

**WATER QUALITY STATUS REPORT • REPORT NO. 75**

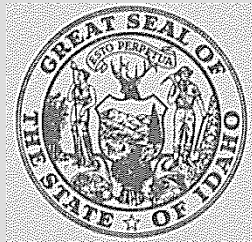
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**SANTA CREEK  
EFFLUENT LIMITATION STUDY  
Benewah County, Idaho  
1986**

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Prepared by  
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&  
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**Department of Health & Welfare  
Division of Environment  
Boise, Idaho**

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## ABSTRACT

A water quality study was initiated on Santa Creek to determine if new effluent limitations are necessary for the discharge from the City of Emida wastewater lagoon. The City of Emida provides secondary treatment of domestic sewage in an unaerated facultative lagoon that discharges to Santa Creek. Santa Creek has designated beneficial uses that include: agricultural water supply, primary contact recreation and secondary contact recreation. Future beneficial uses are salmonid spawning and cold water biota.

Monitoring upstream and downstream of the lagoon discharge to Santa Creek did not show any significant degradation of water quality. However, there were water quality violations in Santa Creek upstream, as well as downstream, of the lagoon outfall. These violations were of dissolved oxygen and temperature for cold water biota and salmonid spawning.

An examination of the ability of Santa Creek to provide a 50:1 dilution, to protect cold water biota and salmonid spawning, was performed using the data collected from this study and historical data from the St. Maries River, to which Santa Creek is a tributary. The correlation between the two sets of data was good ( $r^2=0.81$ ), and the analyses of the data indicate that for a median period from August 18 through October 15 the 50:1 dilution may not be attainable in Santa Creek.

Nonpoint source control strategies may be necessary to fully develop the future beneficial uses. Currently, the State of Idaho Grants Program is working with the Emida Water and Sewer Association to upgrade the wastewater treatment lagoon. The City of Emida should be required to comply with the existing NPDES permit and be phased into a requirement for a non-discharge period.

## INTRODUCTION

The purpose of this study was to document the impact that the City of Emida wastewater discharge may have on existing and future beneficial uses. From this data new effluent limitations and dilution requirements may be necessary to protect beneficial uses. Santa Creek has designated beneficial uses that include agricultural water supply, primary contact recreation and secondary contact recreation. Future beneficial uses are salmonid spawning and cold water biota.

A revised NPDES discharge permit for the City of Emida, to be issued in the future, may include new effluent limitations should the discharge be found detrimental to existing beneficial uses. The existing permit has monthly average limitations of 70 mg/l suspended solids, 45 mg/l BOD, 100 fecal coliform/100 ml and 65% removal of suspended solids and BOD. The existing permit contains no dilution requirements during periods of low stream flow. It has been customary to set a 50:1 dilution requirement for a discharge entering a water designated for cold water biota. A 10:1 dilution is considered adequate for most other beneficial uses.

Water quality data collected in the spring and summer of 1978 indicated that impact from the lagoon during summer low flow was minimal (Idaho Department of Health and Welfare, 1980). This conclusion was obvious, since the lagoon did not discharge from April through September. The 1980 report showed water quality standards violations of temperature, turbidity, and fecal coliform in Santa Creek when the lagoon was not discharging. Charlie Creek, a tributary of Santa Creek, was also reported to have fecal coliform violations. Upon review of historic data, specific violations of standards for existing beneficial uses could not be found.

Population of the community is 104 and has not changed considerably since 1978. As such, wastewater volumes from the lagoon should be similar to those in 1978.

Emida has been considered eligible for assistance in performing an engineering study to evaluate improvements to the collection and treatment system. At this time, effluent sampling, Discharge Monitoring Reports (DMR) and chlorination are not being done, nor have they been done in the past. Therefore, it is not known if improvements are needed in order to meet their existing and or future NPDES permit. The only knowledge of treatment capabilities of the lagoon is from effluent grab samples taken during the 1978 study and samples taken during this 1986 study.

The Santa Creek watershed covers approximately 70 square miles. Its streams flow northeast to the confluence with the St. Maries River. Elevations range from 4000 to 5000 feet along the Palouse divide to 2800 feet at the valley floor near Emida and approximately 2600 ft. at the confluence with the St. Maries River. Snow accumulation is considerable in the upper watershed. Average precipitation ranges from 35 inches in the upper watershed to approximately 25 inches in the lower watershed. The watershed is heavily forested (approx. 90%) except for the valley floor which is open pasture and agricultural land.

Peak runoff is expected during snow melt in early spring (March-April). The volume of summer flow is likely to be dependent upon the duration and intensity of variable spring rain and occasional summer rain. Low flow conditions in the stream usually occur during the mid-summer and fall.

The specific objectives of the study are as follows: 1) estimate the summer low flow regime of Santa Creek; 2) estimate the discharge from the Emida wastewater lagoon to Santa Creek during summer low flow; 3) determine a time period, or stream flow, during which lagoon containment would be necessary so as not to fall below a 50:1 dilution; and 4) if the lagoon does discharge during summer low flow periods, sample pertinent water quality parameters in Santa Creek to determine the degree of impact.

