0.10	0.08	1.6	0.24	0.10	680	161	13	< 0.10	419	19	400	80	19	61	490	170		-
SUMMER STUDY																									
70/08/24	1130		23.0	9.1	-	14.0	< 0.05	0.8	3.6	0.55	0.23	1856	320	41	< 0.10	2135	56	2132	217	56	237	-	-	-	
70/08/25	1030		21.5	8.6	-	15.0	< 0.05	1.5	2.9	0.40	0.01	1723	316	38	< 0.10	1092	61	1031	193	29	164	-	-	-	
70/08/26	1140		24.0	7.8	3.1	18.0	< 0.05	1.7	3.2	0.70	0.40	1691	338	35	< 0.10	1080	52	1028	197	17	180	-	-	-	
70/08/27	1000		22.0	9.2	1.6	13.0	< 0.05	1.4	2.2	1.10	0.50	1605	348	28	< 0.10	1105	46	1059	250	24	226	-	-	-	
70/08/28	1000		21.5	9.0	1.2	12.0	< 0.05	0.5	2.2	0.60	0.40	1505	358	38	< 0.10	1130	54	1076	164	38	126	-	-	-	
70/08/29	1105		22.0	8.6	4.4	-	< 0.05	2.0	0.5	0.76	0.55	1705	364	37	< 0.10	919	70	849	242	54	188	350,000	330	300	
70/08/30	0845		20.0	9.0	2.4	-	< 0.05	1.5	2.4	0.90	0.50	1698	356	50	< 0.10	1178	96	1082	170	66	104	1,600,000	460	980	
70/08/31	0920		20.0	8.8	2.6	-	< 0.05	2.0	2.4	0.80	0.35	1686	380	46	< 0.10	1210	74	1136	254	40	214	70,000	< 200	660	

APPENDIX B

Applicable Water Quality Criteria and Beneficial Water Uses

Water quality criteria based on specific beneficial uses have been adopted by South Dakota. Surface water quality for each specific benefical use are presented in this section.

In instances where the flow in the stream is reduced to zero or where the stream flow is less than the daily average flow of waste discharges, if such discharges are present, the stream then falls into the Intermittent Stream category. The stream shall remain in the Intermittent Stream category until the flow in the stream exceeds the average waste flow for a period of seven consecutive days. The stream shall revert to the original use category at that time. For uses 2a and 2c under the category Fish Life Propagation, the stream shall not revert to the Intermittent Stream category during low flows regardless of whether wastes are being discharged to the stream or not.

CATEGORY NUMBER 1 - DOMESTIC WATER SUPPLY

Definition: Waters in this category are suitable for use for human consumption, culinary or food processing purposes, and other household purposes after suitable treatment by conventional processes.

General: Waters in this category shall be such that with treatment consisting of coagulation, sedimentation, filtration, and disinfection, or equivalent, the treated water in all respects will meet the mandatory requirements of the latest edition of "Drinking Water Standards," prepared by the Public Health Service, U.S. Department of Health, Education and Welfare.

Criteria apply to the untreated water.

Criteria:

Parameter	Limit	Frequency Code
Dissolved solids, total	1000 mg/l	c
Coliform organisms	Not to exceed a MPN or MF of 5000/100 mg as a monthly average value; nor to exceed this value in more than 20% of the samples examined during any one month; nor to exceed 20,000/100 ml in more than 5% of the samples examined in any one month.	-
Nitrates	10 mg/l (as N) or 45 mg/l (as NO_3)	a
pH	Greater than 6.0 and less than 9.0	a

CATEGORY NUMBER 2 - FISH LIFE PROPAGATION

Description: All waters in this category will provide a satisfactory environment for the class of fish described and for all other aquatic life essential to the maintenance and propagation of fish life. There are separate quality criteria for each of the following five subcategories:

a. Cold water permanent	All lakes, streams, and reservoirs capable of supporting a good permanent trout fishery from natural reproduction or fingerling stocking.
b. Cold water marginal	All lakes, streams, and reservoirs suitable for supporting stockings of catchable size trout during portions of the year but - due to low flows, siltation, and warm temperatures - not suitable for a permanent cold water fish population.
c. Warm water permanent	Lakes, streams, and reservoirs suitable for permanent maintenance of warm water fish including walleyes, black bass, or bluegills.
d. Warm water semipermanent	Lakes, streams, and reservoirs suitable for quality warm water fishery but suffering occasional fish kills because of critical natural conditions. Principal species in these waters include walleyes, perch, northern pike, or channel catfish.
e. Warm water marginal	Lakes, streams, and reservoirs suitable for supporting more tolerant species of fish with frequent stocking and intensive management. Principal species in these waters include perch, northern pike, or bullheads.

Criteria:

Pesticides, herbicides and related compounds shall be treated as toxic materials and taste- and odor-producing chemicals.

Temperatures shall not be affected by more than 4°F. in subcategories a, be and c; 5°F. for subcategory d; and 8°F. in subcategory e.

