WATER QUALITY STATUS REPORT ● REPORT NO. 67

PALOUSE RIVER
Latah County, Idaho
1986

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Table of Contents

List of Figures

List of Tables

Appendices

ABSTRACT

The Palouse River is located approximately 42 miles north of Lewiston, Idaho. During 1986 the City of Potlatch applied for a State/EPA grant to upgrade the wastewater treatment facility. The community has a history of not complying with monitoring requirements, and since 1976 has been discharging to the Palouse River without an NPDES permit. The purpose of the summer 1986 study was to review the water quality of the Palouse River in order to recommend discharge limits for the pending facility upgrade and subsequent NPDES permit.

The study determined that the waters of the Palouse River near Potlatch are limited by water quality. Such limitations are apparently the result of contributions from nonpoint source activities within the drainage rather than from specific point discharges. Idaho Water Quality Standards designate uses of the Palouse River as agricultural water supply, warm water biota, and secondary contact recreation, with primary contact recreation reserved as a future use. The designated uses were found to be appropriate with the possible exception of primary contact recreation which may not be reasonable to attain.

The municipal effluent from the City of Potlatch's lagoons did not adversely effect the stream's water quality. Flows within the Palouse River provide a high dilution factor which masks the effluent's effects. The wastewater lagoons are capable of meeting standards equivalent to secondary treatment except for the fecal coliform limits. Accordingly, chlorination should be included in the treatment process. The road to the treatment facility is not maintained during the winter, or allowed by the owner during wet weather. Therefore, access to the lagoons must be improved if necessary maintenance and monitoring are to be accomplished. A foot bridge across the Palouse River may satisfy this need.

INTRODUCTION

The Palouse River discharges into the Snake River approximately 135 river miles to the west of Potlatch, Idaho (Figure 1). The City of Potlatch discharges into the study area which extended from the City of Potlatch downstream 3.5 miles to the bridge crossing on U. S. Highway 95.

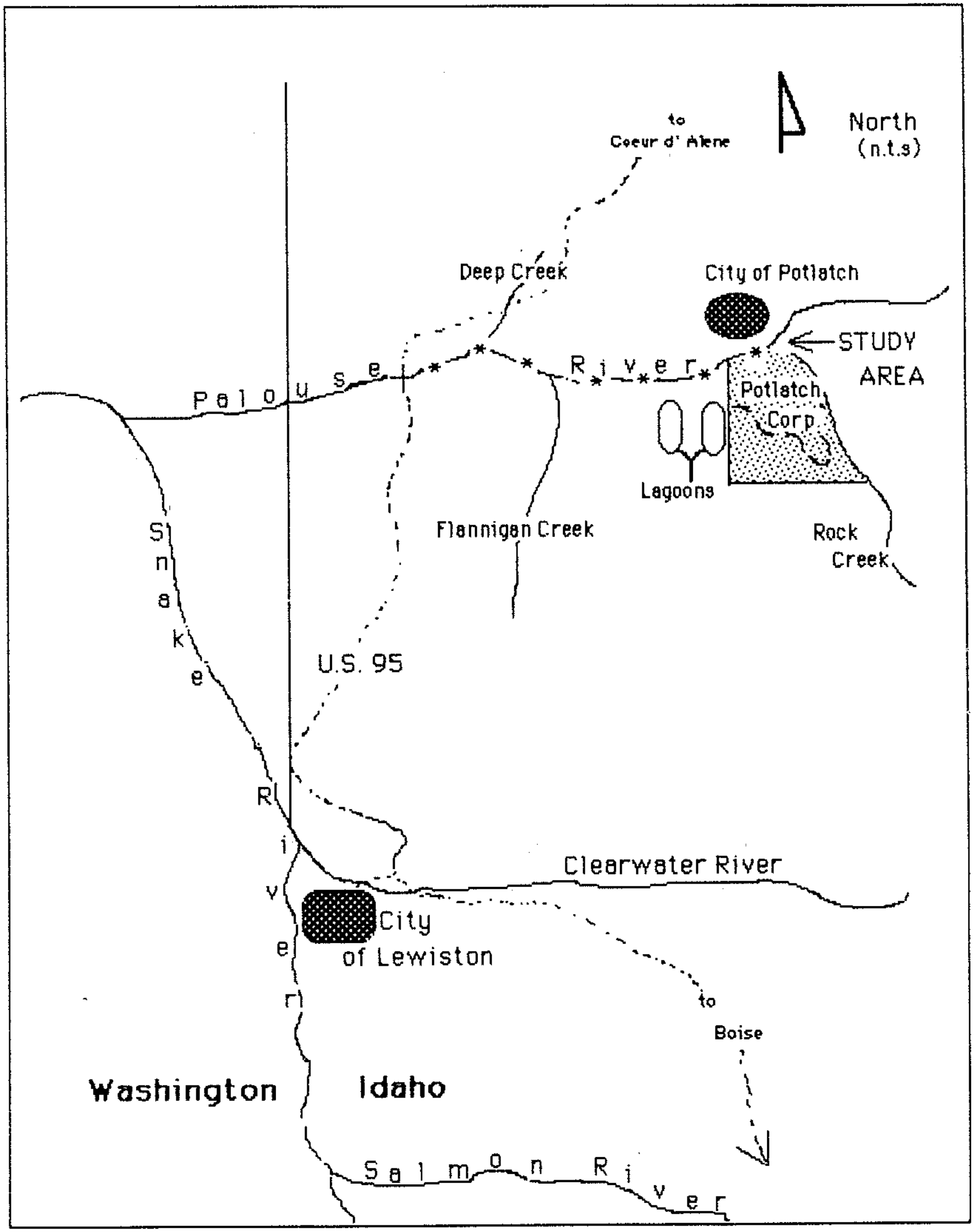
Land use within the Palouse River watershed consists of limited rural development, agricultural use, open grazing, and silvicultural activities (primarily logging). The balance of the drainage basin consists of uncut timber lands.

The Palouse River is identified in the Idaho Water Quality Standards and Wastewater Treatment Requirements (IDHW/DOE,1985) as stream segment C.B. 170. Its designated uses are for agricultural water supply, warm water biota, and secondary contact recreation. General Idaho water quality standards also apply to the Palouse River. They indicate that waters of the state must not contain: hazardous, deleterious, and radio-active materials; floating, suspended, and submerged matter; excess nutrients; and suspended sediment in excess of the limits described within the Idaho Water Quality Standards.

The Palouse River is also designated for future use as a primary contact water system. Primary contact surface waters are defined as being: suitable or intended to be made suitable for prolonged and intimate contact by humans or for recreational activities when the ingestion of small quantities of water is likely to occur. Such waters include those used for swimming, water skiing, and skin diving. One of this study's objectives was to determine if the designated current and future uses are appropriate.

An NPDES permit was issued on March 27, 1974 thereby allowing the municipal lagoons to discharge to the Palouse River, however the permit expired on December 31, 1976. The permit limits were typical of lagoon systems that require equivalent-to-secondary treatment. The City did not apply for a permit renewal until January 3, 1986 and it is still not operating under a valid NPDES permit.

Figure 1 : Schematic of the Palouse River



The City of Potlatch has periodically bypassed the treatment processes. One such action precipitated the issuance of an EPA 309 Order in 1974, which resulted in a fine of $750.00 against the City (L.F.O./D.O.E. Files). Other violations have also been documented by the Division of Environment. Discharge Monitoring Reports (DMR) were periodically submitted to EPA by the City between 1978 and present with records being complete since 1983. The DMRs consistently showed equivalent-to-secondary effluent quality, except for fecal coliform densities which ranged from less than 1 to 24,000 colonies per 100 ml.

Access to the lagoons is through private property for approximately two miles. Snowmobiles or snowshoes must be used to monitor and maintain the facility during portions of the year because access is not maintained through the winter or allowed by the property owner during wet weather.

Study Design and Sample Stations

The historically low flow months of summer were selected for this limited study of the Palouse River. The primary objective of the study was to ascertain the effect of the City's wastewater effluent on the water quality in the Palouse River. The greatest potential for impacting the river is expected during low flows when the dilution ratio is the lowest.

All stations were sampled approximately every three weeks between June 25 and August 21, 1986 for a total of four sample sets. Municipal influent and effluent were sampled three additional times during the high-flow periods of May and early June.

Five sample stations were selected (Figure 2). They included stations number: 1) Palouse River at Rock Creek above the effluent outfall near Potlatch; 2) Potlatch lagoons influent box; 2A) Potlatch lagoons effluent box; 3) Palouse River directly downstream of the outfall at Flannigan Creek; 4) Palouse River at Deep Creek; 5) Palouse River at U.S. highway 95 bridge. STORET numbers were assigned except for stations 1,4, & 5 which are the same as those of a 1978 water quality study (IDHW/DOE,1978) (Table 1).