## MATERIALS AND METHODS

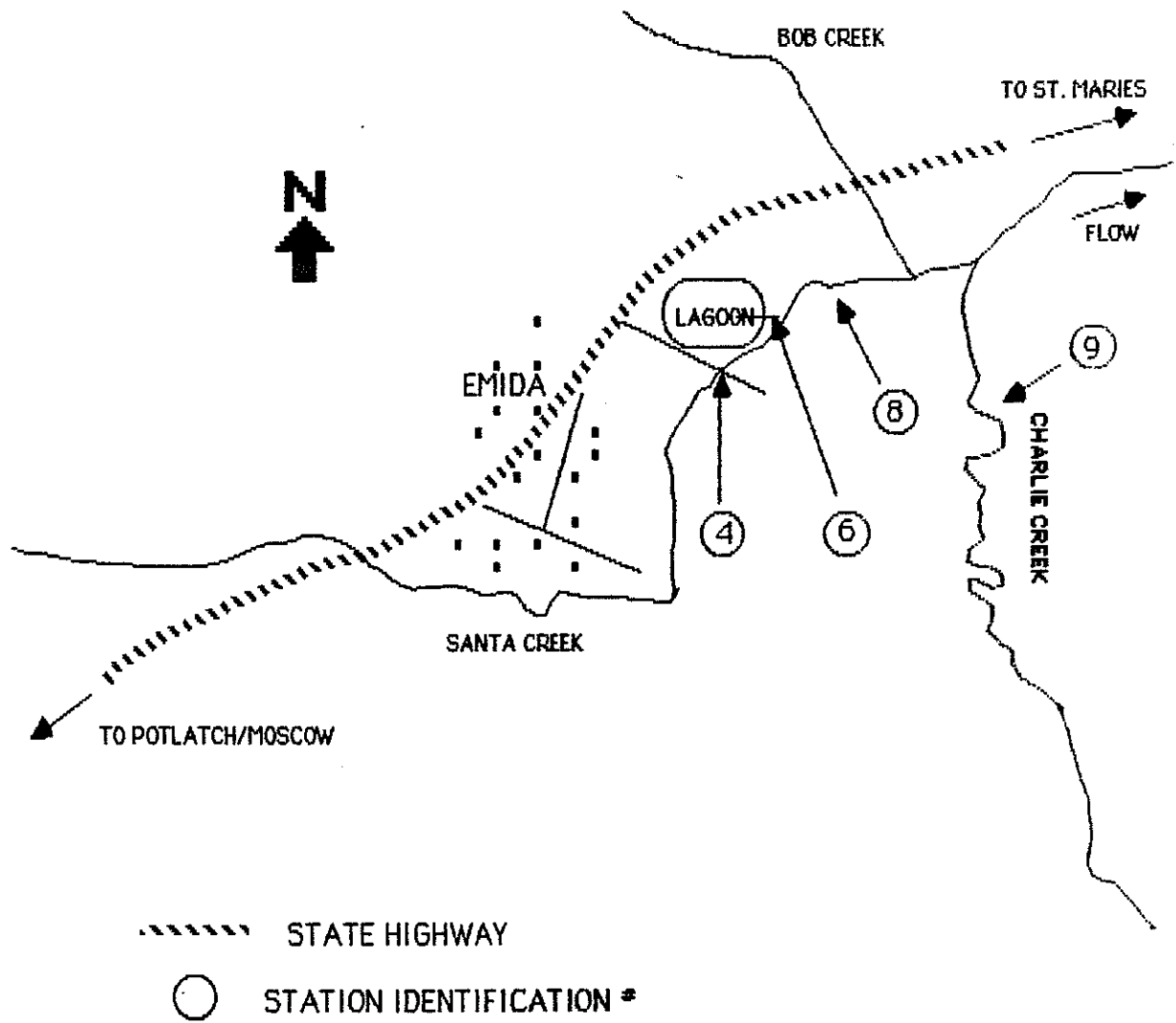
Five sites were used to collect data for the effluent study. Water quality samples were taken at the following four sites (Fig.1): above the wastewater lagoon on Santa Creek; below the wastewater lagoon on Santa Creek; the wastewater lagoon effluent; and Charlie Creek. Corresponding STORET station numbers and descriptions are in Table 1. Stream discharge on Santa Creek was measured at a separate site above the City of Emida. Discharge on Charlie Creek was measured at the water quality sampling site.

TABLE 1: SAMPLING STATION STORET NUMBERS, DESCRIPTIONS AND LOCATIONS FOR SANTA CREEK.

STORET#	RAPID#	DESCRIPTION	LATITUDE	LONGITUDE	RIVERMILE
2000144	4	SANTA CK BL EMIDA, AB WW LAGOON	47 07 10	116 35 35	643.0/131.3/15.7/24.3/9.4
2000146	6	EMIDA EFFLUENT	47 07 15	116 35 30	643.0/131.3/15.7/24.3/9.3
2000340	8	SANTA CK DOWNSTREAM OF EFFL MIXING ZONE	47 07 18	116 35 30	643.0/131.3/15.7/24.3/9.2
2000147	9	CHARLIE CK AT COUNTY RD BRIDGE	47 07 05.0	116 35 10	643.0/131.3/15.7/24.3/8.9/0.8



FIGURE 1: SANTA CREEK SAMPLING SITES



Water quality parameters for which samples were collected were temperature, dissolved oxygen, ammonia nitrogen, total kjeldahl nitrogen, nitrate+nitrite nitrogen, BOD, total phosphorus, specific conductivity, total suspended sediment, fecal coliforms, and fecal streptococcus. The samples were collected once in January 1986 and twice monthly during July through mid-September 1986.

Stream discharge was measured using a Marsh-McBirney flow meter and a four foot wading rod. Cross sections for flow measurement were set up on Santa and Charlie Creeks and used for the duration of the study. A staff gauge was located on the upstream side of the bridge next to the wastewater lagoon. A bench mark (an 8 inch spike) was set in the bridge log at an elevation of 7.42 feet.

