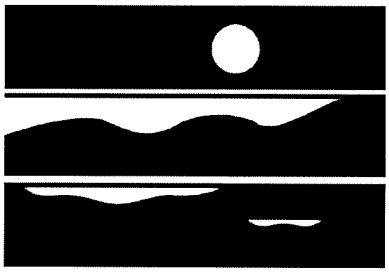

PENDLETON WOOLEN MILLS
CLASS II INSPECTION, APRIL 1993

October 1994

Water Body No. WA-CR-1010
Publication No. 94-162
printed on recycled paper

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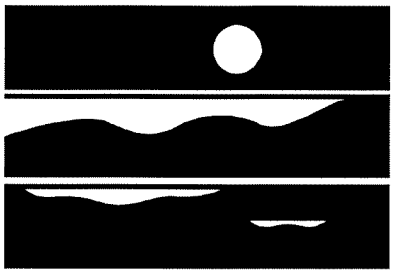

Pendleton Woolen Mills
Class II Inspection, April 1993

by
Marc Heffner

Environmental Investigations and Laboratory Services Program
Olympia, Washington 98504-7710

October 1994

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Abstract

A Class II Inspection was conducted at the Pendleton Woolen Mills Washougal Facility (Pendleton) on April 19-21, 1993. The facility treats process wastewater using an activated sludge process and discharges treated effluent to the Columbia River. Waste activated sludge is spray irrigated on site. Inspection results were within the daily maximum NPDES permit limits and were also less than the daily average limits. Concentrations of the four priority pollutant organic scan compounds detected in the effluent were less than applicable water quality criteria. Effluent copper, zinc, lead, and mercury concentrations exceeded acute and/or chronic water quality criteria. Bioassays found no toxicity due to the effluent. Sludge metals concentrations were less than the guidelines above which land application of municipal sludge is restricted. Sediment composition and chemistry near the Pendleton outfall indicated minimal impact due to the discharge.

Summary

Outfall 001

NPDES Permit Comparison

Inspection results fell within the daily maximum limits and were also less than the daily average limits.

General Chemistry Results

The wastewater treatment process adequately reduced BOD_5, COD, and TSS concentrations. Color was also reduced through the treatment system. Nitrogen concentrations were low in the plant influent and effluent.

High fecal coliform concentrations were detected in the two effluent grab samples.

Flow Measurement

Accuracy of the Pendleton flow meter was not checked during the inspection.

Priority Pollutant Organic Scans

Acetone was the target compound detected in the influent scans at the highest concentration (300-350 μg/L). Several other VOA and BNA target compounds were also detected in the influent. The endrin concentration in the influent was relatively high (estimated concentration 1.1 μg/L).

Only one VOA and three BNA target compounds were detected in the effluent. No pesticides were detected in the effluent. Concentrations of compounds detected were less than applicable water quality criteria.

Concentrations of TICs detected in the influent were greatly reduced by the wastewater treatment process.

Metals

Effluent copper and zinc concentrations exceeded both acute and chronic water quality criteria. Lead and mercury concentrations exceeded the chronic criteria.

Bioassays

Rainbow trout, *Daphnia pulex*, microtox, and fathead minnow bioassays found no toxicity due to the effluent. *Ceriodaphnia dubia* results were inconclusive due to problems with the test.

Split Sample Results

Ecology and Pendleton laboratory results for split samples compare favorably.

The Pendleton and Ecology effluent samples were similar suggesting appropriate sample collection. Several differences were noted between the Ecology and Pendleton influent samples.

Outfalls 004, 005, and 006

Outfall 004 was not flowing and only a small trickle was observed at outfall 005. Neither outfall was sampled.

The 006 discharge was clear with low TSS, TOC, and COD concentrations. The discharge was within permit limits.

Sludge and Sprayfield Runoff

The sludge and runoff samples were collected to assess potential surface water effects due to the sludge. A total of four organics were detected with VOA and BNA scans. Bis(2-ethyl-hexyl)phthalate was detected at the highest concentration (152 μg/L). Dieldrin was detected with the pesticide scan (0.84 μg/L-estimated). Metals detected were at concentrations less than the guidelines for land application of municipal sludge.

The west and north borders were wet with some puddled/ponded areas. The east border was dry, with no evidence of any overland flow from the sprayfield to Gibbons Creek. The ponded runoff sample showed similarities as well as differences when compared to the effluent.

Sediments

Sediment composition and chemistry near the Pendleton outfall indicated minimal impact due to the discharge. *Hyallela azteca* and Microtox bioassays found no toxicity.

Recommendations

General Chemistry Results

- Plant nitrogen concentrations should occasionally be monitored to assure treatment is not inhibited.

- Effluent fecal coliforms should be monitored to determine if high counts are common and corrective action is necessary.

Flow Measurement

- Maintenance records should be checked to assure the meter is routinely calibrated and measuring accurately.

Priority Pollutant Organic Scans

- Endrin should be considered as a candidate for inclusion as a target compound when doing required pesticide monitoring.

Split Sample Results

- Pendleton oil & grease analyses for permit monitoring should be done on grab samples as specified in the permit. Grab samples for sulfide analysis should also be considered.

- Pendleton should inspect their influent sampler and sampler line to assure microbial growth is not affecting the sample.

- The Pendleton influent and effluent composite sample temperatures should be checked to assure the proper temperature is maintained.

Sludge and Sprayfield Runoff

- Potential odor problems should be addressed if sprayfield ponding persists into the warmer weather months.

Introduction

A Class II Inspection was conducted at the Pendleton Woolen Mills Washougal Facility (Pendleton) on April 19-21, 1993. The inspection was conducted by Dennis Ritter of the Ecology Southwest Regional Office and Marc Heffner of the Toxics Investigations Section. Jim Underwood, Environmental Manager, represented Pendleton and provided onsite assistance. Also assisting were Jim Nail and Chris Rafn, the wastewater treatment plant (WWTP) operators. In conjunction with the inspection, sediments were collected near the plant outfall on April 23, 1993. Bernie Strong and Marc Heffner collected the sediments.

The Pendleton facility is a textile mill which receives scoured wool and processes the material using mixing, carding, spinning, weaving, dyeing, carbonizing, and fulling operations. Process wastewater is treated using an activated sludge process and discharged to the Columbia River via outfall 001 (Figure 1). Waste sludge from the activated sludge process is spray irrigated on site (Figure 2). Stormwater runoff is routed to Gibbons Creek via unnamed small tributaries at discharge locations 004,005, and 006. All domestic wastewaters are routed to the local municipal wastewater treatment plant. Wastewater discharge is regulated by NPDES Permit No. WA-000023-0. The permit was issued on August 23, 1991, and expires on August 23, 1996.

Objectives

1. Determine compliance with NPDES permit limits during wet weather conditions.

2. Assess plant self-monitoring program.

3. Evaluate wastewater treatment plant performance.

4. Characterize effluent toxicity with chemical scans and with bioassays.

5. Evaluate the appropriateness of effluent limits and permit conditions.

6. Assess receiving water sediment contamination and toxicity with chemical scans and with bioassays.

Setting

Jim Underwood indicated the primary sources of wastes to the treatment facility were dye residuals and detergents/soaps from washing. The new dye house was still under construction. The computer control available in the new facility should minimize dye wasted to the WWTP.

The wastewater treatment facility was recently upgraded (Figure 1). Flow passes through a roto-screen into a wet well. The roto-screen removes most of the wool fibers from the wastewater. The operator estimated screenings volume to be less than one dumpster per month. Wet well contents are pumped to an equalization (EQ) tank. The wastewater level in the EQ tank varies through the week. The level is raised during the week and is highest on Fridays. The level drops over the weekend as wastewater is fed to the WWTP while little wastewater is being generated in the mill. The EQ tank level is computer controlled.

Waste treatment units include an aeration basin followed by a secondary clarifier. The aeration basin is operated in the extended aeration mode with a mean cell residence time (MCRT) of approximately 40 days. The operator reported a dissolved oxygen (D.O.) concentration of approximately 6 mg/L is maintained in the basin. The sludge recycle rate was approximately 75%, although at the time of the inspection the RAS flow meter was not operating and the flow could only be estimated. Equipment was on hand to repair the meter but repairs had not yet been made.

The secondary clarifier had a "submerged tube" type outlet channel. Flow entered the tube through a series of holes along the top of the tube. The sludge blanket in the clarifier was higher than desired. At least five feet of clearwater were targeted in the ten feet deep clarifier. On April 20 the clearwater depth was only three feet. Jim Nail suspected the RAS pumping rate may have been too low and increased it slightly during the inspection.

Waste activated sludge (WAS) is irrigated on a field next to the WWTP (Figure 2). Sludge is wasted to the field 15 minutes every hour for nine hours on weekdays and 30 minutes every hour for nine hours on weekend days. The grass grown is harvested occasionally by a local farmer for livestock feed. A holding basin for WAS was being planned so sprayfield application will occur only during the dry season.

Procedures

Ecology collected composite and grab samples. Isco composite samplers collected equal volumes of sample every 30 minutes for 24 hours. Pendleton also collected grab and composite samples. The Pendleton composite samples were time proportional. Sample locations are summarized in Figure 1 and Appendix A. Ecology and Pendleton samples were split for analysis by both the Ecology and Pendleton labs.

Receiving water sediments were collected at three stations (Appendix A). Sediment sampling procedures are included in Appendix B.

Samples collected, sampling times, and parameters analyzed are summarized in Appendix C.

Samples for Ecology analysis were placed on ice and delivered to the Ecology Manchester Laboratory. Analytical procedures and the laboratories doing the analyses are summarized in Appendix D.

Analytical Quality Assurance/ Quality Control (QA/QC)

Sampling and laboratory QA/QC procedures were followed. Sampling QA/QC procedures are summarized in Appendix B.

Laboratory QA/QC measures were generally acceptable. Holding times, method blanks, surrogates, matrix and matrix spike duplicate recoveries, dilutions, controls, and instrument calibration were evaluated as appropriate for the particular test. Data are acceptable as qualified in the data tables. Specific QA/QC concerns are noted in Appendix B.

Results and Discussion

Outfall 001

NPDES Permit Comparison

Inspection results were within the daily maximum limits and were also less than the daily average limits (Table 1).

General Chemistry Results

Pendleton wastewater quality was characterized by a moderate BOD_5 (Ecology sample 212 mg/L) and low TSS (Ecology sample 46 mg/L) concentrations (Table 2). The wastewater treatment process adequately reduced BOD_5, COD, and TSS concentrations. NH_3-N and NO_2+NO_3-N concentrations were 0.23 mg/L or less in both the influent and effluent. The nitrogen concentration could inhibit treatment if it becomes too low.

Color in the influent was conspicuous and was quantified at 470 APHA units. The effluent was also colored (200 APHA units). The treatment process removed slightly more than half the color.

High fecal coliform concentrations were detected in the two effluent grab samples (Table 2). Estimated concentrations were 17,000/100mL and 19,000/100mL. Class A state water quality standards for freshwater include a geometric mean of not more than 100 colonies/100 mL

(Ecology, 1992). Dilution of roughly 200:1 would be necessary to meet the fecal coliform standard in the receiving water near the outfall. Fecal coliforms should be monitored to determine if high counts are common and corrective action is necessary.

Flow Measurement

Accuracy of the Pendleton flow meter was not checked during the inspection. Maintenance records should be checked to assure the meter is routinely calibrated and measuring accurately.

Priority Pollutant Organic Scans

Acetone was detected in the influent at the highest concentrations (300 μg/L and 350 μg/L - Table 3). The other VOA compounds detected were at concentrations of 3.2 μg/L or less. Acetone was the only VOA scan target compound detected in the effluent. The estimated concentrations were 5.0 μg/L and 4.1 μg/L in the two effluent grab samples collected. No water quality criteria exist for acetone.

Several target compounds were detected in the influent BNA scan. Di-n-butyl phthalate was detected at the highest concentration (53.6 μg/L). Only three target compounds were detected in the effluent. Concentrations were 2.4 μg/L or less. All compounds detected were at concentrations less than water quality criteria.

Three pesticides were detected in the influent while none were detected in the effluent. The endrin concentration in the influent was relatively high (estimated concentration 1.1 μg/L). Endrin should be considered as a candidate for inclusion as a target compound when doing required pesticide monitoring.

A complete listing of target compounds and analytical results is included in Appendix E.

Tentatively identified compounds (TICs) were detected by the influent VOA scan and the influent and effluent BNA scans (Appendix F). Maximum estimated concentrations were 5,780 μg/L in the influent and 21.6 μg/L in the effluent. Several of the acid compounds detected at higher concentrations are likely associated with the wetting agents, soaps, and dyes used in the process (Sax and Lewis, 1987). Concentrations were greatly reduced by the wastewater treatment process.