FIGURE 2 PALOUSE RIVER SAMPLE STATION LOCATIONS

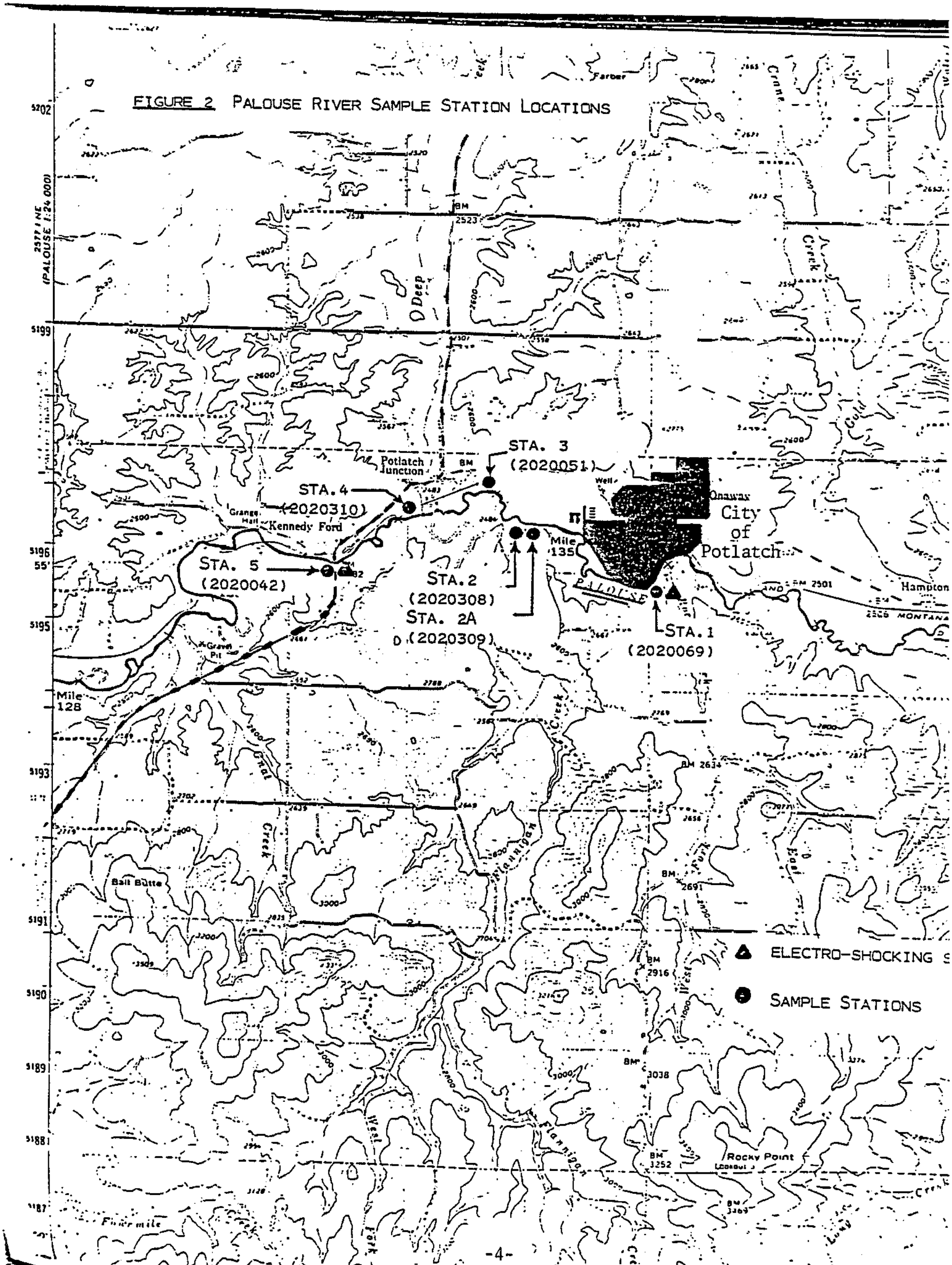


Table 1. Station Descriptions

Stn.	Stn. Description	Storet #	Rv. Mile	Lat/Long
1	Palouse River above outfall@ Rock Creek	2020069	136	46°54'55"/116°53'40"
2	City of Potlatch Lagoon (influent)	2020308	134.7	46°55'20"/116°54'50"
2A	City of Potlatch Lagoon (effluent)	2020309	134.7	46°55'20"/116°54'50"
3	Palouse Rv. below Outfall @ Flannigan Cr.	2020051	134.4	46°55'25"/116°55'10"
4	Palouse Rv. below outfall @ Deep Cr.	2020310	133.2	46°55'30"/115°56'10"
5	Palouse Rv. below outfall @ U. S. 95 bridge.	2020042	132.4	46°55'00"/116°55'05"

Material & Methods

On-site and laboratory analyses were used to determine water quality (Table 2). All collections and preservation procedures conformed to Standard Methods (APHA,1985), EPA guidelines (EPA,1979), or U. S. Geological Survey (USGS,1977). Dissolved oxygen was determined with a YSI Model 54A meter; electrical conductivity and temperature with a YSI Model 33 SCT meter; pH with a Corning Model M-103 meter, and stream velocity with a Marsh McBirney Model 201 meter. Instream flow at Station 5 was determined from a USGS gaging station. Estimates of the municipal influent flow were determined by test pumping the lift station which feeds the lagoons. Volume of wastewater effluent was measured through a 60 degree V-notch weir which had been placed in the discharge box.

Stations 1 and 5 (Figure 2) were electro-shocked in cooperation with the Idaho Department of Fish and Game, to gain information on the resident fish population within the study area. The procedure induced approximately 1000 d.c. volts of electricity into the water which stunned the fish. Nets were then used to collect the fish for the purpose of identification.

Results

The Palouse River exhibited a flow regime typical of low order rivers in North Idaho. Flow at Station 5 declined 67% between June 25, 1986 and July 9, 1986. Minimum and maximum flows during the study were 8 cfs and 101 cfs respectively. Additional flow data were provided by the U.S.G.S. facility at Station #5 which resulted in a mean higher than at the other stations. Exclusion of the additional U.S.G.S. data resulted in an average flow at Station #5 of 12 cfs for the study period (Figure 3A). During July and August the flow stabilized at approximately 10 cfs which is historically typical (U.S.G.S., 1984).

Influent wastewater flows at Station 2 were relatively constant during the study period, with minimum and maximum values of 0.11 cfs (0.07 mgd), and 0.17 cfs (0.11 mgd) (Figure 3B). According to discharge monitoring reports, influent wastewater flows during 1986

Table 2. **Parameter list**

Parameter	Units	STORET	Frequency
Physical			
1) Discharge	cfs	00061	1 per 3 wks.
2) Water Temperature	°C	00010	(all param-
3) Dissolved Oxygen (D.O.)	mg/l	00300	eters)
4) Electrical Conductivity	µmhos/cm	00095	
5) pH	S.U.	00400	
Nutrients			
6) Biochemical oxygen demand (BOD)	mg/l	00310	
7) Suspended solids (S.S.)	mg/l	00530	
8) Total phosphorus (T.P.)	mg/l	00665	
9) Total Kjeldahl nitrogen (T.K.N.)	mg/l	00625	
10) Total ammonia	mg/l	00610	
Bacteria			
11) Fecal Coliform	#/100 ml	31616	

Figure 3A : Mean Palouse River & Wastewater Flows During Summer 1986 Study Period

