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CITY OF GRANDVIEW CLASS II INSPECTION
OCTOBER 21-23, 1991

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ABSTRACT

A Class II Inspection was conducted at the city of Grandview Sewage Treatment Plant on October 21-23, 1991. The treatment system includes a primary clarifier, lagoon system, and spray irrigation. The adequacy of treatment was difficult to assess, however, treatment across the lagoons did not appear to be good. Improved flow measurement at the plant is recommended. The facility's operation is periodically outside all of the State Waste Discharge Permit parameters. Significant laboratory deficiencies were identified. Ground water quality in the vicinity of the treatment lagoons appears degraded. Differentiation between ground water impacts due to the treatment plant, a nearby closed landfill, or other causes could not be made. A small wastewater discharge into the Yakima River was noted, although no indicators of gross contamination were observed in the river. The facility provided good avian and mammalian wildlife habitat.

INTRODUCTION

A Class II Inspection was conducted at the city of Grandview Sewage Treatment Plant (Facility) on October 21-23, 1991. Conducting the inspection were Steve Golding and Marc Heffner of the Washington State Department of Ecology's Compliance Monitoring Unit of the Environmental Investigations and Laboratory Services Program and Phelps Freeborn of the Ecology Central Regional Office (CRO). Allen Gustavson and Dave Lorenz, the treatment plant operators, provided assistance onsite. Additional assistance with ground water monitoring was provided by Kim Sherwood and Bob Raforth of the CRO and Cus Arteaga and Dave Martinez of Grandview.

The city of Grandview operates a wastewater treatment facility regulated by State Waste Discharge Permit #5511 (expiration date: October 2, 1990). The plant treats domestic wastewater and industrial wastewater - primarily from the food processing industry. The system discharges via spray irrigation with additional losses due to evaporation and to percolation through the unlined lagoons and ponds. Effluent from the lagoons is also used by the Department of Wildlife to fill and maintain ponds providing waterfowl breeding and rearing habitat.

A complete inspection would require study of the treatment system, ground water in the area, and the nearby Yakima River. The inspection concentrated on the treatment system and briefly looked at the quality of the ground water and Yakima River. The inspection was designed to provide a first step in evaluating the system. Specific objectives included:

1. assess wastewater treatment plant loading and plant performance;

2. verify State Waste Discharge permit self-monitoring;

3. evaluate the Yakima River for indicators of gross contamination resulting from the treatment plant; and

4. evaluate several monitoring wells for indicators of gross contamination of ground water resulting from the facility.

SETTING

The facility is situated on approximately 1400 acres of city property. The facility consists of a primary clarifier followed by an irregularly shaped aerated lagoon and a series of irregularly shaped lagoons and storage ponds (Figure 1). The system discharges via spray irrigation with additional losses due to evaporation and to percolation through the unlined lagoons and ponds. The land irrigated is scablands with basalt outcroppings dotting the

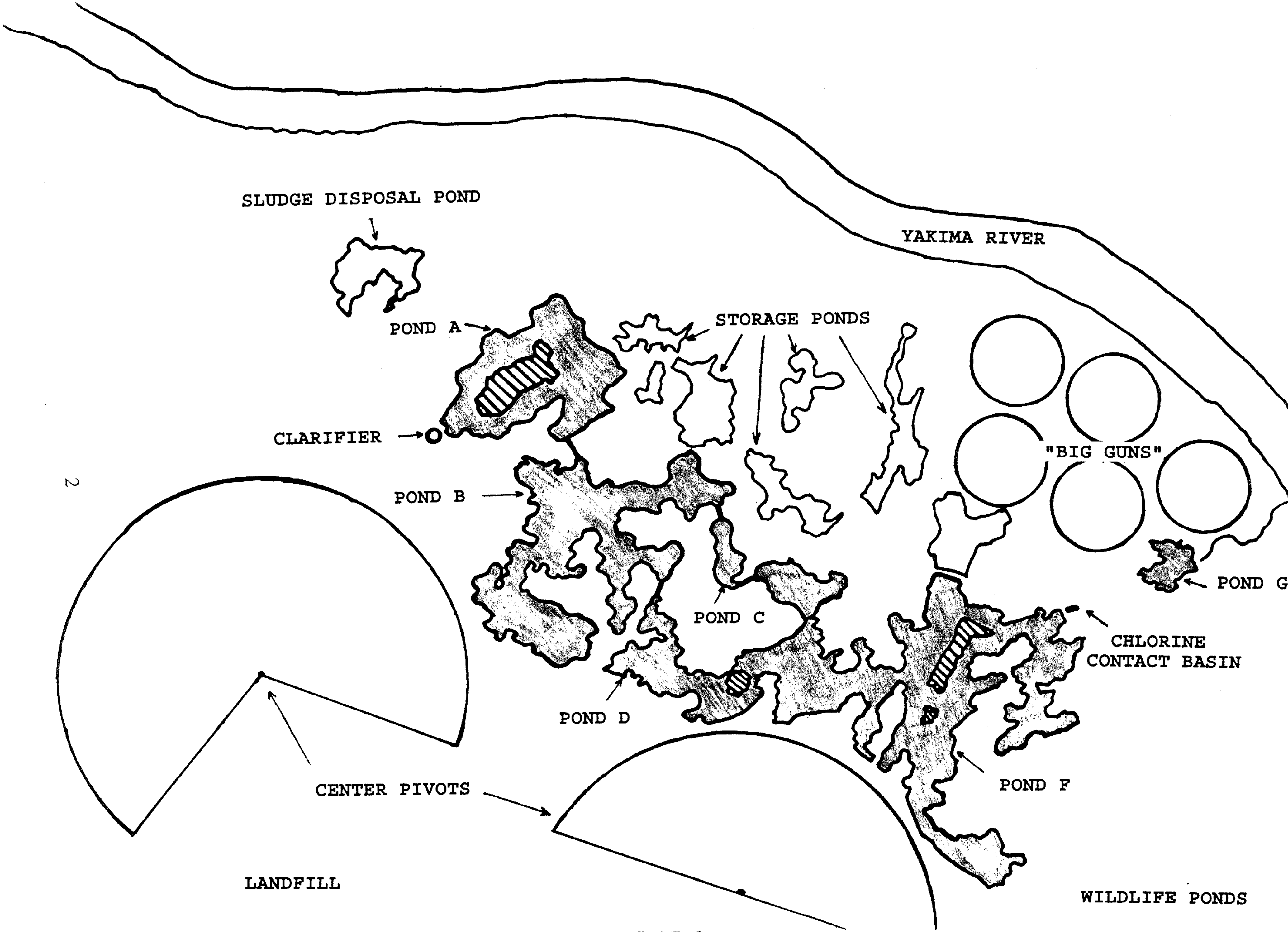

FIGURE 1
FACILITY OVERVIEW - GRANDVIEW, OCTOBER 1991

terrain. Native and naturalized vegetation is allowed to grow; no agriculture is conducted on the spray fields. Water from the facility is also used by the Department of Wildlife to fill and maintain ponds providing waterfowl breeding and rearing habitat. Abundant avian and mammalian wildlife was observed at the wastewater lagoons/sprayfield.

Wastewater is pumped to the plant and after passing through a Parshall flume is routed to the primary clarifier or, when flow is high, spilled through a notch in the headworks basin and routed to Lagoon A. The past practice of liming the entire flow prior to the primary clarifier had apparently reduced the capacity of the line between the headworks box and the primary clarifier. Acid treatments of the line, acidity of the influent, and time have apparently restored most of the capacity. The primary effluent is mixed with effluent from the final treatment lagoon (Lagoon E&F - hereafter referred to as Lagoon F) and enters Lagoon A. Lagoon A is roughly donut shaped and is aerated with twenty (20) 20 horsepower Aire-O2 aerators. Flow is then routed through Lagoon B; Lagoons C and D, which operate in parallel; and Lagoon F. A pump station near the end of Lagoon F pumps effluent either to the "big gun" sprayers or to a wet well near the primary clarifier. Valves along the Lagoon F/wet well line allow some of the flow to be diverted into storage/evaporation ponds between the two locations. From the wet well, flow either joins the primary effluent and returns to Lagoon A, or is pumped to the center pivot sprayers. Lagoon F can also be drained into a chlorine contact chamber, and after chlorination pumped to the Department of Wildlife "east game farm" ponds for use.

Spray irrigation from the system occurs from April through November, with some variability due to annual weather patterns. At the time of the inspection the spray irrigation system included a "full circle" center pivot, a half circle center pivot, and "big gun" units. The half circle center pivot operates through approximately 180 degrees. The "full circle" center pivot is restricted to approximately 210 degrees to prevent the adjoining closed landfill site from being sprayed (Figure 1). From December through March, wastewater is held in the system until the discharging season begins. When storage capacity is approached, additional storage ponds can be dug in low lying areas to increase the storage capacity.

At the time of the inspection the system drawdown for the storage period was almost complete. The Department of Wildlife ponds had been topped off and no further additions were planned until after the storage season. Some irrigation was still occurring. Irrigation is discontinued when ambient temperatures remain below 40°F. Corn processing, which the operators associate with high plant flows and heavy loadings, had been completed approximately one week before the inspection. Grape processing was occurring at the time of the inspection.

Sludge from the primary clarifier is pH adjusted using lime and pumped to a nearby depression on the property. When an area fills with sludge an alternate depression is selected.

PROCEDURES

Ecology collected grab and composite samples from several stations at the facility (Table 1 and Figures 2 & 3). Composite samples of the facility influent, primary clarifier effluent, Lagoon A effluent, and Lagoon F effluent were collected. Ecology Isco composite samplers were set up to collect equal volumes of sample every 30 minutes for 24 hours. Composite jugs were iced to cool samples as they were collected. Grab samples were collected from the facility influent, primary clarifier, Lagoons A, B, C, D, and F, the sludge pond, a storage pond, a runoff area, the Yakima River, facility wells, and a spring at the base of the rimrock. Sampling quality assurance/quality control steps included cleaning samplers prior to the inspection and maintaining chain-of-custody tracking on all samples.

The operators collected plant influent, primary clarifier, and Lagoon F effluent composite samples. The samplers were set to collect equal volumes of sample every hour for 24 hours. The Grandview bottles for the composite samples were not iced or refrigerated. Ecology and Grandview samples were split for analysis by both the Ecology and Grandview laboratories. Samples collected, sampling dates and parameters analyzed are summarized in Appendix 1A.