Metals

Several metals were detected in the influent (Table 3). Of these, four were found in the effluent at concentrations exceeding water quality criteria (Ecology, 1992). Copper and zinc

concentrations exceeded both acute and chronic criteria. The lead and mercury concentrations exceeded chronic criteria.

Bioassays

Rainbow trout, *Daphnia pulex*, and fathead minnow tests found no acute toxicity due to the effluent (Table 4). The microtox test also found no toxic effects.

The fathead minnow chronic test found no toxicity due to the effluent. The *Ceriodaphnia dubia* chronic test found no toxicity in the reproduction portion of the test. The survival portion of the test was inconclusive due to problems with the test.

Split Sample Results

Ecology and Pendleton laboratory results for split samples compare favorably (Table 5). Discrepancies with several individual analyses were noted, but overall comparability was acceptable. The Pendleton laboratory is accredited for BOD, COD, oil and grease, pH, phenolics, TSS and sulfide.

The Pendleton and Ecology effluent composite samples were similar, suggesting appropriate sample collection. The Ecology influent composite sample had a lower TSS concentration than the Pendleton influent composite sample. Ecology analysis also suggest the Ecology sample had a higher BOD_5 and COD concentration than the Pendleton sample. Pendleton should inspect their influent sampler and sampler line to assure microbial growth is not affecting the sample.

The Pendleton influent and effluent composite sample temperatures were higher than the recommended 4°C (Table 2). The problem was pointed out and future inspections should assure it has been corrected.

The Pendleton oil & grease analysis was being done on the composite sample. The test should be run on a grab sample as specified in the permit. Due to preservation requirements and the need to avoid aeration when sampling, changing the required sulfide sample type from a composite to a grab should be considered.

Outfalls 004, 005, and 006

Outfall 004 was not flowing during the inspection. A small trickle was observed at outfall 005. Neither outfall was sampled.

The 006 discharge was sampled but the flow rate was not quantified. Pendleton personnel suspected the flow was cooling water. The discharge was clear and TSS, TOC, and COD concentrations were low; supporting the cooling water theory (Table 2). The discharge was within both permit limits; oil and grease, and pH (Table 1).

Sludge and Sprayfield Runoff

The sludge and runoff samples were collected to assess potential surface water effects due to the sludge. The sludge sample VOA scan detected two compounds at low concentrations; 2.1 μg/L or less (Table 3). Two BNA target compounds were detected; aniline at an estimated concentration of 3.8 μg/L, and bis(2-ethylhexyl)phthalate at a concentration of 152 μg/L. Dieldrin was also detected at an estimated concentration of 0.84 μg/L.

Several metals were also detected in the sludge. Specific criteria for land application of the sludge were not found, so concentrations were compared to municipal land application guidelines (Table 6 - EPA, 1993). All concentrations in the Pendleton sludge were less than the guidelines above which land application is restricted.

The west, east, and north perimeters of the sprayfield were inspected during sample collection (Figure 2). The west and north borders were wet with some puddled/ponded areas. Flowing runoff was not observed. The east border was dry, with no evidence of any overland flow from the sprayfield to Gibbons Creek. Odor problems should be addressed if sprayfield ponding persists into the summer.

The ponded runoff sample showed similarities as well as differences when compared to the effluent. Runoff:effluent parameter concentration ratios ranged from 0.18-4.63 (Table 7). The variability suggests contributions from off site runoff and/or vegetation growth and decay are influencing water quality on the sprayfield.

Sediments

Sediments near the Pendleton outfall indicated an area of minimal deposition. The grain size all three sediments was 100% sand (Table 2). TOC sediments near and below the outfall (0.152% and 0.170%, respectively) were two times the concentration of the above discharge sample (0.070%).

A low concentration of acetone in one of the samples was the only organic detected in the sediments (Table 3). Metals concentrations were similar at all three sampling stations. A complete list of analytes and detection limits is included in Appendix E.

Hyallela azteca and Microtox bioassays indicate no toxicity due to the sediments (Table 8).

References

Ecology, 1992. Water Quality Standards for Surface Waters of the State of Washington, Chapter 173-201A WAC, November 25, 1992.

EPA, 1986. Quality Criteria for Water 1986, EPA 440/5-86-001, May 1, 1986.

EPA, 1993. Federal Register, Vol. 58, No. 32, Part 503, February 19, 1993.

Sax, N.L. and Lewis R.J., 1987. Hawley's Condensed Chemical Dictionary, Eleventh Edition.

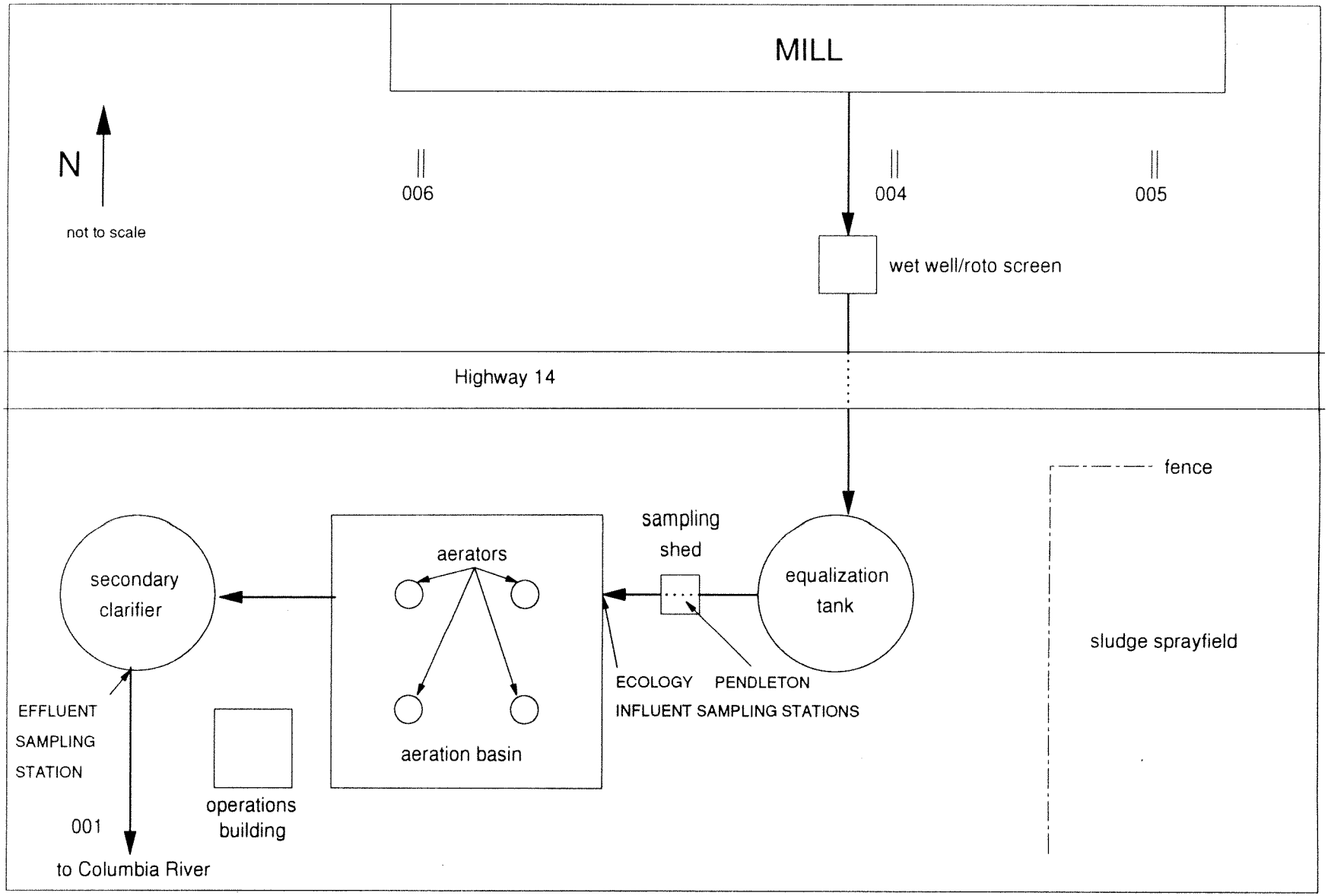

Figure 1 - Flow Scheme - Pendleton, April 1993.

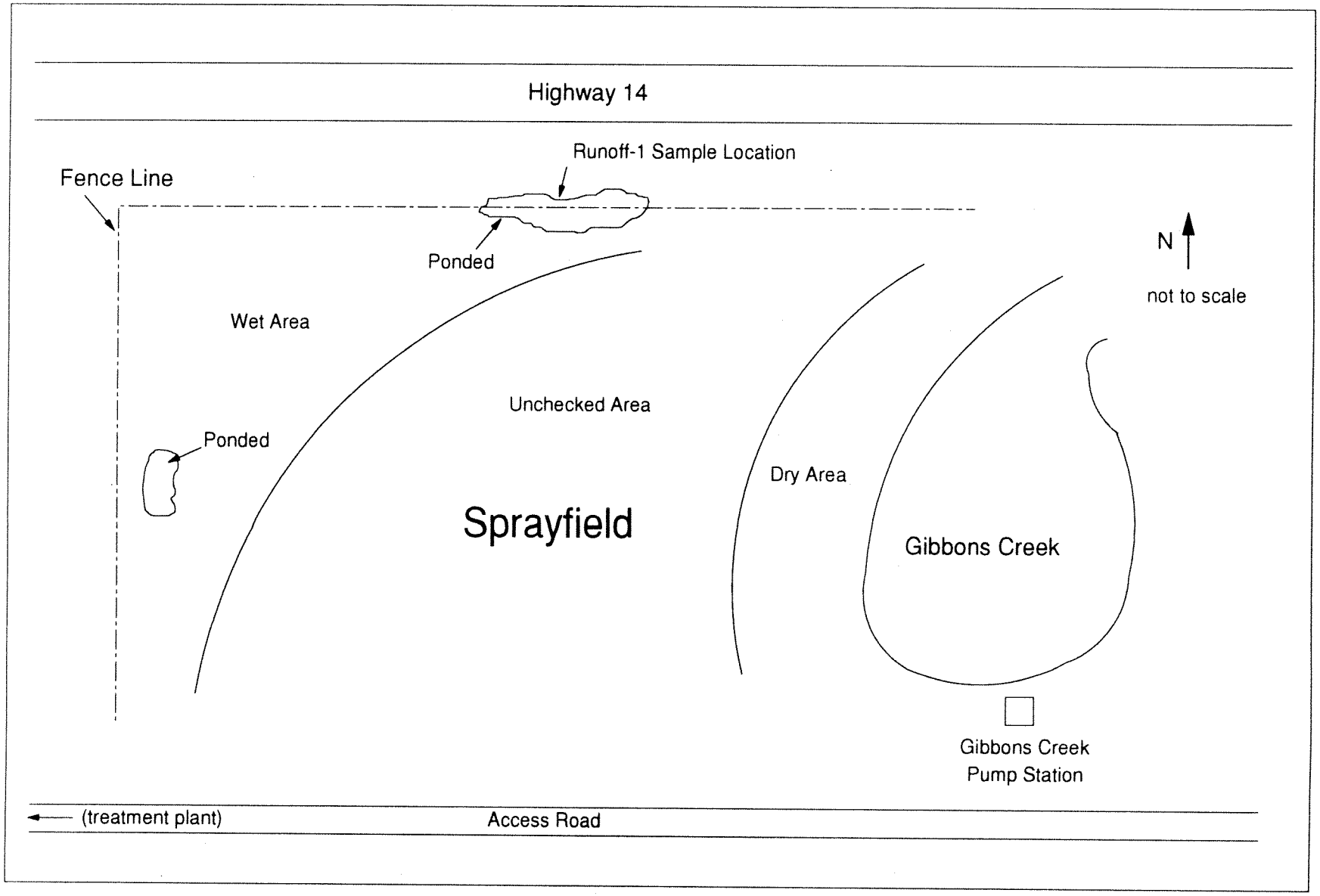

Figure 2 - Sprayfield - Pendleton, April 1993.

Table 1 – Inspection Results/NPDES Permit Limits Comparison – Pendleton, April 1993.