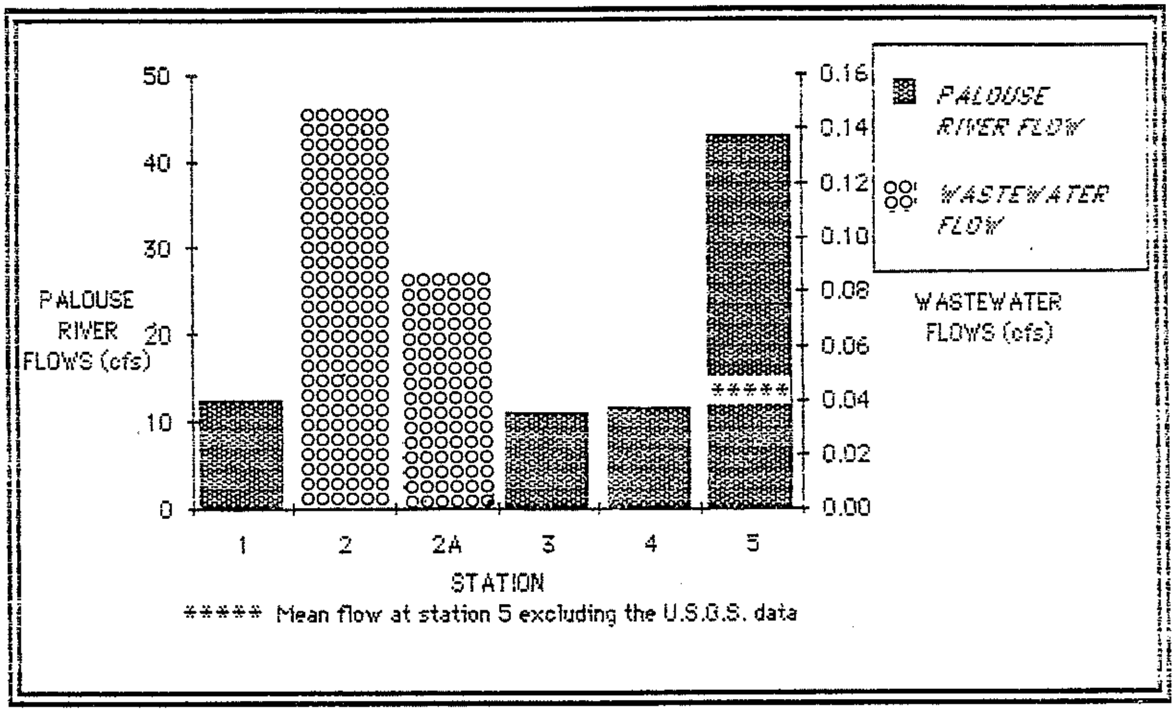
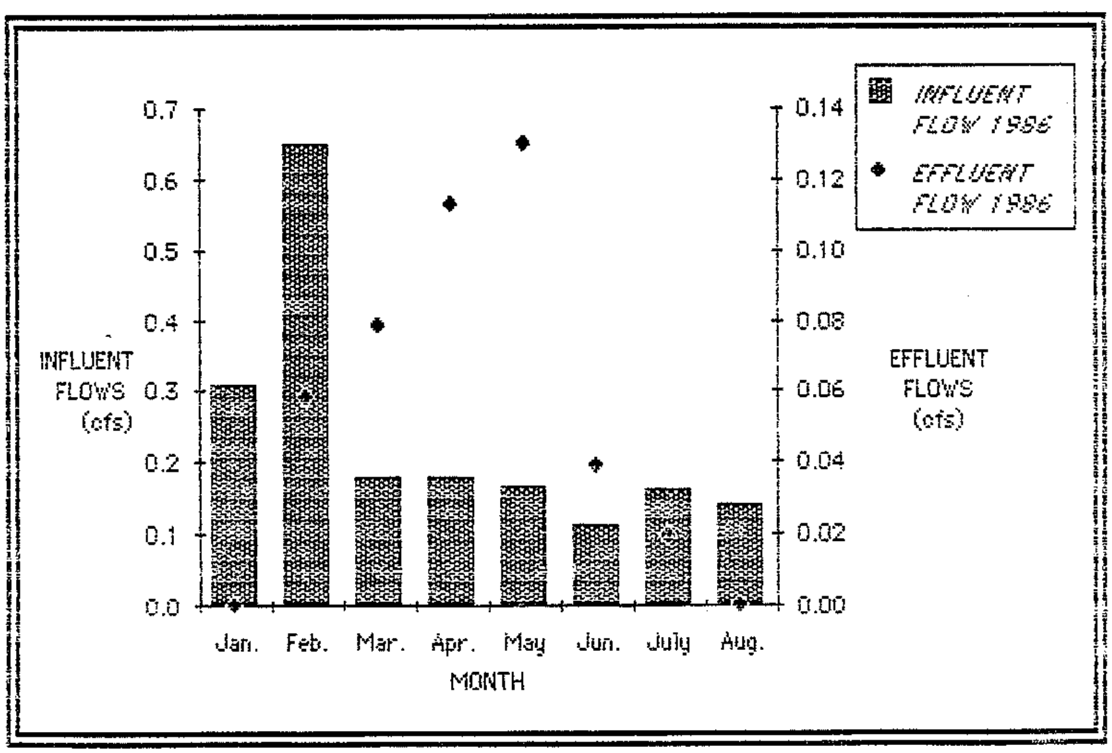


Figure 3B : Mean Influent and Effluent Wastewater Flows During the Summer 1986 Study Period



varied from a maximum of 0.65 cfs (0.42 mgd) to a minimum of 0.11 cfs (0.07 mgd) (Figure 3B). The largest month to month change occurred between February and March which showed a 72% decrease in flow. Discharge from the lagoons at Station 2A declined as the study progressed. The effluent flow peaked during May by discharging an average of 0.13 cfs (0.08 mgd), and declined through late August when no flow was observed from the effluent box. Mean effluent flow at Station 2A was 0.08 cfs (0.05 mgd) (Figure 3A) during the study period. The ratio of effluent flow to river flow did not drop below 400:1 which was realized on June 25, 1986.

In general, the biochemical oxygen demand (BOD) and suspended solids (S.S.) concentrations at Stations 1, 3 ,4 and 5 (the instream stations) were comparable. The instream BOD and S.S. were 1.2 mg/l and 5.6 mg/l respectively (Figure 4). The mean effluent BOD concentration was 15.0 mg/l, and the mean effluent S.S. concentration was 12.8 mg/l. On August 21, 1986, when no effluent was being released at Station 2, a sample was taken from within the basin which contains the weir. The suspended solids concentration for that sample was 218 mg/l.

The maximum BOD and S.S. loadings for the effluent noted during the study period were 16/lbs day and 17 lbs/day respectively. The mean effluent loading for both BOD and S.S. was 6 lbs/day (Figure 5). Considering all river stations the overall mean BOD loadings were 79 lb/day and S.S. were 280 lb/day.

The dissolved oxygen (D.O.) content within the Palouse River ranged from 7.0 mg/l to 10.0 mg/l with a mean of 8.0 mg/l. Effluent D.O. values varied from 0.2 to 3.1 mg/l with a mean of 0.9 mg/l (Figure 6).

Water temperatures were greatest for all stations during the June 25, 1986 site visit. The 23.5°C water temperature which occurred on this date at Station 3 was the highest observed. The lowest instream water temperature recorded over the 4 month study period was 17.0°C. The mean temperature for the effluent of 17.8°C was lower than the 20.8°C value determined as the mean instream temperature (Figure 6).

The instream monitoring stations (1,3,4, and 5) showed similar water chemistry throughout the study. The mean total phosphorus concentration of 0.10 mg/l remained constant at each station (Figure 7). Mean total