Samples for Ecology analysis were preserved as necessary, placed on ice, and delivered to the Ecology Manchester Laboratory. Ecology analytical methods and labs doing analysis are summarized in Appendix 1B.

RESULTS AND DISCUSSION

Ecology Quality Assurance/Quality Control (QA/QC)

All samples were received by the Manchester Laboratory in good condition with chain-of-custody maintained. All sample extraction and analytical holding times were met. The data generated by the analysis of the samples are considered reliable and can be used without qualification, except as noted on Table 2.

The analyses of the blind duplicate of the F-2 grab sample collected from F Lagoon, demonstrate a reasonable correlation between samples (Table 2).

Flow Measurements

An attempt to check flow meter accuracy was made. At the time of the inspection daily peak flows inundated the Parshall flume. This happened often during the peak of the food processing season. The operators stated this condition is caused by scale formation in the pipe leading from the flume to the clarifier due to historic heavy influent liming for disinfection. The reduced capacity of the line backs up flow through the flume causing inaccurate flow measurements. Flows were routinely estimated from pump station records and pump capacities because of the problem with the flume.

Table 1 - Sample Station Descriptions - Grandview, October 1991.

Inf (Influent)
Samples collected at the downstream end of the Parshall flume in the headwords box.

Pri (Primary Effluent)
Samples collected at the outlet of the overflow weir collection tough.

A, B, C, D (Treatment Lagoons)
Samples collected at the outlet structure of the appropriate lagoon.

F (Treatment Lagoon F)
Samples collected at the wet well near Lagoon A, prior to pumping to the center pivot spray fields or mixing with the primary effluent.

QA (Quality Assurance)
A duplicate sample taken of F2 from Lagoon F.

Stor (Storage Pond)
Sample collected from one of the storage ponds along the plant road to Lagoon F. The pond is filled with Lagoon F effluent.

Runoff (Sprayfield Runoff)
Sample collected from the diked end of Lagoon G.

Sludge-1
Limed primary sludge being sent to the disposal pond.

Sludge-2
Floating material collected from the sludge disposal pond.

Riv-1
Yakima River sample collected upstream of the STP near the Bureau of Reclamation gauge station. This sample was collected from the north shore of the river. (Latitude 46° 13', 15"; Longitude 119° 55' 00").

Riv-2
Yakima River sample collected downstream of the STP near the Mabton Siphon crossing. This sample was collected from the south shore of the river. (Latitude 46° 12' 30"; Longitude 119° 52' 10").

Table 1 - Continued.

Seep
Sample of water flowing from the ground below Lagoon G at a rate of approximately 10-15 GPM into the Yakima River approximately 100 feet upstream of the irrigation pipe crossing.

STP-Well
Sample of groundwater collected from the supply well faucet between the lime building and the maintenance shed.

MW 201
Sample of groundwater collected from Monitoring Well 201 northeast of Lagoon A. (Latitude 46° 12' 45"; Longitude 119° 54' 10").

MW 202
Sample of groundwater collected from Monitoring Well 202 located north of the service road between Lagoon A and Lagoon B. (Latitude 46° 12' 32"; Longitude 119° 54' 09:).

Spring
Sample collected from the tap in the shed of the house between the STP and the river.

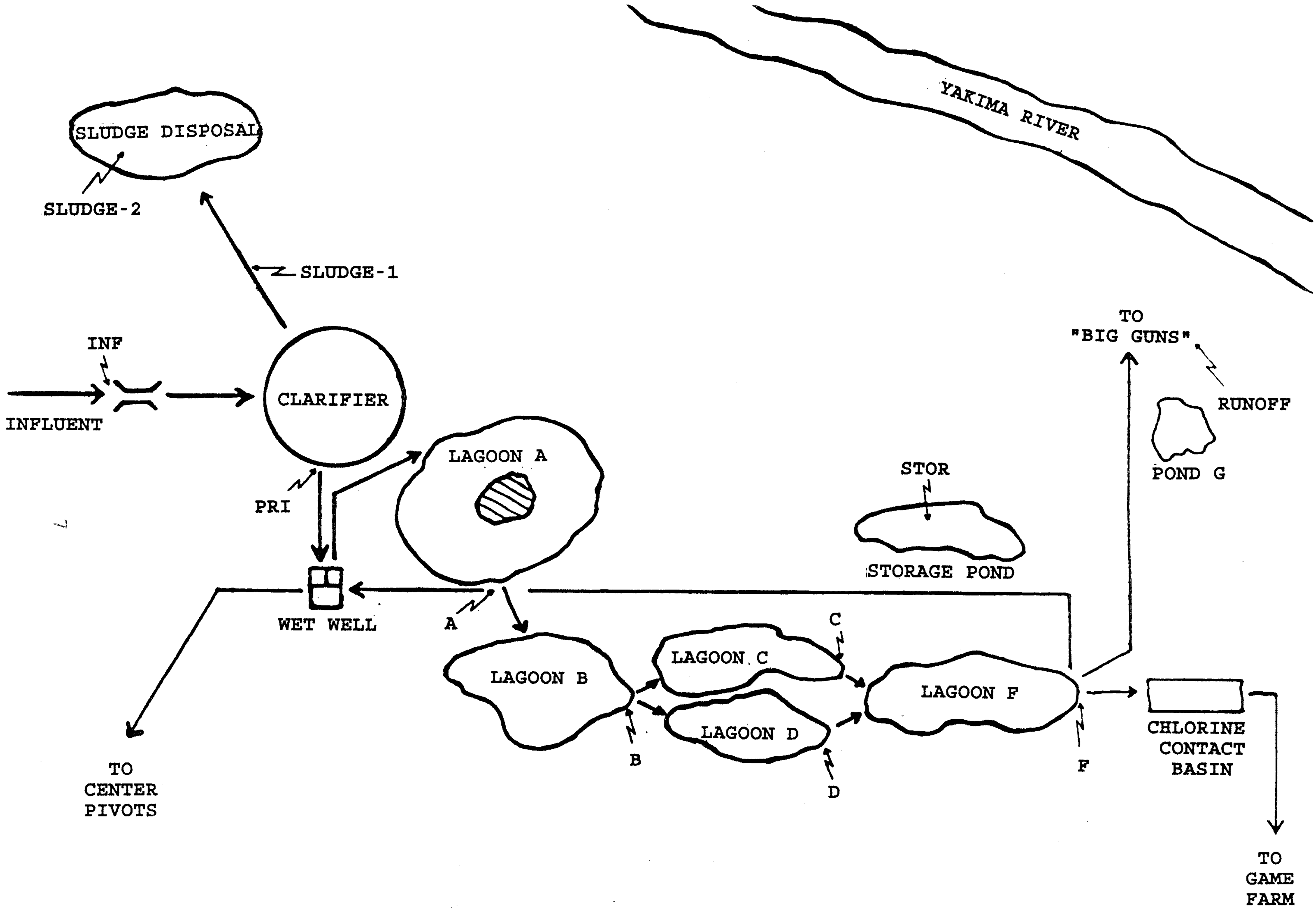

FIGURE 2
FLOW SCHEMATIC AND FACILITY SAMPLING STATIONS
GRANDVIEW, OCTOBER 1991

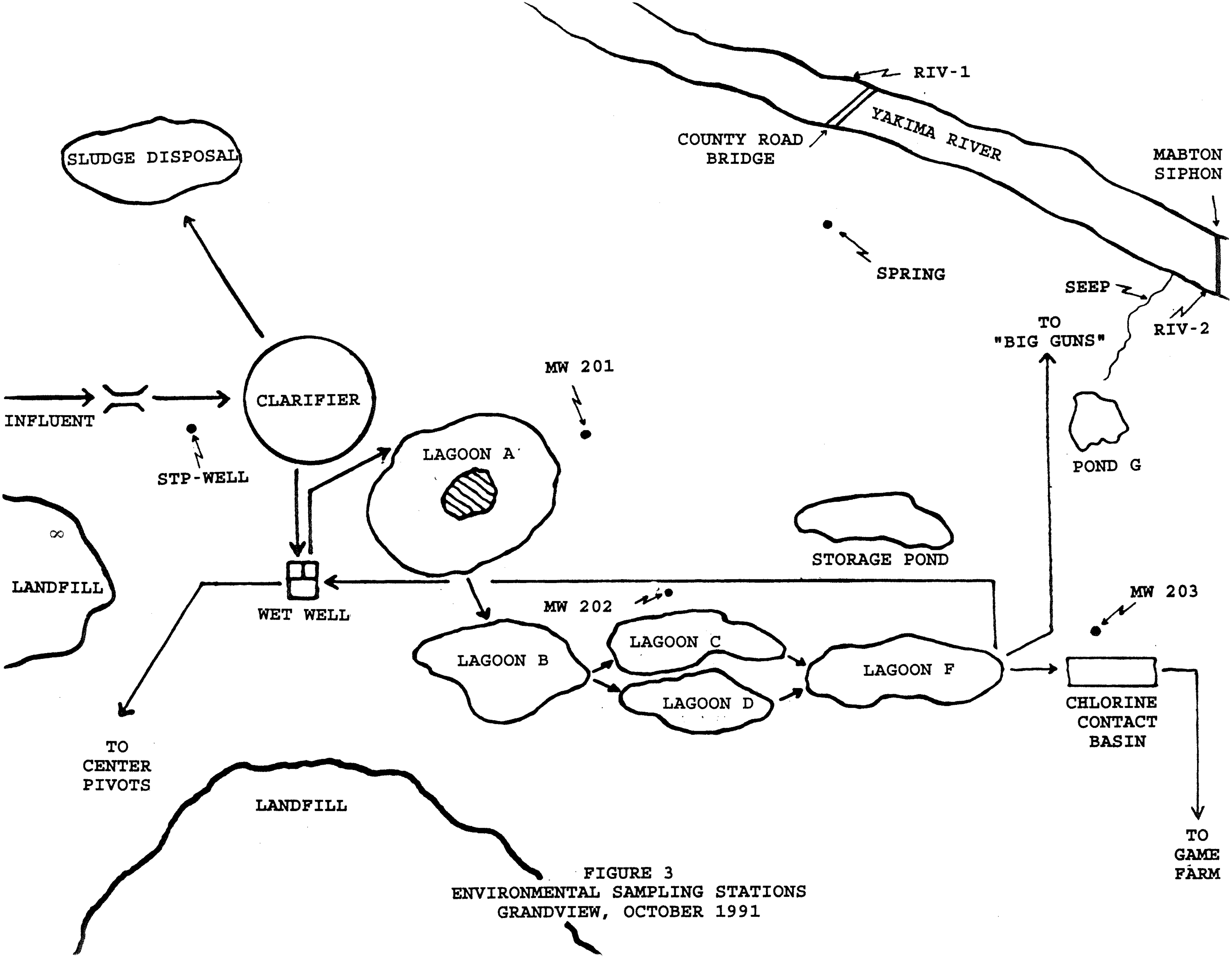

FIGURE 3
ENVIRONMENTAL SAMPLING STATIONS
GRANDVIEW, OCTOBER 1991

An attempt was made by Ecology to measure the flow from the primary clarifier as it passed through a rectangular weir in the primary clarifier/Lagoon F effluent mixing box. However, the addition of Lagoon F effluent to the primary clarifier effluent made it difficult to assess the accuracy of the facility's influent estimates.