001 OUTFALL

Parameter	Units	NPDES Permit Limits Daily Average	NPDES Permit Limits Daily Maximum	Location:	Ef–1	Ef–2	Ef–E	Ef–P
				Type:	grab	grab	E–comp	P–comp
				Date:	4/20	4/20	4/20–21	4/20–21
				Time:	1040	1630	0800–0800	0800–0800
				Lab Log #:	178284	178285	178286	178287
Flow	MGD	1.0	1.25					0.550**
TSS	lbs/D	321	642				92	60
BOD5	lbs/D	204	409				50	23
COD	lbs/D	1487	2975				463	416
Oil and Grease	mg/L	10	15		1UJ	1UJ		
Phenolics Total	lbs/D	1.3	2.6				0.02J	0.02
Temperature	C	++			15.4	16.0		
pH		within range of 6.0 – 9.0			7.2	7.0		
Sulfide	lbs/D	2.6	5.1		*			
Total chromium +	lbs/D	1.3	2.6				0.22P	0.22P
Dieldrin	ug/L	0.038	0.10				0.10U	

006 OUTFALL ***

Parameter	Units	NPDES Permit Limits Daily Average	NPDES Permit Limits Daily Maximum	Location:	006	
				Type:	grab	
				Date:	4/20	
				Time:	1230	
				Lab Log #:	178301	
Oil and Grease		no visible sheen			1UJ	– no visible sheen
pH		within range of 6.0 – 9.0			6.7	

J The analyte was positively identified. The associated numerical result is and estimate.
U The analyte was not detected at or above the reported result.
UJ The analyte was not detected at or above the reported estimated result.
P The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.
Ef wastewater treatment plant effluent (001)
E–comp Ecology composite sample
P–comp Pendleton composite sample
* background color in sample interfered with test
** flow rate provided by Pendleton
*** outfalls 004 and 005 have the same limits, but were not flowing during the inspection
+ total recoverable analysis
++ receiving water temperature less than 20 C at edge of dilution zone

Table 2 – Ecology Laboratory General Chemistry Results – Pendleton, April 1993.

Parameter	Location: / Type: / Date: / Time: / Lab Log #:	Inf-1 grab 4/20 0935 178280	Inf-2 grab 4/20 1700 178281	Inf-E E-comp 4/20-21 0800-0800 178282	Inf-P P-comp 4/20-21 0800-0800 178283	Ef-1 grab 4/20 1040 178284	Ef-2 grab 4/20 1630 178285	Ef-3 grab 4/21 1100 178304	Ef-4 grab 4/21 1200 178305	Ef-E E-comp 4/20-21 0800-0800 178286	Ef-P P-comp 4/20-21 0800-0800 178287	Ef-GC *** 4/20 178288	MLSS-1 grab 4/20 1110 178289	MLSS-2 grab 4/20 1650 178290
GENERAL CHEMISTRY														
Conductivity (umhos/cm)				892	914					989	985	1000		
Alkalinity (mg/L CaCO3)				65	69.2					76.2	76.7	75.8		
Hardness (mg/L CaCO3)				39.9J	36.9J					45.2J	43.3J	46.2J		
Color (APHA units)				470	360					200	190			
Chloride (mg/L)				8.3	8.0					10.6	10.4			
Grain Size (%)														
gravel (+10 mesh)														
sand (20-230 mesh)														
silt (4-8 phi)														
clay (9+ phi)														
TS (mg/L)				951	817					755	905			
TNVS (mg/L)				527	608					644	678			
TSS (mg/L)		49	38	46	88	32	31			20	13	33	3200J	4200J
TNVSS (mg/L)				4	3					1U	1U		700J	700J
% Solids														
BOD5 (mg/L)				212	143					11	5			
COD (mg/L)		613	508	593	471	89.4	101			101	90.7			
TOC (mg/L)		156	138	152	111	33.4	32.4			29.8	28.2			
TOC (% dry wt)														
Total Kjeldahl N(TKN) (mg/L)														
NH3-N (mg/L)				0.225E	0.043E					0.030E	0.033E			
NO2+NO3-N (mg/L)				0.056E	0.01UE					0.053E	0.01UE			
Total-P (mg/L)				0.784	1.10					1.09	0.982			
Oil and Grease (mg/L)		16J	16J			1UJ	1UJ							
F-Coliform MF (#/100mL)								19000JX	17000JX					
Cyanide total (ug/L)				2U	2U					2	2U			
Phenolics Total(ug/L)				23.4	15.0					5.4J	3.9			
FIELD OBSERVATIONS														
Temperature (C)		24.0	25.9			15.4	16.0							
Temp-cooled (C)				4.9	7.2					3.9	11.0			
pH		6.2	5.0	6.7	7.3	7.2	7.0			7.9	7.9			
Conductivity (umhos/cm)		1058	1019	944	952	835	839			1052	989			
Sulfide (mg/L)		*		**	**	*								

J The analyte was positively identified. The associated numerical result is and estimate.
U The analyte was not detected at or above the reported result.
UJ The analyte was not detected at or above the reported estimated result.
E Reported result is an estimate because of the presence of an interference.
UE The analyte was not detected at or above the reported result. The reported result is an estimate because of the presence of an interference.
JX The analyte was positively identified. The associated numerical result is an estimate due to a high background count.
X High background count.
* background color in sample interfered with test
** sulfide odor detected. Test attempted on sample 178282 but background color interfered.
*** equal volumes collected with Ef-1 and Ef-2 grab samples

Inf wastewater treatment plant influent
Ef wastewater treatment plant effluent (001)
MLSS aeration basin solids
Sludge sludge sent to sprayfield
Runoff runoff near sprayfield
Sed river sediment
006 006 discharge
E-comp Ecology composite sample
P-comp Pendleton composite sample

Table 2 – (cont'd) – Pendleton, April 1993.

Parameter	Location: / Type: / Date: / Time: / Lab Log #:	Sludge grab 4/20 1155 178291	Runoff–1 grab 4/20 1130 178292	006 grab 4/20 1230 178301	Sed–1 grab 4/23 1145–1205 178296	Sed–2 grab 4/23 1235–1325 178297	Sed–3 grab 4/23 1345–1400 178298
GENERAL CHEMISTRY							
Conductivity (umhos/cm)			221				
Alkalinity (mg/L CaCO3)							
Hardness (mg/L CaCO3)			21.6J				
Color (APHA units)			140				
Chloride (mg/L)			2.8				
Grain Size (%)							
gravel (+10 mesh)					0	0	0
sand (20–230 mesh)					100	100	100
silt (4–8 phi)					0	0	0
clay (9+ phi)					0	0	0
TS (mg/L)		6430	211				
TNVS (mg/L)		1940	132				
TSS (mg/L)		5900J	10	1U			
TNVSS (mg/L)		1400J	1U				
% Solids					75.1	73.2	75.0
BOD5 (mg/L)							
COD (mg/L)			84.7	5U			
TOC (mg/L)			27.9	1.6			
TOC (% dry wt)		2.45			0.170	0.152	0.070
Total Kjeldahl N(TKN) (mg/L)		78.8					
NH3–N (mg/L)			0.082				
NO2+NO3–N (mg/L)			0.033				
Total–P (mg/L)			5.05				
Oil and Grease (mg/L)			1UJ	1UJ			
F–Coliform MF (#/100mL)			2000X				
Cyanide total (ug/L)		5E					
Phenolics Total(ug/L)		15.3J	2.8				
FIELD OBSERVATIONS							
Temperature (C)			15.0	15.8			
Temp–cooled (C)							
pH			6.5	6.7			
Conductivity (umhos/cm)			194	111.4			
Sulfide (mg/L)							

J The analyte was positively identified. The associated numerical result is and estimate.
U The analyte was not detected at or above the reported result.
UJ The analyte was not detected at or above the reported estimated result.
E Reported result is an estimate because of the presence of an interference.
UE The analyte was not detected at or above the reported result. The reported result is an estimate because of the presence of an interference.
JX The analyte was positively identified. The associated numerical result is an estimate due to a high background count.
X High background count.
* background color in sample interfered with test
** sulfide odor detected. Test attempted on sample 178282 but background color interfered.
*** equal volumes collected with Ef–1 and Ef–2 grab samples

Inf wastewater treatment plant influent
Ef wastewater treatment plant effluent (001)
MLSS aeration basin solids
Sludge sludge sent to sprayfield
Runoff runoff near sprayfield
Sed river sediment
006 006 discharge
E–comp Ecology composite sample
P–comp Pendleton composite sample

Table 3 – VOA, BNA, Pesticide/PCB and Metals Scan Analytes Detected – Pendleton, April 1993.

	Location:	Inf–1	Inf–2	Ef–1	Ef–2	Runoff–1	Sludge	Water Quality Criteria **	
	Type:	grab	grab	grab	grab	grab	grab		
	Date:	4/20	4/20	4/20	4/20	4/20	4/20	Acute	Chronic
	Time:	0935	1700	1040	1630	1130	1155	Fresh	Fresh
	Lab Log#:	178280	178281	178284	178285	178292	178291		
	VOA Compounds (Group)	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	(ug/L)	(ug/L)
	Acetone	350	300	5.0 J	4.1 J		5.0 U		
	Carbon Disulfide	1.0 U	1.0 U	1.0 U	1.0 U		2.1		
c	1,1,1–Trichloroethane	1.1	0.9 J	1.0 U	1.0 U		1.0 U	18,000 *(c)	
	Tetrachloroethene	1.3	1.0 U	1.0 U	1.0 U		1.0 U	5,280 *	840 *
	Toluene	3.2	1.2	1.0 U	1.0 U		1.5	17,500 *	

	Location:	Inf–E	Inf–P	Ef–E	Ef–P	Runoff–1	Sludge		
	Type:	E–comp	P–comp	E–comp	P–comp	grab	grab		
	Date:	4/20–21	4/20–21	4/20–21	4/20–21	4/20	4/20		
	Time:	0800–0800	0800–0800	0800–0800	0800–0800	1130	1155		
	Lab Log#:	178282	178283	178286	178287	178292	178291		
	BNA Compounds (Group)	ug/L		ug/L		ug/L	ug/L		
	Aniline	2.8 J		1.1 U		0.73 U	3.8 J		
	Benzoic Acid	35.1		1.1 U		0.73 U	7.5 U		
i	Diethyl Phthalate	7.1 U		0.22 J		0.73 U	7.5 U	940 *(i)	3 *(i)
i	Di–n–Butyl Phthalate	53.6		1.1 U		0.73 U	7.5 U	940 *(i)	3 *(i)
	2–Methylphenol	1.7 J		1.1 U		0.73 U	7.5 U		
	o–Chlorophenol	7.1 U		1.8		0.73 U	7.5 U	4,380 *	2,000 *
	Benzyl Alcohol	5.9 J		1.1 U		0.73 U	7.5 U		
	Phenol	5.9 J		1.1 U		0.73 U	7.5 U	10,200 *	2,560 *
i	Bis(2–Ethylhexyl)Phthalate	34.3		2.4		0.74 U	152	940 *(i)	3 *(i)
	Pesticide/PCB Compounds (Group)	ug/L		ug/L		ug/L	ug/L		
q	gamma–BHC (Lindane)	0.064		0.05 U		0.05 U	0.05 UJ	2.0	0.08
	Dieldrin	0.10 U		0.10 U		0.10 U	0.84 J	2.5	0.0019
t	Endrin	1.1 NJ		0.10 U		0.10 U	0.10 UJ	0.18 (t)	0.0023 (t)
t	Endrin Ketone	0.038 J		0.10 U		0.10 U	0.10 UJ	0.18 (t)	0.0023 (t)
	Metals ***	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L		
	Arsenic	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	9.5 P		
	Pentavalent							850 *	48 *
	Trivalent							360	190
	Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	130 *	5.3 *
	Cadmium	0.16 P	0.21 P	0.10 U	0.10 P	0.30 P	3.6 P	1.4 +	0.5 +
	Chromium	123	116	49 P	49 P	30 P	1190		
	Hexavalent	10 U	10 U	10 U	10 U			16	11
	Trivalent							903 +	108 +
	Copper	23 P	56.3	23 P	29 P	16 P	98.8	7 +	5 +
	Lead	2.3 J	6.1 J	1.0 J	1.2 J	8.2 J	122	20 +	0.8 +
	Mercury	0.24 J	0.13 J	0.068 J	0.068 J	0.05 U	1.43 N	2.4	0.012
	Nickel	10 U	10 U	10 U	10 U	10 U	19 P	686 +	76 +
	Selenium	2.0 UN	2.0 UN	2.0 UN	2.0 UN	2.0 UN	10 P	260	35
	Zinc	231	406	80.6	111	65.5	3630	53 +	48 +

\+ Hardness dependent criteria (45 mg/L used).
c Total Trichloroethanes
i Total Phthalate Esters
q Total BHCs
t Endrin
compound/metal detected
effluent or runoff concentration exceeds acute and/or chronic water quality criteria

Inf wastewater treatment plant influent
Ef wastewater treatment plant effluent (001)
Sludge sludge sent to sprayfield
Runoff runoff near sprayfield
Sed river sediment
E-comp Ecology composite sample
P-comp Pendleton composite sample

* Insufficient data to develop criteria. Value presented is the LOEL – Lowest Observed Effect Level.
** from Ecology, 1992 and EPA, 1986. 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
*** metals results are total recoverable for log # 178282, 178283, 178286, 178287, & 178292 except for Hg – which is total. metals results are total for log # 178291, 179296, 178297, and 178298.
U The analyte was not detected at or above the reported result.
UJ The analyte was not detected at or above the reported estimated 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.
NJ There is evidence the analyte is present. The associated numerical result is an estimate.
UN The analyte was not detected at or above the reported result and spike recovery was not within control limits.
P The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.