Figure 4 : Mean BOD & S.S. Concentrations During the Summer 1986 Study Period

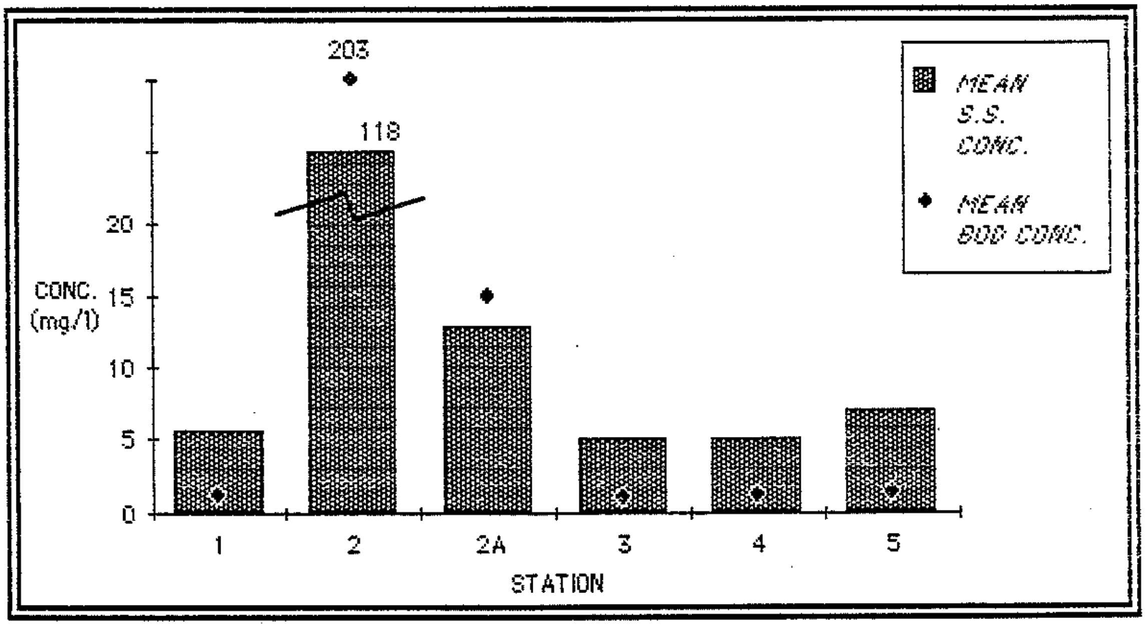


Figure 5 : Mean BOD & S.S. Loadings During the Summer 1986 Study Period

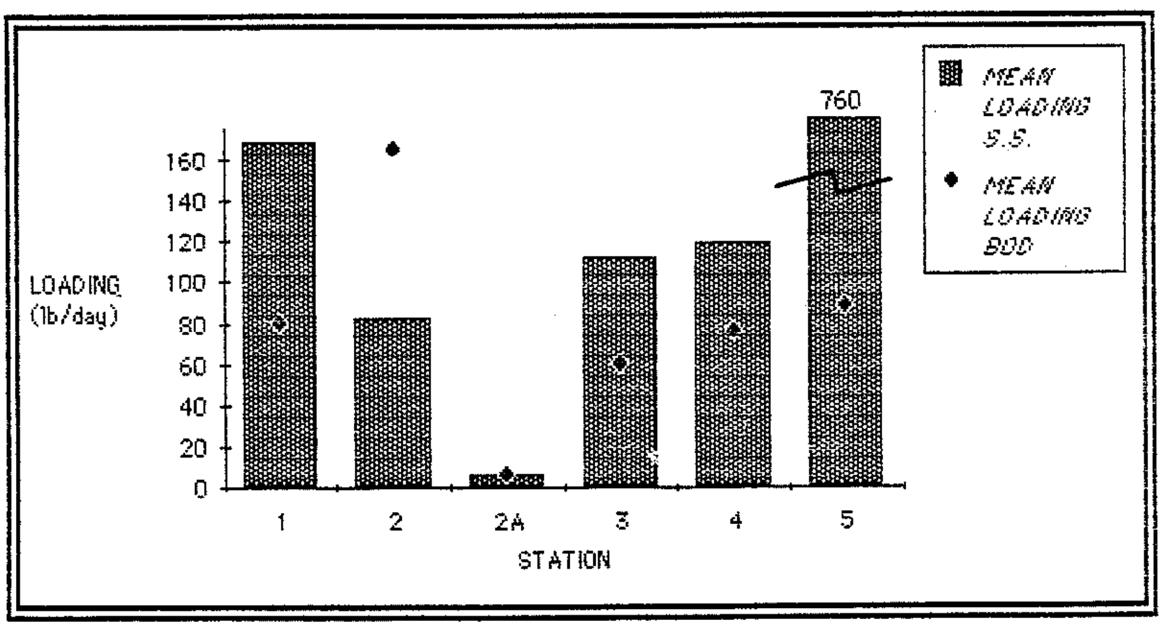


Figure 6 : Mean Dissolved Oxygen Concentration & Water Temperatures During the Summer 1986 Study Period

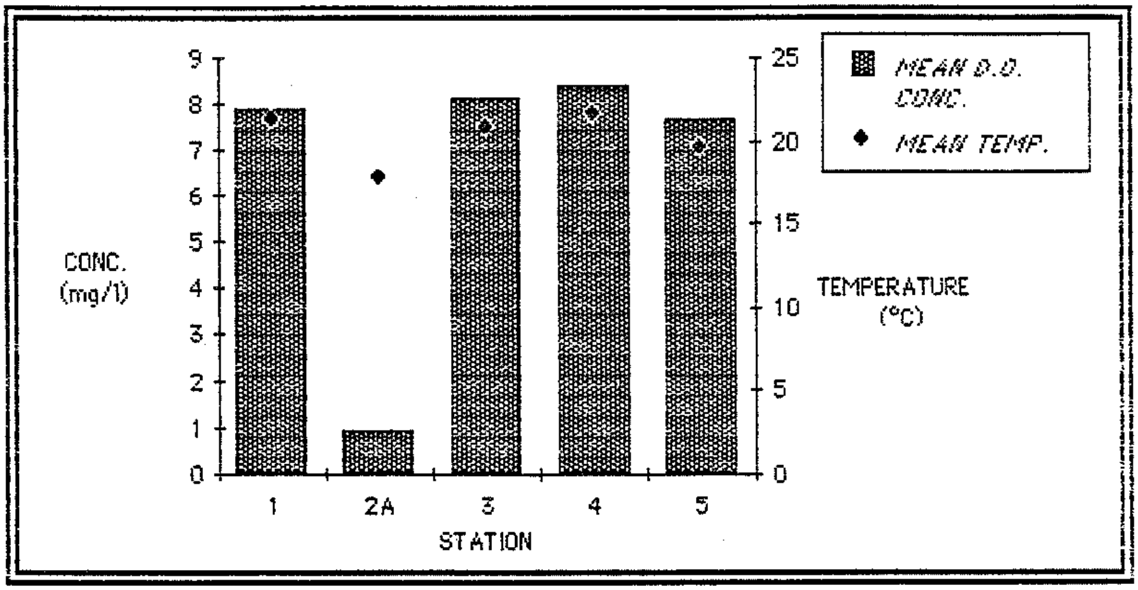
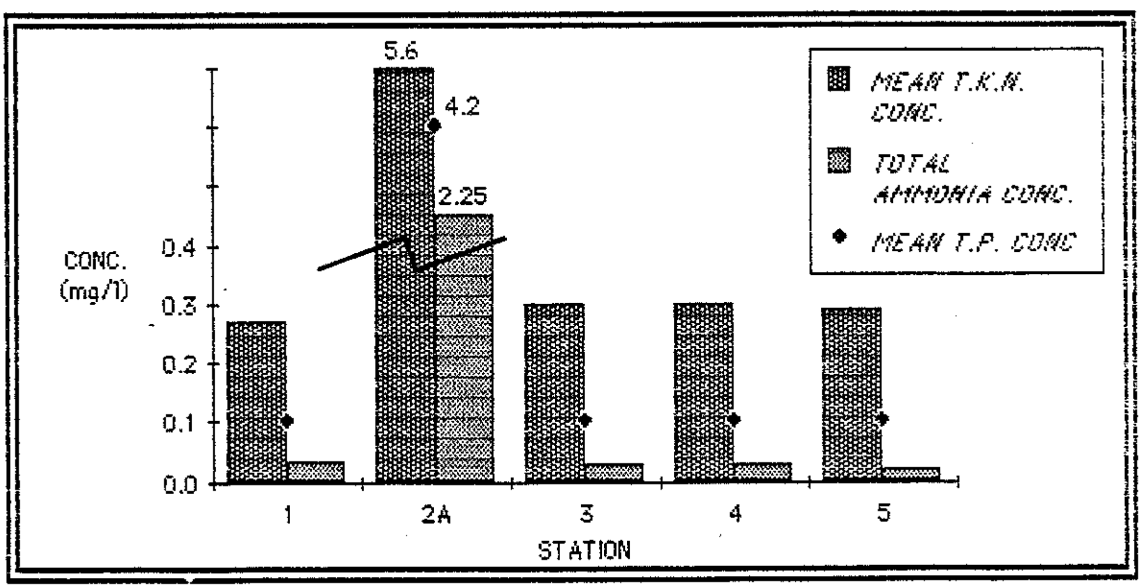


Figure 7 : Mean Nutrient Concentrations During the Summer 1986 Study Period



phosphorus concentration of the wastewater effluent was 4.2 mg/l which did not include a high concentration from a sample collected on May 16, 1986 which was 338 mg/l. A 92.5 mg/l Total Kjeldahl Nitrogen (T.K.N.) concentration was also reported for the effluent on the same date and not considered in calculating mean effluent concentrations. The mean T.K.N. concentrations for the effluent and the overall river samples were 5.6 mg/l and 0.29 mg/.l respectively (Figure 7). Approximately 10 percent of the T.K.N. concentration in the river samples were determined to be in the form of ammonia (Figure 7).

Effluent from the City's lagoons averaged 1 lb/day for total phosphorus, 2 lbs/day for T.K.N. of which 1 lb/day was estimated to be total ammonia. River samples showed mean loadings of 7 lbs/day, 19 lbs/day, and 2 lbs/day for total phosphorus, TKN and total ammonia respectively (Figure 8). Palouse River pH ranged from 6.4 to 7.4 S.U. with a mean of 6.9 S.U. (Figure 9). The wastewater effluent fluctuated from 7.0 to 8.5 S.U. Instream conductivity averaged 65 µmhos/cm with the effluent mean being 471 µmhos/cm (Figure 9).

Fecal coliform counts varied from 27 to 405 colonies per 100 ml in the river and from 6 to 238 colonies per 100 ml in the wastewater effluent. The mean values were 30 and 115 colonies/100 ml for the wastewater effluent and the Palouse River stations respectively (Figure 10).

The resident fish population within the study area of the Palouse River was determined on July 11, 1976 by electro-shocking above the wastewater lagoons at Station 1 and below the lagoons at Station 5. A majority of the fish collected were dace and shiners although some small suckers and squawfish were present. No salmonids or other game fish were collected (Appendix 2).

Quality Assurance

Precision is a measure of the mutual agreement among individual analysis of the same property. The study used replicate samples for BOD, S.S., fecal coliform, T.P., total ammonia and T.K.N. at Stations 1 and 5 to establish precision (Table 3). The average relative range on all replicate samples at both stations was within accepted limits (Bauer, 1985).