An actual water balance for the Grandview treatment lagoons has not been made. The residence time within the treatment system is unknown but estimated to exceed 75 days. Evaporation is considerable in this arid climate and the rate of percolation from the lagoons is unknown. Flow rates of lagoon effluent sent for spray irrigation or to the Department of Wildlife ponds are estimated from pumping records. Sludge wasting rates are also estimated from pumping records.

During the inspection, Grandview estimated the influent flow to be 3.2 MGD and lagoon effluent flow to be 1.3 MGD based on pumping records. A brief review of DMRs suggests similar differences between the influent and effluent flow rates are common. Accurate influent and effluent flow measurements, and an estimate of evaporative water loss from the ponds are needed to construct a reasonable water balance for the facility. The amount of water loss due to lagoon leakage could be reasonably estimated with accurate flow and evaporation data.

General Chemistry

The influent, at the time of the inspection, was characteristic of high strength industrial sewage common to the food processing industry. Total solids, BOD_5, COD and TOC were high while alkalinity and nutrients concentrations were relatively low. Inspection data are provided in Table 2.

Lack of data to construct a water balance for the system prevents evaluation of overall waste treatment across the facility. However, the effluent had high total solids, BOD_5, COD, TOC, alkalinity, chloride, and total-P concentrations (Table 2).

The BOD_5 concentration of the primary clarifier effluent was 915 mg/L prior to entering the aerated Lagoon A. Aeration in Lagoon A and dilution with Lagoon F effluent (BOD_5: 635 mg/L) reduced the BOD_5 concentration by approximately 200 mg/L. The BOD_5 concentration was reduced by roughly another 100 mg/L through the facultative portion of the treatment system. Treatment necessary in the lagoons is dependent on the waste strength allowed to be sent to the sprayfield. EPA guidelines for municipal sprayfield sizing basically look at precipitation, evapotranspiration, and soil percolation rates (USEPA, 1981). BOD_5 loadings to the sprayfield were not a concern in the EPA study as the concentrations were all less than 100 mg/L in the examples provided. The "runoff" sample collected from Lagoon G suggests treatment occurred as the irrigated effluent made its way to and/or resided in the lagoon.

Table 2 - Ecology Laboratory General Chemistry Results - Grandview, October 1991.

Parameter	Location:	Inf-1	Inf-2	Inf-C	Inf-G	Pri-1	Pri-2	Pri-C	Pri-G	A-1	A-2	A-C
	Type:	grab	grab	E-comp	G-comp	grab	grab	E-comp	G-comp	grab	grab	E-comp
	Date:	10/22	10/22	10/22-23	10/22-23	10/22	10/22	10/22-23	10/22-23	10/22	10/22	10/22-23
	Time:	0845	1805			0900	~1815			0920	1730	
	Lab Log #:	438280	438281	438282	438283	438284	438285	438286	438287	438288	438289	438290
GENERAL CHEMISTRY												
Conductivity (umhos/cm)		790	900	820	880	670	850	870	880	1200	1200	1200
pH (SU)												
Alkalinity (mg/L CaCO3)				46	140			170	160			290
Hardness (mg/L CaCO3)				139E	148E			142E	134E			296E
Chloride (mg/L)				80	58			63	63	79	80	78
TS (mg/L)				1450	1400			1090	1000			1370
TNVS (mg/L)				720	690			770	580			770
TSS (mg/L)		340	220	380	450	70	100	110	140	170	150	120
TNVSS (mg/L)				92	100			14	33			4.3
TVS (mg/L)												
% Solids												
BOD5 (mg/L)				860	870			915	990			720
COD (mg/L)		770	2100	1400	1800	1100	920	1100	1100	1300	1200	1300
TOC (water mg/L)		290	750	560	540	460	340	430	400	480	460	460
TOC (soil)												
TKN (mg/L)												
NH3-N (mg/L)				5.8	0.16			0.81	.04U	0.21	0.1	0.1
NO2+NO3-N (mg/L)				0.09	0.02U			0.02U	0.02U	0.02U	0.02U	0.02U
Total-P (mg/L)				2.6	3.2			2.2	1.5	7.5	7.2	9.3
F-Coliform MF (#/100mL)						>1000000				>1000000	>1000000	
Fecal Coliform (#/100 mL)												
T-Coliform MF						>1000000				>1000000	>2000000	
Total Coliform (#/100 mL)												
FIELD OBSERVATIONS												
Temperature (cooled)				3.4				3.3				2.3
Temperature (C)		25.2	25.5		16.1	25	25.4		15.8	15.5	16.1	
pH (SU)		5.88	5.56	6.8	6.25	5.21	5.53	6.21	5.9	5.68	5.83	6.32
Conductivity (umhos/cm)		756	860	890	780	809	790	840	780	1020	1040	1110

E-comp Ecology composite sample
G-comp Grandview composite sample

E Reported result is an estimate because of the presence of interference
U The analyte was not detected at or above the reported result
X High background count

Table 2 (cont.) - Ecology Laboratory General Chemistry Results - Grandview, October 1991.

Parameter	Location:	B	C	D	E	QA	F-1	F-2	F-C	F-G	Sludge-1	Sludge-2
	Type:	grab	grab	grab	grab	grab	grab	grab	E-comp	G-comp	grab	grab
	Date:	10/22	10/22	10/22	10/22	10/22	10/22	10/22	10/22-23	10/22-23	10/22	10/22
	Time:	1102	1545	1600	1145	1715	0945	1715			1330	1345
	Lab Log #:	438291	438292	438293	438294	438295	438296	438297	438298	438299	438304	438305
GENERAL CHEMISTRY												
Conductivity (umhos/cm)		1400	1600	1400		1500	1400	1500	1500	1500		
pH (SU)											12.5	6.65
Alkalinity (mg/L CaCO3)		330	560	230		490	500	480	510	470		
Hardness (mg/L CaCO3)		365E	415	378E		398	402	399	398	397		
Chloride (mg/L)		88	136	93		120	130	120	120	130		
TS (mg/L)		1530	1700	990		1430	1490	1510	1480	1490		
TNVS (mg/L)		820	1520	550		940	870	900	920	890		
TSS (mg/L)		160	170	140		120	120	110	130	140		
TNVSS (mg/L)		14	12	9.8		11	2.4	3.2	12	7.8		
TVS (mg/L)											9640	32730
% Solids											15.8	
BOD5 (mg/L)									635	640		
COD (mg/L)		1500	580	1400		1200	940	870	820	1000		
TOC (water mg/L)		550	270	560		370	370	370	360	370		
TOC (soil)											41000	38000
TKN (mg/L)											590	1900
NH3-N (mg/L)		3.6	8	4.4		5.8	5.6	6.1	5.7	5.4		
NO2+NO3-N (mg/L)		0.02U	0.02U	0.02U		0.02U	0.02U	0.02U	0.02U	0.02U		
Total-P (mg/L)		9.7	8.8	10		9	18	9.6	9.1	9.2		
F-Coliform MF (#/100mL)		130000	2800	23000		15000	41000	22000				
F-Coliform MPN (#/100mL)											50000	1.6E+08
T-Coliform MF		610000X	47000	180000		190000	280000	190000				
T-Coliform MPN (#/100mL)											50000	1.6E+08
FIELD OBSERVATIONS												
Temperature (cooled)									2.6			
Temperature (C)		12.9	12.4	12.6	13.2	11.7	11.8	11.7		10.3	27.7	
pH (SU)		5.66	7.69	6	7.34	6.75	6.92	6.75	7.49	7.74	13.44	7.44
Conductivity (umhos/cm)		1180	1470	1310	1330	1380	1320	1380	1360	1380		

E-comp Ecology composite sample
G-comp Grandview composite sample

E Reported result is an estimate because of the presence of interference
U The analyte was not detected at or above the reported result
X High background count

Table 2 (cont.) - Ecology Laboratory General Chemistry Results - Grandview, October 1991.

Parameter	Location:	Stor	Runoff	Riv-1	Riv-2	Seep	STP-Well	MW 202	MW 203	MW 201	Spring
	Type:	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab
	Date:	10/22	10/22	10/22	10/22	10/22	10/22	10/22	10/22	10/22	10/22
	Time:	1155	1125	1120	1235	1250	1745	1400	1520	1600	1645
	Lab Log #:	438300	438301	438306	438307	438308	438309	438310	438311	438312	438313
GENERAL CHEMISTRY											
Conductivity (umhos/cm)		2400	2400	240	250	2600	540	1500	760	2300	830
pH (SU)											
Alkalinity (mg/L CaCO3)		770	780	110	100	790	180	670	220	840	290
Hardness (mg/L CaCO3)		302	498	102	96.1	498	223	669	313	880	390
Chloride (mg/L)		320	350	4U	5.7	380	23	200	35	230	68
TS (mg/L)		2670	2380	310	207	2370	390	900	380	1750	590
TNVS (mg/L)		1780	1820	230	230	1890	340	730	370	1410	440
TSS (mg/L)		5.3	3.2	22	9.7	100	2U	2U	2.0	4.0	2U
TNVSS (mg/L)		2U	2U	19	7.3	57	2U	2U	2U	2.7	2U
TVS (mg/L)											
% Solids											
BOD5 (mg/L)											
COD (mg/L)		200	96	6.2	180	87	2.6U	7.8	5.2	43	2.6U
TOC (water mg/L)		54	44	5.5	4.6	27	2.0	6.3	3.7	13	4.4
TOC (soil)											
TKN (mg/L)											
NH3-N (mg/L)		9.4	0.28	.04U	0.05	0.22	.04U	0.06	.04U	0.06	0.03
NO2+NO3-N (mg/L)		0.02	0.02U	1.5	1.3	3.6	1.6	0.02U	1.5U	0.02U	0.99
Total-P (mg/L)		3.3	3.9	0.28	0.13	3.4	0.02	0.04	0.02	0.05	0.03
F-Coliform MF (#/100mL)		8U	8U	440	630	67	1U	1U	1U	1U	1U
Fecal Coliform (#/100 mL)											
T-Coliform MF		50J	80J				20	1UX	1X	1UX	1X
Total Coliform (#/100 mL)											
FIELD OBSERVATIONS											
Temperature (cooled)											
Temperature (C)		11.3	12.1	11.1	11.2	11.7	14.1	15.2	14.5	13.7	13.1
pH (SU)		8.84	8.82	8.4	8.53	8.82	7.6	7.6	7.2	8.0	7.5
Conductivity (umhos/cm)		2080	2230	325	305	2380	470	1410	720	2110	810