Table 3 – (cont'd) – Pendleton, April 1993.

	Location:	Sed–1	Sed–2	Sed–3
	Type:	grab	grab	grab
	Date:	4/23	4/23	4/23
	Time:	1145–1205	1235–1325	1345–1400
	Lab Log#:	178296	178297	178298
	VOA Compounds	ug/Kg dry	ug/Kg dry	ug/Kg dry
(Group)				
	Acetone	6.3 U	8.5	6.3 U
	Carbon Disulfide	1.3 U	1.3 U	1.3 U
c	1,1,1–Trichloroethane	1.3 U	1.3 U	1.3 U
	Tetrachloroethene	1.3 U	1.3 U	1.3 U
	Toluene	1.3 U	1.3 U	1.3 U

	Location:	Sed–1	Sed–2	Sed–3
	Type:	grab	grab	grab
	Date:	4/23	4/23	4/23
	Time:	1145–1205	1235–1325	1345–1400
	Lab Log#:	178296	178297	178298
	BNA Compounds	ug/Kg dry	ug/Kg dry	ug/Kg dry
(Group)				
	Aniline	328 U	335 U	370 U
	Benzoic Acid	820 U	837 U	926 UJ
i	Diethyl Phthalate	328 U	335 U	370 U
i	Di–n–Butyl Phthalate	328 U	335 U	370 U
	2–Methylphenol	328 U	335 U	370 U
	o–Chlorophenol	328 U	335 U	370 U
	Benzyl Alcohol	328 U	335 U	370 U
	Phenol	328 U	335 U	370 U
i	Bis(2–Ethylhexyl)Phthalate	328 U	335 U	370 U
	Pesticide/PCB Compounds	ug/Kg dry	ug/Kg dry	ug/Kg dry
(Group)				
q	gamma–BHC (Lindane)	4.0 U	3.2 U	4.0 U
	Dieldrin	8.0 U	6.4 U	8.0 U
t	Endrin	8.0 U	6.4 U	8.0 U
t	Endrin Ketone	8.0 U	6.4 U	8.0 U
	Metals ***	mg/Kg dry	mg/Kg dry	mg/Kg dry
	Arsenic	1.86	1.91	1.64
	Pentavalent			
	Trivalent			
	Beryllium	0.15 P	0.15 P	0.11 P
	Cadmium	0.25 P	0.51 P	0.32 P
	Chromium	11	10.9	16.8
	Hexavalent			
	Trivalent			
	Copper	6.59 B	6.75 B	6.63 B
	Lead	6.8 P	6.6 P	6.1 P
	Mercury	0.019 P	0.022 P	0.012 P
	Nickel	12.9	13.3	13.9
	Selenium	0.40 U	0.40 U	0.40 U
	Zinc	72.9	71.1	68

Table 4 – Effluent Bioassay Results – Pendleton, April, 1993.

NOTE: all tests were run on the effluent (Ef-GC sample) - lab log # 178288

Daphnia pulex - 48 hour survival test
(Daphnia pulex)

Sample	# Tested*	Percent Survival
Control	20	90
6.25 % Effluent	20	95
12.5 % Effluent	20	95
25 % Effluent	20	90
50 % Effluent	20	80
100 % Effluent	20	95

Acute
LC50 = >100 % effluent
NOEC = 100 % effluent

* four replicates of five organisms

Ceriodaphnia dubia - 7 day survival and reproduction test
(Ceriodaphnia dubia)

Sample	# Tested*	Percent Survival	Mean # Young per Original Female
Control	10	80	16.75
6.25 % Effluent	10	80	13.43
12.5 % Effluent	10	50	13.60
25 % Effluent	10	30	18.67
50 % Effluent	10	70	33.33
100 % Effluent	10	60	24.67

Survival	Reproduction
NOEC **	NOEC = 100 % effluent

* ten replicates of one organism
** The effluent does not appear to be toxic. Statistically significant mortality was noted in the 25% effluent test, but problems were found with the dilution water. Lack of statistically significant toxicity in the higher effluent concentrations suggests the effluent was not toxic.

Fathead Minnow - 96 hour survival test
(Pimephales promelas)

Sample	# Tested*	Percent Survival
Control	40	93
6.25 % Effluent	40	100
12.5 % Effluent	40	100
25 % Effluent	40	100
50 % Effluent	40	100
100 % Effluent	40	100

Acute
LC50 = >100 % effluent
NOEC = 100 % effluent

* four replicates of ten organisms

Table 4 - (cont'd) - Pendleton, April, 1993.

Fathead Minnow - 7 day survival and growth test
(Pimephales promelas)

Sample	# Tested*	Percent Survival	Mean Dry Weight per Fish (mg)
Control	40	83	0.235
6.25 % Effluent	40	88	0.285
12.5 % Effluent	40	98	0.273
25 % Effluent	40	88	0.268
50 % Effluent	40	85	0.238
100 % Effluent	40	90	0.253

Survival	Growth
LC50 = >100 % effluent	NOEC = 100 % effluent
NOEC = 100 % effluent	

* four replicates of ten organisms

Rainbow Trout - 96 hour survival test
(Oncorhynchus mykiss)

Sample	# Tested*	Percent Survival
Control	30	100
6.25 % Effluent	30	97
12.5 % Effluent	30	93
25 % Effluent	30	97
50 % Effluent	30	97
100 % Effluent	30	100

Acute
LC50 = >100 % effluent
NOEC = 100 % effluent

* three replicates of ten organisms

Microtox

	EC50 (% effluent)
15 minutes	++

++ high number of negative gammas in statistical analysis - usually indicative of low toxicity. EC50 >45% effluent (the highest effluent concentration tested).

NOEC - no observable effects concentration
LOEC - lowest observable effects concentration
LC50 - lethal concentration for 50% of the organisms
EC50 - concentration at which there is a 50% effect

Table 5 – Split Sample Results Comparison – Pendleton, April 1993.

	Location:	Inf-E	Inf-P	Ef-1	Ef-2	Ef-E	Ef-P
	Type:	E-comp	P-comp	grab	grab	E-comp	P-comp
	Date:	4/20-21	4/20-21	4/20	4/20	4/20-21	4/20-21
	Time:	0800-0800	0800-0800	1040	1630	0800-0800	0800-0800
	Lab Log #:	178282	178283	178284	178285	178286	178287
	Laboratory						
TSS (mg/L)	Ecology	46	88	32	31	20	13
	Pendleton	47	87			24.5	22
BOD5 (mg/L)	Ecology	212	143			11	5
	Pendleton	173	173			13.5	6
COD (mg/L)	Ecology	593	471	89.4	101	101	90.7
	Pendleton	595	528			111	94
Oil and Grease (mg/L)	Ecology			1UJ	1UJ		
	Pendleton						3.2
Phenolics Total (ug/L)	Ecology	23.4	15.0			5.4J	3.9
	Pendleton						10
Sulfide (mg/L)	Ecology			**			
	Pendleton						0.1
pH (S.U.)	Ecology			7.2	7.0		
	Pendleton *			7.4	7.4		

J The analyte was positively identified. The associated numerical result is and estimate.
U The analyte was not detected at or above the reported result.
UJ The analyte was not detected at or above the reported estimated result.
* Pendleton reading taken from continuous pH monitor.
** field test – background color in sample interfered with test
Inf wastewater treatment plant influent
Ef wastewater treatment plant effluent (001)
E-comp Ecology composite sample
P-comp Pendleton composite sample

Table 6 – Sludge Metals/EPA Municipal Land Application Regulations Comparison – Pendleton, April 1993.

	Location:	Sludge		Municipal Sludge Land Application Regulations (EPA, 1993)	
	Type:	grab			
	Date:	4/20			
	Time:	1155		Ceiling *	Pollutant **
	Lab Log#:	178291		Concentrations	Concentrations
Metals (total)		(ug/L)	(mg/Kg dry wt)	(mg/Kg dry wt)	(mg/Kg dry wt)
Arsenic		9.5 P	1.5 P	75	41
Beryllium		1 U	0.2 U		
Cadmium		3.6 P	0.6 P	85	39
Chromium		1190	186	3000	1200
Copper		98.8	15	4300	1500
Lead		122	19	840	300
Mercury		1.43 N	0.2 N	57	17
Nickel		19 P	3.0 P	420	420
Selenium		10 P	1.6 P	100	36
Zinc		3630	567	7500	2800

U The analyte was not detected at or above the reported result.

P The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.

N The spike sample recovery was not within control limits.

* sludge is not suitable for land application if any ceiling concentration is exceeded

** sludge is suitable for land application with minimal restrictions if no pollutant concentrations are exceeded

Table 7 - Effluent / Runoff Comparison - Pendleton, April 1993.

	Location:	Ef-E		Runoff-1		
	Type:	E-comp		grab		
	Date:	4/20-21		4/20		
	Time:	0800-0800		1130		RATIO:
Parameter	Lab Log #:	178286		178292		Runoff / Ef
Conductivity (umhos/cm)		989		221		0.22
Hardness (mg/L CaCO3)		45.2	J	21.6	J	0.48
Color (APHA units)		200		140		0.70
Chloride (mg/L)		10.6		2.8		0.26
TS (mg/L)		755		211		0.28
TNVS (mg/L)		644		132		0.20
TSS (mg/L)		20		10		0.50
TNVSS (mg/L)		1	U	1	U	1.00
COD (mg/L)		101		84.7		0.84
TOC (mg/L)		29.8		27.9		0.94
NH3-N (mg/L)		0.03	E	0.082		2.73
NO2+NO3-N (mg/L)		0.053	E	0.033		0.62
Total-P (mg/L)		1.09		5.05		4.63
Phenolics Total(ug/L)		5.4	J	2.8		0.52
FIELD OBSERVATIONS						
pH		7.9		6.5		0.83
Conductivity (umhos/cm)		1052		194		0.18

Ef	wastewater treatment plant effluent (001)
Runoff	runoff near sprayfield
E-comp	Ecology composite sample
J	The analyte was positively identified. The associated numerical result is and estimate.
U	The analyte was not detected at or above the reported result.
E	Reported result is an estimate because of the presence of an interference.

Table 8 – Sediment Bioassay Results – Pendleton, April 1993.

Sample	Lab Log #	*Hyalella azteca* # Tested*	*Hyalella azteca* Percent Survival**	Microtox EC50
Control		50	92	
Sed–1	178296	50	94	NSR
Sed–2	178297	50	94	NSR
Sed–3	178298	50	92	NSR

* five replicates of ten organisms
** no statistically significant responses relative to control responses
NSR data not suitable for reduction indicating low toxicity
EC50 concentration at which there is a 50% effect

Appendices

Appendix A - Sampling Station Locations - Pendleton, April 1993.

Inf - wastewater treatment plant influent

Pendleton sample - collected from a tap in the line between the equalization tank and the aeration basin.

Ecology samples - collected from the line just upstream of the aeration basin.

Ef - wastewater treatment plant effluent (001 discharge)

Pendleton sample - collected in the effluent weir pipe just upstream of the outlet from the weir pipe. The sampler intake was split to collect sample from flow coming in both directions.

Ecology samples - composite and bioassay samples were collected from the effluent weir pipe. The sampler intake was stationed to the east side of the outlet from the weir pipe. Bioassay samples were pumped from the pipe using the composite sample pump. Grab samples were collected from the clarifier just outside the outlet weir near the composite sampling station.

MLSS - Aeration Basin Solids

Samples collected from the west side of the basin approximately 10 feet from the edge.

Sludge - sludge sent to spray irrigation

Sample collected from the tap near the sludge pump.

Runoff-1 - runoff/ponding at the edge of the sludge sprayfield

Sample collected from ponded water just north of the fence bordering Highway 14.

006 - Discharge 006

Sample collected just downstream of the discharge pipe.

Sed-1

Sediment sample collected just downstream of the Pendleton 001 outfall (Lat 45-34-24; Long 122-21-04). Water depth was 21 feet during sampling.

Sed-2

Sediment sample collected approximately 300 feet downstream from the outfall, the same distance from shore as the outfall (Lat 45-34-26; Long 122-21-08). Water depth was 22 feet during sampling.

Sed-3

Sediment sample collected approximately 0.4 mile upstream of the outfall, the same distance from shore as the outfall (Lat 45-34-15; Long 122-20-55). Water depth was 22 feet during sampling.

Appendix B - Sampling Procedures and QA/QC - Pendleton, April 1993.

Sediment Sampling Procedures

Receiving water sediments were collected with a 0.1 m2 van Veen grab sampler. At each station, the top two centimeters of sample from successive grab samples were collected. A VOA bottle was filled from the first grab. The remainder of the first grab and successive grabs were put in a stainless steel bucket. After an adequate volume was collected, the contents of the bucket were homogenized and put in appropriate containers.