Temperature and dissolved oxygen were measured in the field using a YSI Model 54-A Oxygen Meter. Samples for nitrogen fractions, specific conductivity, BOD and total suspended solids were collected in the field in two 1-liter cubitainers. One cubitainer for nitrogen fractions was preserved in the field with 2.0 ml. of sulfuric acid. Bacteriological samples were taken in sterilized Nalgene bottles.

## **RESULTS AND DISCUSSION**

There was no significant evidence of water quality degradation downstream of the wastewater lagoon (Tables 2 and 3). Figures 2 through 4 show the comparison of mean values of water quality parameters. BOD, fecal streptococcus and total phosphorus are the only parameters that showed higher average concentrations below the lagoon discharge than above. However, these increases are not statistically significant (Table 4). From July to mid-September, the lagoon did not have a visible discharge (Table 5). The lagoon did discharge during the winter sampling run and fall site evaluation. This is consistent with 1978 data.

With the exception of fecal coliform, water quality of the lagoon effluent, when discharging, was within existing permit requirements (Table 5). This is not surprising since disinfection of the effluent is not provided. According to local residents, the lagoon supports a healthy population of carp and whitefish. This suggests that aerobic conditions have persisted for some time. The lagoon likely has a certain amount of leakage. Both the 1978 and 1986 data showed that visible discharge stopped as early as April. Since net evaporation would be small at that time of year, it is assumed that leakage would account for the remaining quantity. The lagoon is located in alluvial silt with seasonally high ground water

TABLE 2: WATER QUALITY DATA FOR SANTA CREEK BELOW EMIDA AND ABOVE THE WASTEWATER LAGOON.  
 VIOLATIONS OF IDAHO WATER QUALITY STANDARDS ARE ALSO LISTED. (STORET STATION #2000144)

PARAMETER	STORET#	1/27/86	7/8/86	7/30/86	8/12/86	8/26/86	9/10/86	9/25/86	11/18/86
DISSOLVED OXYGEN (mg/L)*	000299	**	9.8	10.2	6.2	7.8	3.8	8	7.8
SPECIFIC CONDUCTIVITY (umhos/cm)	000095	**	Lab Error	76	82	87	75	67	62
NITRATE+NITRITE NITROGEN (mg/L as N)	000630	0.23	0.009	0.035	0.014	0.018	0.011	0.02	0.009
TOTAL KJELDAHL NITROGEN (mg/L as N)	000625	0.3	0.34	0.33	0.42	0.4	0.49	0.26	0.4
TOTAL AMMONIA NITROGEN (mg/L as N)	000610	0.136	0.026	0.038	0.064	0.092	0.007	0.02	0.024
TOTAL NITROGEN (mg/L as N)	000600	0.53	0.349	0.365	0.434	0.418	0.501	0.28	0.409
TOTAL PHOSPHORUS (mg/L as P)	000665	0.1	0.1	<.1	<.1	0.052	0.1	0.049	0.068
TOTAL SUSPENDED SOLIDS (mg/L)	000530	6	5	3	5	12	10	7	7
TEMPERATURE (degrees C)*	000010	**	18	19	19.5	19	15	11.2	1
FLOW (cfs)*	000061	**	0.91	0.9	0.45	0.09	0.35	2.56	2.3
BOD5 (mg/L)	000310		<3	2	**	2	1.5	1	<2
FECAL COLIFORM	031616	52	14	22	16	25	60	20	240
FECAL STREP	031679	>60	120	>300	>60	150	36	143	320
STAGE (FT)		**	3.39	3.24	3.15	3.18	3.41	3.72	3.96

\* DENOTES FIELD MEASUREMENT

\*\* DENOTES NO SAMPLE

PARAMETER	AVERAGE	ST DEV	MINIMUM	MAXIMUM	RANGE
DISSOLVED OXYGEN (mg/L)*	38.66	35.40	3.80	87.00	83.20
SPECIFIC CONDUCTIVITY (umhos/cm)	32.10	38.83	0.01	87.00	86.99
NITRATE+NITRITE NITROGEN (mg/L as N)	0.21	0.18	0.01	0.49	0.48
TOTAL KJELDAHL NITROGEN (mg/L as N)	0.21	0.17	0.01	0.49	0.48
TOTAL AMMONIA NITROGEN (mg/L as N)	0.23	0.20	0.01	0.53	0.52
TOTAL NITROGEN (mg/L as N)	0.27	0.18	0.05	0.53	0.48
TOTAL PHOSPHORUS (mg/L as P)	3.96	4.09	0.05	12.00	11.95
TOTAL SUSPENDED SOLIDS (mg/L)	10.51	6.31	1.00	19.50	18.50
TEMPERATURE (degrees C)*	7.88	8.43	0.09	19.50	19.41
FLOW (cfs)*	1.28	0.84	0.09	2.56	2.47
BOD5 (mg/L)	37.96	66.46	1.00	240.00	239.00
FECAL COLIFORM	94	97	14	320	306
FECAL STREP	66	99	3	320	317

WATER QUALITY STANDARDS VIOLATIONS

COLD WATER INTAKE

DISSOLVED OXYGEN <6 mg/L	1
TEMP. (degrees C) >22	0

SALMONID SPAWNING

DISSOLVED OXYGEN <6 mg/L	1
TEMP. (degrees C) >13	5

PRIMARY CONTACT RECREATION

FECAL COLIFORM >500	0
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SECONDARY CONTACT RECREATION

FECAL COLIFORM >800	0
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TABLE 3: WATER QUALITY DATA FOR SANTA CREEK BELOW EMIDA WASTEWATER LAGOON (STORET STATION #000340).  
 VIOLATIONS OF THE IDAHO WATER QUALITY STANDARDS ALSO LISTED.