E-comp Ecology composite sample
G-comp Grandview composite sample

E Reported result is an estimate because of the presence of interference
U The analyte was not detected at or above the reported result
X High background count

Both N and P concentrations were low in the primary clarifier influent and effluent; likely inhibiting biological treatment in Lagoon A. Supplemental N and P to approximate a 100:5:1 (BOD_5:NH_3-N:total-P - WPCF, 1990) ratio in the Lagoon A influent would likely improve treatment in the aerated lagoon. Nutrient checks through the system may be advantageous if treatment improves in Lagoon A with a more favorable BOD_5:nutrient ratio. NH_3-N and total-P concentrations in Lagoon F effluent were higher than in the influent, suggesting higher nutrient concentrations may occur in different wastes coming into the plant. Although higher, the BOD_5:NH_3-N ratio in the Lagoon F effluent was still low. Influent nutrient monitoring appears necessary to maintain a proper balance.

The BOD_5 concentration entering the facultative portion of the treatment system was 720 mg/L. This translates (at a facility estimated flow of 3.2 MGD) into approximately 19,500 pounds BOD_5 per day. The loading design criteria for stabilization ponds is 20 pounds BOD per acre per day on a total pond area basis (Ecology, 1985). This design criteria would dictate the sizing of the remaining lagoons collectively at roughly 1000 acres. The actual surface area of the stabilization ponds collectively is approximately 100 acres. Nutrient addition to the aerated portion of the lagoon should reduce the theoretical size needed.

A review of the inspection data for Lagoons C and D reveals an interesting finding. Lagoons C and D are fed from Lagoon B and operated in parallel. The effluent quality of the two lagoons is substantially different. The effluent quality from Lagoon D is nearly identical to the effluent quality from Lagoon B in COD, TOC, NH_3-N, Total-P, and pH. The effluent from Lagoon C has greatly reduced COD, TOC, and fecal coliform concentrations. One hypothesis is Lagoon C receives less flow from Lagoon B than does Lagoon D, or the configuration of Lagoon D leads to short circuiting, resulting in a longer retention time in Lagoon C. A longer retention time may be responsible for the greater level of treatment in the oxygen demand parameters. This suggests increasing the retention time of the lagoon system may result in a better overall performance of the lagoons.

The BOD_5 concentration of Lagoon F effluent was 635 mg/L. At a facility estimated flow to the spray fields of 1.3 MGD, approximately 7000 pounds of BOD_5 are land applied daily compared to 19,500 pounds of BOD_5 and 3.2 MGD of sewage entering the system on the day of the inspection. Thus, there was an apparent substantial reduction in BOD_5 load through the lagoons. Four possible explanations are noted for these observations.

First, the influent flow estimates were too high and inflated treatment system loading estimates. Second, leakage and evaporation from the lagoons was reducing the BOD_5 load to the sprayfield. The amount of BOD_5 treated in the lagoons and treated during percolation could not be differentiated from the BOD_5 load to the ground water. Third, the loadings to the spray fields may be indicative of a weaker sewage discharged into the facility prior to inspection. And fourth, the effluent pumping estimates were too low. Reliable flow measurements for the influent, and effluent to sprayfields and Wildlife ponds are needed.

Defining the role of the lagoons as a holding system or a treatment system is necessary. If the lagoons are for treatment, nutrient addition to maintain an appropriate BOD_5:NH_3-N: total-P ratio is suggested. Improved water quality in the lagoons lessens potential impacts of oxygen demand parameters due to leakage to the ground water. Potential impacts to ground water due to the nutrients added to the treatment system are a possible negative effect of nutrient addition. Careful monitoring of nutrient concentrations would be an important part of nutrient addition.

Split Sample Comparison/Grandview Laboratory Procedures Review

Ecology laboratory analysis of split samples found generally good correlation between the Ecology and Grandview samples as shown in Table 3. Substantial differences were noted in influent alkalinity and NH_3-N concentrations. The effluent from the primary clarifier showed differences in TNVS, TSS and TNVSS. Also, the Grandview composite samples were much warmer than proper sample holding temperature (4°C). The composite samples should be properly cooled.

Comparison of Ecology and Grandview analytical results of split samples for TSS and BOD_5 showed differences at most sampling locations. Grandview's BOD_5 and TSS results were generally less than the Ecology results (Table 3). The Grandview fecal coliform result (9000/100mL) was less than the Ecology result (22000/100mL), but of similar magnitude.

In conjunction with this Class II Inspection, Dale Van Donsel and Perry Brake of the Ecology's Manchester Laboratory Quality Assurance Section conducted inspections of the Grandview laboratory on October 18 (microbiology) and 30 (chemistry), 1991. They were unable to verify laboratory capability because the laboratory does not have a formal quality assurance program and no test results for quality control. The findings of the inspections are:

1. The laboratory should establish a quality assurance program and publish a QA manual to identify objectives such as bias, precision, and accuracy;

2. Upgrade the laboratory to meet the space requirements specified in ASTM Standard 3856-88.

3. Install a fume hood to prevent the accumulation of fumes harmful to laboratory personnel and equipment. The hood should be set up for an air flow of 75-125 feet per minute with the sash fully open.

4. A spill response kit should be kept in the laboratory as a matter of safety.

5. An autoclave should be purchased to sterilize supplies for fecal coliform analysis.

Table 3 - Split Sample Results Comparison - Grandview, October 1991.

	Location:	Inf-C	Inf-G	Pri-C	Pri-G	F-C	F-G	F-2
	Type:	E-comp	G-comp	E-comp	G-comp	E-comp	G-comp	grab
	Date:	10/22-23	10/22-23	10/22-23	10/22-23	10/22-23	10/22-23	10/22
	Lab Log #:	438282	438283	438286	438287	438298	438299	438297
	Sampler:	Ecology	Grandview	Ecology	Grandview	Ecology	Grandview	Ecology
PARAMETER	Analyzed by:							
Conductivity (umhos/cm)	Ecology	820	880	870	880	1500	1500	
	Grandview							
Alkalinity (mg/L CaCO3)	Ecology	46	140	170	160	510	470	
	Grandview							
Hardness (mg/L CaCO3)	Ecology	139 E	148 E	142 E	134 E	398	397	
	Grandview							
Chloride (mg/L)	Ecology	80	58	63	63	120	130	
	Grandview							
TS (mg/L)	Ecology	1450	1400	1090	1000	1480	1490	
	Grandview							
TNVS (mg/L)	Ecology	720	690	770	580	920	890	
	Grandview							
TSS (mg/L)	Ecology	380	450	110	140	130	140	
	Grandview	287	264	137	99	105	108	
TNVSS (mg/L)	Ecology	92	100	14	33	12	7.8	
	Grandview							
BOD5 (mg/L)	Ecology	860	870	915	990	635	640	
	Grandview	890	910	760	770	565	520	
COD (mg/L)	Ecology	1400	1800	1100	1100	820	1000	
	Grandview							
TOC (mg/L)	Ecology	560	540	430	400	360	370	
	Grandview							
NH3-N (mg/L)	Ecology	5.8	0.16	0.81	<0.04	5.7	5.4	
	Grandview							
NO2+NO3-N (mg/L)	Ecology	0.09	<0.02	<0.02	<0.02	<0.02	<0.02	
	Grandview							
Total-P (mg/L)	Ecology	2.6	3.2	2.2	1.5	9.1	9.2	
	Grandview							
Temperature (C)	Ecology	3.4	16.1	3.3	15.8	2.6	10.3	
	Grandview							
pH (S.U.)	Ecology	6.8	6.25	6.21	5.9	7.49	7.74	
	Grandview							
F-Coliform MF (#/100 mL)	Ecology							22000
	Grandview							9000

E Reported result is an estimate because of the presence of interference

6. The rinse/dilution water used for membrane filtration should be the $KH_2PO_4/MgCl_2$ formulation.

7. Establish and implement a chain-of-custody procedure.

8. Sodium thiosulfate must be added to sample bottles used for fecal coliform analysis prior to collection of chlorinated effluent samples.

9. Edition 14 of Standard Methods was being utilized as the reference for analytical determination in the laboratory. The latest edition of Standard Methods should be acquired.

The Grandview facility has not applied for or received accreditation for their laboratory from the Quality Assurance Section as of the date of this report. A copy of this System Audit Report is provided in Appendix 2.

State Waste Discharge Permit Compliance

Grandview State Waste Discharge permit parameters include influent flow, and clarified effluent fecal coliforms and pH. A review of the monthly monitoring reports indicate the Permittee is often out of compliance with the three permit parameters. The results of the inspection are similar to monthly monitoring data.

Influent flow is limited to a monthly average of 2.56 MGD. The inspection flow was 3.2 MGD. The monthly monitoring reports for September and October 1990, document monthly average flows at 5.16 and 3.63 MGD respectively. The September and October 1991 monthly reports show a decrease in average monthly flow to 2.7 and 3.11 MGD respectively. The facility operators attribute the perceived flow reduction to more accurate flow measurements in 1991 than in 1990, and not a true reduction in flows. In both years influent flows reported exceeded the permit limit.

Grandview has questioned whether the fecal coliform limit is still in effect; suggesting correspondence since the permit was issued changed the requirement. Grandview had historically limed the plant influent to adjust pH and control coliforms and odors. Liming the influent was discontinued when the need to comply with the limit was questioned. No objections to changing the liming procedure were noted and chlorination of the final effluent was required when the additional game ponds were added to the effluent discharge locations. On the monitoring reports, fecal coliforms results are tabulated under the irrigated effluent column rather than clarifier effluent. Thus, fecal coliform sampling for self-monitoring purposes may not correspond to the permit requirement. The monitoring reports indicate the Permittee is not taking fecal coliform samples routinely. Only two fecal coliform results were reported for the month of September 1990, one in October 1990, and no sample results were reported for either May or June of 1991.