Figure 8 : Mean Nutrient Loads During the Summer 1986 Study Period

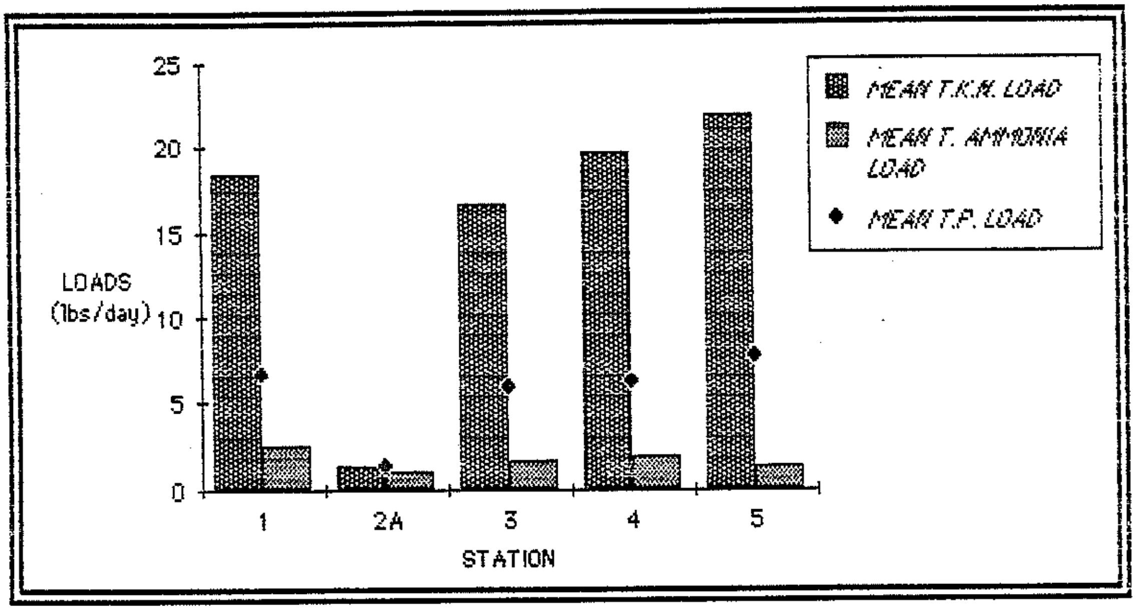


Figure 9 : Mean pH & Conductivity Values During the Summer 1986 Study Period

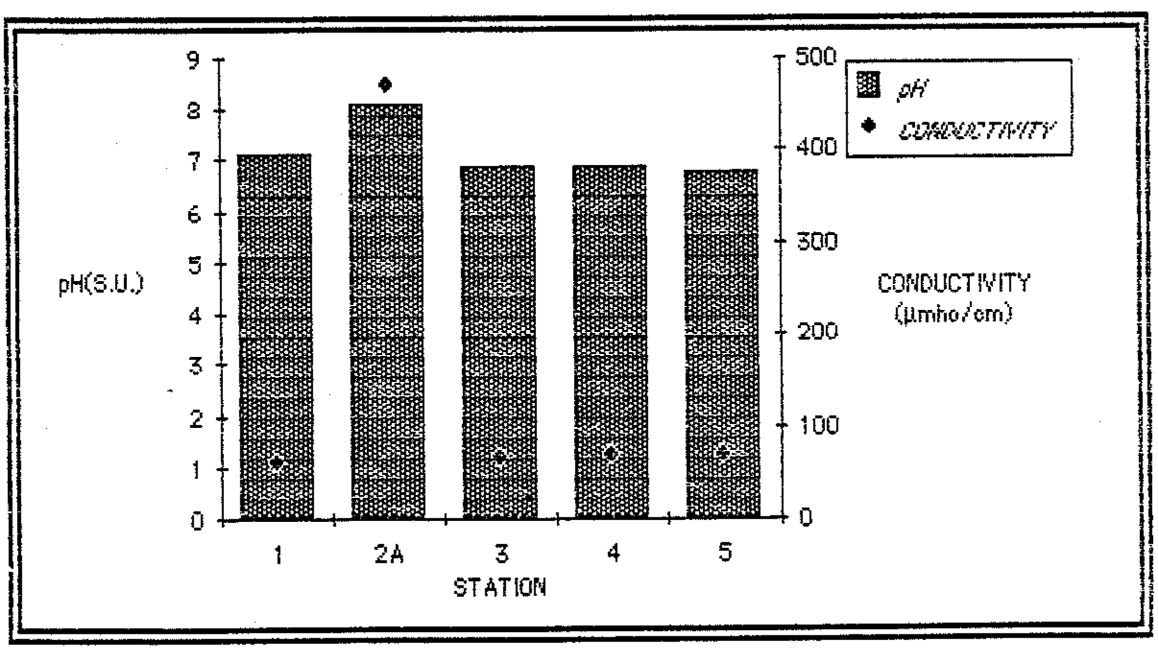


Figure 10 : Mean Fecal Coliform Counts During the Summer 1986 Study Period

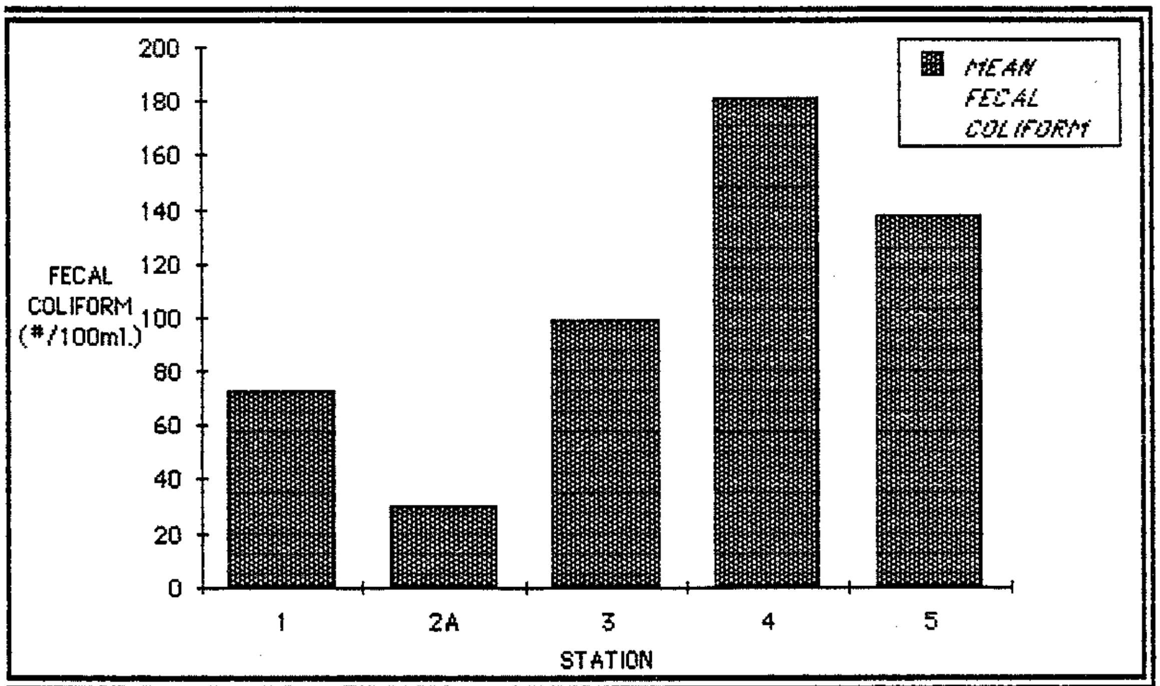


Table 3. Palouse River Quality Assurance - (Summer 1986)

Precision

Parameter	N	X	Ave. Relative Range (%)
BOD	8	1.29	8.7
SS	8	5.75	10.3
Fecal Coliform	8	114.38	47.0
T. Phosphorus	8	0.1	0% *
T. Ammonia	8	0.03	22.4
T.K.N.	8	0.28	6.3

* Artifact in the date which is related to the minimum detection limits.

Accuracy

Stn. #5

Parameter	Percent Recovered
BOD	Invalid
S.S.	87.8%
T.Phosphorus	121.4%

Accuracy is a measure of the agreement of a measured value with an accepted true value. Spiked samples were used at Station 5 for BOD, TP, and suspended solids (Table 3). The percent recovered was within the degree of accuracy established for these parameters (Bauer 1985), with the exception of BOD. The BOD test was determined to be invalid as the result of setup problems at the laboratory, and it was therefore discarded (pers. commun., J. Dodds, Idaho Bureau of Laboratories).