PARAMETER	STORET CODE	1/27/86	7/8/86	7/30/86	8/12/86	8/26/86	9/10/86	9/25/86	11/18/86
DISSOLVED OXYGEN (mg/L)*	000299	**	8.9	8.2	5.3	8.4	4.1	9.1	10
SPECIFIC CONDUCTIVITY (umhos/cm)	000095	**	LE	76	87	87	75	70	63
NITRATE+NITRITE NITROGEN (mg/L as N)	000630	0.15	0.007	0.023	0.017	0.041	0.007	0.008	0.018
TOTAL KJELDAHL NITROGEN (mg/L as N)	000625	0.4	0.31	0.35	0.36	0.34	0.55	0.33	0.25
TOTAL AMMONIA NITROGEN (mg/L as N)	000610	0.102	0.022	0.037	0.048	0.087	0.007	0.033	0.031
TOTAL NITROGEN (mg/L as N)	000600	0.55	0.317	0.373	0.377	0.381	0.557	0.338	0.268
TOTAL PHOSPHORUS (mg/L as P)	000665	0.11	0.1	<1	0.1	0.043	0.1	0.058	0.067
TOTAL SUSPENDED SOLIDS (mg/L)	000530	7	4	3	4	5	6	7	6
TEMPERATURE (degrees C)*	000010	**	19	18	18.7	17	15	11.5	2
FLOW (cfs)*	000061	**	0.91	0.9	0.435	0.09	0.35	2.56	2.3
BOD5 (mg/L)	000310	**	<3	1	**	3	2	2	<2
FECAL COLIFORM	031616	80	17	4	3	6	5	7	140
FECAL STREP	031679	>60	44	>300	>60	380	20	154	320
STAGE (FT)			3.39	3.24	3.15	3.18	3.41	3.72	3.96

\* DENOTES FIELD MEASUREMENT

\*\* DENOTES NO SAMPLE

PARAMETER	AVERAGE	ST DEV	MINIMUM	MAXIMUM	RANGE
DISSOLVED OXYGEN (mg/L)*	24.39	34.17	0.01	87.00	86.99
SPECIFIC CONDUCTIVITY (umhos/cm)	20.96	35.01	0.01	87.00	86.99
NITRATE+NITRITE NITROGEN (mg/L as N)	0.15	0.17	0.01	0.55	0.54
TOTAL KJELDAHL NITROGEN (mg/L as N)	0.27	0.18	0.01	0.56	0.55
TOTAL AMMONIA NITROGEN (mg/L as N)	0.18	0.17	0.01	0.56	0.55
TOTAL NITROGEN (mg/L as N)	1.99	2.58	0.04	7.00	6.96
TOTAL PHOSPHORUS (mg/L as P)	6.54	6.84	0.04	19.00	18.96
TOTAL SUSPENDED SOLIDS (mg/L)	6.85	6.55	0.09	19.00	18.91
TEMPERATURE (degrees C)*	6.49	7.51	0.09	19.00	18.91
FLOW (cfs)*	14.61	35.28	0.09	140.00	139.91
BOD5 (mg/L)	69.88	116.26	1.00	380.00	379.00
FECAL COLIFORM	60	109	3	380	377
FECAL STREP	79	134	3	380	377

WATER QUALITY STANDARDS VIOLATIONS

**COLD WATER BIODA**

DISSOLVED OXYGEN <6 mg/L	2
TEMP. (degrees C) >22	0

**SALMONID SPAWNING**

DISSOLVED OXYGEN <6 mg/L	2
TEMP. (degrees C) >13	5

**PRIMARY CONTACT RECREATION**

FECAL COLIFORM >500	0
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**SECONDARY CONTACT RECREATION**

FECAL COLIFORM >800	0
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Figure 2: Comparison of the arithmetic means (n=8) of nutrient concentrations in Santa Creek for sites above and below the discharge of the Emida wastewater treatment lagoon. (STORET stations 2000144 and 2000340 respectively.)