Fecal coliform bacteria are limited in the clarified effluent to 400/100 ml on a weekly average and 200/100 ml on a monthly average. The inspection clarified effluent result was >1,000,000/100 mL, far in excess of the limit. Lagoon F effluent, wastewater sent to the sprayfields, have no coliform limits in the permit. The Lagoon F fecal coliform counts ranged from 15,000-41,000/100mL and total coliform counts ranged from 190,000-280,000/100mL. It is unclear if the present limit intends to be protective for surface water/spray irrigation contact or to protect ground water from pond leakage. The purpose of coliform limits should be re-evaluated and a determination made if clarified effluent and/or effluent prior to spraying need be monitored/limited.

The pH of the primary clarifier effluent is regulated by the permit. The permit specifies the pH shall not fall outside a range of 7.0 to 9.0. Grandview has difficulty maintaining the pH of the clarifier effluent within the range specified in the permit. When slaked lime was being introduced into the clarifier, the pH routinely exceeded the permit limit. The monthly averages of pH reported by Grandview for September and October 1990 were 11.27 and 10.8, respectively. Now that the practice of liming the clarifier effluent has be suspended, the effluent pH is lower than the permit allows. The monthly averages of pH reported by Grandview for September and October 1991 were 5.7 and 5.64 respectively. Ecology field measurements of two grab samples of clarifier effluent collected during the inspection were 5.2 and 5.5. The pH range suitable for wastewater treatment in the lagoons and/or sprayfields should be evaluated.

In May of 1991, the Ecology Central Regional Office submitted a new monitoring schedule to Grandview for implementation on July 1, 1991. The new monitoring schedule did not change S1 (Final Effluent Limitations of the permit) but did change S2 (Final Testing Schedule). The new monitoring requirements for D.O., fecal coliforms, and percent solids of the sludge discharged were not being recorded on the monthly monitoring reports at the time of the inspection.

Priority Pollutants

All sampling equipment used to collect samples for priority pollutant analyses was cleaned using the approved Ecology cleaning methodology (Appendix 1C).

Pesticide, PCB and metals analyses were run on selected samples (Table 4). Lindane was the only organic priority pollutant detected. It was detected in both the influent and the clarifier effluent samples. The concentration in the clarifier effluent was slightly greater than the chronic toxicity criteria to protect freshwater organisms (EPA, 1986). Pesticide and PCB analyses were not run on Lagoon F effluent samples, thus the concentration of lindane in the effluent is unknown.

Several priority pollutant metals were also detected in the samples collected (Table 4). Even though the effluent is not discharged directly to a receiving water, the effluent concentrations were all less than freshwater acute and chronic toxicity criteria (EPA, 1986).

Table 4 - Pesticide/PCB and Metals Scan Results - Grandview, October 1991.

Location:	Inf-C		Pri-C		A-C		F-C		Sludge-1		EPA Water Quality Criteria Summary			
Type:	E-comp		E-comp		E-comp		E-comp		grab					
Date:	10/22-23		10/22-23		10/22-23		10/22-23		10/22					
Time:									1330		Acute		Chronic	
Lab Log#:	438282		438286		438290		438298		438304		Fresh		Fresh	
Pesticide/PCB Compounds	ug/L		ug/L		ug/L		ug/L		ug/kg-dr		(ug/L)		(ug/L)	
gamma-BHC (Lindane)	**0.011**		**0.13**		N/A		N/A		N/D		2.0		0.08	
Metals									mg/kg-dr					
Arsenic	**2.8**	P	**3.6**	P	**2.3**	P	**2.7**	P	**2.31**	E				
Beryllium		U		U		U		U	**0.22**	P	130	*	5.3	*
Cadmium	**0.51**	PB	**0.23**	PB	**0.4**	PB	**0.34**	PB	**0.408**		18.7	+	3.4	+
Chromium		U		U		U		U	**31.6**					
Copper	**33.1**		**15**		**6.1**	P		U	**35.7**	N	65	+	39	+
Lead	**10.6**	B	**4**	PB	**2.6**	PB	**1.6**	PB	**21**		477	+	18.6	+
Mercury	**0.12**	PN		U		U		U	**0.0658**	N	2.4		0.012	
Nickel	**2.7**	P	**3.1**	P	**2.7**	P	**3.7**	P	**15.8**		4,582	+	509	+
Selenium		U	**5.4**	NJ		U		U		U	260		35	
Silver		U		U		U		U	**0.582**	N	44.0	+	0.12	
Zinc	**145**		**90.3**		**49.3**		**27**		**72.9**	NE	379	+	343	+

NOTE: SOME INDIVIDUAL COMPOUND CRITERIA OR LOELS MAY NOT AGREE WITH GROUP CRITERIA OR LOELS. REFER TO APPROPRIATE EPA DOCUMENT ON AMBIENT WATER QUALITY CRITERIA FOR FULL DISCUSSION.

U The analyte was not detected at or above the reported result.
J The analyte was positively identified. The associated numerical result is an estimate.
B Analyte was found in the analytical method blank, indicating the sample may have been contaminated.
P The analyte was detected above the instrument detection limit but below the established minimum quantification limit.
N For metals analytes the sample is not within control limits.
* Insufficient data to develop criteria. Value presented is the LOEL - Lowest Observed Effect Level.
+ Hardness dependent criteria (200 mg/L used).

The detection limits for the priority pollutant analyses are provided in Appendix 3.

Sludge

Sludge being pumped to the disposal pond (Sludge-1) had a very high pH as a result of liming (Table 2). Solid waste with a pH in excess of 12.5 is considered a dangerous waste. Therefore the pH of the sludge should be maintained between 12.0 and 12.5 so that the sludge is not subjected to more rigorous environmental controls. The pH of the floating material in the disposal pond (Sludge-2) was much lower.

Coliform counts were high in the sludge being sent to the disposal pond (50,000/100mL - fecal and total) and very high in the floating solids in the sludge disposal pond (160,000,000/100mL - fecal and total). Considerable odor was noted at times in the disposal pond area. These counts indicate that the sludge, despite the high pH, may not be adequately disinfected and that bacterial regrowth may be occurring in the disposal pond.

Several metals were detected in the sludge at fairly low concentrations (Table 4 - Appendix 3). No pesticides or PCBs were detected in the sludge.

The sludge management at the facility does not appear to comply with S7 (Solid Waste Disposal) in the permit. Grandview has not applied for or received a solid waste disposal site permit from the Yakima County Health District (McEwen, 1992). Sludge disposal practices should be evaluated in comparison to the new EPA sludge regulations.

Impacts on Surface Water

One direct discharge to the Yakima River was investigated - the permit does not allow direct discharge. A seep was leaking past the embankment forming Lagoon G. Lagoon G was formerly the final treatment lagoon prior to discharge to the Yakima River. At the time of the inspection, Lagoon G was used as a storage pond. The leakage was flowing at an estimated rate of 10-15 gallons per minute through a cattail-lined draw to the Yakima River (Figure 2). A sample of the discharge was collected about fifty feet upstream from where it enters the river, approximately 100 feet upriver of the Mabton Siphon. Water quality in the seep was very similar to water quality in Lagoon G ("runoff" sample - Table 2). Since the inspection, the wastewater application area has been increased resulting in less runoff to Lagoon G. Lagoon G has dried completely at times.

Three other lines of vegetation similar to the seep area were observed between the sprayfield and the river upstream of the siphon. These were not investigated any further.

Two samples were collected to detect any gross levels of contamination in the Yakima River. The downstream river sample (Figure 2, Table 2) does not show any notable differences compared to the upstream river sample, with the exception of COD. Since the downstream

COD is higher than the seep concentration and the other parameters were not similarly effected, this value is probably an error or anomaly.

Impacts on Ground Water

The existing ground water monitoring network is inadequate to define the impacts of the facility on the ground water quality. The deficiencies include:

1) characterization of the hydrogeologic conditions at the facility has not been conducted;

2) background water quality and the effects of other upgradient sources have not been defined; and

3) monitoring wells are not installed downgradient of all disposal activities at the facility.

The deficiencies are discussed in the following paragraphs.

The site is underlain by fractured basalt. Ground water flow patterns in fractured terrains are often complex. The direction of the ground water flow is not known with certainty but assumed to be towards the Yakima River. Also, leakage from the ponds may induce mounding, which can add further complexity to the ground water flow patterns.

Two studies have been conducted in conjunction with the Grandview landfill closures to investigate the potential for ground water contamination caused by the operation of the landfill. The landfill is approximately 1500 feet south and appears to be hydraulically upgradient of the treatment lagoons. A total of ten monitoring wells have been completed, developed, and sampled to evaluate the impacts of the landfill on ground water quality. Impacts to ground water quality have been documented.

In 1982, samples from six monitoring wells adjacent to the landfill were analyzed. Water from all of these wells exceeded one or more of the current ground water criteria of Chapter 173-200 WAC (Sweet, Edwards & Associates, Inc., 1986). These constituents were total coliform, chloride, arsenic, lead, sulfate, and pH. Three of the six monitoring wells are within the areal extent of the "full circle" center pivot spray field. Two of these wells yielded the highest fecal and total coliform counts of all six wells suggesting possible impacts from the operation of the spray fields on ground water. The highest well results were higher than one of the two grab samples collected from Lagoon F for total coliforms, and higher than both wastewater grab samples collected for fecal coliforms.

Four new monitoring wells were added to the monitoring network. In 1989, water from all ten wells was sampled and analyzed. The results show that all exceeded one or more of the current ground water criteria (Converse GES, 1989). These constituents were arsenic, chloride, manganese, sulfate, color, total coliform, and iron.

The maximum concentrations for sulfate, chloride, iron, manganese, fecal coliform, and the minimum for pH documented in the 1982 and 1989 sampling events is greater than the maximums (minimums for pH) seen in the U.S. Geological Survey of the water quality in the Lower Yakima Subregion (USGS, 1986). Heavy metals results were not reported in this survey.

A total of five samples representing ground water quality beneath the facility were taken during the inspection. Three samples were collected from facility monitoring wells. One sample was collected from the water supply well for the facility. The final sample was collected from a spring at the base of the rimrock cliff located between the facility and the Yakima River (Figure 2). This spring provides water to the house located between the treatment facility and the river.