Sampling QA/QC

Chain-of-custody procedures were followed during the inspection. Composite samplers and water sampling equipment were cleaned to sample for priority pollutants using the procedure outlined below.

Sediment sampling equipment, with the exception of the van Veen sampler, was cleaned using the procedure noted below. Caution was used to collect only sediment not in direct contact with the van Veen sampler.

Equipment Cleaning Procedures for Priority Pollutant Sampling

1. Wash with laboratory detergent
2. Rinse several times with tap water
3. Rinse with 10% HNO3 solution
4. Rinse three (3) times with distilled/deionized water
5. Rinse with high purity methylene chloride
6. Rinse with high purity acetone
7. Allow to dry and seal with aluminum foil

Specific Analytical QA/QC Concerns

Hexavalent chromium analyses were performed two days after sample collection - the USEPA method holding time is 24 hours.

Color analyses were performed three days after sample collection - the USEPA method holding time is 48 hours.

Appendix B - (cont'd) - Pendleton, April 1993.

Spike and spike duplicate recoveries were low for arsenic, selenium, and mercury in water samples. Results affected by the low spike recoveries are qualified "N". Affected results close to detection limits are qualified "J". Also, the relative percent difference (RPD) between arsenic spike and spike duplicate results was outside the CLP acceptance limits. Affected arsenic results are qualified "J".

Spike recoveries were outside CLP acceptance limits for lead and antimony in sediments, and silver and mercury in the sludge. Analytes are qualified "N" or "J" based on the severity of interference. Also, copper was detected in the sediment laboratory procedural blank: sediment copper data are qualified "B".

Water semivolatile (BNA) scan matrix spike recoveries and RPDs for the three dichlorobenzenes, hexachloroethane, 1,2,4-trichlorobenzene, hexachlorobutadiene, and 2-methylnapthalene were outside acceptable limits. These compounds are qualified with a "J" for sample 178286.

Sediment semivolatile (BNA) scan matrix spike recoveries and RPDs for benzoic acid, 4-chloroaniline, hezachlorocyclopentadiene, and 4-nitroaniline were outside acceptable limits. These compounds are qualified with a "J" for sample 178298.

Water pesticide/PCB scan surrogate recovery of decachlorobiphenyl (DCBP) was low in samples 178282 and 178291. Target analytes similar to DCBP are qualified "J" if detected and "UJ" if non-detected in both samples. Water pesticide/PCB scan surrogate recovery of tetrachlorometaxylate (TCMX) was low in sample 178291. Target analytes similar to TCMX are qualified "J" if detected and "UJ" if non-detected in sample 178291.

Appendix C – Samples Collected and Parameters Analyzed – Pendleton, April 1993.

Parameter	Location: / Type: / Date: / Time: / Lab Log #:	Inf–1 grab 4/20 0935 178280	Inf–2 grab 4/20 1700 178281	Inf–E E–comp 4/20–21 0800–0800 178282	Inf–P P–comp 4/20–21 0800–0800 178283	Ef–1 grab 4/20 1040 178284	Ef–2 grab 4/20 1630 178285	Ef–3 grab 4/21 1100 178304	Ef–4 grab 4/21 1200 178305	Ef–E E–comp 4/20–21 0800–0800 178286	Ef–P P–comp 4/20–21 0800–0800 178287	Ef–GC *** 4/20 178288	MLSS–1 grab 4/20 1110 178289	MLSS–2 grab 4/20 1650 178290
GENERAL CHEMISTRY														
Conductivity				E	E					E	E	E		
Alkalinity				E	E					E	E	E		
Hardness				E	E					E	E	E		
Color				E	E					E	E			
Chloride				E	E					E	E			
Grain Size														
TS				E	E					E	E			
TNVS				E	E					E	E			
TSS		E	E	EP	EP	E	E			EP	EP	E	E	E
TNVSS				E	E					E	E		E	E
% Solids														
BOD5				EP	EP					EP	EP			
COD		E	E	EP	EP	E	E			EP	EP			
TOC		E	E	E	E	E	E			E	E			
Total Kjeldahl N														
NH3–N				E	E					E	E			
NO2+NO3–N				E	E					E	E			
Total–P				E	E					E	E			
Oil and Grease		E	E			E	E				P			
F–Coliform MF								E	E					
Cyanide (total)				E	E					E	E			
Sulfide											P			
ORGANICS														
VOC		E	E			E	E							
BNAs				E						E				
Pest/PCB				E						E				
Phenolics Total				E	E					E	EP			
METALS														
PP Metals				E	E					E	E			
Hexavalent chromium				E	E					E	E			
BIOASSAYS														
Salmonid (acute series)												E		
Microtox (acute)												E		
Daphnia pulex (acute)												E		
Ceriodaphnia (chronic)												E		
Fathead Minnow (acute)												E		
Fathead Minnow (chronic)												E		
Hyallela (solid acute)														
Microtox (solid acute)														
FIELD OBSERVATIONS														
Temperature		E	E			E	E							
Temp–cooled				E	E					E	E			
pH		E	E	E	E	EP	EP			E	E			
Conductivity		E	E	E	E	E	E			E	E			
Sulfide		E		E	E	E								

Appendix C – (cont'd) – Pendleton, April 1993.

Parameter	Location: / Type: / Date: / Time: / Lab Log #:	Sludge grab 4/20 1155 178291	Runoff–1 grab 4/20 1130 178292	006 grab 4/20 1230 178301	Sed–1 grab 4/23 1145–1205 178296	Sed–2 grab 4/23 1235–1325 178297	Sed–3 grab 4/23 1345–1400 178298
GENERAL CHEMISTRY							
Conductivity			E				
Alkalinity							
Hardness			E				
Color			E				
Chloride			E				
Grain Size					E	E	E
TS		E	E				
TNVS		E	E				
TSS		E	E	E			
TNVSS		E	E				
% Solids					E	E	E
BOD5							
COD			E	E			
TOC		E	E	E	E	E	E
Total Kjeldahl N		E					
NH3–N			E				
NO2+NO3–N			E				
Total–P			E				
Oil and Grease			E	E			
F–Coliform MF			E				
Cyanide (total)		E					
Sulfide							
ORGANICS							
VOC		E			E	E	E
BNAs		E	E		E	E	E
Pest/PCB		E	E		E	E	E
Phenolics Total		E	E				
METALS							
PP Metals		E	E		E	E	E
Hexavalent chromium							
BIOASSAYS							
Salmonid (acute series)							
Microtox (acute)							
Daphnia pulex (acute)							
Ceriodaphnia (chronic)							
Fathead Minnow (acute)							
Fathead Minnow (chronic)							
Hyallela (solid acute)					E	E	E
Microtox (solid acute)					E	E	E
FIELD OBSERVATIONS							
Temperature			E	E			
Temp–cooled							
pH			E	E			
Conductivity			E	E			
Sulfide							

***	equal volumes collected with Ef–1 and Ef–2 grab samples
Inf	wastewater treatment plant influent
Ef	wastewater treatment plant effluent (001)
MLSS	aeration basin solids
Sludge	sludge sent to sprayfield
Runoff	runoff near sprayfield
006	006 discharge
E–comp	Ecology composite sample
P–comp	Pendleton composite sample
E	Ecology laboratory analysis
P	Pendleton laboratory analysis

Appendix D – Ecology Methods and Laboratories – Pendleton, April 1993.

PARAMETER	ECOLOGY METHOD	LABORATORY
GENERAL CHEMISTRY		
Conductivity	EPA, Revised 1983: 120.1	Ecology
Alkalinity	EPA, Revised 1983: 310.1	Ecology
Hardness	EPA, Revised 1983: 130.2	Ecology
Color	NCASI	Weyerhaeuser
Chloride	EPA, Revised 1983: 330.0	Ecology
Grain Size	Tetra Tech, 1986	Soil Technology, Inc.
TS	EPA, Revised 1983: 160.3	Ecology
TNVS	EPA, Revised 1983: 160.3	Ecology
TSS	EPA, Revised 1983: 160.2	Ecology
TNVSS	EPA, Revised 1983: 160.2	Ecology
% Solids	APHA, 1989: 2540G.	Analytical Resources Inc.
BOD5	EPA, Revised 1983: 405.1	Ecology
COD	EPA, Revised 1983: 410.4	Analytical Resources Inc.
TOC (water)	EPA, Revised 1983: 415.1	Ecology
TOC (soil/sed)	Tetra Tech, 1986	Analytical Resources Inc.
Total Kjeldahl N	EPA, Revised 1983: 351.4	Analytical Resources Inc.
NH3-N	EPA, Revised 1983: 350.1	Ecology
NO2+NO3-N	EPA, Revised 1983: 353.2	Ecology
Total-P	EPA, Revised 1983: 365.3	Ecology
Oil and Grease (water)	EPA, Revised 1983: 413.1	Ecology
F-Coliform MF	APHA, 1989: 9222D.	Ecology
Cyanide (total)	EPA, Revised 1983: 335.2	Ecology
ORGANICS		
VOC (water)	EPA, 1986: 8260	Analytical Resources Inc.
VOC (soil/sed)	EPA, 1986: 8240	Analytical Resources Inc.
BNAs (water)	EPA, 1986: 8270	Ecology
BNAs (soil/sed)	EPA, 1986: 8270	Ecology
Pest/PCB (water)	EPA, 1986: 8080	Analytical Resources Inc.
Pest/PCB (soil/sed)	EPA, 1986: 8080	Analytical Resources Inc.
Phenolics Total(water)	EPA, Revised 1983: 420.2	Ecology
METALS		
PP Metals (water)	EPA, Revised 1983: 200 series	Ecology
PP Metals (soil/sed)	EPA, Revised 1983: 200 series	Ecology
Hexavalent chromium	EPA, 1986: 7196	Laucks Testing Laboratories, Inc.
BIOASSAYS		
Salmonid (acute series)	EPA, 1991	Parametrix, Inc.
Microtox (acute)	Beckman, 1982	Parametrix, Inc.
Daphnia pulex (acute)	EPA, 1991	Parametrix, Inc.
Ceriodaphnia (chronic)	EPA, 1989	Parametrix, Inc.
Fathead Minnow (acute)	EPA, 1991	Parametrix, Inc.
Fathead Minnow (chronic)	EPA, 1989	Parametrix, Inc.
Hyallela (solid acute)	ASTM, 1992	Parametrix, Inc.
Microtox (solid acute)	Tetra Tech, 1986/Ecology modified	Parametrix, Inc.

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Appendix E – VOA, BNA, Pesticide/PCB and Metals Scan Results – Pendleton, April 1993.

	Location:	Inf–1	Inf–2	Ef–1	Ef–2	Runoff–1	Sludge	Sed–1	Sed–2	Sed–3
	Type:	grab	grab	grab	grab	grab	grab	grab	grab	grab
	Date:	4/20	4/20	4/20	4/20	4/20	4/20	4/23	4/23	4/23
	Time:	0935	1700	1040	1630	1130	1155	1145–1205	1235–1325	1345–1400
	Lab Log#:	178280	178281	178284	178285	178292	178291	178296	178297	178298
(Group)[1]	VOA Compounds	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/Kg dry	ug/Kg dry	ug/Kg dry
a	Chloromethane	2.0 U	2.0 U	2.0 U	2.0 U		2.0 U	2.5 U	2.5 U	2.5 U
a	Bromomethane	2.0 U	2.0 U	2.0 U	2.0 U		2.0 U	2.5 U	2.5 U	2.5 U
	Vinyl Chloride	2.0 U	2.0 U	2.0 U	2.0 U		2.0 U	2.5 U	2.5 U	2.5 U
	Chloroethane	2.0 U	2.0 U	2.0 U	2.0 U		2.0 U	2.5 U	2.5 U	2.5 U
a	Methylene Chloride	2.0 U	2.0 U	2.0 U	2.0 U		2.0 U	2.5 U	2.5 U	2.5 U
	Acetone	350	300	5.0 J	4.1 J		5.0 U	6.3 U	8.5	6.3 U
	Carbon Disulfide	1.0 U	1.0 U	1.0 U	1.0 U		2.1	1.3 U	1.3 U	1.3 U
b	1,1–Dichloroethene	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
	1,1–Dichloroethane	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
b	trans–1,2–Dichloroethene	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
b	cis–1,2–Dichloroethene	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
a	Chloroform	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
	1,2–Dichloroethane	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
	2–Butanone (MEK)	5.0 U	5.0 U	5.0 U	5.0 U		5.0 U	6.3 U	6.4 U	6.3 U
c	1,1,1–Trichloroethane	1.1	0.9 J	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
a	Carbon Tetrachloride	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
	Vinyl Acetate	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
a	Bromodichloromethane	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
d	1,2–Dichloropropane	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
e	cis–1,3–Dichloropropene	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
	Trichloroethene	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
a	Dibromochloromethane	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
c	1,1,2–Trichloroethane	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
	Benzene	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
e	trans–1,3–Dichloropropene	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
j	2–Chloroethylvinyl Ether	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
a	Bromoform	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
	4–Methyl–2–Pentanone (MIBK)	5.0 U	5.0 U	5.0 U	5.0 U		5.0 U	6.3 U	6.4 U	6.3 U
	2–Hexanone	5.0 U	5.0 U	5.0 U	5.0 U		5.0 U	6.3 U	6.4 U	6.3 U
	Tetrachloroethene	1.3	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
f	1,1,2,2–Tetrachloroethane	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
	Toluene	3.2	1.2	1.0 U	1.0 U		1.5	1.3 U	1.3 U	1.3 U
g	Chlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
	Ethylbenzene	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
	Styrene	1.0 U	1.0 U	1.0 U	1.0 U		1.0 U	1.3 U	1.3 U	1.3 U
	Total Xylenes	2.0 U	2.0 U	2.0 U	2.0 U		2.0 U	2.5 U	2.5 U	2.5 U
	Trichlorofluoromethane	2.0 U	2.0 U	2.0 U	2.0 U		2.0 U	2.5 U	2.5 U	2.5 U
	1,1,2–Trichlorotrifluoroethane	2.0 U	2.0 U	2.0 U	2.0 U		2.0 U	2.5 U	2.5 U	2.5 U

Appendix E (cont'd) – Pendleton, April 1993.