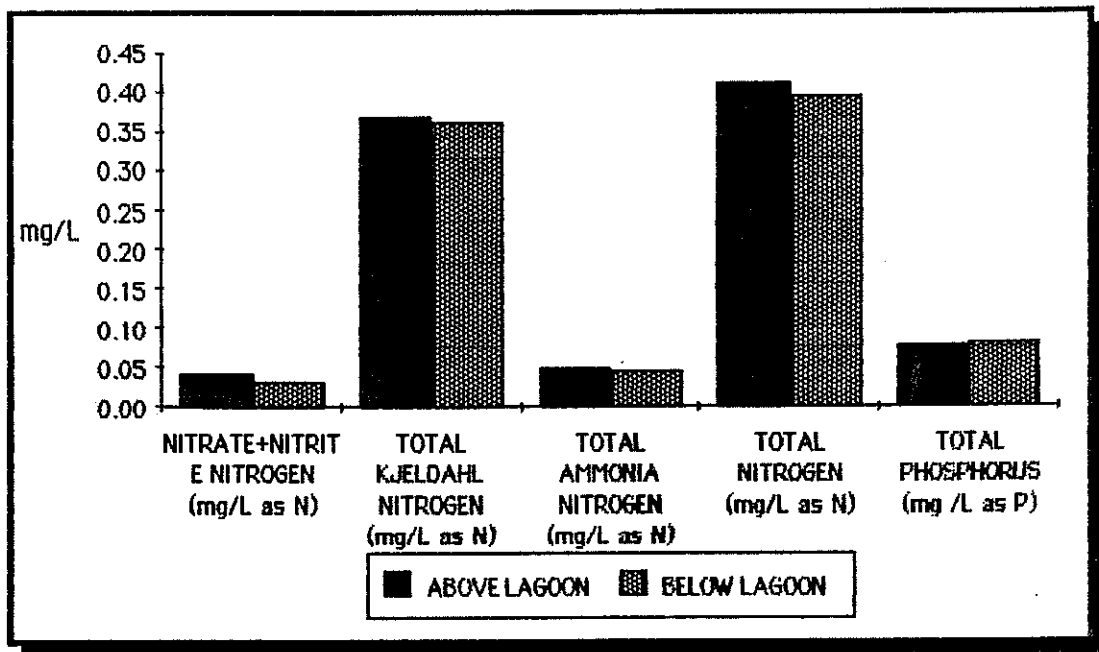


Figure 3: Comparison of the arithmetic means (n=8) of bacteriological indicators in Santa Creek for sites above and below the Emida wastewater treatment lagoon. (STORET stations 2000144 and 2000340 respectively.)

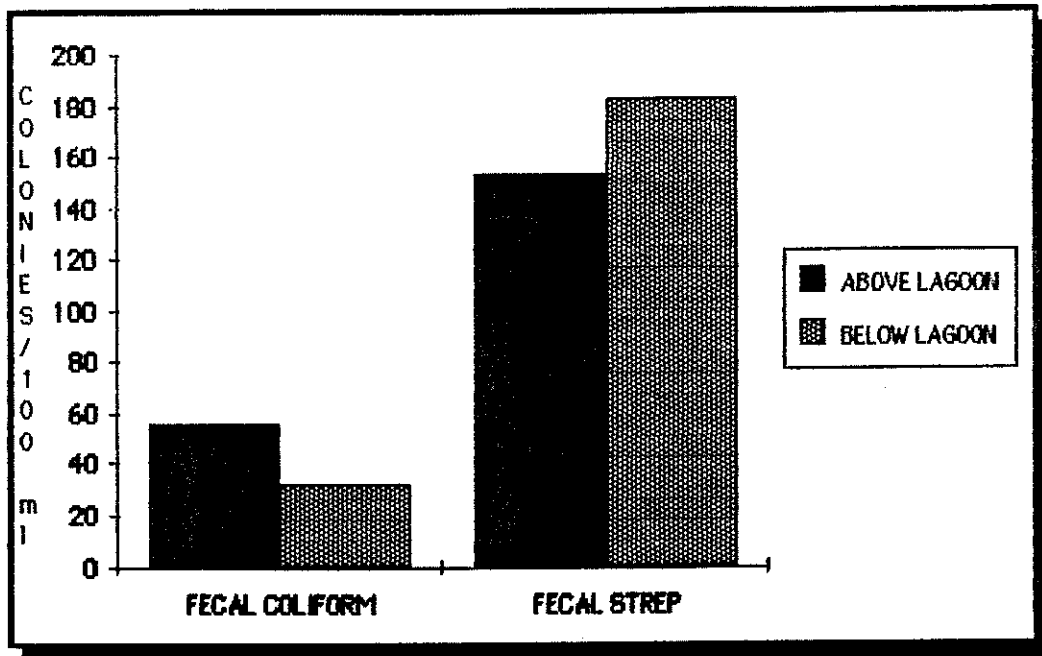


Figure 4: Comparison of the arithmetic means of miscellaneous water quality parameters in Santa Creek for sites above and below the Emida wastewater treatment lagoon. (STORET stations 2000144 and 2000340 respectively.)

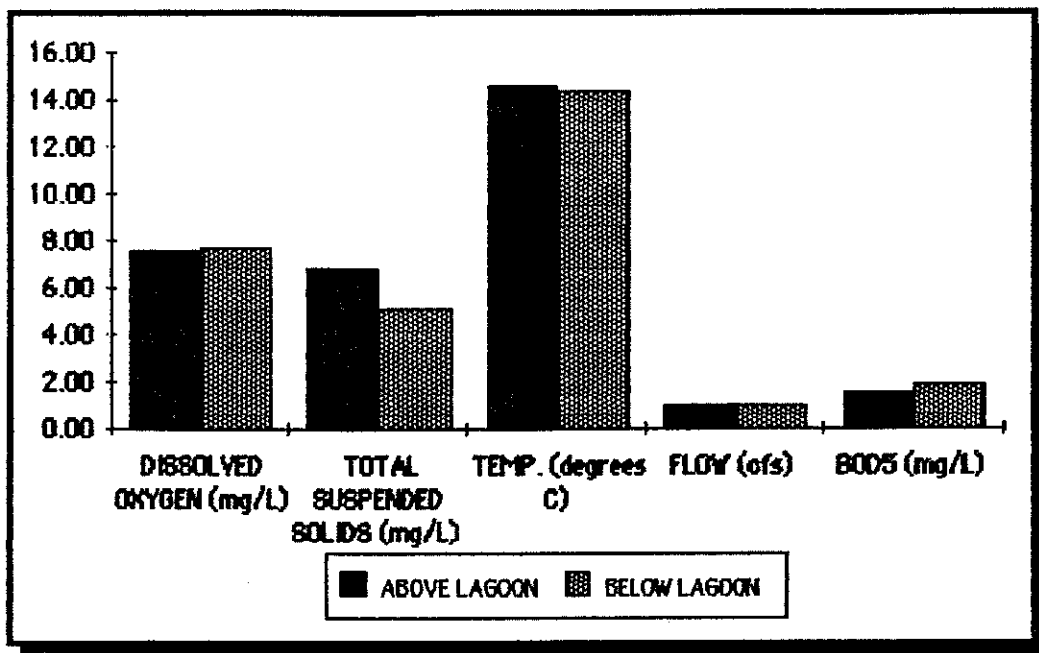


Table 4: The statistical comparison of water quality data collected upstream and downstream of the Emida wastewater lagoon using the one-tailed, paired-sample t test. d is the mean of the differences between upstream and downstream results for each sample date. The null hypothesis (Ho) is that  $d \geq 0$ , and the alternate hypothesis is that  $d < 0$ . For dissolved oxygen, the inequalities are reversed.