The monitoring system in place is not adequate to determine the true impact of the wastewater treatment facility on the ground water. The three monitoring wells and the spring, sampled as part of the Class II Inspection, are all apparently downgradient from the treatment lagoons. The big gun spray fields, used for the disposal of wastewater, located between the lagoons and the Yakima River are likely downgradient from these monitoring wells. Thus, the impact of those spray fields would not be detected by the current monitoring system. If the potential for ground water mounding is ignored, the supply well is upgradient from the treatment lagoons but may be downgradient from a storage lagoon, the center pivot spray fields, and two closed municipal landfills adjacent to the facility. There were no samples collected, at the time of the inspection, from true "background" wells to directly compare with the data generated from this inspection.

It appears that the landfill and/or wastewater treatment facility may have degraded the ground water quality. Ground water quality in the vicinity of the facility is generally poor, exceeding the ground water criterion of Chapter 173-200 WAC for total dissolved solids (500 mg/L) in three of the five samples (MW 201, MW 202, and the spring). The water supply well exceeded the criterion for total coliforms. The operators should continue their practice of bringing drinking water along from off site. Samples from the two monitoring wells closest to Lagoon A (MW 201 and MW 202) had the poorest quality (Table 2). Although the ground water quality beneath the facility is poor, it's quality can not be directly attributed to the facility's operations without further study to characterize the site hydrogeology and enhance the existing monitoring network.

FINDINGS AND RECOMMENDATIONS

Flow Measurement

At the time of the inspection, the Parshall flume was inundated during peak flows and the influent flow rate was estimated with pumping records. Also, the flow rate to the sprayfields was estimated from pumping records. The spraying rate was 40% of the influent flow rate during the inspection: a rate not unusual based on limited review of past monitoring reports submitted by Grandview. The accuracy of the estimates could not be verified.

- The Parshall flume and associated plumbing or an alternative flow meter should be sized to accurately measure plant influent flows. Accurate influent and effluent flow measurements, and an estimate of evaporative water loss from the ponds are recommended. Water loss due to lagoon leakage could be reasonably estimated with accurate flow and evaporation data.

General Chemistry

Plant influent (860 mg/L) and Lagoon F effluent (635 mg/L) had high BOD_5 concentrations. The amount of treatment (in pounds per day of BOD_5 removed) can only be estimated due to the quality of flow data available. The apparent poor treatment is likely related to low NH_3-N and total-P concentrations in the wastewater inhibiting biological activity. Increased detention time in the lagoon system may also encourage more treatment.

- Determining whether the lagoons are treatment ponds or holding ponds prior to land treatment is recommended. If the lagoons are treatment ponds, nutrient (NH_3-N and total-P) addition to the wastewater is recommended. Proper dosage rates and monitoring will be necessary to provide adequate nutrients without providing excess that may threaten ground water quality.

Split Sample Comparison/Grandview Laboratory Procedures Review

The Ecology laboratory analyses found generally good correlation between samples collected by Ecology and Grandview. The Grandview samples were not properly cooled during sample collection.

- Samples should be properly cooled during sample collection.

Comparison of split samples analyzed by Ecology and Grandview found some differences. Grandview results for BOD_5, TSS, and fecal coliforms were generally less than Ecology results.

The Ecology laboratory Quality Assurance Section was unable to verify Grandview's laboratory capability due to a lack of a formal quality assurance program and no test results for quality control. Grandview has not applied for laboratory accreditation and would be unable to receive it until the deficiencies noted in the laboratory review were corrected.

- Correcting the deficiencies noted and earning laboratory accreditation are required by WAC 173-216-125 by July 1, 1994.

State Waste Discharge Permit Compliance

The Permittee was not in compliance with the conditions of their permit. Modifications made to the permit in response to facility changes have clouded the conditions necessary for compliance. The plant influent flow rates reported by the Permittee commonly exceed the permitted flow rates.

The fecal coliform limit applicable to the primary clarifier effluent was exceeded. Grandview has questioned whether this limit is still in effect; suggesting correspondence since the permit was issued changed the requirement. Although not limited, total and fecal coliform counts in lagoon effluent sent to the sprayfields were high during the inspection.

- Determining if the coliform limits are to be protective for surface water/spray irrigation contact or protective of ground water quality in the event of pond leakage is necessary. Based on the determination, monitoring requirements and/or limits can be formulated for clarifier effluent and/or lagoon effluent.

The pH limit, also applicable to the primary clarifier effluent, was outside the specified range during the inspection.

- The pH range suitable for wastewater treatment in the lagoons and/or sprayfields should be evaluated and modified if necessary.

Priority Pollutants

Several metals and the pesticide lindane were detected in the influent and the primary clarifier effluent. The lindane concentration in the clarifier effluent was slightly greater than the chronic toxicity criteria for freshwater. Metals concentrations were less than toxicity criteria.

- Pesticide analyses should be run on a Lagoon F effluent sample to determine if lindane or any other pesticides are being applied to the sprayfields.

Sludge

Sludge being pumped to the disposal pond had a very high pH and high coliform counts.

- The pH of the sludge should be maintained between 12.0 and 12.5 to avoid the need to evaluate the sludge as a possible dangerous waste.

- Accurate pH and quantity records of sludge disposed should be kept.

Considerable odor was noted at times in the disposal pond area. Several metals were detected in the sludge at fairly low concentrations. Pesticides or PCBs were not detected in the sludge.

Grandview has not applied for or received a solid waste disposal site permit from the Yakima County Health District (McEwen, 1992).

- Securing a sludge disposal site permit is recommended. Grandview sludge disposal practices should be evaluated in comparison to the new EPA sludge regulations.

Impacts on Surface Water

No indicators of gross contamination in the Yakima River due to the Grandview STP were found. During the inspection, one small direct discharge from the facility to the Yakima River was identified.

- The Yakima River bank adjacent to the sprayfields should be inspected. Any direct discharges to the river should be identified and eliminated.

Impacts on Ground Water

Some of the ground water samples collected exceeded Washington State Ground Water Criteria for total dissolved solids and total coliforms. It is unclear whether the impacts are primarily attributable to the operation of the wastewater treatment facility, the closed landfill adjacent to the facility or other causes.

- Characterize the site hydrology; and

- Enhance the existing monitoring network to:

    1) Differentiate between any landfill and wastewater treatment facility impacts; and

    2) Define the ground water quality upgradient of landfill and wastewater treatment facility.

    3) Define the ground water quality downgradient of all potential sources of contamination.

Wildlife Habitat

A positive aspect of the treatment system is its wildlife enhancement characteristics. The ponds are inhabited by numerous duck and shorebird species. The spray fields were lush with a dense cover of native and naturalized vegetation, supporting good populations of avian and mammalian species. This aspect of the treatment system should not be overlooked.

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APPENDICES

Appendix 1A - Samples Collected and Parameters Analyzed - Grandview, October 1991.

Parameter	Location:	Inf-1	Inf-2	Inf-C	Inf-G	Pri-1	Pri-2	Pri-C	Pri-G	A-1	A-2	A-C
	Type:	grab	grab	E-comp	G-comp	grab	grab	E-comp	G-comp	grab	grab	E-comp
	Date:	10/22	10/22	10/22-23	10/22-23	10/22	10/22	10/22-23	10/22-23	10/22	10/22	10/22-23
	Time:	0845	1805			0900	~1815			0920	1730	
	Lab Log #:	438280	438281	438282	438283	438284	438285	438286	438287	438288	438289	438290
GENERAL CHEMISTRY												
Conductivity		1	1	1	1	1	1	1	1	1	1	1
pH												
Alkalinity				1	1			1	1			1
Hardness				1	1			1	1			1
Chloride				1	1			1	1	1	1	1
TS				1	1			1	1			1
TNVS				1	1			1	1			1
TSS		1	1	1	1	1	1	1	1	1	1	1
TNVSS				1	1			1	1			1
% Solids												
% Volatile Solids												
BOD5				1	1			1	1			1
COD		1	1	1	1	1	1	1	1	1	1	1
TOC (water)		1	1	1	1	1	1	1	1	1	1	1
TOC (soil)												
TKN												
NH3-N				1	1			1	1	1	1	1
NO2+NO3-N				1	1			1	1	1	1	1
Total-P				1	1			1	1	1	1	1
F-Coliform MF						1	1			1	1	
F-Coliform (sediment)												
T-Coliform MF						1	1			1	1	
T-Coliform (sediment)												
ORGANICS												
Pest/PCB (water)				1				1				
Pest/PCB (soil)												
METALS												
PP Metals				1				1				1

Appendix 1A (cont.) - Samples Collected and Parameters Analyzed - Grandview, October 1991.

Parameter	Locatn:	B	C	D	E	QA	F-1	F-2	F-C	F-G	Stor	Runoff	Cl-1	Cl-2
	Type:	grab	grab	grab	grab	grab	grab	grab	E-comp	G-comp	grab	grab	grab	grab
	Date:	10/22	10/22	10/22	10/22	10/22	10/22	10/22	10/22-23	10/22-23	10/22	10/22	10/22	10/22
	Time:	1100	1545	1600	1145		0945	1715			1155	1125		
	Lab Log #:	438291	438292	438293	438294	438295	438296	438297	438298	438299	438300	438301	438302	438303
GENERAL CHEMISTRY														
Conductivity		1	1	1	1	1	1	1	1	1	1	1		
pH														
Alkalinity		1	1	1	1	1	1	1	1	1	1	1		
Hardness		1	1	1	1	1	1	1	1	1	1	1		
Chloride		1	1	1	1	1	1	1	1	1	1	1		
TS		1	1	1	1	1	1	1	1	1	1	1		
TNVS		1	1	1	1	1	1	1	1	1	1	1		
TSS		1	1	1	1	1	1	1	1	1	1	1		
TNVSS		1	1	1	1	1	1	1	1	1	1	1		
% Solids														
% Volatile Solids														
BOD5									1	1				
COD		1	1	1	1	1	1	1	1	1	1	1		
TOC (water)		1	1	1	1	1	1	1	1	1	1	1		
TOC (soil)														
TKN														
NH3-N		1	1	1	1	1	1	1	1	1	1	1		
NO2+NO3-N		1	1	1	1	1	1	1	1	1	1	1		
Total-P		1	1	1	1	1	1	1	1	1	1	1		
F-Coliform MF		1	1	1	1	1	1	1			1	1	1	1
F-Coliform (sediment)														
T-Coliform MF		1	1	1	1	1	1	1			1	1	1	1
T-Coliform (sediment)														
ORGANICS														
Pest/PCB (water)														
Pest/PCB (soil)														
METALS														
PP Metals									1					

Appendix 1A (cont.) - Samples Collected and Parameters Analyzed - Grandview, October 1991.