Discussion

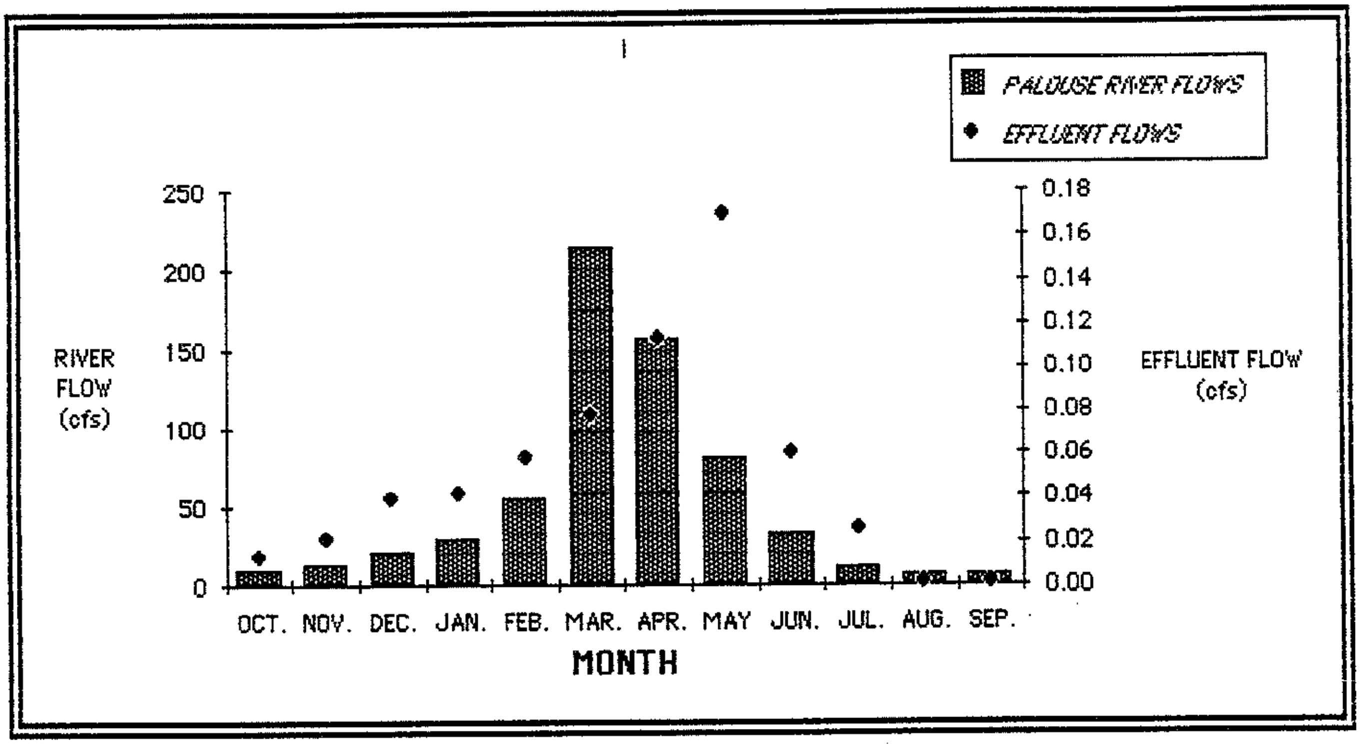
Discharge/Flow

Peak flow in the Palouse River usually occurs during March. The drainage basin receives a moderately heavy snowpack each year which causes the peak to occur during the spring thaw. The base flow for the stream is probably due to springs in the upper reaches of the drainage basin. Minimum flows are approximately 10 cfs, and the average annual discharge over the past 22 years is 280 cfs. (U.S.G.S.,1984).

Influent wastewater flows (Station 2) decreased 72 percent between February and March, which is probably due to decreased inflow and infiltration which accompanied the spring runoff. The average influent flow was 0.22 cfs (0.14 mgd) from January thru August 1986 with peak flow of 0.65 cfs (0.42 mgd) being reported in February. The ratio of the peak wet weather flow to the average flow was 1.9:1 which is lower than the 3.8:1 ratio recognized by the Recommended Standards for Sewage Works (1978).

Dilution of the wastewater effluent was apparently responsible for minimizing potential problems associated with the discharge of wastewater to the Palouse River. Comparing the information available from the U.S.G.S. gaging facility at Station 5 for the past ten years to the wastewater effluent flow records for the past three years indicates that a dilution of at least 400:1 can be expected to occur greater than 95% of the time (Figure 11). July is anticipated to be the month when the minimum river to wastewater flow ratio will occur. The minimum flow ratio is

Figure 11 : Estimated Minimium Monthly Palouse River Flows based on the past 10 years (95% Chance of Exceedence) & Maximium Monthly Effluent Flows for the past 3 years



estimated to be 421:1 with a greater than 95% chance of being exceeded. Minimum dilution values are commonly used for rivers such as the Palouse of 50:1 to reduce health and aesthetic problems. The available dilution factor which is 8 times the usually accepted ratio apparently reduces any adverse effects associated with the wastewater effluent.

Designated Uses

The monitoring information determined from Station 1 revealed the general water quality of the Palouse River study area to be limited. Such limitations are already reflected in the designated uses (IDHW/DOE, 1985).

Warm Water Biota:

Water temperatures in the river exceeded the maximum allowable temperature of 22°C for cold water biota twice during the study period. The mean water temperature of 20.8°C also exceeded the maximum allowable average temperature of 19°C required for a cold water biota classification. Thus the warm water biota designation was supported.

Secondary Contact Recreation:

Fecal coliform counts are not to exceed a geometric mean of 50 colonies/100 ml, and 200 colonies/100 ml (based on 5 samples over a 30 day period) for primary and secondary contact recreation classifications respectively (IDHW/DOE). The instream geometric mean for fecal coliform did not exceed 181 colonies/100 ml. A secondary contact recreation classification is appropriate for the Palouse River.

Primary Contact Recreation (future):

As previously discussed, the fecal coliform density during the study period exceeded the primary contact recreation classification. Since the water temperature is typically warm and the sources which contribute fecal coliforms to the river are not isolated, reduction of the fecal coliform counts and a decrease in temperature would be difficult and costly. Although swimmers were observed during the study, the future use designation of the Palouse River as a primary contact recreation water is very optimistic if not unrealistic.

Agricultural Water Supply:

A specific criterion has not been established for "Agricultural Water Supply," however, the water must be "suitable for irrigation of crops or as drinking water for livestock." The waters of the Palouse do not receive wastewater from commercial businesses or other sources which could introduce toxic or harmful chemicals. Therefore a designation for the Palouse River to supply water for agricultural purposes is reasonable.

This study did not indicate hazardous, deleterious, or radioactive materials; floating, suspended, and submerged matter; excess nutrients; BOD or COD; and suspended sediment to be present in the Palouse River. Therefore the general water quality criteria are apparently being satisfied.

<u>B.O.D., S.S.,</u>

In general the BOD and S.S. concentrations at stations 1,3,4, &5 (the instream locations) were comparable. The mean instream BOD and S.S. levels were 1.2 mg/l and 5.6 mg/l respectively. On August 21, 1986 no effluent was being released from the weir at Station 2, and a sample was instead taken from within the basin which contained the weir. The suspended solids concentration for that sample was 218 mg/l. The high concentration was due to suspended material which was visually evident in the basin. Apparently suspended solids collected in the box during the no discharge period. Therefore it is reasonable to assume that when discharge begins in the fall a high S.S. concentration is introduced into the Palouse River but the occurrence is probably only for a short period of time.

Effluent quality for BOD ranged from 10.5 mg/l to 25 mg/l with the mean being 6 mg/l. The DMRs for the past 3 years showed the maximum BOD concentration to be 28 mg/l, and S.S. was 66 mg/l. The mean S.S. concentration determined by this study was 6 mg/l with a maximum of 18 mg/l. Customary BOD and S.S. effluent limits for facilities such as the City of Potlatch lagoons are 45 mg/l for BOD and 70 mg/l for S.S.

Effluent BOD and suspended solid loadings during the study period and the DMRs show the loading rates to be within equivalent to secondary treatment limits. The maximum BOD and S.S. loadings noted during the study period were 16 lbs/day and 18 lbs/day respectively. The average percent removal for BOD was 96% and 93% for S.S. Only 65% removal is usually required for such lagoon treatment facilities.

pH and Conductivity

The Palouse River showed an average pH of 7.0 S.U. which ranged from 6.4 to 7.4 S.U. The wastewater effluent showed minimum and maximum pH values of 7.0 and 8.5 S.U. respectively. Both values are within the range of 6.0 to 9.0 S.U. usually set for treatment standards which are equivalent to secondary.

Conductivity within the river averaged 66 µmhos/cm with the highest value being 80 µmhos/cm. The higher mean conductivity value of 471 µmhos/cm present in the wastewater may have contributed to the minor increase of 6 µmhos/cm between Stations 1 and 3. Potable water within the United States generally ranges from 50 to 1500 µmhos/cm.

Temperature

The average instream water temperature during the study period was 20.8°C with a high of 23.5°C being recorded. The Palouse River is not protected from the sun due to a lack of foliage on the river banks, which combined with the shallow moving characteristic of the river causes the water temperature to be typically high. As mentioned previously the recorded water temperatures support the warm water biota designation for the river.