	Location:	Inf-E	Ef-E	Runoff-1	Sludge	Sed-1	Sed-2	Sed-3
	Type:	E-comp	E-comp	grab	grab	grab	grab	grab
	Date:	4/20-21	4/20-21	4/20	4/20	4/23	4/23	4/23
	Time:	0800-0800	0800-0800	1130	1155	1145-1205	1235-1325	1345-1400
	Lab Log#:	178282	178286	178292	178291	178296	178297	178298
(Group)[1]	BNA Compounds	ug/L	ug/L	ug/L	ug/L	ug/Kg dry	ug/Kg dry	ug/Kg dry
n	Benzo(a)Pyrene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
l	2,4-Dinitrophenol	142 U	22.2 U	14.7 U	151 U	3280 U	3350 U	3700 U
n	Dibenzo(a,h)Anthracene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
n	Benzo(a)Anthracene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	4-Chloro-3-Methylphenol	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	Aniline	2.8 J	1.1 U	0.73 U	3.8 J	328 U	335 U	370 U
	Dimethylnitrosamine	7.1 U	1.1 U	0.73 U	7.5 U			
	Benzoic Acid	35.1	1.1 U	0.73 U	7.5 U	820 U	837 U	926 UJ
	Hexachloroethane	7.1 U	1.1 UJ	0.73 U	7.5 U	328 U	335 U	370 U
	Hexachlorocyclopentadiene	70.8 UJ	NAR	7.3 UJ	75.5 UJ	1640 U	1670 U	1850 UJ
	Isophorone	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
n	Acenaphthene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
i	Diethyl Phthalate	7.1 U	0.22 J	0.73 U	7.5 U	328 U	335 U	370 U
i	Di-n-Butyl Phthalate	53.6	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
n	Phenanthrene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
i	Butylbenzyl Phthalate	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
k	N-Nitrosodiphenylamine	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
n	Fluorene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	Carbazole	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	Hexachlorobutadiene	7.1 U	1.1 UJ	0.73 U	7.5 U	328 U	335 U	370 U
	Pentachlorophenol	35.4 U	5.6 U	3.7 U	37.7 U	328 U	335 U	370 U
	2,4,6-Trichlorophenol	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	2-Nitroaniline	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
l	2-Nitrophenol	17.7 U	2.8 U	1.8 U	18.9 U	820 U	837 U	926 U
	1-Methylnaphthalene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
n	Naphthalene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	2-Methylnaphthalene	7.1 U	1.1 UJ	0.73 U	7.5 U	328 U	335 U	370 U
m	2-Chloronaphthalene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	3,3'-Dichlorobenzidine	14.2 U	2.2 U	1.5 U	15.1 U	656 U	670 U	740 U
	Benzidine	14.2 U	2.2 U	1.5 U	15.1 U	656 U	670 U	740 U
	2-Methylphenol	1.7 J	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
h	1,2-Dichlorobenzene	7.1 U	1.1 UJ	0.73 U	7.5 U	328 U	335 U	370 U
	o-Chlorophenol	7.1 U	1.8	0.73 U	7.5 U	328 U	335 U	370 U
	2,4,5-Trichlorophenol	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	Nitrobenzene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	3-Nitroaniline	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	4-Nitroaniline	7.1 U	1.1 U	0.73 U	7.5 U	820 U	837 U	926 U
l	4-Nitrophenol	17.7 U	2.8 U	1.8 U	18.9 U	820 U	837 U	926 UJ
	Benzyl Alcohol	5.9 J	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
p	4-Bromophenyl Phenylether	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	2,4-Dimethylphenol	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	4-Methylphenol	28.0 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
h	1,4-Dichlorobenzene	7.1 U	1.1 UJ	0.73 U	7.5 U	328 U	335 U	370 U
	4-Chloroaniline	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 UJ
	Phenol	5.9 J	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	Pyridine	14.2 U	2.2 U	1.5 U	15.1 U			
j	Bis(2-Chloroethyl)Ether	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
j	Bis(2-Chloroethoxy)Methane	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
i	Bis(2-Ethylhexyl)Phthalate	34.3	2.4	0.74 U	152	328 U	335 U	370 U
i	Di-n-Octyl Phthalate	7.1 U	1.1 U	0.73 U	7.5 U	820 U	837 U	926 U
g	Hexachlorobenzene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
n	Anthracene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
g	1,2,4-Trichlorobenzene	7.1 U	1.1 UJ	0.73 U	7.5 U	328 U	335 U	370 U
	2,4-Dichlorophenol	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
o	2,4-Dinitrotoluene	17.7 U	2.8 U	1.8 U	18.9 U	820 U	837 U	926 U
n	Pyrene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
i	Dimethyl Phthalate	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	Dibenzofuran	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
n	Benzo(g,h,i)Perylene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
n	Indeno(1,2,3-cd)Pyrene	7.1 U	1.1 U	0.73 U	7.5 U	820 U	837 U	926 U
n	Benzo(b)Fluoranthene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
n	Fluoranthene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
n	Benzo(k)Fluoranthene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
n	Acenaphthylene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
n	Chrysene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	Retene	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
l	4,6-Dinitro-2-Methylphenol	70.8 U	11.1 U	7.3 U	75.5 U	820 U	837 U	926 U
h	1,3-Dichlorobenzene	7.1 U	1.1 UJ	0.73 U	7.5 U	328 U	335 U	370 U
o	2,6-Dinitrotoluene	17.7 U	2.8 U	1.8 U	18.9 U	820 U	837 U	926 U
k	N-Nitroso-di-n-Propylamine	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
p	4-Chlorophenyl Phenylether	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U
	1,2-Diphenylhydrazine	14.2 U	2.2 U	1.5 U	15.1 U	656 U	670 U	740 U
	Bis(20chloroisopropyl)-	7.1 U	1.1 U	0.73 U	7.5 U	328 U	335 U	370 U

Appendix E (cont'd) – Pendleton, April 1993.

	Location:	Inf-E	Inf-P	Ef-E	Ef-P	Runoff-1	Sludge	Sed-1	Sed-2	Sed-3
	Type:	E-comp	P-comp	E-comp	P-comp	grab	grab	grab	grab	grab
	Date:	4/20-21	4/20-21	4/20-21	4/20-21	4/20	4/20	4/23	4/23	4/23
	Time:	0800-0800	0800-0800	0800-0800	0800-0800	1130	1155	1145-1205	1235-1325	1345-1400
	Lab Log#:	178282	178283	178286	178287	178292	178291	178296	178297	178298
(Group)[1]	Pesticide/PCB Compounds	ug/L		ug/L		ug/L	ug/L	ug/Kg dry	ug/Kg dry	ug/Kg dry
q	alpha-BHC	0.05 U		0.05 U		0.05 U	0.05 UJ	4.0 U	3.2 U	4.0 U
q	beta-BHC	0.05 U		0.05 U		0.05 U	0.05 UJ	4.0 U	3.2 U	4.0 U
q	delta-BHC	0.05 U		0.05 U		0.05 U	0.07 UJ	4.0 U	3.2 U	4.0 U
q	gamma-BHC (Lindane)	0.064		0.05 U		0.05 U	0.05 UJ	4.0 U	3.2 U	4.0 U
r	Heptachlor	0.05 U		0.05 U		0.05 U	0.05 UJ	4.0 U	3.2 U	4.0 U
	Aldrin	0.05 U		0.05 U		0.05 U	0.05 UJ	4.0 U	3.2 U	4.0 U
r	Heptachlor Epoxide	0.05 U		0.05 U		0.05 U	0.05 UJ	4.0 U	3.2 U	4.0 U
s	Endosulfan I	0.05 U		0.05 U		0.05 U	0.05 UJ	4.0 U	3.2 U	4.0 U
	Dieldrin	0.10 U		0.10 U		0.10 U	0.84 J	8.0 U	6.4 U	8.0 U
u	4,4'-DDE	0.10 U		0.10 U		0.10 U	0.15 UJ	8.0 U	6.4 U	8.0 U
t	Endrin	1.1 NJ		0.10 U		0.10 U	0.10 UJ	8.0 U	6.4 U	8.0 U
s	Endosulfan II	0.10 UJ		0.10 U		0.10 U	0.10 UJ	8.0 U	6.4 U	8.0 U
u	4,4'-DDD	0.10 UJ		0.10 U		0.10 U	0.10 UJ	8.0 U	6.4 U	8.0 U
s	Endosulfan Sulfate	0.10 UJ		0.10 U		0.10 U	0.10 UJ	8.0 U	6.4 U	8.0 U
u	4,4'-DDT	0.10 UJ		0.10 U		0.10 U	0.10 UJ	8.0 U	6.4 U	8.0 U
	Methoxychlor	0.50 UJ		0.50 U		0.50 U	0.50 UJ	40 U	32 U	40 U
t	Endrin Ketone	0.038 J		0.10 U		0.10 U	0.10 UJ	8.0 U	6.4 U	8.0 U
t	Endrin Aldehyde	0.10 UJ		0.10 U		0.10 U	0.10 UJ	8.0 U	6.4 U	8.0 U
v	gamma-Chlordane	0.05 U		0.05 U		0.05 U	0.05 UJ	4.0 U	3.2 U	4.0 U
v	alpha-Chlordane	0.05 U		0.05 U		0.05 U	0.05 UJ	4.0 U	3.2 U	4.0 U
	Toxaphene	5.0 U		5.0 U		5.0 U	5.0 UJ	400 U	320 U	400 U
	Aroclor-1242/1016	1.0 U		1.0 U		1.0 U	1.0 UJ	80 U	64 U	80 U
w	Aroclor-1248	1.0 U		1.0 U		1.0 U	1.0 UJ	80 U	64 U	80 U
w	Aroclor-1254	1.0 U		1.0 U		1.0 U	1.0 UJ	80 U	64 U	80 U
w	Aroclor-1260	1.0 U		1.0 U		1.0 U	1.0 UJ	80 U	64 U	80 U
w	Aroclor-1221	4.0 U		2.0 U		2.0 U	4.0 UJ	160 U	128 U	160 U
w	Aroclor-1232	1.0 U		1.0 U		1.0 U	1.5 UJ	80 U	64 U	80 U
	Metals ***	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/Kg dry	mg/Kg dry	mg/Kg dry
	Antimony	30 U	30 U	30 U	30 U	30 U	30 U	3 UJ	3 UJ	3 UJ
	Arsenic	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	9.5 P	1.86	1.91	1.64
	Pentavalent									
	Trivalent									
	Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	0.15 P	0.15 P	0.11 P
	Cadmium	0.16 P	0.21 P	0.10 U	0.10 P	0.30 P	3.6 P	0.25 P	0.51 P	0.32 P
	Chromium	123	116	49 P	49 P	30 P	1190	11	10.9	16.8
	Hexavalent	10 U	10 U	10 U	10 U					
	Trivalent									
	Copper	23 P	56.3	23 P	29 P	16 P	98.8	6.59 B	6.75 B	6.63 B
	Lead	2.3 J	6.1 J	1.0 J	1.2 J	8.2 J	122	6.8 P	6.6 P	6.1 P
	Mercury	0.24 J	0.13 J	0.068 J	0.068 J	0.05 U	1.43 N	0.019 P	0.022 P	0.012 P
	Nickel	10 U	10 U	10 U	10 U	10 U	19 P	12.9	13.3	13.9
	Selenium	2.0 UN	2.0 UN	2.0 UN	2.0 UN	2.0 UN	10 P	0.40 U	0.40 U	0.40 U
	Silver	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	3 UJ	0.3 U	0.3 U	0.3 U
	Thallium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10.0 U	0.50 U	0.50 U	0.50 U
	Zinc	231	406	80.6	111	65.5	3630	72.9	71.1	68

[1]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.
- UJ The analyte was not detected at or above the reported estimated 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.
- N For metals analytes – the spike sample recovery is not within control limits.
- NJ There is evidence the analyte is present. The associated numerical result is an estimate.
- UN The analyte was not detected at or above the reported result and spike recovery was not within control limits.
- P The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.
- NAR no analytical result
- * Insufficient data to develop criteria. Value presented is the LOEL – Lowest Observed Effect Level.
- ** pH dependent criteria (7.8 pH used).
- *** metals results are total recoverable for log # 178282, 178283, 178286, 178287, & 178292 except for Hg – which is total. metals results are total for log # 178291, 179296, 178297, and 178298.
- + Hardness dependent criteria (45 mg/L used).