Specific criteria for each of the described subcategories are presented on the following page. The frequency code shown applies to all categories.

Criteria: (Fish Life Propagation - Cont.)

Parameter	Subcategories a	b	c	d	e	Frequency Code
Chlorides	100	-	-	-	-	c
Cyanides	0.02	0.02	0.02	0.02	0.05	a
Dissolved oxygen (greater than)	6.0	5.0	5.0*	5.0**	2.0	a
Hydrogen sulfide	0.3	0.5	0.5	1.0	1.0	a
Iron (total)	0.2	0.2	0.2	0.2	-	b
pH	6.6-8.6	6.5-8.8	6.5-8.8	6.3-9.0	6.0-9.3	a
Suspended solids	30	90	90	90	150	c
Temperature (degrees F.)	68	75	80	90	93	a
Turbidity (j.c.u.)	25	50	50***	100	-	c

Note: All values in mg/l unless indicated otherwise.

* 6.0 mg/l for Big Stone Lake & Lake Traverse in April and May.

** When flows in the Big Sioux River at Brandon equal or exceed the flows given below, the respective criterion of 4.0 mg/l or 5.0 mg/l dissolved oxygen applies from Klondike Dam to the lower end of Sioux Falls Diversion Ditch:

Season	4.0 mg/l D.O. (flow - cfs) 1970	1980	5.0 mg/l D.O. (flow - cfs) 1970	1980
Summer (June 15th - Sept.15th)	90	105	160	200
Fall (Sept. 15th - Dec.15th)	35	45	45	55
Winter (Dec. 15th -March 15th)	60	70	70	80
Spring (March 15th - June 15th)	35	45	45	55

When flows at Brandon are less than those indicated for 4 mg/l D.O., the "Intermittent Stream" category (7) applies.

*** 25 j.c.u. for Big Stone Lake and Lake Traverse.

CATEGORY NUMBER 3 - RECREATION

Definitions: These waters are suitable for swimming, water skiing, skin diving, fishing, boating, sailing, picnicking, and other water-related kinds of recreation. There are separate criteria for each of the following sub-categories:

a. Immersion Sports - includes swimming, water skiing, skin diving, and other water sports.
b. Limited Contact Recreation - includes fishing, boating, sailing, picnicking, and other water related recreation.

General: The criteria for recreation normally will apply only during the recreation season. However, if the receiving waters are used extensively for winter recreation, the criteria for limited contact recreation shall apply during the winter months.

Criteria:

Parameter	Limit	Frequency Code
a. Immersion Sports		
Coliform organisms	Not to exceed a MPN or MF of 1000/100 ml as a monthly average; nor to exceed this value in more than 20% of the samples examined in any one month; nor to exceed 2400/100 ml on any one day during the recreation season.	-
Fecal coliform organisms	Not to exceed a concentration of 200/100 ml as a monthly average; nor to exceed this value in more than 20% of the samples examined in any one month; nor to exceed 500/100 ml on any one day during the recreation season.	-
Dissolved oxygen	Greater than 2 mg/l	a
b. Limited Contact Recreation		
Coliform organisms	Not to exceed a MPN or MF of 5000/100 ml as a monthly average; nor to exceed this value in more than 20% of the samples examined in any one month; nor to exceed 10,000/100 ml on any one day during the recreation season.	-

b. Limited Contact Recreation (cont.)

Parameter	Limit	Frequency Code
Fecal coliform organisms	Not to exceed a concentration of 1000/100 ml as a monthly average; nor to exceed this value in more than 20% of the samples examined in any one month; nor to exceed 2000/100 ml on any one day during the recreation season.	-
Dissolved oxygen	Greater than 2 mg/l	a

CATEGORY NUMBER 4 - WILDLIFE PROPAGATION AND STOCK WATERING

Definition: These waters are satisfactory as habitat for aquatic and semi-aquatic wild animals and fowl and suitable for watering domestic and wild animals and fowl.

General: No pollution shall be permitted in these waters which will cause inhibited growth, physical impairment, or injurious effects on wild or domestic animals and fowl normally inhabiting or using the water.

Criteria:

Parameter	Limit	Frequency Code
Alkalinity, total (as $CaCO_3$)	750 mg/l	c
Dissolved solids, total	2500 mg/l	c
Conductivity	4000 micromhos/cm @ 25°C.	c
Nitrates (as NO_3)	50 mg/l	b
pH	Greater than 6.0 and less than 9.5	a

CATEGORY NUMBER 5 - IRRIGATION

Definition: These waters are suitable for irrigating farm and ranch lands, gardens, and recreation areas.

General: Since the suitability of a water for irrigation primarily is dependent on characteristics of the irrigated soil, only ranges for upper limits of pollutional parameters affecting irrigation are specified. The required water quality will be established by the Committee on an individual basis after consideration of appropriate soil test results and other pertinent information.