Parameter	Location:	Sludge-1	Sludge-2	Riv-1	Riv-2	Riv-3	STP-tap	Well 1	Well 2	Well 3	Spring
	Type:	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab
	Date:	10/22	10/22	10/22	10/22	10/22	10/22	10/22	10/22	10/22	10/22
	Time:	1330	1345				1745	~1500			1645
	Lab Log #:	438304	438305	438306	438307	438308	438309	438310	438311	438312	438313
GENERAL CHEMISTRY											
Conductivity				1	1	1	1	1	1	1	1
pH		1	1								
Alkalinity				1	1	1	1	1	1	1	1
Hardness				1	1	1	1	1	1	1	1
Chloride				1	1	1	1	1	1	1	1
TS				1	1	1	1	1	1	1	1
TNVS				1	1	1	1	1	1	1	1
TSS				1	1	1	1	1	1	1	1
TNVSS				1	1	1	1	1	1	1	1
% Solids		1	1								
% Volatile Solids		1	1								
BOD5											
COD				1	1	1	1	1	1	1	1
TOC (water)				1	1	1	1	1	1	1	1
TOC (soil)		1	1								
TKN		1	1								
NH3-N				1	1	1	1	1	1	1	1
NO2+NO3-N				1	1	1	1	1	1	1	1
Total-P				1	1	1	1	1	1	1	1
F-Coliform MF				1	1	1	1	1	1	1	1
F-Coliform (sediment)		1	1								
T-Coliform MF							1	1	1	1	1
T-Coliform (sediment)		1	1								
ORGANICS											
Pest/PCB (water)											
Pest/PCB (soil)		1									
METALS											
PP Metals		1					1				

Appendix 1B - Ecology Analytical Methods and Laboratories Used - Grandview, October 1991.

Parameter	Method	Laboratory
Conductivity	EPA Method 120.1	Sound Analytical Service, Inc.
Alkalinity	EPA Method 310.1	Sound Analytical Service, Inc.
Hardness	EPA-130.2	Manchester
Chloride	EPA Method 325.2	Sound Analytical Service, Inc.
TS	EPA Method 160.3	Sound Analytical Service, Inc.
TNVS	SM 2540E	Sound Analytical Service, Inc.
TSS	EPA Method 160.2	Sound Analytical Service, Inc.
TNVSS	SM 2540E	Sound Analytical Service, Inc.
TVS	EPA Method 160.4	Sound Analytical Service, Inc.
% Solids	----------------	Calculated
BOD5	EPA Method 405.1	Water Management Laboratories, Inc.
COD	EPA Method 410.1	Sound Analytical Service, Inc.
TOC (water)	EPA Method 415.2	Sound Analytical Service, Inc.
TKN	EPA Method 351.2	Sound Analytical Service, Inc.
NH3-N	EPA Method 350.1	Sound Analytical Service, Inc.
NO2+NO3-N	EPA Method 353.2	Sound Analytical Service, Inc.
Phosphorus-Total	EPA Method 365.1	Sound Analytical Service, Inc.
F-Coliform MF	SM 9222D	Manchester
F-Coliform MPN	SM 9221C, 9221A/9221C	Manchester
T-Coliform MF	SM 9222B	Manchester
T-Coliform MPN	SM 9221B, 9221A/9221	Manchester
Pest/PCB (water)	EPA Method 8080	Manchester
PP Metals	EPA Method 200	Manchester

Appendix 1C - Priority Pollutant Cleaning Methodology - Grandview, October 1991.

Priority Pollutant Cleaning Methodology

1. Wash with laboratory grade detergent (Liqui-Nox).
2. Rinse several times with tap water.
3. Rinse with 10% nitric acid solution.
4. Rinse three (3) times with distilled/deionized water.
5. Rinse with reagent-grade methylene chloride.
6. Rinse with reagent-grade acetone.
7. Allow to air dry and seal with aluminum foil.

APPENDIX 2

WASHINGTON STATE DEPARTMENT OF ECOLOGY
ENVIRONMENTAL INVESTIGATIONS AND LABORATORY SERVICES
QUALITY ASSURANCE SECTION

SYSTEM AUDIT REPORT

LABORATORY:	Grandview Wastewater Treatment Facility Laboratory	
ADDRESS:	City of Grandview 207 West 2nd Grandview, WA 98930	
DATE OF AUDIT:	October 18 and 30, 1991	
AUDITORS:	Dale Van Donsel	Microbiology
	Perry Brake	General Chemistry
PERSONNEL INTERVIEWED:	Alan Gustavson	Head Operator
	David Lorenz	Assistant Head Operator

AUTHENTICATION:

Dale J. Van Donsel

Perry F. Brake

GENERAL FINDINGS AND RECOMMENDATIONS

General

1. A system audit was conducted at the Grandview Wastewater Treatment Facility laboratory on October 18 (microbiology) and 30 (chemistry), in conjunction with the Class II Inspection of the treatment facility. The purpose of the audit was to verify laboratory capabilities pertaining to analyses required in the treatment plant discharge permit and to review analytical and quality control data. General audit findings and recommendations are documented below. Significant recommendations for improvement of laboratory operations are highlighted by use of *italics*.

2. A very significant deficiency in the overall lab operation at the Grandview facility lab was the lack of a formal (i.e., documented) quality assurance (QA) program designed to assure reliability of analytical data generated in the lab. *A recommendation was made to the head operator that establishment of such a program and publication of a QA manual be made a high priority.* A model QA manual for a wastewater treatment facility lab had previously been given to the lab and the manual was discussed in detail during the lab visit. The intent at the Grandview lab is to formalize their QA program and write a QA manual in the near future. A commitment was made by the visiting team to assist the lab in development of the QA program and manual.

Personnel

3. Mr. Gustavson is responsible for all analytical procedures used in the lab and shares doing the actual analyses with Mr. Lorenz. Mr. Gustavson has several years experience in analytical procedures and appeared very knowledgeable in methods and techniques for which the laboratory is responsible. Mr. Lorenz has less experience but has effectively learned the procedures through on-the-job training.

Facility

4. The lab facility consists of one very small room which is also used for most administrative functions (i.e., as office space). Current floor and bench space is inadequate to support current lab operations and efficient administrative functions (considerably less than the 150 square feet floor space, and 15 linear bench space per person recommended in ASTM Standard 3856-88). Mr. Gustavson advised the visiting team of plans to convert a room currently being used as a workshop into a lab. A recommendation was made to pursue those plans and to lay out any new lab in a manner that will ease performance of those tests to be conducted in the lab.

5. The was no fume hood in the lab to prevent harmful vapors from accumulating in the lab. Lack of a fume hood constitutes a significant safety hazard as fumes can be harmful to the operators and others in the lab. Some fumes can also be harmful to equipment in the lab. *A*

fume hood in the new lab. The hood should be set up for an air flow of 75-125 feet per minute with the sash fully open, and the flow should be checked periodically (e.g., every year) or whenever there is suspicion that flow may have been reduced for some reason. (NOTE: Air velocity measuring devices are available from several suppliers, but the Grandview facility should consider borrowing a device periodically from another lab or perhaps a fire department.)

Equipment and Supplies

6. *A recommendation was made for the lab to purchase a spill cleanup kit (as a safety matter and not a matter affecting quality of the analytical work done in the lab).* Information on "Kolor-safe" liquid neutralizers, relatively inexpensive spill kits available from Aldrich, was provided to the lab. These and other similar kits would be sufficient for the Grandview lab.

7. The laboratory lacks any means of sterilizing supplies for fecal coliform analysis. This is a basic requirement for sample bottles, buffered rinse/dilution water, and discarded cultures. None of these items are particularly heat-sensitive, so the minimum acceptable would be a vertical autoclave (electric pressure cooker). However, if funds permit, a bench top (horizontal) autoclave is recommended. This will be safer and more useful, especially if additional types of testing will be done in the future. It may be possible to do without an autoclave if the lab purchases the pre-sterilized sample containers described in paragraph 12 below, installs new UV tubes in the filter holder sterilizer, and purchases prepared and pre-sterilized buffered rinse/dilution water. However, constant purchase of this water could become a significant expense for the lab.

8. An ultraviolet disinfecting unit is used for membrane filter holders. This is satisfactory, but there was no way of judging the effectiveness of the lamps (a UV meter or test of culture-killing capacity is necessary). Because of this, it was recommended that replacement tubes be ordered. When an autoclave is received, this can be the primary means of filter holder sterilization, and the UV unit used for disinfection between samples. The tubes should have a useful life of approximately 4,000 hours, so a log of usage time will help track this.

9. The rinse/dilution water used for membrane filtration is prepared according to the formulation in an old Millipore publication, and contains phosphate only. The $KH_2PO_4/MgCl_2$ formulation should be used; information about this was provided.

10. The 0.45μ membranes used are acceptable, but for use with chlorinated effluents, the lab should consider ordering the Millipore type HC membranes. These have been developed specifically for this purpose. The M-FC medium ampoules used are from Millipore. While these are acceptable according to *Standard Methods*, this medium contains rosolic acid. This is added to keep down counts of "background" organisms, but it can suppress growth of fecal coliforms from chlorinated effluents. It is recommended that a small trial order of Gelman M-FC ampoules be obtained. This version does not contain rosolic acid, and together with the type HC membranes will give better

recovery. However, if this allows growth of too many interfering colonies, the original Millipore medium should be used.

<u>Sample Management</u>

11. Formal chain-of-custody procedures had not been documented (as might be expected, given the absence of a documented QA program in the lab) to assure samples were being properly secured and accounted for from time of receipt in the lab to disposal. *A recommendation was made to establish and implement such procedures to preclude potential problems should future analytical results be involved in litigation.* With proper documentation, sample handling procedures currently used in the lab will suffice for chain-of-custody purposes. The lab's QA manual should document the fact that those procedures, which include identification of all facility personnel involved in analyzing a specific sample, constitute the chain-of-custody procedures for the lab. A copy of ASTM Standard D 4840-88, "Sampling Chain of Custody Procedures," was provided to Mr. Gustavson subsequent to the visit.