- a Total Halomethanes
- b Total Dichloroethenes
- c Total Trichloroethanes
- d Total Dichloropropanes
- e Total Dichloropropenes
- f Total Tetrachloroethanes
- g Total Chlorinated Benzenes (excluding Dichlorobenze
- h Total Dichlorobenzenes
- i Total Phthalate Esters
- j Total Chloroalkyl Ethers
- k Total Nitrosamines
- l Total Nitrophenols
- 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)

Appendix F – Tentatively Identified Compounds (TICs) – Pendleton, April 1993.

TICs are noted on the attached lab data sheets. The sample numbers on the data sheets correspond to the lab log numbers noted below.

Location:	Inf–1	Inf–2	Inf–E	Ef–E	Runoff–1	Sludge
Type:	grab	grab	E-comp	E-comp	grab	grab
Date:	4/20	4/20	4/20–21	4/20–21	4/20	4/20
Time:	0935	1700	0800–0800	0800–0800	1130	1155
Lab Log#:	178280	178281	178282	178286	178292	178291

J The analyte was positively identified. The associated numerical result is an estimate.
NJ There is evidence the analyte is present. The associated numerical result is an estimate.

ANALYTICAL
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ORGANIC ANALYSIS DATA SHEET - Tentatively Identified Compounds

Sample No: 178280

Lab ID: D606A
Matrix: Water

QC Report No: D606-WDOE
Project No: Pendelton Class II

Data Release Authorized: _____
Report: 05/13/93-MAC:GaT

Date Received: 04/23/93

	CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (µg/L)	
1	~~-~~	~~Unknown (bp m/e 44)~~	~~VOA~~	~~210~~	~~3 JB~~	KF
2	-	Unknown (bp m/e 45)	"	290	21 J	
3	~~-~~	~~Silane isomer (bp m/e 281)~~	"	~~899~~	~~9 JB~~	KF
4	-	Unknown (bp m/e 57)	"	1039	120 J	
5	~~-~~	~~Silane isomer (bp m/e 73)~~	"	~~1078~~	~~12 JB~~	KF
6						
7						
8						
9						
10						
11						
12						
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17						
18						
19						
20						
21						
22						
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30						

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ORGANIC ANALYSIS DATA SHEET - Tentatively Identified Compounds

Sample No: 178281

Lab ID: D606B
Matrix: Water

QC Report No: D606-WDOE
Project No: Pendelton Class II

Data Release Authorized: _____
Report: 05/07/93-MAC:GaT

Date Received: 04/23/93

	CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (µg/L)	
1	~~-~~	~~Silane isomer (bp m/e 281)~~	~~VOA~~	~~899~~	~~3 JB~~	KF
2	-	Unknown (bp m/e 57)	"	1039	140 J	
3	~~-~~	~~Silane isomer (bp m/e 73)~~	"	~~1078~~	~~7 JB~~	KF
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
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30						

Project: DOE-714Y PENDELTON Officer: MRH Account: D3800

Laboratory: Ecology, Manchester

Sample No: 93 176282 Description: INF-E Source: Industrial Inplant Waters

Begin Date: 93/04/21 :

B/N/Acid Scan *** Continued ***	Water-Total Result	Units
Di-n-Octyl Phthalate	7.1U	ug/l
HEXACHLOROBENZENE	7.1U	ug/l
Anthracene	7.1U	ug/l
1,2,4-Trichlorobenzene	7.1U	ug/l
2,4-Dichlorophenol	7.1U	ug/l
2,4-Dinitrotoluene	17.7U	ug/l
Pyrene	7.1U	ug/l
Dimethylphthalate	7.1U	ug/l
Dibenzofuran	7.1U	ug/l
Benzo(ghi)perylene	7.1U	ug/l
Indeno(1,2,3-cd)pyrene	7.1U	ug/l
Benzo(b)fluoranthene	7.1U	ug/l
Fluoranthene	7.1U	ug/l
Benzo(k)fluoranthene	7.1U	ug/l
Acenaphthylene	7.1U	ug/l
Chrysene	7.1U	ug/l
Retene	7.1U	ug/l
4,6-Dinitro-2-methylph+	70.8U	ug/l
1,3-Dichlorobenzene	7.1U	ug/l
2,6-Dinitrotoluene	17.7U	ug/l
N-Nitroso-di-n-Propyla+	7.1U	ug/l
4-Chlorophenyl-phenyle+	7.1U	ug/l
1,2-Diphenylhydrazine	14.2U	ug/l
BIS(2OCHLOROISOPROPYL)+	7.1U	ug/l
Surrog: 2-Fluorobiphen+	87	% Recov
2-Fluorophenol	86	% Recov
Surrog: 2,4,6-Tribromo+	107	% Recov
Terphenyl-d14	89	% Recov
Pyrene-d10	NAF	% Recov
1,2-DICHLOROBENZENE-D4	86	% Recov
Surrog: D5-Nitrobenzene	101	% Recov
Surrog: Phenol D5	79	% Recov
D4-2-CHLOROPHENOL (SS)	93	% Recov

Tent Ident - B/N/Aci *** Continued ***	Water-Total Result	Units
OCTANOIC ACID	11.4NJ*	ug/l
Decanoic Acid, Di-	159NJ*	ug/l
Heptadecanoic acid	89.5NJ*	ug/l
Decanoic Acid, Tetra-	410NJ*	ug/l
Ethanol, 2-[(2-ethylhe+	9.8NJ*	ug/l
9-HEXADECENOIC ACID	326NJ*	ug/l
UNKNOWN HYDROCARBON 1	127NJ*	ug/l
UNKNOWN HYDROCARBON 2	274NJ*	ug/l
UNKNOWN HYDROCARBON 3	229NJ*	ug/l
UNKNOWN COMPOUND 1	17.1NJ*	ug/l
UNKNOWN COMPOUND 2	118NJ*	ug/l
UNKNOWN COMPOUND 3	93.6NJ*	ug/l
UNKNOWN COMPOUND 4	95.3NJ*	ug/l
UNKNOWN COMPOUND 5	149NJ*	ug/l
UNKNOWN COMPOUND 7	128NJ*	ug/l
UNKNOWN COMPOUND 8	89.8NJ*	ug/l
UNKNOWN COMPOUND 10	615NJ*	ug/l

Ion Chromatography	Water-Filtere Result	Units
Chloride	8.3 *	mg/l

Tent Ident - B/N/Aci	Water-Total Result	Units
Decanoic Acid, Hexa-	2920NJ*	ug/l
OCTADECANOIC ACID	1280NJ*	ug/l
1-Hexanol, 2-Ethyl-	725NJ*	ug/l
ETHANOL, 2-BUTOXY-	423NJ*	ug/l
ETHANOL, 2-(2-BUTOXYET+	144NJ*	ug/l
9-OCTADECENOIC ACID (Z+	5780NJ*	ug/l

(Sample Complete)

Project: DOE-714Y PENDELTON Officer: MRH Account: D3800

Laboratory: Ecology, Manchester

Sample No: 93 178286 Description: EF-E Source: Industrial Effluent

Begin Date: 93/04/21 :

B/N/Acid Scan *** Continued *** Matrix Spike #2	Water-Total Result	Units
2-Methylphenol	82	% Recov
1,2-Dichlorobenzene	32	% Recov
o-Chlorophenol (2-Chlo+	73	% Recov
2,4,5-Trichlorophenol	95	% Recov
Nitrobenzene	75	% Recov
3-Nitroaniline	83	% Recov
4-Nitroaniline	88	% Recov
4-Nitrophenol	89	% Recov
Benzyl Alcohol	81	% Recov
4-Bromophenyl-phenylet+	84	% Recov
2,4-Dimethylphenol	86	% Recov
4-Methylphenol	83	% Recov
1,4-Dichlorobenzene	30	% Recov
4-Chloroaniline	73	% Recov
Phenol	76	% Recov
Pyridine	NAF	% Recov
bis(2-Chloroethyl)Ether	68	% Recov
bis(2-Chloroethoxy)Met+	80	% Recov
BIS(2-ETHYLHEXYL) PHTH+	83	% Recov
Di-n-Octyl Phthalate	82	% Recov
HEXACHLOROBENZENE	86	% Recov
Anthracene	85	% Recov
1,2,4-Trichlorobenzene	38	% Recov
2,4-Dichlorophenol	86	% Recov
2,4-Dinitrotoluene	96	% Recov
Pyrene	86	% Recov
Dimethylphthalate	91	% Recov
Dibenzofuran	80	% Recov
Benzo(ghi)perylene	85	% Recov
Indeno(1,2,3-cd)pyrene	90	% Recov
Benzo(b)fluoranthene	92	% Recov
Fluoranthene	84	% Recov
Benzo(k)fluoranthene	84	% Recov
Acenaphthylene	75	% Recov
Chrysene	86	% Recov
Surrog: 2-Fluorobiphen+	60	% Recov
2-Fluorophenol	69	% Recov
Retene	NAF	% Recov
4,6-Dinitro-2-methylph+	64	% Recov
1,3-Dichlorobenzene	26	% Recov
2,6-Dinitrotoluene	98	% Recov
N-Nitroso-di-n-Propyla+	75	% Recov
Terphenyl-d14	81	% Recov
Pyrene-d10	NAF	% Recov

B/N/Acid Scan *** Continued *** Matrix Spike #2	Water-Total Result	Units
1,2-DICHLOROBENZENE-D4	38	% Recov
Surrog: D5-Nitrobenzene	79	% Recov
Surrog: Phenol D5	77	% Recov
4-Chlorophenyl-phenyle+	80	% Recov
1,2-Diphenylhydrazine	NAF	% Recov
BIS(20CHLOROISOPROPYL)+	70	% Recov
D4-2-CHLOROPHENOL (SS)	75	% Recov
Surrog: 2,4,6-Tribromo+	96	% Recov

Tent Ident - B/N/Aci	Water-Total Result	Units
Decanoic Acid, Hexa-	21.6NJ*	ug/l
OCTADECANOIC ACID	9.7NJ*	ug/l
Oleic acid	14.2NJ*	ug/l
ETHANOL, 2-(2-BUTOXYET+	3.0NJ*	ug/l
Decanoic Acid, Tetra-	1.8NJ*	ug/l
Decanoic Acid, Penta-	1.0NJ*	ug/l
9-HEXADECENOIC ACID	13.9NJ*	ug/l
UNKNOWN COMPOUND 1	0.67NJ*	ug/l
UNKNOWN COMPOUND 2	2.0NJ*	ug/l
UNKNOWN COMPOUND 3	0.77NJ*	ug/l
UNKNOWN COMPOUND 4	0.92NJ*	ug/l
UNKNOWN COMPOUND 5	1.3NJ*	ug/l
UNKNOWN COMPOUND 6	2.6NJ*	ug/l
UNKNOWN COMPOUND 7	6.6NJ*	ug/l
Butane, 1-(2-methoxyet+	8.2NJ*	ug/l
Ethanol, 1-(2-Butoxyet+	18.3NJ*	ug/l

Ion Chromatography	Water-Filtere Result	Units
Chloride	10.6 *	mg/l

(Sample Complete)

Project: DOE-714Y PENDELTON Officer: MRH Account: D3800

Laboratory: Ecology, Manchester

Sample No: 93 178292 Description: RUNOFF-1 Source: Water (General)

Begin Date: 93/04/20 :