Parameter	n	d	Calculated t statistic	Critical t statistic	Status
Dissolved Oxygen	7	0.1	0.042	1.943	Accept Ho
Specific Conductivity	6	-2	-0.7	-2.015	Accept Ho
NO3 + NO2	8	0.009	0.29	-1.895	Accept Ho
Total Kjeldahl N	8	-0.01	0.15	-1.895	Accept Ho
Ammonia	8	0.005	0.36	-1.895	Accept Ho
Total N	8	0.016	0.24	-1.895	Accept Ho
Total P	8	-0.014	-0.4	-1.895	Accept Ho
Suspended Solids	8	2	0.7	-1.895	Accept Ho
Temperature	7	0.2	0.18	1.943	Accept Ho
BOD	6	-0.2	-0.3	-2.015	Accept Ho
Fecal Coliform	8	23	0.59	-1.895	Accept Ho
Fecal Strep	8	-19	-0.21	-1.895	Accept Ho



TABLE 5: WATER QUALITY DATA FROM THE ENDA WASTEWATER LAGOON EFFLUENT.  
(STREET STATION # 2000146).

PARAMETER	STORET CODE	1/27/86	7/8/86	7/30/86	8/12/86	8/26/86	9/10/86	9/25/86	11/18/86
DISSOLVED OXYGEN (mg/L)*	000299	**	**	**	**	**	**	11.5	8.4
SPECIFIC CONDUCTIVITY (umhos/cm)	000095	**	**	**	**	**	**	373	361
NITRATE+NITRITE NITROGEN (mg/L as N)	000630	0.069	**	**	**	**	**	0.072	0.209
TOTAL KJELDAHL NITROGEN (mg/L as N)	000625	**	**	**	**	**	**	123	7.15
TOTAL AMMONIA NITROGEN (mg/L as N)	000610	12.4	**	**	**	**	**	0.512	0.594
TOTAL NITROGEN (mg/L as N)	000600	0.069	0	0	0	0	0	12.372	7.359
TOTAL PHOSPHORUS (mg/L as P)	000665	5.6	**	**	**	**	**	3.3	2.9
TOTAL SUSPENDED SOLIDS (mg/L)	000530	17	**	**	**	**	**	42	38
TEMPERATURE (degree C)*	000010	**	**	**	**	**	**	125	3
FLOW (cfs)*	000061	**	**	**	**	**	**	**	**
BOD5 (mg/L)	000310	16	**	**	**	**	**	320	21
FECAL COLIFORM	031616	470000	**	**	**	**	**	2000	3000
FECAL STREP	031679	**	**	**	**	**	**	2000	7000
STAGE (FT)		**	**	**	**	**	**	**	**

\* DENOTES FIELD MEASUREMENT

\*\* DENOTES NO SAMPLE OR DISCHARGE

PARAMETER	AVERAGE	STD DEV	MINIMUM	MAXIMUM	RANGE
DISSOLVED OXYGEN (mg/L)*	188.5	206.2	0.4	373.0	364.6
SPECIFIC CONDUCTIVITY (umhos/cm)	146.9	201.0	0.1	373.0	372.9
NITRATE+NITRITE NITROGEN (mg/L as N)	4.0	5.6	0.1	123	12.2
TOTAL KJELDAHL NITROGEN (mg/L as N)	6.6	5.9	0.5	124	11.9
TOTAL AMMONIA NITROGEN (mg/L as N)	3.0	5.1	0.0	124	12.4
TOTAL NITROGEN (mg/L as N)	2.9	4.1	0.0	124	12.4
TOTAL PHOSPHORUS (mg/L as P)	18.1	17.7	2.9	42.0	39.1
TOTAL SUSPENDED SOLIDS (mg/L)	225	16.8	3.0	42.0	39.0
TEMPERATURE (degree C)*	7.8	6.7	3.0	125	9.5
FLOW (cfs)*	*DIV/0!	*DIV/0!	16.0	21.0	3.0
BOD5 (mg/L)	95007.4	209631.2	16.0	470000.0	46984.0
FECAL COLIFORM	96800	288635	2000	470000	468000
FECAL STREP	4500	3536	2000	7000	5000
STAGE (FT)					

on the flood plain of Santa Creek. Sealing of the lagoon was done with native material and no bentonite. It is likely that leakage is ground water controlled. A mass balance using influent flow and evaporation would need to be done in order to estimate the quantity of leakage. Impact from leakage to shallow ground water is apparently minor; since water quality violations in the receiving stream upstream and downstream of the lagoon discharge increased from one to two, respectively, with regard to dissolved oxygen standards for cold water biota/salmonid spawning (Tables 2 and 3). Note that the upstream station is near violation for 8/12/86, the date of the additional violation at the downstream station. Absence of nearby drinking water wells precludes drinking water problems from this pollutant source.

Charlie Creek has a larger watershed and much higher sustained summer flows than Santa Creek. Given flow and watershed area, it is a misnomer that Charlie Creek is a tributary of Santa Creek (see Figure 5). In essence, Charlie Creek provides major dilution of Santa Creek. That portion of Santa Creek below the lagoon and above confluence of Charlie Creek (1/4-1/2 river miles) is the only reach where an impact could occur.