Fecal Coliform

The wastewater effluent quality indicates that the treatment lagoons are capable of meeting equivalent-to-secondary standards with the possible exception of fecal coliform. Customarily, fecal coliform limits are set at 100 colonies/100 ml and 200 colonies/100 for weekly and monthly averages respectively. Although these limits were not exceeded during the study period, discharge monitoring reports between 1983 and 1986 consistently showed counts in excess of 200 colonies/100 ml. Such an increase in bacteria during the winter months when the biological activity has decreased is common. Instream fecal coliform counts were near the upper limits for secondary contact recreational waters, and the winter counts according to DMRs exceeded the customary limits for effluent discharge. Chlorination of the effluent may provide the necessary disinfection to reduce the bacteria densities.

Dissolved Oxygen

The mean concentration of dissolved oxygen at the stations on the Palouse River did not vary significantly from the mean value of 8.0 mg/l. The municipal effluent, which had a mean D.O. concentration of 0.9 mg/l, did not cause a D.O. sag within the river. The river below the point of discharge actually showed a small increase in D.O. concentration that was probably due to a change in the river gradient and increased aeration.

Phosphorus

Phosphorus is essential to organism growth, and may be of particular concern where phosphate is a growth limiting nutrient. The ortho-phosphate form is essentially equivalent to dissolved phosphate. For this study it was decided that little additional information would be gained by breaking total phosphate into its various components.

The mean phosphate concentration of 0.10 mg/l remained constant over the course of the study at each instream station. The effluent showed an extremely high phosphate concentration of 338 mg/l on May 16, 1986. Unfortunately, instream sample collections did not begin until June 25, 1986 so the effect of the effluent on the Palouse River was not determined. The high reading may have been the result of a contaminated sample or spring turnover of the lagoon. Turnover usually occurs twice a year and is a phenomenon which results when the water temperature becomes uniform throughout, enabling the lagoon to mix nutrients and sediment from the bottom. Such action can result in higher nutrient concentrations at the surface. Since the higher effluent concentration was not supported by elevated influent values or other effluent samples, and seemed to be an isolated occurrence, the higher value was disregarded. The recommended concentration of 0.1 mg/l for waters not directly entering reservoirs or lakes was approached, but not exceeded, during the study period. The largest monthly loadings occurred in June when approximately 360 pounds of phosphorus were transported through the study area, of which only 30 pounds were contributed by the wastewater effluent.

Nitrogen

Nitrogen is another important nutrient which is present in large concentrations in the City of Potlatch's wastewater. All forms of nitrogen are biochemically interconvertible, and therefore, are of interest in effluent limitation studies.

Nitrite and nitrate are oxidized forms of nitrogen which are available for uptake by aquatic and terrestrial plants. Concentrations of these inorganic forms of nitrogen in excess of 0.3 mg/l are considered likely to accelerate lake eutrophication. Organic forms of nitrogen include proteins, urea, nucleic acids, and numerous synthetic organic materials. Analysis of total Kjeldahl nitrogen (T.K.N.) includes the organic forms as well as the ammonia fraction.

The mean T.K.N. concentration of the Palouse River was 0.29 mg/l. The values ranged from a high of 0.37 mg/l to a low of 0.23 mg/l among the instream stations. The mean T.K.N. concentrations of 5.60 mg/l in the effluent may have caused the 0.3 mg/l increase which occurred between Stations 1 and 3.

On June 25, 1986 an effluent sample for T.K.N. showed a concentration of 92.5 mg/l. As mentioned previously the high reading may have been the result of a contaminated sample or spring turnover. In any event, the occurrence seemed to be an isolated occurrence and was disregarded. The average instream total ammonia concentration was 0.03 mg/l which represents 4.0 percent of the T.K.N. value. During the study the maximum amount of organic and ammonia nitrogen exported from the study area in one month occurred during June of 1986; of the 1020 pounds, 60 pounds were attributable to the wastewater lagoons.

Ammonia is present in most waters and exists as part of the nitrogen cycle. The toxicity of aqueous solutions of ammonia is attributed to the un-ionized (NH_3) portion of the compound. Levels of un-ionized ammonia in the range of 0.20 to 2 mg/l have been shown to be toxic to some species of freshwater aquatic life. To provide safety for those life forms not examined, 1/10th of the lower value of this toxic effect range results in a criterion of 0.02 mg/l of un-ionized ammonia. The maximum instream un-ionized ammonia concentration noted during the study period was 0.001 mg/l on August 21, 1986 below the lagoons, at Station 4.

Fish Survey:

The resident fish population within the study area of the Palouse River was determined on July 11, 1976 by electro-shocking above and below the wastewater lagoons at Station 1 and Station 5. A majority of the fish collected were dace and shiners although some small suckers and squawfish were present. No salmonids or other game fish were collected (Appendix 2). The upper reaches of the Palouse River have been stocked with trout, but a lack of these species within the study area is indicative of the shallow and warm water which offers little protective habitat for fish.

Conclusions

1) The City of Potlatch's wastewater facility was not operating under an NPDES permit during the course of the study conducted between May and August 1986. During this study period, the facility produced effluent which would meet equivalent-to-secondary discharge requirements. However, DMRs indicate that fecal coliform counts during the winter months have been typically in excess of the customary limits for equivalent-to- secondary treatment.

2) During the low instream flow period of this study effluent volume decreased until there was no discharge by mid-August.

3) Nutrients from the wastewater facility do not significantly impact the Palouse River.

4) The designated general uses for the Palouse River within the study reach are appropriate. They are:

   ... Agricultural Water Supply
   ... Warm Water Biota
   ... Secondary Contact Recreation

5) The Palouse River is designated for secondary contact recreation. The geometric mean of 200 colonies of fecal coliform bacteria per 100 ml was approached, but not exceeded.

6) The future use designation for the Palouse River as a primary contact recreation water is very optimistic, and may not be reasonable to attain.

7) Access to the wastewater lagoons is limited. Winter access is by snowmobile for approximately two miles via private property; this unduly restricts monitoring and general operational visits.

8) A dilution factor of at least 400:1 was provided during the study period; according to U.S.G.S. records, similar dilution factors can be expected during the entire year with at least a 95% chance of exceedance.

Recommendations

1) The City of Potlatch's wastewater facility, is capable of producing an effluent that will not adversely affect the water quality of the Palouse River. The facility should provide equivalent-to-secondary treatment in order to prevent aesthetic and public health concerns.

2) Chlorination should be required for the effluent since instream fecal coliform counts are approaching the upper limits for the designated uses in the Palouse River, and according to DMRs effluent counts are periodically exceeding customary equivalent-to-secondary permit limits.

3) Access to the lagoons must be improved in order to satisfy the monitoring requirements of the NPDES permit and to provide routine maintenance. A foot bridge across the Palouse River may be adequate.

4) The requirement of a minimum dilution factor of 400:1 is reasonable for the facility to attain during all months of the year.

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.Appendix 1 : Water Quality Data Collected During the Summer 1986 Study

STORET	STA	DATE d/m/y	LOCATION	TEMP °C	FLOW cfs	pH S.U	COND µhmo /cm	D.O. mg/L	FECAL #/.1L	T.P mg/L	T.P Load lb/dy	T.K.N mg/L	T.K.N Load lb/dy	NH3&4 mg/l	NH3&4 Load lb/dy	S.S. mg/L	S.S. Load lb/dy	B.O.D mg/L	B.O.D Load lb/dy
2020069	1	5/16/86	Palouse R/Rock C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*	1	5/29/86	Palouse R/Rock C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*	1	6/25/86	Palouse R/Rock C	23.0	-	7.0	55	7.6	100	0.10	-	0.29	-	0.017	-	15	-	1.1	-
*	1	7/9/86	Palouse R/Rock C	21.5	19.36	6.6	59	7.6	103	0.10	10	0.25	26	0.04	4	3	313	0.9	89
*	1	7/31/86	Palouse R/Rock C	20.0	10.27	7.4	61	8.4	104	0.10	6	0.23	13	0.026	1	2	111	1.9	105
*	1	8/21/86	Palouse R/Rock C	20.8	7.75	7.4	69	7.9	27	0.10	4	0.32	13	0.044	2	2	84	1.1	46
*	1	MINIMUM	Palouse R/Rock C	20.0	7.75	6.6	55	7.6	27	0.10	4	0.23	12	0.017	1	2	84	0.9	46
*	1	MAXIMUM	Palouse R/Rock C	23.0	19.36	7.4	69	8.4	104	0.10	10	0.32	26	0.044	4	15	313	1.9	105
*	1	MEAN	Palouse R/Rock C	21.3	12.46	7.1	61	7.9	73	0.10	7	0.27	18	0.032	3	5.5	169	1.2	80
2020308	2	5/16/86	Lagoon Influent	12.1	0.17	7.2	600	1.0	TNTC	12.1	11	29.40	27	145.0	133	100	92	108.0	99
*	2	5/29/86	Lagoon Influent	14.0	0.16	8.0	600	0.6	.19 M	1.90	2	22.50	21	10.15	9	60	52	251.0	230
*	2	6/25/86	Lagoon Influent	16.5	0.11	7.3	660	0.2	1.4 M	10.6	6	33.40	20	20.70	12	194	115	251.0	149
*	2	7/9/86	Lagoon Influent	-	0.17	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*	2	7/31/86	Lagoon Influent	-	0.15	-	-	-	-	-	-	-	-	-	-	-	-		-
*	2	8/21/86	Lagoon Influent	-	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*	2	MINIMUM	Lagoon Influent	12.1	0.11	7.2	600	0.2	18500	1.90	2	22.50	20	10.15	9	60	52	108.0	99
*	2	MAXIMUM	Lagoon Influent	16.5	0.17	8.0	660	1.0	TNTC	12.1	11	33.40	27	145.0	133	194	115	251.0	230
*	2	MEAN	Lagoon Influent	14.2	0.15	7.5	620	0.6	64000	8.20	6	28.43	23	58.62	51	118	86	203.3	159