B/N/Acid Scan *** Continued ***	Water-Total Result	Units
2-Chloronaphthalene	0.73U	ug/l
3,3'-Dichlorobenzidine	1.5U	ug/l
Benzidine	1.5U	ug/l
2-Methylphenol	0.73U	ug/l
1,2-Dichlorobenzene	0.73U	ug/l
o-Chlorophenol (2-Chlo+	0.73U	ug/l
2,4,5-Trichlorophenol	0.73U	ug/l
Nitrobenzene	0.73U	ug/l
3-Nitroaniline	0.73U	ug/l
4-Nitroaniline	0.73U	ug/l
4-Nitrophenol	1.8U	ug/l
Benzyl Alcohol	0.73U	ug/l
4-Bromophenyl-phenylet+	0.73U	ug/l
2,4-Dimethylphenol	0.73U	ug/l
4-Methylphenol	0.73U	ug/l
1,4-Dichlorobenzene	0.73U	ug/l
4-Chloroaniline	0.73U	ug/l
Phenol	0.73U	ug/l
Pyridine	1.5U	ug/l
bis(2-Chloroethyl)Ether	0.73U	ug/l
bis(2-Chloroethoxy)Met+	0.73U	ug/l
BIS(2-ETHYLHEXYL) PHTH+	0.74U	ug/l
Di-n-Octyl Phthalate	0.73U	ug/l
HEXACHLOROBENZENE	0.73U	ug/l
Anthracene	0.73U	ug/l
1,2,4-Trichlorobenzene	0.73U	ug/l
2,4-Dichlorophenol	0.73U	ug/l
2,4-Dinitrotoluene	1.8U	ug/l
Pyrene	0.73U	ug/l
Dimethylphthalate	0.73U	ug/l
Dibenzofuran	0.73U	ug/l
Benzo(ghi)perylene	0.73U	ug/l
Indeno(1,2,3-cd)pyrene	0.73U	ug/l
Benzo(b)fluoranthene	0.73U	ug/l
Fluoranthene	0.73U	ug/l
Benzo(k)fluoranthene	0.73U	ug/l
Acenaphthylene	0.73U	ug/l
Chrysene	0.73U	ug/l
Retene	0.73U	ug/l
4,6-Dinitro-2-methylph+	7.3U	ug/l
1,3-Dichlorobenzene	0.73U	ug/l
2,6-Dinitrotoluene	1.8U	ug/l
N-Nitroso-di-n-Propyla+	0.73U	ug/l
4-Chlorophenyl-phenyle+	0.73U	ug/l

B/N/Acid Scan *** Continued ***	Water-Total Result	Units
1,2-Diphenylhydrazine	1.5U	ug/l
BIS(20CHLOROISOPROPYL)+	0.73U	ug/l
Surrog: 2-Fluorobiphen+	63	% Recov
2-Fluorophenol	62	% Recov
Surrog: 2,4,6-Tribromo+	94	% Recov
Terphenyl-d14	71	% Recov
Pyrene-d10	NAF	% Recov
1,2-DICHLOROBENZENE-D4	62	% Recov
Surrog: D5-Nitrobenzene	75	% Recov
Surrog: Phenol D5	56	% Recov
D4-2-CHLOROPHENOL (SS)	71	% Recov

Tent Ident - B/N/Aci	Water-Total Result	Units
Decanoic Acid, Hexa-	5.0NJ*	ug/l
OCTADECANOIC ACID	1.4NJ*	ug/l
Decanoic Acid, Tetra-	1.2NJ*	ug/l
9-HEXADECENOIC ACID	2.3NJ*	ug/l
UNKNOWN HYDROCARBON 1	2.6NJ*	ug/l
UNKNOWN HYDROCARBON 2	2.6NJ*	ug/l
UNKNOWN HYDROCARBON 3	2.1NJ*	ug/l
UNKNOWN COMPOUND 3	1.4NJ*	ug/l
UNKNOWN COMPOUND 4	0.84NJ*	ug/l
UNKNOWN COMPOUND 5	3.5NJ*	ug/l
UNKNOWN COMPOUND 6	1.5NJ*	ug/l
UNKNOWN COMPOUND 7	1.9NJ*	ug/l
UNKNOWN COMPOUND 8	1.5NJ*	ug/l
UNKNOWN COMPOUND 9	16.0NJ*	ug/l
UNKNOWN COMPOUND 10	2.8NJ*	ug/l
UNKNOWN COMPOUND 11	2.9NJ*	ug/l

Ion Chromatography	Water-Filtere Result	Units
Chloride	2.8 *	mg/l

(Sample Complete)

Project: DOE-714Y PENDELTON Officer: MRH Account: D3800

Laboratory: Ecology, Manchester

Sample No: 93 178291 Description: SLUDGE Source: Sludge (General)

Begin Date: 93/04/20 :

B/N/Acid Scan *** Continued ***	Water-Total Result	Units
2-Methylnaphthalene	7.5U	ug/l
2-Chloronaphthalene	7.5U	ug/l
3,3'-Dichlorobenzidine	15.1U	ug/l
Benzidine	15.1U	ug/l
2-Methylphenol	7.5U	ug/l
1,2-Dichlorobenzene	7.5U	ug/l
o-Chlorophenol (2-Chlo+	7.5U	ug/l
2,4,5-Trichlorophenol	7.5U	ug/l
Nitrobenzene	7.5U	ug/l
3-Nitroaniline	7.5U	ug/l
4-Nitroaniline	7.5U	ug/l
4-Nitrophenol	18.9U	ug/l
Benzyl Alcohol	7.5U	ug/l
4-Bromophenyl-phenylet+	7.5U	ug/l
2,4-Dimethylphenol	7.5U	ug/l
4-Methylphenol	7.5U	ug/l
1,4-Dichlorobenzene	7.5U	ug/l
4-Chloroaniline	7.5U	ug/l
Phenol	7.5U	ug/l
Pyridine	15.1U	ug/l
bis(2-Chloroethyl)Ether	7.5U	ug/l
bis(2-Chloroethoxy)Met+	7.5U	ug/l
BIS(2-ETHYLHEXYL) PHTH+	152 *	ug/l
Di-n-Octyl Phthalate	7.5U	ug/l
HEXACHLOROBENZENE	7.5U	ug/l
Anthracene	7.5U	ug/l
1,2,4-Trichlorobenzene	7.5U	ug/l
2,4-Dichlorophenol	7.5U	ug/l
2,4-Dinitrotoluene	18.9U	ug/l
Pyrene	7.5U	ug/l
Dimethylphthalate	7.5U	ug/l
Dibenzofuran	7.5U	ug/l
Benzo(ghi)perylene	7.5U	ug/l
Indeno(1,2,3-cd)pyrene	7.5U	ug/l
Benzo(b)fluoranthene	7.5U	ug/l
Fluoranthene	7.5U	ug/l
Benzo(k)fluoranthene	7.5U	ug/l
Acenaphthylene	7.5U	ug/l
Chrysene	7.5U	ug/l
Retene	7.5U	ug/l
4,6-Dinitro-2-methylph+	75.5U	ug/l
1,3-Dichlorobenzene	7.5U	ug/l
2,6-Dinitrotoluene	18.9U	ug/l
N-Nitroso-di-n-Propyla+	7.5U	ug/l

B/N/Acid Scan *** Continued ***	Water-Total Result	Units
4-Chlorophenyl-phenyle+	7.5U	ug/l
1,2-Diphenylhydrazine	15.1U	ug/l
BIS(20CHLOROISOPROPYL)+	7.5U	ug/l
Surrog: 2-Fluorobiphen+	41	% Recov
2-Fluorophenol	61	% Recov
Surrog: 2,4,6-Tribromo+	78	% Recov
Terphenyl-d14	40	% Recov
Pyrene-d10	NAF	% Recov
1,2-DICHLOROBENZENE-D4	65	% Recov
Surrog: D5-Nitrobenzene	71	% Recov
Surrog: Phenol D5	49	% Recov
D4-2-CHLOROPHENOL (SS)	67	% Recov

Tent Ident - B/N/Aci	Water-Total Result	Units
Decanoic Acid, Hexa-	512NJ*	ug/l
Thymine	7.4NJ*	ug/l
Decanoic Acid, Tetra-	62.1NJ*	ug/l
Decanoic Acid, Penta-	27.4NJ*	ug/l
9-HEXADECENOIC ACID	842NJ*	ug/l
TETRADECANOIC ACID, 12+	21.4NJ*	ug/l
Benzofuran, 2-ethenyl	6.3NJ*	ug/l
UNKNOWN COMPOUND 1	9.0NJ*	ug/l
UNKNOWN COMPOUND 1	13.4NJ*	ug/l
UNKNOWN COMPOUND 2	16.8NJ*	ug/l
UNKNOWN COMPOUND 3	8.2NJ*	ug/l
UNKNOWN COMPOUND 4	7.1NJ*	ug/l
UNKNOWN COMPOUND 5	16.1NJ*	ug/l
UNKNOWN COMPOUND 6	72.6NJ*	ug/l
UNKNOWN COMPOUND 8	28.7NJ*	ug/l
UNKNOWN COMPOUND 9	60900NJ*	ug/l

(Sample Complete)

Appendix G - GLOSSARY

ABN	Acid base-neutral, semivolatile organics, see BNA
AED	Atomic Emission Detector
BNA	Base-neutral acids, semivolatiles, see ABN
BOD	Biological Oxygen Demand
CLP	Contract Laboratory Program
COD	Chemical Oxygen Demand
co-elutants	When two or more compounds have the same chromatographic retention time
CVAA	Cold Vapor Atomic Absorption
d-deuterium	An isotope of hydrogen
DL	Detection Limit
DOC	Dissolved Organic Carbon
DW	Dangerous Waste
ECD	Electron Capture Detector-Sensitive to halogen compounds - use: halogenated hydrocarbons
EHW	Extremely Hazardous Waste
ELD	Electrolytic Detector - Hall
EP TOX	Extraction Procedure Toxicity
Fatty Acid	Monobasic organic acids derived from hydrocarbons; include both saturated and unsaturated acids
FID	Flame Ionization Detector-Sensitive to carbon compounds, used in the determination of hydrocarbons
Flash Point	Minimum temperature that will enable combustion or explosions to take place
FTIR	Fourier Transform Infra-Red
GC	Gas Chromatography
GCMS	Gas Chromatography Mass Spectrometry, also GC/MS
HC	Hydrocarbon
HDPE	High Density Polyethylene
HH	Halogenated Hydrocarbon
HPLC	High Performance Liquid Chromatography
HSD	Halogen-Specific Detector - use: halogenated hydrocarbons
HW	Hazardous Waste
HWPAH	Hazardous Waste Polynuclear Aromatic Hydrocarbon
ICP	Inductively Coupled Plasma
ICP/MS	Inductively Coupled Plasma/Mass Spectrometry
IDL	Instrument Detection Limit
isomer	One of two or more substances which have the same elementary composition but differ in structure and hence in properties
isotope	One of two or more nuclides having the same atomic number, but differing in mass number

Isotopically labelled	The substitution of one or more isotopes for elements in a compound
kg	kilogram (1 X 10^3 grams)
L	Liter (1 X 10^3 milliliters)
LC50	Concentration which is lethal to 50% of the test organisms
LOD	Limit of Detection
LOEC	Lowest Observable Effect Concentration
m^3	Cubic meter (1 X 10^3 liters)
MBAS	Methylene Blue Active substances
metalloids	Elements that exhibit transitional characteristics between metals and non-metals, examples include silver, selenium, antimony
MF	Membrane Filter
mg	milligram (1 X 10^{-3} grams)
mL	Milliliter (1 X 10^{-3} liters)
MPN	Most Probable Number
ng	Nanogram (1 X 10^{-9} grams)
nm	Nanometer (1 X 10^{-9} meters)
NOEC	No Observable Effect Concentration
NPDES	National Pollution Discharge Elimination System
NPOC	Non-Purgeable Organic Carbon
NTU	Nephelometric Turbidity Unit
OSHA	Occupation Safety and Health Administration
OSW	Office of Solid Waste
PCB	Polychlorinated Biphenyl
PE	Polyethylene
pg	Picogram (1 X 10^{-12} grams)
pH	Hydrogen Ion Concentration
PID	Photoionization Detector - use: aromatic hydrocarbons
PLM	Polarized Light Microscopy
POC	Purgeable Organic Carbon
Polyvalent	Capable of having more than one valance state
PP	Priority Pollutant
ppb	Parts per billion (1 X 10^{-9} ug/L or ug/kg)
ppm	Parts per million (1 X 10^{-6} ug/L or ug/kg)
ppt	Parts per thousand (1 X 10^{-3} ug/L or ug/kg)
PQL	Practical Quantitation Limit
PUF	Polyurethane Foam
SDWA	State Drinking Water Act
SOW	Statement of Work
SW	Solid Waste

TC	Target Compounds or Total Carbon
TCD	Thermal Conductivity Detector
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TIC	Total Inorganic Carbon or for GCMS Tentatively Identified Compound
TNVS	Total Non-Volatile Solids
TNVSS	Total Non-Volatile Suspended Solids
TOC	Total Organic Carbon
TP	Total Phosphorous
TPH	Total Petroleum Hydrocarbons
TS	Total Solids
TSS	Total Suspended Solids
TVS	Total Volatile Solids
ug	Microgram (1×10^{-6} grams)
ug/m^3	Microgram per cubic meter
VOA	Volatile Organic Analysis
VOC	Volatile Organic Carbon
ZHE	Zero Headspace Extractor