Typically, Charlie Creek showed lower temperatures, higher DO, and lower nutrient concentrations than Santa Creek (Table 6). Water quality of Charlie Creek and Santa Creek is consistent with existing but not future beneficial uses.

Both streams exhibited numerous violations of temperature and dissolved oxygen which are defined as critical for cold water biota and salmonid spawning (future beneficial uses). These violations occurred in Santa Creek both upstream and downstream of the lagoon. No violations of existing beneficial use standards were observed during the study. See Tables 2, 3 and 6 water quality data summaries for lists of violations at each STORET sampling location.

A habitat survey was done by Idaho Department of Fish and Game (IDFG) in the summer of 1986. In general, the survey determined Santa Creek to have poor habitat for trout. The IDFG could not determine whether Santa Creek is used seasonally by a remnant population of cutthroat trout. Although habitat is poor, the Department of Fish and Game requested that a migratory corridor be maintained. The discharge from the City of Emida does not appear to conflict with this request at present.

Using the 50:1 dilution of the effluent by Santa Creek that is necessary for protecting future beneficial uses in the creek, the dates of no discharge to the creek can be established. This assumes that the flow in the creek reaches a low

Figure 5: Comparison of stream flows for Santa Creek and Charlie Creek.

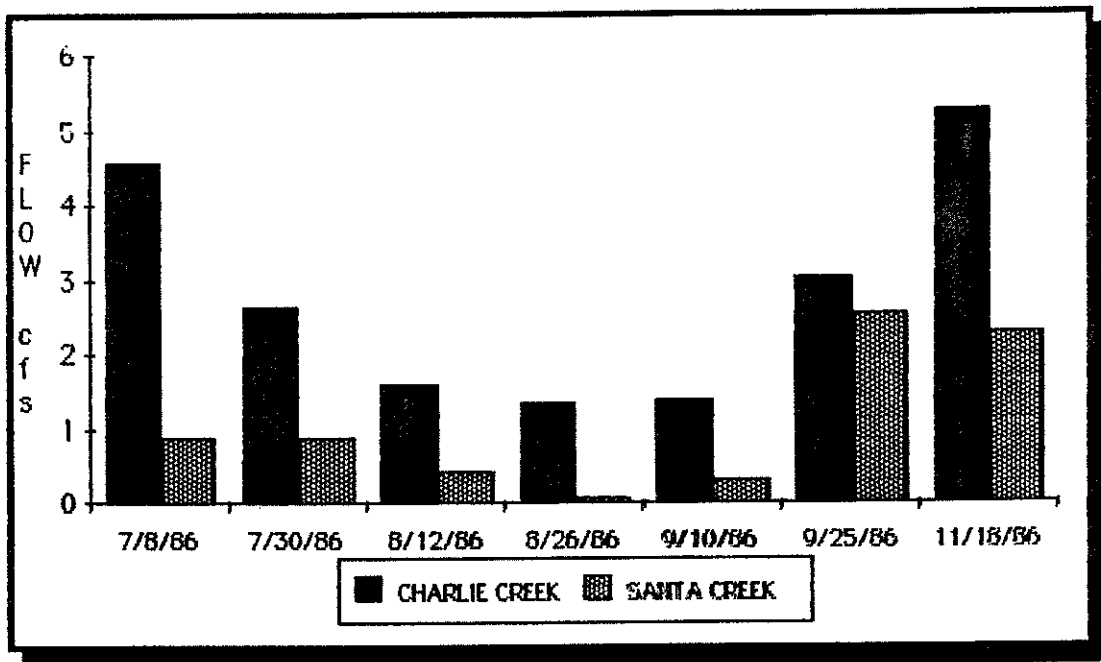


TABLE 6: WATER QUALITY DATA FOR CHARLIE CREEK AT THE COUNTY ROAD BRIDGE (STREET STATION #2000147)  
 VIOLATIONS OF THE IDAHO WATER QUALITY STANDARDS ARE ALSO LISTED.

PARAMETER	STORECODE	1/27/06	7/0/06	7/30/06	8/12/06	8/26/06	9/10/06	9/26/06	11/10/06
DISSOLVED OXYGEN (mg/L)*	000299	**	10.7	10.5	8.4	7.4	11.9	11	0
SPECIFIC CONDUCTIVITY (umhos/cm)	000095	**	29	35	35	35	36	35	37
NITRATE+NITRITE NITROGEN (mg/L as N)	000630	**	0.007	0.118	0.013	0.033	0.007	0.03	0.013
TOTAL KJELDAHL NITROGEN (mg/L as N)	000625	**	0.23	0.13	0.22	0.15	0.16	0.17	0.05
TOTAL AMMONIA NITROGEN (mg/L as N)	000610	**	0.022	0.106	0.054	0.002	0.007	0.027	0.029
TOTAL NITROGEN (mg/L as N)	000600	**	0.237	0.248	0.233	0.183	0.167	0.2	0.063
TOTAL PHOSPHORUS (mg/L as P)	000665	**	<1	<1	<1	0.034	<1	0.024	0.026
TOTAL SUSPENDED SOLIDS (mg/L)	000530	**	<2	<2	<2	<2	<2	<2	<2
TEMPERATURE (degrees C)*	000010	**	17	18	20	21.5	15	10	2.8
FLOW (cfs)*	000061	**	4.6	2.66	1.61	1.37	1.41	3.06	5.3
BOD5 (mg/L)	000310	**	<3	1	**	1	1	0.5	<2
FECAL COLIFORM	031616	**	300	63	>60	>60	>60	60	7
FECAL STREP	031679	**	48	82	>60	100	13	153	200
STAGE (FT)		**	3.39	3.24	3.15	3.18	3.41	3.72	3.96