Criteria for coliform organisms only apply to water used to irrigate root crops or recreation areas.

Irrigation criteria apply during the irrigation season only. In the enforcement of these criteria, the Committee will specify whether total dissolved solids or electrical conductivity shall be used and whether sodium adsorption ratio or soluble sodium percentage shall be used; it being understood that the criteria for both total dissolved solids and electrical conductivity reflect one pollution characteristic and the criteria for both sodium adsorption ratio and soluble sodium percentage reflect another characteristic.

Criteria:

Parameter	Limit	Frequency Code
Coliform organisms	The MPN or MF shall not exceed 5000/100 ml as a monthly average; nor shall the number exceed 10,000/100 ml in any one sample (root crops and recreation).	-
Fecal coliform organisms	The concentration shall not exceed 1000/100 ml as a monthly average; nor shall the number exceed 2000/100 ml in any one sample (root crops and recreation).	-
Dissolved solids, total	700 to 1500 mg/l	d
Conductivity	1000 to 2500 micromhos/cm @ 25°C.	d
Sodium adsorption ratio*	10 to 26	d
Soluble sodium percentage**	30 to 70%	d

Note: When two values are given, they indicate the range in permissable limit.

* Calculated from: $SAR = \frac{Na}{(\frac{1}{2}(Ca + Mg))^{\frac{1}{2}}}$ where Na, Ca, and Mg are concentrations of sodium, calcium, and magnesium in milliequivalents (meq) per liter of water.

** Calculated from: $Na\% = \frac{100\ Na}{Na + Ca + Mg + K}$ where Na, Ca, Mg and K are concentrations of sodium, calcium, magnesium, and potassium in meq/liter.

CATEGORY NUMBER 6 - COMMERCE AND INDUSTRY

Definition: This category includes all waters suitable for use as cooling water, industrial process water, navigation, and production of hydroelectric power.

General: Industries requiring high quality water are expected to provide treatment facilities to produce water of the desired quality. Criteria presented apply to the untreated water. Waters used for food processing shall conform to the criteria established for Category Number 1 - Domestic Water Supply.

Criteria:

Parameter	Limit	Frequency Code
Dissolved solids, total	2000 mg/l	c
pH	Greater than 6.0 and less than 9.5	a

CATEGORY NUMBER 7 - INTERMITTENT STREAM

Definition: This category includes most watercourses with zero flow; flows less than the daily average waste flow; or with flows less than the daily average irrigation return flow.

General: All wastes discharged to streams, lakes, or reservoirs in this category shall have been subjected to at least secondary treatment or its equivalent; and, if prescribed by the Committee, approved tertiary treatment shall be provided. Industrial or other waste waters not amenable to biological treatment shall be physically or chemically treated as directed by the Committee after consideration of downstream land and water uses. The criteria for coliform organisms may be waived at the discretion of the Committee if downstream land and water uses do not warrant such control. These criteria also apply to irrigation return flows and other similar waters discharged to lakes, streams, or reservoirs.

Criteria:

Parameter	Limit	Frequency Code
Coliform organisms	Not to exceed a MPN or MF of 20,000/100 ml as a monthly average value; nor to exceed this value in more than 20% of the samples tested in any one month; nor to exceed 50,000/100 ml in any of the samples tested.	-
Biochemical oxygen demand (5 day 20°C.)	30 mg/l	b
pH	Greater than 6.0 and less than 9.5	a
Suspended solids	30 mg/l	b

FREQUENCY CODE	SAMPLING BASE AND ALLOWABLE DEVIATIONS
a	The value specified shall be maintained at all times without exception.
b	The value specified shall be maintained at all times based on results of composite samples collected over a 24-hour sampling period. In addition, the concentration of the pollution characteristic shall not exceed 1.75 times the value specified for the material in any one grab sample collected during the sampling period.
c	The value specified shall be maintained at all times based on the average of composite or grab samples collected in a manner approved by the Committee over a five-day period. In addition, the concentration of the pollution characteristic shall not exceed two times the value specified for the material in any one grab sample collected during the sampling period.
d	The value specified shall be maintained at all times based on the average of composite or grab samples collected in a manner approved by the Committee over a 30-day period. In addition, the concentration of the pollution characteristic shall not exceed three times the value specified for the material in any one grab sample collected during the sampling period.

The designated beneficial uses of the James River and tributaries involved in this investigation are listed below:

1. James River, Missouri River to Huron
   - Cold water marginal fishery
   - Limited contact recreation
   - Wildlife propagation and stock watering
   - Irrigation

2. James River, Huron to James Diversion Dam
   - All in (1)
   - Domestic water supply

3. James River, Diversion Dam to ND-SD border.
   - Same as (1)

4. Firesteel Creek
   - Warm water permanent fishery
   - Imersion sports
   - Limited contact recreation
   - Wildlife propagation and stock watering
   - Irrigation

5. All Other Tributaries
   - Wildlife propagation and stock watering
   - Irrigation