- Unreported Data

* Data was considered not to be representative of the water quality at that station and was therefore determined to be invalid

TNTC Bacteriological data reported as "To Numerous To Count". Assumed equivalent to 1000 colonies / 100 ml. for determining geometric means.

Appendix 1 : Water Quality Data Collected During the Summer 1986 Study

STORET	STA	DATE d/m/y	LOCATION	TEMP °C	FLOW cfs	pH S.U	COND µhmo /cm	D.O. mg/L	FECAL #/.1L	T.P mg/L	T.P Load lb/dy	T.K.N mg/L	T.K.N Load lb/dy	NH3&4 mg/l	NH3&4 Load lb/dy	S.S. mg/L	S.S. Load lb/dy	B.O.D mg/L	B.O.D Load lb/dy
2020309	12-A	5/16/86	Lagoon Effluent	11.0	0.15	8.5	338	3.1	10	*338	*	*92.5	*	2.060	2	10	8	10.0	8
"	12-A	5/29/86	Lagoon Effluent	17.5	0.19	8.5	410	0.2	10	4.00	4	5.85	6	2.740	3	18	18	16.0	16
"	12-A	6/25/86	Lagoon Effluent	20.7	0.06	8.4	500	0.3	30	4.20	1	5.34	2	1.740	1	16	5	18.1	6
"	12-A	7/9/86	Lagoon Effluent	19.0	0.04	7.0	490	0.3	238	4.94	1	7.31	2	4.810	1	12	3	25.0	5
"	12-A	7/31/86	Lagoon Effluent	18.8	0.01	8.2	488	1.2	6	3.90	0	4.60	0	0.693	0	8	0	10.5	1
"	12-A	8/21/86	Lagoon Effluent	19.9	0.00	7.8	600	0.3	180	4.00	0	4.90	0	1.470	0	*218	0	10.6	0
"	12-A	MINIMUM	Lagoon Effluent	11.0	0.00	7.0	338	0.2	6	3.90	0	4.6	0	0.693	0	8	0	10.5	0
"	12-A	MAXIMUM	Lagoon Effluent	20.7	0.19	8.5	600	3.1	238	4.94	4	5.85	6	4.810	3	18	18	25.0	16
"	12-A	MEAN	Lagoon Effluent	17.8	0.08	8.1	471	0.9	30	4.2	1	5.60	2	2.252	1	13	6	15.0	6
2020309	13	5/16/86	Palouse R/Flan.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	13	5/29/86	Palouse R/Flan.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	13	6/25/86	Palouse R/Flan.	23.5	-	6.7	67	8.2	100	0.10	-	0.34	-	0.030	-	14	-	0.7	-
"	13	7/9/86	Palouse R/Flan.	21.5	15.40	7.0	62	8.2	110	0.10	8	0.25	21	0.022	2	2	166	1.0	83
"	13	7/31/86	Palouse R/Flan.	18.5	9.75	6.9	65	8.8	46	0.10	5	0.32	17	0.025	1	2	105	1.3	68
"	13	8/21/86	Palouse R/Flan.	19.8	7.85	7.0	72	7.1	140	0.10	4	0.29	12	0.043	2	2	85	1.1	47
"	13	MINIMUM	Palouse R/Flan.	18.5	7.85	6.7	62	7.1	46	0.10	4	0.29	12	0.022	1	2	85	1.0	47
"	13	MAXIMUM	Palouse R/Flan.	23.5	15.42	7.0	72	8.8	140	0.10	8	0.34	21	0.043	2	14	166	1.3	83
"	13	MEAN	Palouse R/Flan.	20.8	11.00	6.9	67	8.1	99	0.10	6	0.30	17	0.030	2	5	119	1.0	66

- Unreported Data

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STORET	STA	DATE d/m/y	LOCATION	TEMP °C	FLOW cfs	pH S.U	COND µhmo /cm	D.O. mg/L	FECAL #/.1L	T.P mg/L	T.P Load lb/dy	T.K.N mg/L	T.K.N Load lb/dy	NH3&4 mg/l	NH3&4 Load lb/dy	S.S. mg/L	S.S. Load lb/dy	B.O.D mg/L	B.O.D Load lb/dy
2020310	14	5/16/86	Palouse R/Deep C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	14	5/29/86	Palouse R/Deep C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	14	6/25/86	Palouse R/Deep C	22.5	-	6.7	63	7.7	160	0.10	-	0.24	-	0.013	-	14	-	1.1	-
"	14	7/9/86	Palouse R/Deep C	22.5	16.94	6.8	63	8.3	110	0.10	9	0.28	26	0.019	2	2	183	1.0	91
"	14	7/31/86	Palouse R/Deep C	19.0	8.82	6.7	66	7.5	151	0.10	5	0.31	15	0.028	1	2	95	2.0	95
"	14	8/21/86	Palouse R/Deep C	22.2	9.32	7.4	80	10.0	405	0.10	5	0.37	19	0.057	3	2	100	0.7	35
"	14	MINIMUM	Palouse R/Deep C	19.0	8.82	6.7	63	7.5	129	0.10	5	0.24	15	0.013	1	2	95	2.0	35
"	14	MAXIMUM	Palouse R/Deep C	22.5	16.94	7.4	80	10.0	405	0.10	9	0.37	26	0.057	3	14	183	0.7	95
"	14	MEAN	Palouse R/Deep C	21.6	11.69	6.9	68	8.4	181	0.10	6	0.30	20	0.029	2	5	126	1.2	74
2020042	15	5/16/86	Palouse R/U.S.95	-	101.0	-	-	-	-	-	-	-	-	-		-	-	-	-
"	15	5/29/86	Palouse R/U.S.95	-	99.00	-	-	-		-	-		-	-		-	-		-
"	15	6/25/86	Palouse R/U.S.95	22.0	24.00	6.4	64	7.1	70	0.10	12	0.26	34	0.005	1	20	2587	0.7	91
"	15	7/9/86	Palouse R/U.S.95	20.0	17.80	6.9	62	7.0	150	0.10	10	0.27	26	0.017	2	2	192	1.25	120
"	15	7/31/86	Palouse R/U.S.95	17.0	8.80	6.8	68	7.4	173	0.10	5	0.31	15	0.026	1	2	95	2.50	119
"	15	8/21/86	Palouse R/U.S.95	19.5	8.00	7.1	78	9.2	204	0.10	4	0.31	13	0.040	2	2	86	1.1	47
"	15	MINIMUM	Palouse R/U.S.95	17.0	8.00	6.7	62	7.0	70	0.10	4	0.26	13	0.005	1	2	86	0.7	47
"	15	MAXIMUM	Palouse R/U.S.95	22.0	101.0	7.4	78	9.2	204	0.10	12	0.31	34	0.040	2	20	2587	2.5	120
"	15	MEAN	Palouse R/U.S.95	19.6	43.10	6.8	68	7.7	138	0.10	8	0.29	22	0.022	2	7	760	1.4	94

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APPENDIX 2

Reg
1540 Warner A
Lewiston, Idaho 8
Telephone: (208) 743-

September 30, 1986

Mr. Mark Von Lindern
Division of Environment
1239 Idaho Street
Lewiston, ID 83501

Dear Mark:

On 11 July 1986 fisheries personnel from the Idaho Department of Fish and Game used electrofishing gear to sample the Palouse River at the Highway 95 bridge and in the vicinity of Rock Creek. No gamefish were collected at either location. Dace and red-side shiners comprised the majority of fish collected. Lesser numbers of small suckers (less than 6 inches in length) were also collected. Squawfish ranging from 8-14 inches were collected at the Rock Creek site but not at the Highway 95 bridge location.

Sincerely,

Ronald L. Lindland

Ronald L. Lindland
Regional Fishery Biologist

RLL/cf

EQUAL OPPORTUNITY EMPLOYER