\* DENOTES FIELD MEASUREMENT

\*\* DENOTES NO SAMPLE

PARAMETER	AVERAGE	ST DEV	MINIMUM	MAXIMUM	RANGE
DISSOLVED OXYGEN (mg/L)*	9.70	1.73	7.40	11.90	4.50
SPECIFIC CONDUCTIVITY (umhos/cm)	34.57	2.57	29.00	37.00	8.00
NITRATE+NITRITE NITROGEN (mg/L as N)	0.03	0.04	0.01	0.12	0.11
TOTAL KJELDAHL NITROGEN (mg/L as N)	0.16	0.06	0.05	0.23	0.18
TOTAL AMMONIA NITROGEN (mg/L as N)	0.05	0.04	0.01	0.11	0.10
TOTAL NITROGEN (mg/L as N)	0.19	0.06	0.06	0.25	0.19
TOTAL PHOSPHORUS (mg/L as P)	0.03	0.01	0.02	0.03	0.01
TOTAL SUSPENDED SOLIDS (mg/L)	*DIV/0	*DIV/0	0.00	0.00	0.00
TEMPERATURE (degrees C)*	14.90	6.51	2.00	21.50	18.70
FLOW (cfs)*	2.86	1.58	1.37	5.30	3.93
BOD5 (mg/L)	0.88	0.25	0.50	1.00	0.50
FECAL COLIFORM	107.50	130.89	7.00	300.00	293.00
FECAL STREP	99.33	68.42	13.00	200.00	187.00

**VIOLATIONS OF IDAHO WATER QUALITY STANDARDS**

**COLD WATER BIODA**

DISSOLVED OXYGEN <6 mg/L	0
TEMP. (degrees C) >22	0

**SALMONID SPAWNING**

DISSOLVED OXYGEN <6 mg/L	0
TEMP. (degrees C) >13	5

**PRIMARY CONTACT RECREATION**

FECAL COLIFORM >500	0
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**SECONDARY CONTACT RECREATION**

FECAL COLIFORM >800	0
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flow threshold where the 50:1 dilution requirement cannot be attained. Since effluent flows from the lagoon were not measured, an estimate of effluent flow was employed to determine the period a no-discharge limitation should be established. The value used for effluent flow was the estimated 1990 influent design flow of 0.0104 mgd (0.0161 cfs). This assumes that influent and effluent flow would be equal.

Utilizing the discharge data of Santa Creek collected from this study (July 8, 1986, to November 18, 1986) a 50:1 dilution cannot be attained from approximately August 1 through September 13. However, the period of low discharge in Santa Creek will vary annually. Examination of United States Geologic Survey (USGS) discharge reports (USGS, 1979 to 1986) revealed no records for Santa Creek. There were records for the St. Maries River into which Santa Creek flows. Correlations between Santa Creek stream flows measured during the study and St. Maries River USGS records for the same dates gave an  $r^2 = 0.81$ . In regressing the two data sets, the equation  $Q_{SMR} = 43.1 + (21.8 * Q_{SC})$  was obtained, where  $Q_{SMR}$  = St. Maries River flow (cfs) and  $Q_{SC}$  = Santa Creek flow (cfs). The appropriate threshold value for Santa Creek (0.82 cfs), below which a 50:1 dilution cannot be attained, gave a threshold discharge value for the St. Maries River to compare with the historic USGS data. The value obtained was 61 cfs.

Examination of the USGS data for the St. Maries River revealed that for the periods examined (water years 1979 through 1985) the 1979 data gave the longest below threshold period; ie. from July 23 to October 16. In 1983, the threshold was not crossed. Other years revealed numerous crossings of the threshold. The results are summarized in Table 7. The results of the analyses indicate that an appropriate period for a no-discharge period should be from mid-August through mid-October.

Table 7: Time periods when the St. Maries River discharge values crossed the derived threshold of 61 cfs. \*Data from Santa Creek collected for this study.

<u>Year</u>	<u>Periods below or near threshold</u>	<u>Total Days</u>	<u>Number of Threshold Crossings (&lt;61cfs)</u>
1979	7/23-10/15	84	1
1980	8/26-11/17	83	4
1981	8/25-11/12	79	3
1982	8/23-10/17	55	3
1983	-	0	0
1984	8/17-09/20	34	2
1985	8/18-09/06	19	1
1986*	8/01-09/13	44	-
average date	8/17-10/10		
median date	8/18-10/15		

## CONCLUSIONS AND RECOMMENDATIONS

Water quality supports the existing beneficial uses in Santa Creek. Sampling above and below the discharge to Santa Creek did not show any significant degradation of water quality. No significant increase over the background was found for the water quality parameters analyzed during this study. An analysis of stream discharge necessary to obtain a 50:1 dilution of effluent, to protect future beneficial uses, revealed a median period from August 18 to October 15 during which the dilution could not be attained.

Assuming there is no discharge during the months of concern, the location of the lagoon and its discharge does not appear to be detrimental to the development of future beneficial uses. Violation of temperature and dissolved oxygen standards for future beneficial uses already occur above the lagoon, as well as below. There was, however, an increase from one to two violations for dissolved oxygen from the upstream and downstream stations, respectively. In order to fully develop future beneficial uses, riparian, watershed management, and other nonpoint source control strategies may be necessary.

Sampling, submittal of DMRs and provisions for disinfection of the effluent, as required by the existing NPDES permit, are not being provided at this time. The State of Idaho Grants Program is currently working with the Emida Water and Sewer Association to upgrade the wastewater treatment lagoon. The City of Emida should be required to comply with these permit conditions and be phased into a required no-discharge period.

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