12. Sodium thiosulfate is not added to sample bottles prior to collection of chlorinated effluent samples. This is required to neutralize chlorine before testing for fecal coliforms. Either 1 mL of 0.1% or 0.1 mL of 1% sodium thiosulfate should be added before sterilization. One suggestion was not mentioned during the visit: in view of the lab's current lack of an autoclave, pre-sterilized sample containers already containing sodium thiosulfate may be the best solution. Plastic bags (Whirl-Pak) or plastic bottles (Corning) are inexpensive and available from various suppliers.

<u>PE Samples</u>

13. Blind performance evaluation (PE) samples were not provided to the lab prior to the visit because they apparently were not required by the Quality Assurance Project Plan (QAPjP) associated with the Class II Inspection. Because the facility is not a major permitted discharger, the lab does not participate in EPA's DMR-QA studies. Consequently, there were no results of blind PE sample analyses available for review. A recommendation was made for the lab to contact Mr. Dan Baker at EPA Region 10 for the purpose of signing up for WP Study 028 and subsequent studies. For the purposes of this Class II inspection, the lab's performance evaluation should be based on results of analysis of samples split between the Grandview lab and Manchester Environmental Laboratory.

<u>Quality Assurance/Quality Control</u>

14. The most significant deficiency in the quality assurance area is the lack of a formal QA program, already mentioned in paragraph 2 above. Within the QA program, the most significant deficiency is the lack of any protocol to establish data quality objectives (in terms of bias and precision, or, together, accuracy) and track the lab's capability to meet those objectives. Because of this deficiency, there is no basis for the lab analysts or outside evaluators to determine whether or not the lab is "in control" on a continuing basis. The following recommendations were made to assist the lab in setting up a protocol to establish and track data quality objectives:

a. *The lab should establish a schedule for routinely analyzing quality control (QC) samples along with other analyses.*

(1) *First priority should go to analyzing standard solutions (solutions of known concentration) for those parameters where it is appropriate to do so.* One objective in doing this QC test is to discover any bias, or systematic error, in the test by comparing the observed value to the known or expected value. Another objective is to track precision, or random error, as the tests are done repetitively . For the facility performance parameters reported by the Grandview lab, appropriate standard solution tests would be BOD (the glucose-glutamic acid solution described in the method), and TSS (using a suspension of a suitable material such as Sigma Cell 20, information on which was provided to the lab by the visiting team), and perhaps residual chlorine using Hach ampules (after the requirement is initiated for the lab to analyze for residual chlorine).

(2) *Second priority should go to analyzing duplicate samples, preferably from the effluent stream since duplicates taken elsewhere in the facility are likely to vary widely in concentration.* The objective here is to track precision of analysis on real samples (as opposed to the relatively clean standard solutions). For the facility performance parameters reported by the Grandview lab, appropriate duplicate tests (on effluent samples) would BOD, TSS, pH, and (eventually) residual chlorine. Duplicates are appropriate for virtually any chemistry test, should other tests be added in the future. Duplicate tests can also be done on fecal coliforms if time and manpower resources allow.

b. *After running sufficient QC tests to provide statistically significant data (ten tests of a given type are enough but 20 are better), control charts should be constructed and used as a means to check precision as a routine procedure.* Information on how to construct and use control charts for both standard solutions and duplicate analyses can be found in Appendix L of the Procedural Manual for the Environmental Laboratory Accreditation Program. Consistent use of control charts will provide evidence to interested parties, inside and outside the lab, concerning capability of the lab to accurately analyze environmental samples.

15. At this time no specific QA/QC procedures are being recommended for fecal coliform testing. Instead, the lab should concentrate on making the important corrections listed in this report.

Methods

16. For the fecal coliform test, only 1 mL is usually filtered, and this would result in one or no colonies per membrane. It was recommended that larger volumes be filtered in order to get a valid estimate of fecal coliforms in the effluent. Specific volumes cannot be suggested; these can vary and will depend on TSS, chlorine level, and numbers of coliforms as well as background organisms. Volumes of 5, 20, and 50 mL might be good starting points.

17. *Standard Methods*, edition 14 was being used as the reference for analytical determinations being done in the lab. There were significant changes made in methods common to wastewater facilities between editions 14 and 15, and edition 15 is the earliest edition allowed for NPDES discharge monitoring according to 40 CFR 136. *A recommendation was made for the lab to acquire a later version of Standard Methods (preferably the latest edition which is Edition 17).*

Appendix 3 - Pesticide/PCB and Metals Scan Results - Grandview, October 1991.

Location:	Inf-C		Pri-C		A-C		F-C		Sludge-1		EPA Water Quality Criteria Summary			
Type:	E-comp		E-comp		E-comp		E-comp		grab					
Date:	10/22-23		10/22-23		10/22-23		10/22-23		10/22					
Time:									1330		Acute		Chronic	
Lab Log#:	438282		438286		438290		438298		438304		Fresh		Fresh	
Pesticide/PCB Compounds	ug/L		ug/L		ug/L		ug/L		ug/kg-dr		(ug/L)		(ug/L)	
alpha-BHC	0.007	U	0.016	U					120	U	100	*(q)		
beta-BHC	0.007	U	0.016	U					120	U	100	*(q)		
delta-BHC	0.007	U	0.016	U					120	U	100	*(q)		
gamma-BHC (Lindane)	**0.011**		0.013						120	U	2.0		0.08	
Heptachlor	0.007	U	0.016	U					120	U	0.52	(r)	0.0038	(r)
Aldrin	0.007	U	0.016	U					120	U	3.0			
Heptachlor Epoxide	0.007	U	0.016	U					120	U	0.52	(r)	0.0038	(r)
Endosulfan I	0.007	U	0.016	U					120	U	0.22	(s)	0.056	(s)
Dieldrin	0.007	U	0.016	U					120	U	2.5		0.0019	
4,4'-DDE	0.007	U	0.016	U					120	U	1,050	*	0.001	(u)
Endrin	0.007	U	0.016	U					120	U	0.18	(t)	0.0023	(t)
Endosulfan II	0.007	U	0.016	U					120	U	0.22	(s)	0.056	(s)
4,4'-DDD	0.007	U	0.016	U					120	U	0.6	*	0.001	(u)
Endosulfan Sulfate	0.007	U	0.016	U					120	U	0.22	(s)	0.056	(s)
4,4'-DDT	0.007	U	0.016	U					120	U	1.1	(u)	0.001	(u)
Methoxychlor	0.007	U	0.016	U					120	U			0.03	
Endrin Ketone	0.007	U	0.016	U					120	U	0.18	(t)	0.0023	(t)
alpha-Chlordane	0.007	U	0.016	U					120	U	2.4	(v)	0.0043	(v)
gamma-Chlordane	0.007	U	0.016	U					120	U	2.4	(v)	0.0043	(v)
Toxaphene	0.14	U	0.16	U					1200	U	0.73		0.0002	
Aroclor-1016	0.072	U	0.31	U					1200	U	2.0	(w)	0.014	(w)
Aroclor-1221	0.072	U	0.16	U					1200	U	2.0	(w)	0.014	(w)
Aroclor-1232	0.072	U	0.16	U					1200	U	2.0	(w)	0.014	(w)
Aroclor-1242	0.072	U	0.16	U					1200	U	2.0	(w)	0.014	(w)
Aroclor-1248	0.072	U	0.16	U					1200	U	2.0	(w)	0.014	(w)
Aroclor-1254	0.072	U	0.16	U					1200	U	2.0	(w)	0.014	(w)
Aroclor-1260	0.072	U	0.16	U					1200	U	2.0	(w)	0.014	(w)
Endrin Aldehyde	0.007	U	0.016	U					1200	U	0.18	(t)	0.0023	(t)
Chlordane	0.072	U	0.016	U					1200	U	2.4	(v)	0.0043	(v)
Metals Hardness = 200									mg/kg-dr					
Antimony	30	U	30	U	30	U	30	U	3	U	9,000	*	1,600	*
Arsenic	**2.8**	P	**3.6**	P	**2.3**	P	**2.7**	P	**2.31**	E				
Beryllium	1	U	1	U	1	U	1	U	**0.22**	P	130	*	5.3	*
Cadmium	**0.51**	PB	**0.23**	PB	**0.4**	PB	**0.34**	PB	**0.408**		18.7	+	3.4	+
Chromium	5	U	5	U	5	U	5	U	**31.6**					
Copper	**33.1**		**15**		**6.1**	P	3	U	**35.7**	N	65	+	39	+
Lead	**10.6**	B	**4**	PB	**2.6**	PB	**1.6**	PB	**21**		477	+	18.6	+
Mercury	**0.12**	PN	0.05	U	0.05	U	0.05	U	**0.0658**	N	2.4		0.012	
Nickel	**2.7**	P	**3.1**	P	**2.7**	P	**3.7**	P	**15.8**		4,582	+	509	+
Selenium	2	U	**5.4**	NJ	2	U	2	U	0.4	U	260		35	
Silver	0.5	U	0.5	U	0.5	U	0.5	U	**0.582**	N	44.0	+	0.12	
Thallium	2.5	U	2.5	U	2.5	U	2.5	U	0.25	U	1,400	*	40	*
Zinc	**145**		**90.3**		**49.3**		**27**		**72.9**	NE	379	+	343	+

1NOTE: SOME INDIVIDUAL COMPOUND CRITERIA OR LOELS MAY NOT AGREE WITH GROUP CRITERIA OR LOELS.
REFER TO APPROPRIATE EPA DOCUMENT ON AMBIENT WATER QUALITY CRITERIA FOR FULL DISCUSSION.

Appendix 3 (cont.) - Pesticide/PCB and Metals Scan Results - Grandview, October 1991.

U	The analyte was not detected at or above the reported result.
J	The analyte was positively identified. The associated numerical result is an estimate.
B	Analyte was found in the analytical method blank, indicating the sample may have been contaminated.
P	The analyte was detected above the instrument detection limit but below the established minimum quantification limit.
N	For metals analytes the sample is not within control limits.
*	Insufficient data to develop criteria. Value presented is the LOEL - Lowest Observed Effect Level.
**	pH dependent criteria (7.8 pH used).
+	Hardness dependent criteria (100 mg/L used).

m	Total Chlorinated Naphthalenes
n	Total Polynuclear Aromatic Hydrocarbons
o	Total Dinitrotoluenes
p	Total Haloethers
q	Total BHCs
r	Heptachlor
s	Endosulfan
t	Endrin
u	DDT plus metabolites
v	Total Chlordane
w	Total Aroclors (PCBs)